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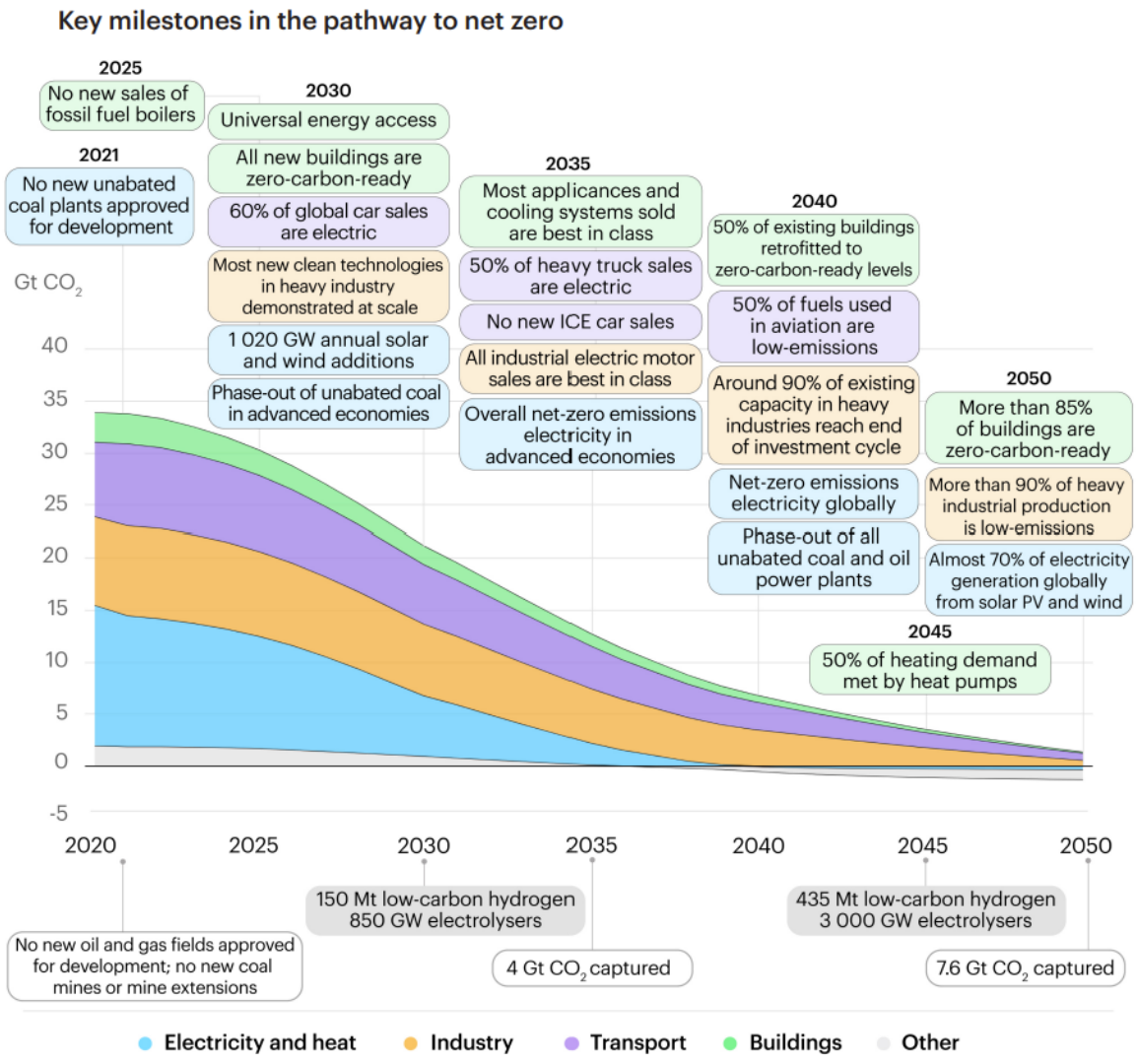
Driving the change for the FUTURE of HVAC & Pumping machines

