

Solar Installation for Hot Water Perparation – “Roza” Hotel

Site and conditions

Name of the project	"Roza" Hotel
Meteorological Station	Varna
Annual solar radiation (slopped) MWh/ m ²	1.3824
Average annual temperature °C	12.22
Average annual wind speed m/s	4.37
Desired water temperature °C	60
Quantity of consumed hot water L/d	3790
Number of analyzed months	6.95

System characteristics

Type of installation	Active bi-valent
Conventional energy source	Electricity
Seasonal efficiency %	85
Solar collector Type	flat
Manufacturer	Heliotech
Model	HI-32T
Effective area m ²	2.8
Fr (tau alpha) coefficient	0.7
Wind correction for Fr (tau alpha) s/r	0
Fr UL coefficient (W/ m ²)/°C	3.5
Wind correction for Fr U (J/m ²)/°C	0
Optimum number of collectors	19
Number of collectors	21
Total collector area m ²	59.8
Ratio: accum. volume/collector area L/ m ²	45.9
Total accumulating volume L	2747.1
Pump power for 1 sq.m. collector area W/ m ²	10
Installation losses 0 - 1	0.01
Losses-contamination or snow-falls on the collectors 0-1	0.03
Horizontal distance - collectors: boiler-house r	5
Number of floors-collectors: boiler-house	2

Annual energy production

Pump energy MWh	0.8391
Specific contribution kWh/m ²	450.01
System efficiency %	0.4466
Solar contribution (for analysed months) %	0.6147
Utilised solar energy MWh	26.933
kWh	26932

Calculation of heat requirements

Number analyzed months	6.95
Type of installation	active
Configuration	accumulating volume
Type building consumer	Hotel

Number of consumers number	100
Occupancy percentage	0-11
Expected consumption (at »60 °C) L/d	3790
Hot ater consumption L/d	4790
Desired water temperature °C	60
Number of days per week d	7
Pool Type	Outdoor
Area m ²	48
Cover utilisation h/day	16
Desired pool temperature °C	27
Coefficient of "wind-blowing"	0.2
Factor of shadowing of pool 0 - 1	0.2
Cold water temperature	Min. °C 8.7163 Max. °C 15.716
Number of months for system utilisation	6.95
Energy requirements for analyzed months MWh	43.813

Annual energy balance

Supplied renewable energy MWh	26.933
Required additional electricity MWh	0.8391

Financial parameters

Conventional energy price BGL/kWh	0.12
Energy price increase %	20
Inflation %	6
Installation life-time	25

Project costs and savings

Total costs		
Study	1.1%	BGL 240
Design	1.1%	BGL 240
Engineering	1.1%	BGL 240
Equipment	68.4%	BGL 15592
Installation balance	23.1%	BGL 5271.2
Others	5.3%	BGL 1199.2
TOTAL:		22 782 BGL

Financial parameters

Net Present Value - NPV	BGL 99639
Annual Life Cycle Savings	BGL 10977
Profit index	4.4
IRR and ROI %	23.8