Large-scale solar systems

Statistics, as of 19.05.08

Queries since 2006	343	Total with	115,660 m²
	154	since Jan. 2008	52,000 m²
	59	Process heat (17 %)	52,881 m²
	8	Cooling	3,520 m²
	264	Hot water	49,631 m²
	124	Space heating	25,279 m²
	65	Foreign (19 %)	43,936 m²
Implementations	13	Finished	2,143 m²
	26	Under construction	2,080 m²
	24	Relatively certain	18,864 m²

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Problems with the market stimulation program (MAP)

- Subsidised per collector area instead of performance, i.e.
<u>The poorer a subsidisable collector,
the more subsidy it receives.</u>

- Impractical and sometimes technically silly regulations
on storage

- Obviously disadvantageous conditions for solar pipe technology

- Subsidy cannibalism

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Process heat at 400 W/m²

Best flat collector — **Normal flat collector** — **CPC Star Azzurro**

45.4 kW
233 m²

24.1 kW
439 m²

8.4 kW 1259 m²

Collector field power [kW] (y-axis: 0, 10, 20, 30, 40, 50, 60)

Collector air temperature - air temperature [°C] (x-axis: 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180)
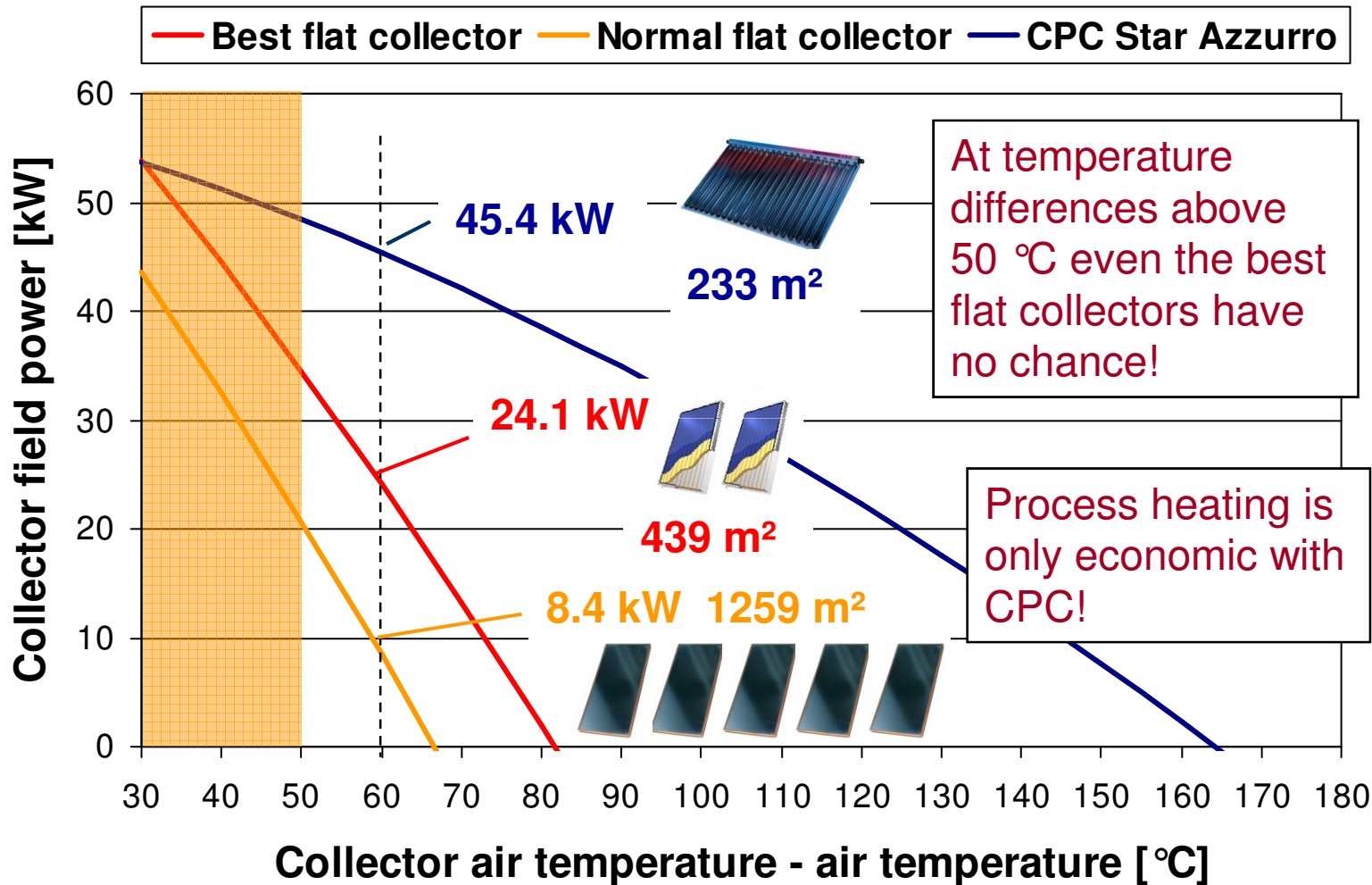
At temperature differences above 50 °C even the best flat collectors have no chance!

