R&I Solar Heating and Cooling Policy Insights

Pedro Dias
Solar Heat Europe/ESTIF Secretary General

SunHorizon Solar Stakeholders Workshop
September 10th 2020
Solar Thermal Heating and Cooling in Europe

**HIGHLIGHTS**

Increase in total installed capacity 2019: 1,5 GW_{th} (+ 2.4%)
Solar Thermal Heating & Cooling Market

Installed capacity:
- World: 479 GW\textsubscript{th}
- Europe: 36 GW\textsubscript{th}

Energy produced:
- World: 389 TWh
- Europe: 26 TWh

Source: IEA-SHC
The largest solar thermal heating plants in Europe (per sector)

Solar Heat for Industrial Processes: Issoudun, France 2020
12 MW$_{th}$ of European made flat plate collectors supplying 8 GWh of heat for malting process

Solar District Heating: Silkeborg, Denmark 2017
110 MW$_{th}$ of European made flat plate collectors supplying 80 GWh/a of heat to district heating network
Based on Comext (2018), Lako, P (2008), Eurostat (2018), Wind, I (2009), and Jha, V (2009). Note: Data for 1999 and 2016 was 0 for all countries so it was excluded. For an explanation of the methodology used, see Annex C.
Cost-supply curve of renewable energy options to go beyond the 27% target for 2030

*Substitution costs compared to reference technology & potential increase in RES share*

Renewable Energy Prospects for the European Union, EC, IRENA, 2018
Energy Demand in Europe

EU Final Energy Demand

1,197 Twh

- 25% Electricity
- 47% Heating & Cooling
- 28% Transport

1,050 Twh

292 Twh

© RHC-ETIP
Digitalisation
- Smart Appliances
- Smart Buildings
- Smart Networks

Both thermal and power driven.
Heating & Cooling in Energy Decarbonisation

HEATING & COOLING IS ESSENTIAL FOR DECARBONISATION

Critical milestone 2030

Demand/Supply Transition

BUILDINGS

INDUSTRY

INDIVIDUAL/COLLECTIVE SYSTEMS

DISTRICT HEATING

INDUSTRIAL PLANTS

Planned replacement

Aggregation projects

Transition to RES-H&C (large investment)
RHC-ETIP Strategic Research and Innovation Agenda

Webinar 15/09 10h00
2.00 WELCOME & INTRO
- MASTER OF CEREMONY: Marisol Oropesa, Business & Mktg. Strategist, matters.mx
- KEYNOTE SPEECH: Javier Urchueguía, Chairman, RHC ETIP
- RHC ETIP PROJECTS DATABASE: Dan Stefanica, Project Manager, EHPA

2.10 CLEAN ENERGY TRANSITION PARTNERSHIP
- Strategic Research & Innovation Agenda: SRIA
- PRESENTATION: Michael Hübner, Austrian Ministry of Climate Action
- Gordi Breemboom, NL Enterprise Agency, Adviser

2.20 RHC ETIP & CLEAN ENERGY TRANSITION SRIAS
- INTERVIEW:
  - Moderator - Marla San Roman, Int. Sales Dir, Heat, ORRU
  - Michael Hübner, Austrian Ministry of Climate Action
  - Javier Urchueguía, Chairman, RHC ETIP

2.35 QUESTIONS & ANSWERS

2.40 INNOVATIVE TECHNOLOGY DEVELOPMENTS for a 100% RHC sector
- PANEL DISCUSSION:
  - Moderator - Reghina Dimitriou, Policy Officer, EGEC
  - Øyvind Skreberg, Chief Scientist, SNIRY Bioenergy, SINTEF
  - Christian Holter, CEO, Solis Solar Energy Systems GmbH
  - Russell McKenna, Professor, University of Aberdeen
  - Speaker 4

3.30 THE LITHUANIAN PERSPECTIVE
- NATIONAL ROUNDTABLE:
  - Moderator - Eglė Rondytė, Managing Dir, Vrij Atnaujinimų paieška
  - Indre Butienė, Head of Strat. Planning, City of Klaipėda
  - Liudas Getautas, President, LT Heat Pump Assoc
  - Valdas Lukoševičius, President, LT District Heating Assoc
  - Darius Biekša, Director, LT Energy Agency

4.30 WRAP UP
- MASTER OF CEREMONY: Marisol Oropesa, Business & Mktg. Strategist, matters.mx
- KEYNOTE SPEECH: Javier Urchueguía, Chairman, RHC ETIP

4.45 END OF THE EVENT
Focused on results by 2020

- Large Scale Solar Thermal
- Solar Active House
- Solar Compact Hybrid Systems
Solar Thermal Projects: SDH, SHIP

Solar District Heating:
- SUNSTORE4
- SDH ‘series’

Solar Heat for Industrial Process:
- FRESH NRG
- ENTHALPY

Pictures form projects „SunStore4“ & „Fresh-Ngr“
Solar Thermal Projects: SAH

Solar Active House:
  • Arkol (DE)
  • HP-LP-SOLAR-FAÇADE

Pictures from project „HeizSolar“ & Arkol
Solar Compact Hybrid Systems:

- SYSTHEFF
- MacSHEEP
- Zeosol
• R&I investments for RES-E & RES-H&C should be dealt separately in funding programs
  • Sector coupling actions can be include in either, though E & H should be separate

• Horizon Europe should cover more high TRL projects
  • More balanced approach between basic research and demonstration
  • Promote solutions integrating several RES-H&C technologies

• SHC requires large scale demonstration projects
  • Process heat, applying SHC to different sectors (different demand profiles)

• SHC required low to mid TRLs on:
  • Collectors (PVT, polymer, high vacuum)
  • Solar cooling
  • Materials
  • Storage materials
Industrial challenges

- Scalability
- Smartness
- Hybrid solutions
- Sector Coupling
- Thermal Energy Storage
- Building integration
- Competitiveness
Learning Curves

© Solar Heat Europe

System cost: €/kWth

Energy cost: €-ct/kWth

DHW-SFH 2.8 kWth
COMBI-SFH 4.9 kWth
DHW-MFH 35 kWth
SDH (DS) 7 000 kWth

LCoH&C  System Costs  Average LCoH&C
Scalability

- Explore economies of scale
  - SDH: 20-35 EUR/MWh

- Broaden the range of large applications
  - Solar Heat for Industrial Processes (SHIP)
    - More demonstration covering different industrial sectors and processes
  - Solar District Heating (SDH)

- Increase reliability
  - Improve guarantees of performance
Market Segments for Different Collectors
SHIP example

<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>LOW TEMP</th>
<th>MEDIUM TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOOD AND BEVERAGE</td>
<td>DRYING</td>
<td>BOILING</td>
</tr>
<tr>
<td></td>
<td>WASHING</td>
<td>STERILIZING</td>
</tr>
<tr>
<td></td>
<td>PASTEURISING</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HEAT TREATMENT</td>
<td></td>
</tr>
<tr>
<td>PAPER</td>
<td>COOKING/DRYING</td>
<td>BLEACHING</td>
</tr>
<tr>
<td>TEXTILE</td>
<td>BLEACHING/PRESSING</td>
<td>DRYING</td>
</tr>
<tr>
<td></td>
<td>WASHING/DYEING</td>
<td>FIXING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DEGREASING</td>
</tr>
<tr>
<td>CHEMICAL</td>
<td></td>
<td>SOAP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SYNTHETIC RUBBER</td>
</tr>
<tr>
<td>PLASTIC</td>
<td>PREPARE/DISTILL</td>
<td>SEPARATE</td>
</tr>
<tr>
<td></td>
<td>BLEND</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EXTEND</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DRY</td>
<td></td>
</tr>
<tr>
<td>ALL INDUSTRIES</td>
<td>PRE-HEATING</td>
<td>LP STEAM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MP STEAM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP STEAM</td>
</tr>
</tbody>
</table>

Scalability

© TVP Solar
Smartness

- Improvements in:
  - Heat metering
  - Function & yield control
  - Plug-and-Flow
  - Interconnectivity
  - Smart sector integration

Figure: Resol
• Develop novel hybrid solutions
  • Combine technologies
    • Components: E.g. PVT
    • Systems: E.g. HP&ST
  • Combine sources
    • Several RES-H&C
    • Solar heat with RES-E
  • Promote & develop new solutions for the BIG Enabler
    • Thermal Energy Storage
Sector coupling
Sector coupling

1. House and PV cooling in summer.
2. PV panel – Solar panel. Cooled to optimize electricity production.
3. Air-to-water heat pump.
4. Isolated temperature segments. The Ecovat is divided into temperature segments to optimize the thermal quality of the stored water and the heat transfer efficiency. The segments are horizontally divided by natural stratification.
5. Water-to-water heat pump. Heat is transferred inside the Ecovat from cold low layers to hot higher layers. The produced cold is stored for summer.
Thermal Energy Storage (TES)

- Positive for solar heating & cooling
  - Low cost
  - Seasonal/diurnal
- Essential for:
  - Smart thermal grids / Sector coupling
  - 100% solar heat solutions
- Make TES central topic in energy transition
  - Bring relevant players to invest in TES
- Different TRL levels of TES solutions
Building integration

- Improve BIS: building integrated solar
  - solar thermal
  - PV
  - PVT

- Solutions focused on
  - New built
  - Large renovations

Figures: AEE Intec
Competitiveness

Projected change in the cost of a solar water heater

Learning curves of PV and solar thermal systems in Germany


The benchmark system costs without subsidies and VAT show similar learning rates for PV and Solar Thermal. The stronger market development of PV lead, however, to larger absolute price reductions. Credits: University of Kassel 2017
LCoH comparison between solar heat, gas and electricity
Competitiveness
Pedro Dias
Secretary General
Tel: +32 2 318 40 60
Pedro.Dias@SolarHeatEurope.eu

Solar Heat Europe/ESTIF
Place du Champ de Mars 2,
B-1050 Brussels, Belgium
http://www.SolarHeatEurope.eu