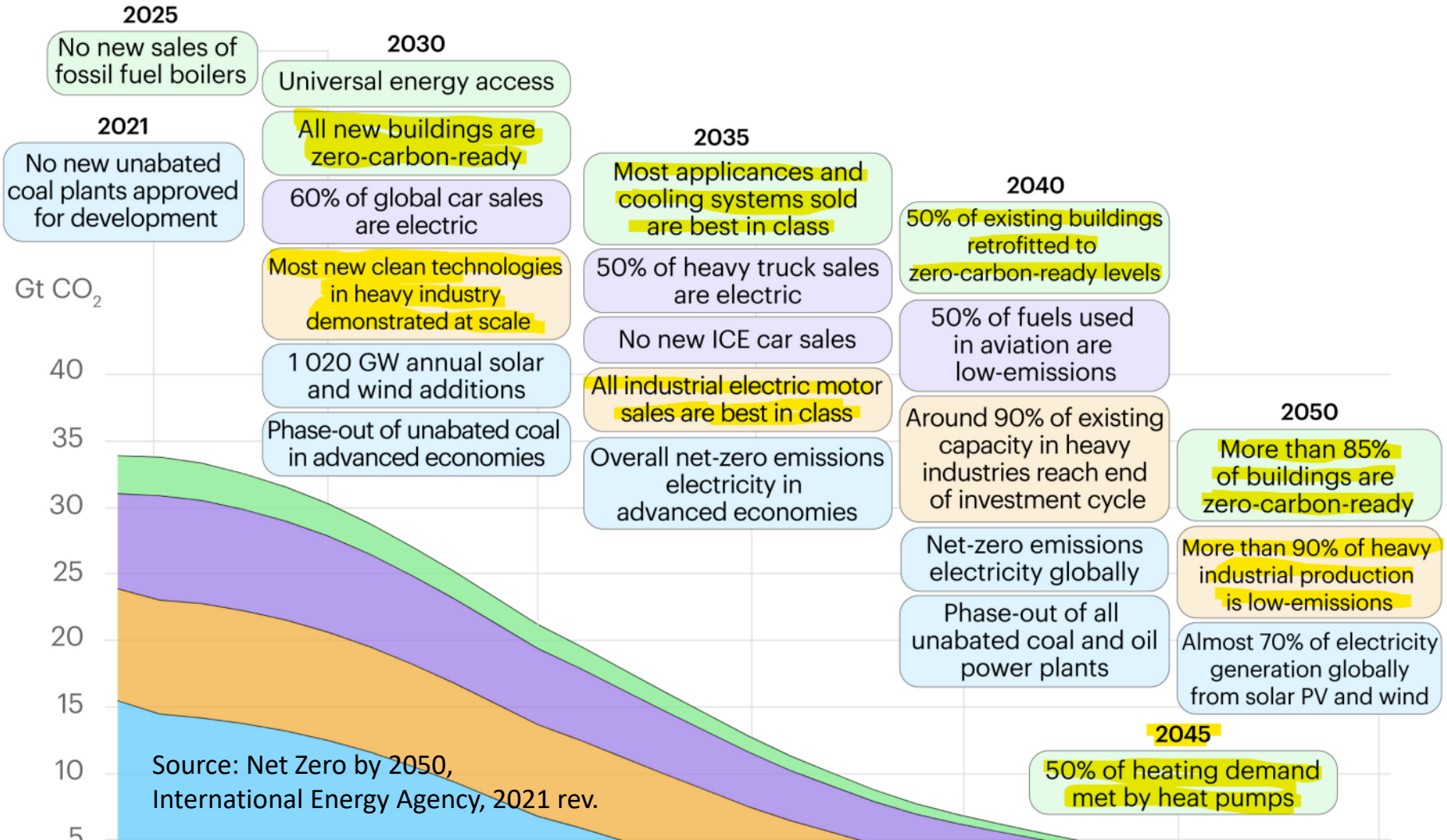
HVAC & Technology regulations: focus on heat pumps

Alexander Cohr Pachai
Consultant

Energy Efficiency – Why is it important?

Source: Net Zero by 2050, International Energy Agency, 2021 rev.





Source: Net Zero by 2050,
International Energy Agency, 2021 rev.

