



ENGINEERING
TOMORROW



Keynotes on CO₂ developments and system outlooks

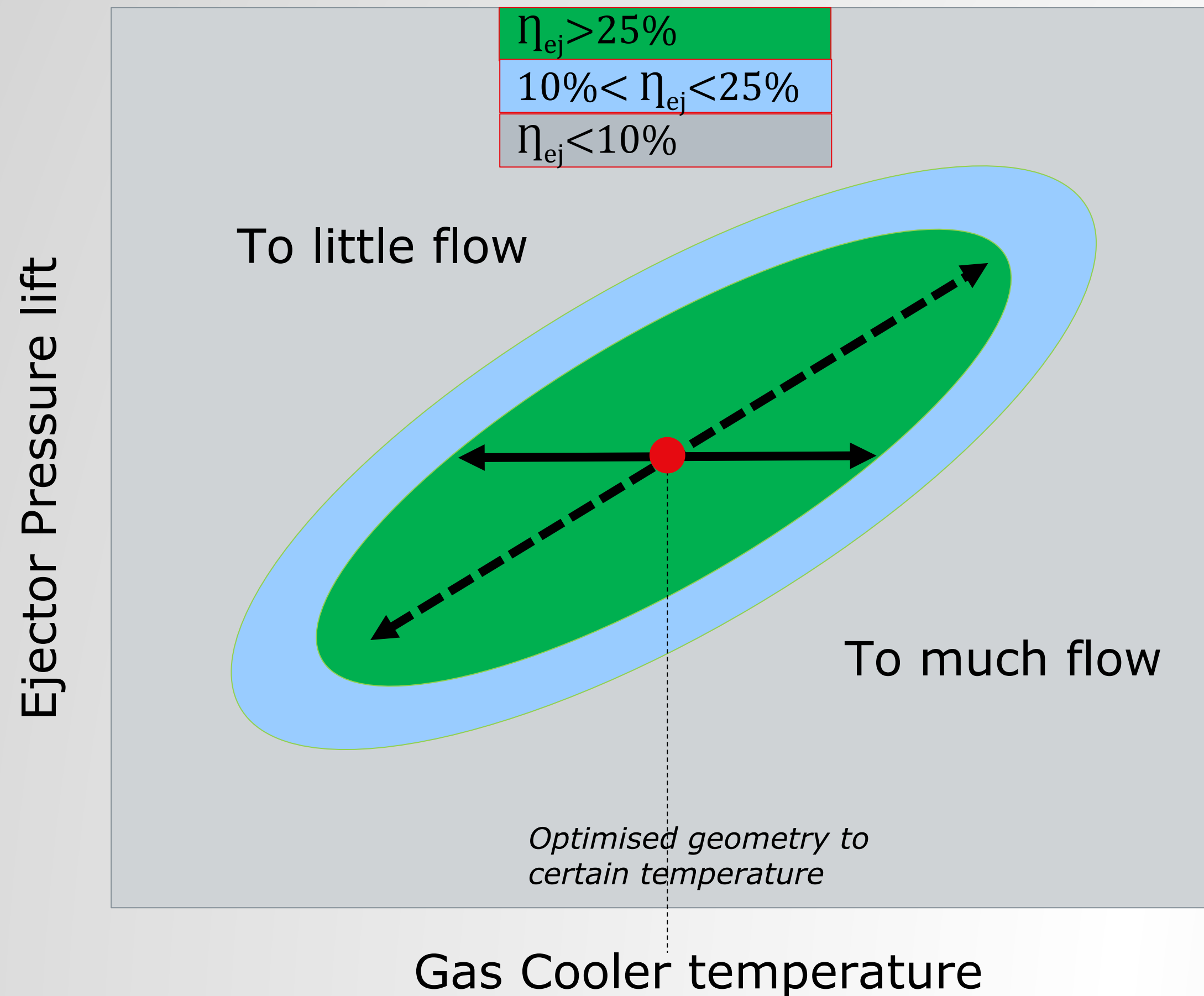
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Content

- How the Multi Ejector Solution™ performs
- Multi Ejector Solution field test
- COP improvements
- Geographical outlook on performance
- Integration of heating and cooling
- Heat recovery – make it easy
- Conclusion



