



OST

Ostschweizer
Fachhochschule

Aktuelles aus der Solarwärmebranche

Swissolar Focus: Chancen für die Solarwärme

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INSTITUT FÜR
SOLARTECHNIK

Der Blick nach Europa

Decarbonising heat with Solar thermal

Market outlook 2022/2023



40.5_{GW_{th}}

Cumulative capacity
in operation in Europe



+12%

market growth
(2022 vs 2021)

#Heatishalf

Heat is half of our current energy needs Giving heat the visibility it deserves...

Heat is half of the total energy that we need – far more than the energy required for fuel/transport and electricity.

Despite this, only 10% of our heat worldwide is generated from renewable sources.*

In addition, REN 21 reports that globally:

- demand for energy increased by +4% in 2021, based on more use of fossil fuels
- most national renewable targets are based upon electricity generation, not heat

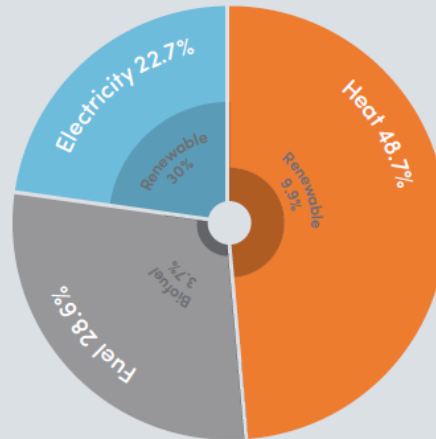
Energy demand grew

4%
in 2021

compared to the pre-pandemic level

* Essentially biomass

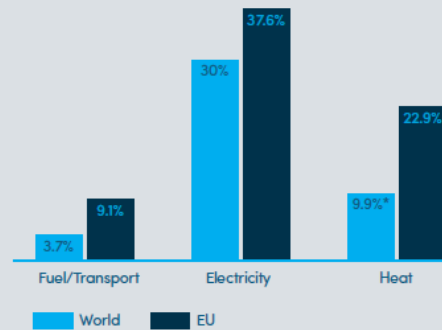
Total final energy and total modern renewable energy share, by energy carrier, global data (Source: REN21)



EU Renewable Energy Directive (RED) targets (2023):

- Art. 3: Total share of RES sources in 2030: 42.5%, aiming for 45%
- Art. 23: Binding target for the share of RES for heating and cooling: Member States to increase by at least 0.8 percentage points annually (for 2021-2025) and by at least 1.1 percentage points annually (for 2026-2030).

Share of Renewable Energy Sources (RES) Worldwide (Sources: REN 21, Eurostat April 2022)

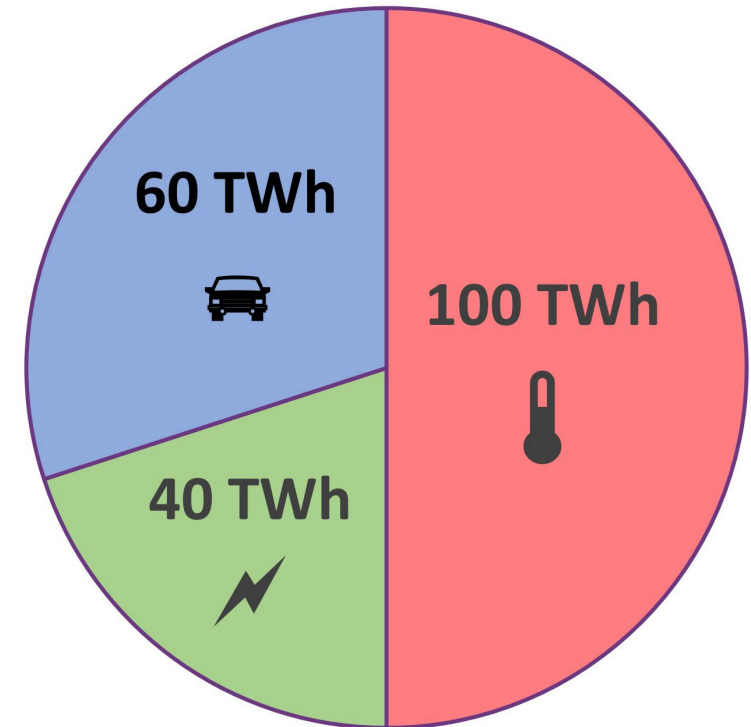


Europe is a clear role model in terms of roll out of renewable energies compared to the rest of the world. Yet, a great percentage still remains ahead to achieve the climate targets and CO₂ emission reductions, EU energy security and reduction of dependency from fossil fuel imports.

In addition, most policy measures implemented to date in Europe have essentially tackled the electricity agenda.

Giving more visibility to heat and its decarbonisation, notably through direct RES heat sources such as Solar Thermal, is therefore urgent and of utmost importance to:

- relieve pressure on the grid
- create a level playing field for all technologies.



Solar Thermal:

An obvious source of energy to provide hot water and heating for millions of applications, from individuals to professional users...

Solar thermal is based on a simple principle: capturing the free energy of the sun to deliver hot water and heat.

