

First  
**100% CO<sub>2</sub> ice rink**  
in Europe

**ATMOsphere Europe 2015**

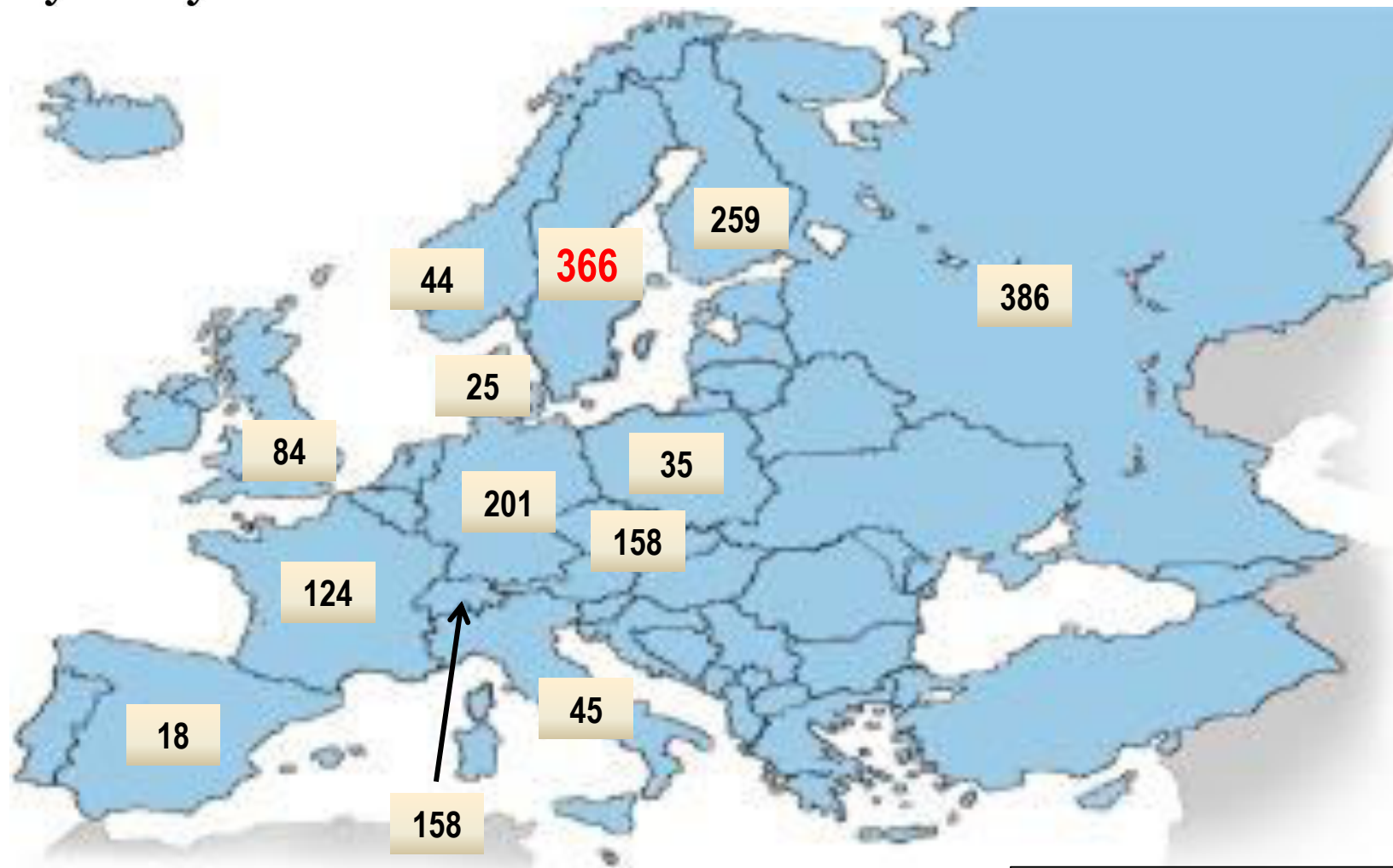
**16MAR15**

**Jörgen Rogstam**  
Energi & Kylanalyt

