Layout Document

Project number:	**77152185**
Prepared:	
Description	

Property	Museum of the Future
Country	UAE

Installer:	Middle East Industrial Services & Commercial Agencies (MEISCA)
Street	
Post Code / Town	Dubai
Phone	
Fax / Mobilephone:	
E-Mail:	

Notes:

- The solar quotation is prepared as per information provided by MEISCA
- The daily demand of 3500l @ 62°C can be achieved with 20 x SOL 27 Premium W loading 3 x SBB 1000 WP SOL. Each DHW cylinder is backed up with 12 kW electrical booster
- The circulating pump for solar collectors has to be arranged on-site. Suggestion: Grundfos 25 - 80
- The simulation shows that the solar collector covers around 86% of the total DHW demand. The rest has to be covered with electrical boosters

Solutions:

- List of materials and solar simulation are included
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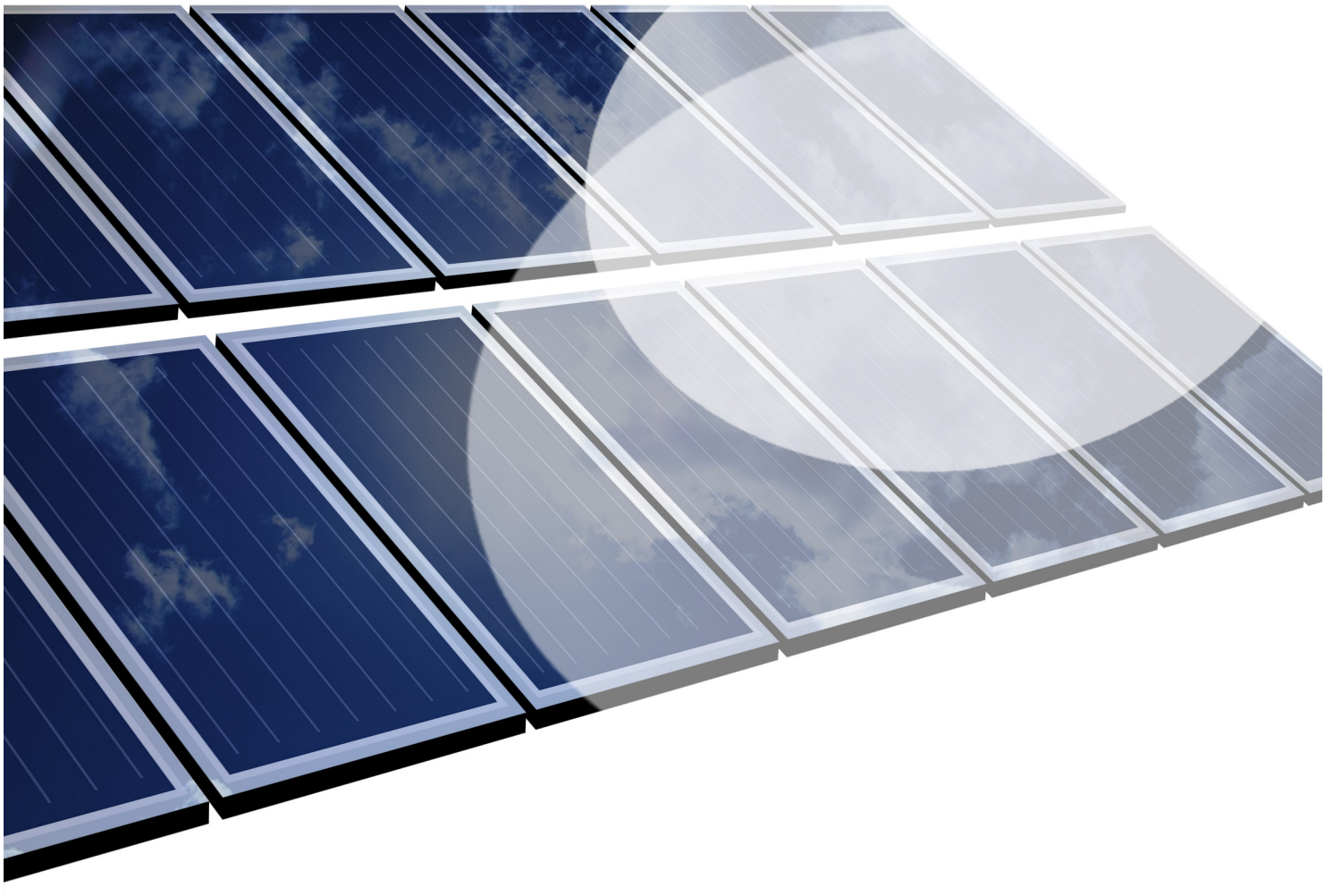
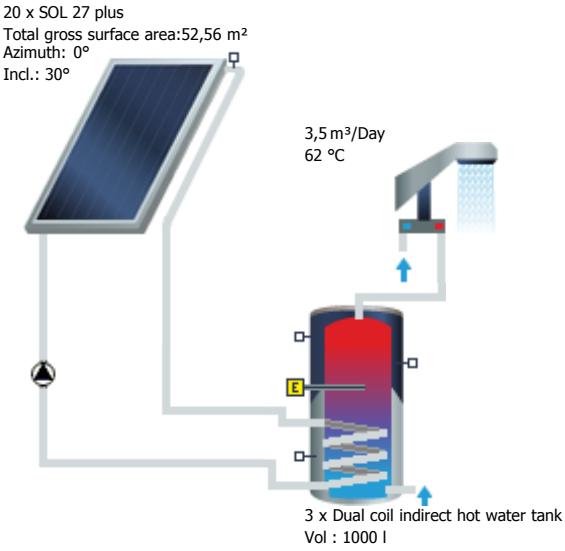
STIEBEL ELTRON