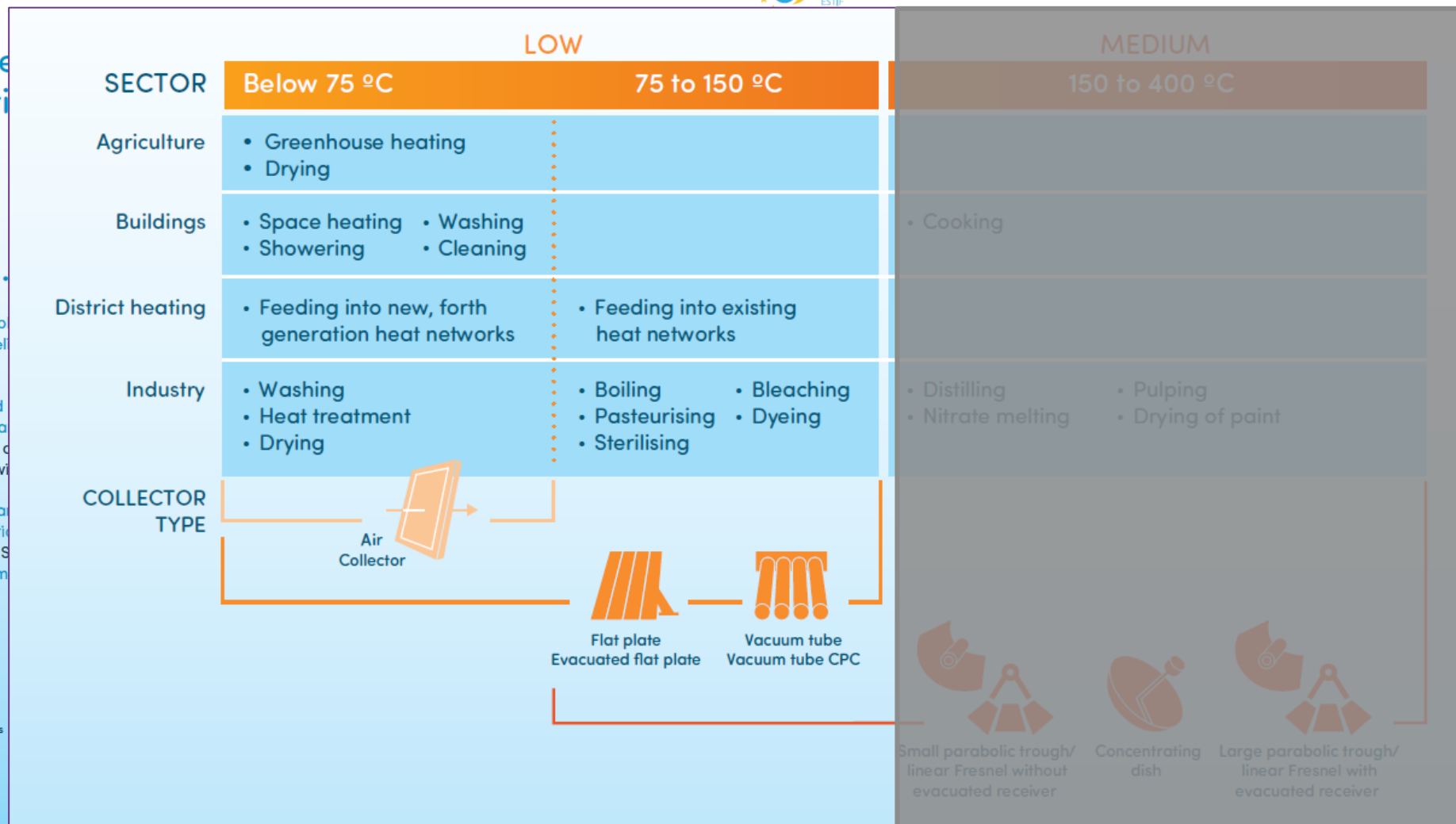
Members of Solar Heat Europe are proud of their strong manufacturing base of solar thermal collectors in Europe, meeting 90% of demand and being a net exporter worldwide.

Technological innovation has resulted in various ways to harness solar thermal for domestic and industrial use. Certification, including the Solar Keymark, provides reassurance to consumers and public authorities.

The Solar Keymark CEN Keymark Scheme



- Over 20 years of certification standards
- More than 1150 certificates granted
- CEN scheme
- Transparent and open
- More than 300 stakeholders



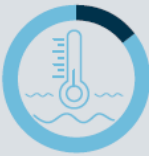
Residential buildings

The needs

Space heating
64.4%



Water heating
14.5%



80% of the energy needs by EU households relate to space heating & water heating.

Both can be addressed by Solar Thermal but only a fraction (1.5%) currently are.



Lighting & electrical
appliances 13.6%



Cooking
6%



Other uses
1.1%



Space cooling
0.5%



Source: Eurostat



EU Renewable Energy Directive (RED) targets (2023):

- Art. 15a (new): sub-sectoral target for the share of RES in buildings: 49% in 2030.
- Art. 15c: introduction of renewable acceleration areas, where permit-granting shall be further streamlined.
- Art. 16c: specific provisions regarding permitting for the installation of solar energy equipment and co-located energy storage assets.

Energy consumption for heating in buildings by source, global data, 2021 (Source REN 21)

63%
fossil fuels & other

23%
traditional biomass

14%
renewables

- 0.6% Renewable district heat
- 1.0 % Geothermal heat
- 1.5% Solar heat
- 3.0% Renewable electricity
- 3.6% Ambient heat
- 4.6% Modern bioenergy



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Residential buildings

The solution: Providing hot water and heat directly from the sun's energy with Solar Thermal

More than **10 million** rooftops in Europe are equipped with solar thermal & thermal storage

Total installed capacity in Europe (mainland): **40.5 GW_{th}**

That's 58 million m² of collectors

Constituents of the total installed capacity in 2021

Source: Solar Heat Europe/IEA Solar Heating and Cooling Programme - Solar Heat Worldwide

	Technology	% of total
Water-based solar collectors m ²	Unglazed	3.27%
	Flat Plate Collector	87.68%
	Evacuated Tube	8.92%
Air-based solar collectors m ²	Unglazed	0.05%
	Glazed	0.08%



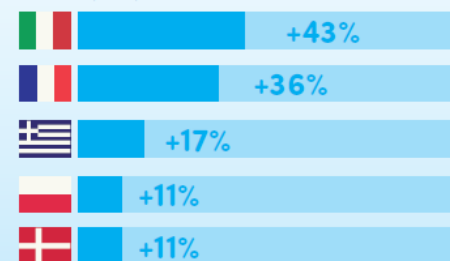
Did you know that Super Bonus in Italy, or Ma Prime Rénove in France have been significantly supporting the increase of sales in residential buildings in 2022?



