“Solar Thermal In The Future Energy Mix: The European Case”

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SOLAR TR2016

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What will the future energy mix look like…

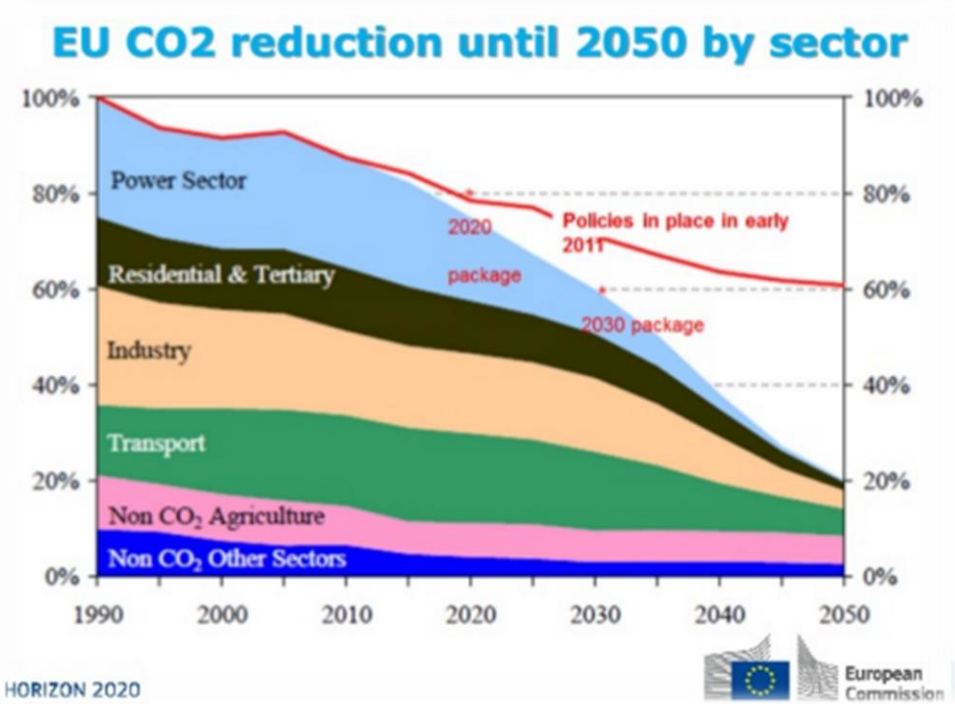
in 2050?

We don't know!

