



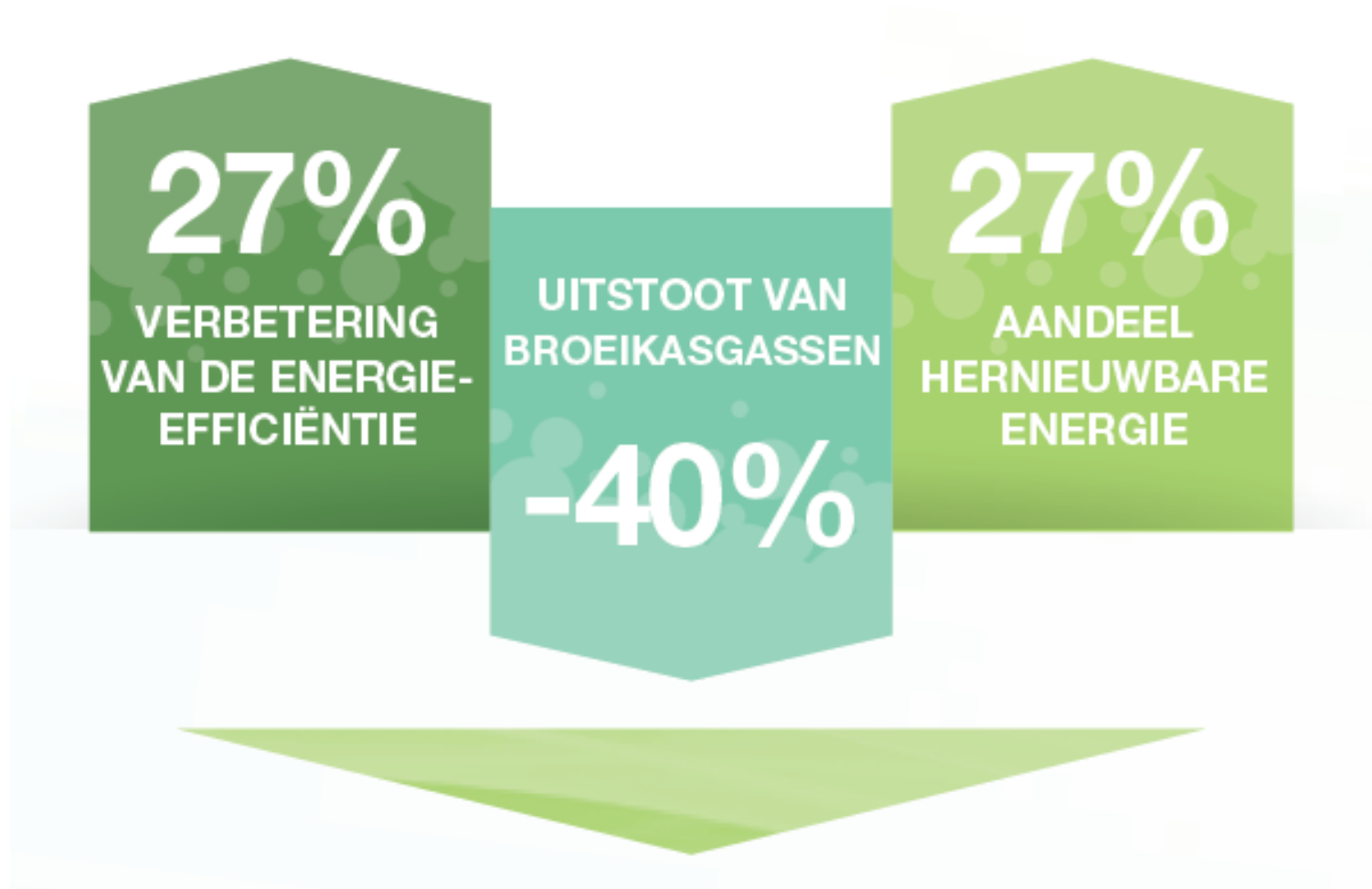
Themabijeenkomst inzet en onderhoud warmtepompen

- Introductie
 - Christian Löhr Accountmanager Carrier
 - Albert Dubbink Tendermanager ULC Technisch Beheer