Process heating is only economic with CPC!

Irradiation
400 W/m² reflects the average irradiation on the collector over a year

Example
Aperture area: 233 m²
Collector: 80 °C
Air: 20 °C

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Large-scale solar systems

Absurd interpretations of the subsidy regulations

- Recreational baths are not process heating applications.
- Heating of indoor swimming pools requires additional huge buffer tanks.
- The nature, sense and purpose of combi tanks are thwarted.

A deterring lack of information

- BAFA, KfW, state subsidies, EU subsidies, BMWi ... ??
- Exclusion or cumulative principle?
- Can the project start after approval or not?
- Processing and advice from the KfW has been stopped since December 2007

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The world's largest CPC evacuated tube collector system

Solar cooling in summer, heating in winter

Collector surface area	1,330 m² gross
Heat accumulator	17 m³
Peak power	1.2 MW
Max. cont. power	0.65 MW
Guaranteed yield	500 MWh per year
Electrical energy req.	2.5 MWh per year

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The world's most innovative solar system

Backup boiler support for heating a recreational swimming pool
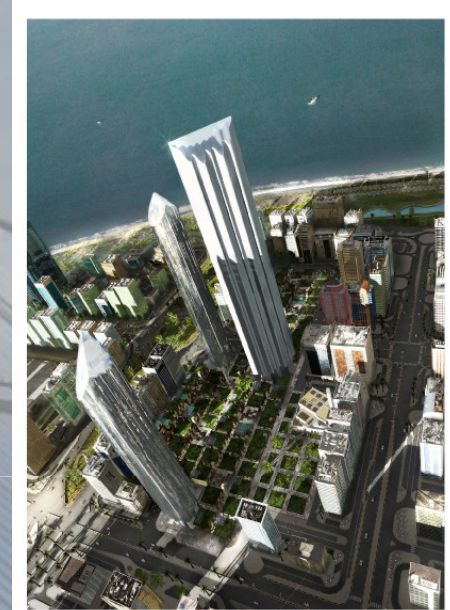
Collector surface area 98 m², no heat accumulator!

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Apartment buildings

The most unspectacular large-scale solar systems

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Interesting projects

Underground railway washing system at
Coney Island, New York   150 m²
Springhill and Mt. Eden prison in New Zealand   324 m²
Shopping malls in the USA   686 m²
Reference system for the G8 Summit
in Hokkaido, Japan   100 m²
District heating provision   4,400 m²
District heating provision   >> 10,000 m²
Residential tower in the Masdar project,
Abu Dhabi   5,000 m²

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Large-scale solar systems

The advantages of the AquaSystem

- The solar system works like an additional boiler with freely selectable temperature.

- Solar heat exchanger, antifreeze and additional fittings
  are not necessary. This reduces the costs enormously.

- No more overheating problems. Process heat collection up to 130 ℃
  is possible with this. The system can be placed in a standstill condition without
  reservations. This allows the use of a smaller, more efficient tank.

- An outstanding thermal stratification in the tank and a minimum tank
  storage requirement ensure extremely fast availability of the solar heat.

- Compared to conventional operation, approx. 50 % of pump running time and
  pump energy is saved over the year.

