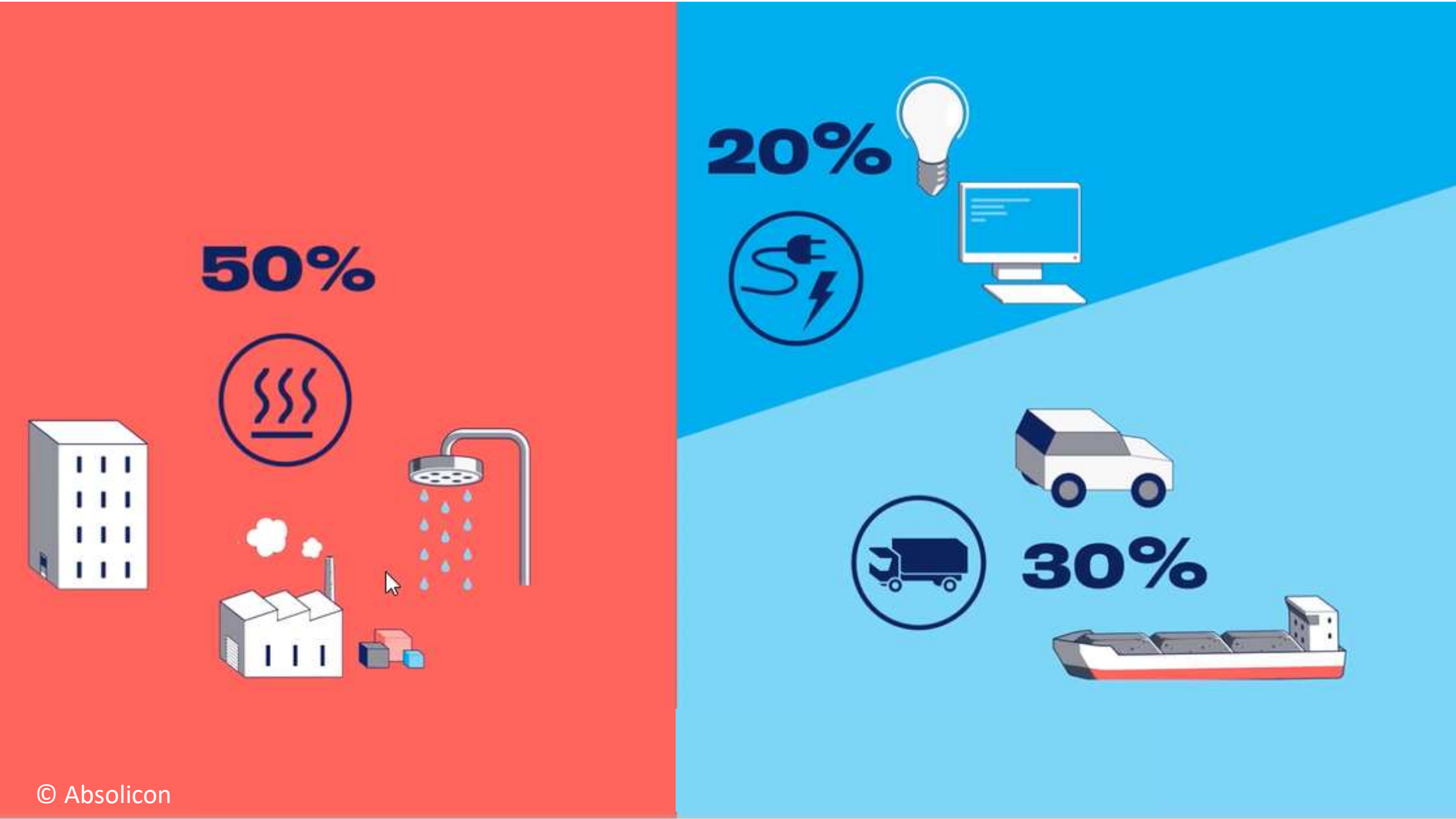
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Efficient solar district heating systems
SHC Task 68

French National Day
Sophia Antipolis, 13.06.2023

Task Manager Viktor Unterberger
Task Duration: 01.04.2022 – 31.03.2025

#HeatisHalf



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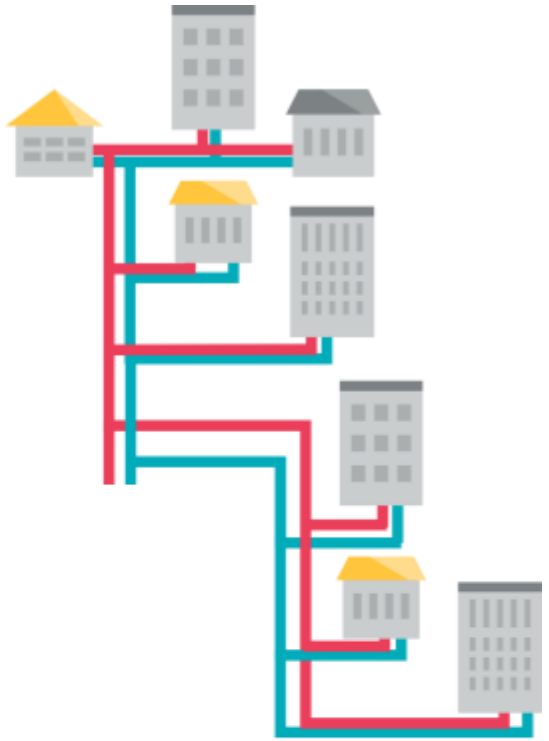

