



Why consider PVT systems ?

IEA SHC Task 60 2018-2020

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OA Task 60

task60.iea-shc.org

PVT strengths

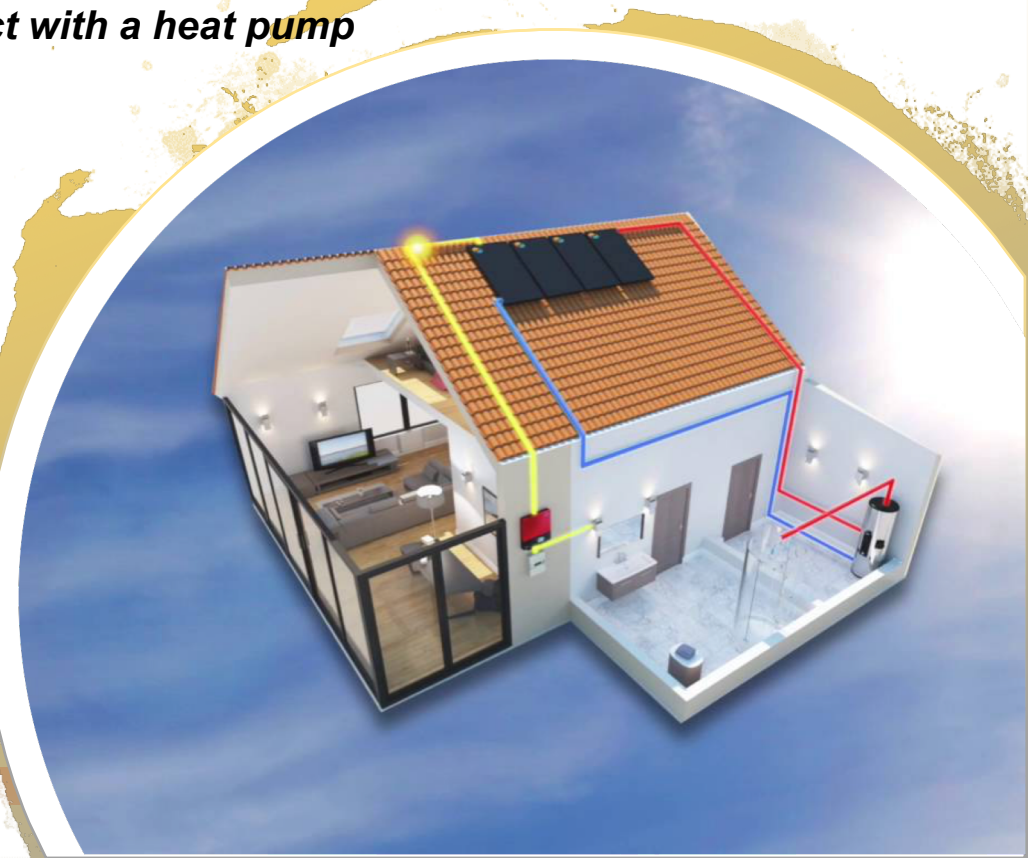


Delivery of:

- Heating up to 170 C ! *Direct or indirect with a heat pump*
- Cooling *indirect or direct at night*
- Electricity *for all kind of usage*

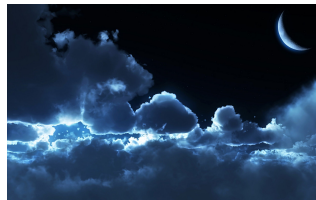
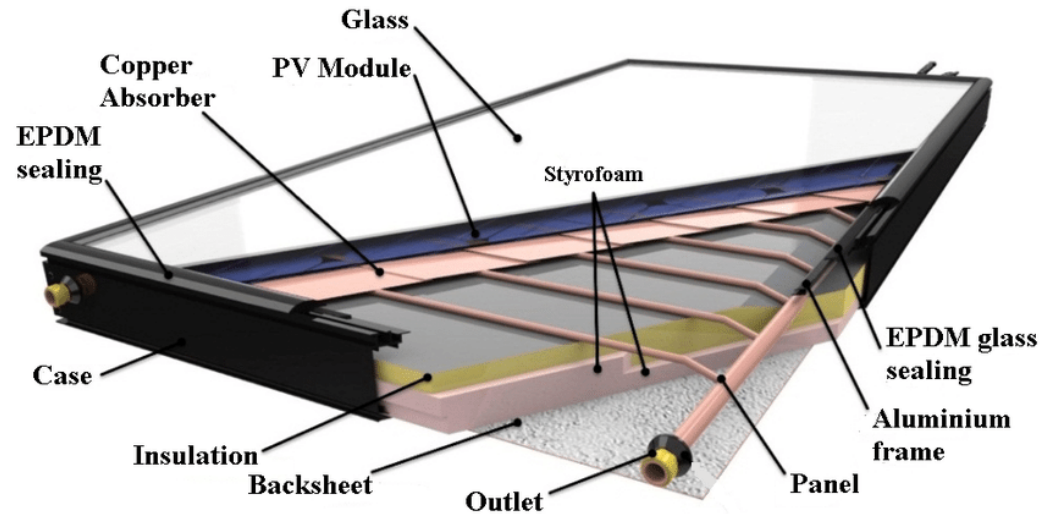
PROs

- Maximize output per area
- 100% solar in fav. cases
- Heat pump source at no noise
- Borehole regeneration
- Payback time if load is constant



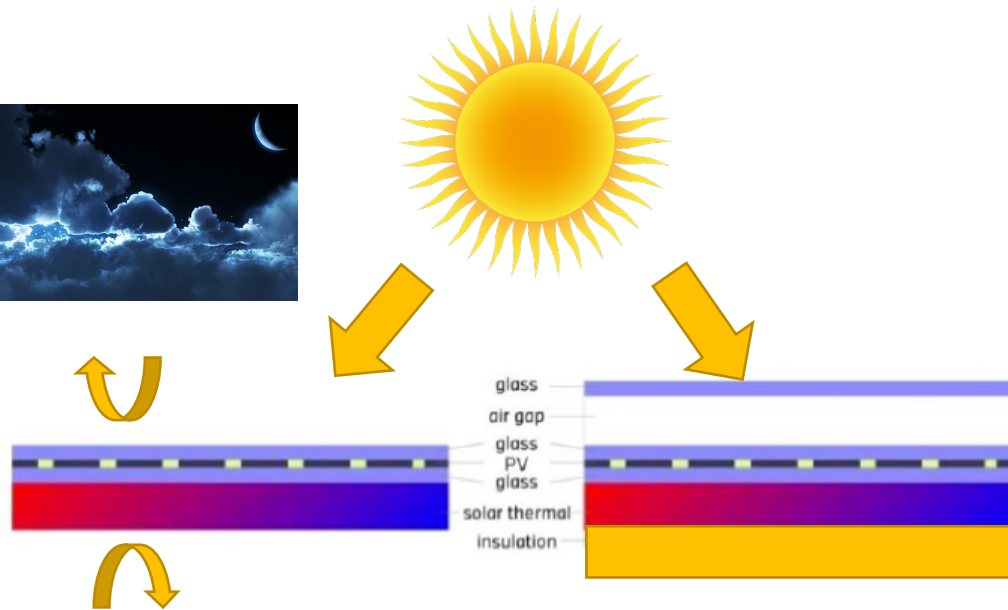
What is PVT ?