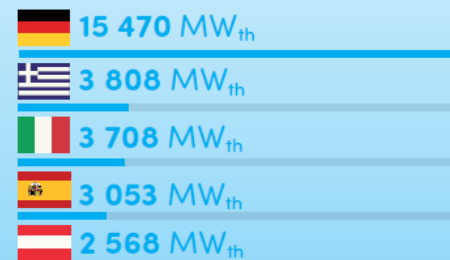
Total installed capacity in 2022: **1.63 GW_{th}** +12%

An increase of 2.2 million m²

Countries with largest increase of sales in 2022 (vs 21)



Countries with the largest Solar Thermal installed capacity (in operation):



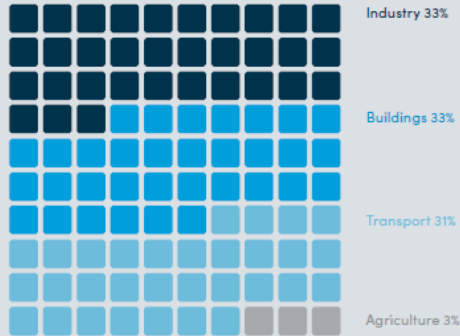
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Industry Decarbonisation The needs

Industry represents

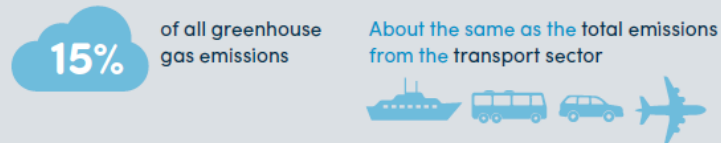
33%
of the energy
needs globally

75%
of these needs
apply to heat



Source: REN 21

Industrial process heating in 2016 emitted 7.5 metric gigatons of CO₂
That's the equivalent to:



IEA reported that only 9% of the total industrial energy uses were based on renewables sources. 45% from Coal, 30% from Natural Gas, 15% from Oil.

Source: WBCSD/Bloomberg NEF report "Hotspots for Renewable Heat", Sep. 21

Decarbonising industrial heat will play a key role in achieving net-zero targets

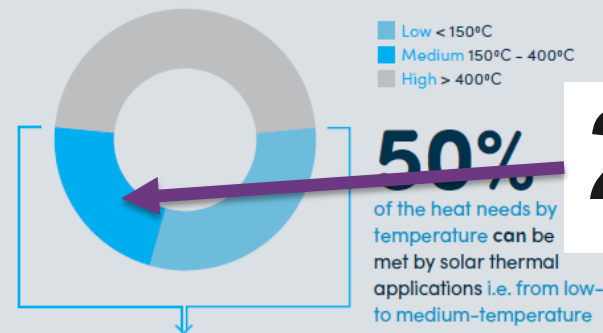


EU Renewable Energy Directive (RED) targets (2023):

- Art.22a: new sub-sectoral target for industry: average increase of 1.6 percentage points for the share of RES (for the periods 2021-25 and 2026-30).

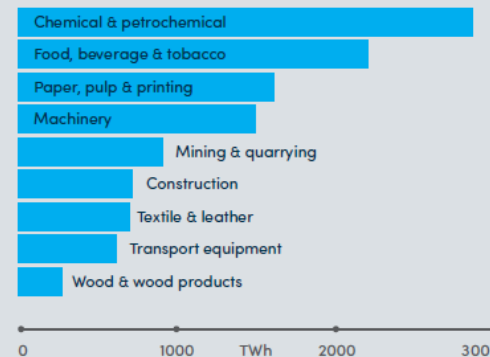
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Global industrial heat demand by temperature (2018)
(Source: IRENA, IEA)



25%

Demand for low- to medium-temperature heat in selected industries globally 2018 (TWh):



Source: IEA. Note: Demand for low- to medium-temperature heat in energy-intensive industry is excluded since it represents a small portion of the total and is usually available as a by-product of high-temperature heat.

District heating

282

towns and cities in Europe
use solar heat¹, with

1 373 MW_{th}

in operation

In 2023, the total number of District Heating networks existing in the EU reached 17,000²

Yet the share of Solar Thermal, based on total energy output, is only 0.5%.

Solar Thermal has great potential to be the route towards district heating decarbonisation.

1 source IEA SHC/solrico/Austria Solar
2 source EHP

81%

of the total Solar District Heating networks in the world are in Europe



EU Renewable Energy Directive (RED) targets (2023):

- Art. 24: raises the indicative target for the share of RES and waste heat in district heating and cooling from a 1 percentage point increase to 2.2 percentage points (for 2021-2030).

Solar thermal district heating networks in operation by European country:



Did you know?



In the Netherlands a 48,000m² project is under construction? This will be the fourth biggest district heating network supplied by solar thermal in the world, with a capacity of 37 MW_{th} .



In 2022 Germany's Solar Thermal district heating capacity grew by **+30%** 9 new systems representing a collector area of 28,000 m² with a capacity of 19.6 MW_{th} .



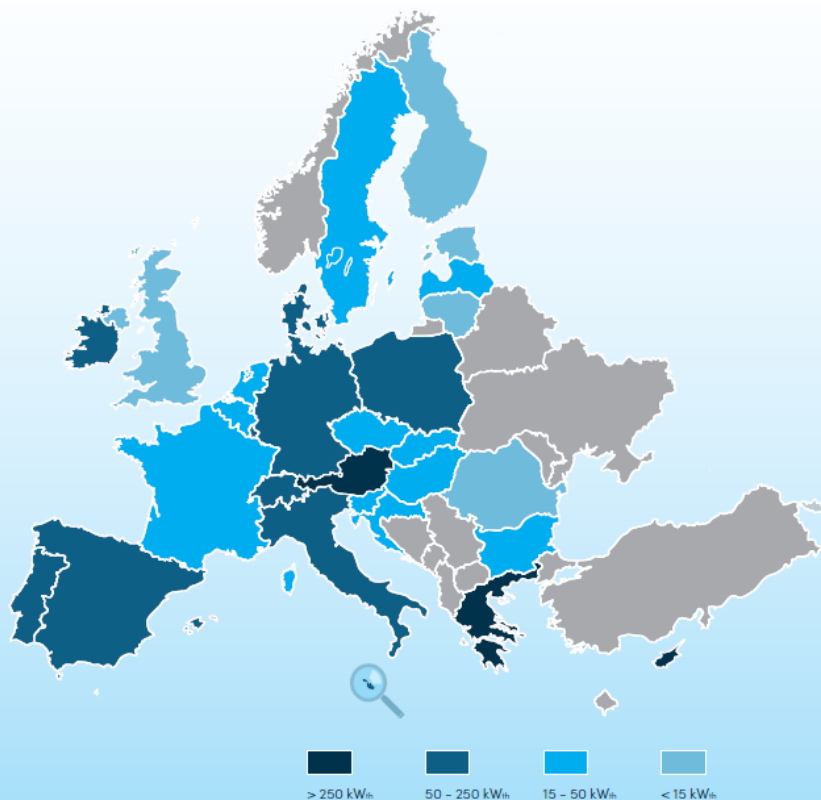
Out of the 20 biggest SDH in operation in the world, **16** are in Denmark, totalling an installed capacity of 394 MW_{th} .



