SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

SHC
TASK 66
Solar Energy Buildings

Eurosun 2024, *August 30th 2024*

Towards Solar Energy Buildings

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EuroSun2024

EUDP

DTU

Demonstration cases

Location of demonstration cases

Demonstration Cases overview

21 Demo cases

	Solar Energy Building	Solar Energy Building Technologies													
		Energy source								Energy storage					
		sun				water		earth	air	electrical storage		thermal storage			
		Photovoltaic	Solar thermal collectors	Solar-air collector	PVT-collectors	Hydropower plant	Groundwater and heat pumps	Geothermal and heat pumps	Air-source heat pumps	batteries	Mobile batteries (E-mobility)	Hot water storage	Thermochemical storage	Ice storage	Thermal mass activation
Europe	Austria, SEB No. 1	X				X	X			X	X	X			X
	Austria, SEB No. 13	X			X			X		X	X	X			X
	Austria, SEB No. 14	X					X		X			X			X
	Austria, SEB No. 9	X					X			X		X			
	Germany, SEB No. 20	X	X							X	X	X			
	Germany, SEB No. 8	X						X		X		X			
	Germany, SEB No. 10	X		X				X		X	X	X		X	
	Germany, SEB No. 5	X	X							X	X	X			
	Germany, SEB No. 22				X						X	X		X	X
	Germany, SEB No. 21	X	X									X		X	
	Portugal, SEB No. 6		X									X			
	Poland, SEB No. 7		X					X				X	X		
	Denmark, SEB No. 24	X			X		X			X	X	X			
Asia	China, SEB No. 23	X								X	X				
	China, SEB No. 26		X					X	X			X			
	India, SEB No. 16	X													
	India, SEB No. 17	X	X												
	India, SEB No. 18	X								X					
	India, SEB No. 19	X	X									X			
	India, SEB No. 3	X		X								X			X
	Australia, SEB No. 25	X	X						X	X	X	X			
	Total	17	9	2	3	1	4	5	3	11	9	17	1	3	5

Solar fraction

Heating
20% - 94%

Cooling
33% - 100%

Electricity
14% - 100%

Trends

Europe

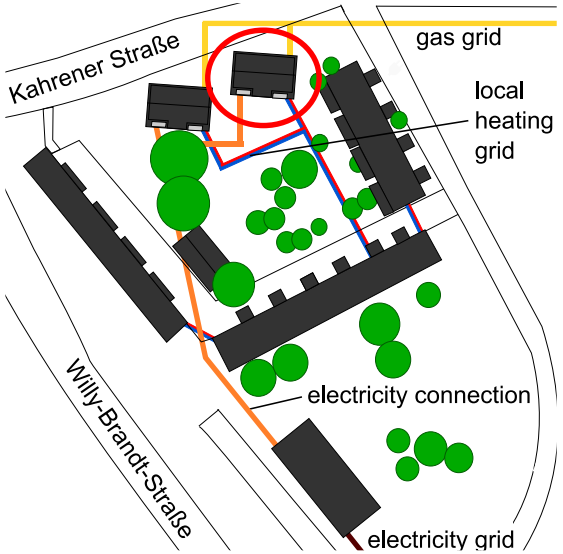
- Systems with a mixture of a **high number of different technologies**
- PV, HP, Battery, Solar thermal, Hot water storage, Ice storage, Anergy network, advanced control strategies, and Thermal mass activation
- On average, European Solar Energy Buildings use **5 different technologies**

Asia

- Systems with **few different technologies**
- PV, battery, Solar thermal, Hot water storage, and Thermal mass activation
- On average, Asian Solar Energy Buildings use **3 different technologies**

Climate zone: **Continental**
Significant annual variation in temperature, with warm summers and cold winters

Multifamily solar house, Kahrener Straße, Cottbus, Germany (51.76° N, 14.35° E)



Building
- New building from 2019
- Living area: 605 m^2

Energy technologies
- Solar thermal collector: 100 m^2
- Heat storage: 24.6 m^3
- Gas boiler: 48,2 kW for backup heating (condensing gas boiler)
- PV: 29.6 kWp
- Battery: 46.8 kWh
- Geothermal collector system for cooling
- Electrical vehicle charging station

Solar fraction (measured)
- **Heating: 56 %**
- **Cooling: 100 %**
- **Electricity: 73 %**

The surplus of heat and electricity is consumed decentrally through **networking and sector coupling in the neighborhood and through e-mobility**.