- The comprehensive functional monitoring of the controller discovers and signals
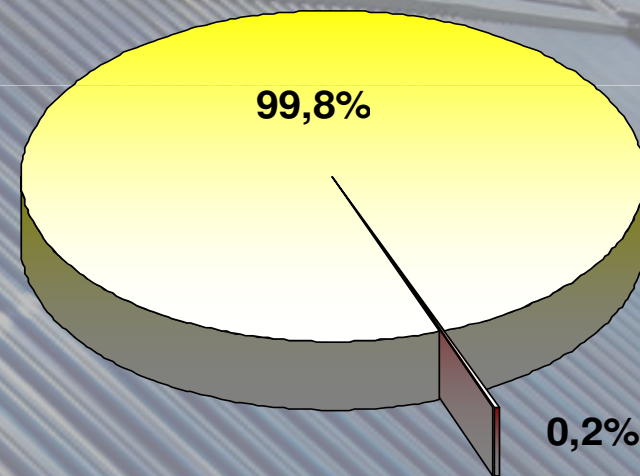 faults immediately, thus ensuring optimal operation.

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Solar industry: approx. 75 % (estimated)

AquaSystem: > 99.8 % (ensured)
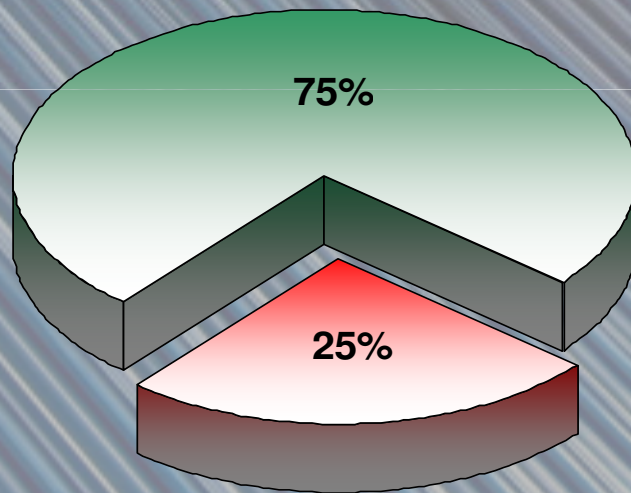
75%

25%

☐ **Functional** ☐ **Non-functional**

99,8%

0,2%

☐ **Functional** ☐ **Non-functional**

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Amortisation and profit estimates

100 Liter [€]

3000 l-Preis [€]

28. Mai 2008   93,2 € /100 L
Durchschnittspreis Bundesgebiet

2008

Heizöl-EL Preis für 3000L
Ø -   inkl. 19% Mwst.

www.tecson.de ©TECSON

2008

2007

2006

2007

2006

Jan. Feb. Mär. Apr. Mai Jun. Jul. Aug. Sep. Okt. Nov. Dez.

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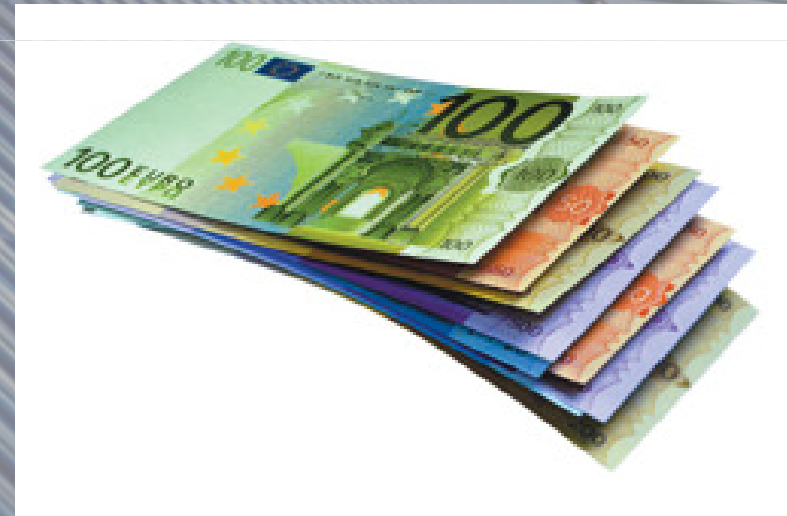
Amortisation estimates