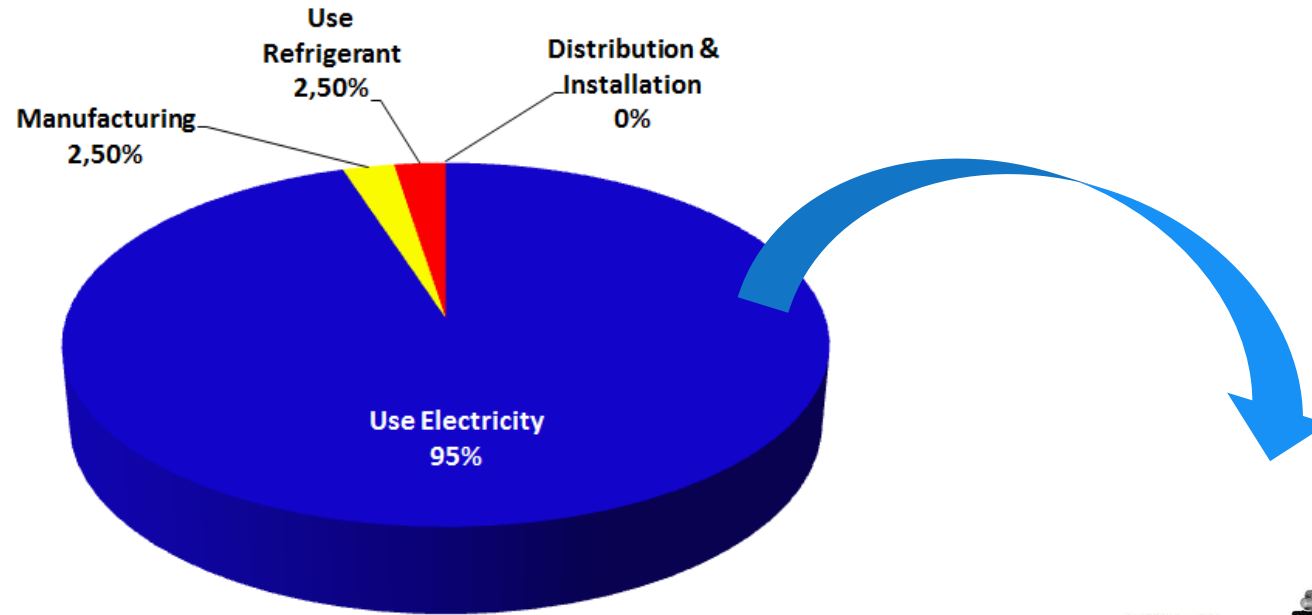


- Koelmiddelen, ontwikkelingen en duurzaamheid
- Cyclus in een installatie
- Soorten en selectiemogelijkheden
- Ontwikkelingen onderhoud en beheer
- Plaatsing in systeem
- Altijd maatwerk