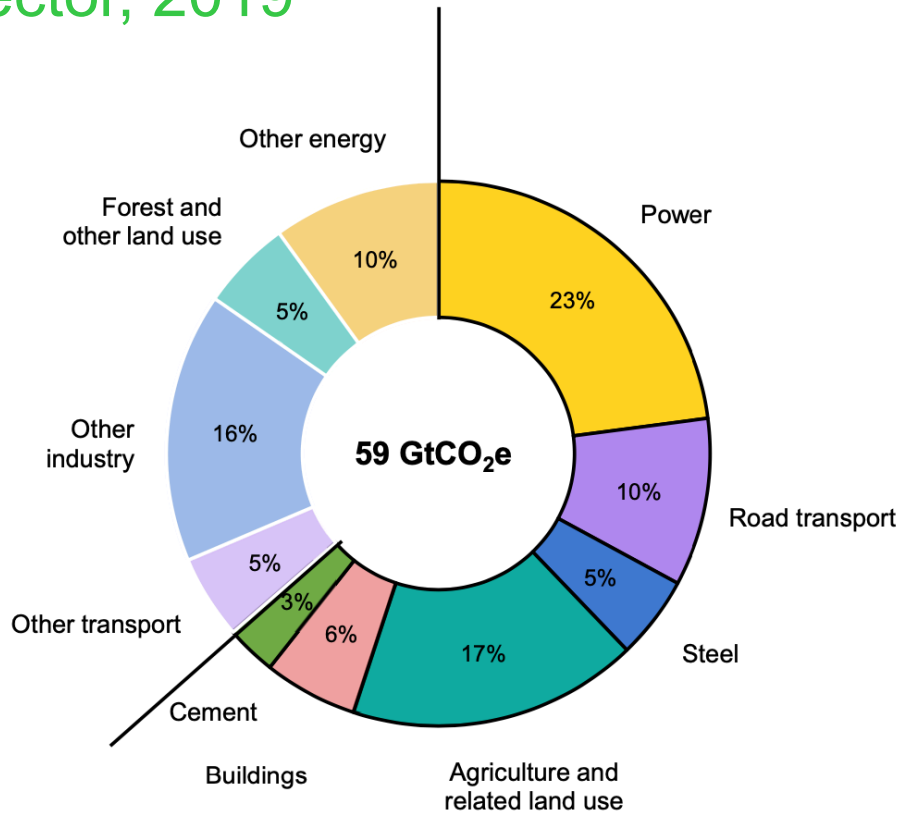
The first lines of latest report

Breakthrough Agenda Report 2023

- Over the past year, we have seen an acceleration in the global low-carbon transition, with progress often happening faster than most realise. This includes **record deployment of solar PV, electric cars and heat pumps**, which are all important solutions as Countries transition to net zero emissions.
- However, it is also clear that **the transition is still not going fast enough** – and is occurring at very different speeds across regions and sectors. For example, the record deployment of renewables and the **incredibly rapid growth in sales of electric vehicles that took place in 2022, were both heavily concentrated in China, Europe and the United States. Stronger international collaboration is urgently needed** to accelerate the pace of a just transition, **ensuring that clean technologies and sustainable solutions are accessible to all.**

Greenhouse gas emissions by sector, 2019

- Many sectors will be affected and in different ways
- Power production, Transport, Agriculture in general and industry are main contributors
- CO2 is just one of several emissions causing the problem



