Process Heat
Direct Steam Process Cold
Renewable Energy Solutions Onsite
Desalination Photovoltaic Air Conditioning
Polygeneration Power Generation
Process Air Combined Heat and Power
Water Treatment

Solar Process Heat Solutions

Energy Contracting & Heat Purchase Agreements

Innovation Fund Workshop

Christian Zahler, Industrial Solar GmbH

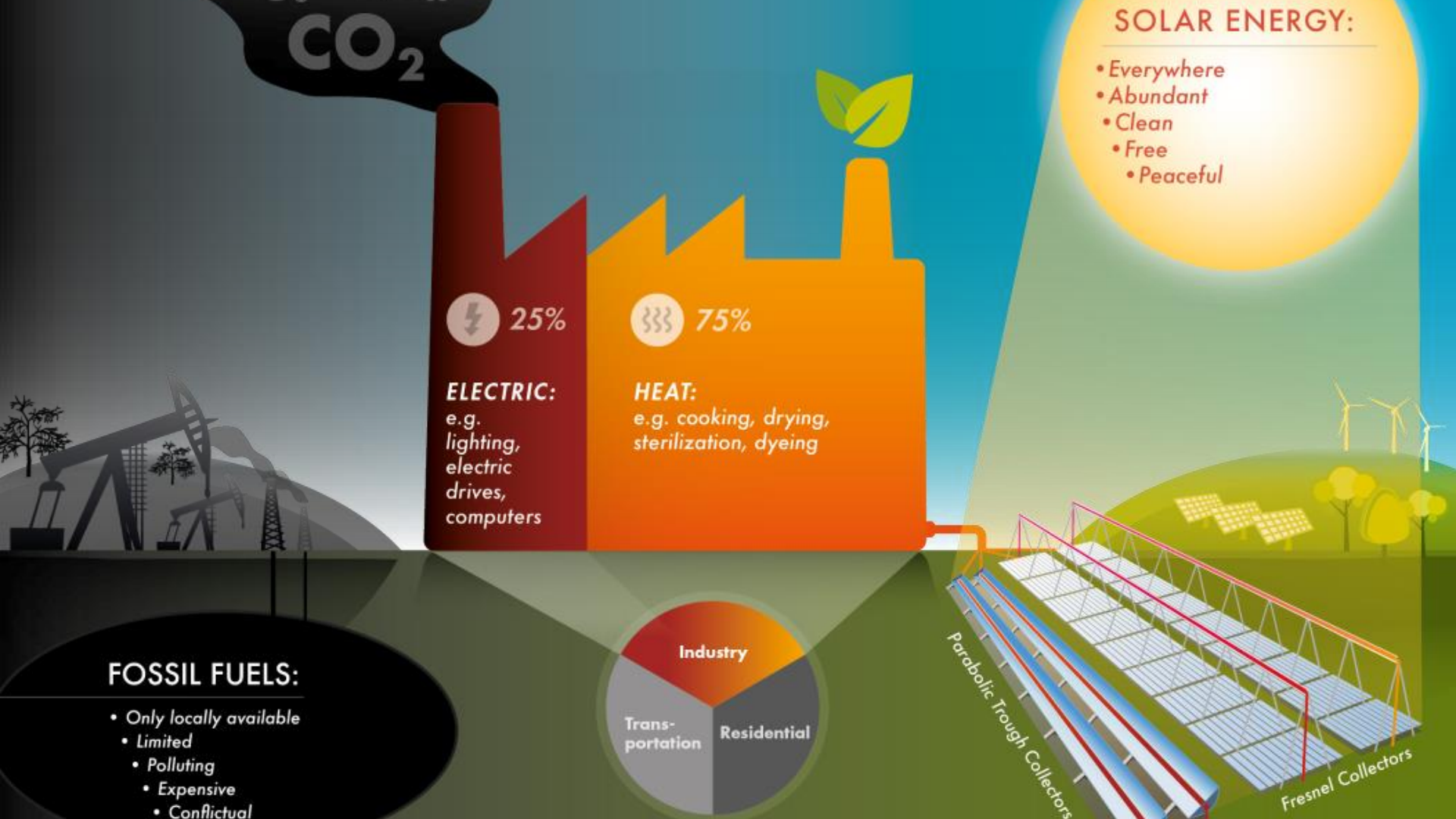
Brussels, 25 June 2019

INDUSTRIAL SOLAR

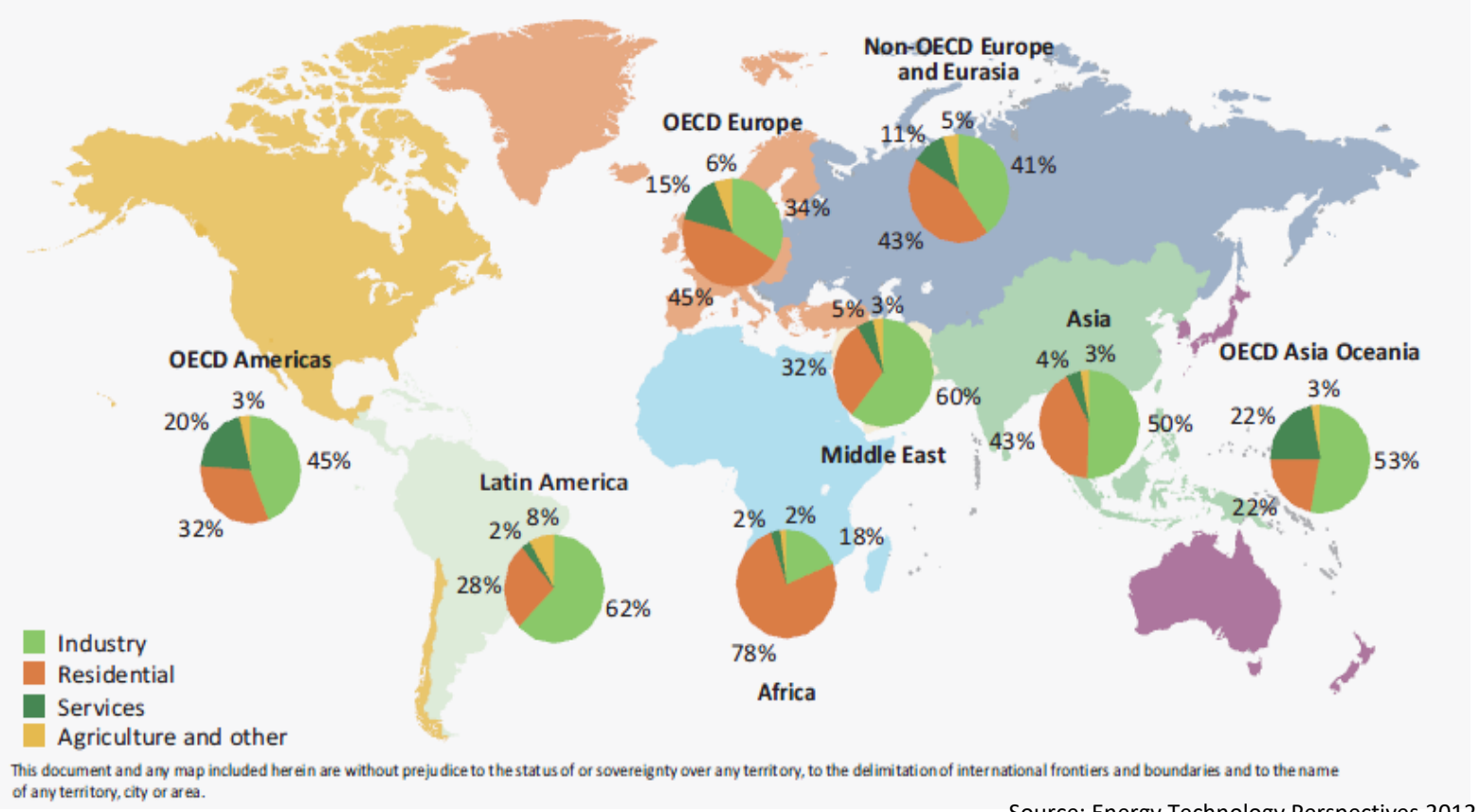
renewables onsite

Industrial Solar was founded in 2008 in the environment of the renowned Fraunhofer Institute for Solar Energy Systems (ISE) to realize solar thermal projects based on its innovative Fresnel collector.

Today Industrial Solar is the world leader in Fresnel projects for industrial heat supply and delivers comprehensive and customized energy solutions as a One-Stop-Shop.


CO_2
SOLAR ENERGY:
• Everywhere
• Abundant
• Clean
• Free
• Peaceful
25%
ELECTRIC:
e.g. lighting, electric drives, computers
75%
HEAT:
e.g. cooking, drying, sterilization, dyeing
FOSSIL FUELS:
• Only locally available
• Limited
• Polluting
• Expensive
• Conflictual
Industry
Trans-portation
Residential
Parabolic Trough Collectors
Fresnel Collectors

Market – Global Heat Demand



Source: Energy Technology Perspectives 2012

Fossil fuel companies are benefitting from global subsidies of **$5,300,000,000,000 (5.3 tn) a year**, equivalent to **$10,000,000 a minute** every day, according to a estimate by the **International Monetary Fund**.

