

# The Economics of Solar Thermal Technologies

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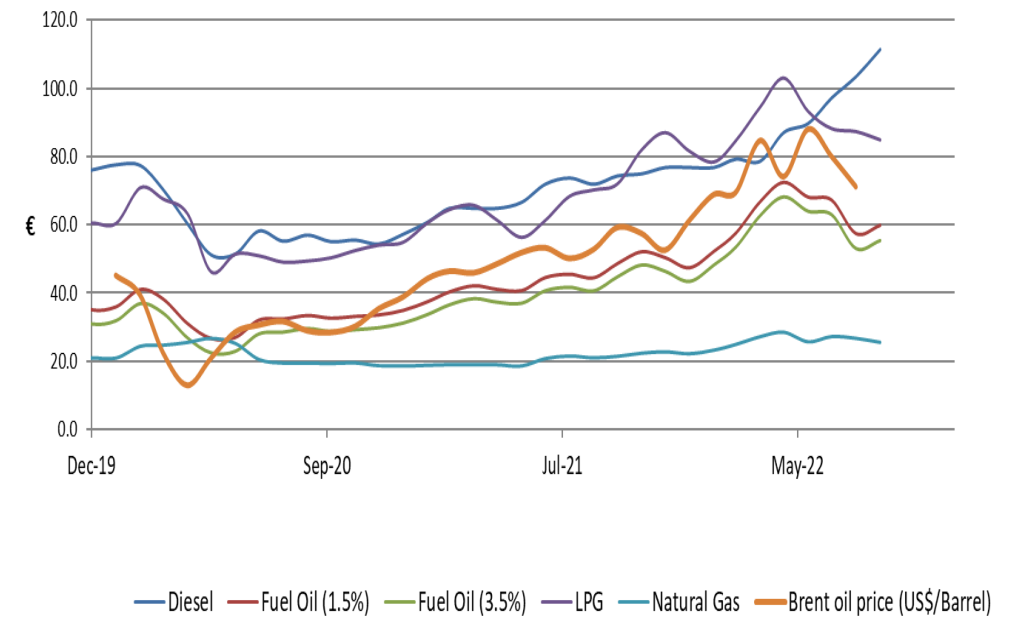
# Agenda

- Key factors for feasibility
- Business models
- Financing
- Case study
- Local experience