# Gimo ice rink - 2013



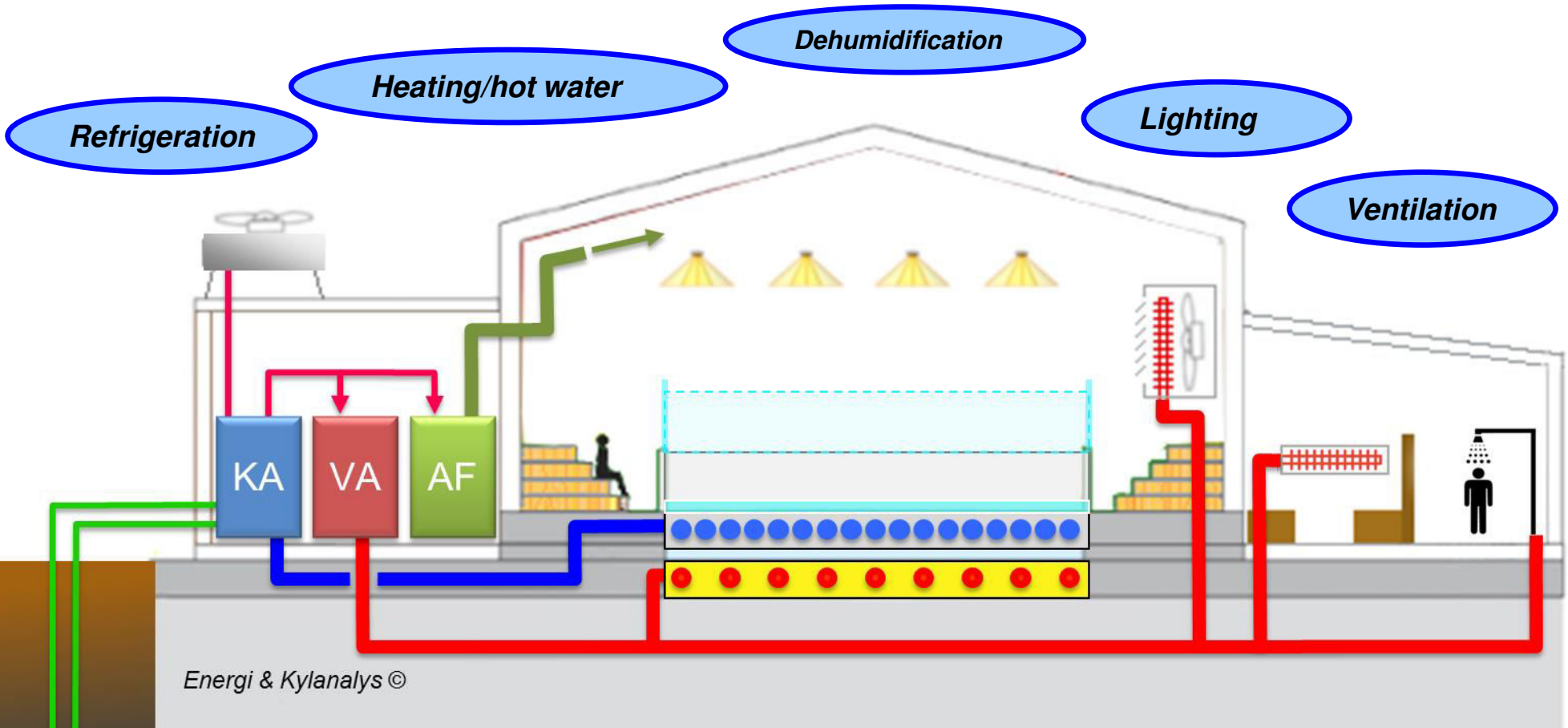
# Ice rinks in Europe



|                |             |
|----------------|-------------|
| <b>Canada:</b> | <b>2631</b> |
| <b>USA:</b>    | <b>1898</b> |

