

# **Different System Solutions for Supermarkets**

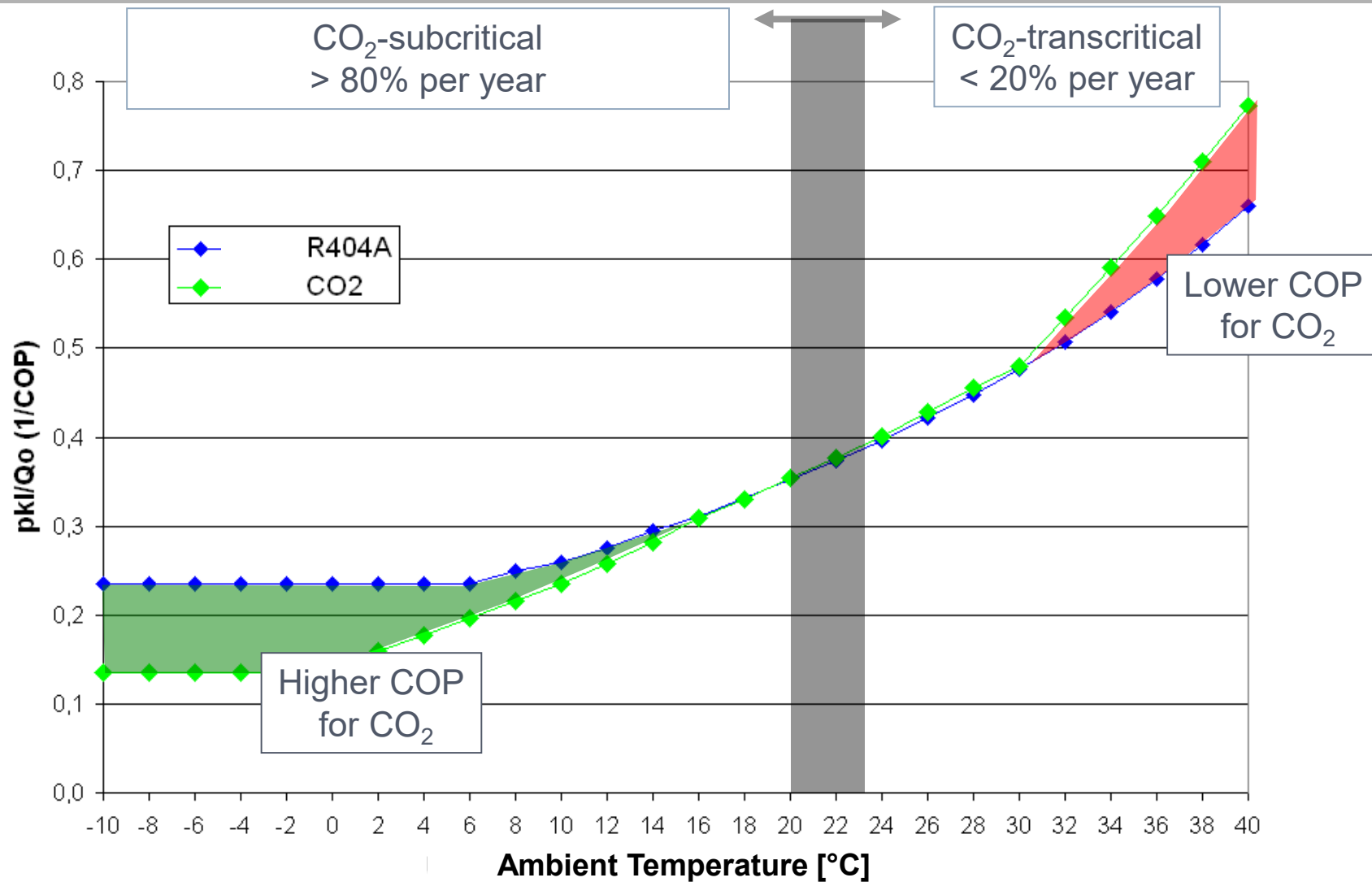
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**CH-Schaffhausen, 27./ 28.6.19**

# Different System Solutions for Supermarkets

- Energy Efficiency
  - The CO<sub>2</sub> - Equator
- Efficiency Technologies CO<sub>2</sub> Remote Systems
  - Semi-Flood
  - Parallel Compression
  - Ejector Gas/ Liquid
  - Availability of Efficiency Technologies CO<sub>2</sub>
- Plug-In R290
- Semi-Plug-In R290
- R290 Liquid Chiller
- Summary

# ENERGY EFFICIENCY – BERLIN CLIMATE



# THE CO<sub>2</sub>-EQUATOR

Equivalent efficiency level for CO<sub>2</sub>-Equator at 15°C annual average temperature.

North of the CO<sub>2</sub>-Equator standard CO<sub>2</sub>-booster-systems have significant efficiency gains versus conventional F-gas systems.