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Recap: Solar Thermal 2022

Market overview - All applications



- 1) The relation between collector area and capacity is $1\text{ m}^2 = 0.7\text{ kW}_{\text{th}}$ (kilowatt-thermal)
 2) Capacity "in operation" refers to the solar thermal capacity built in the past and deemed to be still in use. Solar Heat Europe/ESTIF assumes a 20 year product life for all systems installed since 1990. Most products today would last considerably longer, but they often cease to be used earlier, e.g. because the building was demolished, or there has been a change of building use.
 3) The figures shown here relate to Metropolitan France (mainland). As a reference, in 2021 the newly installed capacity in overseas departments is estimated to be around 60 MW_{th} (86 000 m²).

Country	Cumulative Installed Capacity in Operation (MW _{th})	Annual evolution 2022/2021	New installed capacity in 2022 (in m ²)	Use of Solar thermal per capita
DE	15 470	2%	710 000	
GR	3 808	5%	419 000	
IT	3 708	5%	321 750	
ES	3 053	2%	145 500	
AT	2 568	-3%	58 970	
PL	2 354	6%	210 000	
FR	1 956	3%	106 175	
DK +	1 261	-1%	2 664	
CH	1 072	0%	24 605	
PT	964	5%	68 565	
CY	676	5%	73 924	
BE	501	2%	18 500	
UK	495	-2%	4 825	
CZ +	459	3%	25 503	
NL	443	2%	42 097	
IE +	292	0%	1 116	
HU *	258	3%	14 000	
HR	202	4%	13 558	
RO *	186	6%	16 932	
SE	180	-5%	2 014	
BG +	150	7%	18 500	
SK *	142	5%	14 060	
SL	93	0%	1 479	
FI +	54	9%	8 000	
LU +	53	3%	3 681	
ML +	36	-3%	1 083	
LV *	30	4%	1 700	
LT *	19	7%	1 751	
EE *	17	6%	1 425	
EU27 + CH + UK	40.501	2.6%	2 331 376	

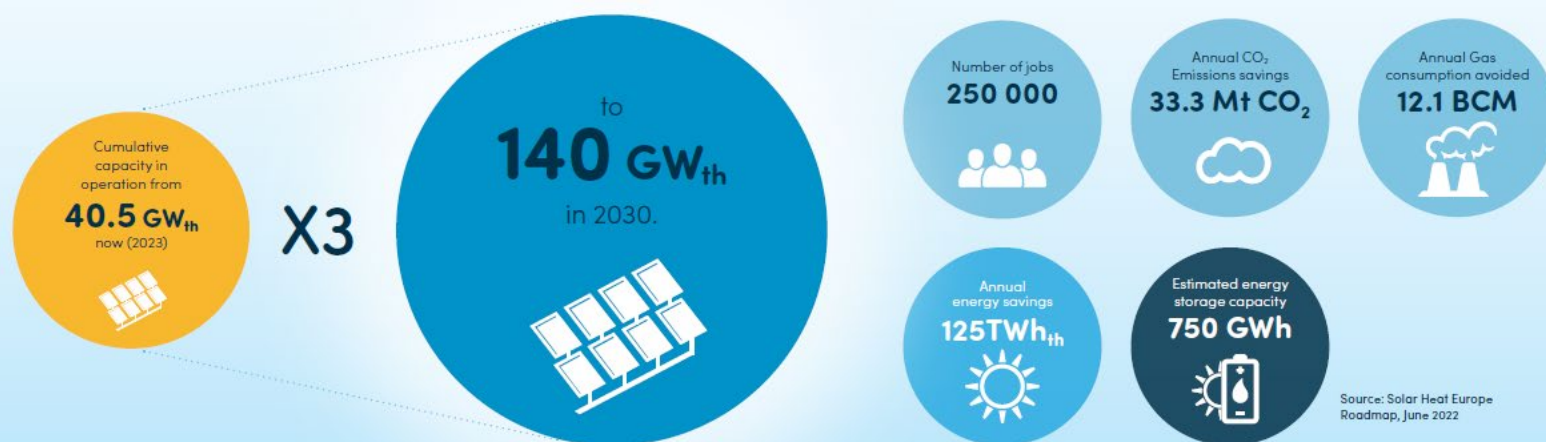
0 kW_{th} per 1000 capita 800

* Solar Heat Europe estimations
 + Based on the EurObserv'ER "Solar thermal and CSP Barometer" (2022).

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Solar heating & cooling Perspectives

By 2030, solar heat in Europe has ambitions to provide:



For more information on solar heating & cooling:

Global: International Energy Agency – Solar Heating & Cooling Programme
www.iea-shc.org

EU: Solar Heat Europe
www.solarheateurope.eu
info@solarheateurope.eu
+32 2 318 40 60

Und was passiert in der Schweiz ?