Those subsidies will be reduced to zero!

Global Climate Finance

Global investment to address climate change has been steadily increasing.

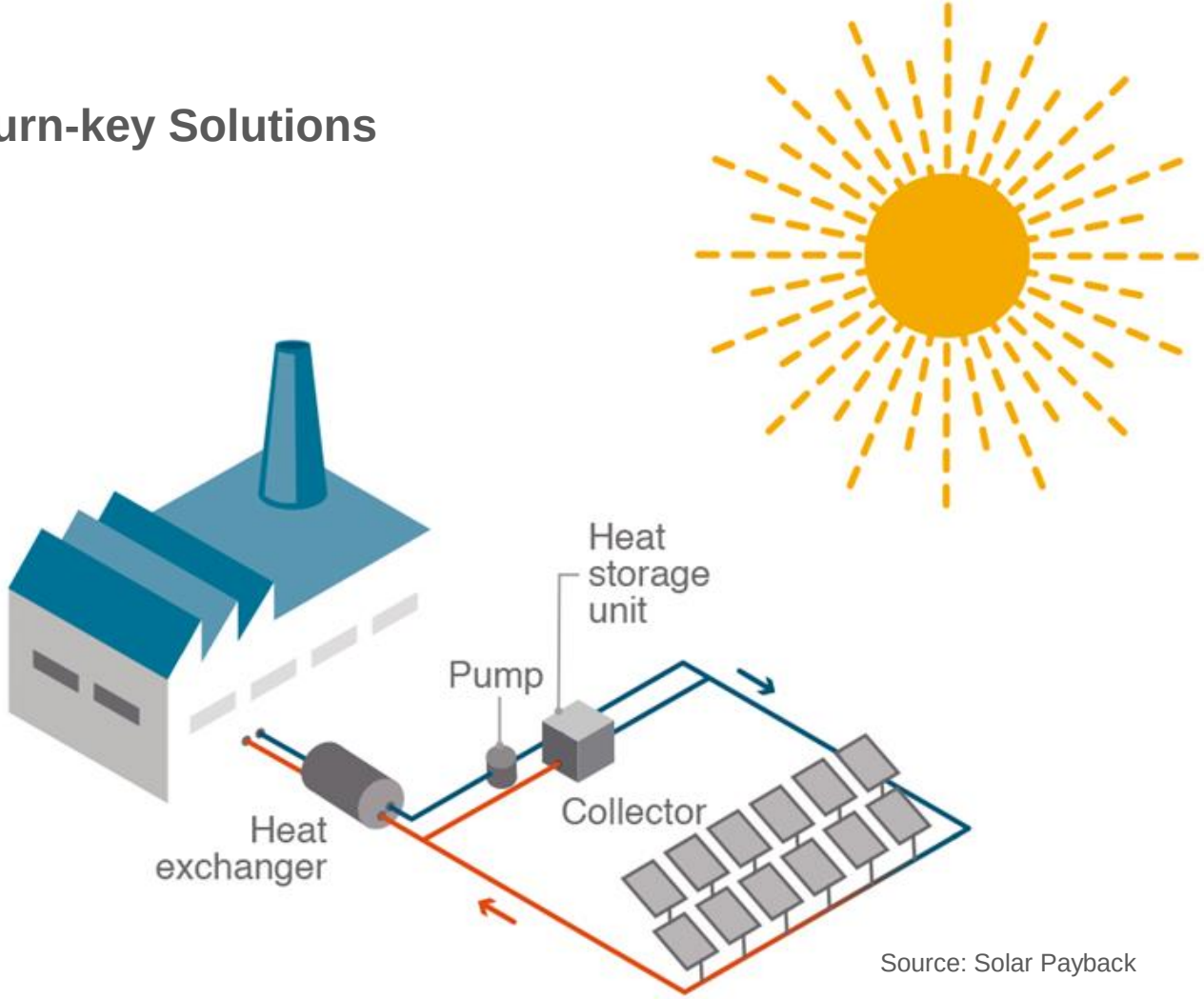
463.000.000.000 US$ Climate Projects

(average value of 2015 and 2016)