**Target:**  
Shifting or complete elimination of the “CO<sub>2</sub>-Equator” in Europe!

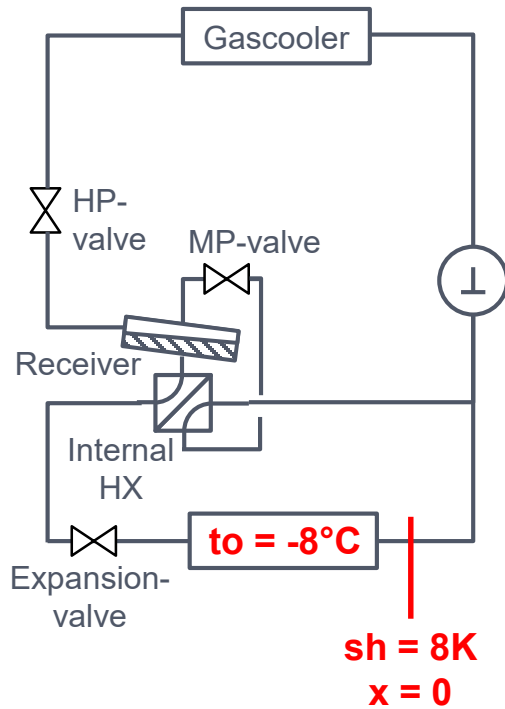


## Available Efficiency Technologies for CO<sub>2</sub> Remote Systems

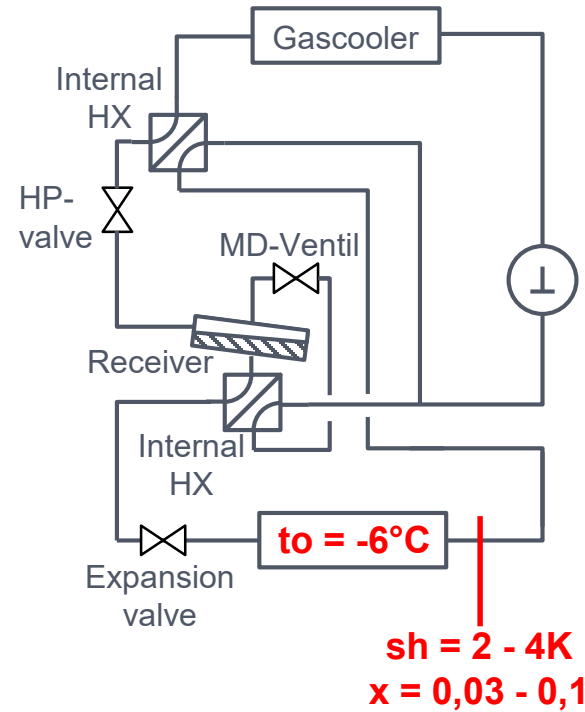
# EFFICIENCY TECHNOLOGIES CO<sub>2</sub>

## “Semi-Flood”

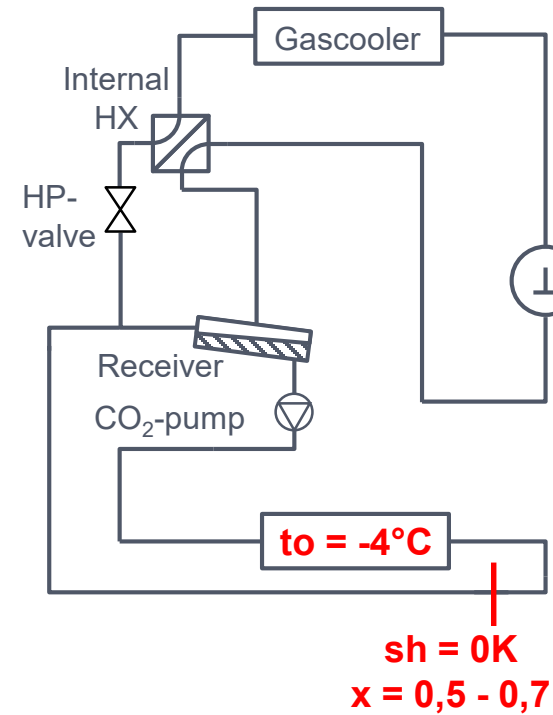
Standard DX  
CO<sub>2</sub>-concept



“Semi-Flood” with  
internal HX



Flooded  
CO<sub>2</sub>-concept

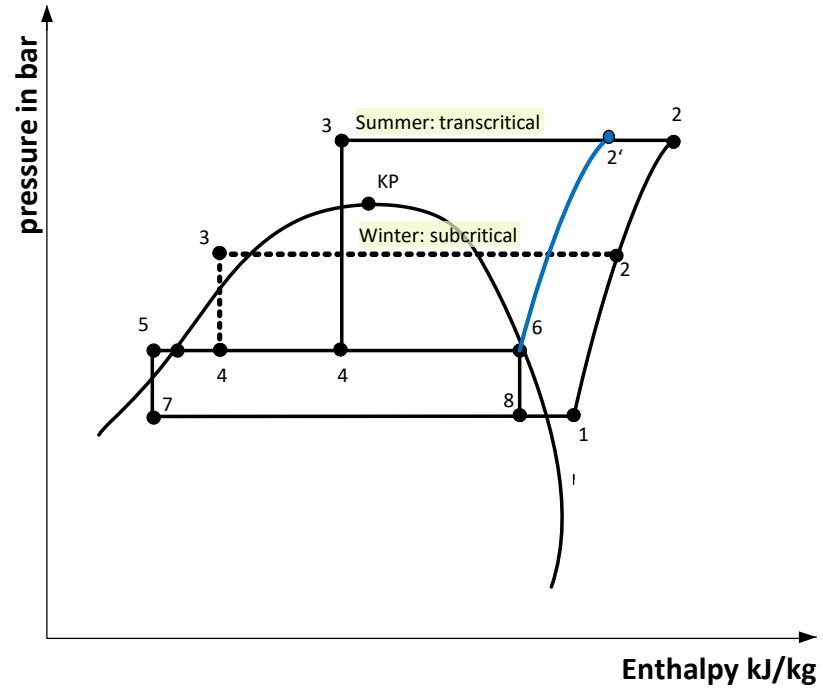
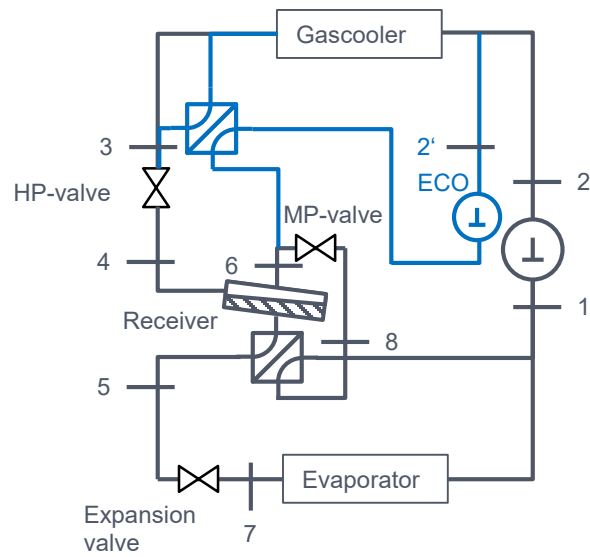