But we know trends…

Trends for 2050

- **Decarbonisation**



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Trends for 2050

- Decarbonisation
- **Decentralisation**

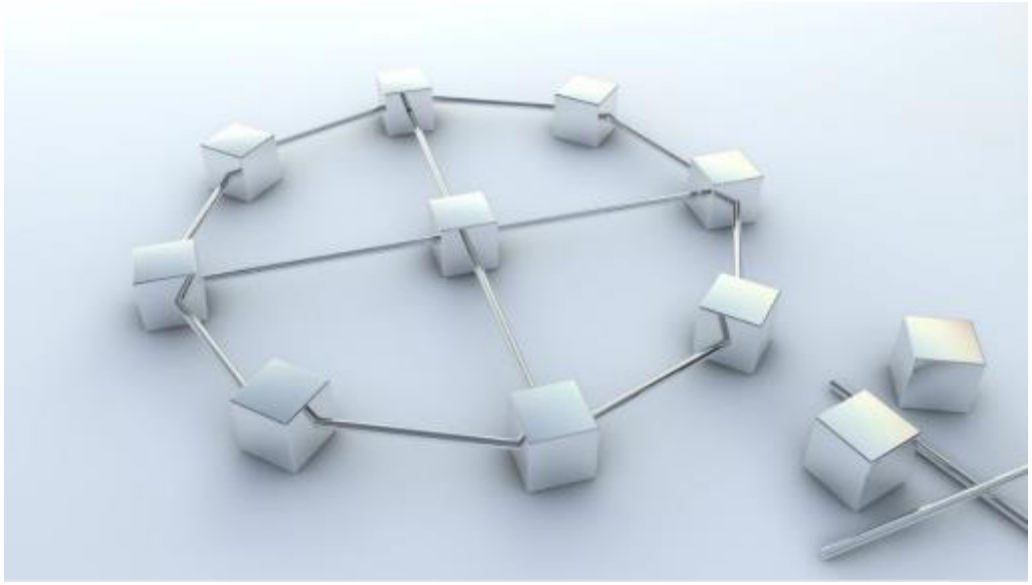

Figure: Procurious

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Trends for 2050

- Decarbonisation
- Decentralisation
- **Smartness**

Figure: EC, Smart Cities and Communities

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Trends for 2050

- Decarbonisation
- Decentralisation
- Smartness

Heating

&

Cooling

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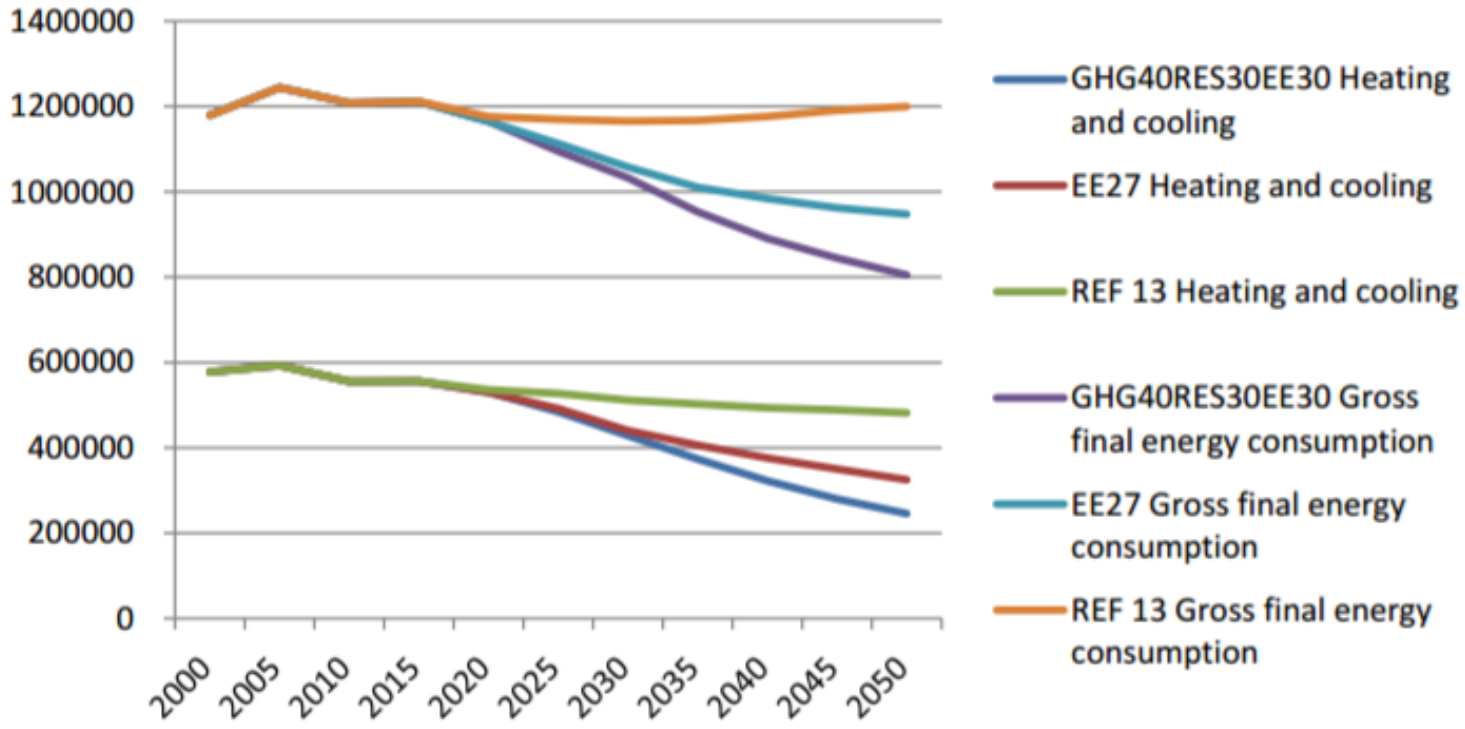
Future of Heating and Cooling

- Demand reduction



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Future of Heating and Cooling

- Building integration

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Future of Heating and Cooling

- Hybrid solutions
  - Technologies
    - Ex: PVT
    - Ex: HP&ST
  - Sources
    - RES-H&C
    - RES-E

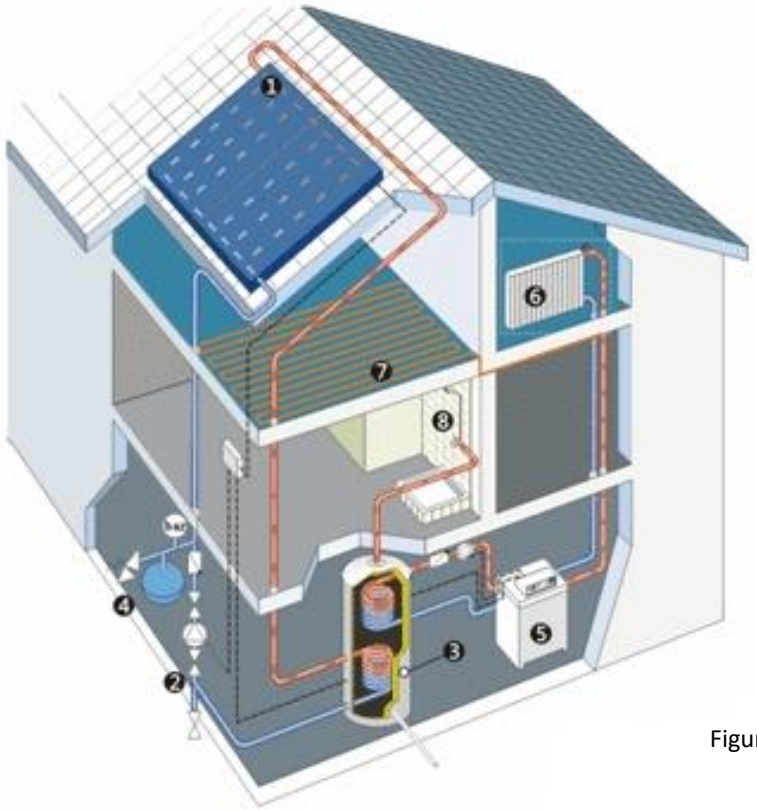

Figure: Homestead

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Future of Heating and Cooling