Industry committed to 100% RE www.there100.org

Adobe
Biogen
amalgamated bank
Interface
Sarasin
Johnson & Johnson
Kingspan
AstraZeneca
SGS
Autodesk
Bank of America
M&S
Unilever
Bloomberg
H&M
British Land
BT
CaixaBank
Coca-Cola
Mars
Microsoft
Nestlé
Nike
colruyt group
alstria
First German REIT
Crédit Agricole
Dalmia
Bharat Cement
P&G
proximus
rackspace
RELX Group
dentsu aegis network
Diageo
DNB
Elion 亿利资源
Nordea
novo nordisk
Pearson
Philips
Elopak
Equinix
Formula E
facebook
DSM
salesforce
SAP
Save
GM
Givaudan
Goldman Sachs
Google
Aviva
sky
Steelcase
Broad Group 匠大科技集团
helvetia
Hewlett Packard Enterprise
hp
Swiss Post
Swiss Re
Tata Motors
TD Bank
IFF
IKEA
Infosys
ING
Tetra Pak
UBS
Commerzbank
Vaisala

One-Stop-Shop – Turn-key Solutions



Source: Solar Payback

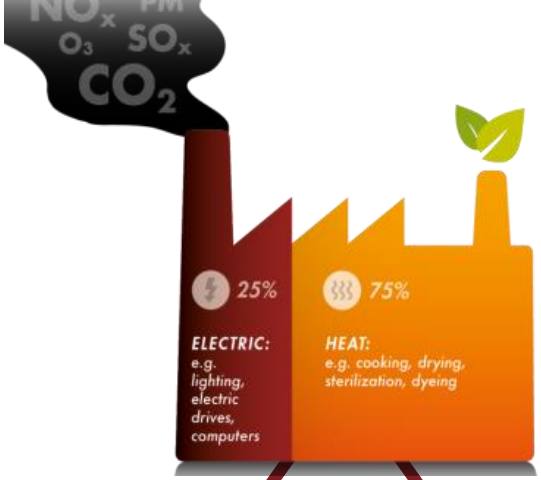
Reference: Solar Cooling of Data Center
Country: South Africa
Year: 2014

- Telecommunication Industry
- Fresnel collector
- 484 m^2 collector area
- 272 kW_{th} thermal power
- 180 °C pressurized Water
- Absorption Chiller
- 330 kW_{th} cooling capacity

Reference: Solar Steam Generation & Solar Cooling
Country: Jordan
Year: 2017

- Tobacco Industry
- Fresnel collector
- 1254 m² collector area
- 705 kW_{th} thermal power
- 225°C saturated steam
- Absorption chiller

Triple Challenge



1) INDUSTRY:

- Stay competitive
- CAPEX vs OPEX
- Good to have vs. must have
- Limited resources for RE projects

2) EPCs

- Long sales cycle
- Economy of scale
- Cost reduction
- Little & difficult finance schemes

3) Investors

- Bankable projects
- Minimum investment > 5 m€
- Max. X% of project volume
- Missing CSH expertise

EPC Solutions

Hypothesis

A fund to finance ESCOs in selected emerging markets is an attractive investment opportunity and an effective mean to reduce carbon emissions and foster economic development.

Conclusion Pre-Feasibility-Study

Contracting RE and EE for Industry and Commerce in Emerging Countries

Co-Financed by

KFW DEG

Conclusion Feasibility Study

- 79 proposals received of which 77 MWth 1-8 €C/kWh and 150 MWe 8-30 €C/kWh
- An energy contracting fund could achieve IRRs between 10-30%
- Fund would have a positive impact for climate change and socio economic development
- ESCOs are well suited to overcome the investment constraints of end-users and banks
- There is little experience and awareness about ESCOs in emerging markets
- The major risks with energy contracting are country and project specific
- Similar investment vehicles do not focus explicitly on energy contracting for industry
- Performance warranties are available