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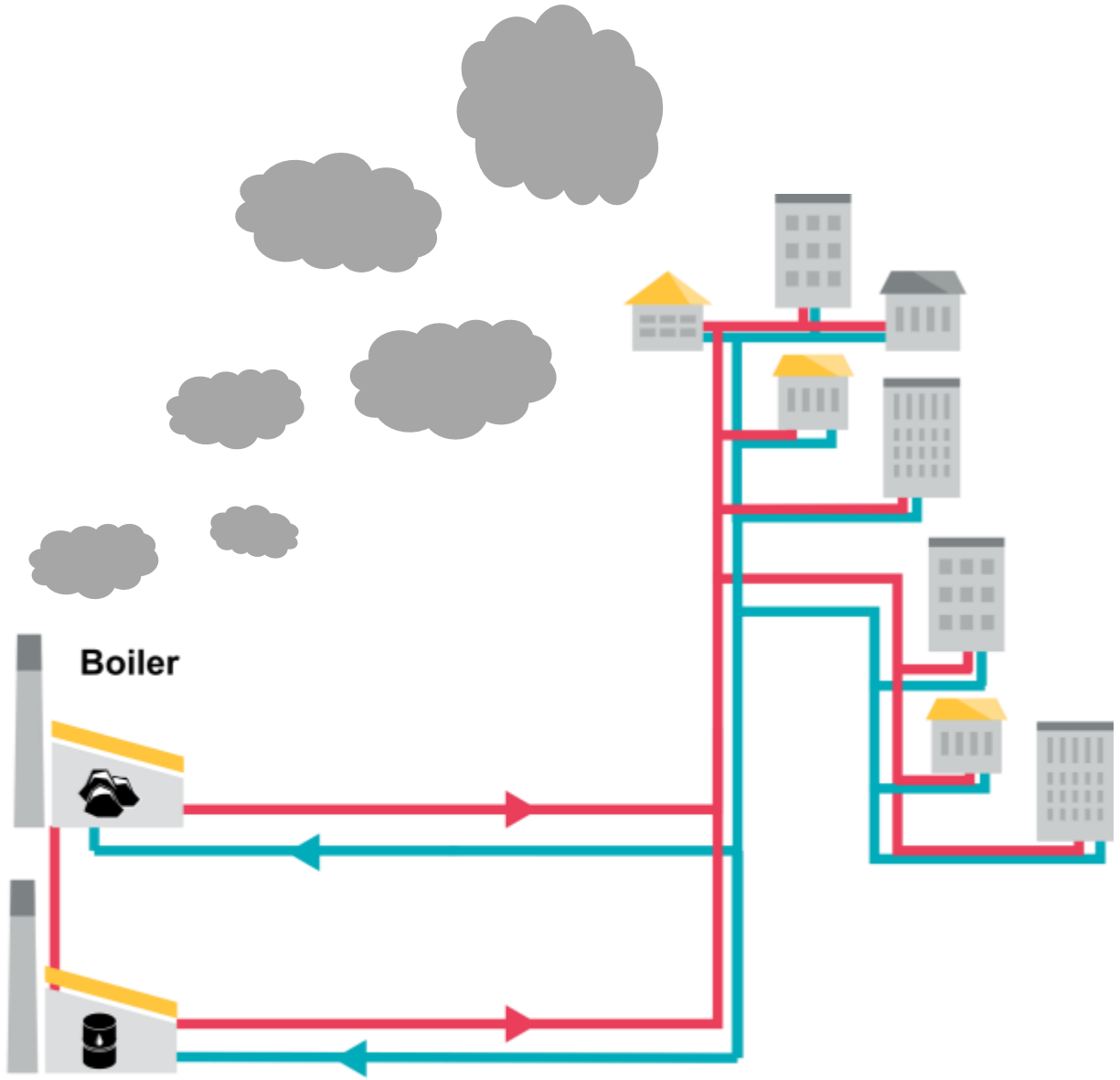

< 10% Renewables

https://www.iea.org/reports/district-heating

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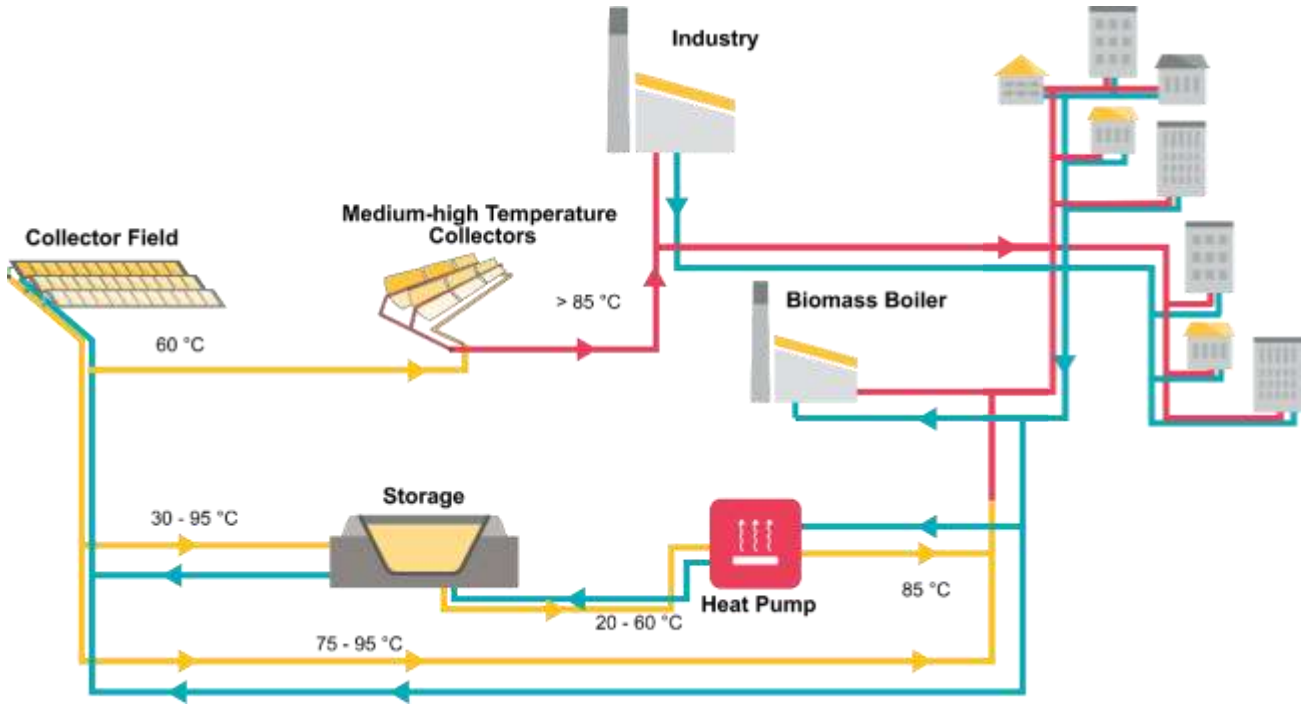
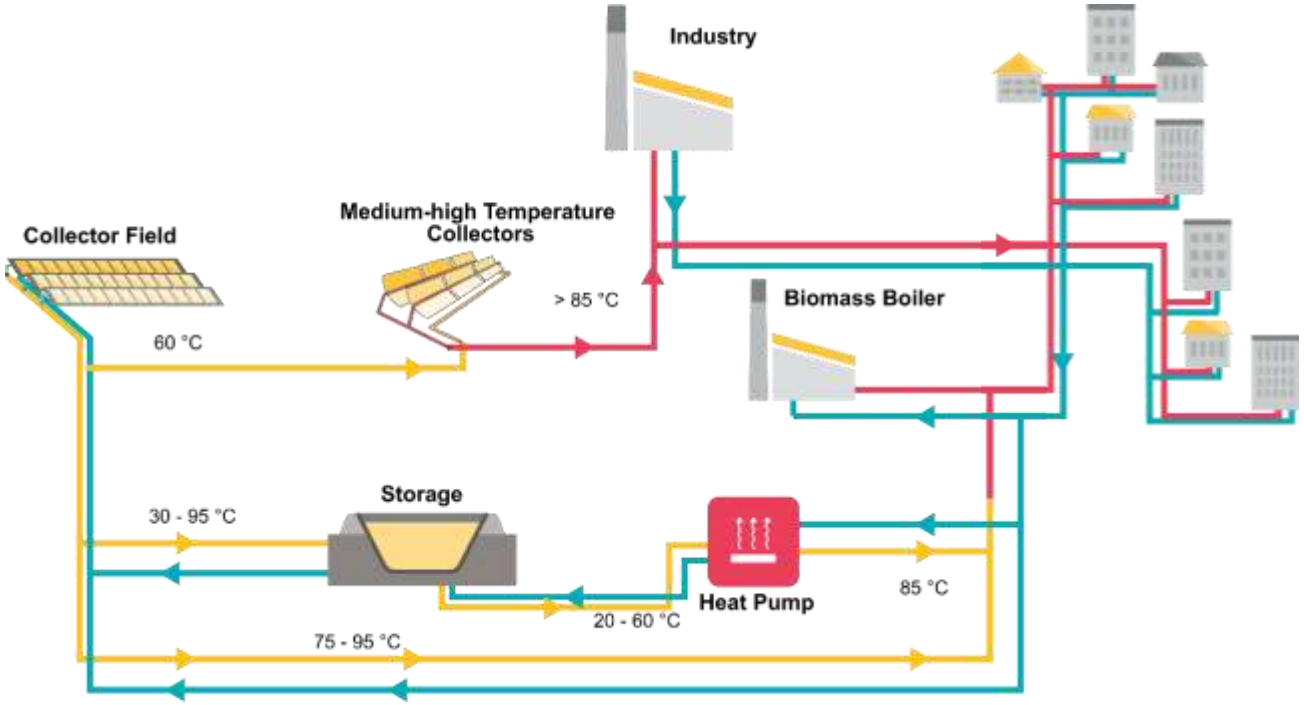