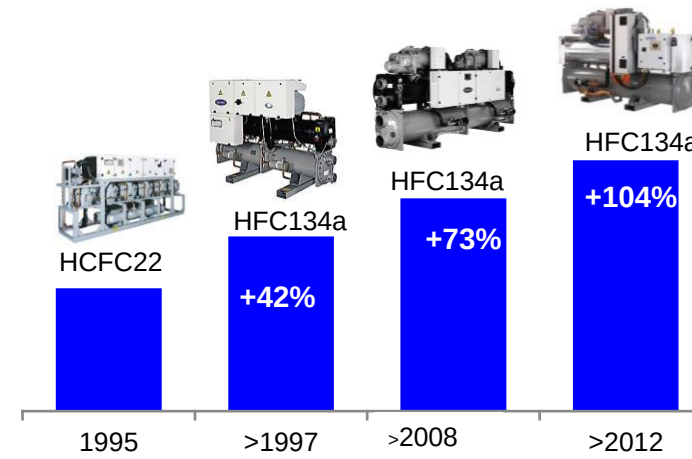
Europese klimaatdoelstellingen



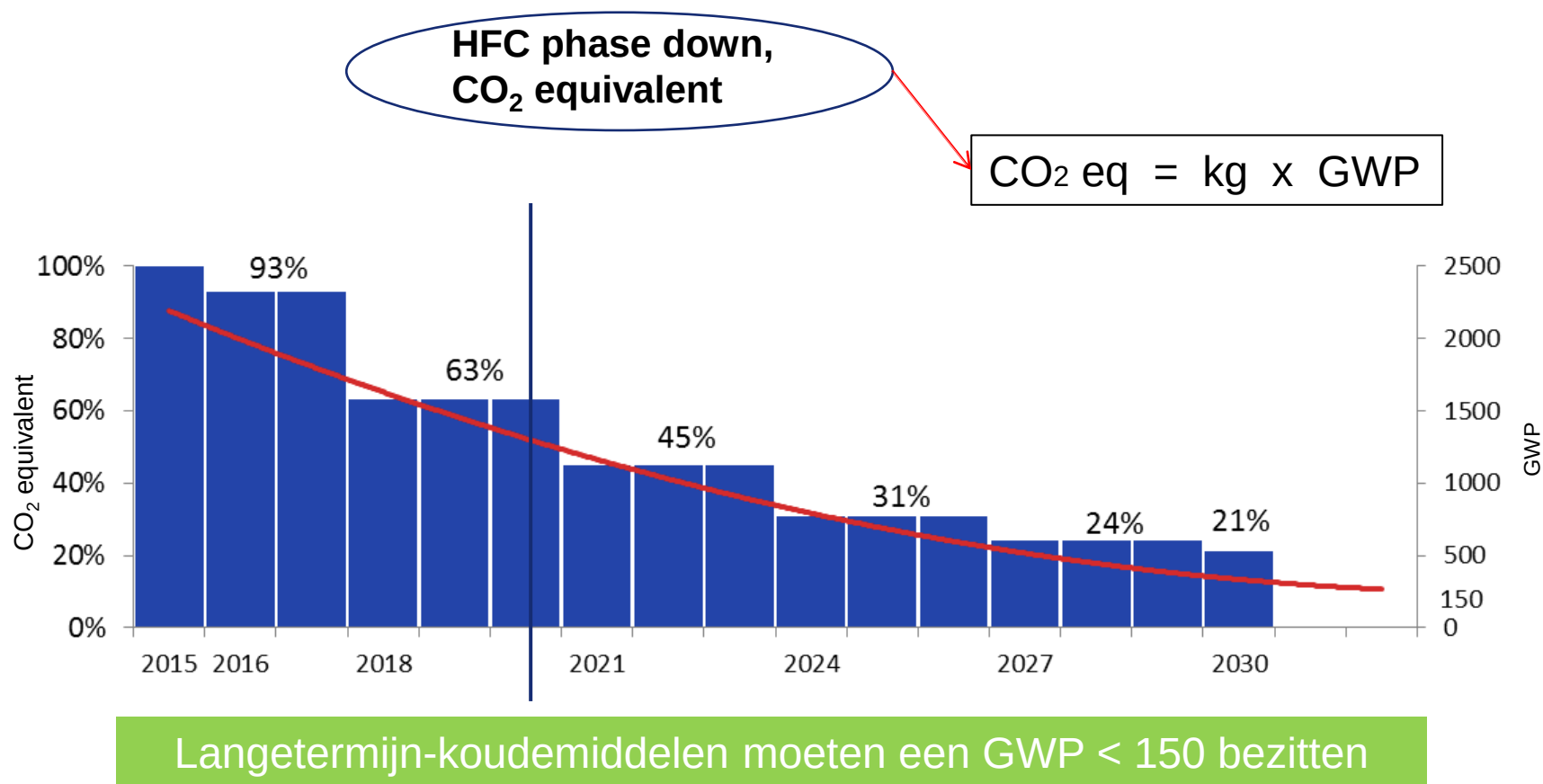
Verbetering energie efficiency



Is “indirecte” uitstoot broeikasgassen



Eu F-gassen verordening



Opmerking: GWP volgens IPCC AR4, behalve voor HFO's: IPCC AR5

Koudemiddelmogelijkheden

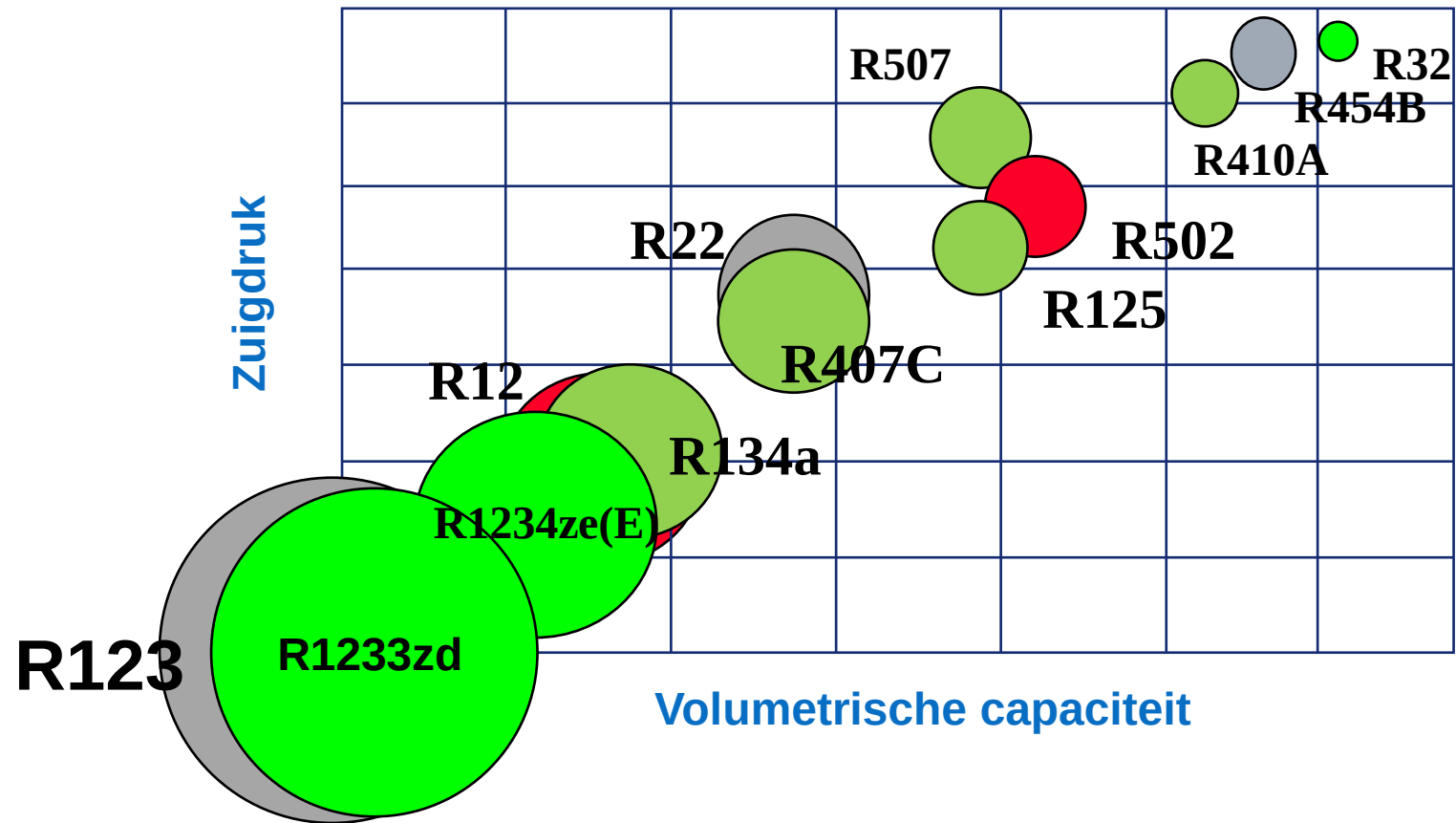
Name	ASHRAE designation	GWP ₁₀₀	COP compared to R410A in basic cycle	Capacity compared to R410A in basic cycle
Ethane	R170	6	–	–
Propene (propylene)	R1270	2	1.033	0.689
Propane	R290	3	1.014	0.571
Methoxymethane (dimethylether)	R-E170	1	0.996	0.392
Cyclopropane	R-C270	86	1.018	0.472
Fluoromethane	R41	116		
Difluoromethane	R32	677	1.038	1.084
Fluoroethane	R161	4	1.026	0.601
1,1-Difluoroethane	R152a	138	0.981	0.399