sh = superheat

x = liquid portion

# EFFICIENCY TECHNOLOGIES CO<sub>2</sub>

## Parallel compression

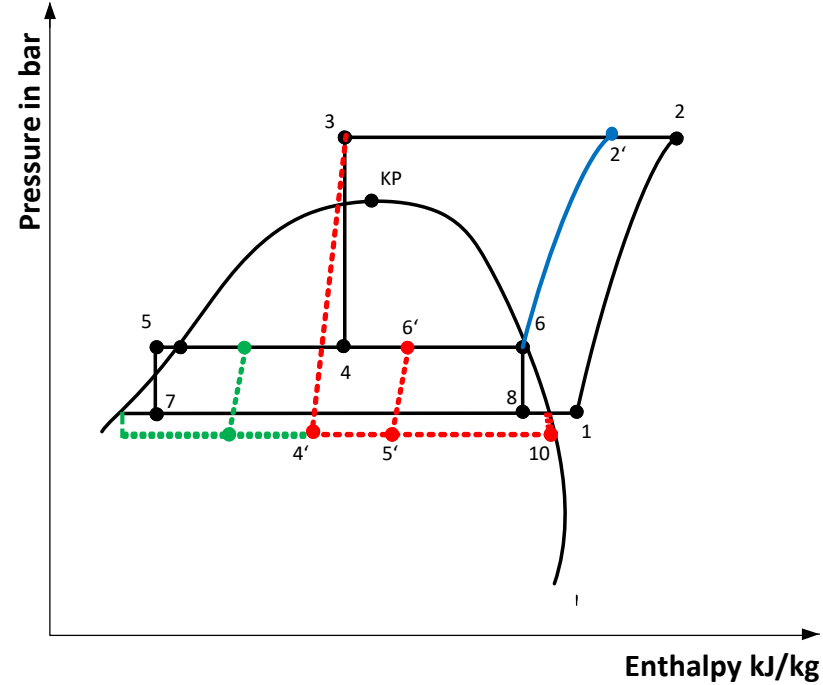
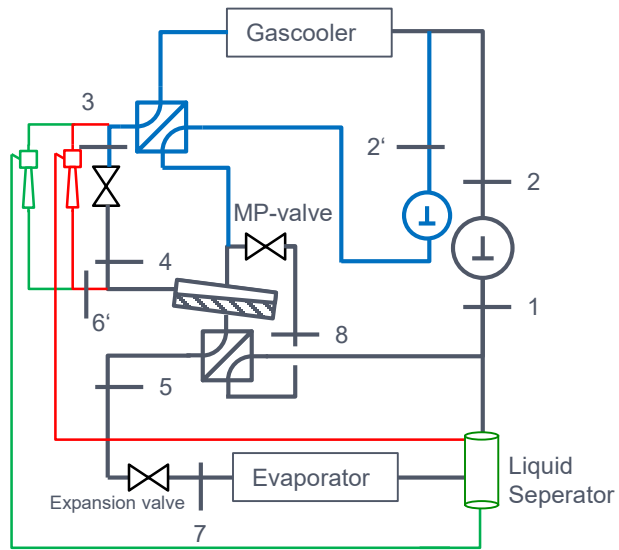


Standard process CO<sub>2</sub>-transcritical

ECO compressor (parallel compression)

# EFFICIENCY TECHNOLOGIES CO<sub>2</sub>

## Parallel compression combined with liquid and gas ejector



Standard process CO<sub>2</sub>-transcritical

ECO compressor (Parallel compression)

Gas-ejector (low suction portion / high pressure lift)