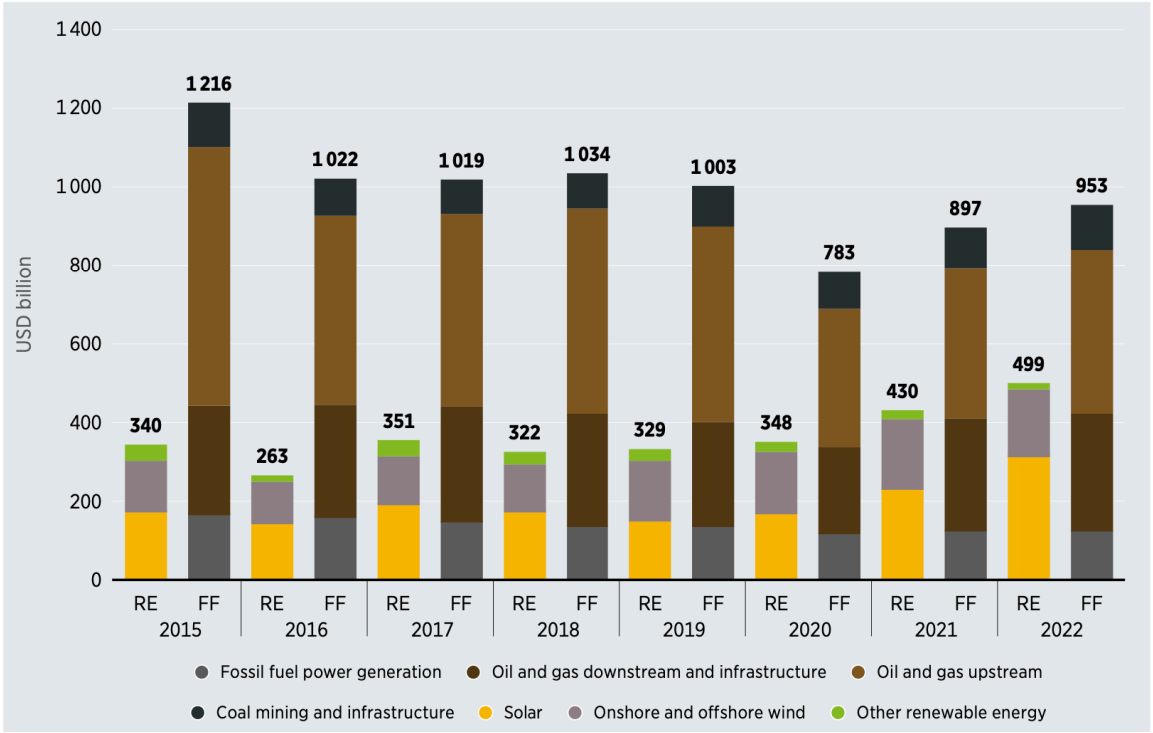
es: Emissions are broken down by direct emissions in each sector. Only energy-related emissions from cement are ıd. Emissions from hydrogen production cut across several sectors. GHGs = CO_2, CH_4, F-gases, HFCs, PFCs, S ıs.

: PCC (2022), Climate Change 2022: Mitigation of Climate Change.

The Clear Message from IEA

- Priority action: Drive a historic surge in **clean energy investment**
- Policies need to be designed to send **market signals** that unlock new **business models and mobilise private spending**, especially in emerging economies
- An unparalleled **clean energy investment** boom lifts global economic growth
- New **energy security concerns emerge** and old ones remain
- The energy transition requires **substantial quantities of critical minerals**, and their supply emerges as a significant **growth area**
- The rapid **electrification** of **all sectors** makes electricity even more central to energy security around the world than it is today

Annual investment in renewable energy vs. fossil fuels, 2015-2022



Note: FF = fossil fuel; RE = renewable energy.
Based on: CPI (2022a) and IEA (2022b).

Citation: IRENA and CPI (2023), *Global landscape of renewable energy finance, 2023*, International Renewable Energy Agency, Abu Dhabi. ISBN: 978-92-9260-523-0

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The Clear Message from IEA

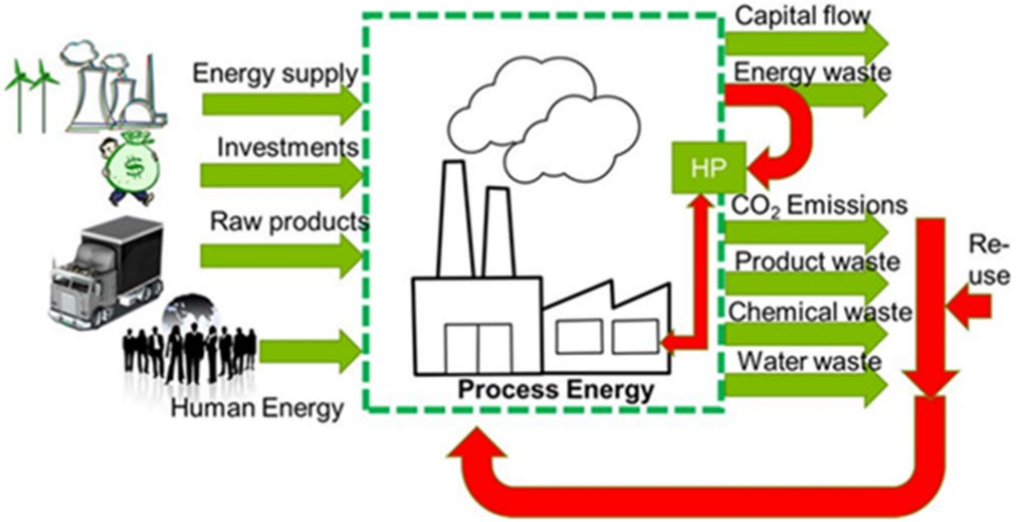
- Electricity accounts for **around 40% of heat demand by 2030** and about **65% by 2050**
- For low- (<100 °C) and some medium- (100-400 °C) temperature heat, **electrification includes an important role for heat pumps**
- In the NZE, around **500 MW of heat pumps** need to be installed **every mon th over the next 30 years**
- **Not all regions are moving equally fast**, and many come from a low activity level and growing

What does it all mean for HVAC&R industry?

