

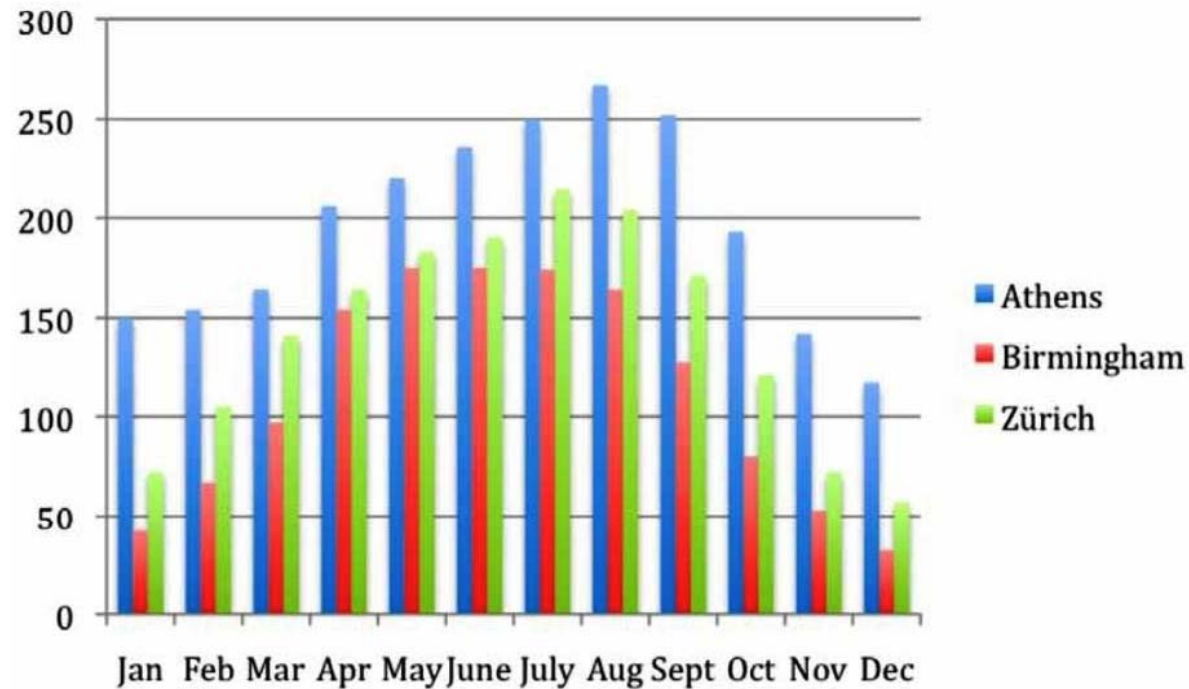
# Solar Heating Systems Site Commissioning

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Commissioning Authority

# Why Greece is a blessed country?

ΓΕΝΙΚΗ ΣΥΝΕΛΥΣΗ ΕΒΗΕ 31/1/2020



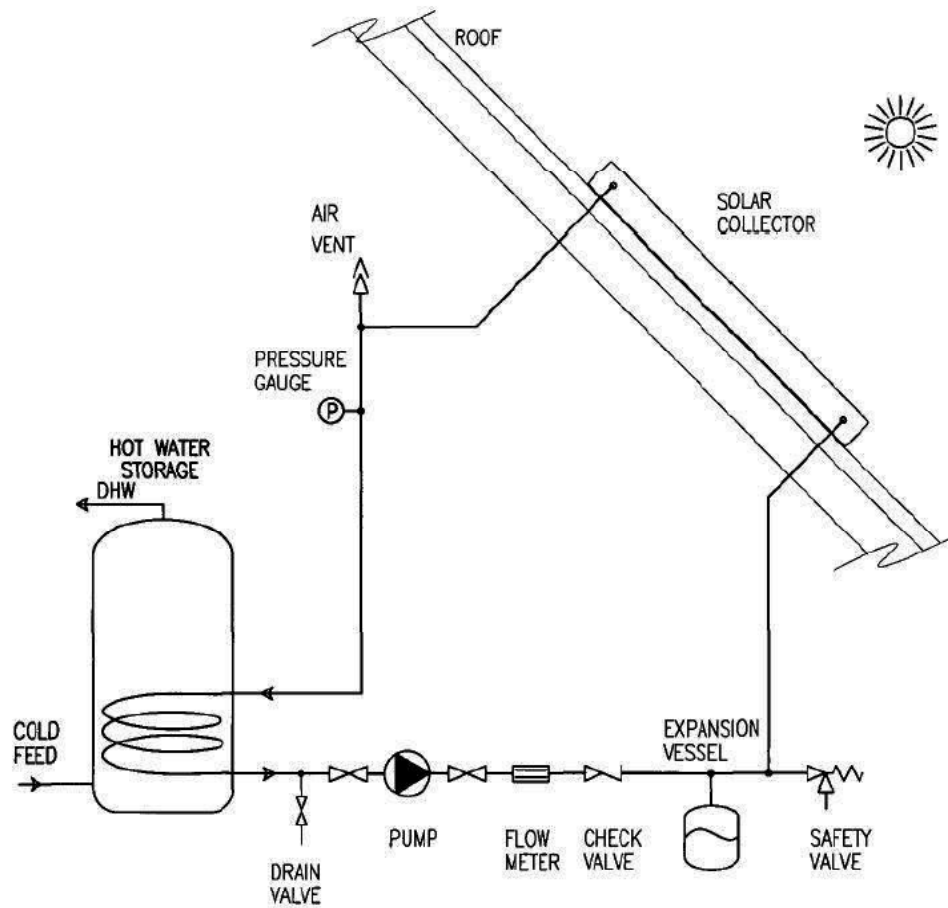
Monthly solar irradiance (kWh) on a flat plane facing South with a tilt angle of 45°