# Fuel prices and trends in Jordan

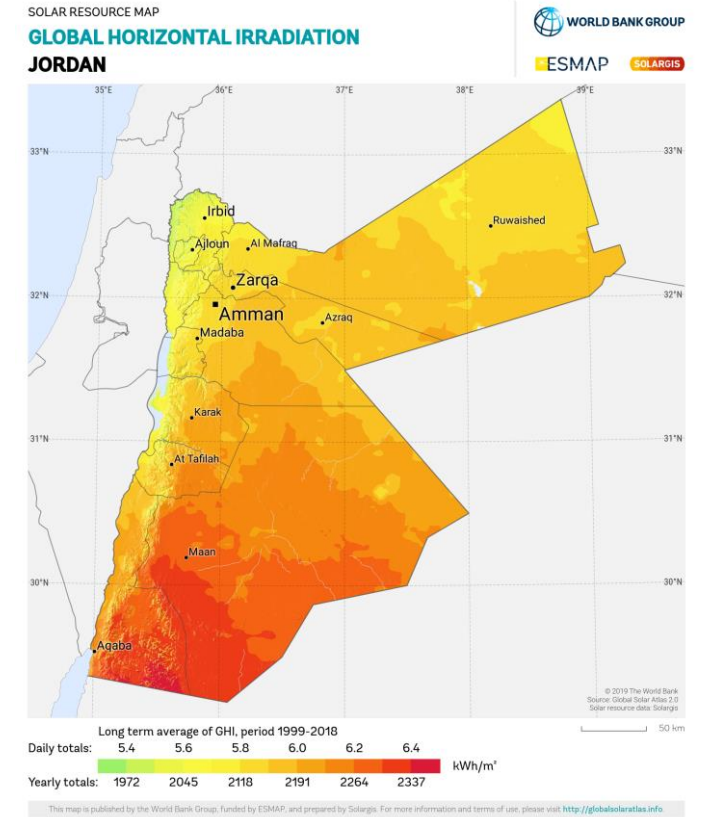
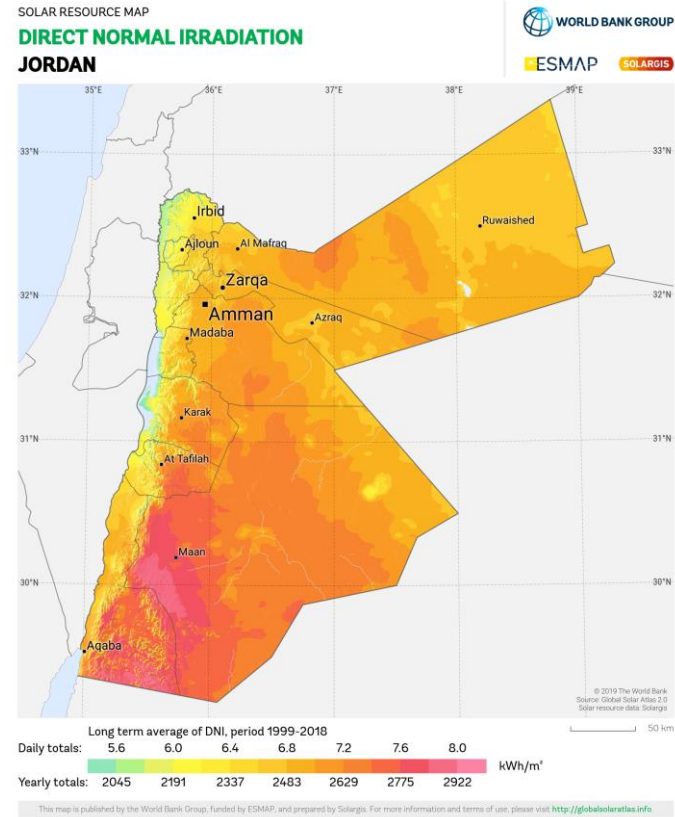
- Very high prices for industrial fuels
- Different prices/fuel
- Natural gas available only for few heavy industries
- Published monthly – following international prices
  - <https://www.memr.gov.jo/Default/En>