- Demand reduction
- Building integration
- Hybrid solutions

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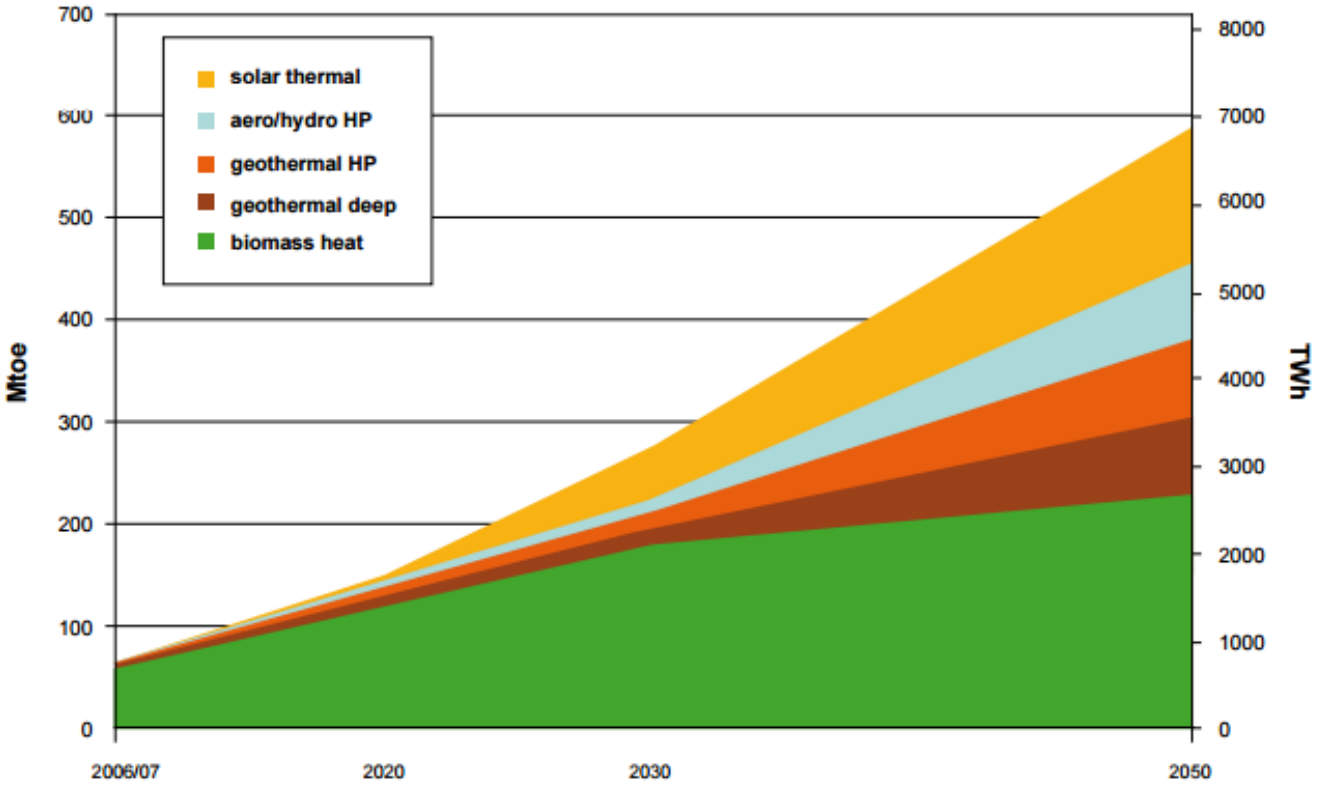
Pathway to RES Heating and Cooling

Renewable heating: Technological potential



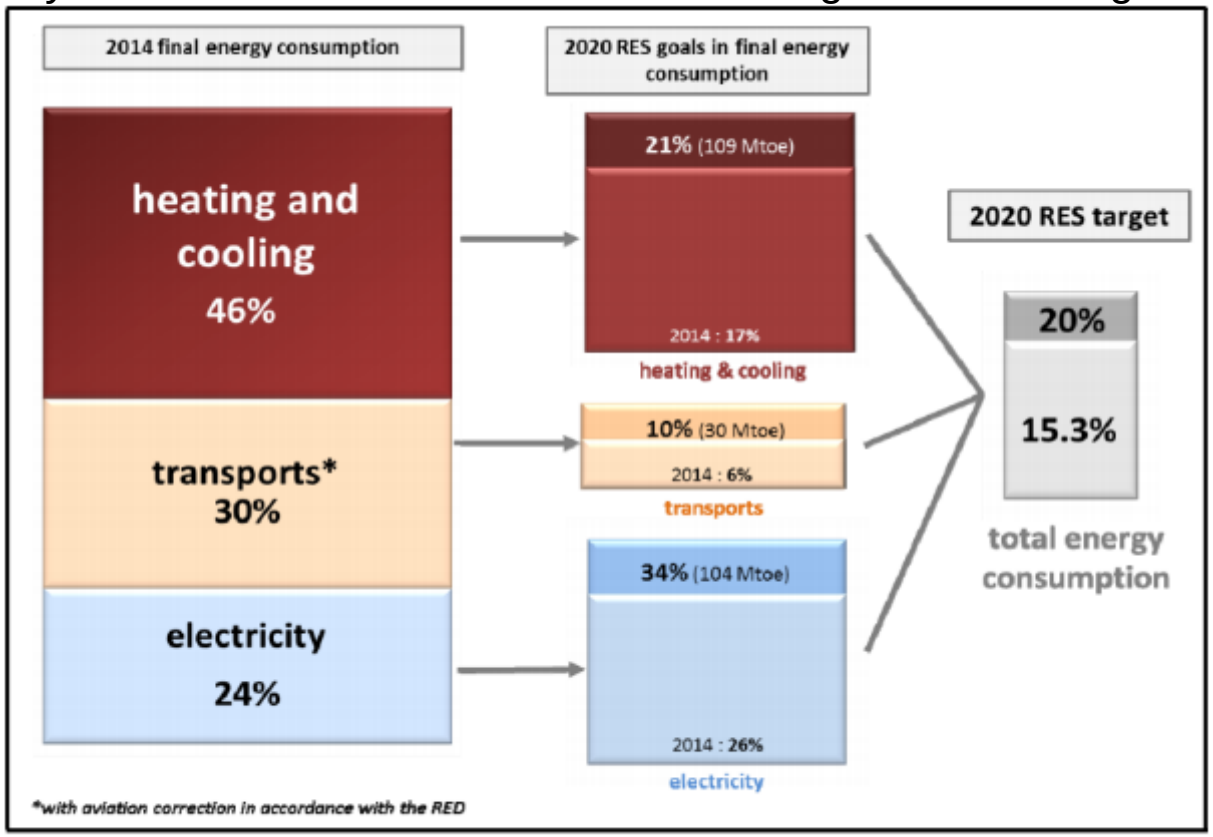
From a technological point of view, by 2030 renewable heating and cooling technologies could supply over half of the heat used in Europe.

By 2050, RHC could be able to satisfy 100% of the European heating demand (biomass: 231 Mtoe, geothermal: 150 Mtoe, solar thermal: 133 Mtoe, heat pumps: 75 Mtoe).

