INDUSTRIAL SOLAR
thermal solutions

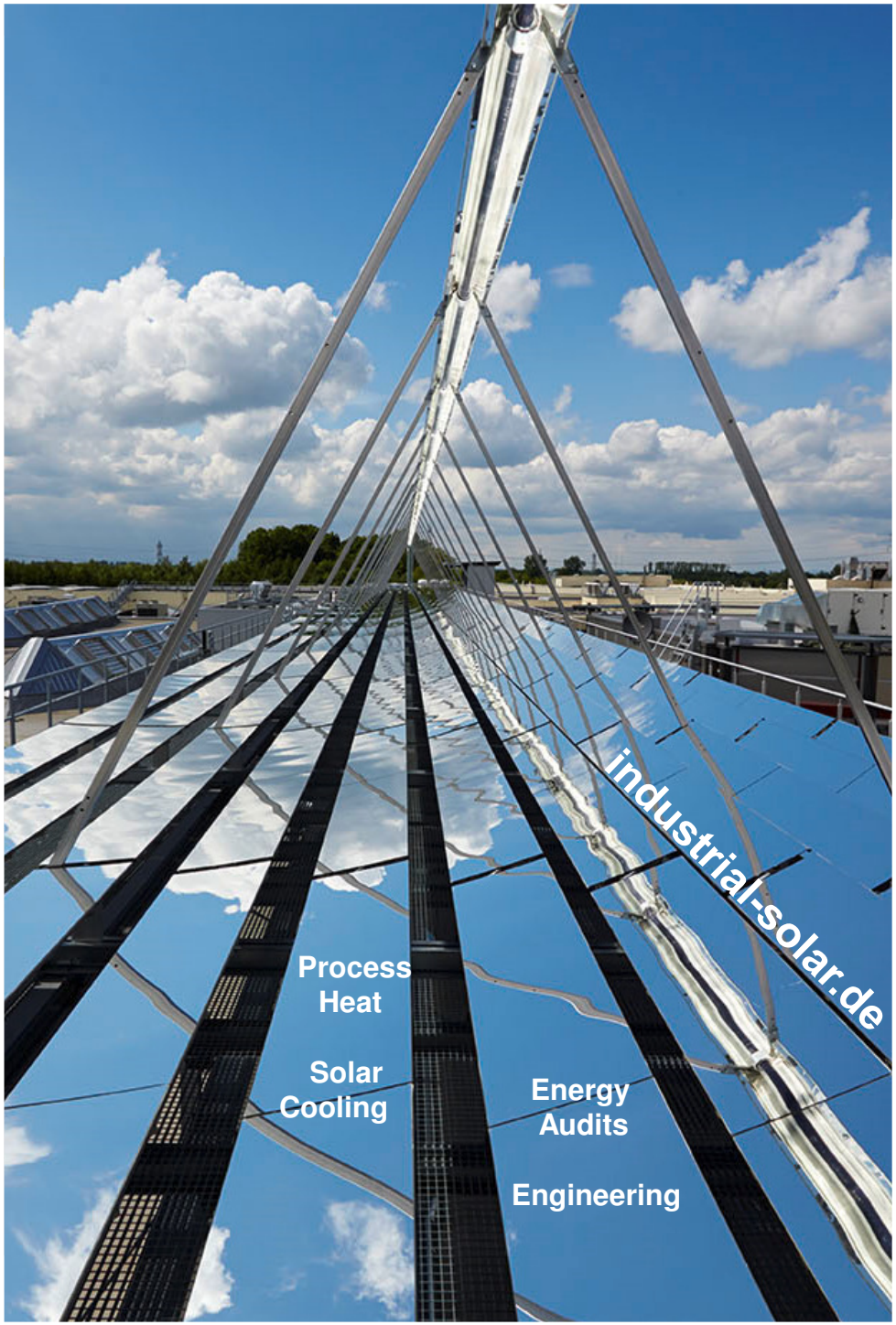
ISES webinar:
New Business Models for Commercial Solar Thermal
subtask
Internal Rate of Return calculations for solar concentrating applications.

June, 23rd 2015

Topics

INDUSTRIAL SOLAR
thermal solutions

1. Introduction Industrial Solar GmbH
2. Status Quo – Commercial Solar Thermal
3. Main Economic Figures
4. IRR Explanation and Calculation for CSP
5. Conclusion



INDUSTRIAL SOLAR
thermal solutions

Company Profile

Industrial Solar GmbH is a provider of customized solutions in the field of renewable energy technologies on-site for process heat, cooling and power.