Solar District Heating Systems

Goals of the IEA SHC Task 68

- **Provide** the **heat most efficiently at** the **desired temperature level**
- **Increase digitalization level** for a more **efficient data preparation** and **utilization**
- **Make SDH systems more cost-efficient** and explore **new business models**
- **Raise awareness** for solar technologies and **efficiently disseminate the results**

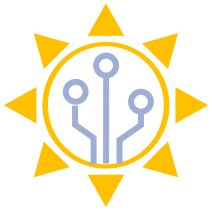


- ✓ **April 2022 – March 2025**
- ✓ **10 Participating countries** (Austria, China, Denmark, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, UK
- ✓ Task Manager: Viktor UNTERBERGER

Task Structure

Subtask A: Concepts

- Requirements | Planning | Configuration | Modelling



Subtask B: Data preparation & utilization

- Gathering/Storing data | Auto. Monitoring/Evaluation | Control

Subtask C: Business models

- Financing & Investment schemes | Risks & Barriers | Cost red.

Subtask D: Use Cases and Dissemination

- Demos | Awareness | Market overview | Best practice

Technologies / Components

Systems

- Medium to high temperature SDH – directly by solar
- Medium to high temperature SDH – indirectly by solar (e.g. solar + heat pump / biomass / waste heat …)

Subtask A – Concepts

Subtask leader:
Magdalena Berberich, Solites, (Germany)

Planned activities of Subtask A:

A1: **Comparison of different collector technologies for providing medium-high temperature** heat with respect to technical and economic characteristics.

A2: **Collection of requirements and concepts** necessary to efficiently plan, design and scaling-up SDH systems, especially considering medium-high temperature heat.

A3: **Analysis of existing simulation tools for the simulation of efficient SDH systems**, especially considering medium-high temperature heat.

A4: **Define performance and efficiency measures** for SDH systems on component and system level