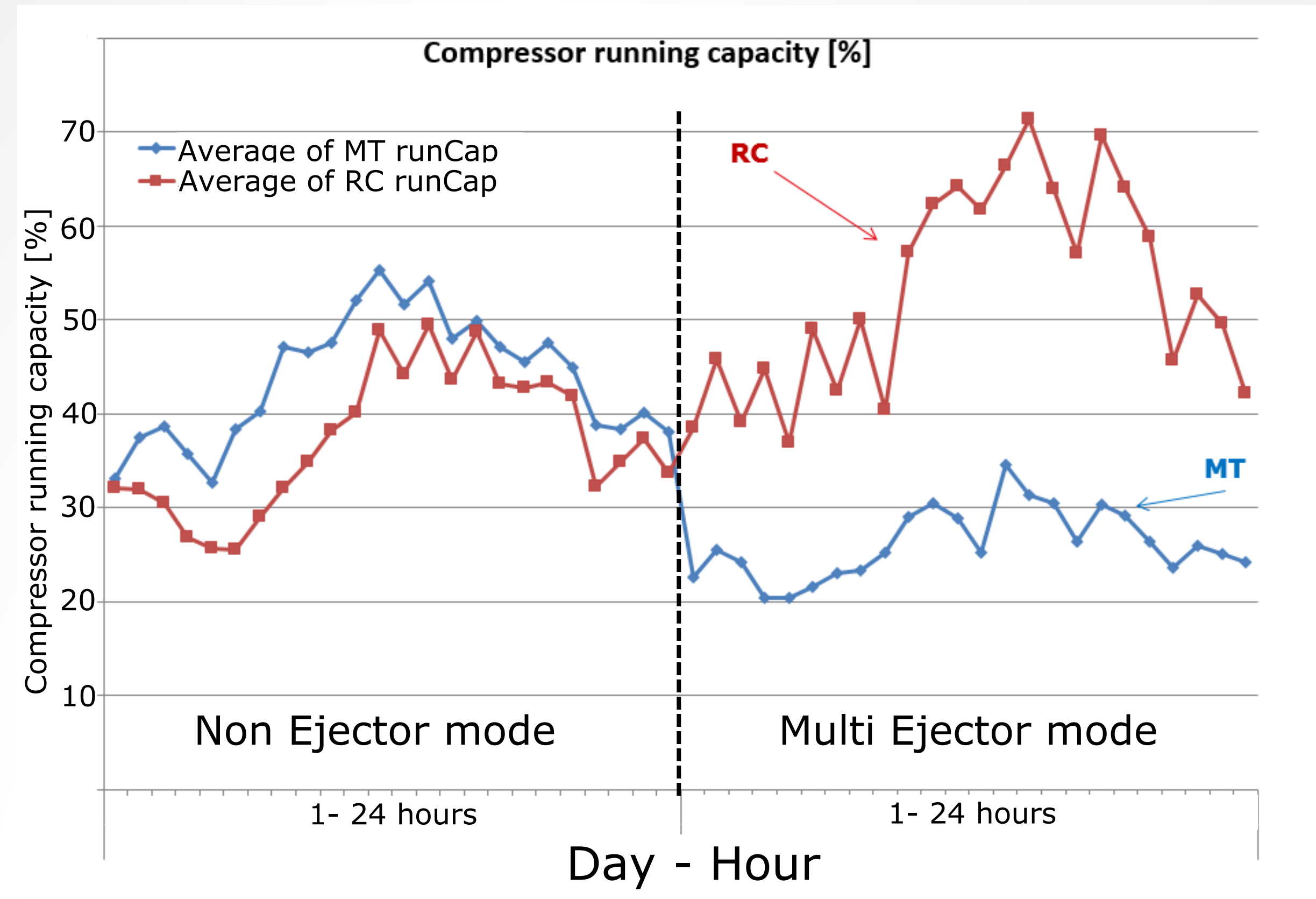
How to operate the Multi Ejector Solution



- The Multi Ejector Solution is optimised for a certain climate
- Operation to be ensured in the green area
- Different control strategies can apply
 - Constant pressure lift
 - Pressure lift as function of gas cooler temperature