Contact person: **Lukas Oppelt**, lukas.oppelt@tu-freiberg.de

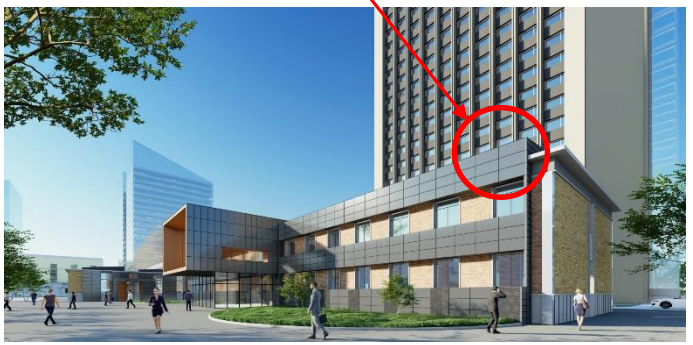
East Beisanhuan Road, China. *Office building in Beijing, CABR (net ZEB)* (39.96° N, 116.41° E)

Climate zone: **Continental**
Significant annual variation in temperature with cold sunny winters and hot, sultry, and rainy summers (Monsoon)

Before: 3000 m² office building (1970)

After: 3000 m² energy renovated office building + 235 kWp PV (2021)

PV modules as shadow curtain



Building
- Existing office building, renovated 2021
- Gross area: 3000 m²

Energy technologies
- PV panels
- DHW: Electrically heated hot water tank
- Summer: Split air conditioner
- Winter: District heating
- Electric vehicle charging station

Solar fraction (measured)
- **Electricity: 58.4 %**

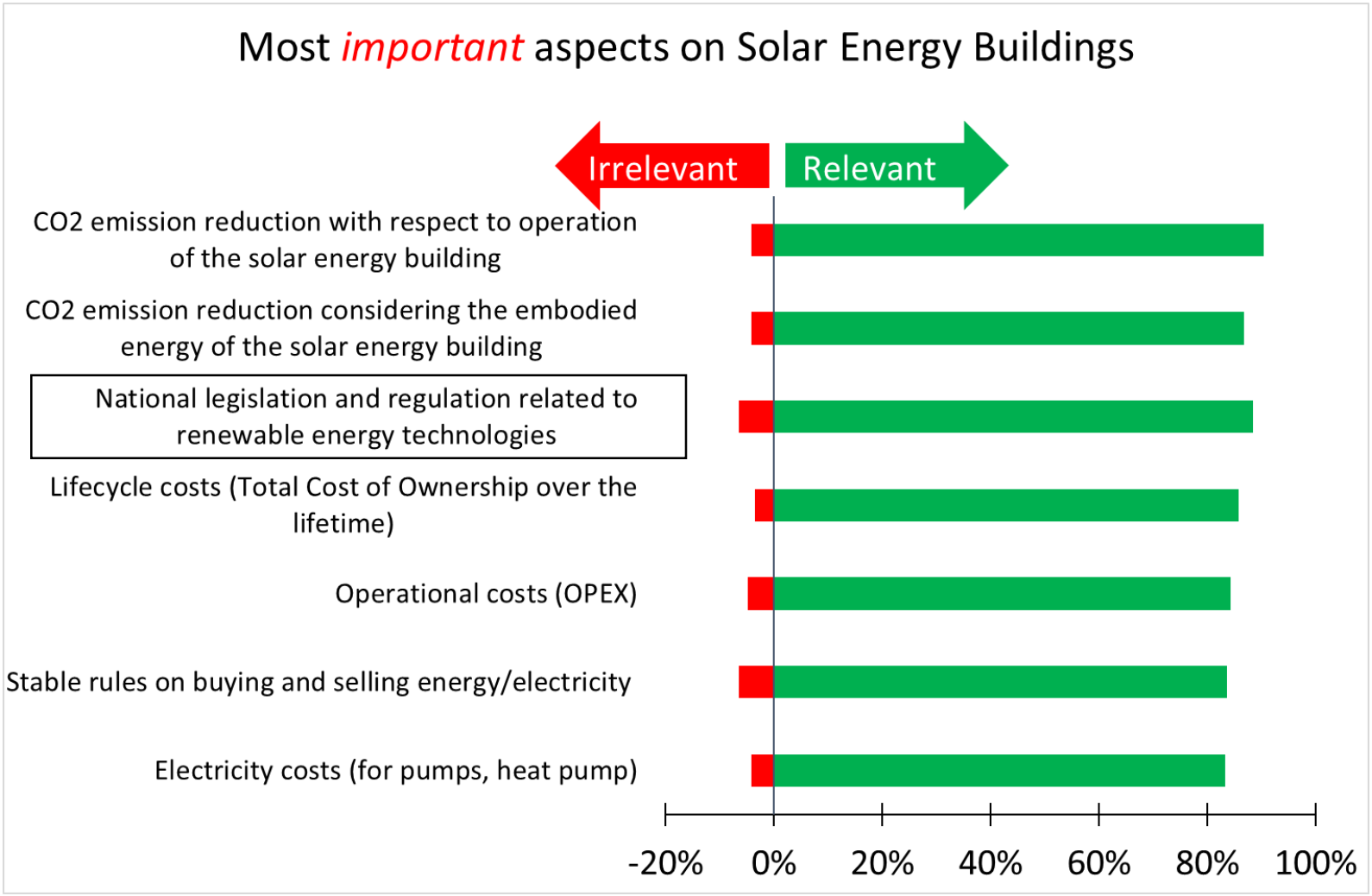
Monocrystalline silicon
569 m² (115 kWp)