Hybrid tech

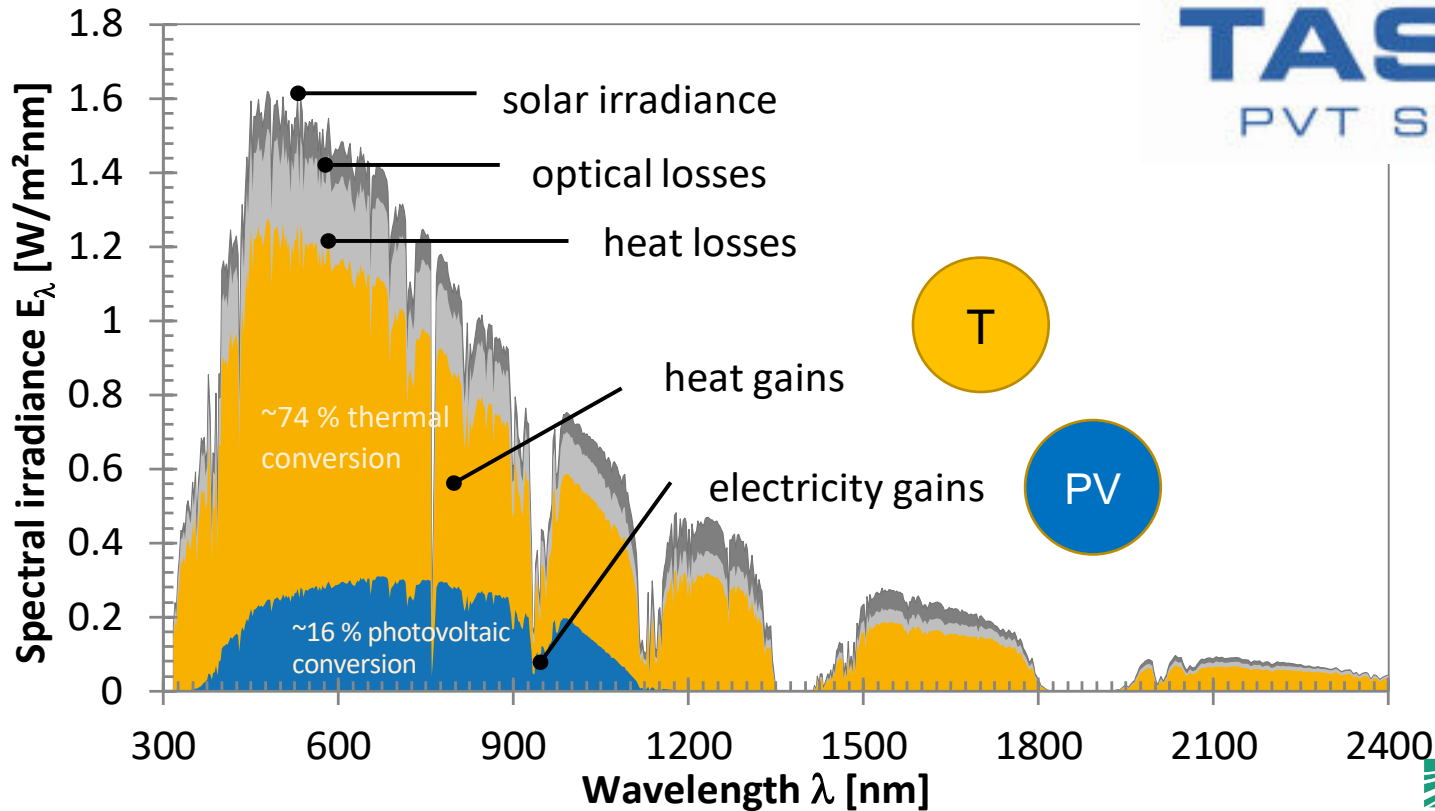


No cover:

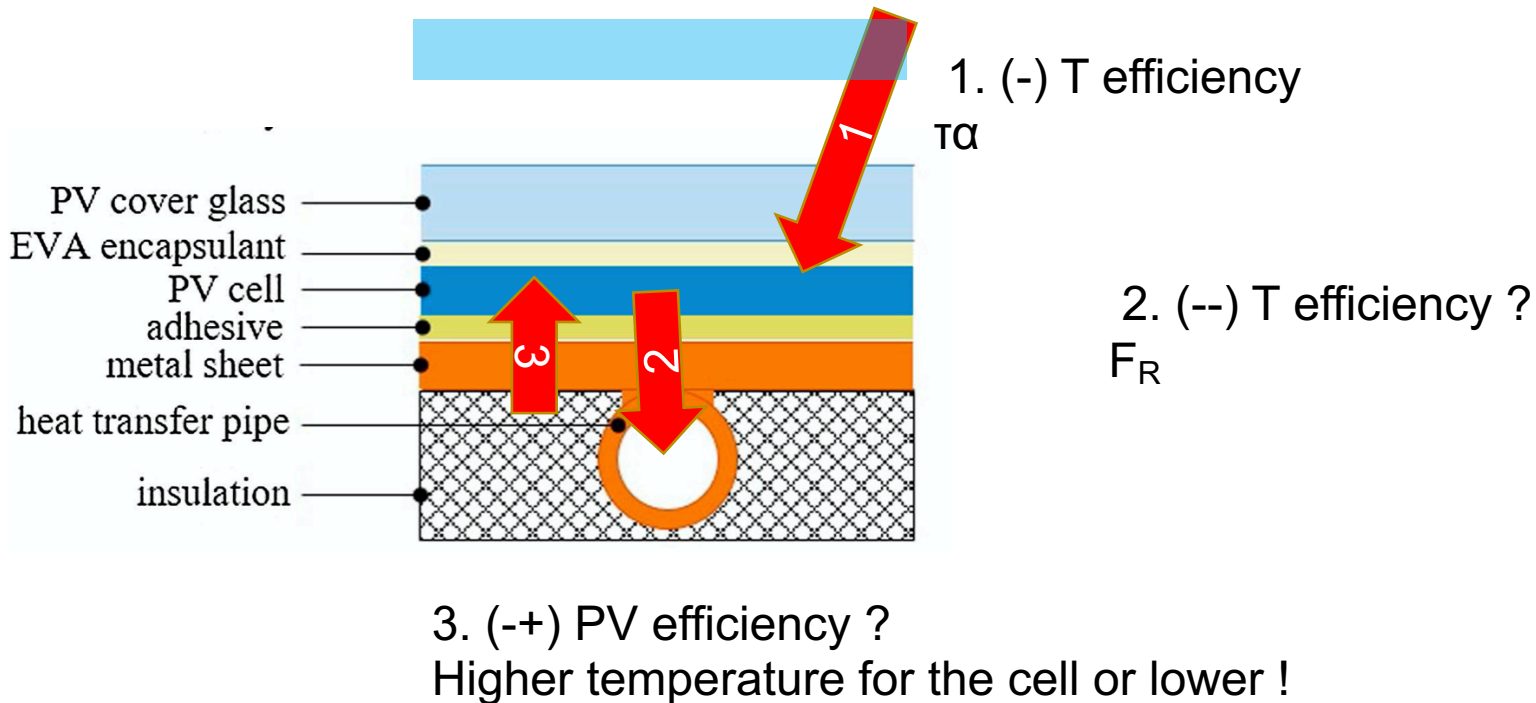
Wind
Infrared
Sensitive
Collector



Why more solar energy ?

