



Renewable heating & cooling in the residential sector

Decarbonising the heating and cooling sector





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Figure 5. GHG emissions trajectory in a 1.5 °C scenario



How will EU become climate neutral by 2050?



Decarbonisation of heating – which way?

- DHC use of waste heat, solar, geothermal, heat pumps, biomass, etc.,
- Heat pump,
- Gas decarbonisation (biomethane, hydrogen + e-methane) or
- Biomass boilers



What if we use only heat pumps?

- Heat peak is up to 5-20 times higher than electric peak
- At low temperatures when peak occures, COP will be around 2
- So, 2.5-10 times!!!!!!! No way!
- We can solve it using heat storage, around 4 m3 per dwelling - not practical in urban areas



What if we use heat pumps in urban areas?



Diocletian palace from 3rd century – is this the right way to sustainable heating?

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Surplus heat in Europe







4th generation district heating

- Low temperature 60-70/40
- Low ratio heating/hot water continuity of heat load
- Heat storage (4 m³/customer)
- CHP follows electricity market
- Waste heat from various sources (power plants, waste to energy, industry)
- Heat from solar, biomass, geothermal, (bio)gas
- Electric heaters / heat pumps



Efficient DHC – Art. 24 recast EED

- Until 2025 at least 50% RES, 50% waste heat, 75% cogenerated heat
- From 2026 at least 50% RES, 50% waste heat, 80% of heat from high-efficiency cogeneration heat or at least combination of such thermal energy where RES is at least 5% and the total share of RES, waste heat or high-efficiency cogenerated heat is at least 50%
- From 2035 at least 50% RES and waste heat (where RES is at least 20%)
- From 2045 at least 75 % RES and waste heat (where RES is at least 40%)
- From 2050 only RES and waste heat (where RES is at least 60%)



Solar DHC in Vukovar





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Thermal energy storage





- Seasonal pit thermal storage
- Discounted to represent hourly cost of storing heat in PTES



Solar DHC





Peta, the Pan-European Thermal Atlas: renewable energy Disclaimer: The data provided on this website is indicative and for research purposes responsibility is taken for the accuracy of included figures or for using them for uninter



Geothermal energy

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Power-to-heat with heat pumps will help integrate wind and solar







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Conclusions

- Wind and solar are coming, but difficult to integrate
- Integration of power, heating, cooling, water and transport system necessary
- Smart energy systems cheap and simple
- District heating in urban, heat pumps in rural and suburban areas – renewables and renewable electricity
- Biomass used in cascade