Jordan fuel prices in € / MWh (gross) 01.2016 - 05.2022



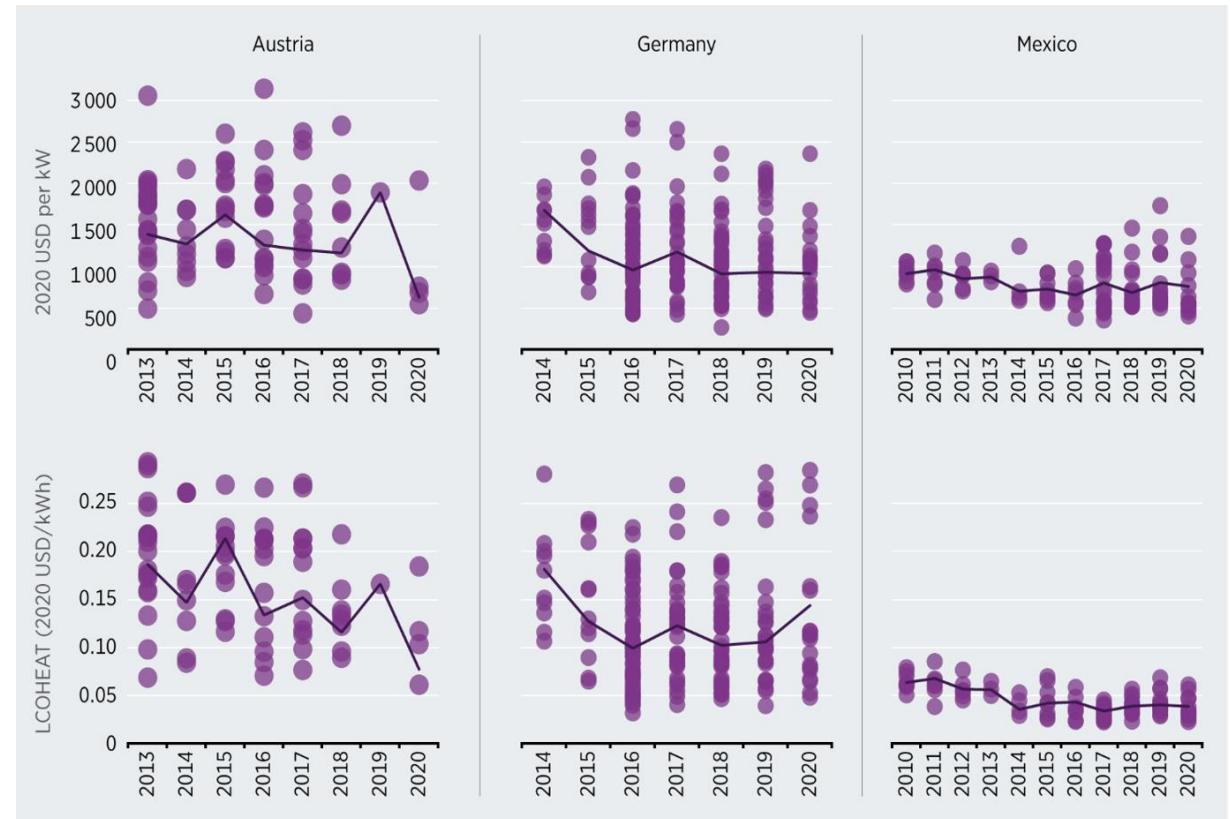
# Solar resource

- Very high solar resource!



# System Costs

- In international range
- Some local collector manufacturers, not for large installations (see below)
- Good local contractors available
- No customs or taxes



Source: IRENA (2021), Renewable Power Generation Costs in 2020

# Yields

## Theoretical maximum performance

- Load profile (losses during weekends, holidays and energy which can't be stored)

= **Practical maximum performance** (maximized by proper system design)

- Operation losses (maintenance down-times, cleaning, ...)

