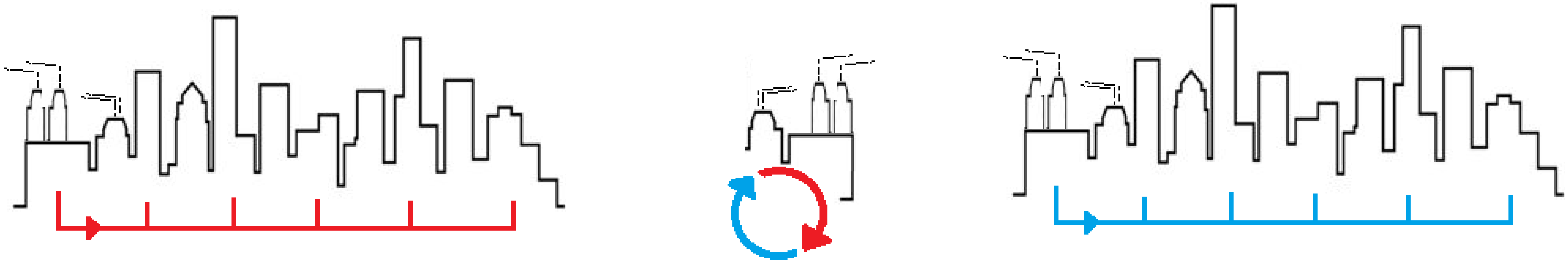
ENERGY EFFICIENCY INCREASE

in

DISTRICT HEATING AND DISTRICT COOLING, WASTE HEAT UTILISATION



Dr. Romanas Savickas

ENERGY EFFICIENCY IN DISTRICT HEATING AND COOLING, WASTE HEAT UTILISATION

- In 2023 district heating production was responsible for ~10% of the global final heating needs in buildings and industry.
- District heating provides great potential for efficient, cost-effective and flexible energy production, large-scale integration of low-emission energy sources.
- However, the decarbonisation potential of district heating is largely untapped, as fossil fuels still takes a noticeable part of district network supplies globally (~90% of total heat production, IEA 2023).
- Net Zero Emissions by 2050 (NZE) Scenario requires significantly stronger efforts to rapidly improve the energy efficiency of production, existing networks and switch them to renewable heat sources such as bioenergy, solar thermal, large-scale heat pumps and geothermal.
- Other priorities include integrating secondary heat sources such as waste heat from industry, data centres, metro tunnels, industry, electrolysers, nuclear power plants, etc., investing in heat storage capacities, enabling sector coupling, developing high-efficiency infrastructure in areas with dense heat demand.

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- District cooling systems consumes 35 percent to 20 percent less electricity as compared to traditional air-cooled air-conditioning systems and individual water-cooled air-conditioning systems using cooling towers respectively.
- District cooling offers numerous advantages to multiple buildings and urban areas:
- Energy efficiency. Centralizing the cooling generation allows for economies of scale and improved system optimization.
- Cost savings. Reduces cooling costs because of the centralization of equipment and operations, leading to lower maintenance and operational expenses. Reduces the need for costly individual building cooling systems.
- Scalability. DC systems are easily expandable, new buildings added.
- Environmental sustainability. Reduces greenhouse gas emissions, easily integrate renewable energy sources such as solar, wind, and geothermal energy eliminating the need for fossil fuels.
- Reliability. DC systems has higher reliability compared to individual cooling systems. In the face of extreme weather events or natural disasters, may provide more robust and resilient cooling solutions, minimizing service disruptions.