EFH/MFH -> Wärmepumpe übernimmt Wärmeproduktion

- Fokus auf eine Technologie ist gefährlich
Monokulturen vs. Resilienz
- Kollektornorm wird aktuell erweitert
«Air-brine Collectors», PVT
Quelle für WP
- Regeneration Erdsonden
- Mehr als 70% wohnen in urbanem Raum
-> Platz ist teuer
-> Wärmenetze



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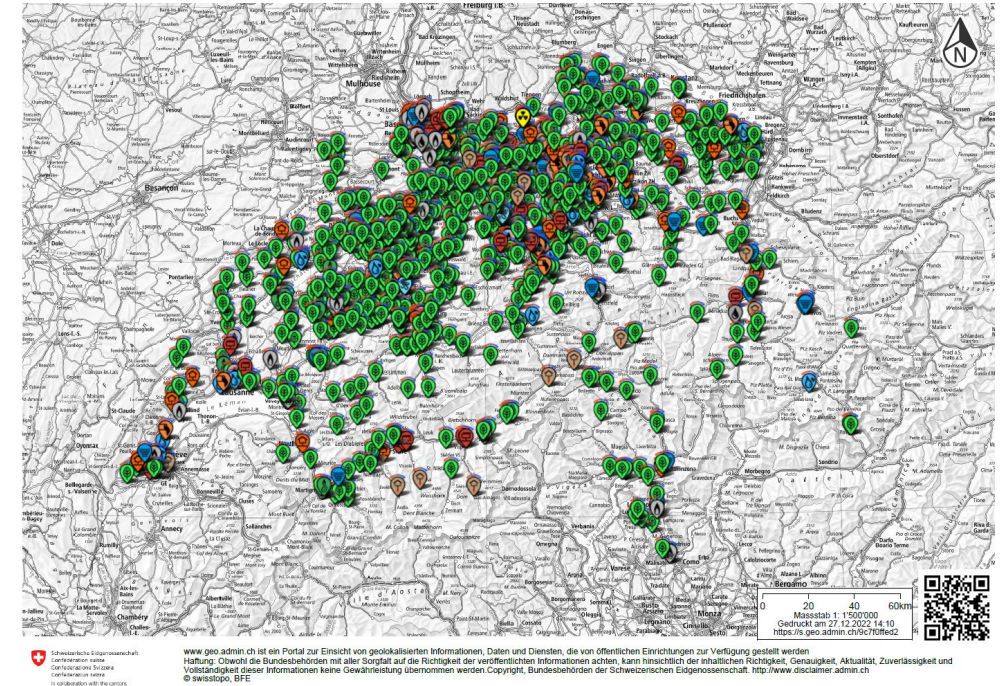
EFH/MFH -> Wärmepumpe übernimmt Wärmeproduktion

- **Neue PVT Kollektoren (abgedeckt)
Warmwasser und Strom**
- **Mehr als 70% wohnen in urbanem Raum**
 - > Platz ist teuer.
 - > Wärmenetze



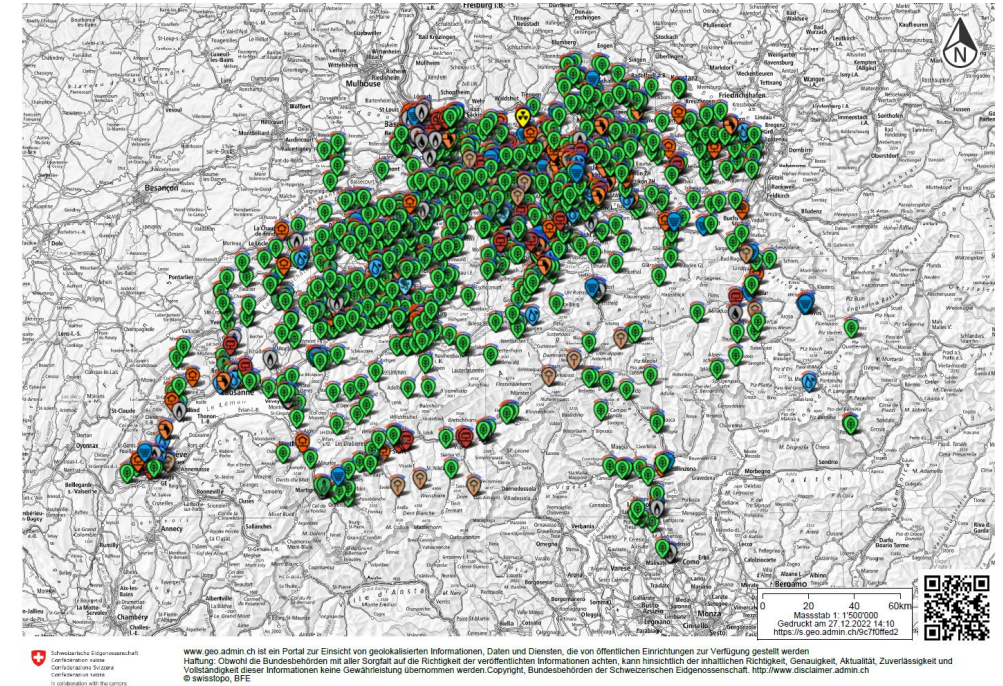
Und was passiert in der Schweiz ?

- > 1000 Wärmenetze in der Schweiz
- > 11 TWh – 11% der Wärme
- Quelle: Biomasse, Abfall, (Gas, Öl).
- Biomasse wird knapp
- Abfall wird weniger
- Abhängigkeit von Import