Core product is the Fresnel-Collector.

Industrial Solar´s team has an extensive expertise in international projects from pre-feasibility studies over Front-End-Engineering & Design (FEED) to turn-key-projects for all kind of industrial applications.

INDUSTRIAL SOLAR
thermal solutions

Status Quo – Commercial Solar Thermal

INDUSTRIAL SOLAR
thermal solutions

1. Potential of solar-thermal process heat is huge and still underestimated
2. Increasing interest and budgets for commercial solar thermal investments
3. Low fossil fuels costs but increasing pressure to reduce its dependency
4. Solar heat generation costs (LCOE) are 3 – 7 € Cent/kWh depending on location and system size
5. Industry focus for RE is mainly on payback-time instead of IRR

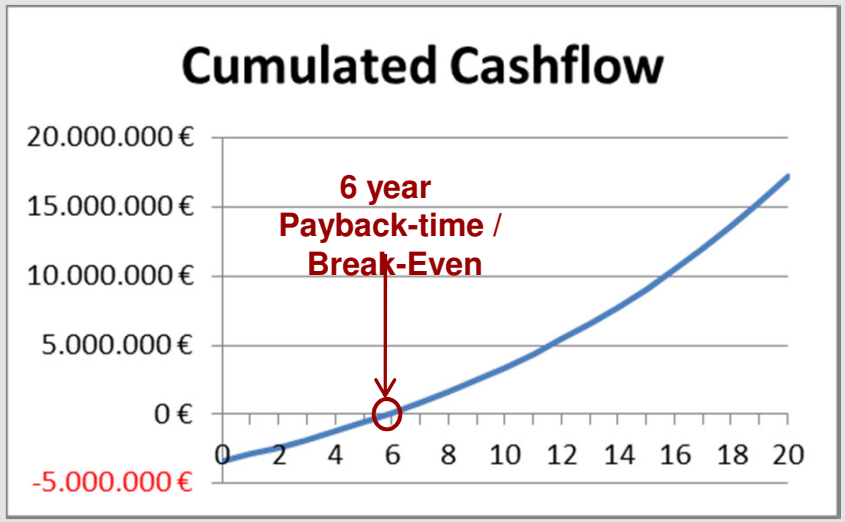
> Commercial solar thermal has a huge potential is gaining market momentum

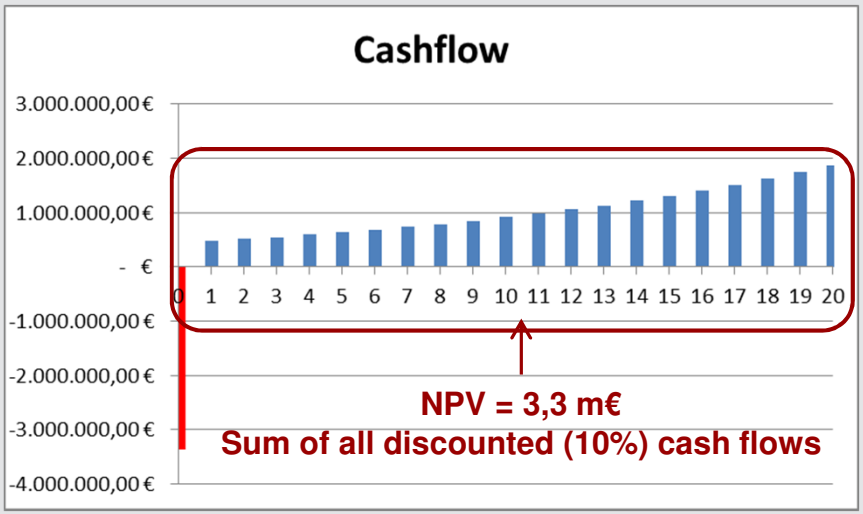
Main economic figures

INDUSTRIAL SOLAR
thermal solutions

Payback-time: Period of time required to recoup an investment or
Period of time to reach the break-even point.