Results of annual simulation

Installed collector power:		36,79 kW
Installed solar surface area (gross):		52,56 m²
Irradiation on to collector surface (active):	101,90 MWh	2.126,41 kWh/m²
Energy delivered by collectors:	48,73 MWh	1.016,96 kWh/m²
Energy delivered by collector loop:	47,73 MWh	995,98 kWh/m²
DHW heating energy supply:		49,82 MWh
Solar contribution to DHW:		45,78 MWh
Energy from auxiliary heating:		7,2 MWh
Natural gas (H) savings:		**5.632,7 m³**
CO2 emissions avoided:		**11.911,15 kg**
DHW solar fraction:		**86,5 %**
Fractional energy savings (DIN CEN/TS 12977-2):		**86,2 %**
System efficiency:		**44,9 %**

Site data

Climate file

Location:	Dubai Intl Airp.
Climate data record:	Dubai Intl Airp.
Total annual global irradiation:	2020,07 kWh/m²
Latitude:	25,25 °
Longitude:	-55,33 °

Domestic hot water

Average daily consumption:	3,5 m³
Desired temperature:	62 °C
Consumption profile:	Public authority
Cold water temperature:	February: 26,5 °C August: 30,5 °C
Circulation:	No

System

Collector loop

Manufacturer:	Stiebel Eltron GmbH & Co. KG
Type:	SOL 27 plus
Number:	20,00
Total gross surface area:	52,56 m²
Total active solar surface area:	47,92 m²
Tilt angle:	30 °
Collector Orientation:	180 °
Azimuth:	0 °

Dual coil indirect hot water tank

Manufacturer:	Standard
Type:	3 x Dual coil indirect hot water tank
Volume:	3 x 1000 l

Auxiliary heating

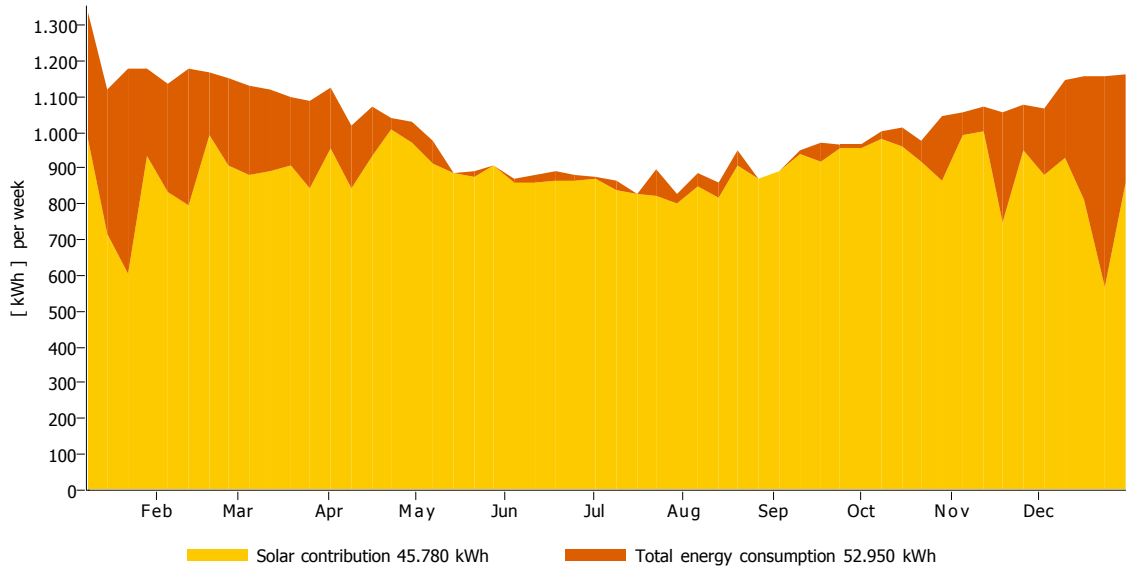
Manufacturer:	No boilers present
Type:	No boilers present
Nominal output:	0 kW