Example

- **Large-scale solar energy system with 200 m² gross surface area**

- **Apartment block with 40-50 flats**

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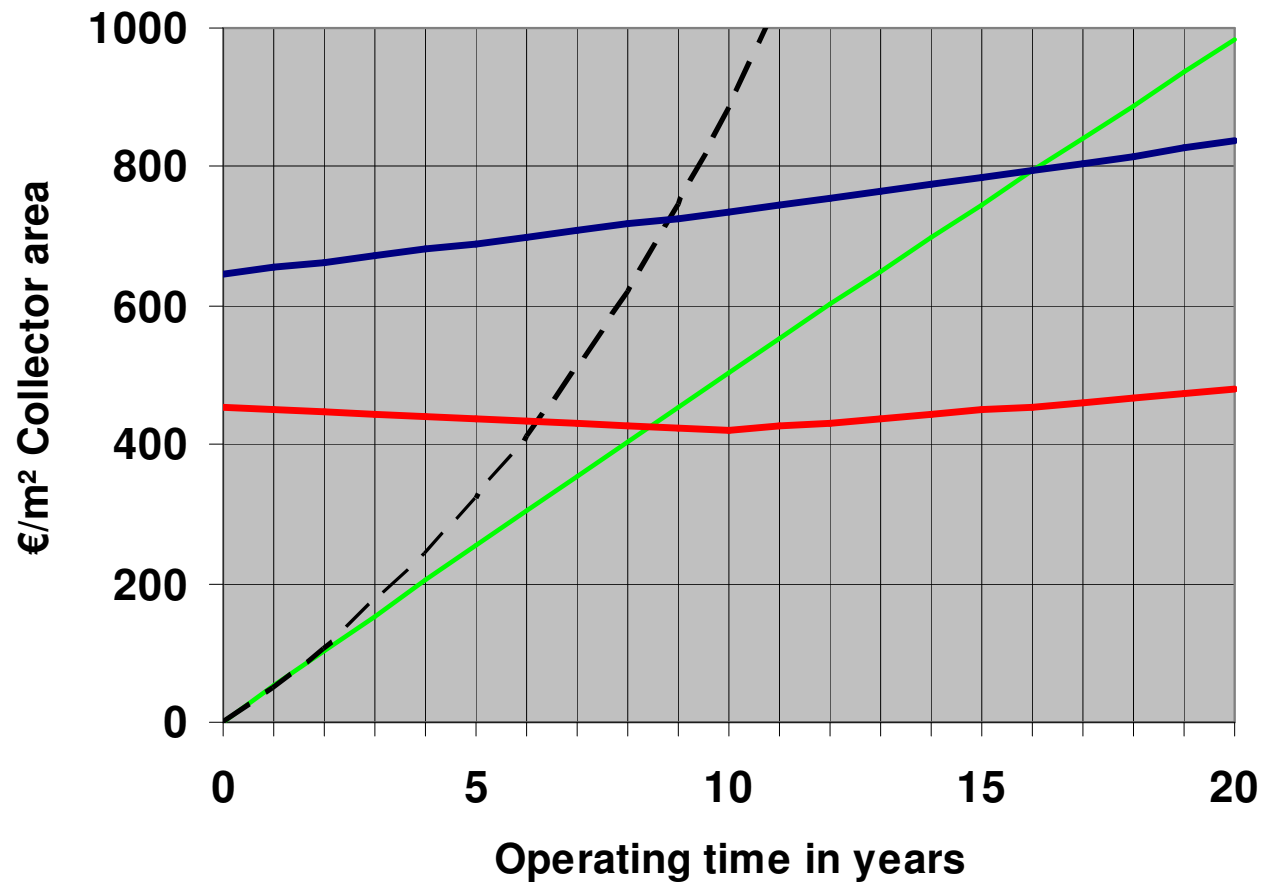Natürlich Wärme   PARA DIGMA

Assumed parameters

- Investment costs € 130,000 exclusive of VAT   (650 €/m²)

