SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Photovoltaic-Thermal Systems (PVT) achieve market relevance

Thomas Ramschak, AEE INTEC

http://task60.iea-shc.org/

Task Organisation

Operating Agent
JC Hadorn, Switzerland

A
PVT systems in operation

T. Ramschak,
AEE INTEC, Austria

In situ

B
PVT Performance characterization

K. Kramer, Fraunhofer ISE, Germany

LAB

C
PVT Systems modelling

As. Sanz
Tecnalia, Spain

Models
Simulation

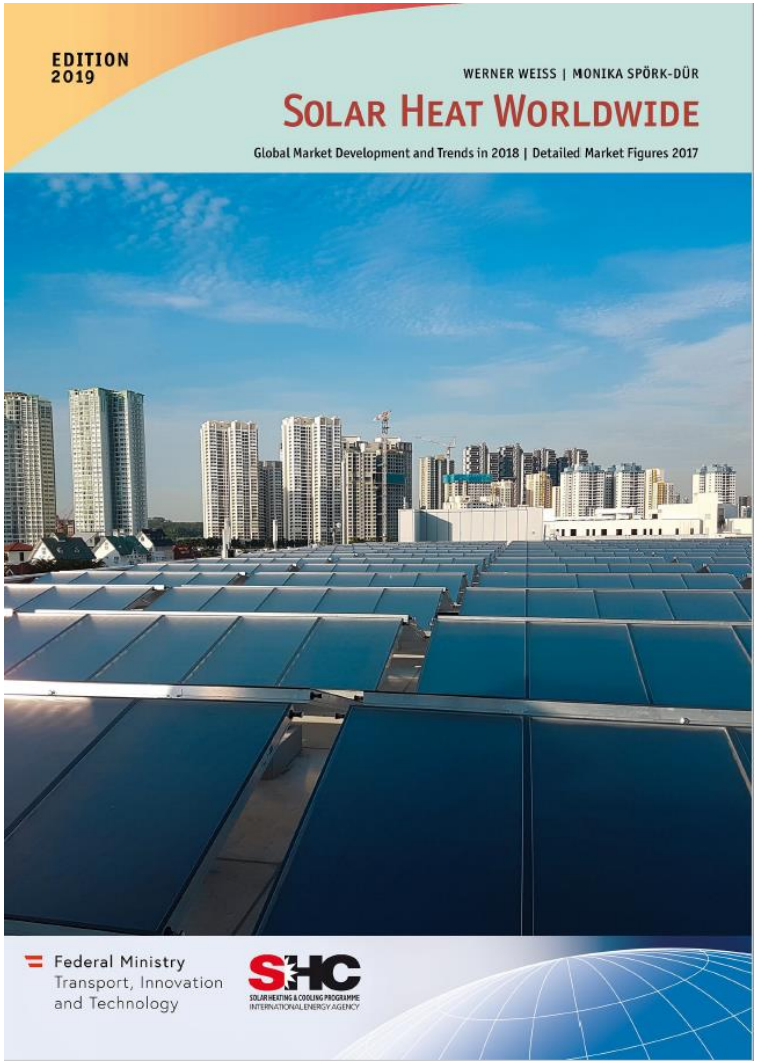
D
Systems performance assessment, dissemination and market support

A. Haeberle, SPF, Switzerland

Evaluate
Communicate
On PVT

Highlight and Trends

Ed. 2019 PVT for the first time



TASK60
PVT SYSTEMS

Survey

- ❖ PVT-collector
  - – Type of collector
  - – Collector area
  - – Power output (thermal, electric)
  - – PV Technology
  - – Export
- ❖ Application
  - – Type of application
  - – Number of installations
  - – Average system size
  - – Etc.

IEA-SHC TASK 60 - Application of PVT Collectors

Market Survey Factsheet

Please fill in the orange fields!