1,1,2,2-Tetrafluoroethane	R134	1120	0.967	0.348
Fluoroethene	R1141	<1	0.968	1.346
1,1,2-Trifluoroethene	R1123	3	0.956	1.054
3,3,3-Trifluoroprop-1-yne	–	1.4	0.988	0.545
2,3,3,3-Tetrafluoroprop-1-ene	R1234yf	<1	0.954	0.414
(E)-1,2-difluoroethene	R1132(E)	1	1.016	0.591
3,3,3-Trifluoroprop-1-ene	R1243zf	<1	0.964	0.372
1,2-Difluoroprop-1-ene	R1252ye	2	0.973	0.355
(E)-1,3,3,3-tetrafluoroprop-1-ene	R1234ze(E)	<1	0.939	0.320
(Z)-1,2,3,3,3-pentafluoro-prop-1-ene	R1225ye(Z)	<1	0.922	0.273
1-Fluoroprop-1-ene	R1261ze	1	0.975	0.353
Trifluoro(methoxy)methane	R-E143a	523	0.957	0.366
2,2,4,5-Tetrafluoro-1,3-dioxole	–	1	0.936	0.337
N,N,1,1-tetrafluormethanamine	–	20	0.965	0.807
Difluoromethanethiol	–	1	1.010	0.582
Trifluoromethanethiol	–	1	0.977	0.418
Carbon dioxide	R744	1	–	–
Ammonia	R717	<1	1.055	0.746