Data BS EN 15316-4-3:2007

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# Lets start discussing ...

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Source: CIRSE Solar Heating Design and Installation Guide

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# EN 12977-1

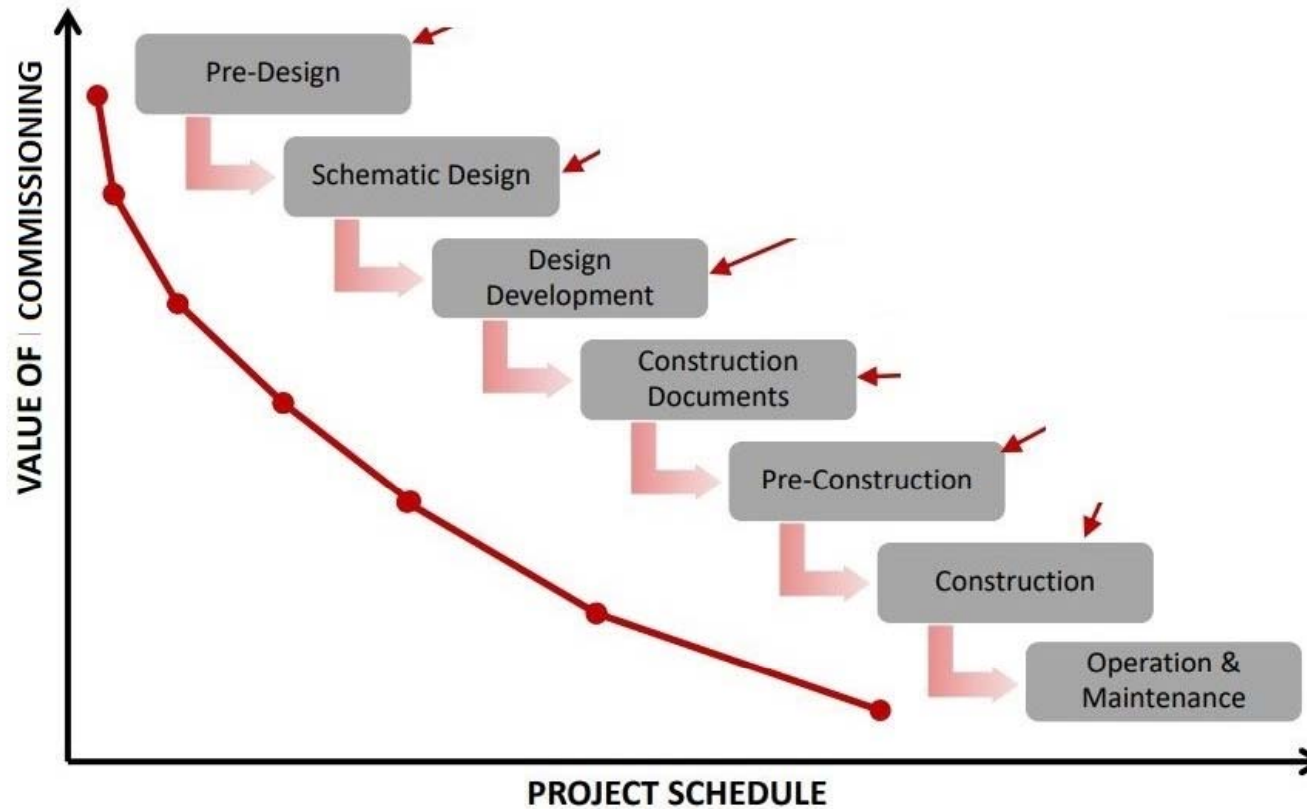
**Custom built solar heating systems  
(EN 12977-1:2018, EN 12977-2:2018,  
EN 12977-3:2018, EN 12977-4:2018 and  
EN 12977-5:2018)**