Company: XXX

1) Cumulated PVT Collectors by End of 2017

Cumulated manufactured Collector Area by End of 2017

	Water Collectors			Air Collectors	Concentrators	Total
	uncovered (wisc)	covered	evacuated tube			
Cumulated gross collector area [m²]	0,0	0,0	0,0	0,0	0,0	0,0
Cumulated Thermal power output [kWth]	0,0	0,0	0,0	0,0	0,0	0,0
Cumulated nominal PV power [kWpeak]	0,0	0,0	0,0	0,0	0,0	0,0
PV-Technology (mono-Si, poly-Si, etc.)						

EXPORT in 2017

Countries	gross collector area in [m²]

Market Share by Type of APPLICATION - Installations by End of 2017

Application		Number of installations [#]	Average System Size [m²]	Typical collector operation temperature [°C]	Use of heat produced by the PVT collector Direct (D), Serial (S), Parallel (P), Regeneration (R)
Swimming pool heating		0	0	0	☐ D ☐ S ☐ P ☐ R
Domestic hot water systems for single family houses		0	0	0	☐ D ☐ S ☐ P ☐ R
Domestic hot water systems for multiple family houses, offices, hotels, etc.		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar combi systems for single family houses		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar combi systems for multiple family houses, offices, hotels, etc.		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar air(pre)heating/cooling for buildings (house, hall, etc.)		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar district heating systems		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar heat for industrial applications (e.g. drying and cleaning processes, rearing of animals, food processing, precess heat, etc.)		0	0	0	☐ D ☐ S ☐ P ☐ R
others	aaabbbccc	0	0	0	☐ D ☐ S ☐ P ☐ R
Total		0			

2) Manufactured PVT Collectors in 2018

New manufactured PVT Collectors by the End of September 2018

	Water Collectors			Air Collectors	Concentrators	Total
	uncovered	covered	evacuated tube			
Gross collector area [m²]	0,0	0,0	0,0	0,0	0,0	0,0
Thermal capacity [kWth]	0,0	0,0	0,0	0,0	0,0	0,0
Nominal PV power [kWpeak]	0,0	0,0	0,0	0,0	0,0	0,0
PV-Technology (mono-Si, poly-Si, etc.)						

Market Share by Type of APPLICATION - New Installations by the End of September 2018

Application		Number of installations [#]	Average System Size [m²]	Typical collector operation temperature [°C]	Use of heat produced by the PVT collector Direct (D), Serial (S), Parallel (P), Regeneration (R)
Swimming pool heating		0	0	0	☐ D ☐ S ☐ P ☐ R
Domestic hot water systems for single family houses		0	0	0	☐ D ☐ S ☐ P ☐ R
Domestic hot water systems for multiple family houses, offices, hotels, etc.		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar combi systems for single family houses		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar combi systems for multiple family houses, offices, hotels, etc.		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar air heating/cooling for houses, industrie, etc.		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar district heating systems		0	0	0	☐ D ☐ S ☐ P ☐ R
Solar heat for industrial applications (e.g. drying and cleaning processes, rearing of animals, food processing, precess heat, etc.)		0	0	0	☐ D ☐ S ☐ P ☐ R
others	aaabbbccc	0	0	0	☐ D ☐ S ☐ P ☐ R
Total		0			