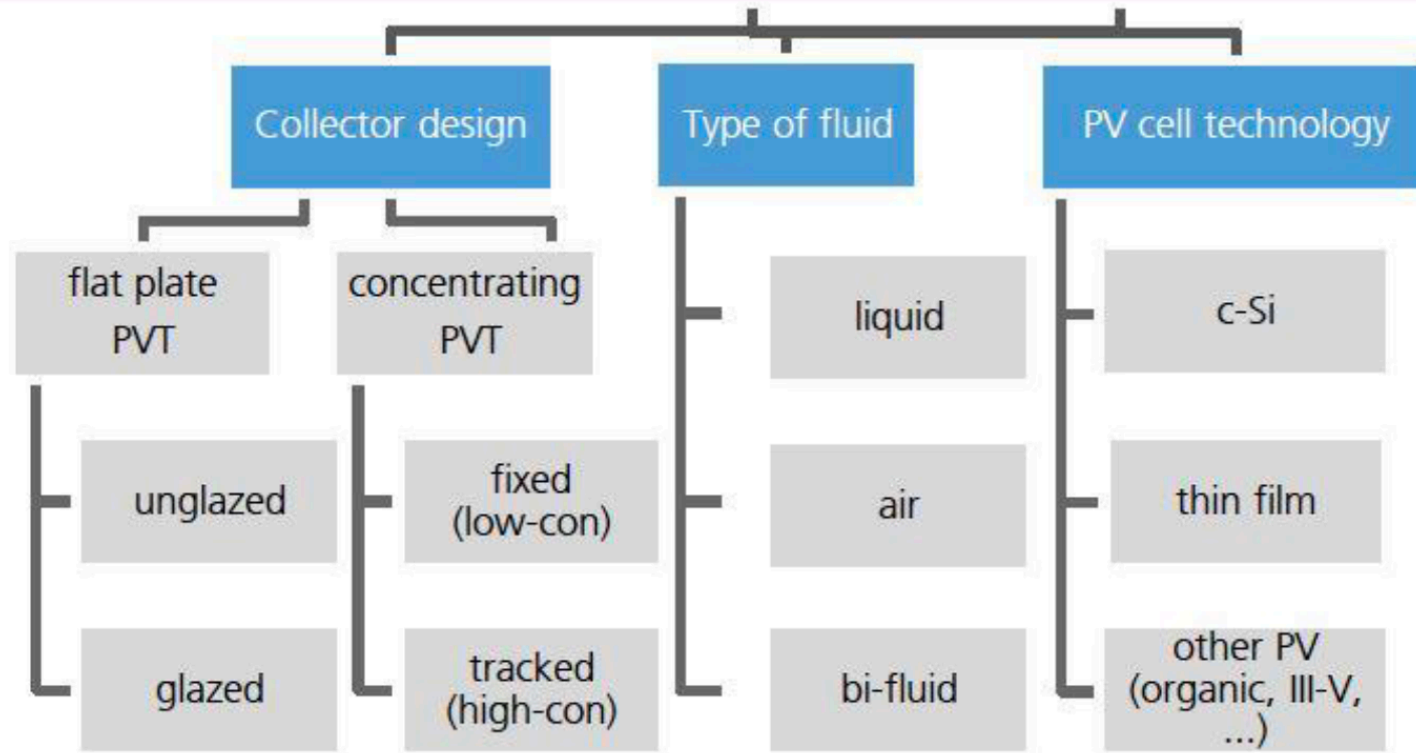


Factors affecting the performance



Cross section from: A Mellor et al. Solar energy 174, nov 2018

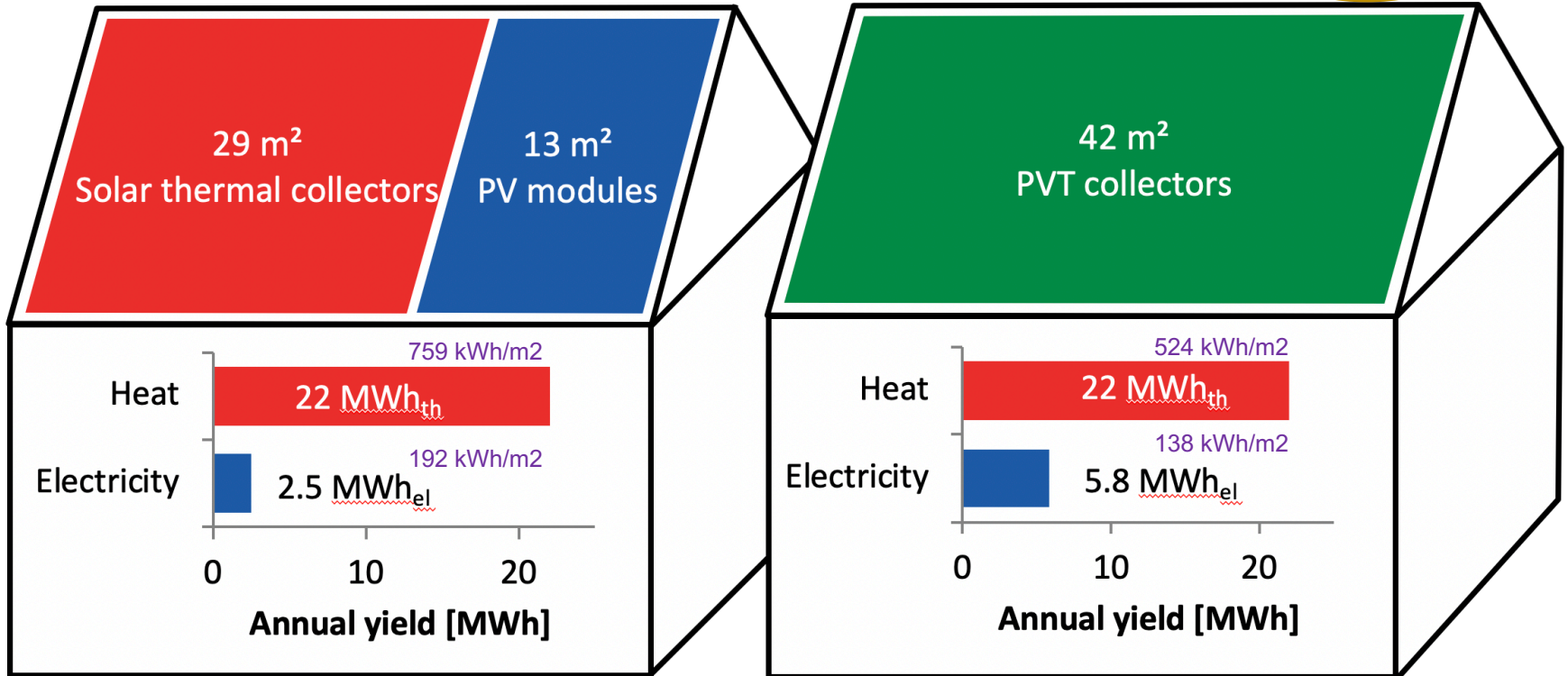
Classification of PVT collectors



PV&T Side-by-sideor..... PVT

Climate: mid Europe

E+13%



Electricity : Heat 1 : 3.8

Cost limit ?

Well design and sourced PVT can make it !