Forced circulation systems for hot water preparation and/or space heating/cooling, assembled using components and configurations described in a documentation file (mostly small systems)

Uniquely designed and assembled systems for hot water preparation and/or space heating/cooling (mostly large systems)

# Commissioning Process

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# EN 12977-2

- ΓΕΝΙΚΗ ΣΥΝΕΛΥΣΗ ΕΒΗΕ 31/1/2020
- Test methods
  - Components and pipe work
  - Safety equipment and indicators
  - Installation
  - Initial operation, inspection and commissioning.
  - System performance

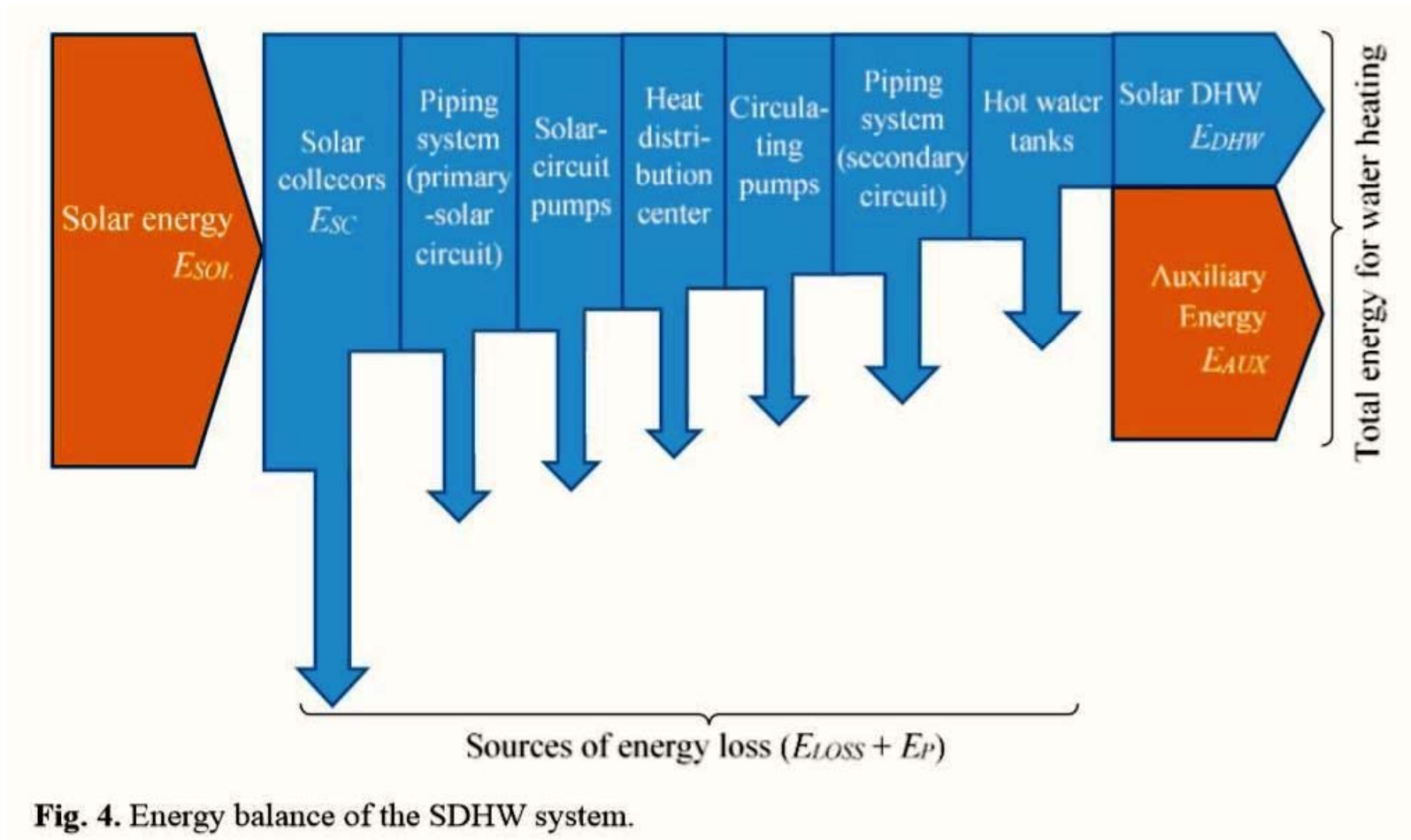
# EN 12977-2

- Optional performance test (small systems)
- Long term performance prediction
- Performance test reports
- Annex A: Reference conditions
- Annex B: Additional info

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# Inefficiencies in a STS - 2

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**Fig. 4.** Energy balance of the SDHW system.



# SIMULATION PROGRAM

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## Results of annual simulation

Installed collector power: flat-plate collector	4,20 kW	
Installed solar surface area (gross): 5,00 m <sup>2</sup>	6 m <sup>2</sup>	
Irradiation on to collector surface (active):	6,92 MWh	1.153,16 kWh/m <sup>2</sup>
Energy delivered by collectors:	2.151,20 kWh	358,53 kWh/m <sup>2</sup>
Energy delivered by collector loop:	1.870,98 kWh	311,83 kWh/m <sup>2</sup>
DHW heating energy supply:	2709,87 kWh	
Solar contribution to DHW:	1870,98 kWh	
Energy from auxiliary heating:	1337,08 kWh	
<b>Natural gas (H) savings:</b>		<b>278,5 m<sup>3</sup></b>
<b>CO2 emissions avoided:</b>		<b>588,92 kg</b>
<b>DHW solar fraction:</b>		<b>58,3 %</b>
<b>Fractional energy savings (EN 12976):</b>		<b>57,8 %</b>
<b>System efficiency:</b>		<b>27,0 %</b>

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# Pre-commissioning checks

Pre-Cx checks

ΓΕΝΙΚΗ ΣΥΝΕΛΥΣΗ ΕΒΗΕ 31/1/2020

	ISSUE	MORE	OK	NOK	REMARKS
1	Water contamination	Check the design of all circuits to avoid water contamination for backflow from all circuits to drinking main supplies	<input type="radio"/>	<input type="radio"/>	