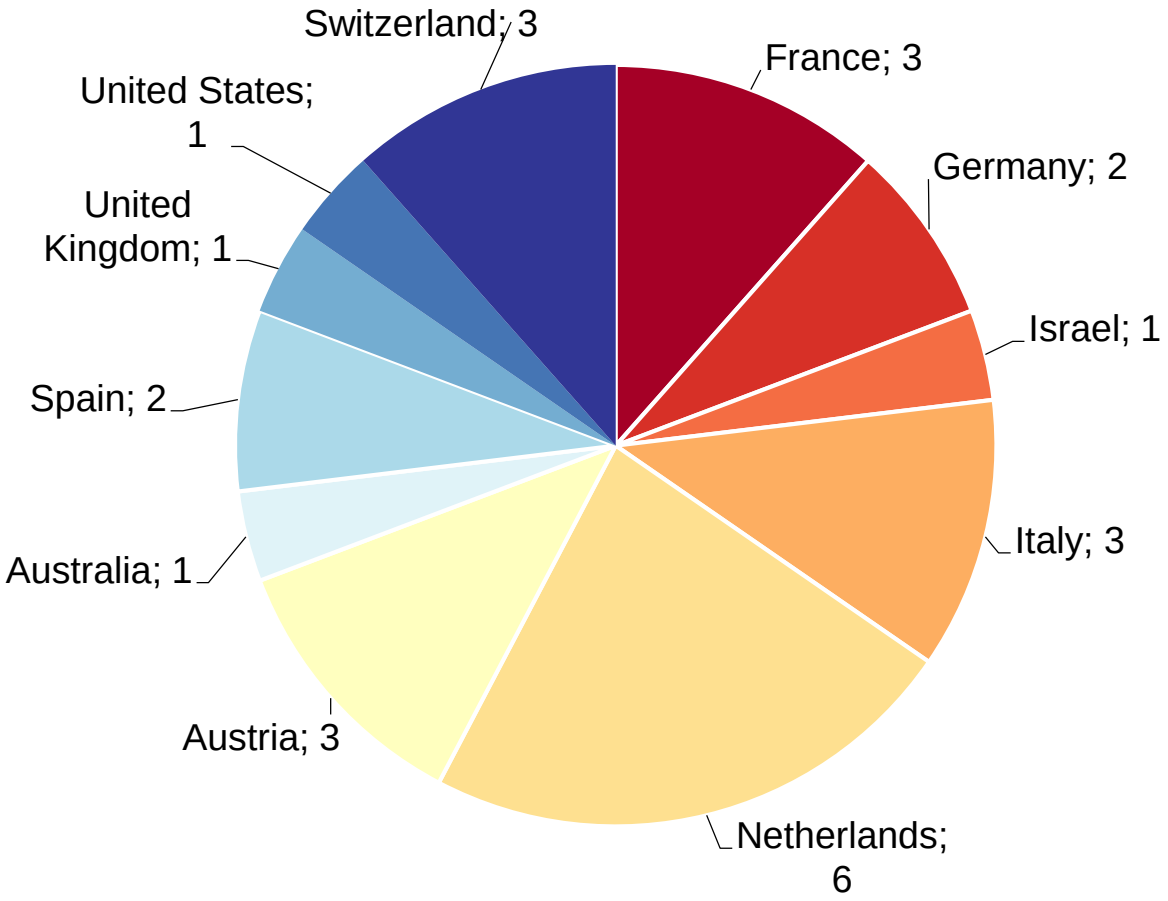
SHC SOLAR HEATING & COOLING PROGRAMME INTERNATIONAL ENERGY AGENCY

Market overview

- Total: 26 PVT collector manufacturer

(non-exhaustive overview)