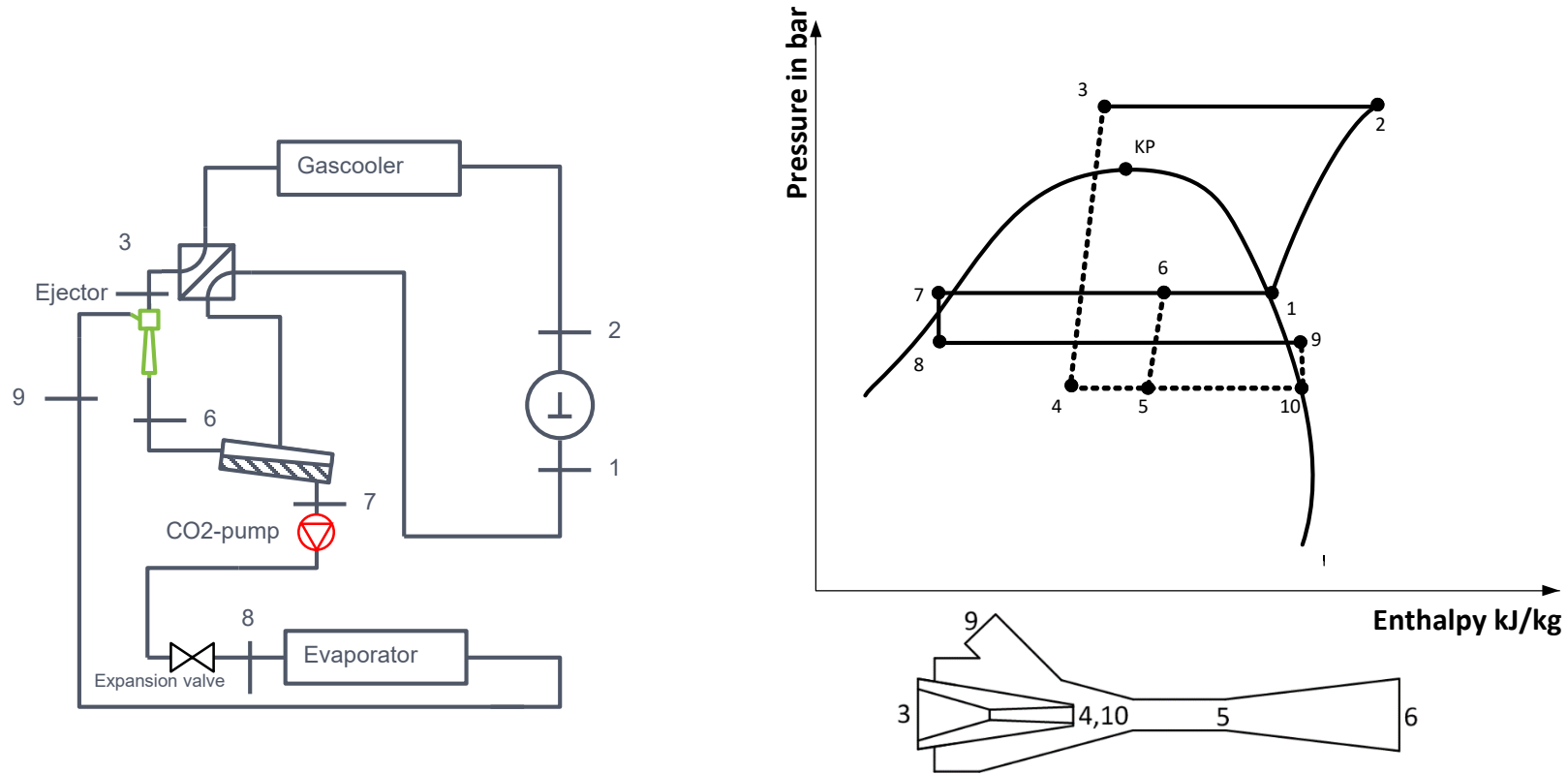
Liquid-ejector enables Semi-Flood





# EFFICIENCY TECHNOLOGIES CO<sub>2</sub>

## Modulating ejector & CO<sub>2</sub> pump

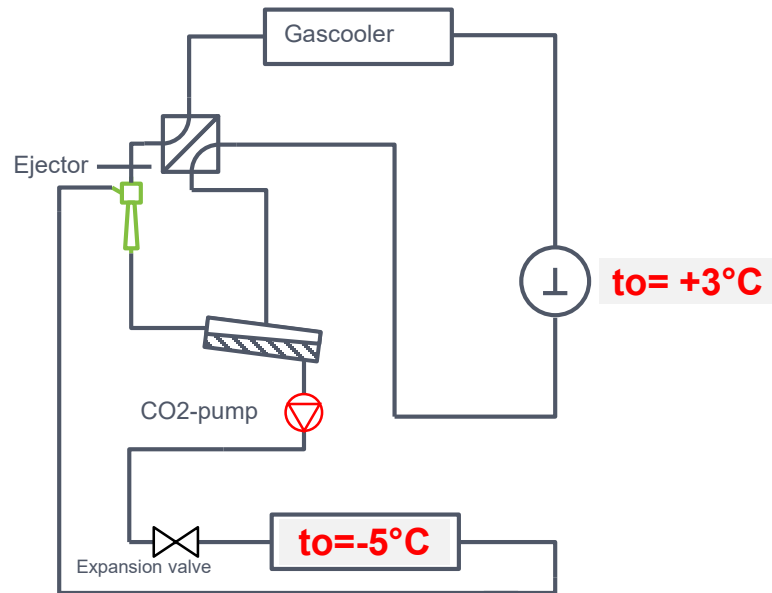


Gas-/ Liquid-ejector (high suction portion / low pressure lift), enables Semi-Flood CO<sub>2</sub>-pump (assists pressure lift, if needed)