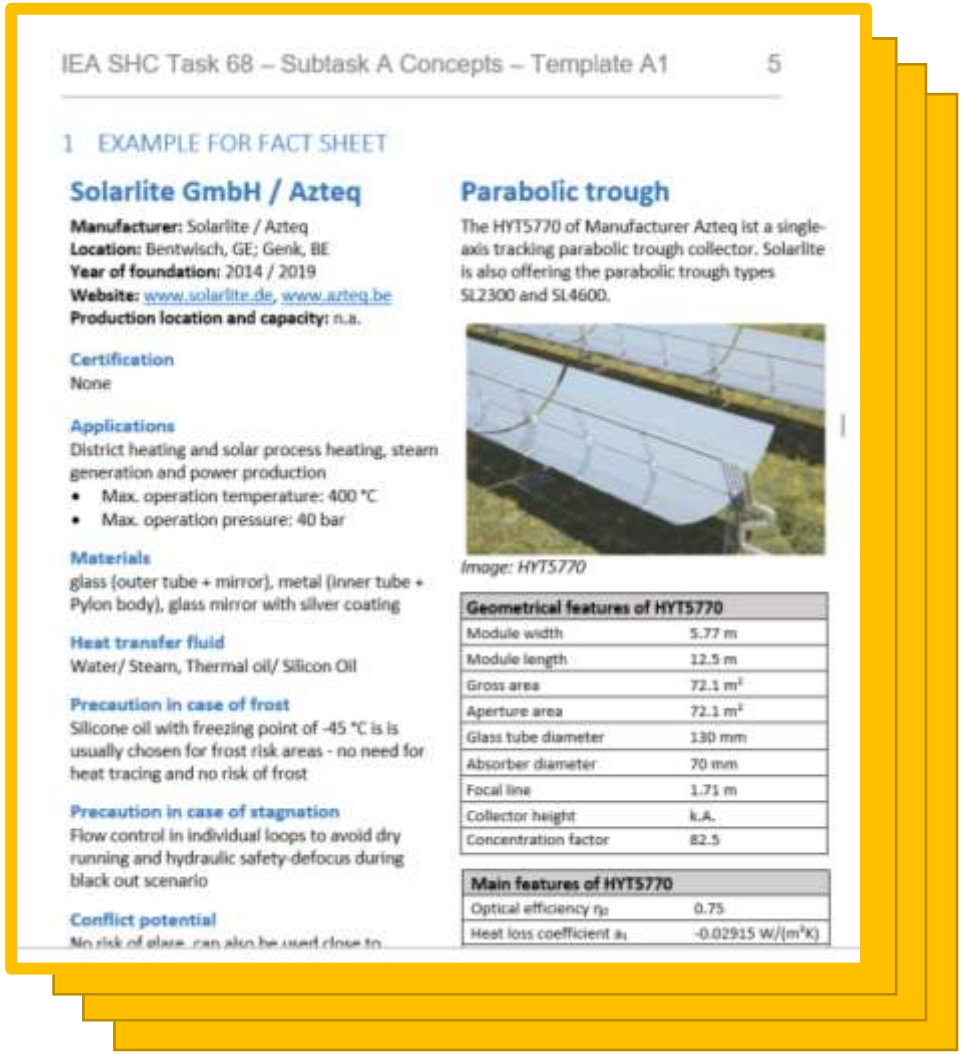
Icons partly taken from "https://www.flaticon.com/" title="Flaticon"

Current work and preliminary results – Comparison of collector technologies

Many collector solutions available:

- Heliac
- TVP
- Parabolic trough
- Flat plate
- …

➔ Goal is to provide fact sheets to make them comparable



IEA SHC Task 68 – Subtask A Concepts – Template A1 5

1 EXAMPLE FOR FACT SHEET

Solarlite GmbH / Azteq

Manufacturer: Solarlite / Azteq
Location: Bentwisch, GE; Genk, BE
Year of foundation: 2014 / 2019
Website: www.solarlite.de, www.azteq.be
Production location and capacity: n.a.

Certification
None

Applications
District heating and solar process heating, steam generation and power production
- Max. operation temperature: 400 °C
- Max. operation pressure: 40 bar

Materials
glass (outer tube + mirror), metal (inner tube + Pylon body), glass mirror with silver coating

Heat transfer fluid
Water/ Steam, Thermal oil/ Silicon Oil

Precaution in case of frost
Silicone oil with freezing point of -45 °C is is usually chosen for frost risk areas - no need for heat tracing and no risk of frost

Precaution in case of stagnation
Flow control in individual loops to avoid dry running and hydraulic safety defocus during black out scenario

Conflict potential
No risk of glare, can also be used close to

Parabolic trough

The HYT5770 of Manufacturer Azteq ist a single-axis tracking parabolic trough collector. Solarlite is also offering the parabolic trough types SL2300 and SL4600.

Geometrical features of HYT5770	
Module width	5.77 m
Module length	12.5 m
Gross area	72.1 m²
Aperture area	72.1 m²
Glass tube diameter	130 mm
Absorber diameter	70 mm
Focal line	1.71 m
Collector height	k.A.
Concentration factor	82.5

Main features of HYT5770	
Optical efficiency η_0	0.75
Heat loss coefficient a_1	-0.02915 W/(m²K)

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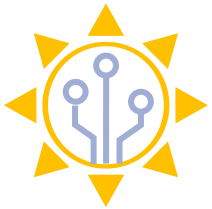

Subtask B: Data preparation & utilization

- Gathering/Storing data | Auto. Monitoring/Evaluation | Control

Subtask C: Business models

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Subtask B – Data preparation & utilization

Subtask leader
Sabine Putz, SOLID, (Austria)

Planned activities

B1: Describe and propose efficient solutions to gather, store and distribute data from heterogenous devices on a single- but also multi-plant level.

B2: Develop guidelines for the validation of data from SDH systems.

B3: Collect, describe, develop and apply techniques for analysis, monitoring and fault detection of data.

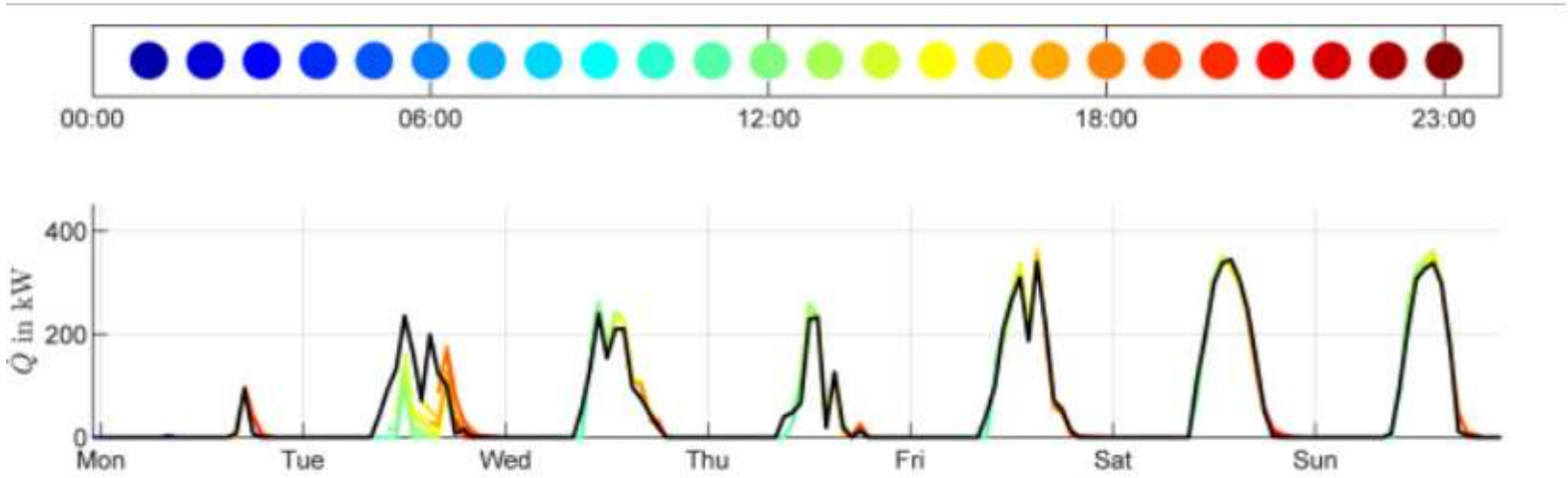
B4: Comparison of state-of-the-art available control strategies on sub- (=component level) and superordinate level (=system level).