Beperkt overzicht mogelijke enkelvoudige stoffen die als koudemiddel toepasbaar zijn.

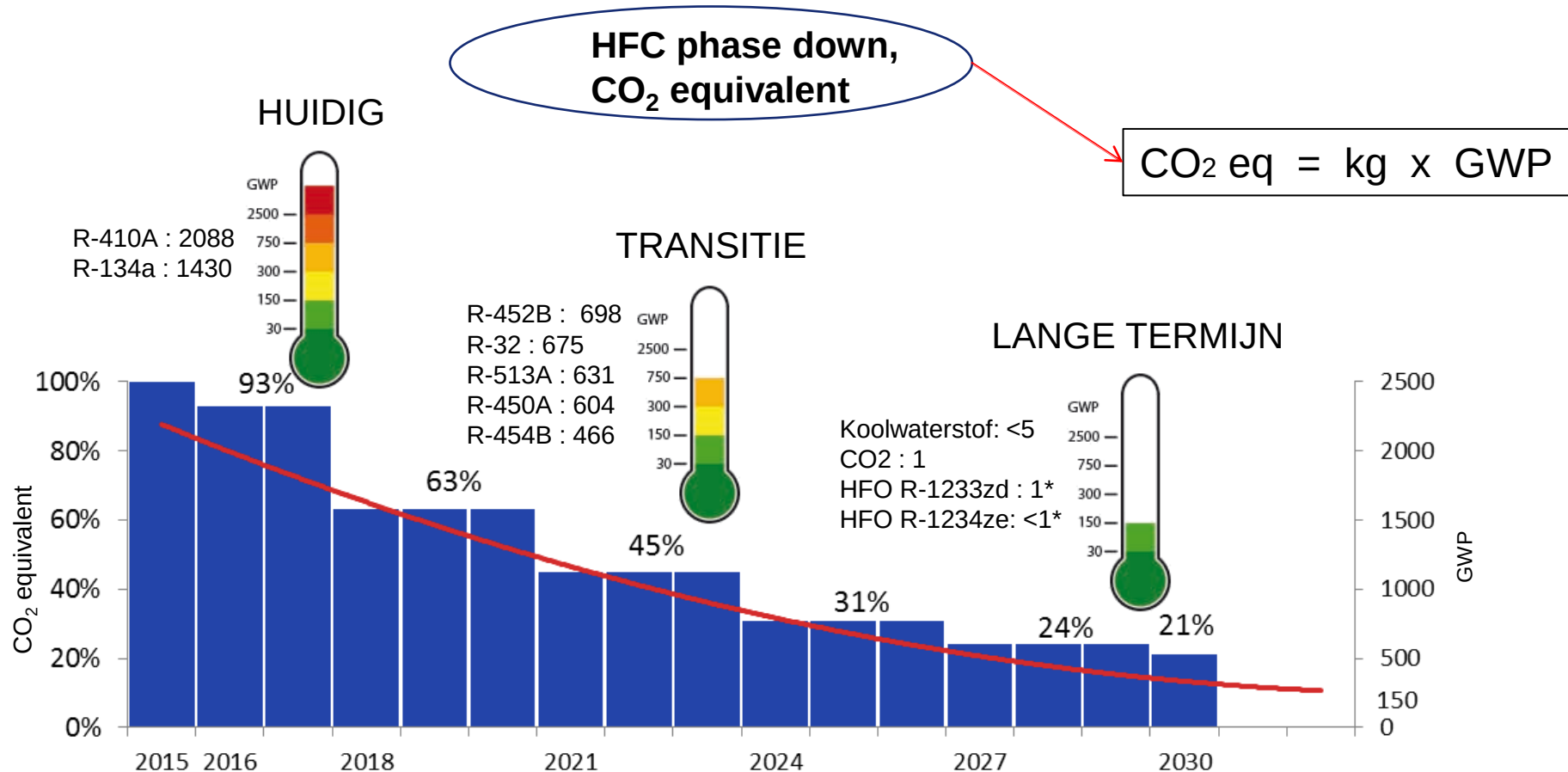
Hiernaast mengsels:

- R400 serie. Mengsels van stoffen die zich gedragen als twee stoffen en dus met een glide (R407C, R410A, R454B)
- R500 serie. Mengsels van stoffen die zich gedragen als nieuwe stof (R502, R513A, R515...)

Koelmachine aanpassing R-32



Eu F-gassen verordening



Langetermijn-koudemiddelen moeten een GWP < 150 bezitten

Opmerking: GWP volgens IPCC AR4, behalve voor HFO's: IPCC AR5

Waarom R-32 voor scroll-koelmachines?



**Tot 80% minder
CO₂ equivalent
dan R-410A**

R-32 helpt het milieu
te beschermen
en aanhouden van
HFK-quota



**Tot 10% meer
energie-efficiëntie**

in vergelijking met
R-410A
en geschikt
voor alle klimaten



Gebruikersvriendelijk

R-32 is
overal beschikbaar



Veilig

Eenvoudige installatie,
inbedrijfstelling en
onderhoud*

* Specifieke veiligheidsmaatregelen kunnen
nodig zijn bij transport, bedrijf en onderhoud van
de apparatuur

Warmtepomp techniek

Van opwekking naar efficiënt verplaatsen van warmte



Elektrisch gedreven
Rendement tot 7



Gas of Olie gestookt
Rendement < 1



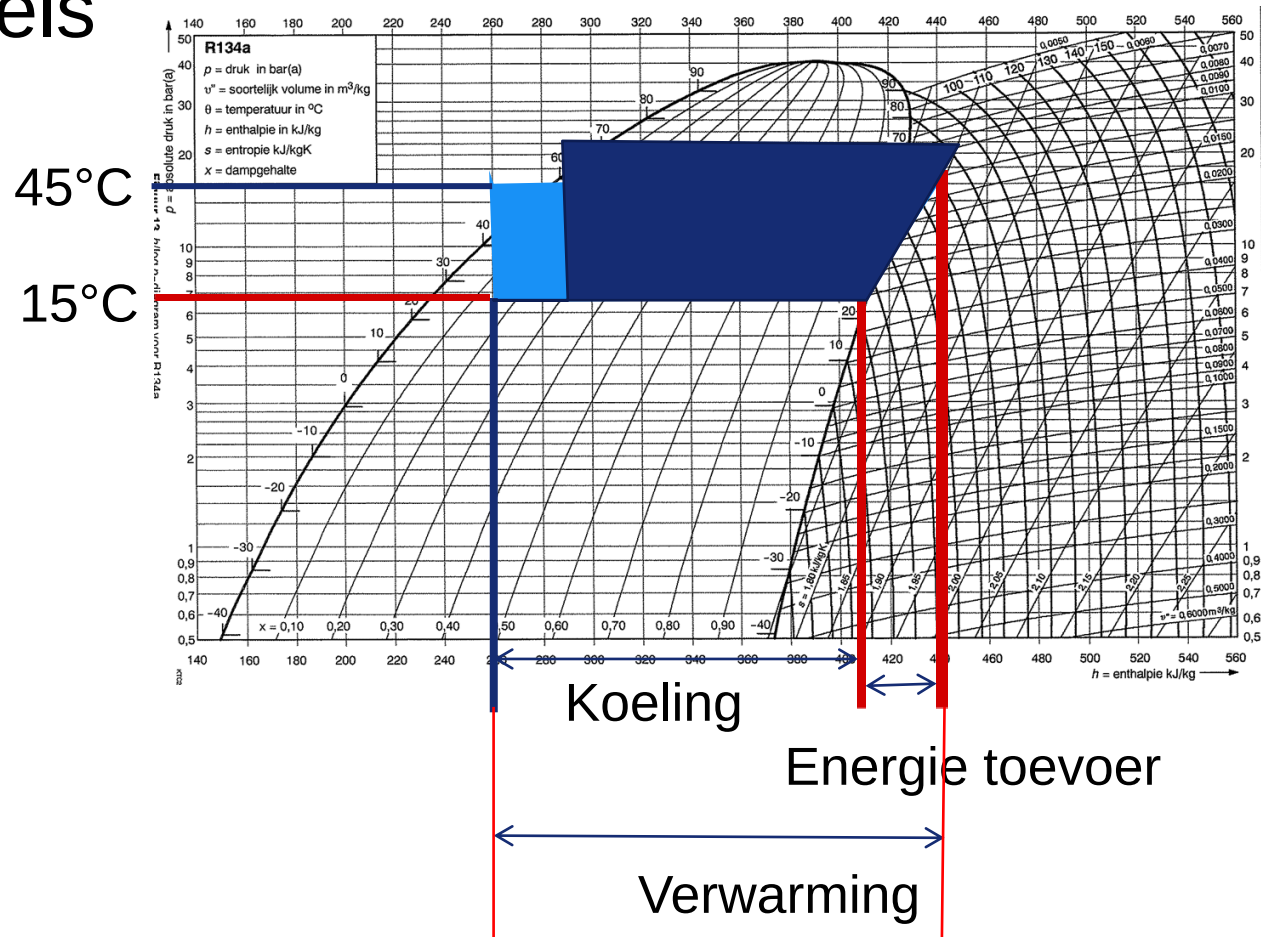
Warmtepomp techniek

Rendement regels

Hoe hoger de
temperatuursprong hoe
lager het rendement

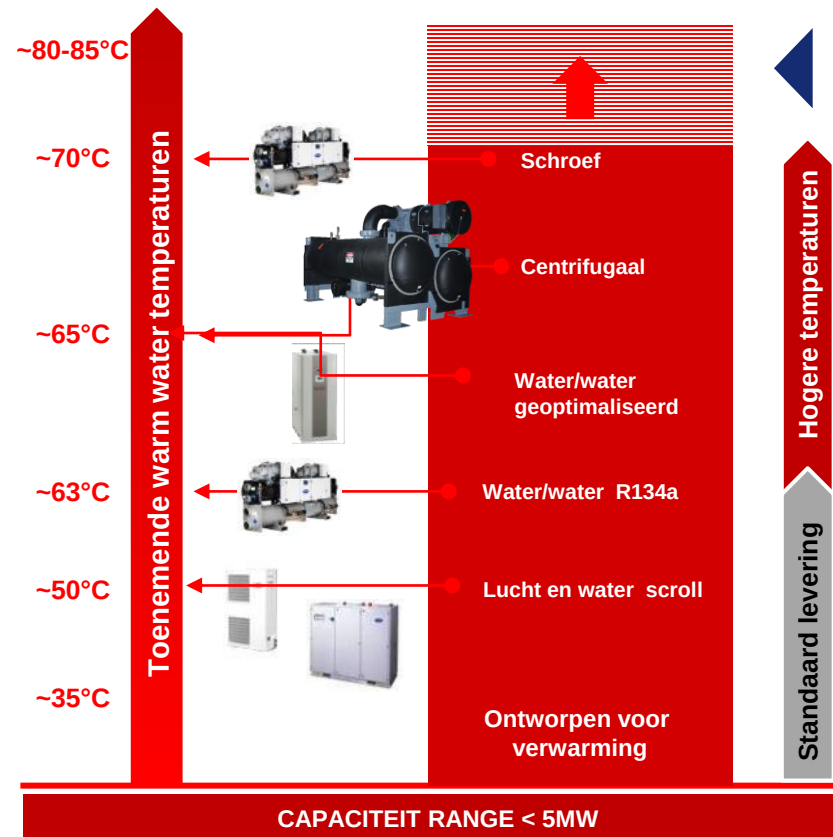
$$\frac{\text{Verwarming}}{\text{Energie toevoer}} = \text{COP}$$