Legend

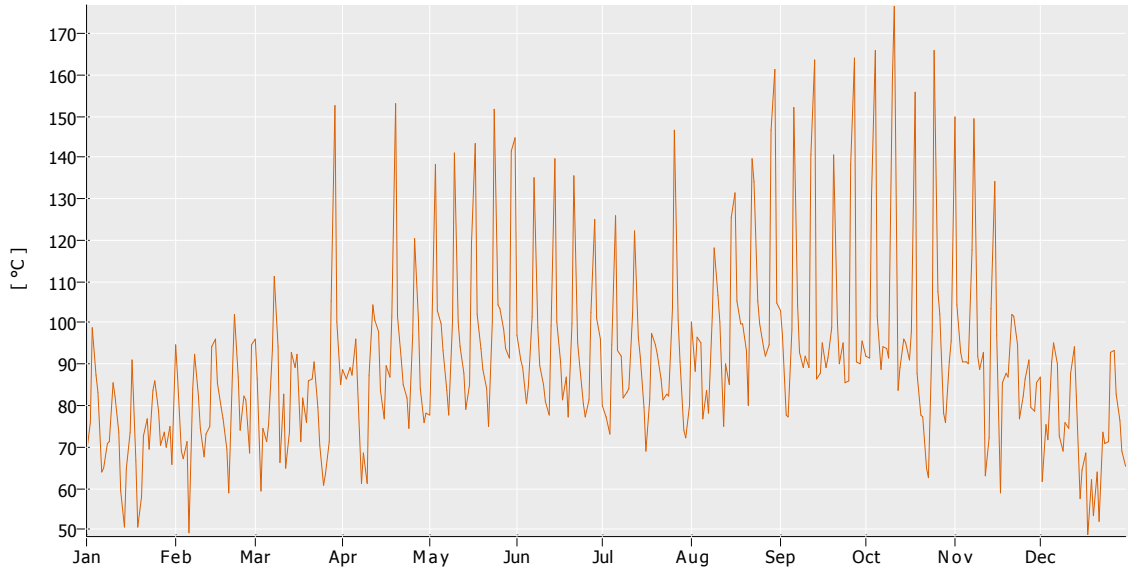
With test report

Solar Keymark

Solar energy consumption as percentage of total consumption



Daily maximum collector temperature

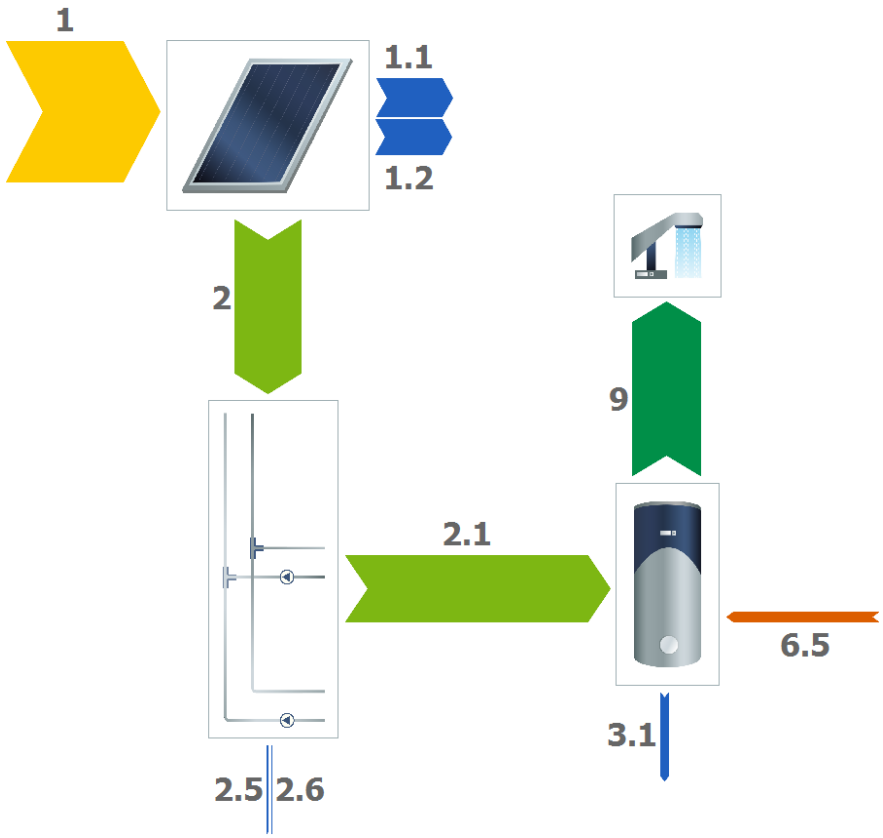


These calculations were carried out by T*SOL Pro 5.5 (R11) - the simulation program for solar thermal heating systems. The results are determined by a mathematical model calculation with variable time steps of up to 6 minutes. Actual yields can deviate from these values due to fluctuations in climate, consumption and other factors. The system schematic diagram above does not represent and cannot replace a full technical drawing of the solar system.

Financial analysis

System	
Active surface area:	47,92 m²
System yield:	45,78 MWh
Annual fuel savings:	5.632,7 m³ Natural gas (H)
Financial analysis parameters	
Life span:	20 Years
Interest on capital:	2,5 %
Reinvestment return:	2,5 %
Energy cost escalation rate:	3,0 %
Running cost escalation rate:	1,5 %
Financing	
Total investments:	47.920 €
Subsidies:	0 €
Loan capital:	0 €
Remaining investment:	47.920 €
Running costs in first year:	0 €
Savings in first year:	2.816 €
Financial analysis	
Cost of solar energy:	0,067 €/kWh
Capital return time:	14,0 Years
Amortization period:	16,8 Years
Profitability	
Return on assets:	157,9 %
Return on equity:	157,9 %