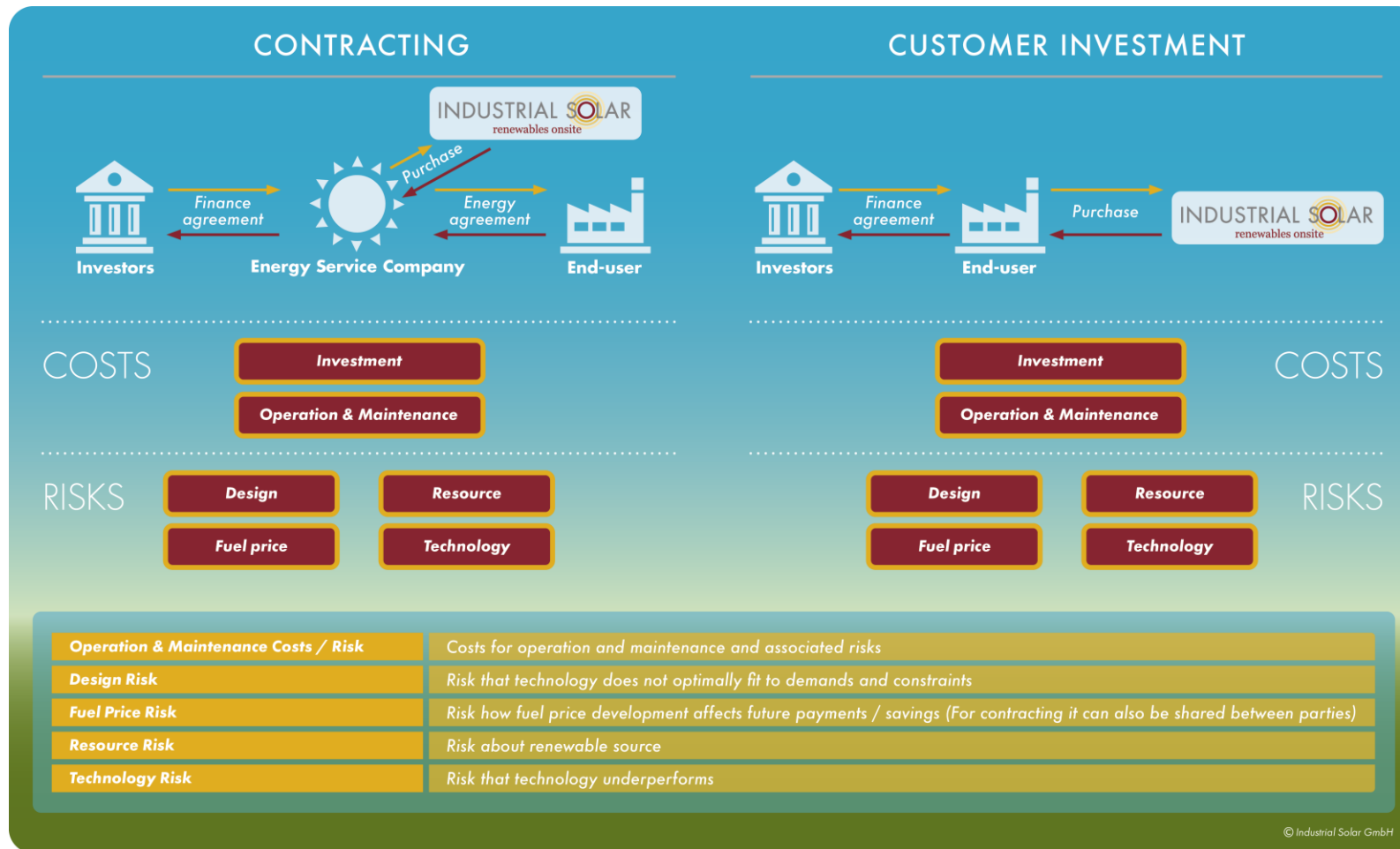
= **Actual performance** (maximized by proper components and operation)

- Monetary savings (fluctuating fuel prices)

= **Actual saving** (Money in JD)

Comment: Differences to PV (technical and commercial)

# Business Models



# Financing in Jordan – Customer Investment

- Companies typically cash constrained (many SMEs)
- Companies dislike the greater uncertainty of fuel price fluctuations compared to PV
- Numerous soft-loan schemes available
  - <http://jreeef.memr.gov.jo/Default/EN>
  - Green credit lines (via local banks)
  - Frequently international R&D / demonstration projects addressing the subject
- No taxes or customs on renewable energy / energy efficiency equipment



# Financing in Jordan – Contracting

- Concept of contracting known – commonly applied for larger PV projects
- Some local investors have increasing interest due to difficult PV situation
- At least one major ESCO project for large scale (fossil) heating and cooling (Abdali Mall)
- No solar thermal contracting done yet
- Ownership for foreign companies difficult

# Case Study – 1/2

- Food factory in greater Amman
- Fuel diesel – 120 €/MWh (current prices and exchange rate)
- Installed steam boiler capacity 4 tons/h
- Constraint: Space of max 500 m<sup>2</sup>
- Integration: Process integration

# Case Study – 2/2

- Collector field: 130 kW (200 m<sup>2</sup>)
- Irradiation on collector surface (active): 390 MWh
- Energy delivered by collectors: 170 MWh
- Energy delivered to customer: 145 MWh
- Saving: 17.400 €/a

# Summary – practical experience

- Very high energy costs – increased again in last 6 months
- Some references of larger solar thermal installations
- Some local manufacturers, not addressing process heat applications (<https://www.hanania.jo> / <https://www.nursolarsys.com> )
- Good local contractors available
- Financing for industrial / commercial projects remains difficult
- Project development major challenge
  - Uncertainty of load profile
  - System design and integration concept
  - End-users reluctant to pay for engineering services

# Contact us

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