B5: Develop and define requirements and concepts for open data approaches

Icons partly taken from "https://www.flaticon.com/" title="Flaticon"

Current work and preliminary results – Control strategies

… for **solar thermal systems** e.g. considering self-learning forecasting methods (➔LINK)



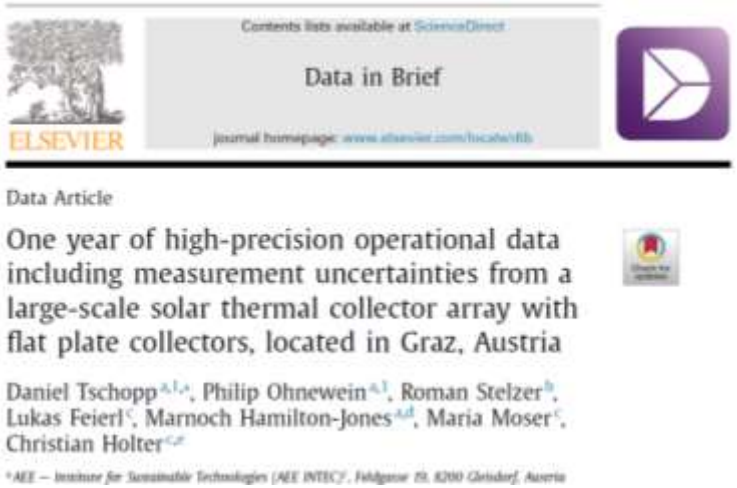
… but also energy management systems (EMS) for **whole district heating systems** (➔ LINK)

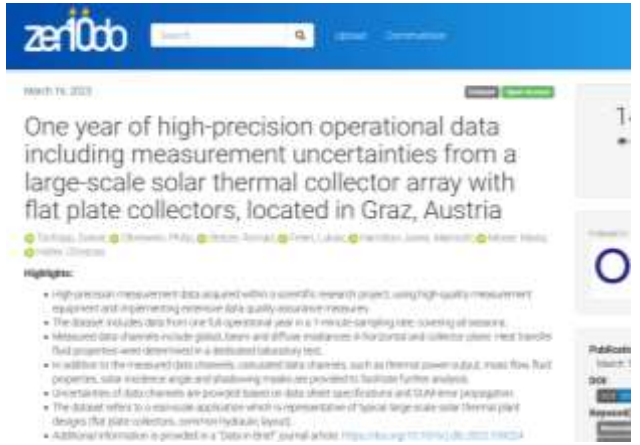
35% reduction in CO_2 emissions
7% fuel cost reduction
during 1 month (April 2021)

Current work and preliminary results – Control strategies and Open Data

- **Collection of open data sources / platforms**
  ➔ planned joint publication through task 68 community

- Specific **measurement data of real plants available as open-data sets**, by data in Brief article and made accessible for download





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-

Subtask C – Business models

Subtask leader
Luuk Beurskens, TNO, (the Netherlands)

Planned activities

C1: Collect and provide an **overview of financing and investment schemes** worldwide for SDH systems.

C2: **Evaluate, discuss and propose possible new business models** for efficient SDH systems, with a special focus on medium-high temperature or/and digitalization aspects.

C3: Define a standard, **certain criteria or a seal of approval for planners/designers** of SDH systems

C4: Collect, list and compare measures and **possibilities to reduce the costs** of SDH systems.

Icons partly taken from "https://www.flaticon.com/" title="Flaticon"

Current work and preliminary results – overview of financing and investment schemes

1. **Types of support schemes for renewables (describing the schemes: investment subsidy, production subsidy, loans, tenders, …)**

for different countries

- **Performance of funding scheme (e.g. realized solar thermal installation,** annual budget,=
- **History: situation before funding scheme came into force**
- **Policy design: features of the funding scheme**
- **Strengths and weaknesses: experiences with funding scheme from market parties and policy makers**
- **Suggested improvements, specifically for large-scale solar thermal energy**

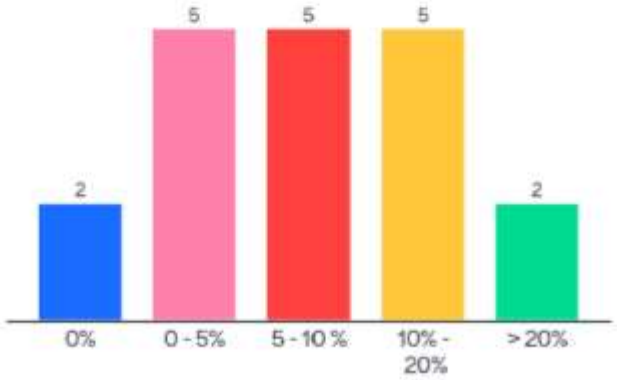
2. **Types of business models for solar thermal (describing the business models)**

for different countries

- **Ownership Business Models (public-private partnership, multiparty, lease/hire)**
- **Service Business Models (user cooperative, Energy Performance Contracting)**

Current work and preliminary results – possibilities to reduce the costs

What overall investment-cost reduction is feasible up to 2030?



Which components are most likely to result in a cost reduction ?