Internal rate of return rate, IRR:	4,33 %
Net present value:	9.656 €
Reinvestment premise	
Profit:	46.425 €
Modified internal rate of return, MIRR:	3,45 %

Energy balance schematic



Legend

1	Irradiation on to collector surface (active)	101.897 kWh
1.1	Optical collector losses	27.320 kWh
1.2	Thermal collector losses	25.845 kWh
2	Energy from collector array	48.733 kWh
2.1	Solar energy to storage tank	47.728 kWh
2.5	Internal piping losses	822 kWh
2.6	External piping losses	183 kWh
3.1	Tank losses	5.084 kWh
6.5	Electric element	7.169 kWh
9	DHW energy from tank	49.820 kWh

Glossary

1	Irradiation on to collector surface (active)
	Solar energy irradiated onto tilted collector area (active surface area)
1.1	Optical collector losses
	Reflection and other losses
1.2	Thermal collector losses
	Heat conduction and other losses
2	Energy from collector array
	Energy output at collector array outlet (i.e. before piping)
2.1	Solar energy to storage tank
	Energy from collector loop to storage tank (minus piping losses)
2.5	Internal piping losses
	Internal piping losses
2.6	External piping losses
	External piping losses
3.1	Tank losses
	Heat losses via surface area
6.5	Electric element
	Energy from electric water heater element
9	DHW energy from tank
	Heat from tank (exluding circulation) for DHW consumption