Source: RHC Technology Platform

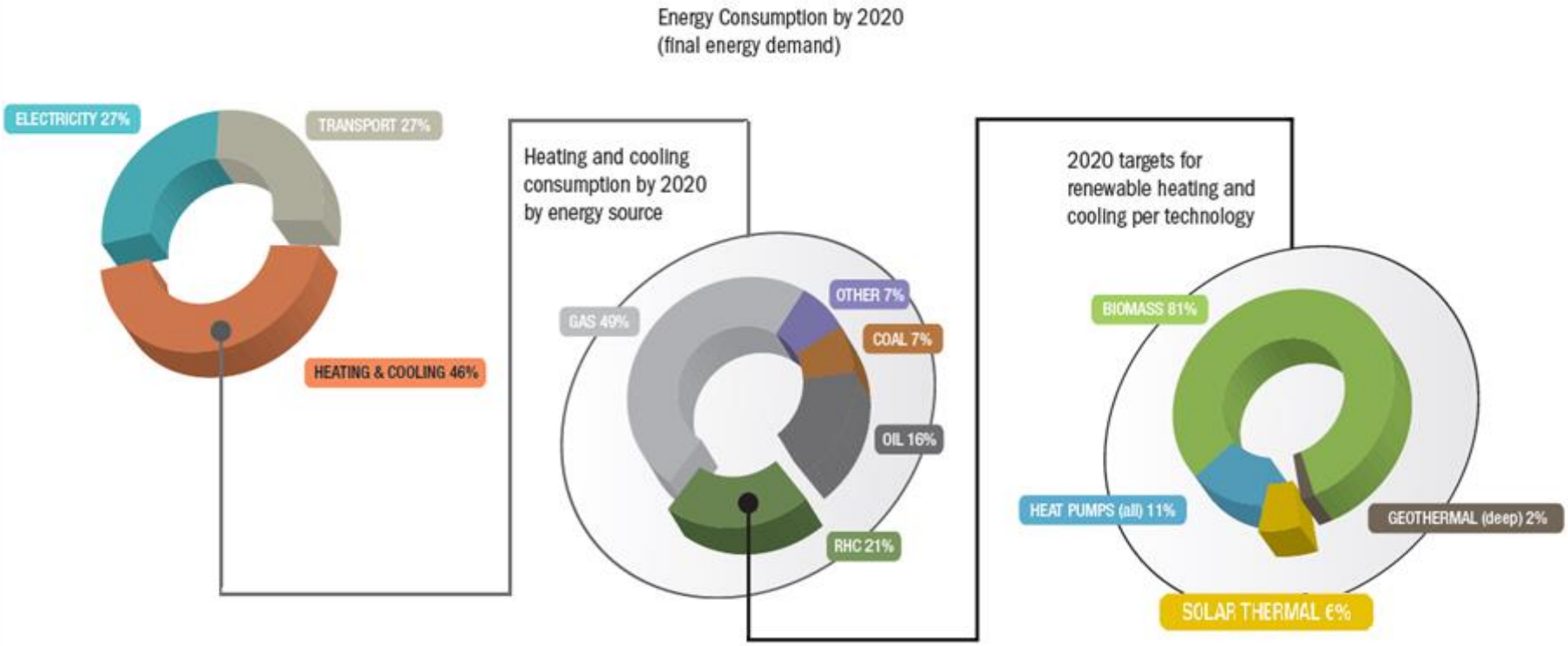
Pathway to RES Heating and Cooling

Final Energy consumption in Europe:
by sector with renewable share in 2014 against 2020 targets



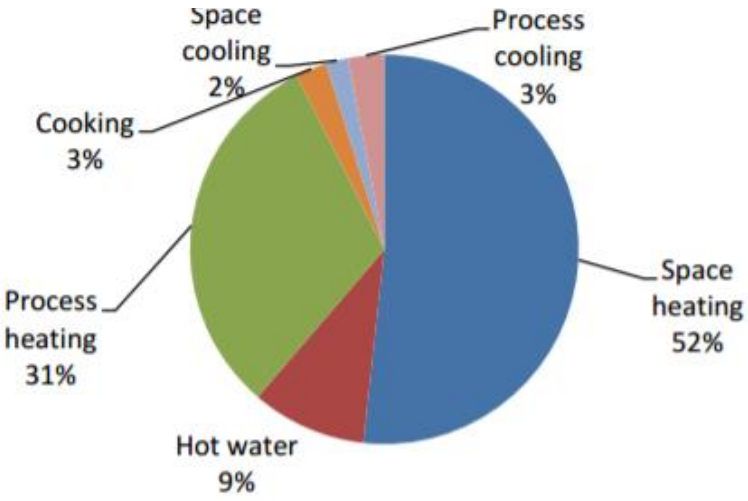
Source: European Commission, based on *Eurostat* calculation. 2014 data are model based estimates.

Pathway to RES Heating and Cooling

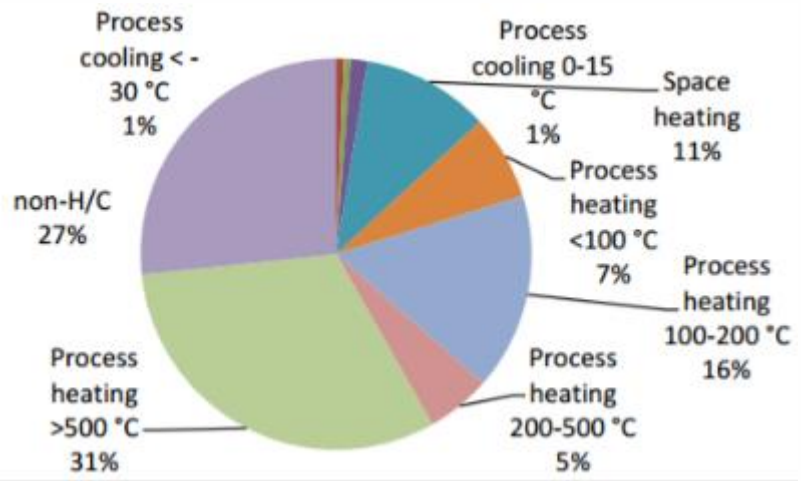


Pathway to RES Heating and Cooling

Heating and cooling end-uses in 2012 (Mtoe, %)