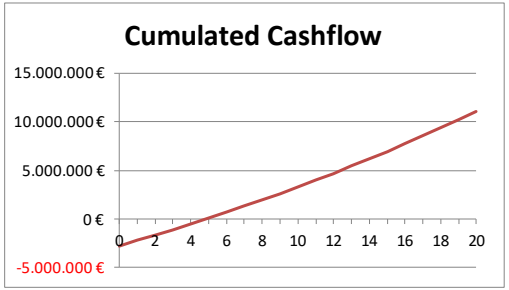
Case Study Jordan – Chemical Company

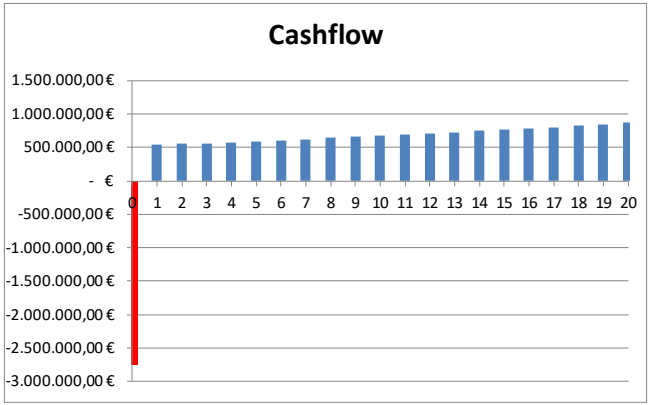
System Data

- 3,5 MWth
- 2,75 m€ Investment
- 8,6 €Cent/kWhth
- 3% Increase p.a.

Financial results with 100% equity

NPV (Net Present Value)	€	5.251.186 €
IRR over 10 years	€	17%
IRR over 20 years	€	21%
Paybacktime	a	4,87
Solar Heat Costs (O&M only)	€/kWh	0,006 €





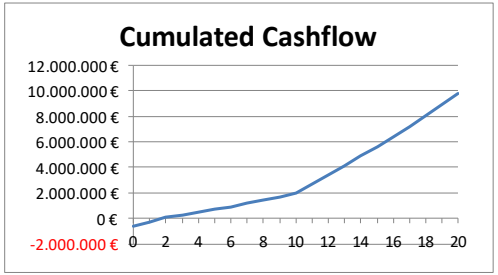
Financing Data

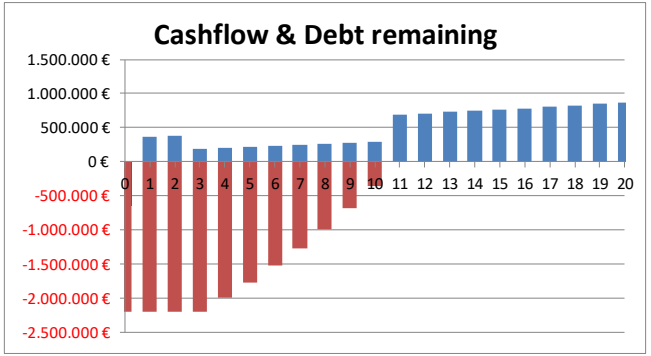
- 80% Debt / 2,2 m€
- 8% p.a. Interest rate
- 5% Discount factor
- 2 years free
- 8 repayments

Financial results with equity of: 20%

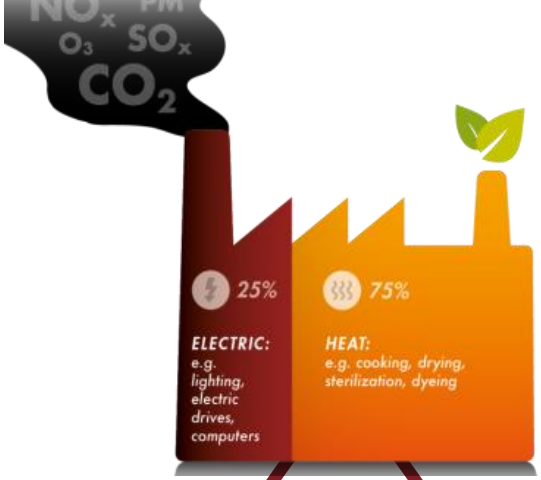
NPV (Net Present Value)	€	4.813.524 €
IRR over 10 years	€	45%
IRR over 20 years	€	48%
Paybacktime	a	1,74
Solar Heat Costs (O&M only)	€/kWh	0,006 €

Annuity factor definition $$ANF_{n,i} = \frac{(1+i)^n \cdot i}{(1+i)^n - 1}$$





Triple Opportunity



1) INDUSTRY

- Increasing solar process heat demand
- Decreasing fossil fuels subsidies
- Sustainability > shareholder value
- Potential obligations to use RE

2) FINANCING

- Growing climate finance > better finance programs
- Growing number of impact investors and sustainability indexes
- Carbon Tax / emission certificate

3) EPCs

INDUSTRIAL SOLAR
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- Engineering
- EPC-Services
- Turnkey-Solutions>One Stop Shop
- Financing partners

ESCOs Multi Billion Market Potential

EPC Solutions

INDUSTRIAL SOLAR

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