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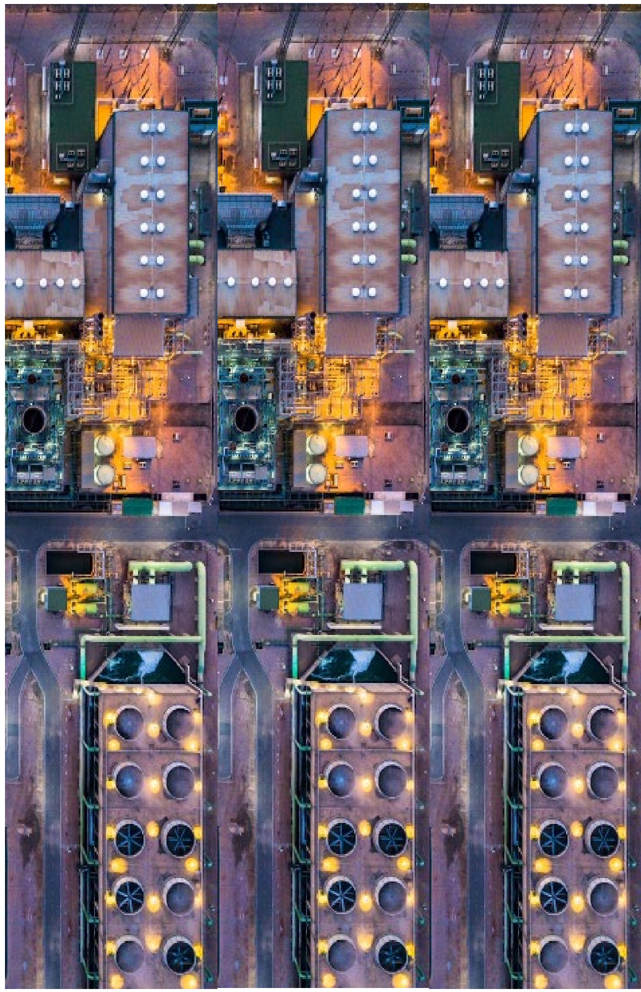
- Sector coupling due to a synergetic effect provides an opportunity to increase the overall energy system efficiency at much higher level and beyond the individual specific components efficiencies.

- For example the synergy between the buildings energy efficiency and district heating / cooling systems allows to reduce energy demand in buildings and integrate innovative low temperature district heating systems based on renewable energy production.

- The waste heat integration from industries as steel processing plants allows to utilise waste heat potential which otherwise would be lost and to reduces the demand on fossil fuels.



WASTE HEAT AND COLD UTILISATION

- A drastic transformation of the current energy model based on oil and coal should be implemented and gaseous fuels as biomethane as the purified version of biogas produced from the breakdown of organic matter is seen as one of renewable gases of the future available to decarbonise the energy system. Other gaseous fuels such as green hydrogen also plays important role in the future energy system with projected 14% share from the 2050 energy profile. These fuels provides smaller carbon footprint and it emits fewer air pollutants than other fossil fuels.
- The transportation and storage of these fuels mainly is done in the cryogenic liquid form, which allows to transport fuel instead of pipelines buy other means as shipping. These cryogenic energy sources are an attractive cold thermal energy sources because of its very low temperature. At receiving terminals these fuel sources are heated up to ambient temperature (regasified) and supplied to final consumers.
- The cold thermal energy released throughout this process is usually wasted in most regasification terminals worldwide, although it can be recovered and used as a byproduct for numerous industrial applications.