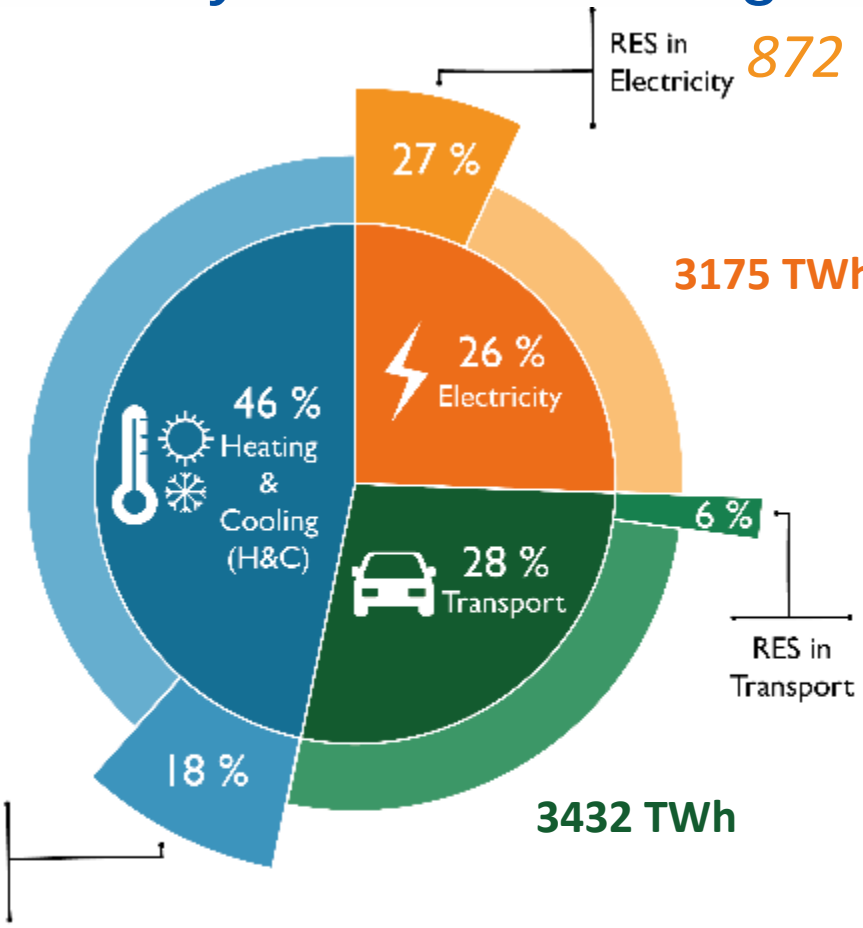


EU28 final energy consumption in industry per end-use (2012)



Source: European Commission, EUSHC

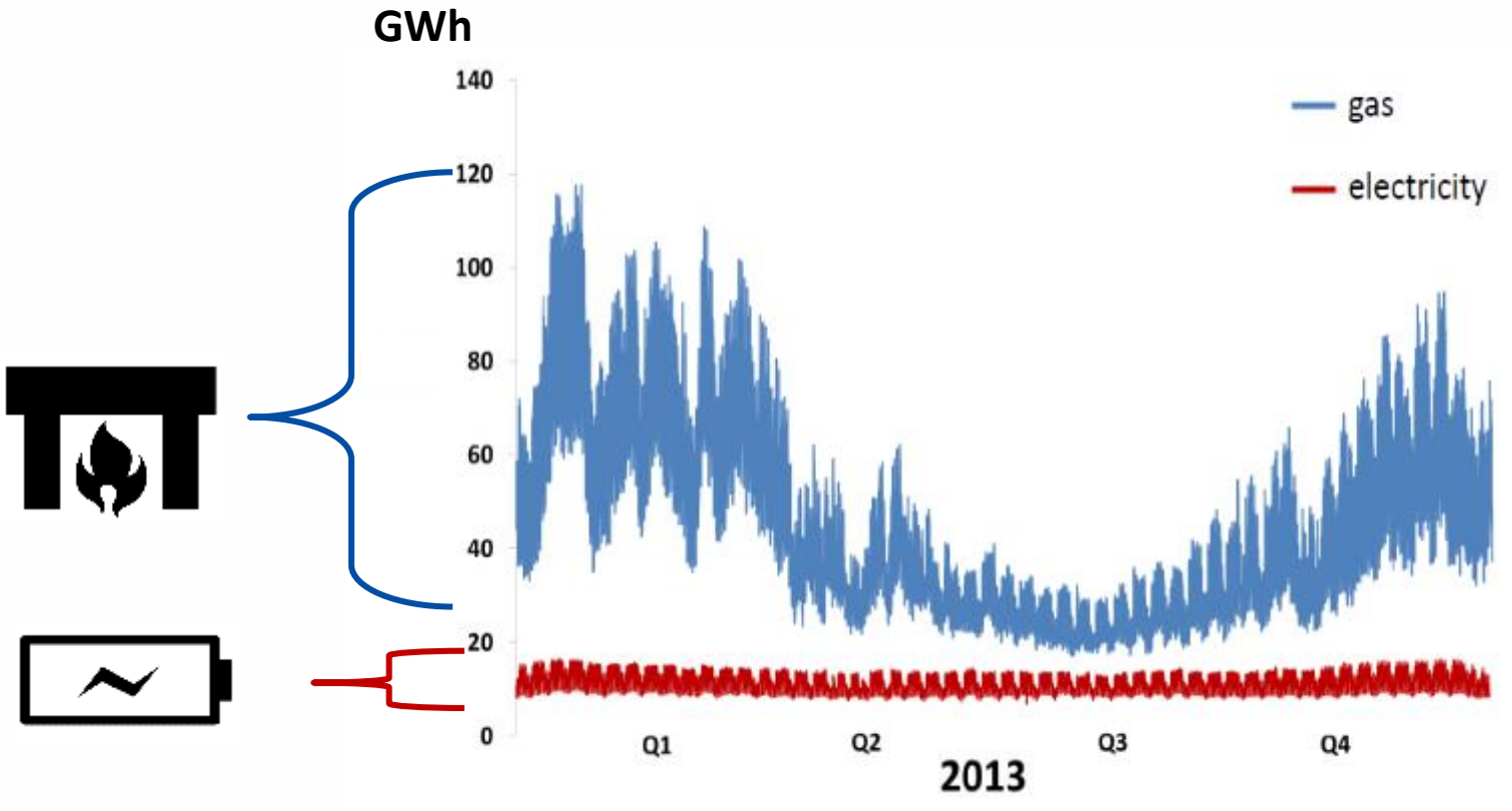
Pathway to RES Heating and Cooling



EU28 Sector's shares on total generation (inner ring) & RES shares for each sector (outer) for 2014

Source; Eurostat data for 2014 (SHARES)

Pathway to RES Heating and Cooling



Annual fluctuation of gas/electricity demand, The Netherlands, 2013. Source: GasNaturally.