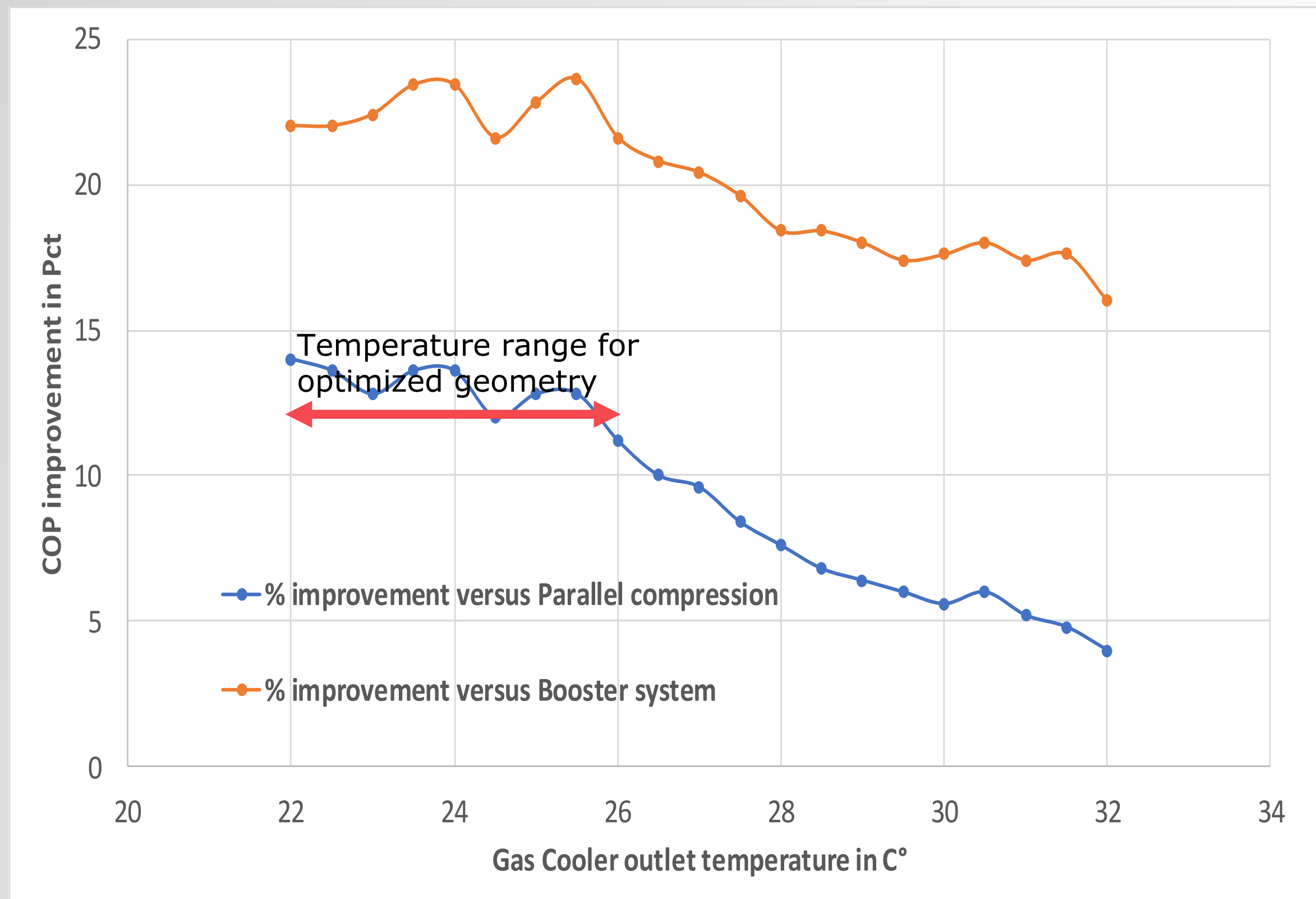
Field test results –gas ejector

- Performance measured during long test period of 3 months
- Efficiency calculations are made based on
 - 15 min sampling frequency
 - 24 hour load profile is constant