Source: IIHF 2014 & SIF 2015

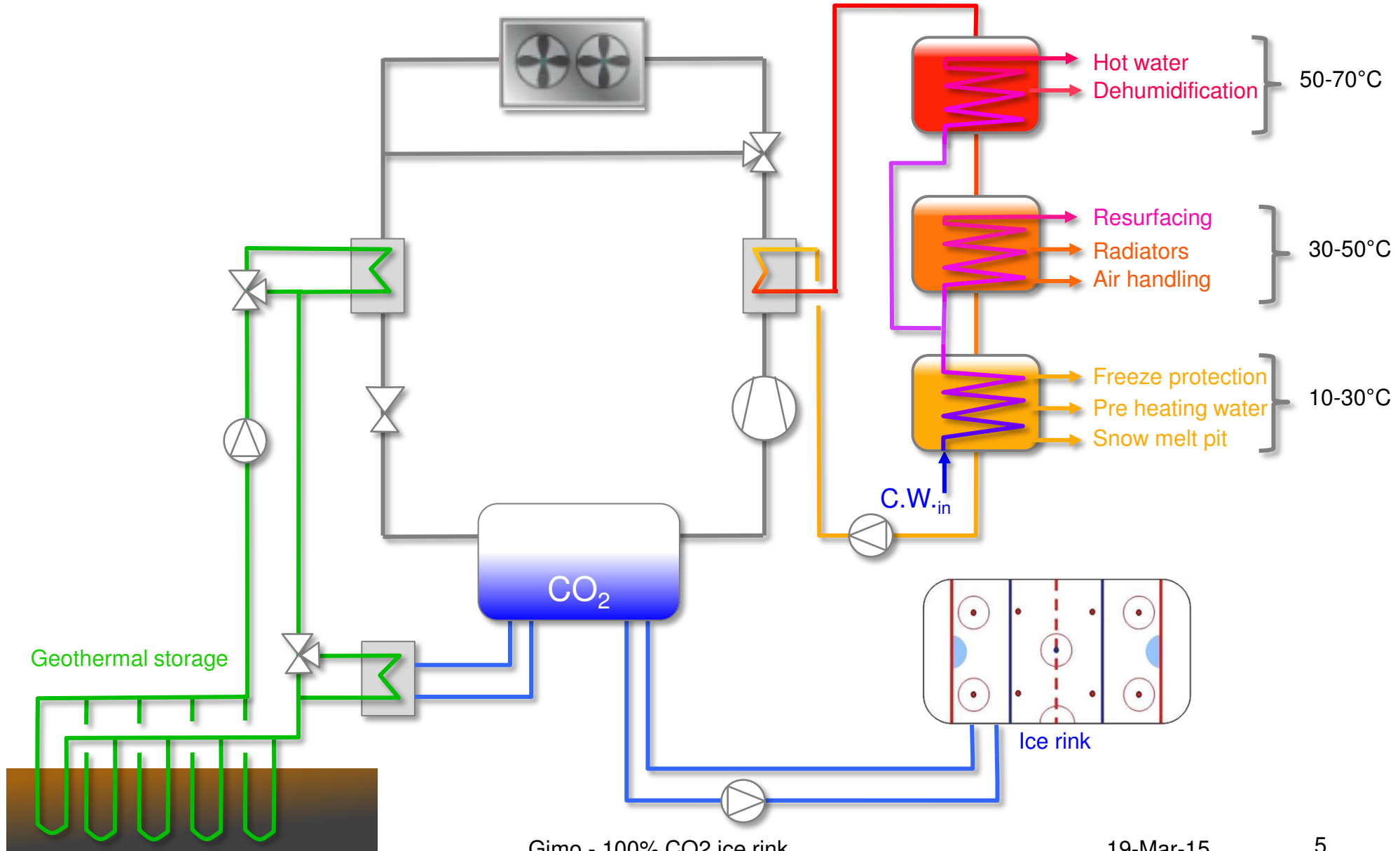
# Gimo ice rink CO<sub>2</sub> – energy systems