Pathway to RES Heating and Cooling

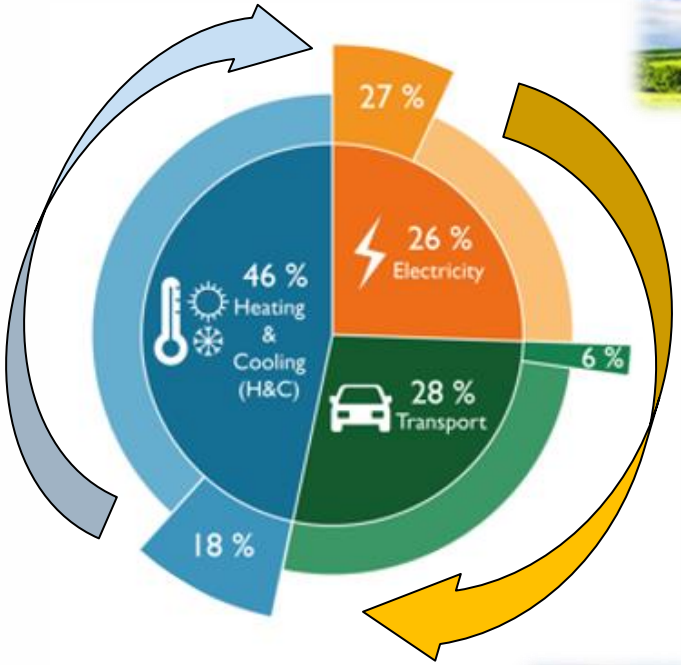


Figure: Buzzle

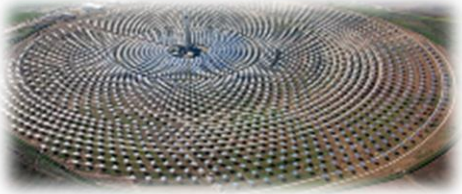


Figure: Wonderlist

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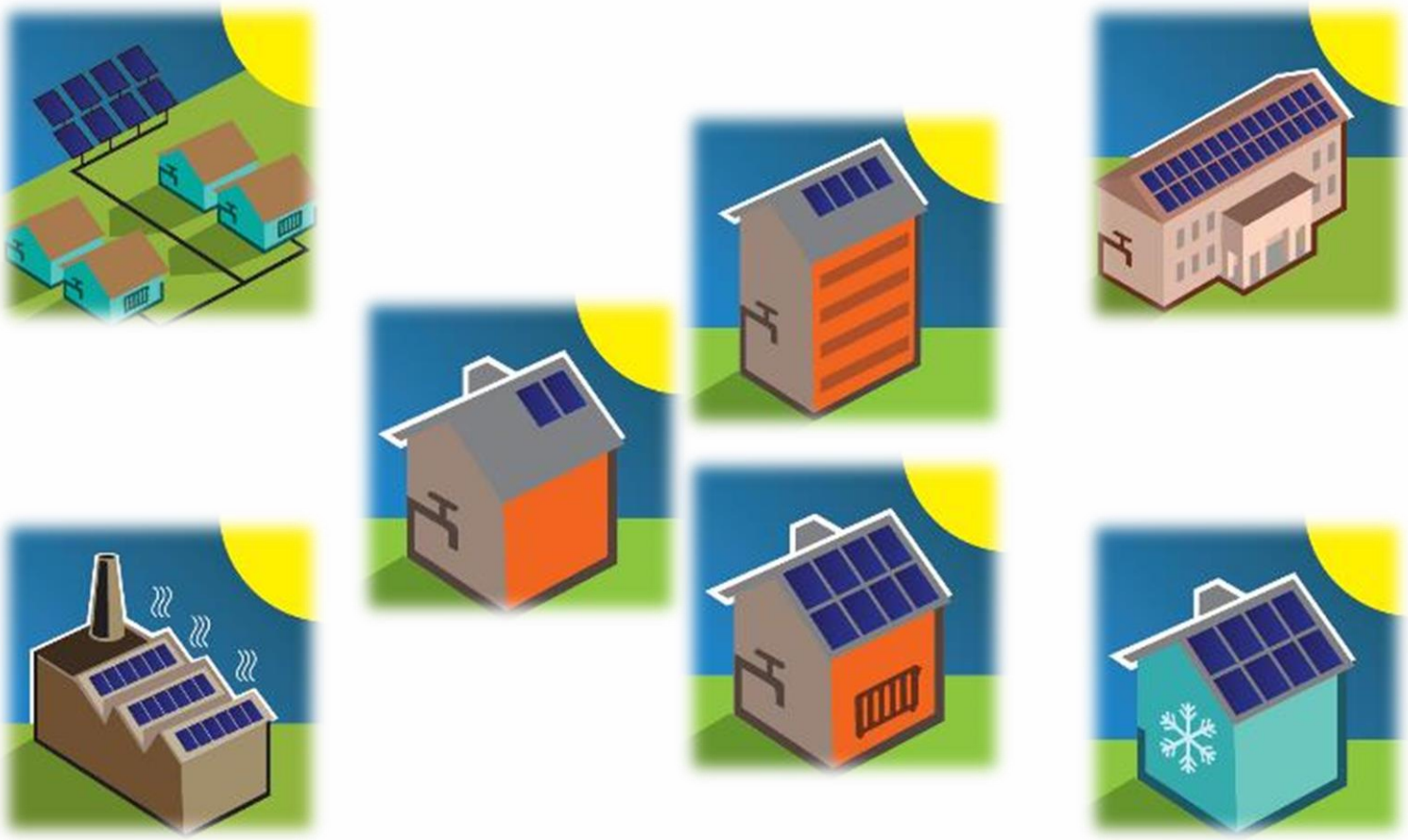
Solar thermal in the future energy mix