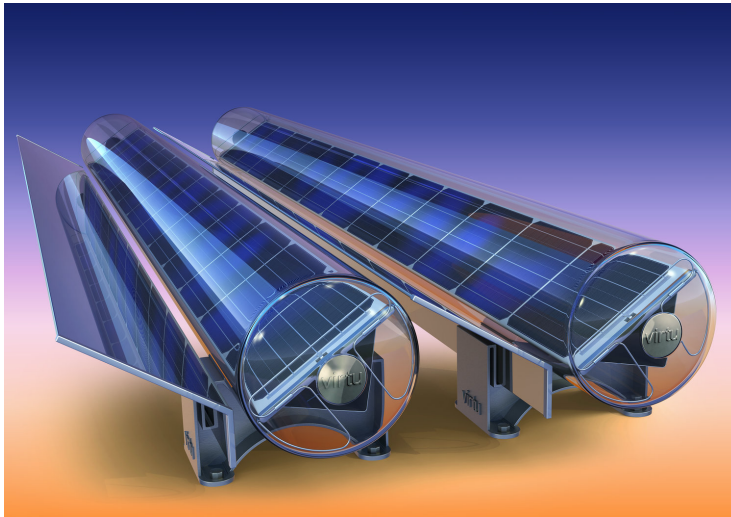
Standalone components

- T glazed : 250 €/m²
- PV: 0.6 €/W for 190 W/m² = 114 €/m²

Hybrid...suppose same productivity or same value of energy

- PVT glazed < 364 €/m² ?
- + savings on components + time 50 €/m²

Examples of PVT collectors 1

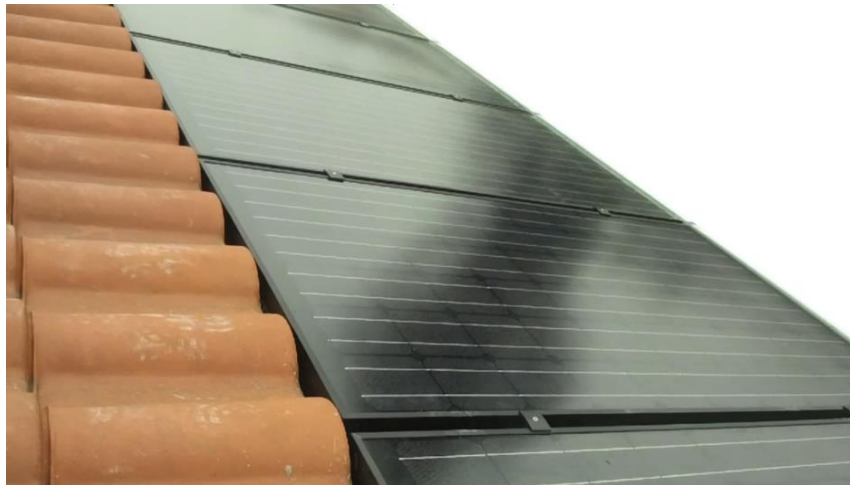


Courtesy of 3FSolar, Naked energy, Meyer Burger

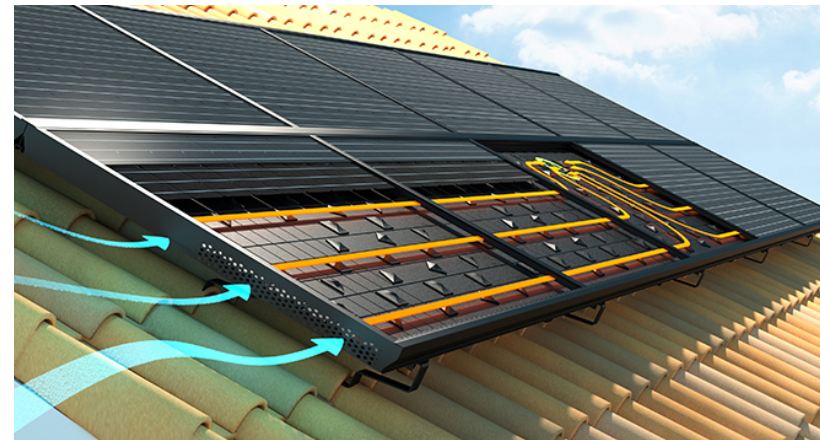
Example of PVT Collectors 2



glazed



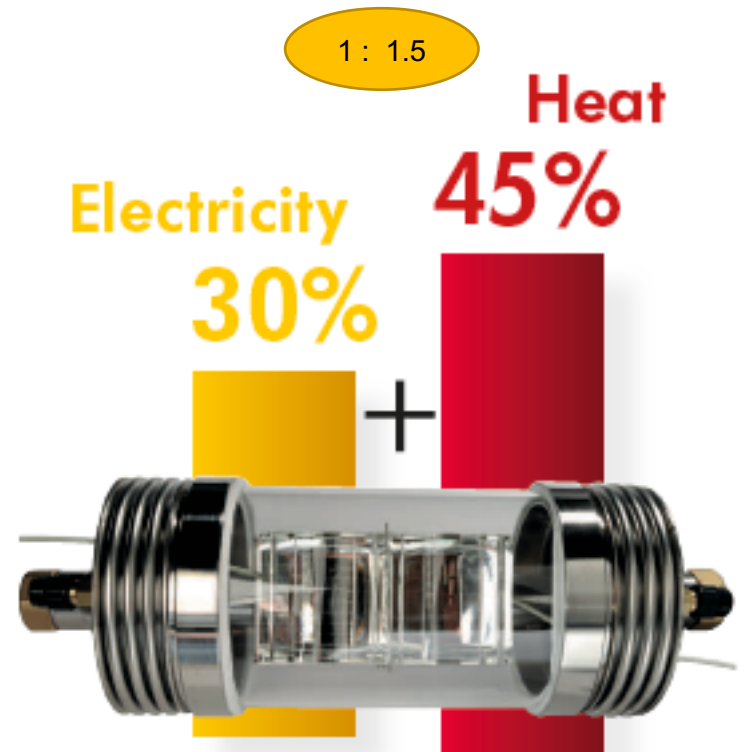
WISC



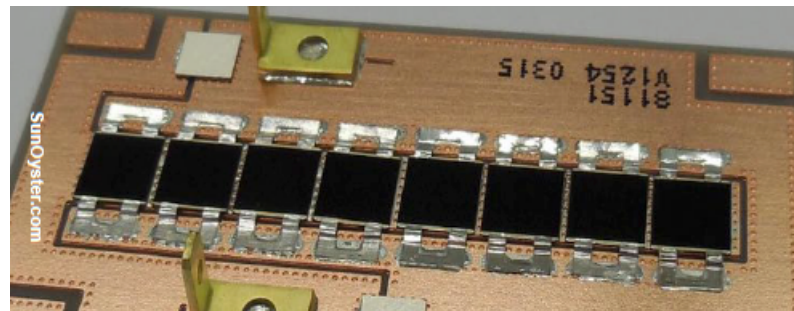
Air

Courtesy of Abora, Dualsun, Systovi

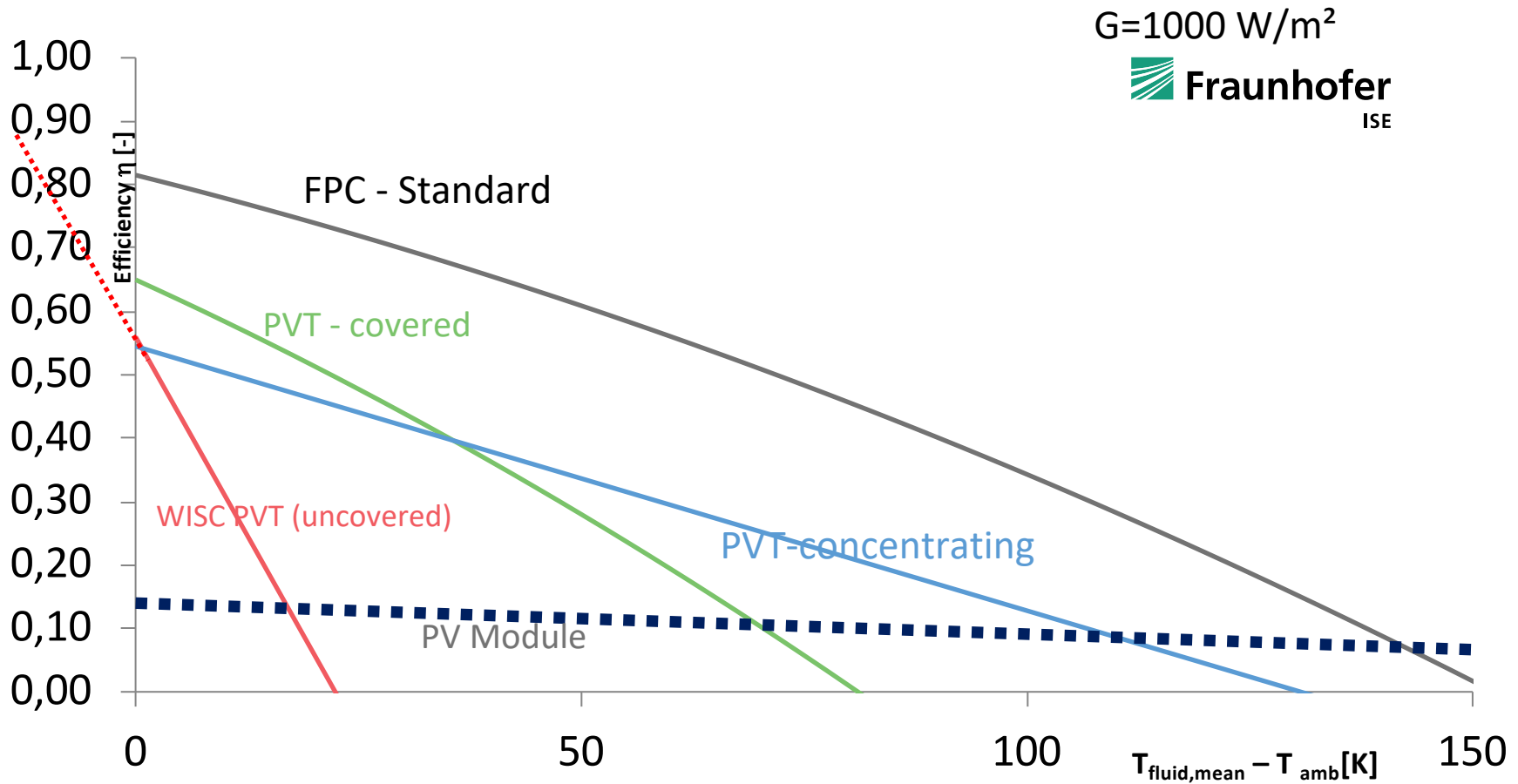
Example of PVT concentration collectors 3



