



## Naps Solar Roof (NSR) Systems

Naps Solar Roof (NSR) systems for houses are complete standardised systems in which the array and an inverter are well-matched in characteristics. They are modular in that larger systems can be built up by using two or more standard systems.

They are designed for simple installation on most types of roof. Typical installation time is less than one day for the smaller systems, and no drilling of roof tiles is required.

These products, a result of Naps extensive expertise in solar electricity, are for the discerning customer who wants to take advantage of clean solar electricity in a simple package.

Installing a rooftop solar power generator can provide a household with a significant fraction of its annual electricity needs. In some countries any excess solar electricity can be sold to the electricity network at an attractive price, so users can obtain a financial pay pack in addition to saving on electricity purchases. In some other countries, a grant can be obtained for part of the cost of the system and its installation.

### NSR systems are clean

The Naps Solar Roof generates clean electricity whenever there is daylight and feeds it into the home electricity supply.

Photovoltaics is unique in that it can be mounted on buildings to produce electricity at the point of demand without any adverse environmental effects (no noise, no moving parts, no exhaust gases and no dangerous by-products).

### Naps at Your service

Although the NSR system packages are as standardised as possible, the roof type has to be known in order to specify the roof attachments correctly, and there are some minor variations in the electrical equipment needed to conform to the regulations in different countries. Your local Naps contact will be able to finalise these details and arrange for installation by one of our specialist partners.

*Naps Solar Roof systems offer a reliable and easy way to produce energy at your own home. Above: typical examples of installed roof systems*

## System components

The NSR system comprises the photovoltaic modules, mounting structure, hooks or clamps for roof fixing, cables, dc connection box with lightning protection and circuit breaker(s) and an inverter to convert the dc solar electricity into ac electricity, which is fed into the house's standard electrical supply. The inverter can transmit data to a wireless monitor, to a PC or to a data logger if the owner wants to monitor the performance of the solar roof.

## Modular construction

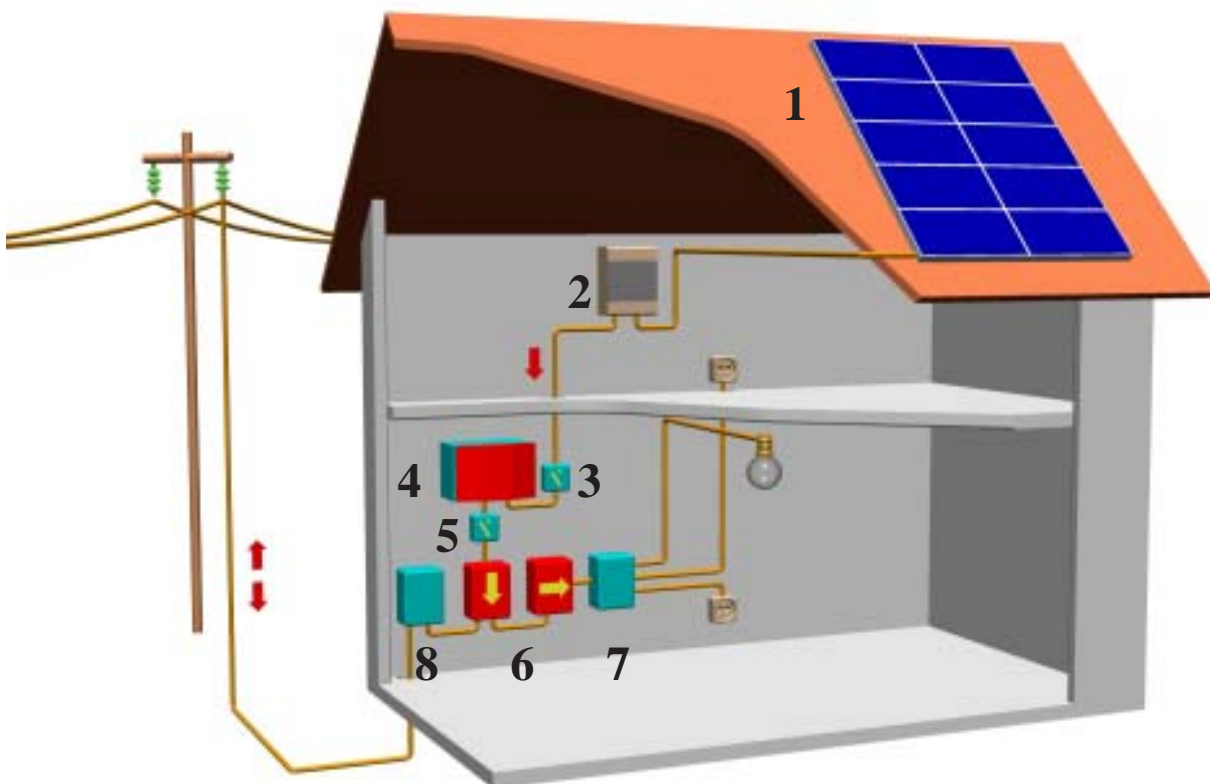
Larger rooftop installations can be built up from two or more solar roof systems which will feed into the ac electricity supply independently. Because of this modularity, NSR systems can be expanded at any time in the future, as long as there is sufficient roof space.

