SOLAR DISTRICT HEATING

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DISTRICT HEATING IN EU

• Heating (and cooling) neglected! Too much focus on electricity?
• > 70% of EU citizens in urban areas!
• > 6000 district heating systems!
  .. covering 12-14% of our heat demands..
• Large potential to use more ..!
≈ 6 000 DH systems in Europe

≈ 100 systems use solar heat
DISTRICT HEATING

- Dense building area, town or village
- Heating plant + distribution system
- Hot water 100-70 °C is supplied, cold water 60-30 °C is returned, and heated to be supplied again
Block and District heating
(Nah- und Fernvärme)

60-30 °C

100-70 °C
Sample: City of Stockholm, Sweden
DISTRICT HEATING

- Flexible to use different and change heat sources
- Combined heat & power (CHP)
- Heat only boilers (HOB)
- Waste heat from industries
- Waste incineration
- Large heat pumps, etc.
- Solar heat !?
SOLAR DISTRICT HEATING

- (Large) solar collector array(s)
- Connected in the heating plant
- Or to the heat distribution system
- Combined with a storage to increase the use of solar heat
Why?
High tax on natural gas
High share wind power
~ 144 heating and 4 cooling plants > 1 MW\textsubscript{th} (> 1 400 m\textsuperscript{2} )
SOLAR DISTRICT HEAT

• Collector array + buffer storage
  0.1 - 0.2 m³ w.e. / m² collector array
  10 - 20% of annual DH load

• Collector array + seasonal storage
  1.0 – 3.0 m³ w.e. / m² collector array
  40 - 70 % of annual DH load

• Collector array feeds into large DH systems (like PV systems)
  No storage (heat distributed ..)
  Fraction of DH load
Central plants
New building area in Onsala - 1995

Sweden

Wood pellet boiler plant

36 residential units
New building area in Neckarsulm - 1997

Combined with seasonal storage

Germany
New DH system in Ellös - 2010

Wood chips boiler - 4 MW
1 000 (2 000) m² collectors
200 m³ water tank

Sweden
EKSTA – Daycare Vallda Backa - 1982

EKSTA – New res. area Vallda Heberg - 2012

Sweden

Wood pellet boiler plant
2013
Marstal District Heating
33 000 m\(^2\) – 23 MW\(_{\text{th}}\)

SE - Lyckebo 1983

75 000 m\(^3\) water pit storage

≈ 17 000 m\(^2\) – 1996-2003

≈ 15 000 m\(^2\) - 2013

Denmark
2015: Vojens 70 000 m²  2016: Silkeborg 150 000 m²

2014
Dronninglund District Heating
35 500 m² – 26 MW_{th}

60 000 m³ water pit storage

Denmark
Distributed plants
Distributed plant (Feed-in)

Distributed plant (Feed-in)

Solar collectors

Return 60-30 °C
2006
Graz district heating; 7 500 m² - 5.4 MW\text{th}

AEVG

Austria
SDH - SWOT

• **S:** Renewable heat ... everywhere ...
  (Fixed heat cost .. !)

• **W:** Low energy density (& utilization time)
  (Bio fuels 30-50 times the land area !!)

• **O:** RE district heat in villages and cities ....
  RE district cooling ...

• **T:** Lack of incentives, knowledge and interest
  (Policy, desision makers, utilities, etc.)
  Gas networks ... waste heat ...
Biofuels to heat/electr./fuels:
~ 40 - 1 MWh/ha.yr

Solar radiation to heat/electr.:
~ 2 000 - 500 MWh/ha.yr

Ulsted, DK
OPPORTUNITIES

• Mature and operational technology!
• EU and city planners can (should) consider DH and SDH..
• DH developers can (should) use solar heat as driver / complement..
• Solar collector developers can (should) increase their market by developing DH applications ..!
• Well adapted collector arrays
• Feasible costs due to scale
• Lack of policy – SDHp2m
• DH, space and storage are key factors
• Come and learn about the latest SDH developments!

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Graz - AT