NPV: Defined as the sum of discounted cash flows over a period of time or
Todays value of an investment





IRR - Explanation

INDUSTRIAL SOLAR
thermal solutions

- The internal rate of return (IRR) on an investment or project is the "annualized effective compounded return rate" or rate of return that makes the net present value (NPV) of all cash flows (both positive and negative) from a particular investment equal to zero
- It can also be defined as the discount rate at which the present value of all future cash flows is equal to the initial investment
- In more specific terms, the IRR of an investment is the discount rate at which the net present value of costs (negative cash flows) of the investment equals the net present value of the benefits (positive cash flows) of the investment

IRR - calculations for CSP

INDUSTRIAL SOLAR
thermal solutions

System Data		
Solar collector modules	#	648
Size of collector / aperture area	m²	14.256
Thermal peak power of collector field	MW	**8,01**

Investment		
Total Turn Key Investment	€	4.500.000
Tax credit / Incentives rate	%	25%
Tax credit / Incentives absolute	€	1.125.000
Total Investment (after incentives, subsidies)	€	3.375.000
Investment pro kW	€ / kW	421
Investment pro m²	€ / m²	237

Yearly O&M Costs and other data		
O&M cost p.a. in % of total investment	%	2,0%
Escalation of O&M costs	%	5,0%
Yearly system degradation	%	0,25%
O&M	€ / a	90.000
Life time	a	20

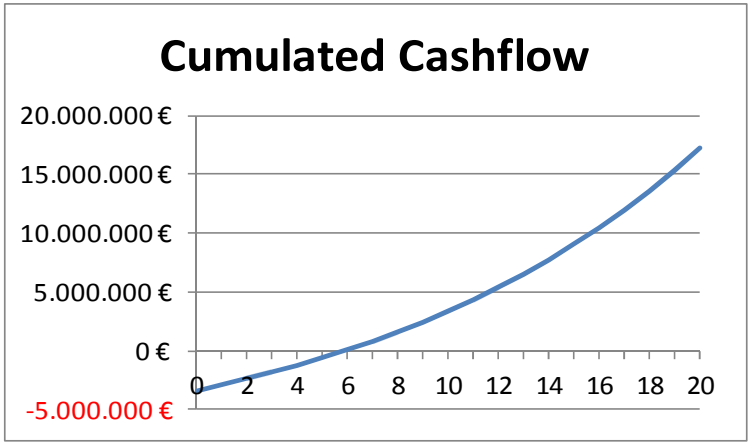
Local Data and Energy Costs		
Location irradiation / DNI	kWh / m² / a	2.000
⌀ yearly efficiency	%	42,5%
Thermal earnings per m² and year	kWh / m² / a	850
Thermal Earnings (GHP north-south)	MWh / a	12.118
Boiler efficiency	%	80%
Fossil fuel (to calculate emissions)	type	Diesel
kWh per kg fossil fuel	kWh	10,50
Price per kg fossil fuel	€/kg	0,350
Yearly increase of fossil fuel	%	7,5%
Fossil Energy price at location (effective)	€ Cent / kWh	4,17

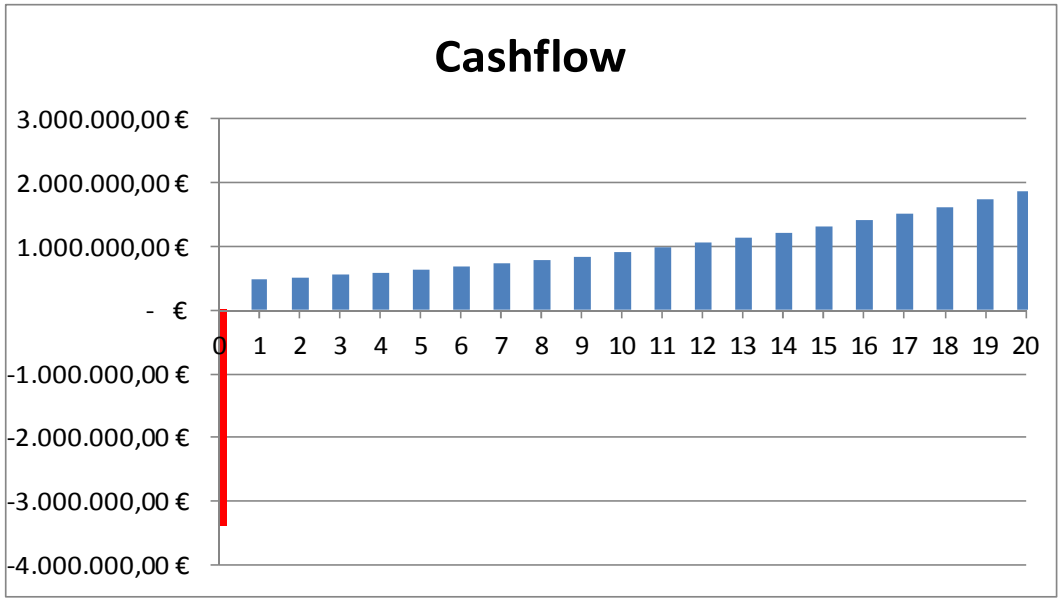
Financing Model		
Equity	%	50%
Debt / Loan	€	1.687.500 €
Equity	€	1.687.500 €
Debt / Loan Interest Rate	%	10,0%
Loan payments start in year	#	2
Number of payments	#	8
Discounting factor	%	10,0%
Annuity factor	%	18,74%
Annuity	€	316.312 €