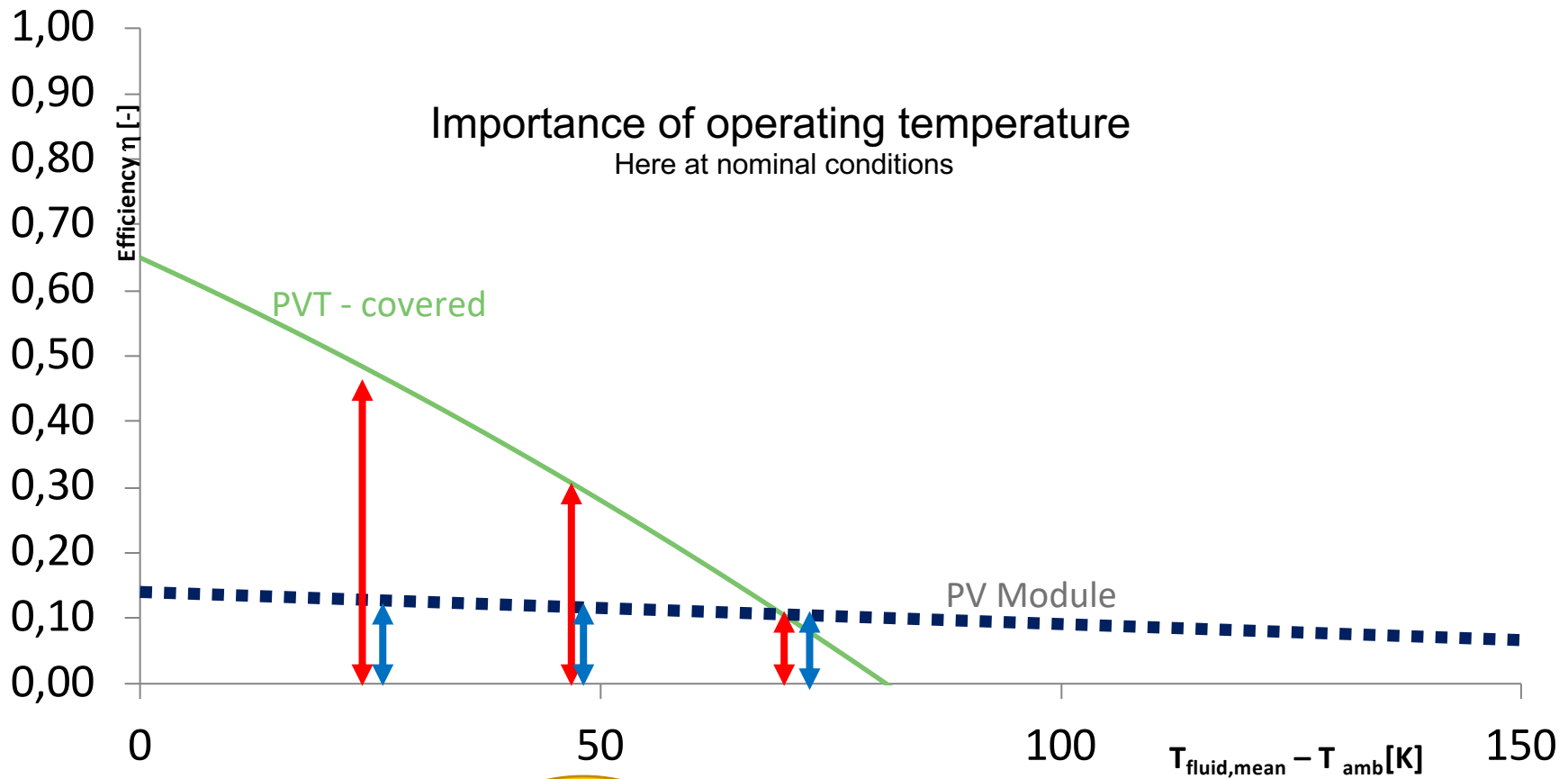
Courtesy of Sunoyster



PVT Technologies – Concept Efficiencies

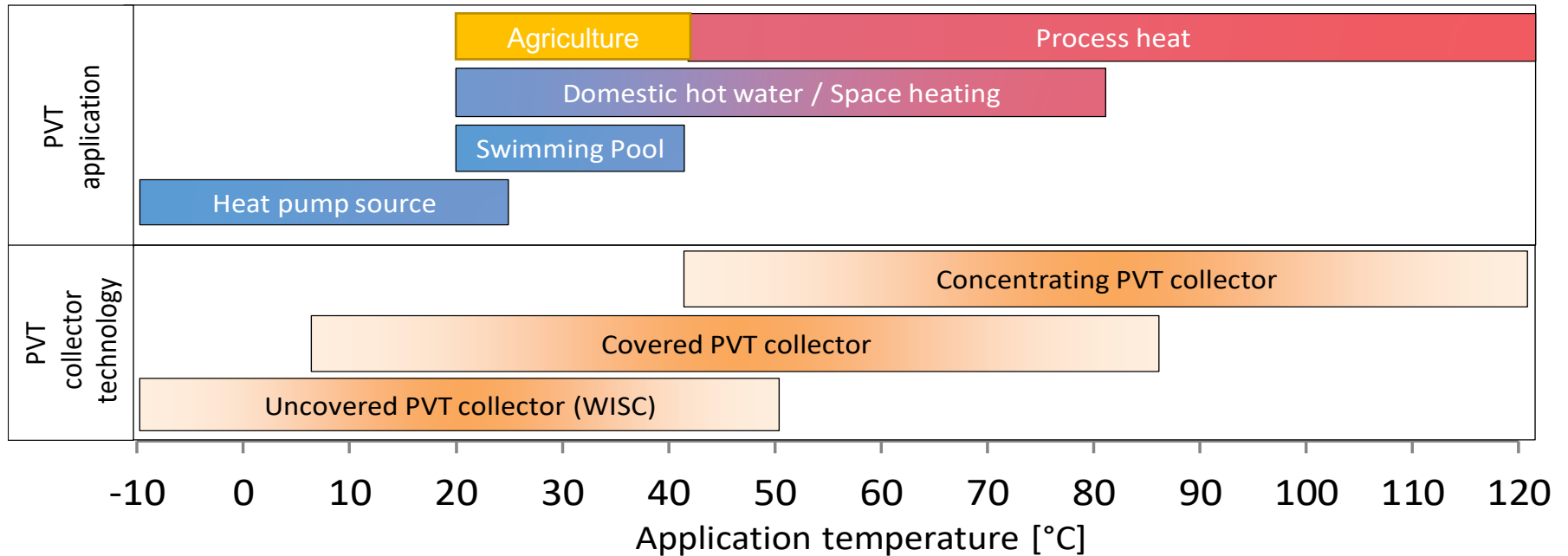


PVT Technologies – Concept Efficiencies



Electricity : Heat 1 : 3.8

Applications



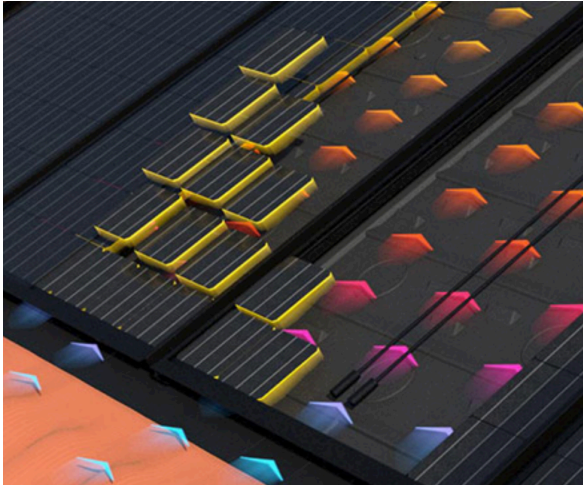
https://en.wikipedia.org/wiki/Photovoltaic_thermal_hybrid_solar_collector