- Countries: 11



Category of PVT collectors

Water Collectors

- Uncovered (wisc)
- Covered
- Evacuated tube

Source: DualSun

Source: 3F Solar

Source: Naked Energy

Air Collectors

Source: GSE Integration

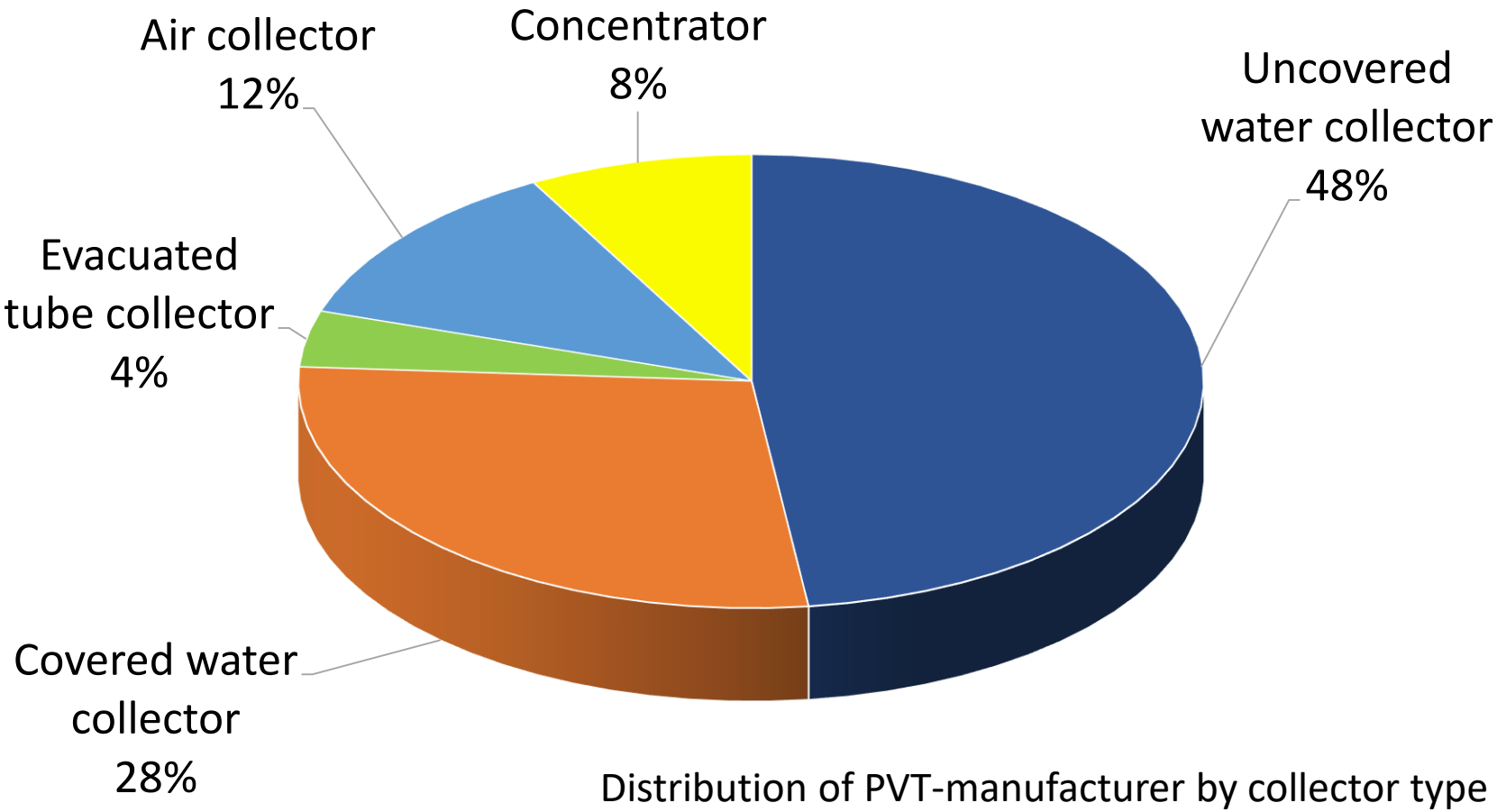
Source: Systovi