Solar thermal in the future energy mix

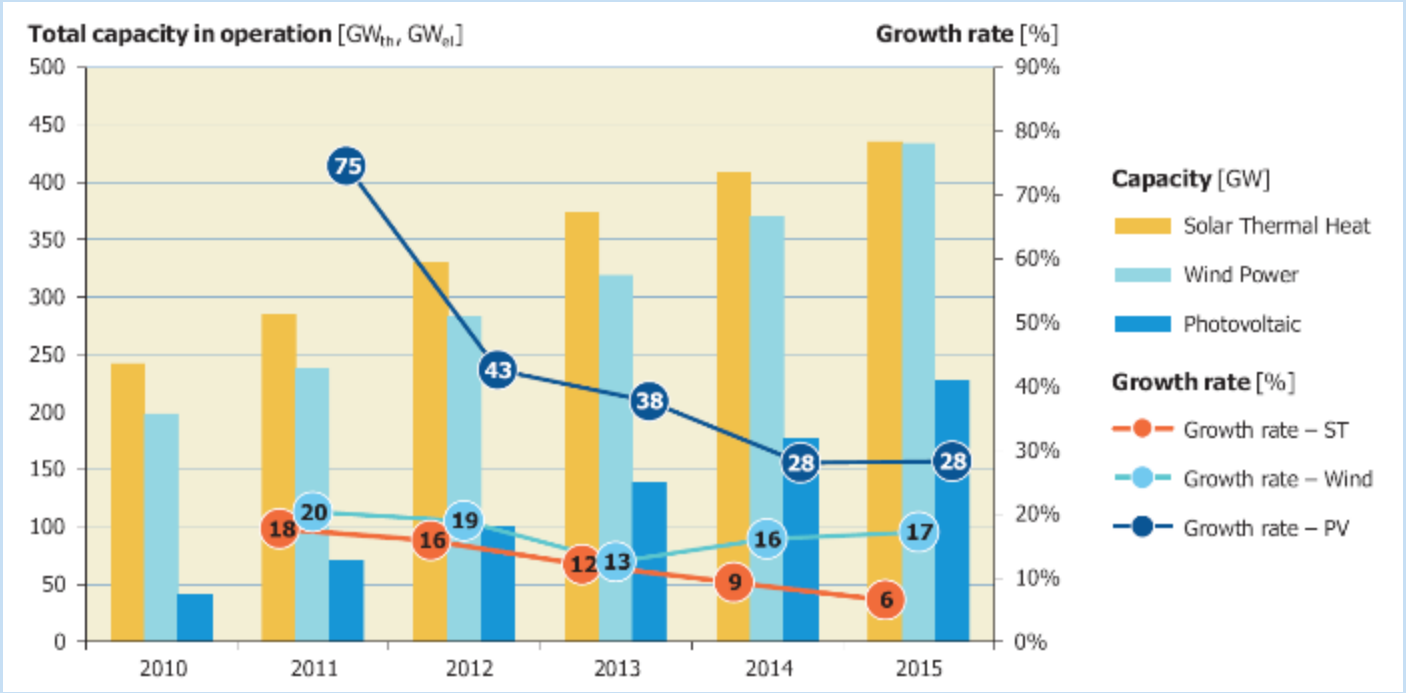
Solar thermal 8% of modern renewable heat output

Large-scale solar systems in district heating networks

Markets expanded for solar process heat in industry

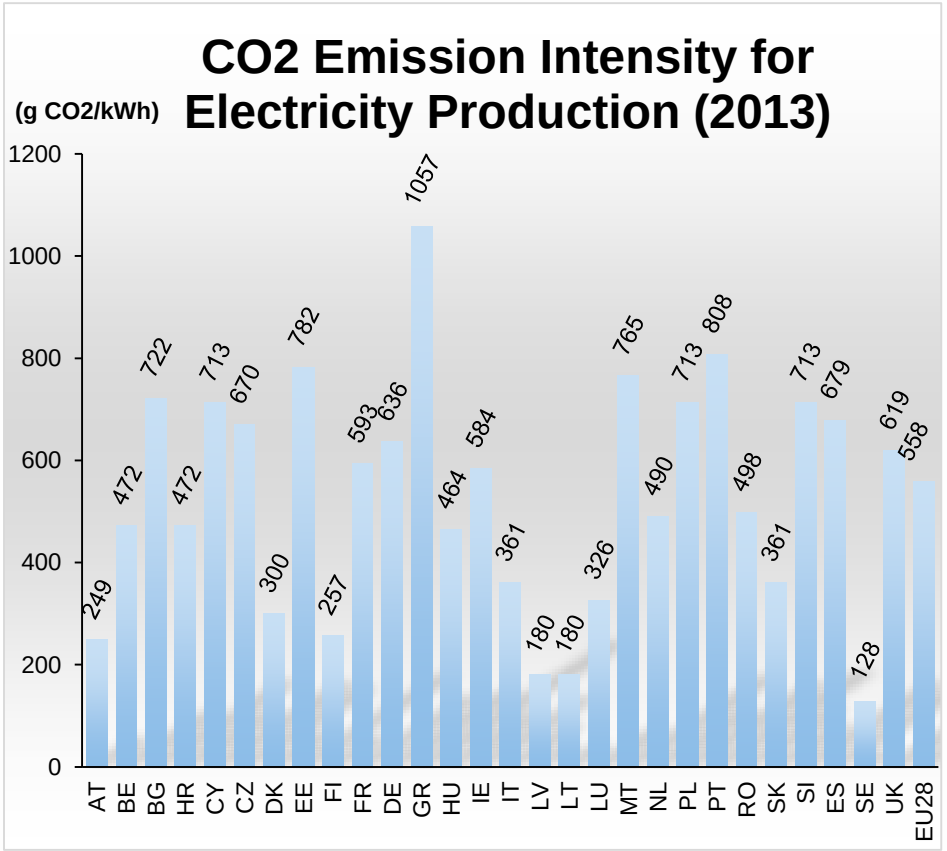
Leading modern renewable energy technology in terms of cumulated installed capacity, next to wind, behind hydro