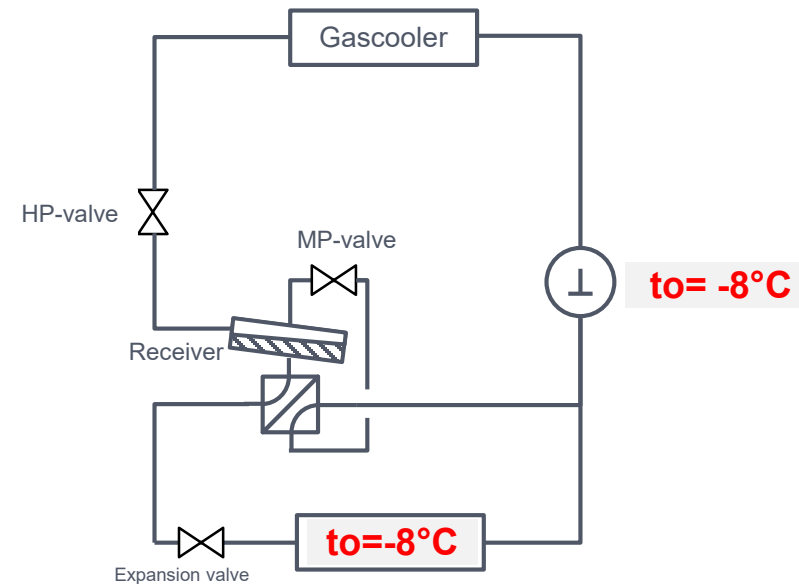
# ENERGY SAVINGS BY

## Increasing the compressor suction pressure

Semi-Flood & modulating ejector  
& CO<sub>2</sub>-pump

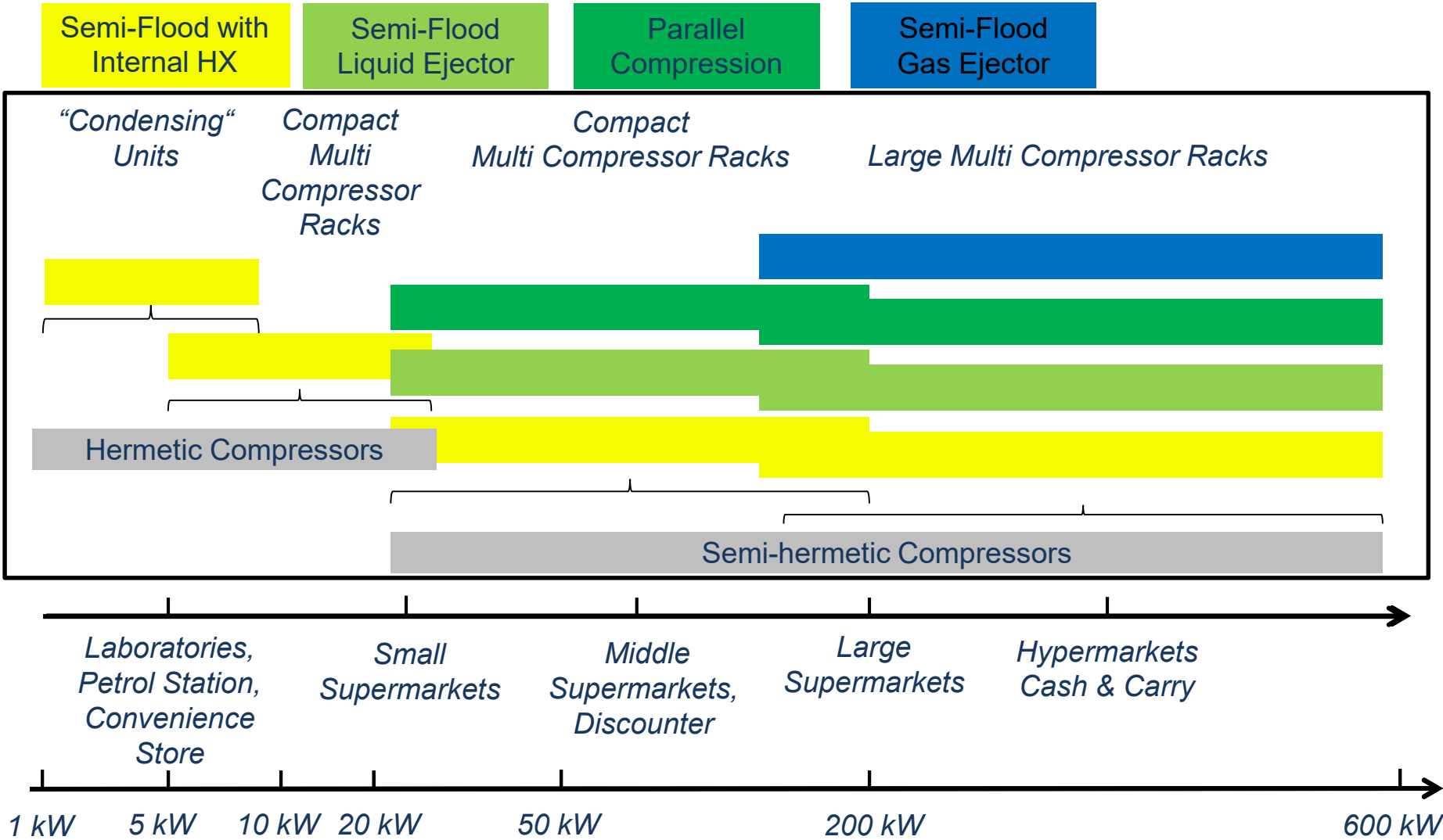


Standard  
CO<sub>2</sub>-concept



Comparison at summer condition and equivalent product temperatures

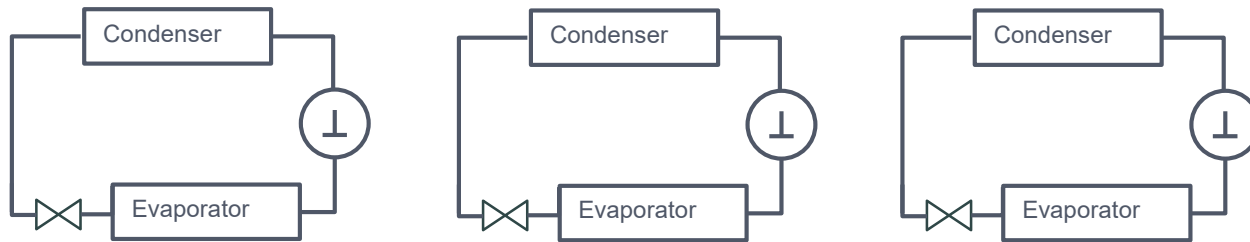
# AVAILABILITY EFFICIENCY TECHNOLOGIES CO<sub>2</sub>