## Simple and fast to install

Naps has a range of proven mounting methods to fit the solar modules to different types of roof. Naps Slide-In roof mounting system provides fast, efficient and low cost methods of fixing the modules on top of sloping roofs, requiring minimum disruption to the existing roof structure. A typical roof installation time is around half a day for a 1 kWp system.

Naps solar modules are made using the highest standards of construction and carry a 25 year limited power warranty. Once installed, they will provide a reliable source of clean electricity for decades.

The Slide-In roof mounting system provides an air gap between the rear of the modules and the roof surface. This allows air cooling of the modules which increases the available power.



General schematic of a solar electric building systems and the main components :

(a.c. connection and metering details may vary slightly in different countries)

1 Solar array, 2 Array box (string fuses, blocking diodes, lightning protection), 3 DC switch (not needed in all countries), 4 Inverter, 5 a.c. switch (optional), 6 Energy counters, 7 House distribution box (with fuses), 8 House electricity supply.

## Mounting method

Almost any type of roof can be fitted with the Naps Slide-In roof mounting system. Using special hooks or clamps means no drilling of the roof surface is needed.

Other types of roof fixings can be provided for different roof constructions. Note that the full specification of the the roof type has to be known in order to specify the roof attachments correctly.



Naps Slide-In roof mounting system is a reliable and flexible system that is adjustable in all directions to compensate for variations in roof surfaces. Special clamps connect the mounting profile and the roof fixing to horizontal support tubes.



Other types of 'over-roof' mounting system, like this one used by our German partner company, may be used in some projects.

If a roof-integrated solution is needed, we can offer modules with the Solrif frame system. For flat roofs and sunshades, there are a variety of other mounting systems which can be used. The same electrical building blocks as shown below can be used, but the dimensions will be slightly different to those in the table.

## Standard system specifications

The performance and dimensional data refer to systems mounted using Naps Slide-In structures.

### A) Systems with NP200GK module, for connection to up to 3 phases

System	kWp	inverter(s)	modules blocks x high x wide	array height m	array width m	array area m <sup>2</sup>
NSR-1200-1100-200NP	1.2	SB1100	1 x 3Hx2W	2.998	3.006	9.012
NSR-1800-1700-200NP	1.8	SB1700	1 x 3Hx3W	2.998	4.489	13.458
NSR-2400-2x1100-200NP	2.4	2 x SB1100	2 x 3Hx2W	2.998	6.042	18.114
NSR-3600-2x1700-200NP	3.6	2 x SB1700	2 x 3Hx3W	2.998	9.008	27.006
NSR-3600-3x1100-200NP	3.6	3 x SB1100	3 x 3Hx2W	2.998	9.078	27.216
NSR-5400-3x1100-200NP	5.4	3 x SB1700	3 x 3Hx3W	2.998	13.527	40.554

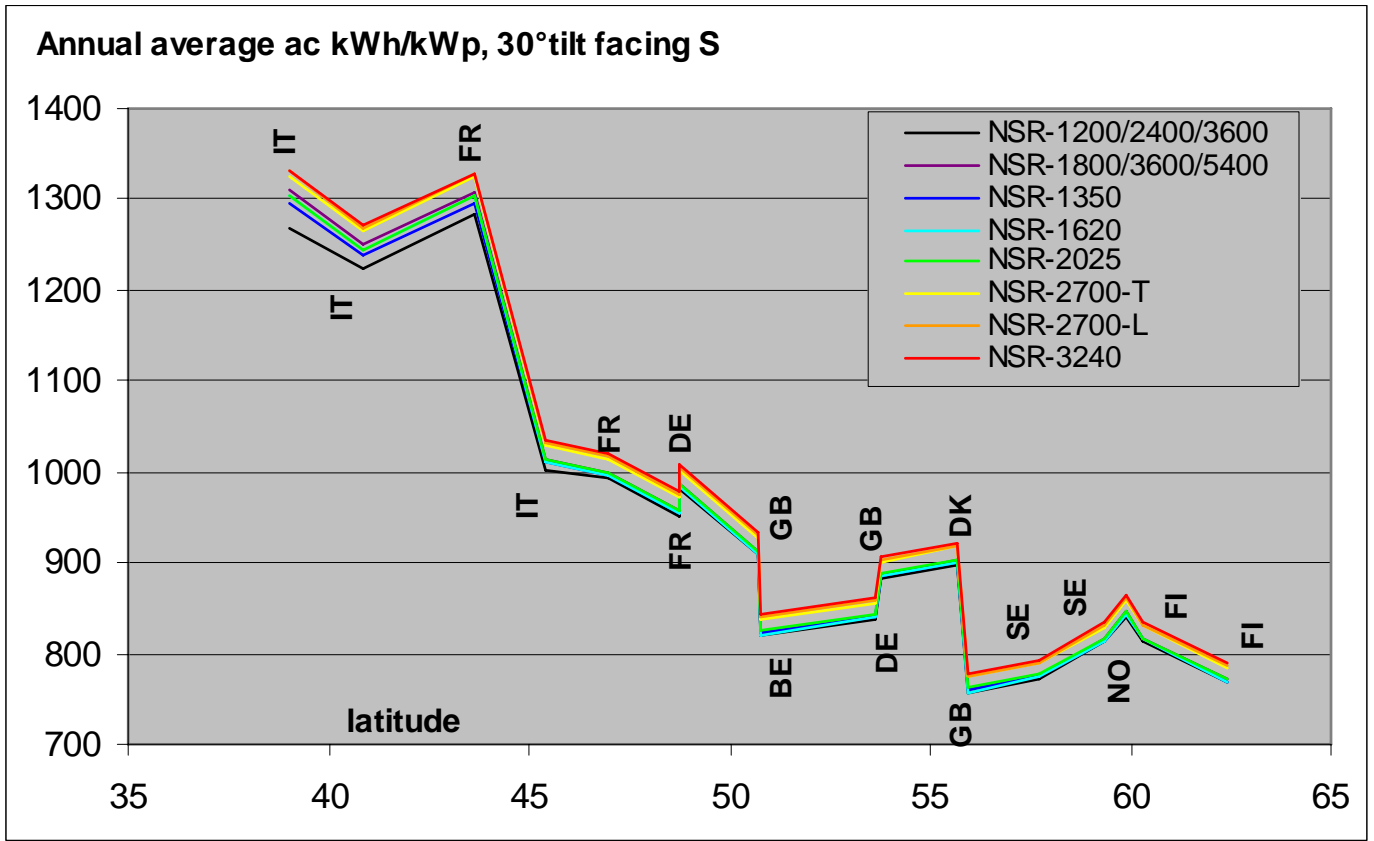
### B) Systems with NP135GK module, for connection to 1 phase, max 16A/phase