Concentrators

Source: Solarus

Source: Sunoyster

Market overview – PVT-Producer



Distribution of PVT-manufacturer by collector type

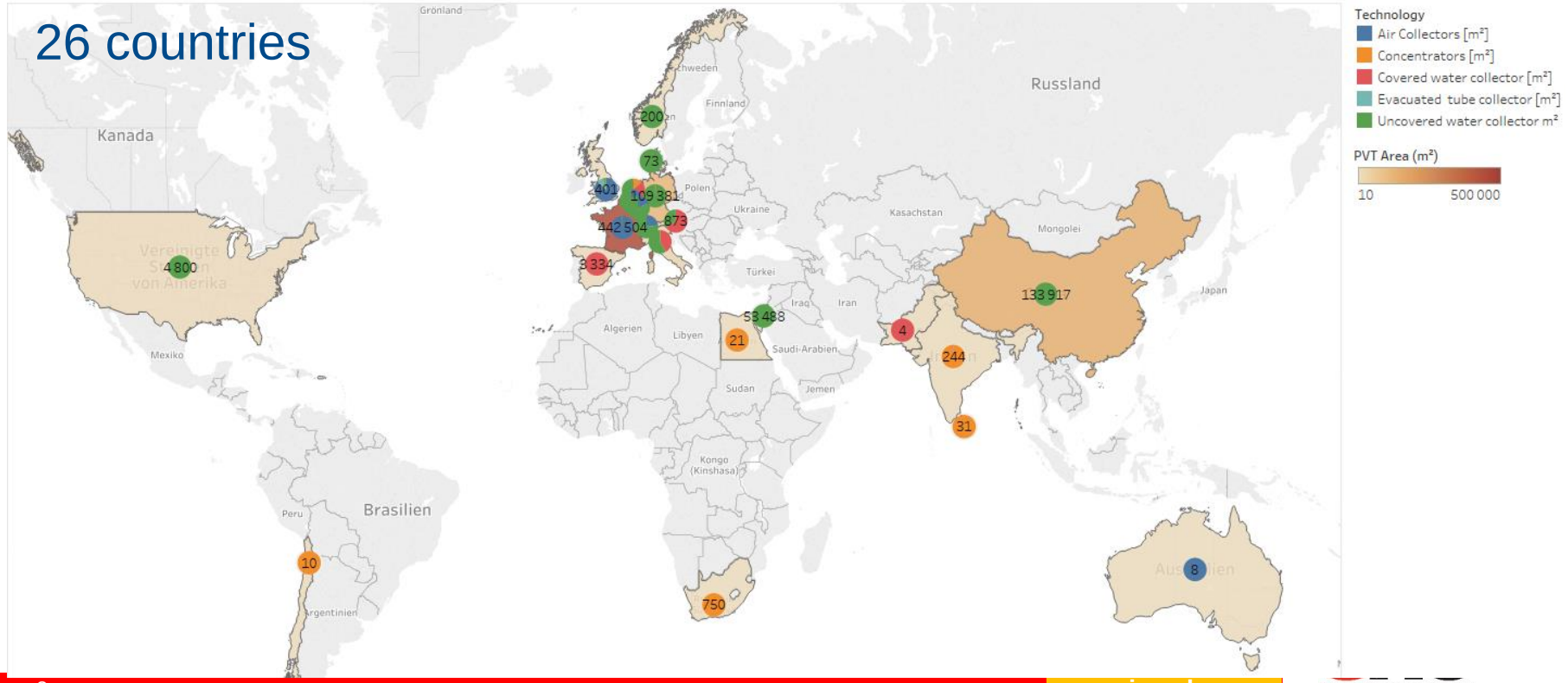
World map – Installed PVT collector area

Cumulated installed collector area by end of 2018:

- 57% uncovered
- 41% air collectors
- 2% covered

~ 1.1 Mio m²

26 countries



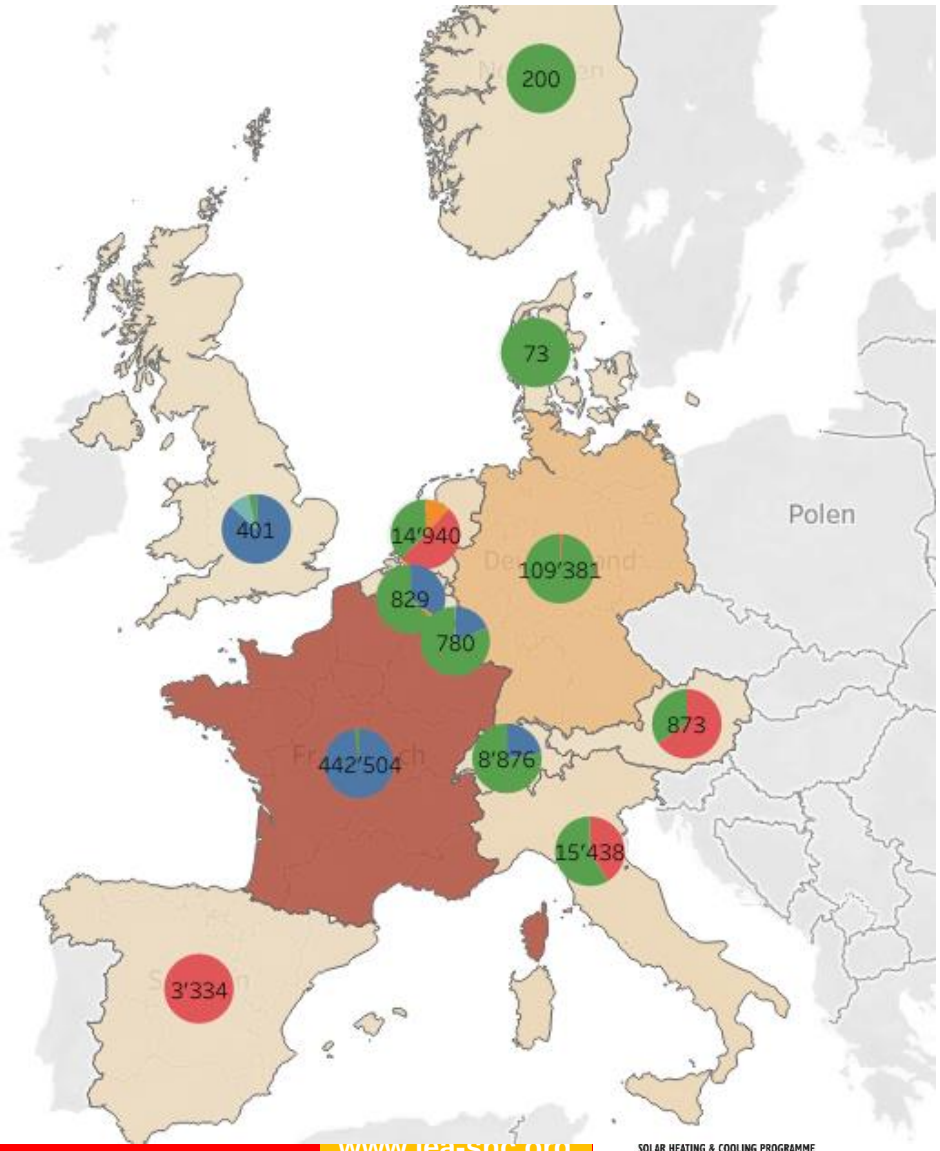
PVT - European market

Market leader:

France (442.500 m²)

Germany (109.400 m²)