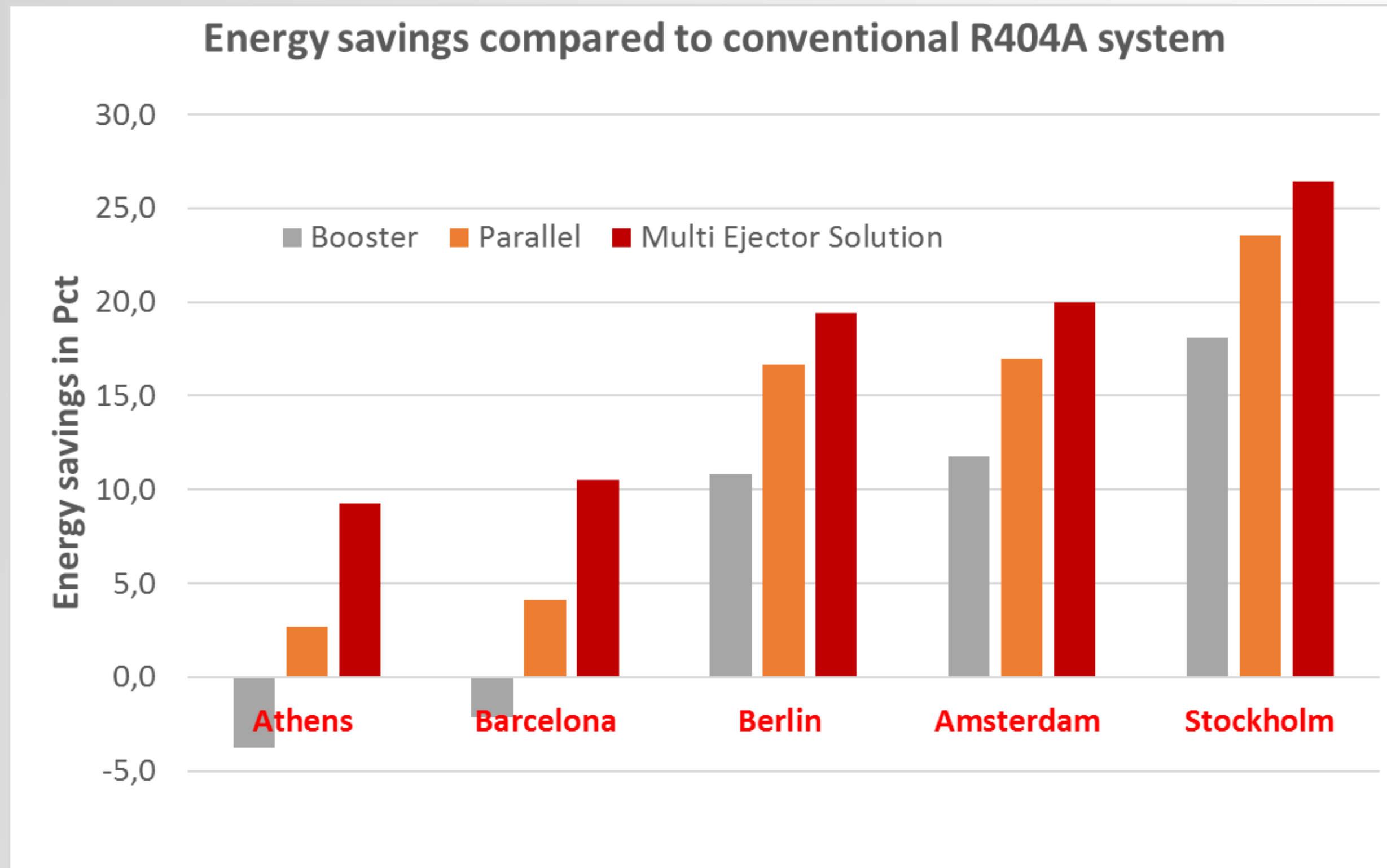
Plant	Location	Out door temperature	Evaporators	AC [%omt]	Size [MT kW]	Heat recovery
4	Africa	27	DX	No	120	N

COP improvements



- Optimization of the Multi Ejector Solution characteristic is done for 24 C°.
- Relative COP improvements are evident as function of temperature
- Total efficiency improvement is calculated as operational hours at certain temperatures at certain capacities