Financing	Planing and engineering design of plants and BoP	The panels themselves
Everything outside the collector	Balance of plant	Solar collertors
BoO	BoP	Collector, Hydraulics

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Subtask D – Use Cases and Dissemination

Subtask leader

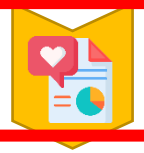
Joakim Byström, Bengt Söderbergh, Absolicon, (Sweden)

Planned activities

D1: **Collect and provide an overview of efficient SDH installations** as well as their description and structure, especially providing medium-high temperatures.

D2: **Provide valuable future scenarios as well as qualitative and quantitative targets for the solar sector** and policy makers regarding SDH systems

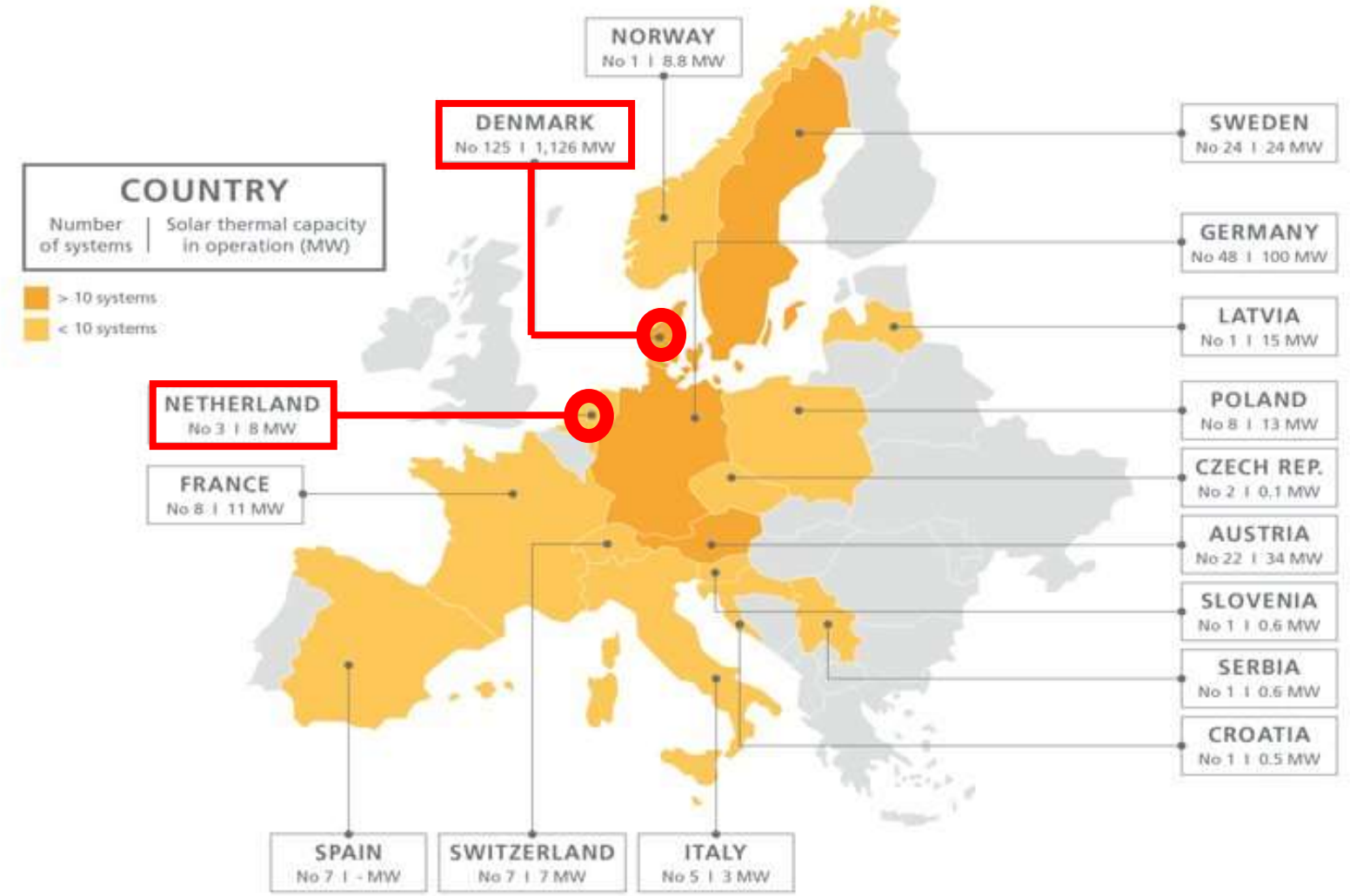
D3: Prepare and manage **industry workshops.**



D4: Prepare appealing **documents for industry and public** in order to increase the knowledge regarding efficient SDH systems, the benefits from data and ways to cut costs.

Icons partly taken from "https://www.flaticon.com/" title="Flaticon"