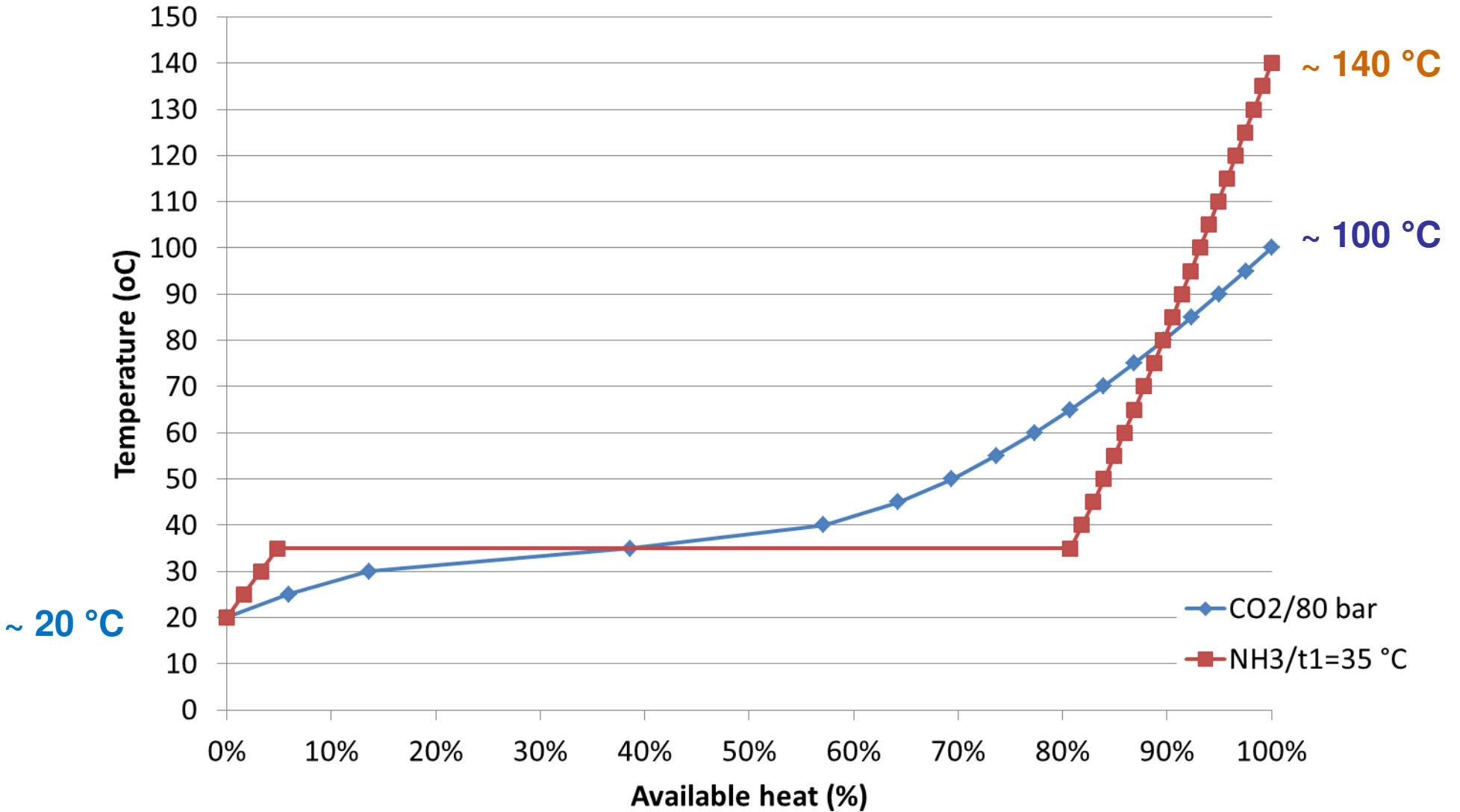
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- CO<sub>2</sub> direct refrigeration system
- 100% heat recovery (no other heating system/source)
- Geothermal storage (enabling heat pump function)