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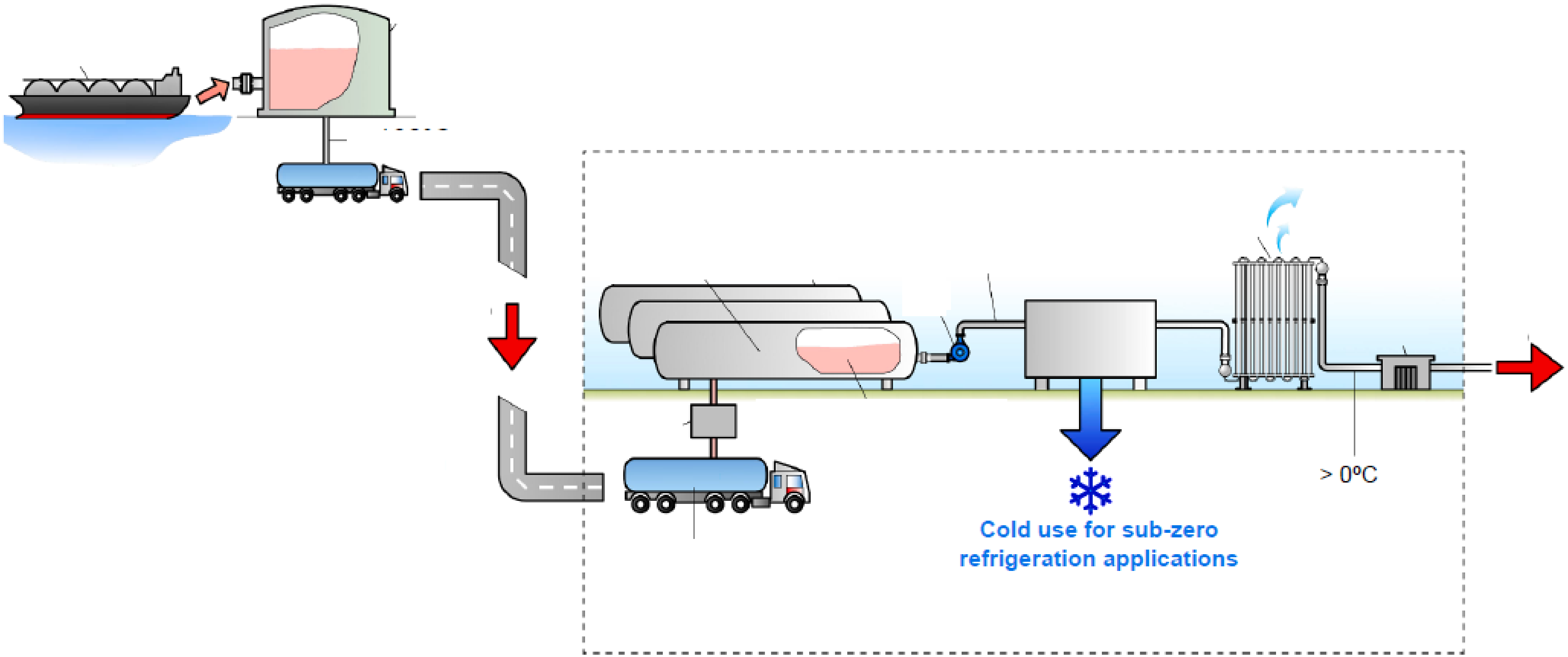

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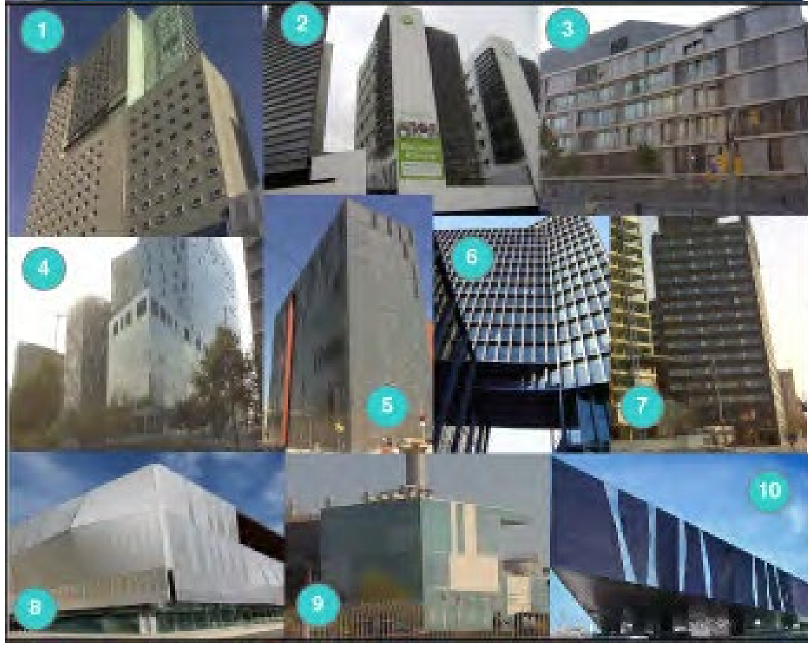
- One of the private district heating and cooling energy systems utility companies launches the deployment of a residual cold recovery solution in Barcelona, which will allow the generation of 131 GWh of local, affordable and environmentally-friendly energy per year.
- This solution allows us to avoid the emissions linked to energy production that would have been necessary in the absence of recovered energy. This represents over 42,000 tonnes of CO2 avoided per year for the Barcelona project.
- Project allows to recover the energy emitted during the conventional regasification process at minus 160°C in order to deliver it to the network in the form of gas at a temperature of around -2°C / 0°C.
- Utilising energy from the residual cold, it will be recycled and reinjected into the urban district cooling grid, connecting public infrastructures (Palacio de Congresos) and the Mercabarna, a major food market for the region, all located in the port area.



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THANK YOU

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