Huidige technologie is
max 60-70°C
temperatuursprong



Nieuwe marktvraag

Huidige warmtepomp mogelijkheden



Runtesten richting 85°C met nieuwe koudemiddelen

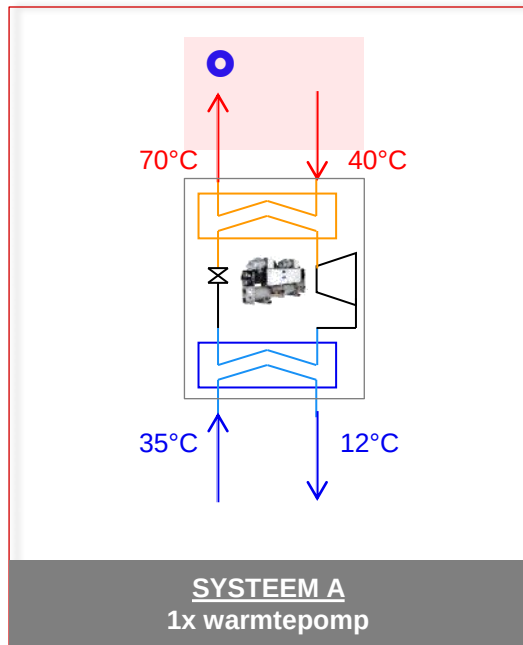
Hogere temperaturen

⇒ compressor optimalisatie naar 70°C water temperaturen

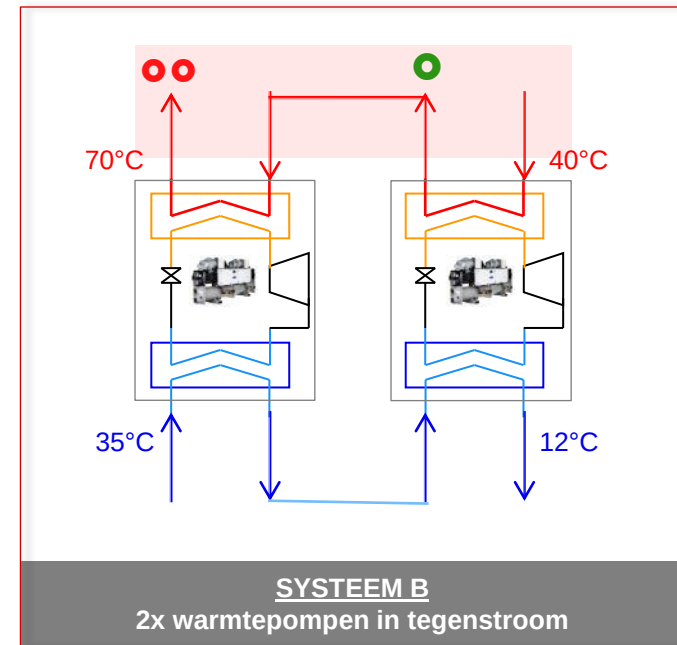
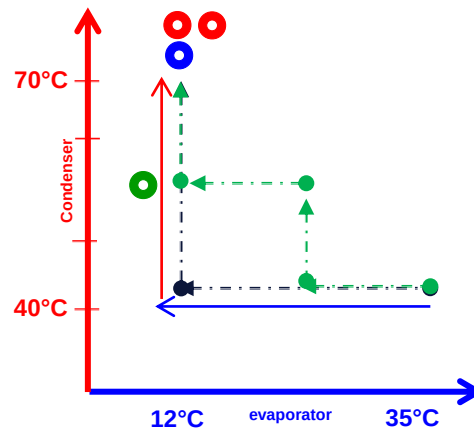
Laag en medium temperaturen