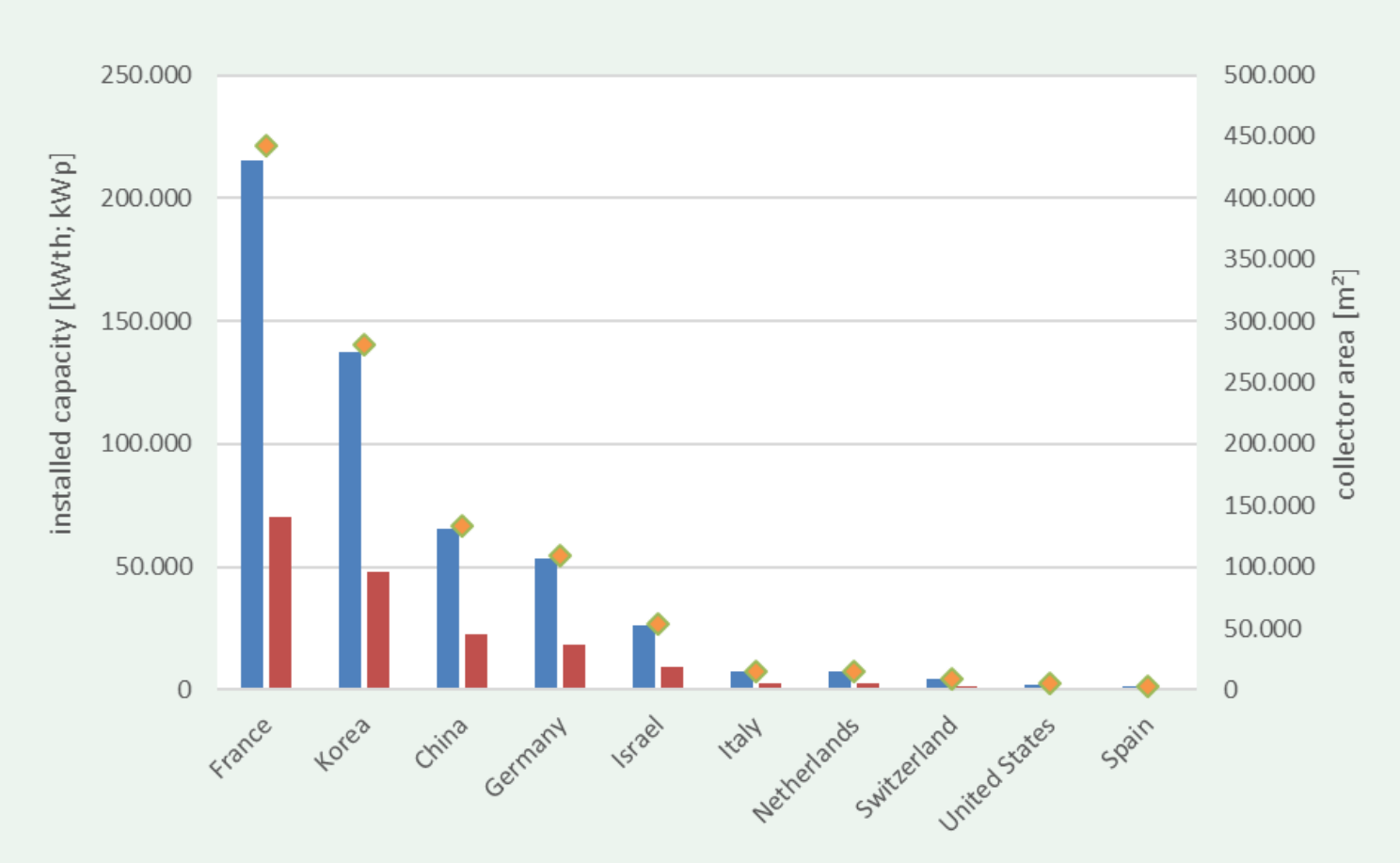
Netherlands and Italy (15.000 m²)