2	Scald protection	Check the design plan to see an automatic cold water mixing device	<input type="radio"/>	<input type="radio"/>	
3	High-temperatures	Check the hydraulic scheme for peak temps & longer stagnation	<input type="radio"/>	<input type="radio"/>	
4	Reverse circulation	Check the hydraulic scheme to ensure that no unintended reverse circulation will occur.	<input type="radio"/>	<input type="radio"/>	
5	Pressure resistance	Check individual working pressures for Store & heat exchangers for 1,5 times the pressure	<input type="radio"/>	<input type="radio"/>	
6		Check if the systems documentation for the installer describes a pressure resistance test for the collector loop.	<input type="radio"/>	<input type="radio"/>	
7	Materials	Check if the documentation includes info about the durability of the materials exposed to weathering with regards to UV radiation and other conditions.	<input type="radio"/>	<input type="radio"/>	

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# Commissioning Checks

Cx checks

ΓΕΝΙΚΗ ΣΥΝΕΛΥΣΗ ΕΒΗΕ 31/1/2020

	ISSUE	MORE	OK	NOK	REMARKS
1	Check of the short-term	Compare the measured solar heating system gain with the one predicted by Simulation using the actual weather and operating conditions as measured during the short-term test	<input type="radio"/>	<input type="radio"/>	
2	Short-term test	Detail measurements include the energy gain of the collector array and the energy balance of the stores.	<input type="radio"/>	<input type="radio"/>	
3		Comparing the observed and simulated energy gives a validation of collector and storage design parameters and the measured data for the collector array are also used for direct identification of the collector array parameters.	<input type="radio"/>	<input type="radio"/>	
4		When the parameters of the the components are verified the long-term prediction of the system gain is enabled	<input type="radio"/>	<input type="radio"/>	
5		A detection of possible sources of system malfunctioning.	<input type="radio"/>	<input type="radio"/>	
		The difference between predicted and			

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