Material composition

PROJECT

Museum of the Future

Dubai

PLG_152185

CUSTOMER

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Solar

Position		ID	Quantity	Name
1		230017	20	Solar flat-plate collector SOL 27 premium W The collector is available for vertical and horizontal installation and thus designed specifically for the relevant application. The laser-welded aluminium full area absorber with copper harp is provided with highly selective vacuum coating (Miro-Therm). The hydraulic connection between collectors is made by means of a plug-in connector system. An anti-reflection safety glass cover protects the absorber and guarantees a high level of transmission. The collector is insulated on the sides and back panel with low outgassing mineral wool (black backed). Its main characteristic is low thermal conductivity. The hydraulic connection between collectors is made by means of a plug-in connection system. Operating the collectors with a prepared water:glycol mixture (H-30 L) provides the essential frost protection. The collector casing is made from seawater-resistant aluminium.
2		230920	20	Mounting frame SOL R1 W In combination with the fixing sets, the mounting frames SOL R1 and SOL R2 enable on-end installation of the collectors next to each other. The SOL R1 W is specifically designed for across installation of the collectors next to and above each other.
3		230171	16	Frame connection set SOL RV The frame connection sets ensure secure connection of two mounting frames. The frame connection set SOL RV should be used for connection in the case of on-end installation and across installation next to each other. For across installation above each other, RV-W should be selected.
4		230178	40	Mounting kit flat roof SOL BF-W The SOL BF-W mounting kit allows horizontal installation of collectors on flat roofs or on the wall.
5		230185	16	Push-fit connection SOL SV-A The SOL SV-A plug-in connection provides the hydraulic connection of two rooftop collectors mounted one above the other.
6		230913	4	Push-fit connection SOL SV-F The SOL SV-F push-fit connection is primarily intended for hydraulic connection of rooftop collectors in the case of flat roof installation and wall mounting.
7		230141	1	Solar control unit SOM 6 plus The solar control unit SOM 6 plus is used with standard solar heating systems. The temperature differential control unit is designed for a single consumer. The standard setup is programmed into the controller. A simple and intuitive menu guide is provided in the form of pictorial graphics on the multi-function combination display. The display is backlit. Including 2 temperature sensor PT 1000, spare fuse, screws and rawl plugs, 4 strain reliefs and heat conducting paste. Order the collector sensors separately.
8		231912	3	Warm water cylinder SBB 1000 WP SOL Floorstanding DHW cylinder, enamelled steel. Models SBB 600-1000 WP SOL are suitable for heat pump operation with optional solar thermal DHW heating. implemented with two internal twin pipe indirect coils, enamelled and resistant to scaling. The lower indirect coil is connected to the solar thermal system; the upper one to the heat pump. With larger heat pumps, both indirect coils can be connected in series. Specifically allocated sensor wells are fitted to the cylinder for connection to the control unit. The thermal insulation WDH SBB as an accessory ensures very low heat losses. Protective anode, thermometer and blank flange for inspection ports included as standard. The flanged apertures can optionally be equipped with flanged immersion heaters (type FCR 28). SBB 600 WP SOL with threaded connector G 1 1/2 in the upper third, for optional fitting of the BGC threaded immersion heater.
9		231959	3	Thermal insulation WDH 1000 SBB High grade EPTS rigid foam thermal insulation with insulation cover and floor disc for floorstanding DHW cylinders SBB 600/800/1000 WP SOL. Graphite inserts in the EPTS and fleece ensure lowest heat losses. Wedge-shaped cut-outs and fleece layer ensure an optimum match to the cylinder. Prepared adhesive joint in the wedge-shaped cut-outs enables adjustment to the shape prior to installation. External plastic jacket in white; cover in basalt grey. Thermal insulation secured with a quick-release hook strip.

10		000694	3	Electrical heating flange FCR 28/120 Flanged immersion heaters for horizontal installation in sealed DHW cylinders with flange connector to DIN 4805, e.g. mating flange GF 28. Observe the details supplied by the cylinder manufacturer and DIN 4753 or 4751.Standard delivery: Temperature controller with frost protection setting, high limit safety cut-out, flange gasket, protective cover with two cable inlets.
11		232629	1	Corrugated pipe connector WRV 40 Corrugated connection pipe with union nut and threaded end for optional linking of the lower and upper indirect coils.
12		074100	14	Heat transfer liquid H30-LS, 20 l Ready to use heat transfer medium (on polypropylene glycol basis) for solar systems with corrosion and anti-boiling protection. Frost protection down to -30° (H-30 L) or -28° (H-30 LS).Never dilute with water. No health risks.
13		165818	1	Temperature sensor PT 1000 Accessories for solar control units, sensor diameter 6 mm, tolerance DIN class B, ICE 75 I, lead material silicone, lead lengths 1450 mm, operating temperature -50 to +180 °C.
14		165342	1	Immersion sensor TF 6 A The TF 6 is an additional immersion sensor for the heat pump system.
15		231899	2	Solar expansion vessel 80 l Floorstanding 80 litre diaphragm expansion vessel for sealed unvented solar thermal systems. Suitable for H-30-L.

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