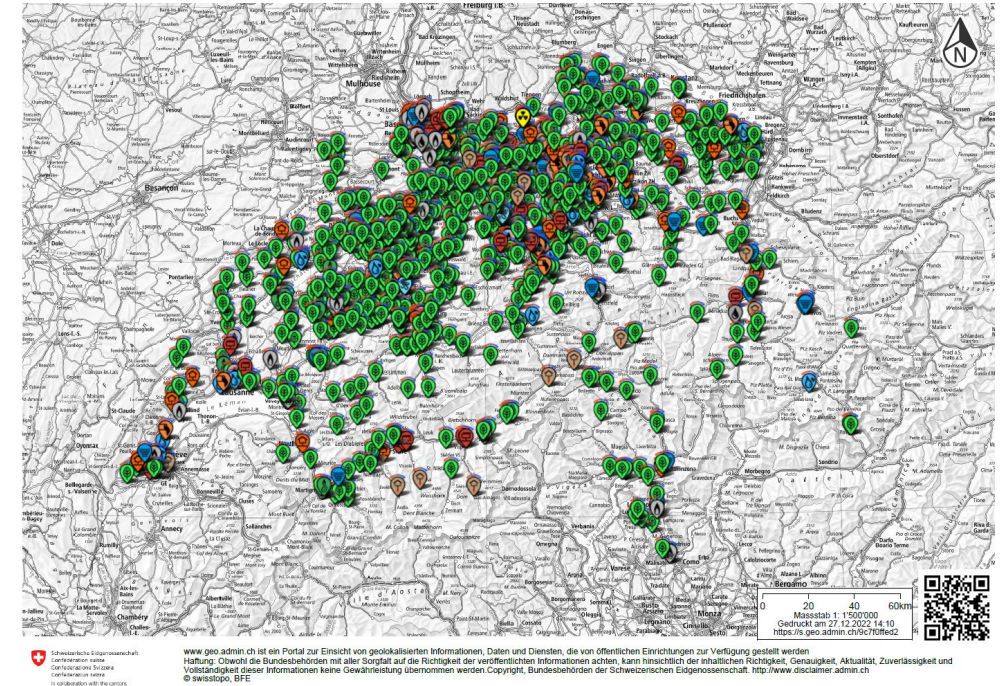
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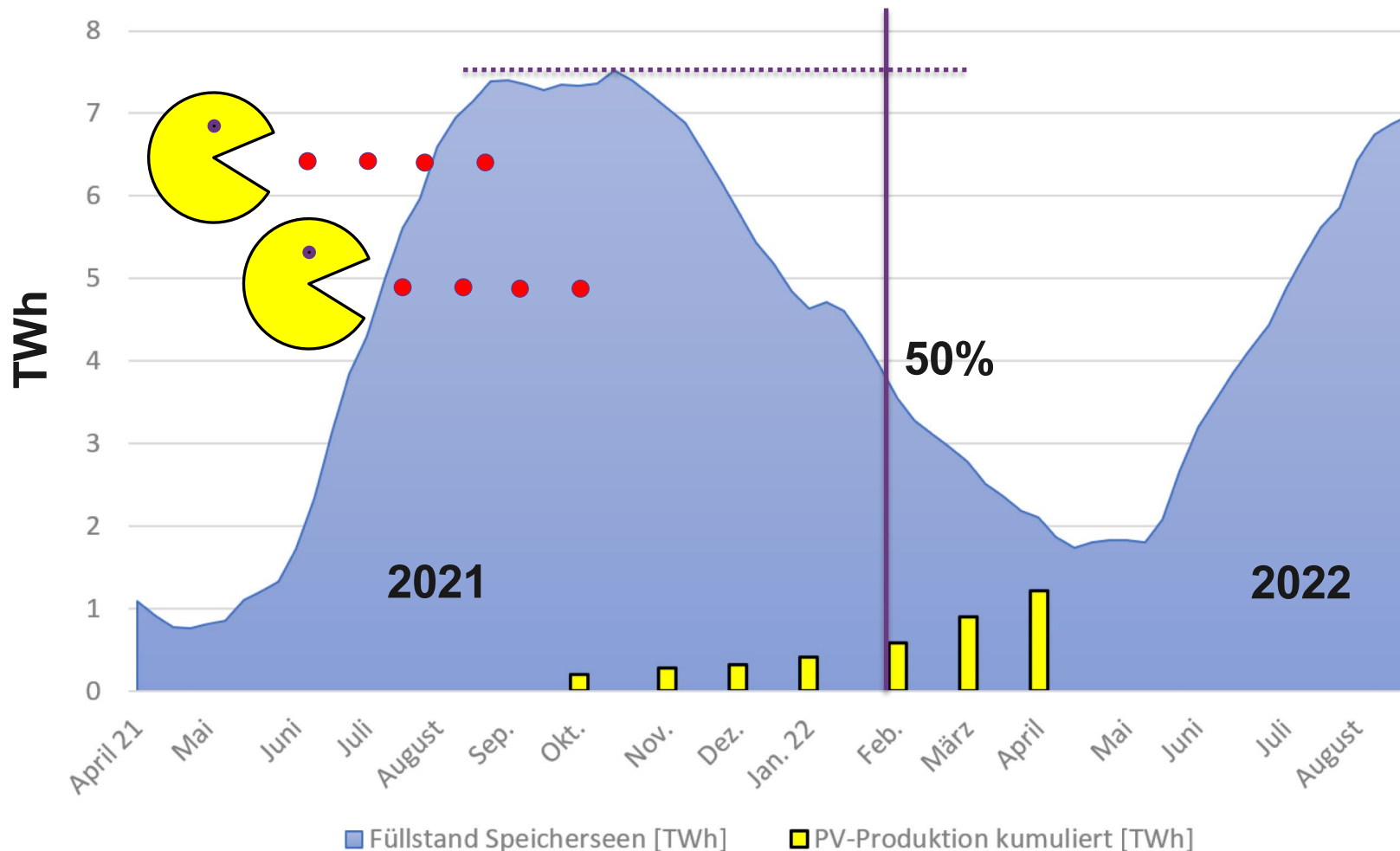


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- Abhängigkeit von Import -> Solarwärme
- Wärmelücke (Dezember/Januar/Februar) -> Grosse Speicher