- **Decarbonisation** is very high in demand
- We see more and more big companies **requesting PFAS free technology** and that includes sealing materials
- We see a race for getting heat pumps ready for large **District Heating systems in the multi-MW size**
- In Industrial process industry, where 75% of the used energy is for heating, a race is also ongoing for **reaching 160 °C** or even higher
- **Steam producing heat pumps** are also on the bucket list
- Everything is evaluated on the **Energy Efficiency** and **climate impact**

Integration and optimisation

- The cheapest energy is the energy we don’t use
- The essential message is Integration and intelligent optimisation of the whole Building Management system
- **Reuse of low value heat**
- Recycling is good for environment and for business



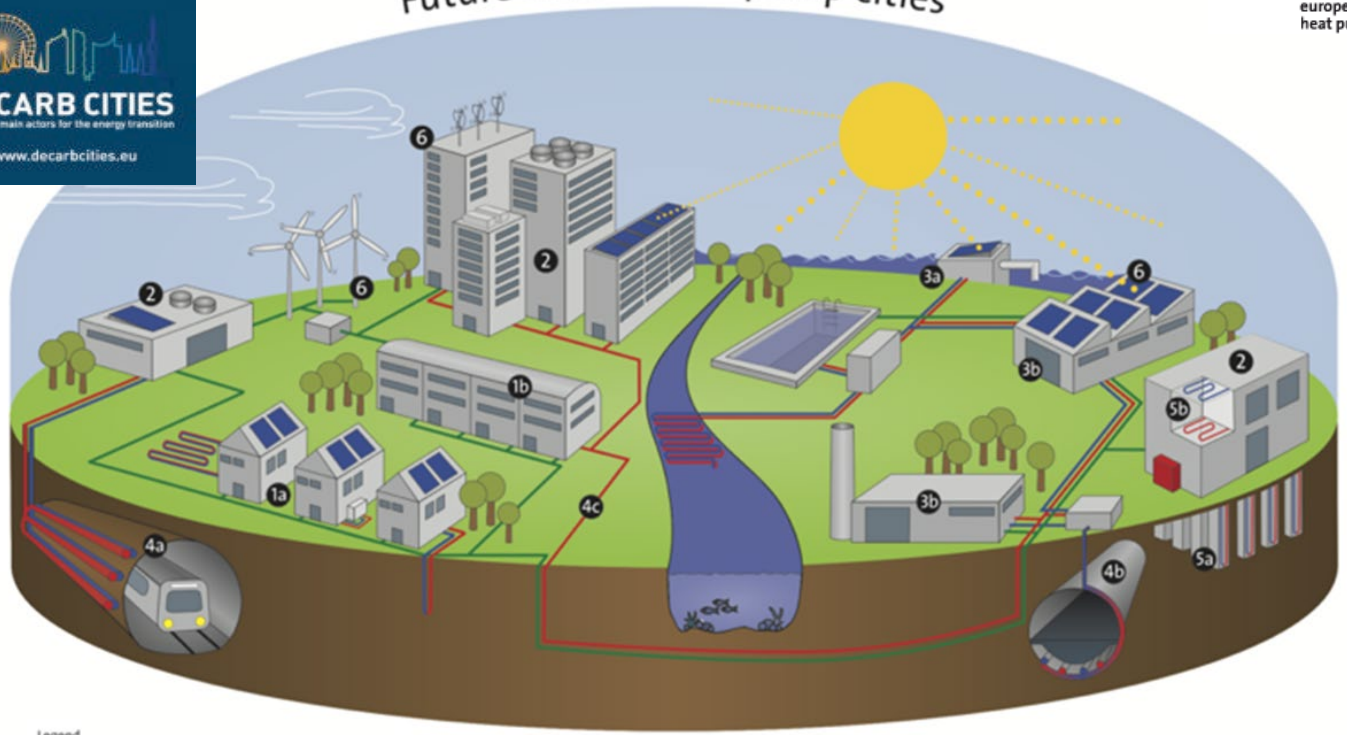
Trends for more efficient HVAC systems

- For large buildings and multifamily houses, the use of building management systems will be essential
- Solar energy systems and buffer tanks can accumulate energy sufficient for a week
- Larger compressors tend to have a higher efficiency
- Chillers and heat pumps can supply both heating and cooling simultaneously becoming very efficient
- $COP_{cooling} = X$; $COP_{heating} = X+1$; $COP_{system} = COP_c+COP_h$
- This only apply to one stage systems