# Gimo CO<sub>2</sub> – energy system



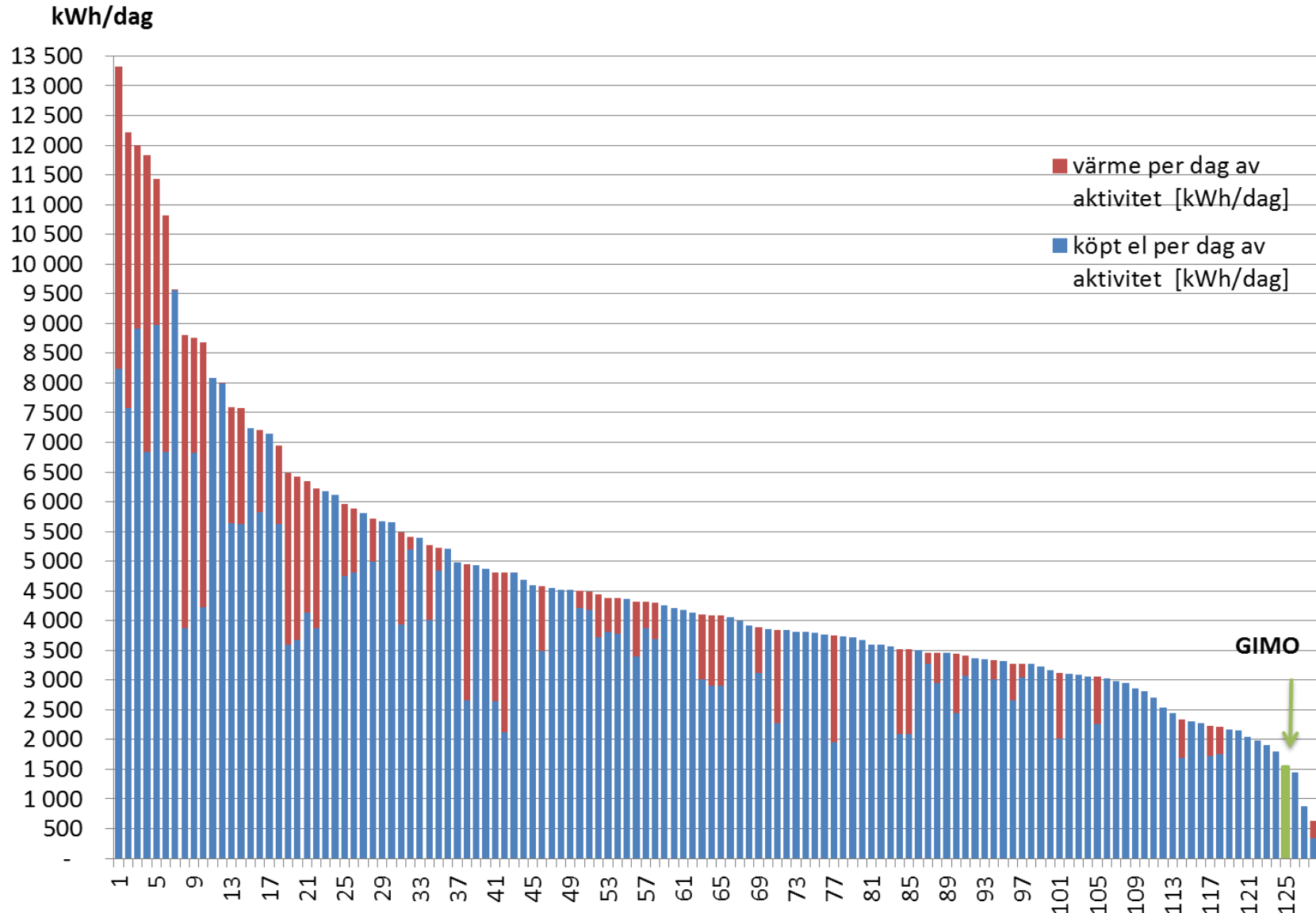
# Heat recovery CO<sub>2</sub> vs ammonia



## Energy saving forecast

- Energy usage Gimo ice rink for the years 2010 – 2012:
  - Season 950 000 kWh
  - Energy/day 4 200 kWh/day
- Energy usage "New Gimo ice rink" 2014
  - Energy/day 1 550 kWh/day
  - Forecast 350 000 kWh/season
- Forecasted energy saving: appr. - 600 000 kWh/year (-60%)

# Energy usage per day – 130 ice rinks





# Why CO<sub>2</sub> systems in ice rinks?

- Energy efficient
  - No heat exchanger losses
  - Less parasitic losses
- Excellent heat recovery
  - More energy on a higher temperature level
- Common technology
  - Availability of spare parts
  - Availability of service companies and staff
- Lower life cycle cost
  - Lower investment and operating cost
  - Lower service and maintenance

***Thank you for the attention!***



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## Gimo ice rink features:

- 100% CO<sub>2</sub> system
  - CO<sub>2</sub> DX in the rink floor
- Full heat recovery
  - No external heat required
- Heat pump function
  - Off season heating function
- Geothermal storage
  - Subcooling – in warm periods
  - Heat source – in cold periods
- Dehumidifier with preheating (recovered heat)
- LED lighting system