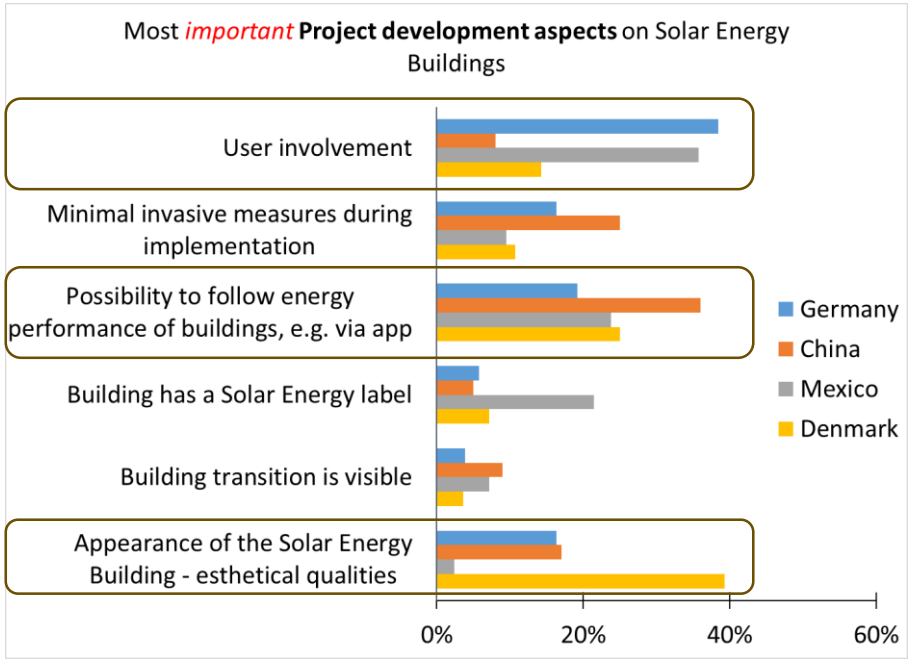
Thin film
849 m² (118 kWp)

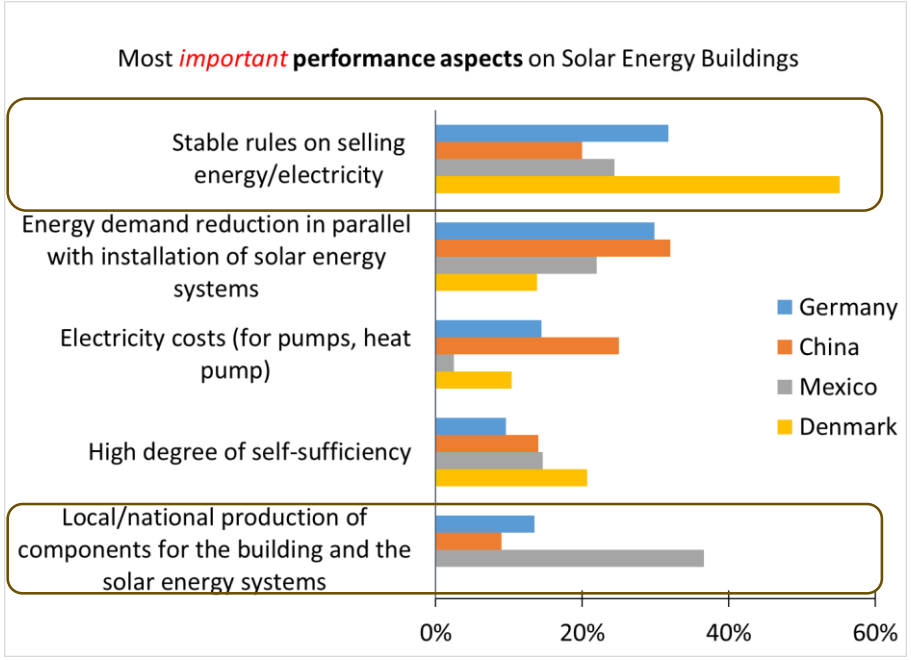
Transparent thin film
51.6 m² (2.2 kWp)