DECARB CITIES
Cities as main actors for the energy transition
www.decarbcities.eu

ehpa
european
heat pump association

Future cities = heat pump cities



Legend

1 Heat pumps in residential buildings
1a Heat pumps in single-family houses
1b Heat pumps in multi-family houses
2 Heat pumps in office and commercial buildings

3 Industrial use of heat pumps
3a Source for district heating
3b Process energy

4 Heat pump use in and for infrastructure
4a Subways/Tunnels
4b Sewage systems
4c Energy grid (district heating or "cold source")

5 The building structure as heat exchanger
5a Heat piles
5b Activated concrete
6 Heat pumps as storage for green electricity

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An example of integration of heat pump

- In a fish processing plant the parts of the waste heat from chillers and freezers is used by a heat pump to produce hot water
- Savings on water and chemicals in the cooling tower
- Energy savings on water heating
- Short return on investment

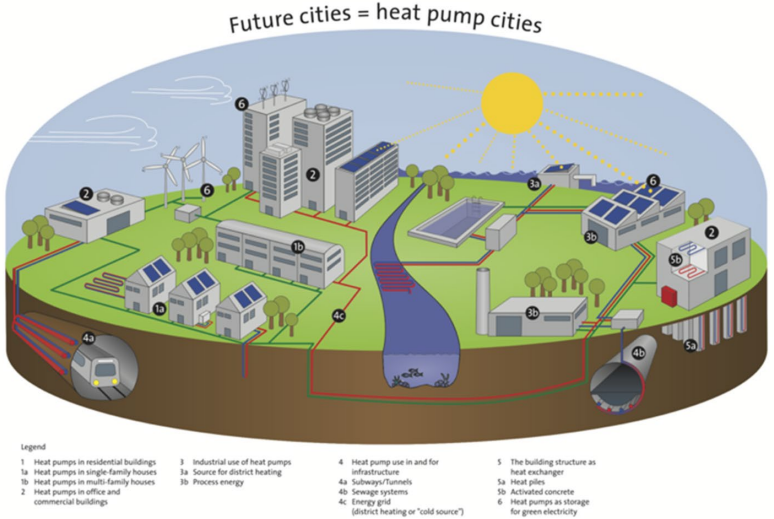
Water	6,716.16	€/year
Chemicals	1,210.40	€/year
inspection	0.00	€/year
Saving on tower	**7,926.56**	**€/year**
Net Energy savings	33,115.28	€/year
Total savings	**41,041.84**	**€/year**
Aprox price	80,000	€
ROI	1.95	**Year**

Source: Pachai, A.C.: Applying a heat pump to an industrial cascade system, Zagreb Interclima 2013

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Where big HVAC players are going

- Focus on building and production automation
- Decarbonisation, energy optimisation and waste reduction
- Connect devices and use them in the most optimal way together
- HVAC systems connect to the net and used for balancing the grid or taking advantage of the low net tariffs



Source: EHPA

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Trends for pumps and pumps systems

- Variable speed depending on the signals from BM system
- Prepared for different secondary working fluids
- Self-diagnosing also for present of air



Trends for ventilation systems

- Ventilation and air treatment for especially sensitive residential homes and sensitive areas (medical or hospitals similar sensitive areas)
- Air filtration to avoid contamination by virus, e.g., corona or harmful pollutants in operation theatres
- Semiconductor clean rooms, to avoid dust or dangerous gases
- Access control to some spaces including special machine rooms
- Safety systems including detectors for smoke and gases and associated ventilation requirements

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Conclusion

- The world is rapidly changing and the focus in many countries is about the Global Warming, bio-diversity and energy efficiency
- We see a strong push to get out of natural gas and other fossil fuels
- We also see the circular economy getting momentum
- Pollution from human activities are under strong scrutiny, e.g., phosphor from agriculture, chemicals or break down products of same in water and air pollution – all affecting the everyday of humans
- The changes mean much more work for everybody – not less


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Thank you!