D.D4 Dissemination documents for industry and public



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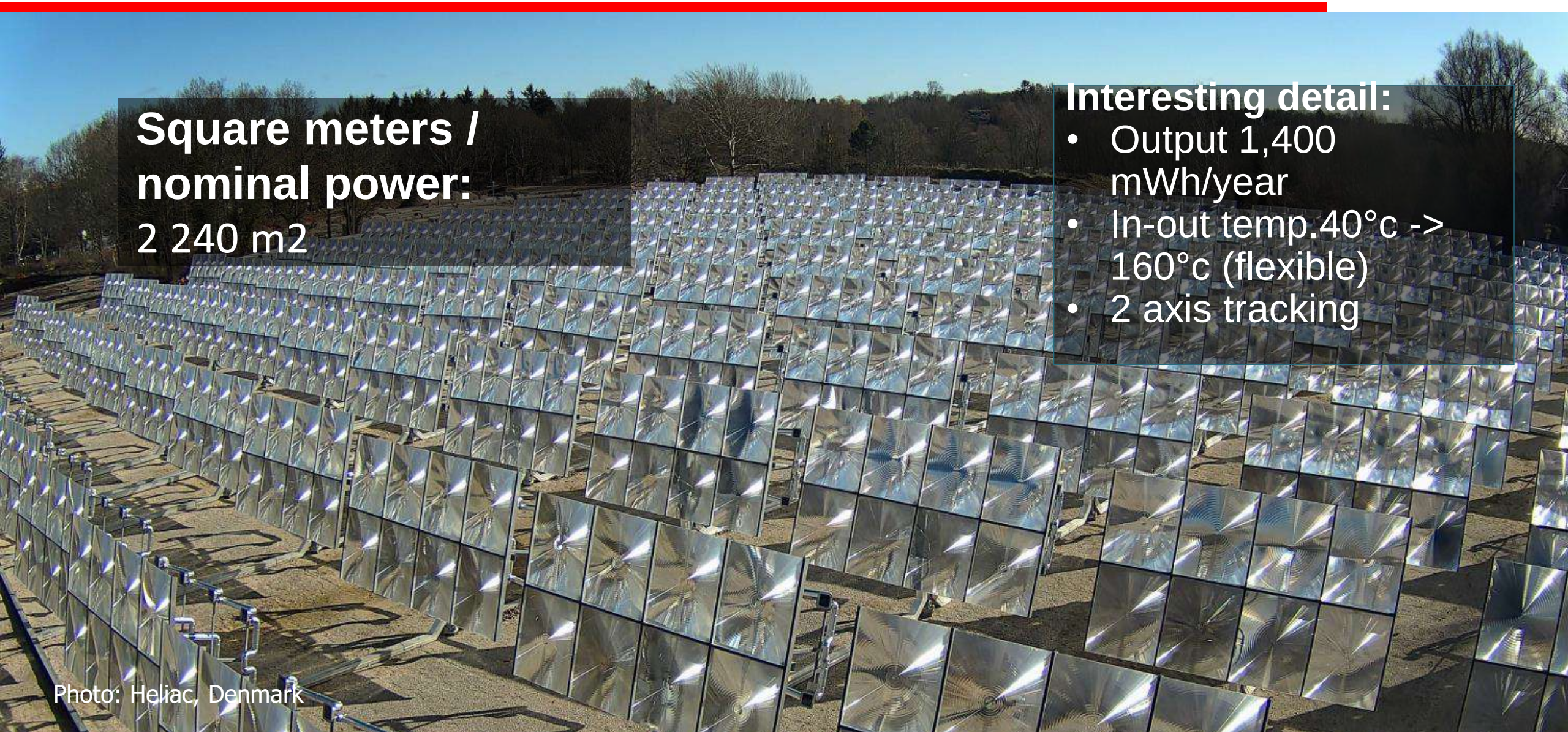
High temperature through large lenses

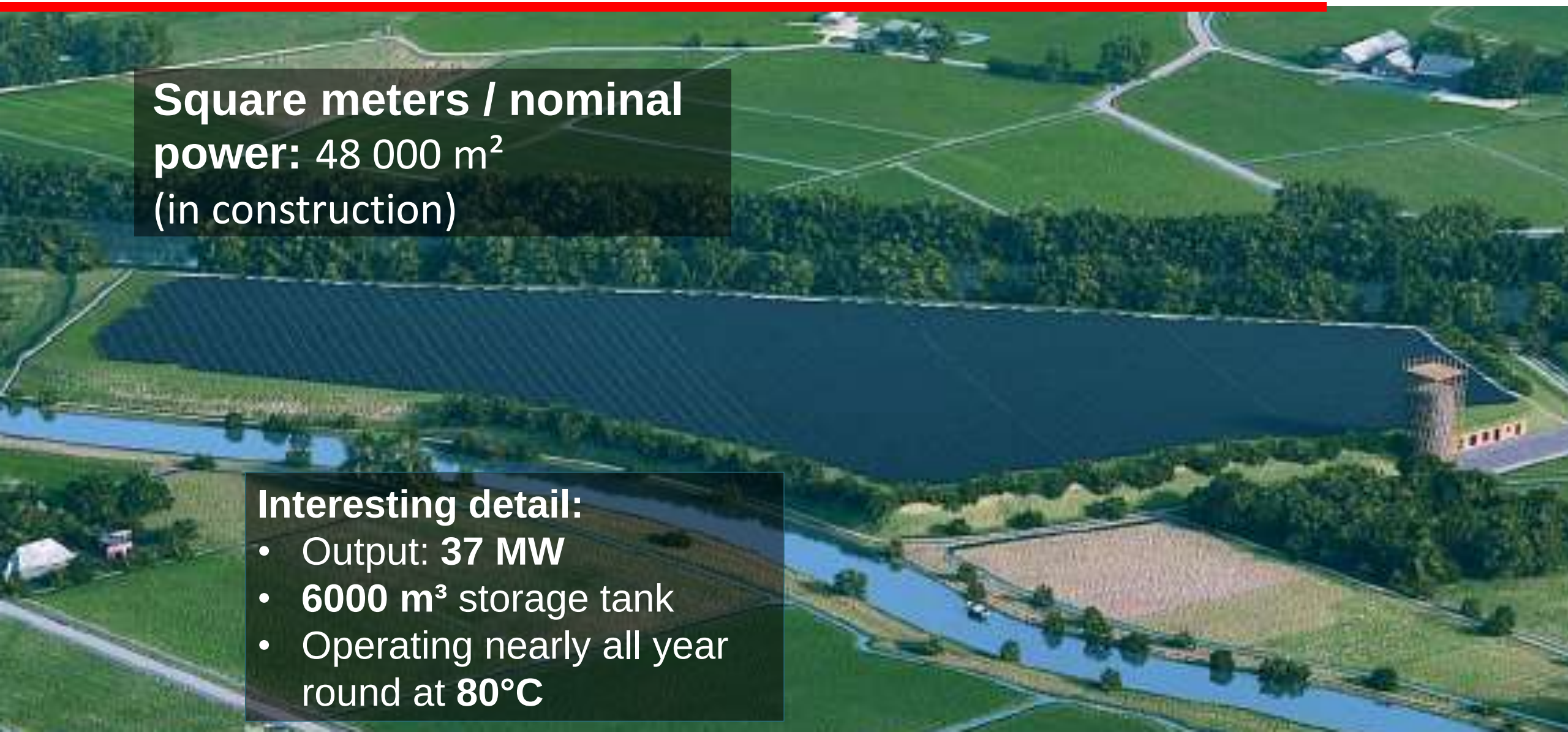


Square meters / nominal power:
2 240 m2

Interesting detail:
- Output 1,400 mWh/year
- In-out temp.40°c -> 160°c (flexible)
- 2 axis tracking

Photo: Heliac, Denmark

High performance through long-lasting vacuum



Square meters / nominal power: 48 000 m²
(in construction)