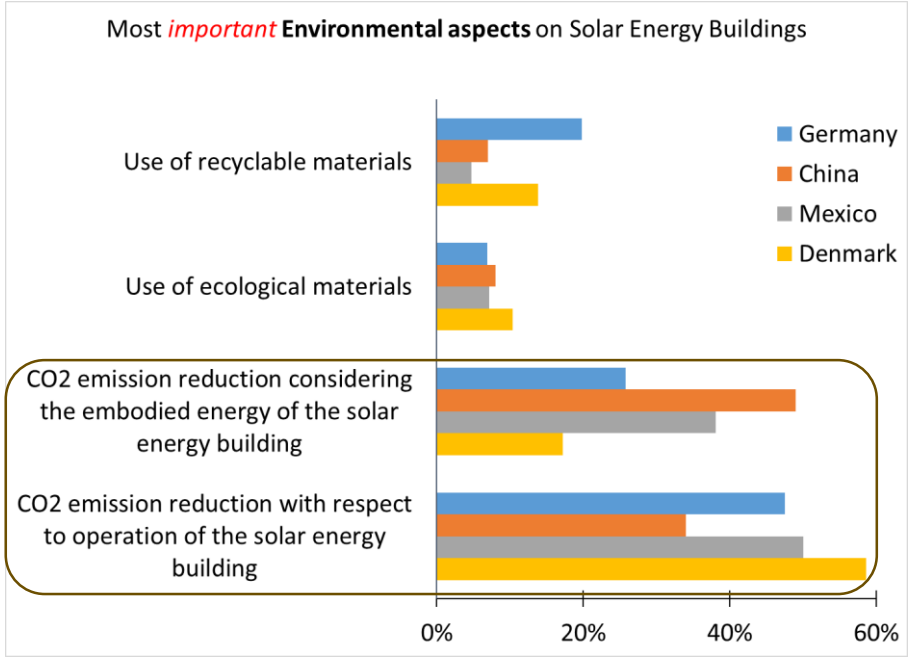
Contact persons: **Xinyu Zhang**, zxyhit@163.com and **Wenbo Cai**, c18519533681@163.com

Stakeholder opinion





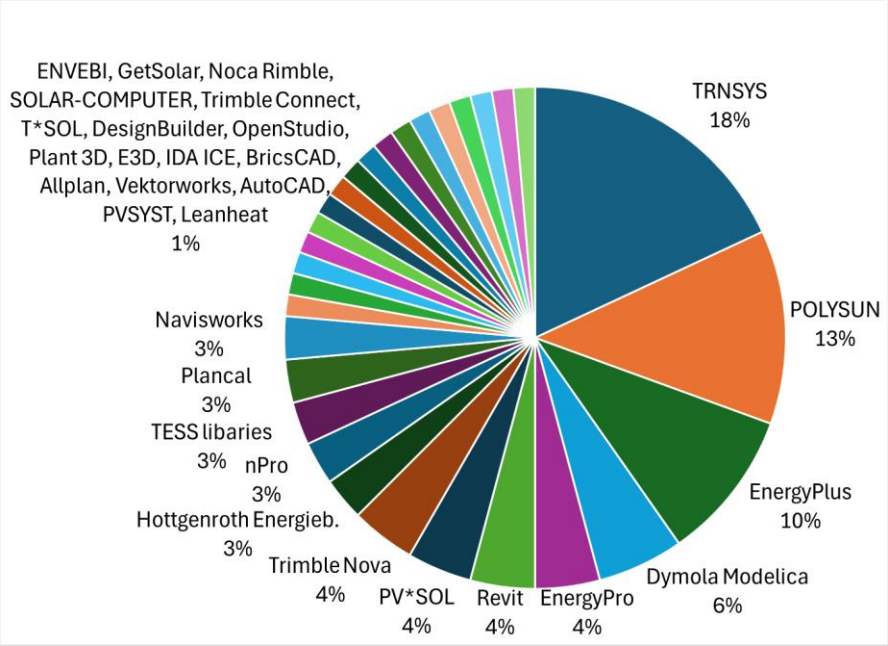




On top of the list

Programs used for Solar Energy Buildings

71 commercial programs used



Commercial programs are used for:

- Design and Planning
- Construction and Verification
- Operation and Maintenance

No commercial programs are used for:

- Renovation and End-of-life

Self-made programs are used because:

- Complexity and costs of commercial programs
- Limitations in commercial programs

Important to reach a high degree of self-sufficiency at a low cost

- Reduce the energy demand for buildings
- Use low-temperature heating systems (floor heating or oversized radiators)
- Use solar energy systems to cover the energy demand
- Reduce electricity consumption when renewable electricity is limited – use energy storage
- Use smart control systems to improve the interplay with the energy grids and further reduce the system size and costs

Recommendations

- Develop solar energy systems with **storage** and smart control giving a good interplay with the energy grids

Thanks for listening!

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