- Subsidised to 30 % by the KFW Bank

- Current energy price of heating oil € 0.90 /l

- Operating time of the solar system is 20 years

- Tax write-off (distributed over 10 years) at a tax rate of 20 %

- Annual solar profit 500 kWh/m²

- Annual degree of use of the heat generator without the solar system is 90 % (modern oil boiler)
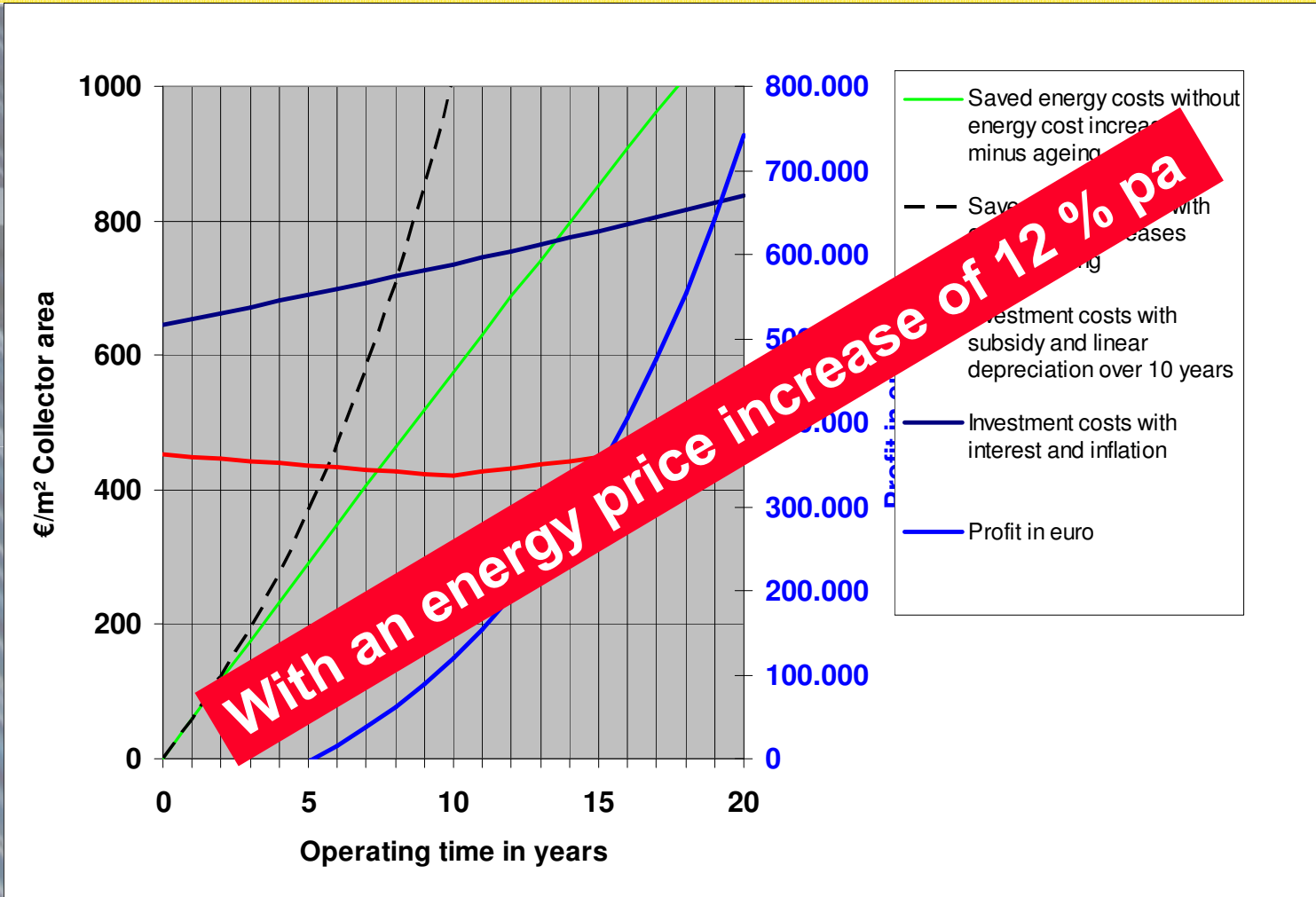
Natürlich Wärme