## Gimo CO<sub>2</sub> – refrigeration system

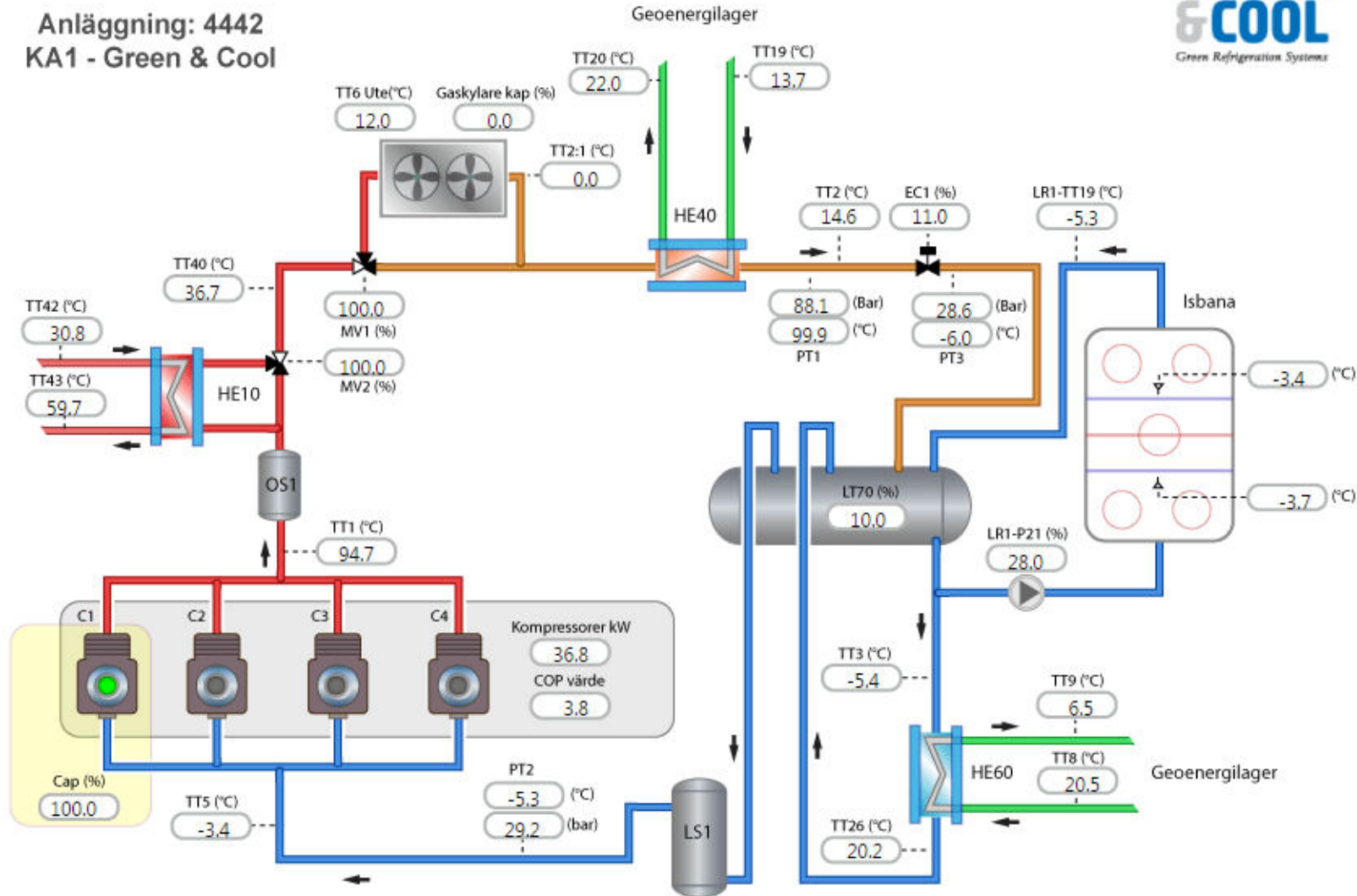


- CO2 refrigeration system - 250 kW cooling capacity
- CO2 pump module - distributing CO2 to the rink floor
- Tube system in rink floor – copper tubes (Ishol – 1/2")

# CO2-system - overview

GIMO ISHALL

Anläggning: 4442  
KA1 - Green & Cool



# Heat/recovery system

GIMO ISHALL

Anläggning: 4442  
VÅV VP1

| Energi kWh              | Effekt kW |
|-------------------------|-----------|
| 25900                   | 107.6     |
| Framled °C              | Retur °C  |
| 59.8                    | 31.1      |
| Flöde m <sup>3</sup> /h |           |
| 3.29                    |           |

Heat recovery →