Examples

PVT heating / summer night cooling

injected in the ventilation system – renovation and low energy houses



20 m² T 500 kWh/m² E 150 kWh/m² 1/3.3



Courtesy of Systovi

Cell temp coeff. on P_{max}: - 0.47 %/K

Firemen house - Zaragoza Spain

28 PVT panels 46 kg – 66% SF
43.4 m²
7.28 kW

T 31'184 kWh = 718 kWh/m²
E 9'618 kWh = 1320 kWh/kWp 221 kWh/m²
Ratio Energy PVT: 1/3.2



Courtesy of Endef

Example: Ground coupled heat pump

GS-Regeneration - P&D project Oberfeld

Object

3 MFH, 100 flats, 5345 m² ERA (energy reference area)

Heating system

28 boreholes of 200 m

Decentralized heat pumps

1300 m² PVT collector area

Performance 1st year of operation

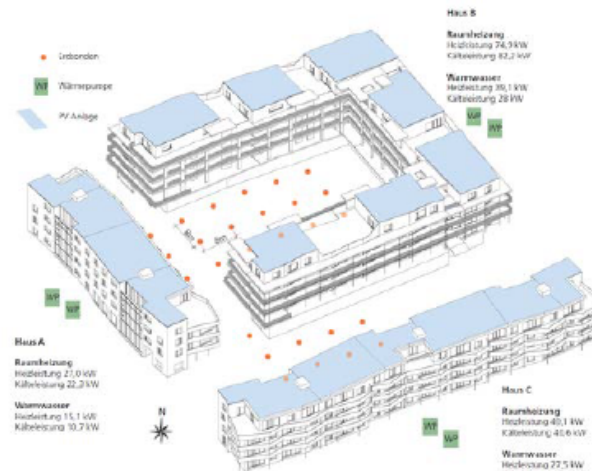
Thermal yield 330 kWh/m²

Electrical yield 163 kWh/m²

Degree of GS-regeneration 125 %

Monitoring

SPF Rapperswil



Courtesy of Meyer Burger

Bildquelle: «Solararchitektur» EnergieSchweiz

Large industrial projects

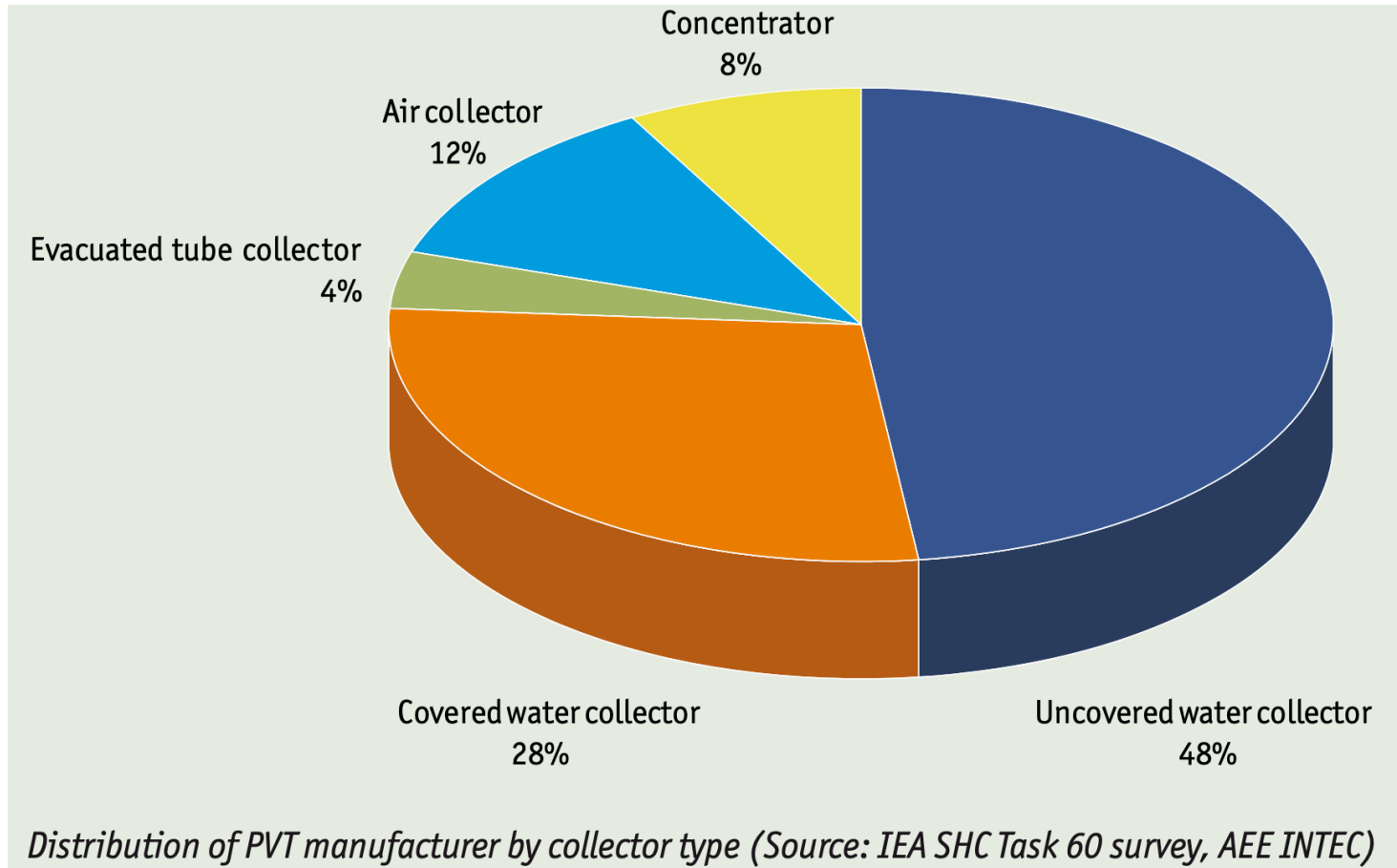
Greenhouses ground heating and ventilation fans 1MW – 2011 - I