Global installed capacity by country

Thermal capacity: **524,2 MWth**

Nominal PV Power: **178,2 MWpeak**



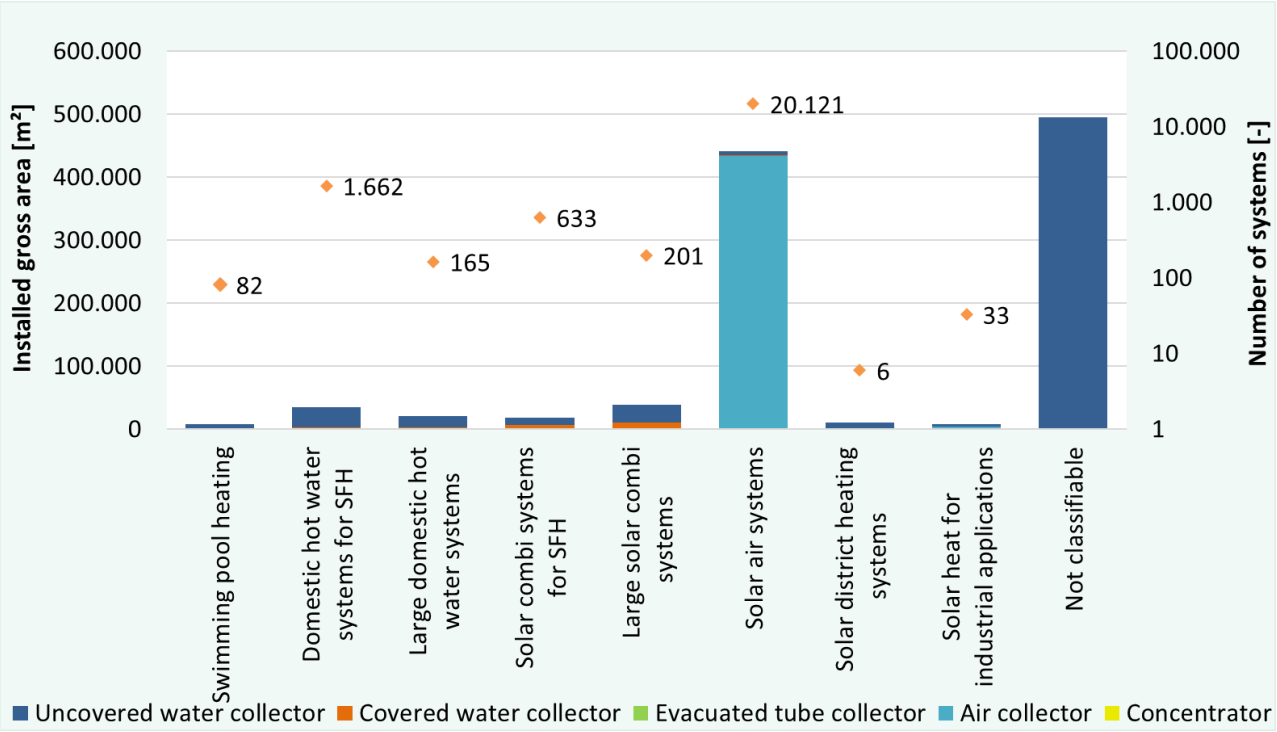
SHC SOLAR HEATING & COOLING PROGRAMME INTERNATIONAL ENERGY AGENCY

Global PVT-system plants in operation by type of application

By end of 2018: **>22.900 systems, 581.000 m²**

~2.200 systems with uncoverd collectors

- 75% DHW – SFH, MFH, hotels, hospitals, etc.
- 21% Combi systems



SHC SOLAR HEATING & COOLING PROGRAMME INTERNATIONAL ENERGY AGENCY

Uncovered PVT GS-Regeneration

Building complex (7 MFH, 50 flats, swimming pool)

Source: Swiss Travel Fund Cooperative (Reka)

Heating system
31 boreholes of 150 m
Centralized heat pumps
Heat recovery for pool and DHW
672 m² PVT collector area

Performance:
Thermal yield 400 kWh/m²
Electrical yield 130 kWh/m²
Degree of GS regeneration 98 %

Covered PVT collectors for hotels

Source: EndeF

Performance:
Thermal yield 112.814 kWh/a
Electrical yield 34.600 kWh/a
CO2 saving: 41.639 kg/a

Low concentration PVT collectors for industrial application

Performance:
450 MWh heat and 15 MWh electicity

Source: Solarus

www.iea-shc.org