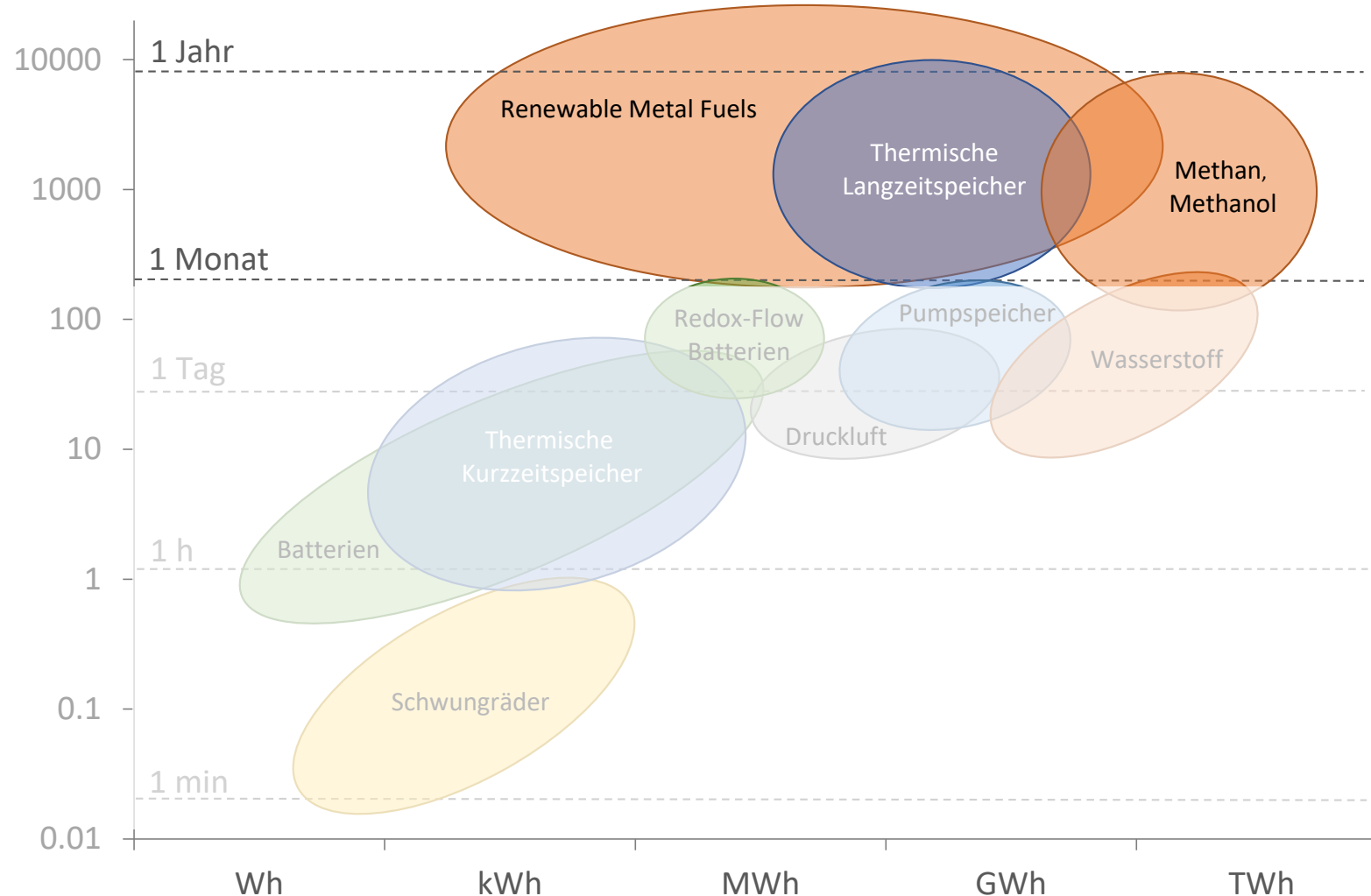


Bester Speicher ist das was nicht verbraucht wird.



- Stauseen sind im Januar auf 50%
- E-Mobilität
- WP

Bei der Speicherung haben wir nicht viele Optionen



Nur wenige Techniken für Speicherdauer über Monate

→ **Renewable Metal Fuels:**
Technologiereife 4-5 von 10,
noch nicht einsatzbereit

→ **Thermische Langzeitspeicher:**
Technologiereife 10,
einsatzbereit und kostengünstig

→ **Methan, Methanol**
(Power-to-Gas/Liquid):