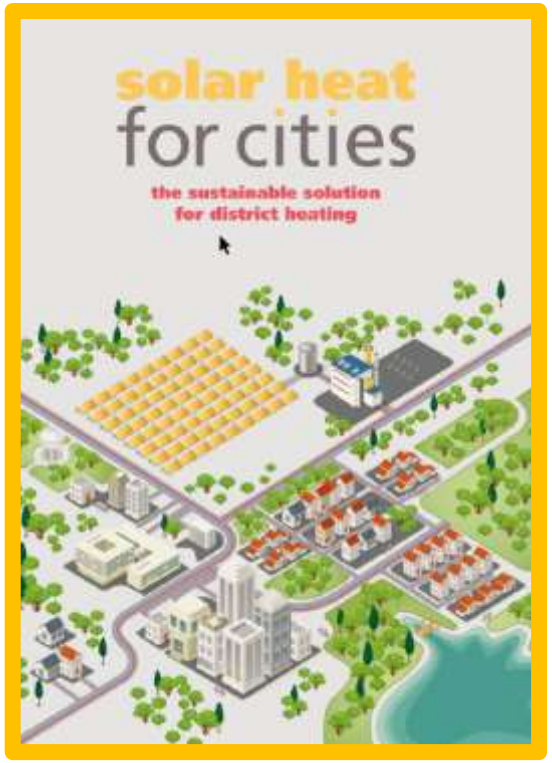
Interesting detail:

- Output: **37 MW**
- **6000 m³** storage tank
- Operating nearly all year round at **80°C**

Current work and preliminary results – Dissemination documents for industry and public

- Further source of information:

Task 55



LINK: files.iea-shc.org/public/mrj/d-d2-investor-brochure.pdf

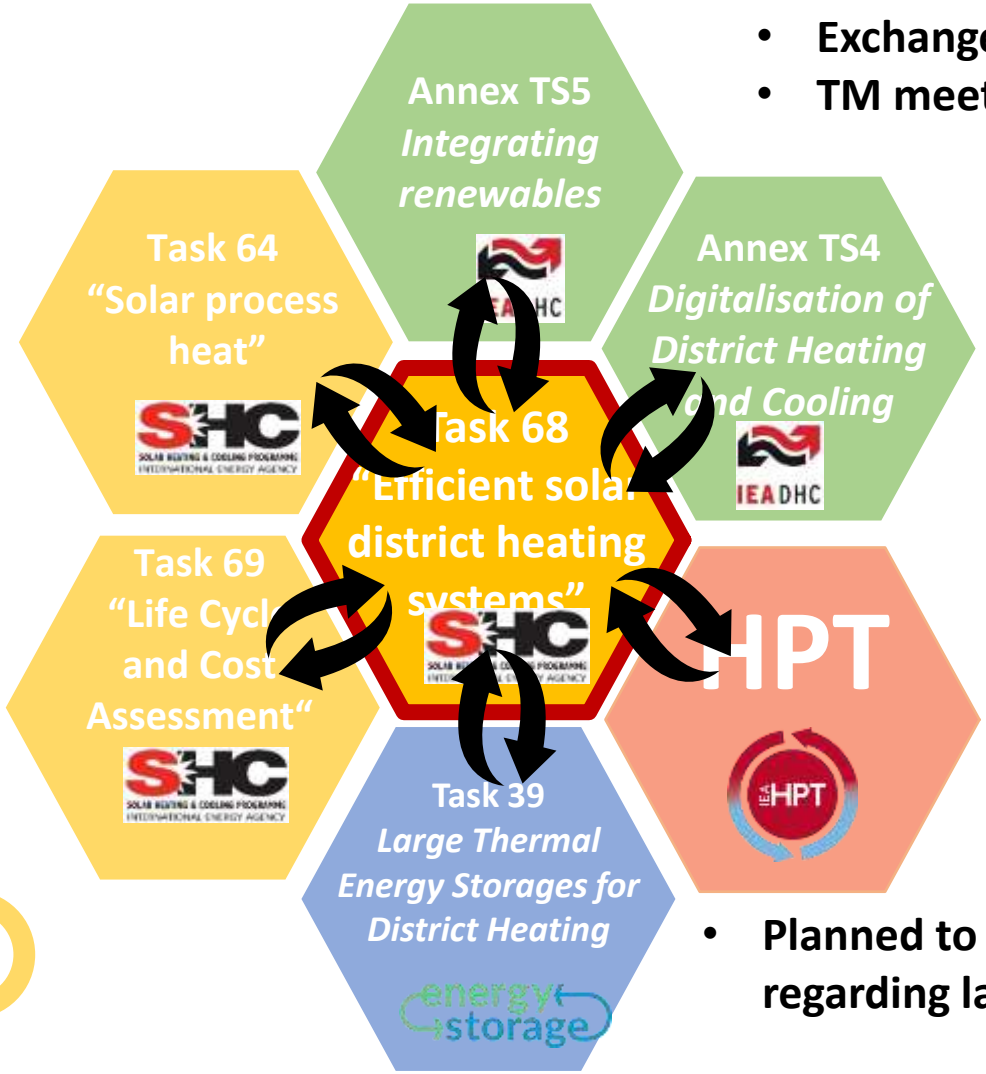
Task 68

Website for cities:
www.solardistrictheating.eu

Collaboration Overview

- Joint meeting in Sweden October 2023
- Exchange of experts
- TM meetings

- Aligned meeting
- Organization of technical tours
- Exchange of task experts



- TCP Workshop in Graz
- Exchange on TM level

- Participation in Task meeting Annex 56 IoT for Heat Pumps
- Planned to have a joint meeting in the future

- Highly suitable for collaboration regarding costs (Task 68 / subtask C)

- Planned to have a joint meeting regarding large-scale storages

Timeline


April 2022
Kick-off Meeting
Nov 2022
2nd Task Meeting
June 2023
3rd Task Meeting
Oct 2023
4th Task Meeting
(Sweden)
until Mar. 2025
Semi-annual Expert Meetings
Mar. 2025
End of Task

Are you interested ?

JOIN US for our next Task Meeting in October in Härnösand together with Annex Ts 5 *Integrating renewables* ☺

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TASK 68

Efficient Solar District Heating Systems

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Efficient solar district heating systems

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