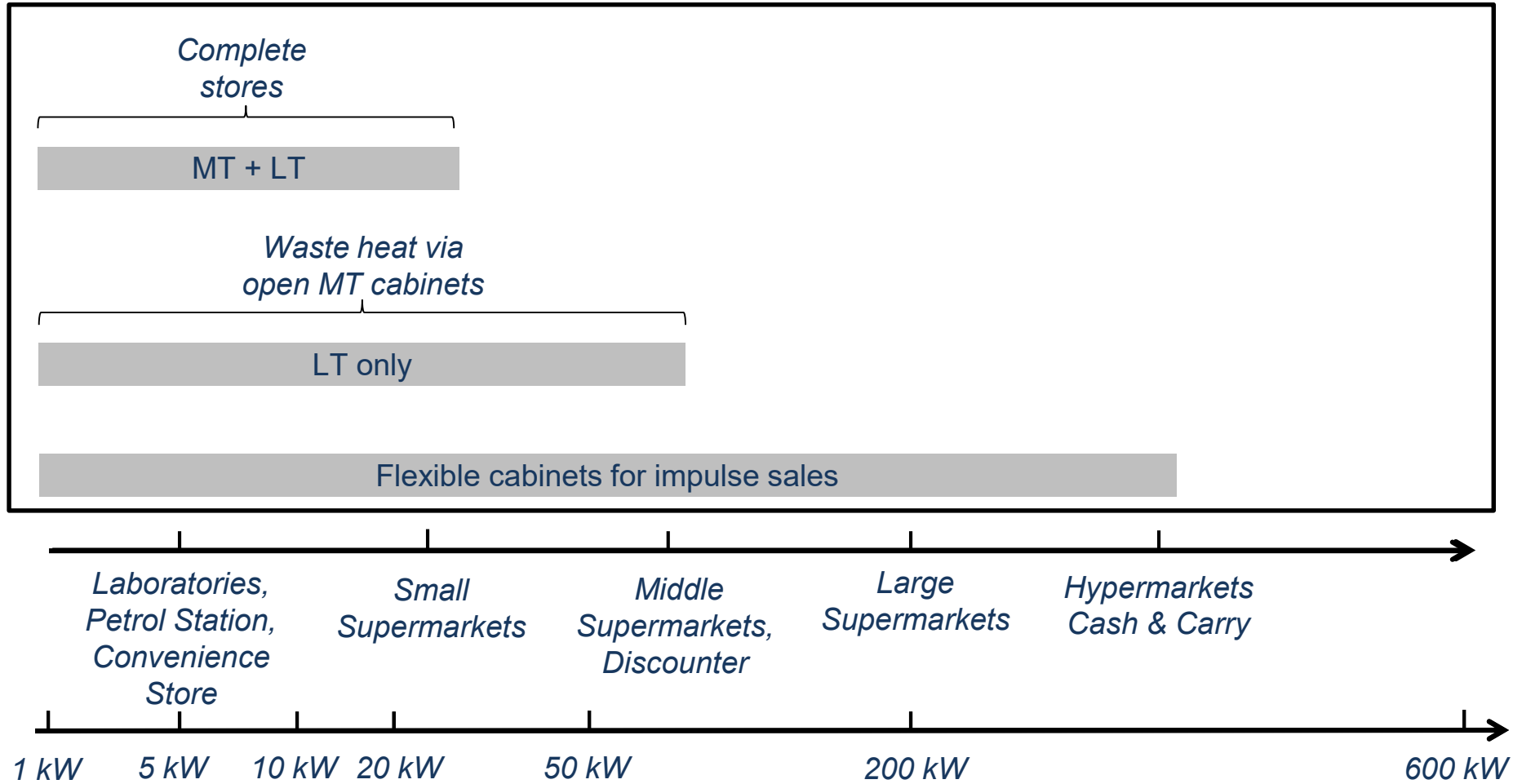
## Plug-In R290 Solutions

# PLUG-IN R290

Waste heat to the sales floor air

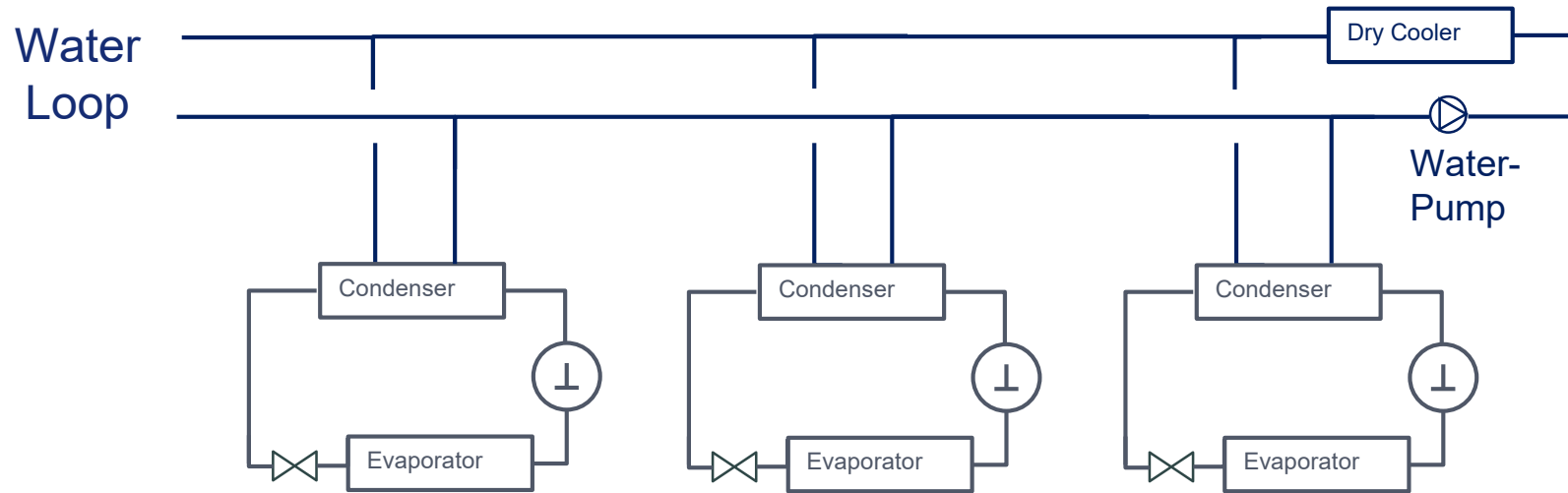


# AVAILABILITY PLUG-IN R290



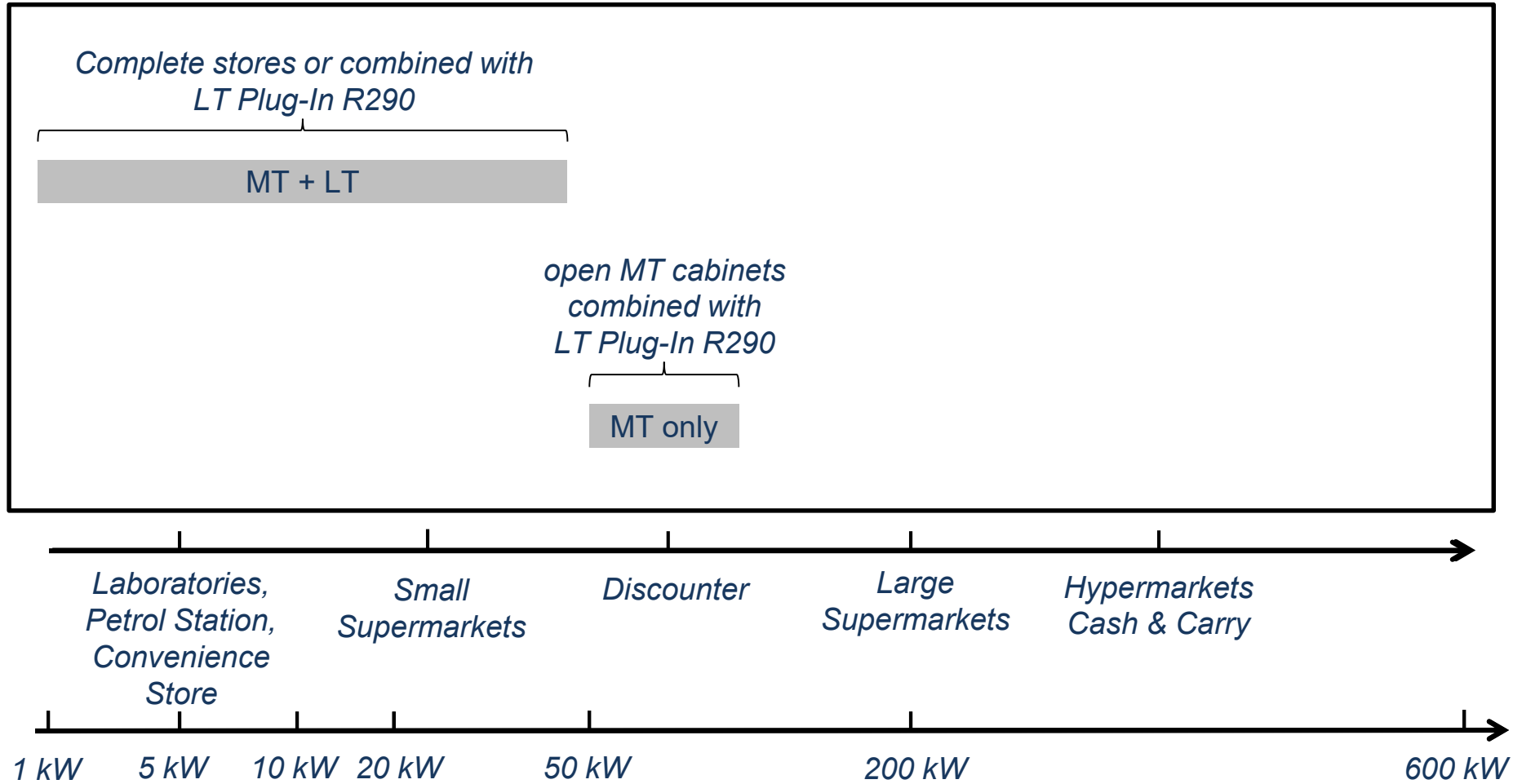