→ Deutlich teurer, benötigt
Kohlenstoffquelle / -senke

Erdbecken-Wärmespeicher: Beispiele



Dronninglund, DK
62'000 m³
~ 3.6 GWh



Vojens, DK:
200'000 m³
~ 12 GWh

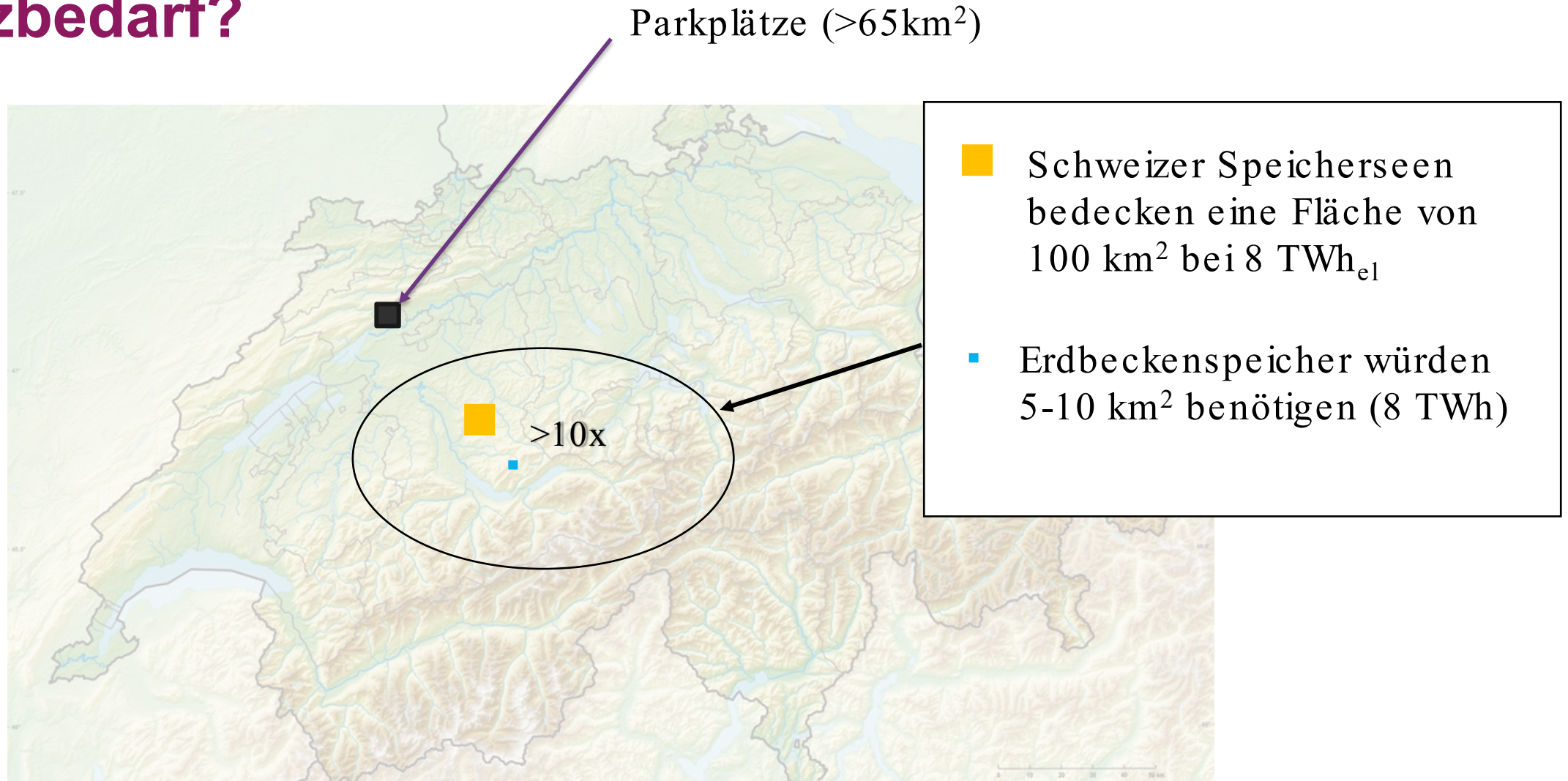


Meldorf, DE:
45'000 m³
~ 2.4 GWh

Investitionskosten: ca. 30 CHF/m³
0.5 CHF pro kWh Kapazität
4 Rp pro kWh Umsatz (20 Jahre, Zins 5%)

Quellen: NIRAS Aalborg, Thomas Labda / LinkedIn, Solarheateurope

Platzbedarf?



Wärmenetzkollektoren

 GreenOneTec (Arcon)

 Meriaura (Savo)

 Ritter

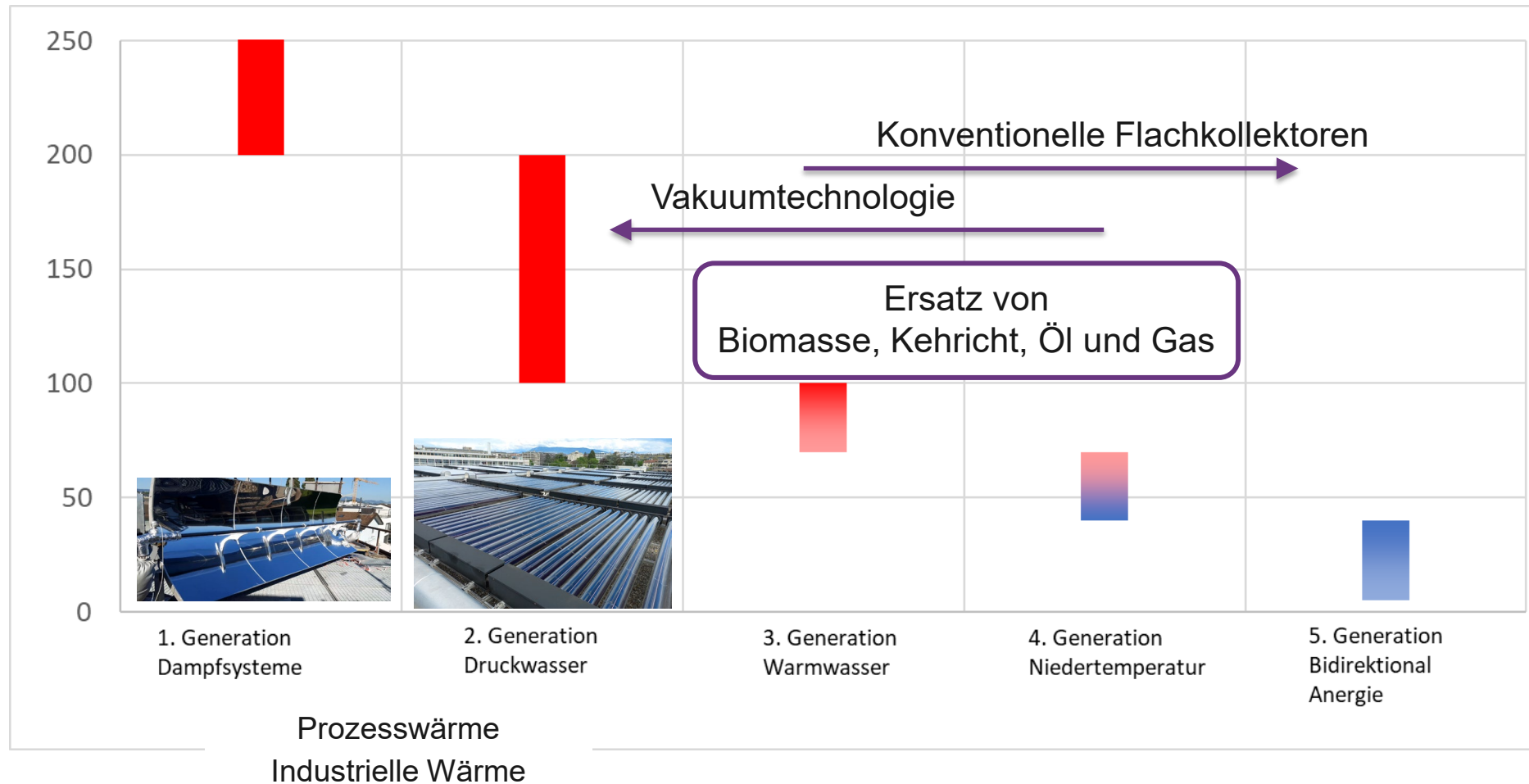
 TVP

 Absolicon

 Viessmann



3.- 4. Generation, 40-100 °C





Ettenheim (DE) 1800 m²

Friesach (AT) 5750 m²



Zürich (DE) 1150 m²

HUG Genf



Groningen (NL) 48000 m²,
70-90°C



© TVP Solar



Randegg (DE) 2400 m²



Industrielle Wärme / Prozesswärme

- Temperaturen bis etwa 150°C, aber je tiefer desto besser.
- Technisch gesehen kein sehr grosser Unterschied zu Wärmenetzen.
- Grosser Speicher ist wichtig
oder
der Bedarf so gross, dass niemals Überproduktion entsteht.
- Ökonomischer Unterschied: Lebensdauer.
Wärmenetz eher 30+ Jahre
Prozesswärme 5-10 Jahre (günstigere Kollektoren, Leasen, ...)

Herzlichen Dank für Ihren Besuch