Courtesy of Millenium Electric T.O.U Ltd

PVT Collectors – Market Development

~ 1.1 Mio m² installed PVT collector gross area



Data from 26 manufacturers, gathered and processed by Thomas Ramtschak, AEE intec within Task 60

Best applications for ROI



Hotels



Residences



Industry



Sport centers



Campsites



Multidwelling houses



Hospitals



Car washes

- **T: High DHW demand + low seasonality**
- **PV: Feed in tarif or electricity tarif (high self consumption)**
- **Payback time: 4 to 8 years in latitude -40/+40 climate**

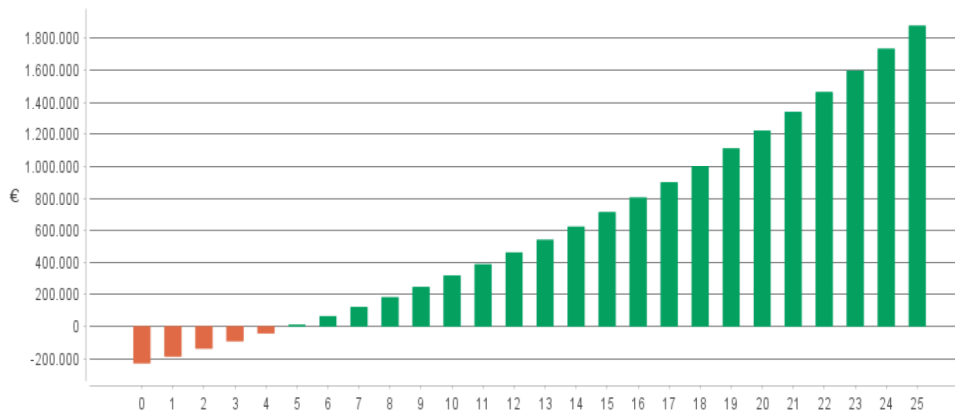
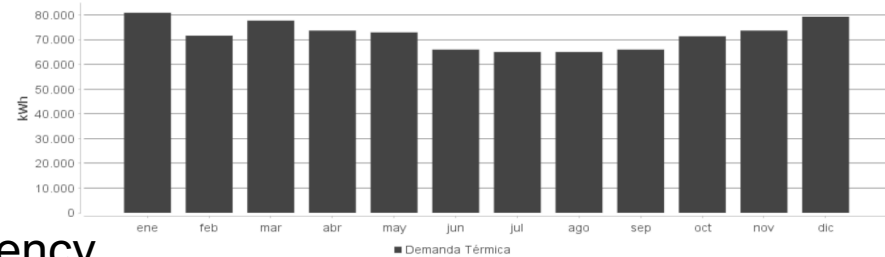
Hotel case in Barcelona – 200 rooms

200 PVT modules - 314 m² - 56 kWp

Annual demand: 833'000 kWh
 Solar fraction: 34%

T: 295'000 kWh = 940 kWh/m², 50% efficiency
 PV: 70'000 kWh = 1'250 kWh/kWp, 80 % self

Investment: 730 €/m²
 Payback time: 4 years !



Industry Involvement in Task 60

- DualSun, F
- Systovi, F
- GSE, F
- PA-ID , D
- Solarus, NL
- Abora, SP
- Endef, SP
- 3F-SOLAR, A
- Trigo energies, CDN
- Solink, I
- Consolar, D
- SunOyster, D
- Naked energy, UK
- Sunovate, Australia
-

Significant Developments & Results in Task 60 2018 – 2020



WIKIPEDIA page



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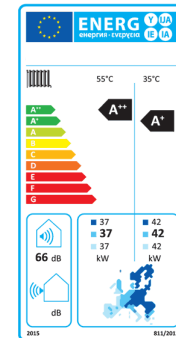
PVT challenges

- *Industrial reliable products: OK*
- *Models, Simulation and prediction : OK*

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1. Awareness
2. Testing T and PV
3. Temperature influences and durability
4. Labels and certificates Solar keymark



PVT challenges

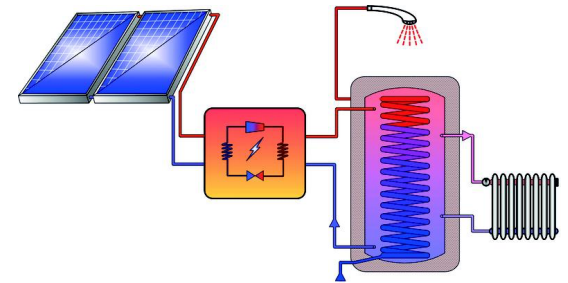
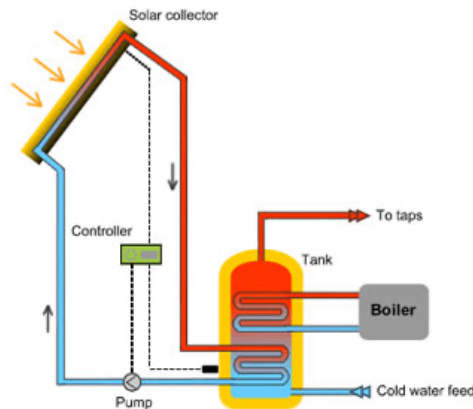
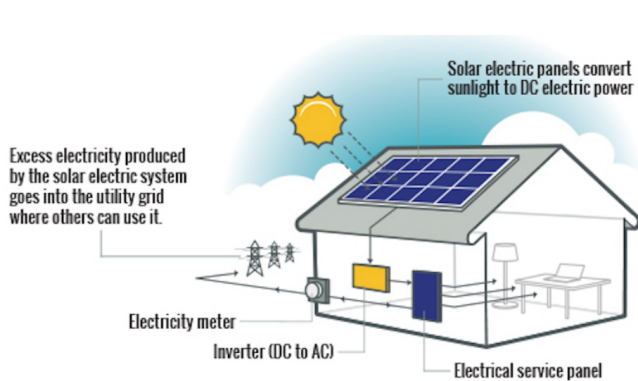
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1. Awareness
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5. Investment + TCO
 6. Optimisation in multi-variables env.
 7. Best practices – case studies
 8. KPIs for fair comparisons.... Seasonal Performance Factor of T + PV
 9. BIPVT

So to conclude, we have a message:

If you consider PV, why not PVT ?

If you need solar DHW, why not PVT ?

Thinking to switch to heat pump, why not with PVT ?



PVThanks

www.iea-shc.org



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Linkedin #PVT

https://en.wikipedia.org/wiki/Photovoltaic_thermal_hybrid_solar_collector