## Semi-Plug-In R290 Solutions

# SEMI-PLUG-IN R290



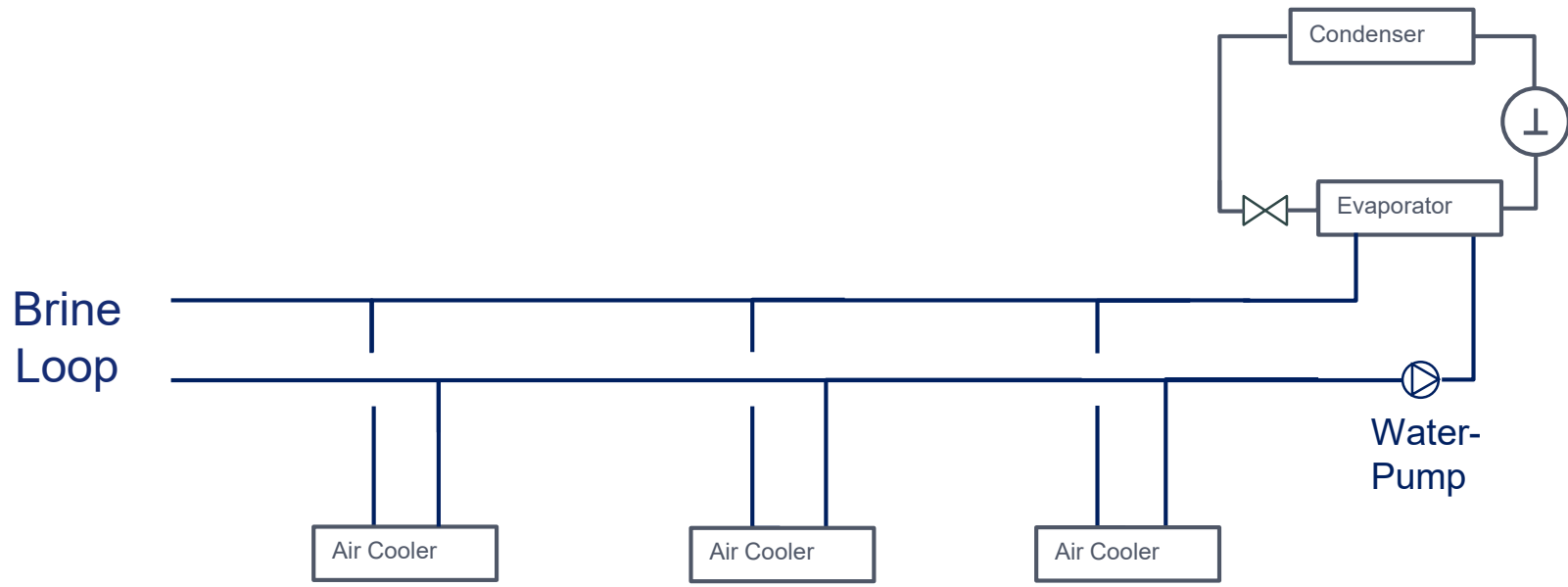


# AVAILABILITY SEMI-PLUG-IN R290

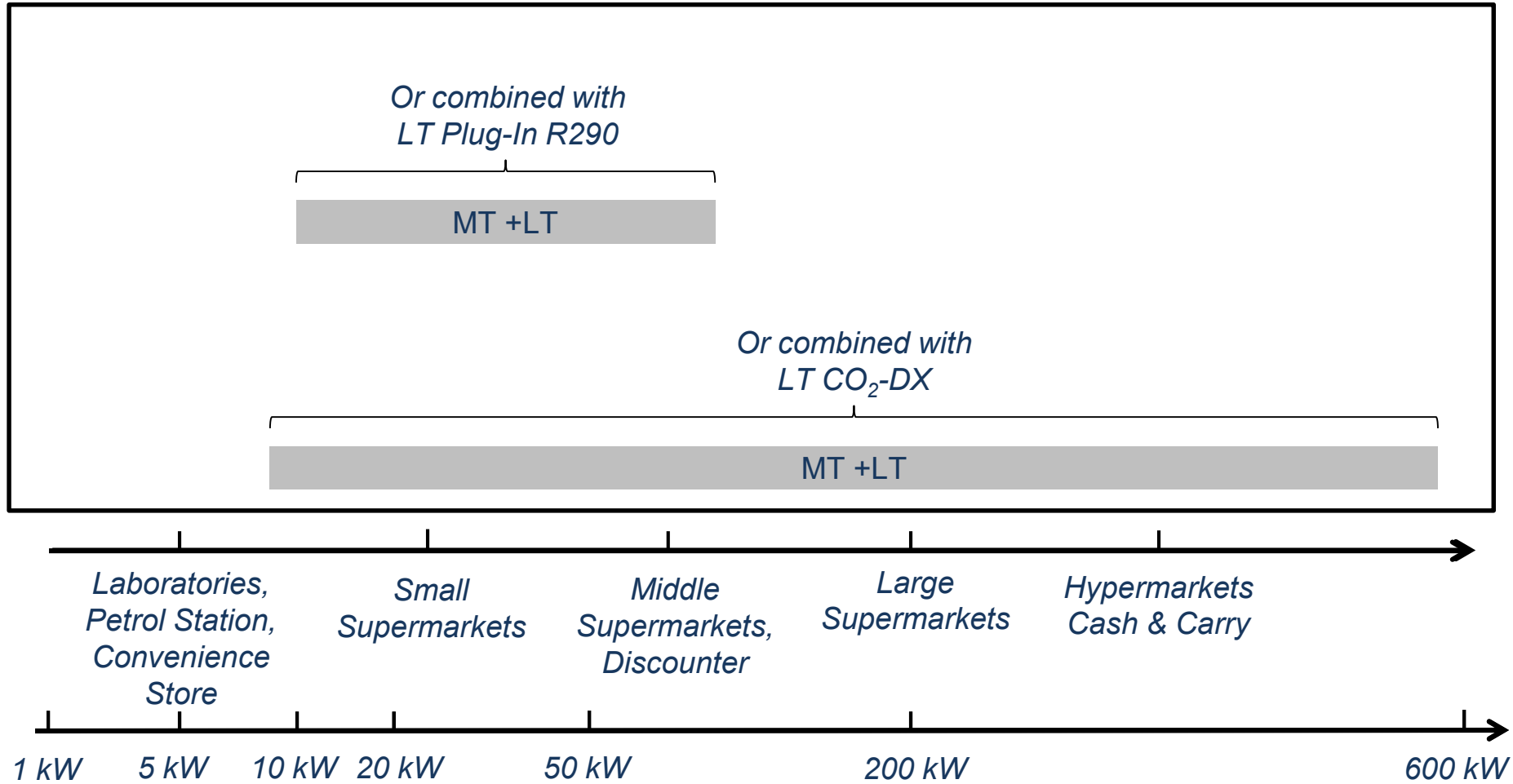