Financial results with 100% equity

NPV (Net Present Value)	€	3.306.659 €
IRR over 10 years	€	13%
IRR over 20 years	€	20%
Paybacktime	a	5,90
Solar Heat Costs (O&M only)	€/kWh	0,007 €

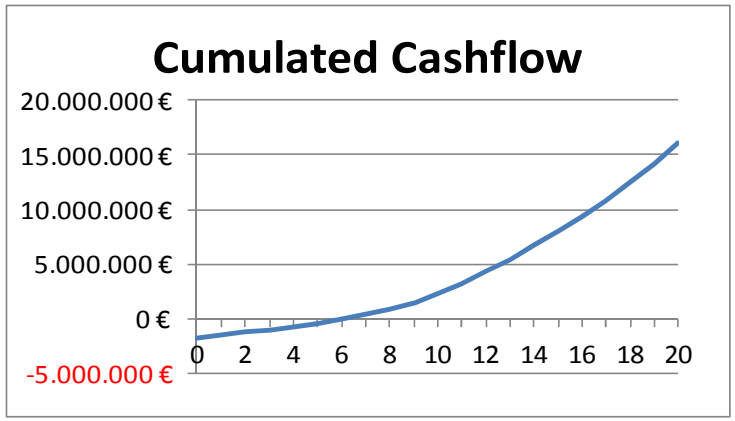
Carbon Emission Reduction t/a 3050

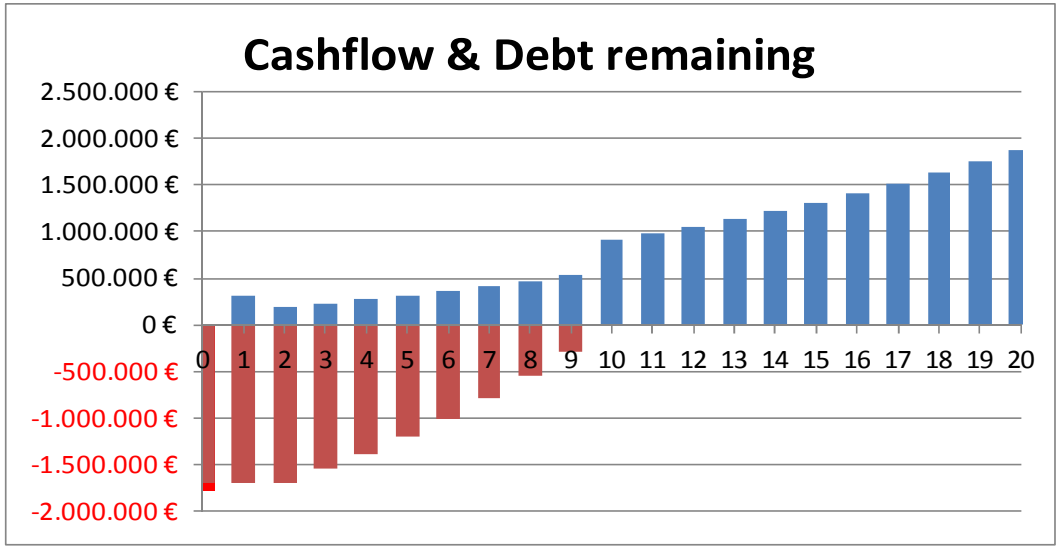




Financial results with equity of: 50%

NPV (Net Present Value)	€	3.229.954 €
IRR over 10 years	€	15%
IRR over 20 years	€	23%
Paybacktime	a	6,21
Solar Heat Costs (O&M only)	€/kWh	0,007 €