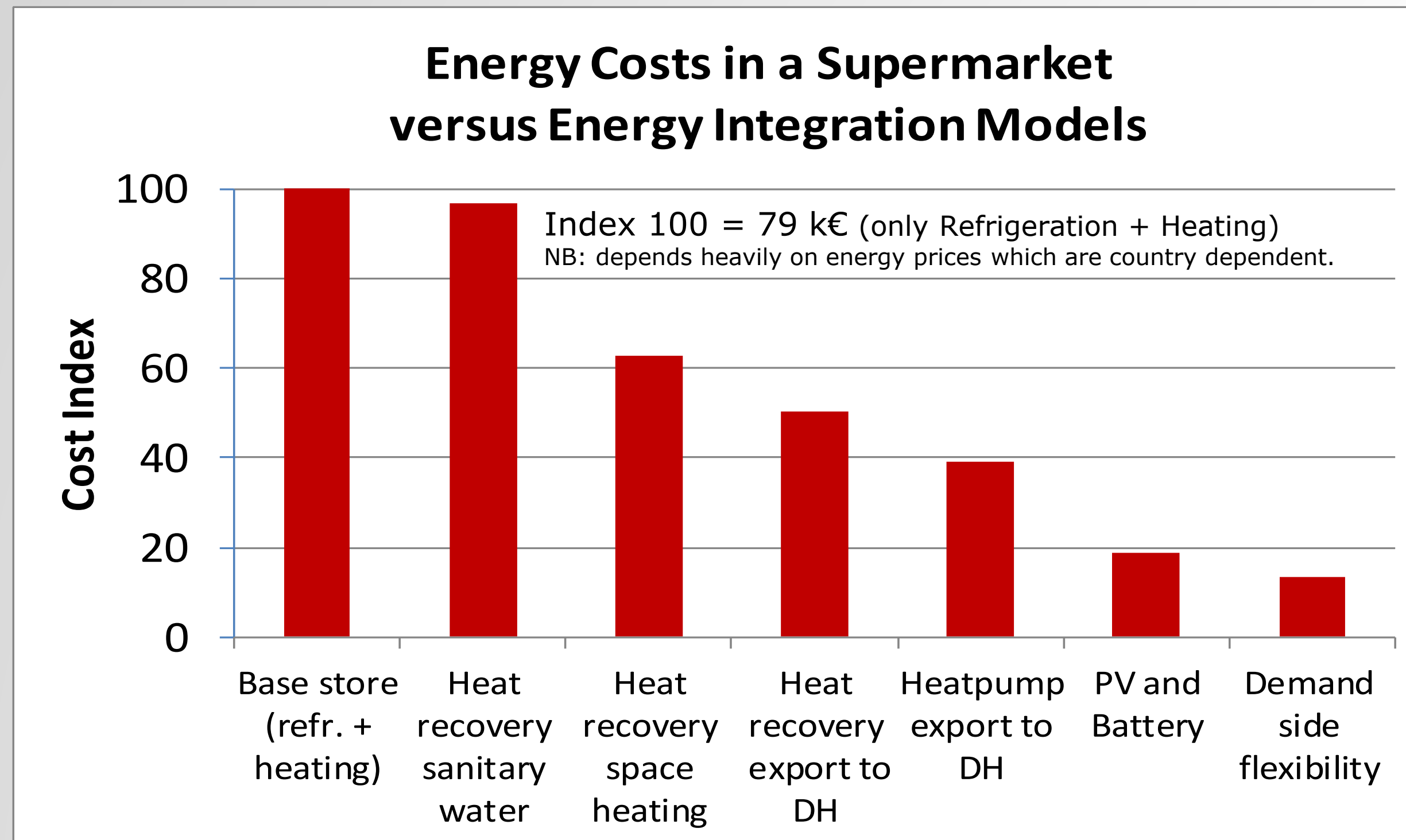
Comparison between systems at selected cities



- Several geographical locations were simulated during a year
- The energy saving potentials using Multi Ejector Solution is up to more than 25 %

Multi Ejector Solution versus ...		
Comparison	The South	The North
R404A	10 %	22 %
Booster	13 %	8%
Parallel	7%	3%