Annual surcharges and discounts

- Ageing of the collectors 0.5 %

- Operating costs 2 %

- Energy price increase 12 %
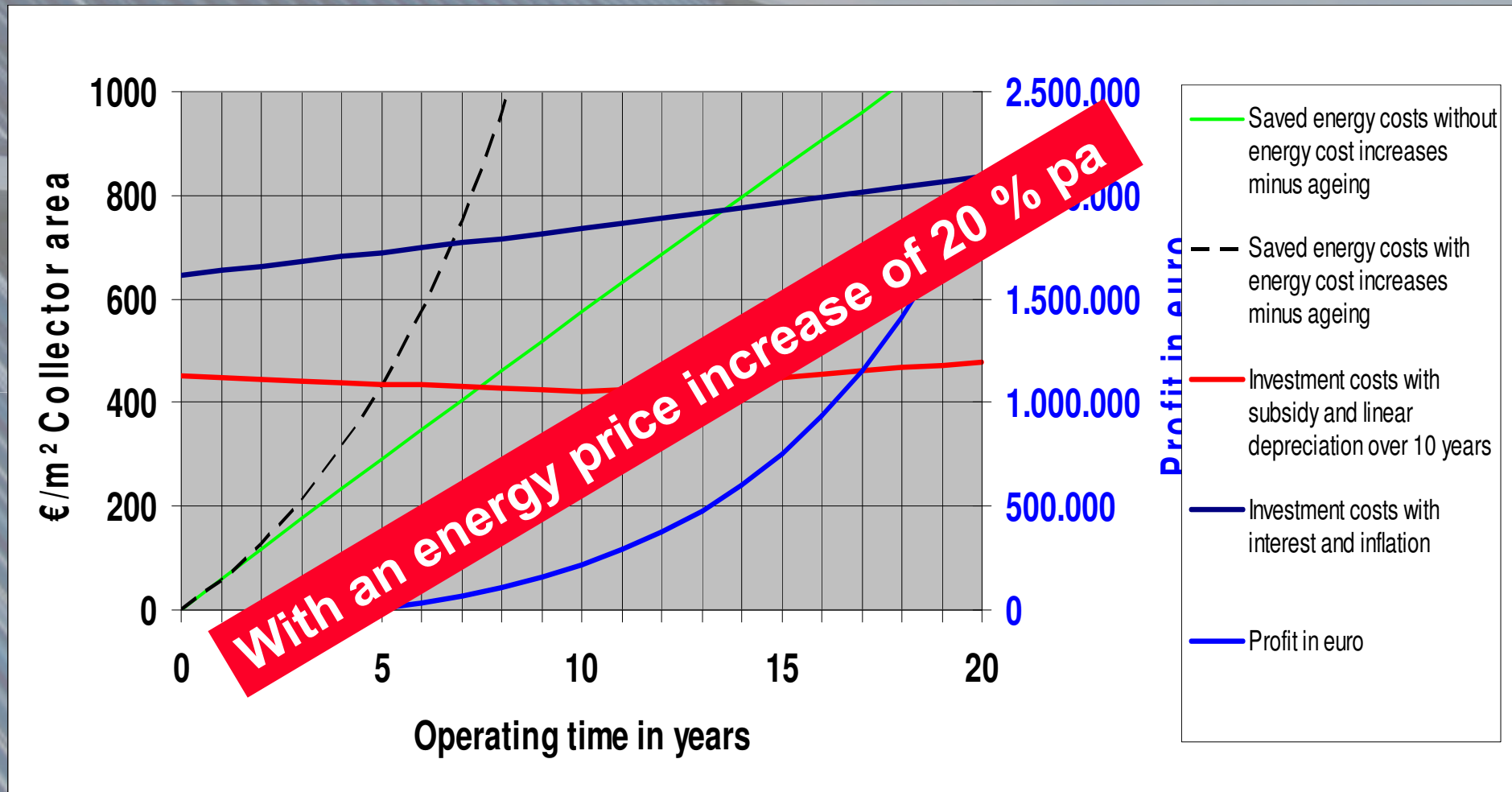
- Interest on capital 4 %

- Inflation 2.5 %

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Amortisation estimate 3

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Effective interest rate on the investment sum = 13 %

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With an energy price increase of 20 % pa

Chart legend:
- Saved energy costs without energy cost increases minus ageing (green)
- Saved energy costs with energy cost increases minus ageing (dashed)
- Investment costs with subsidy and linear depreciation over 10 years (red)
- Investment costs with interest and inflation (dark blue)
- Profit in euro (blue)

Y-axis left: €/m² Collector area (0, 200, 400, 600, 800, 1000)
Y-axis right: Profit in euro (0, 500.000, 1.000.000, 1.500.000, 2.000.000, 2.500.000)
X-axis: Operating time in years (0, 5, 10, 15, 20)

Effective interest rate on the investment sum = 18 %

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What are the risks?

- **Falling energy costs – very unlikely**

- **No more state subsidies – interest approx. 2 % less**

- **Failure of the SGA – reduced to a minimum by functional monitoring / yield guarantee from Paradigma**

- **The sun no longer shines – we humans will then have other things to worry about**

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