System	kWp	inverter	modules blocks x high x wide	array height m	array width m	array area m <sup>2</sup>
NSR-1350-1100-135NP	1.35	SB1100	1 x 5Hx2W	3.390	3.016	10.224
NSR-1620-1700-135NP	1.62	SB1700	1 x 4Hx3W	2.720	4.504	12.251
NSR-2025-1700-135NP	2.025	SB1700	1 x 5Hx3W	3.390	4.504	15.269
NSR-2700-2500-135NP-T	2.7	SB2500	1 x 5Hx4W	3.390	5.992	20.313
NSR-2700-2500-135NP-L	2.7	SB2500	1 x 4Hx5W	2.720	7.480	20.346
NSR-3240-2500-135NP	3.24	SB2500	2 x 4Hx3W	2.720	9.038	24.583

### Notes:

Larger systems may be built up of two or more of the above building blocks. The minimum spacing between array blocks in larger systems is 30mm in the horizontal direction and 50mm in the vertical direction.

## Typical system performance in Europe



### Average annual performance range for the countries indicated

system	ac kWh	kWh/kWp	kWh/sq m
NSR-1200-1100-200NP	909-1540	758-1283	101-171
NSR-1800-1700-200NP	1367-2358	759-1310	102-175
NSR-2400-2x1100-200NP	1818-3080	758-1283	101-171
NSR-3600-2x1700-200NP	2733-4716	759-1310	102-175
NSR-3600-3x1100-200NP	2728-4619	758-1283	101-171
NSR-5400-3x1100-200NP	4100-7074	759-1310	102-175
NSR-1350-1100-135NP	1027-1750	761-1296	100-171
NSR-1620-1700-135NP	1227-2114	758-1305	100-173
NSR-2025-1700-135NP	1545-2642	763-1305	101-173
NSR-2700-2500-135NP-T	2089-3581	774-1326	103-176
NSR-2700-2500-135NP-L	2093-3593	775-1331	103-177
NSR-3240-2500-135NP	2522-4313	778-1331	103-175

These performance figures are carefully calculated for average sunlight availability in various typical locations in Italy, France, Germany, UK, Belgium, Denmark and the southern parts of Sweden, Norway and Finland and are for a South-facing Solar Roof with a tilt angle of 30°.

South-facing Solar Roofs tilted at between 30° and 45° will give outputs within 3% of those shown here. Shadows and orientations other than due South will result in lower output than illustrated. An unshadowed Solar Roof with 30-45° tilt facing South-East or South-West will give 93-95% of the output of a Solar Roof facing due South.

These calculations include all losses due to operating temperature, inverter losses, etc, plus reasonable allowances for module soiling and module operating mismatch. Calculations do not include losses for below average sunshine, shadows or other factors.

### Energy payback time

*(time to produce more energy than is used in manufacturing from raw materials)*

Due to thinner wafers used in the solar cells, this is now in the range 2.6 to 4.6 years for all the above sites and systems.

### Avoided CO<sub>2</sub> emissions

for NSR systems in the above areas are in the range of 0.6 to 1.1 tonnes CO<sub>2</sub> equivalent per kWp per year, assuming that 'average emission' fossil fuel electricity is replaced. The higher figure refers to Southern Europe.

If 'national average electricity' is replaced, the above figures should be multiplied by approximately 70% for countries with a significant proportion of fossil fuel generation (e.g. Germany, Italy, UK).