435 GWth
(622 mio $m^{2)}$
of solar
thermal
installed
capacity



Solar thermal in the future energy mix

- Decarbonisation
  - Residual power
  - No emissions
  - Good life-cycle impact



Solar thermal in the future energy mix

- Decentralised
  - Good energy density
  - Low foot-print
  - Scalable

Figure: SOLID

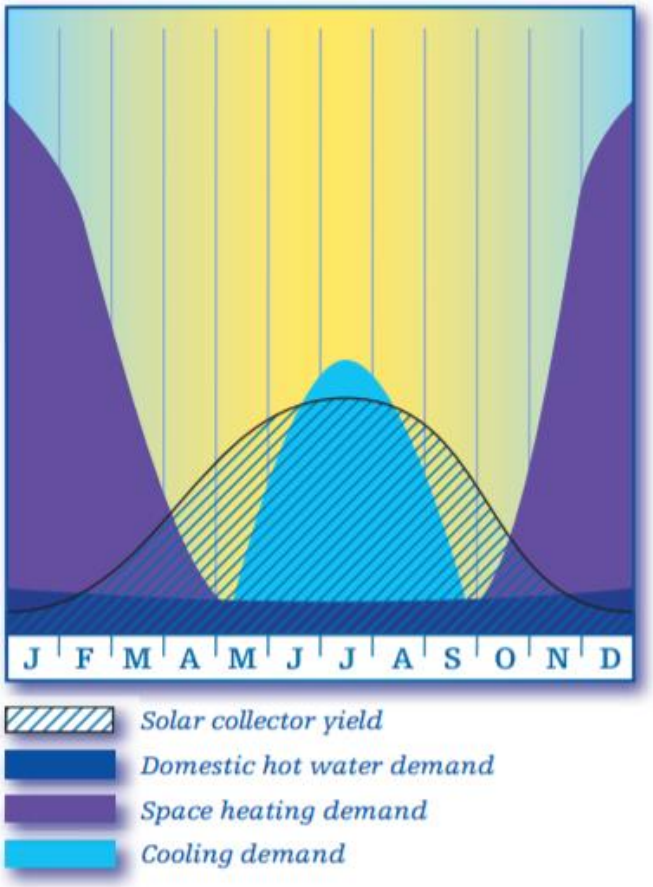
Solar thermal in the future energy mix

- Smartness
  - Improvements in:
    - Heat metering
    - Function & yield control
    - Plug-and-Flow
    - Interconnectivity

Figure: Resol

Solar thermal in the future energy mix

- Demand reduction
  - Positive for solar thermal
  - Lower variations in load
  - Water heating needs remain



Solar thermal in the future energy mix

- Building integration
  - Already existing for
    - New built
    - Large renovation
  - Pre-fabricated façades

Figures: AEE Intec

Solar thermal in the future energy mix

- Hybrid solutions
  - Already combined with other solutions
  - Improvements expected in:
    - heat storage
    - PVT

Figure: Rheem

Figure: Sonnenkraft

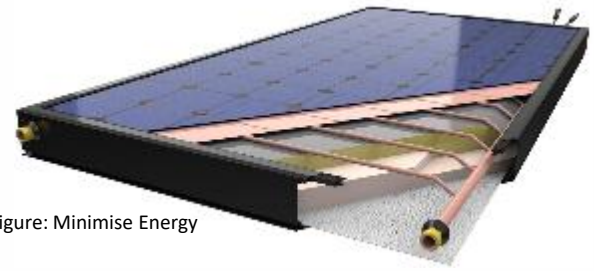
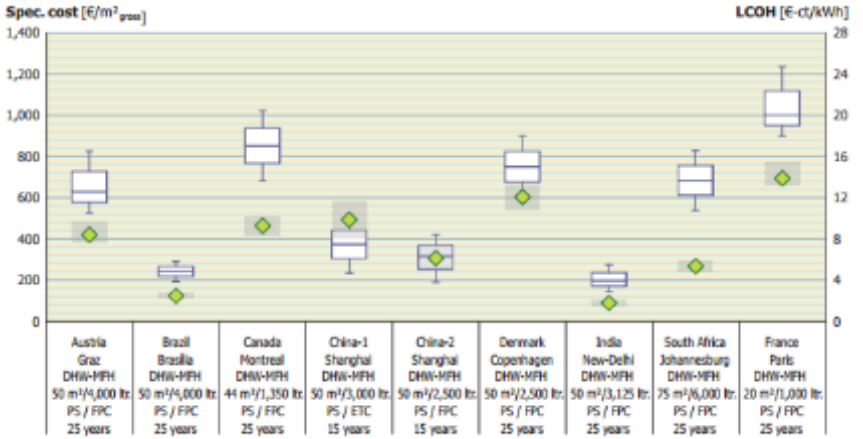
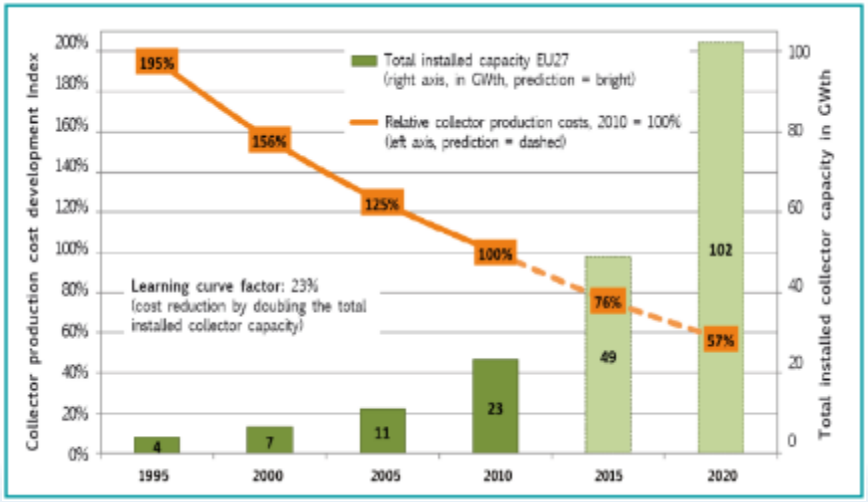


Figure: Minimise Energy

Solar thermal in the future energy mix

- Competitiveness
  - Several solutions with low LCoH
  - Part of best cost-optimal solutions (ex: Germany)
  - Learning curve factor of 23%
  - High local economic impact





Solar thermal in the future energy mix

- Decarbonisation
- Decentralisation
- Smartness
- Demand reduction
- Building integration
- Hybrid solutions
- Competitiveness

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