## R290 Liquid Chiller

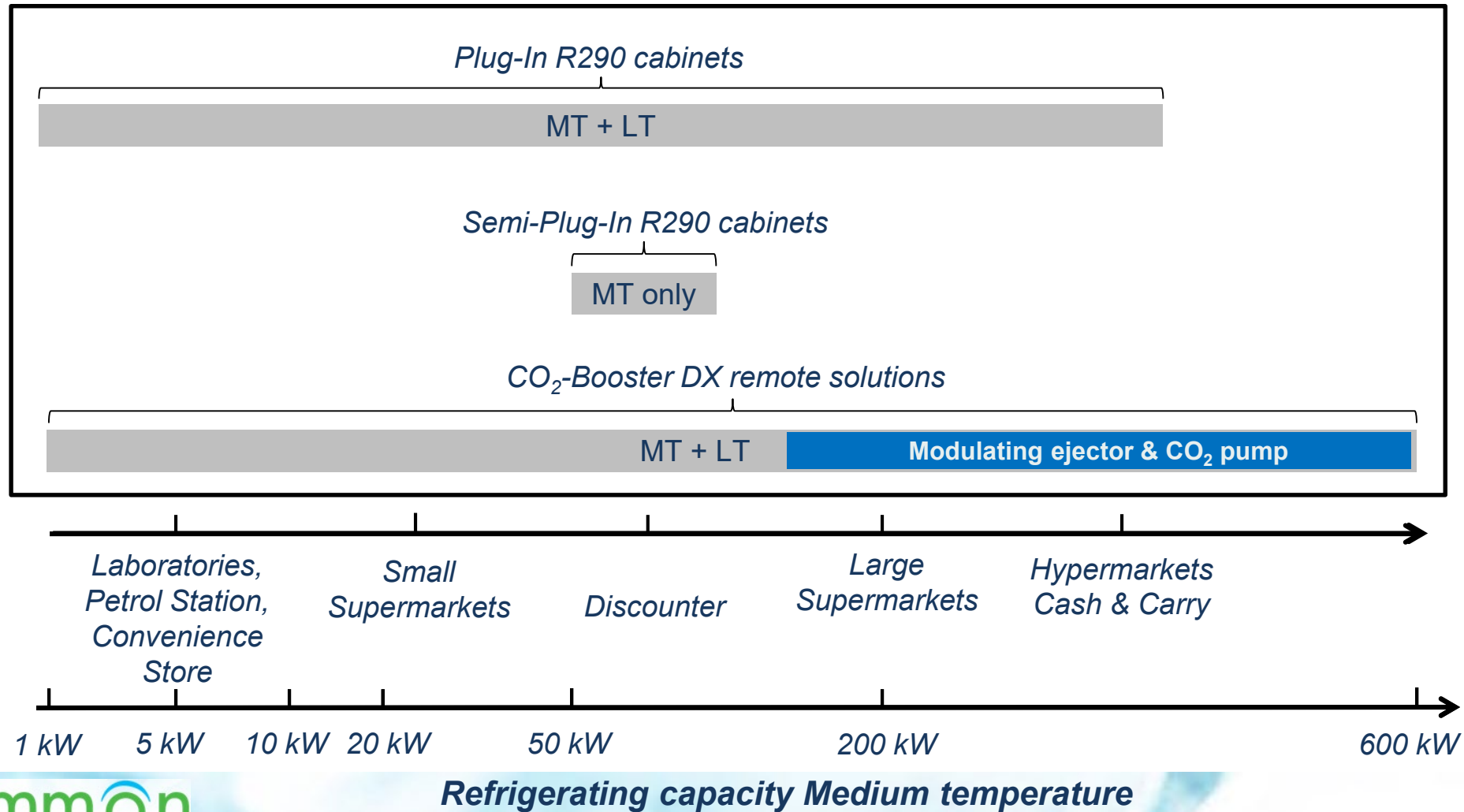
# R290 Liquid Chiller



# AVAILABILITY R290 LIQUID CHILLER



# CARRIER NATURAL EFFICIENT SOLUTIONS AVAILABLE



# SUMMARY NATURAL REFRIGERANTS CO<sub>2</sub> + R290