IRR – Factors of Influence

INDUSTRIAL SOLAR
thermal solutions

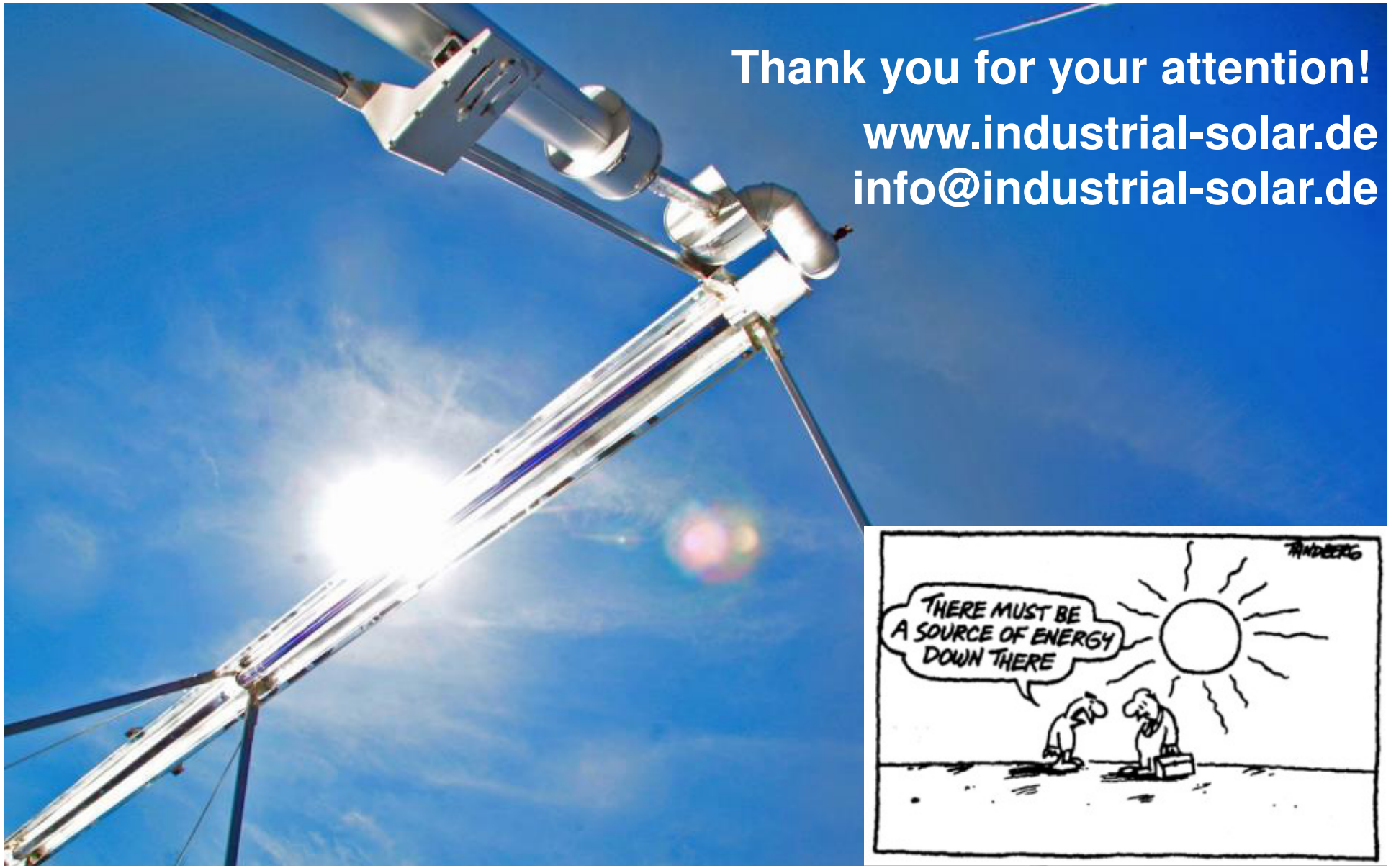
- Local energy costs
- DNI of location
- Energy price increase
- System-size / System costs
- Tax credit & incentives
- Equity/Debt ratio
- Interest rate
- Loan period

Conclusion

INDUSTRIAL SOLAR
thermal solutions

- Renewable energy (RE) investments are long term infrastructure investments
  - Thus RE investments should not be compared with investments into production-equipment of the core- business where short payback-times (1-3 years) are essential
    - Therefore the IRR should have a higher priority than the payback-time
      - Hence the IRR is an important indicator about the profitability of an investment
      - The IRR-expectations of an RE investment should reflect its specific risk-profile and sustainability effects

INDUSTRIAL SOLAR
thermal solutions



Thank you for your attention!

www.industrial-solar.de

info@industrial-solar.de