Integration of cooling and heating

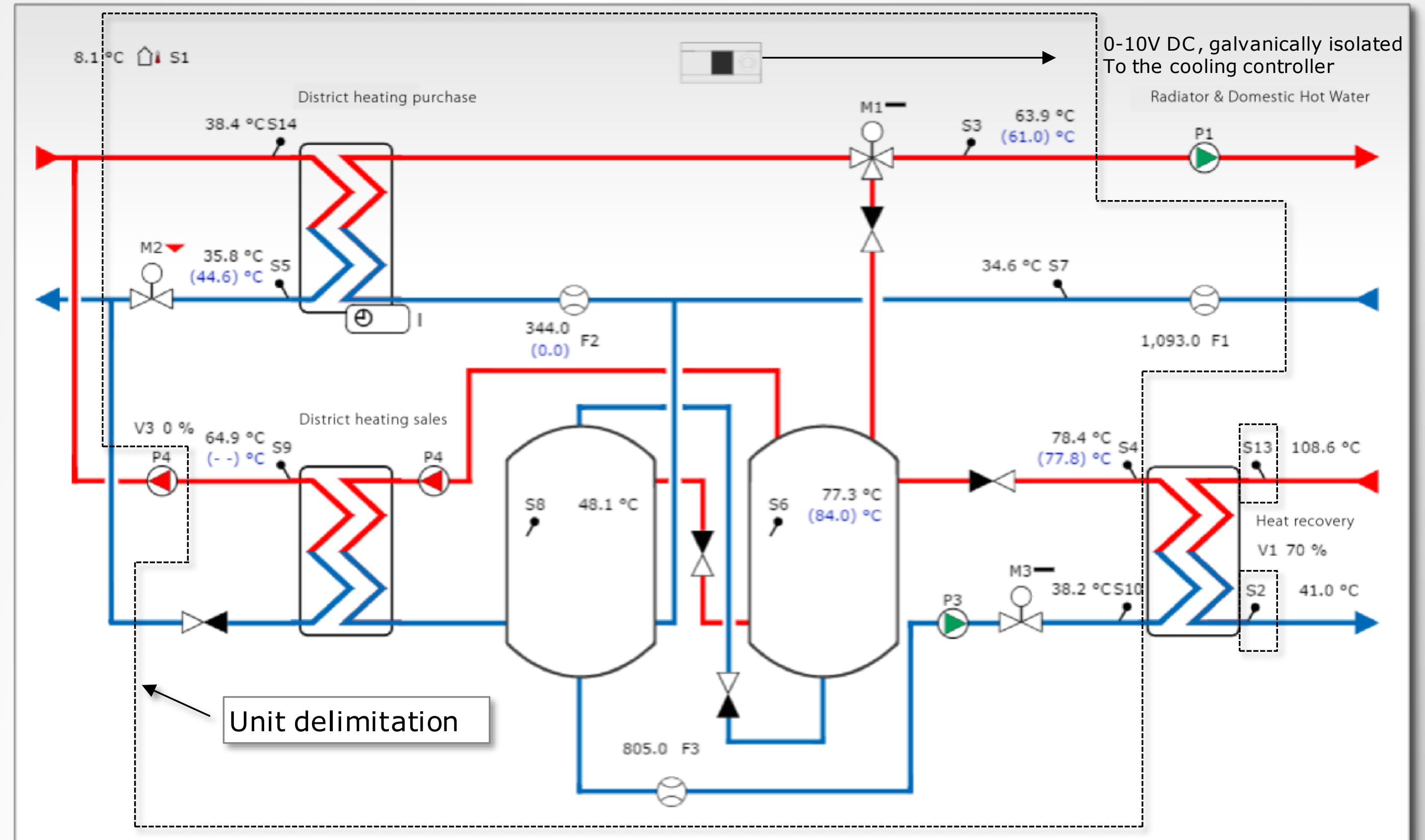


- Integrated systems will increasingly be used
- Attractive pay back even at normal running conditions
- Potential for utilising spare compressor capacity
- Multi Ejector Solution will increase efficiencies in typical heat recovery systems

Electricity (base)	0,14 € / kWh	DSF	KW reductn	Min. per event	Events per day	Value per kWh	SUM year €
Electricity (HP mode)	0,04 € / kWh	Defrost	13	90	3	0,03	570
Gas	0,55 € / m ³	Capacity reduction	20	30	4	0,03	390
District Heating	0,05 € / kWh	Imbalance Service	53	15	n.a.	60	3200

Heat recovery must be easy

- System designs are moving into maturity
- Roll out requires robust and stable plug & play solutions
- Experience crystallizes into products
- 4 versions are available today



Conclusion

- Several test sites continue to show stable efficiency improvements using the Multi Ejector Solution
- Long term data acquisition shows clear correlation between temperature and efficiency improvements
- Multi Ejector Solution performance improves the efficiency considerably using the right control strategy
- Integrated systems will become much wider used and utilise Multi Ejector Solution
- Heat recovery systems can benefit from the Multi Ejector Solution performance
- Critical issues around heat recovery can be mitigated by applying best unitary design