⇒ lucht en water als bron en productie water temperaturen <65°C

Slimme hydraulische inpassing

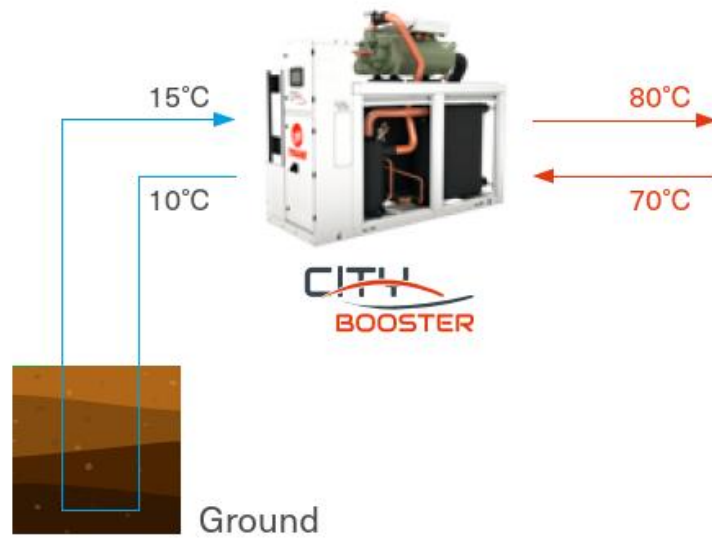


COP = 3,0

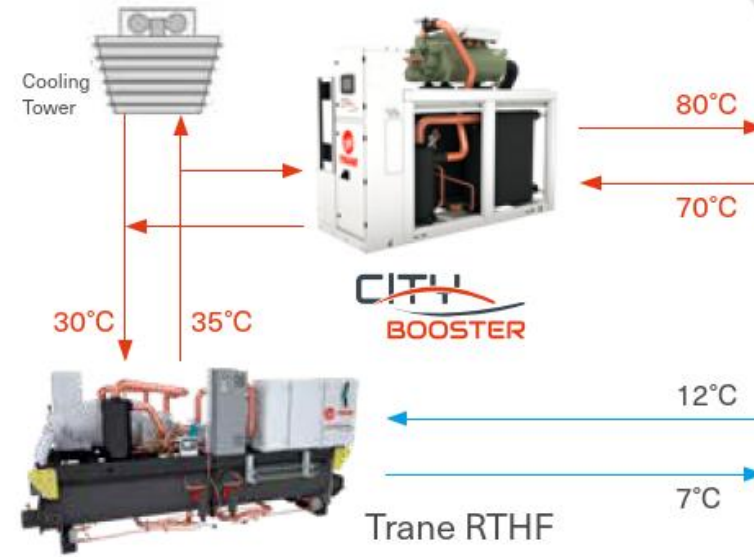


COP = 4,2

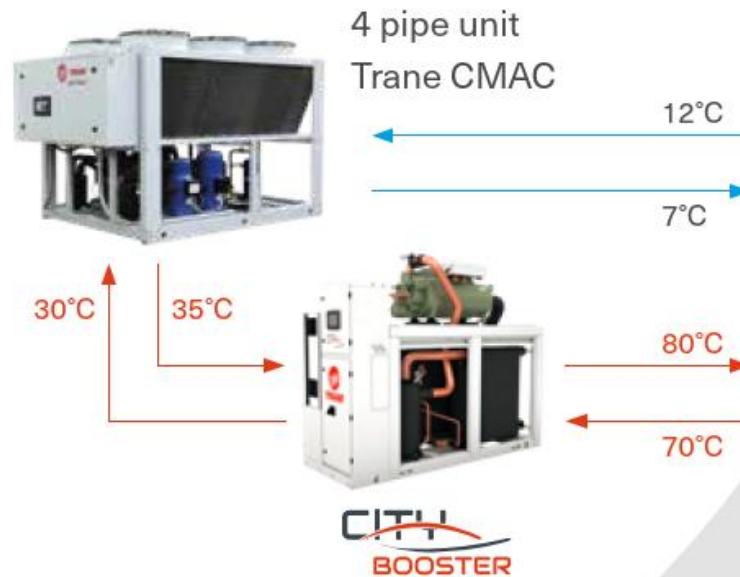
Geothermal heating



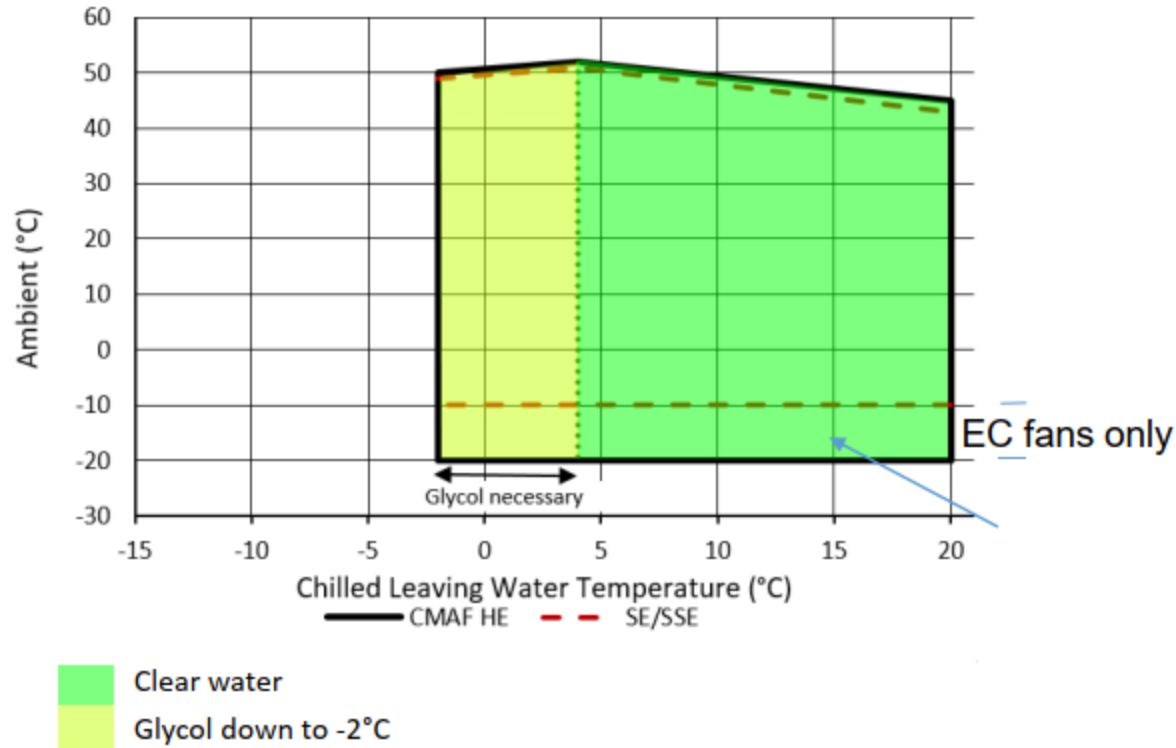
Heat recovery cascade



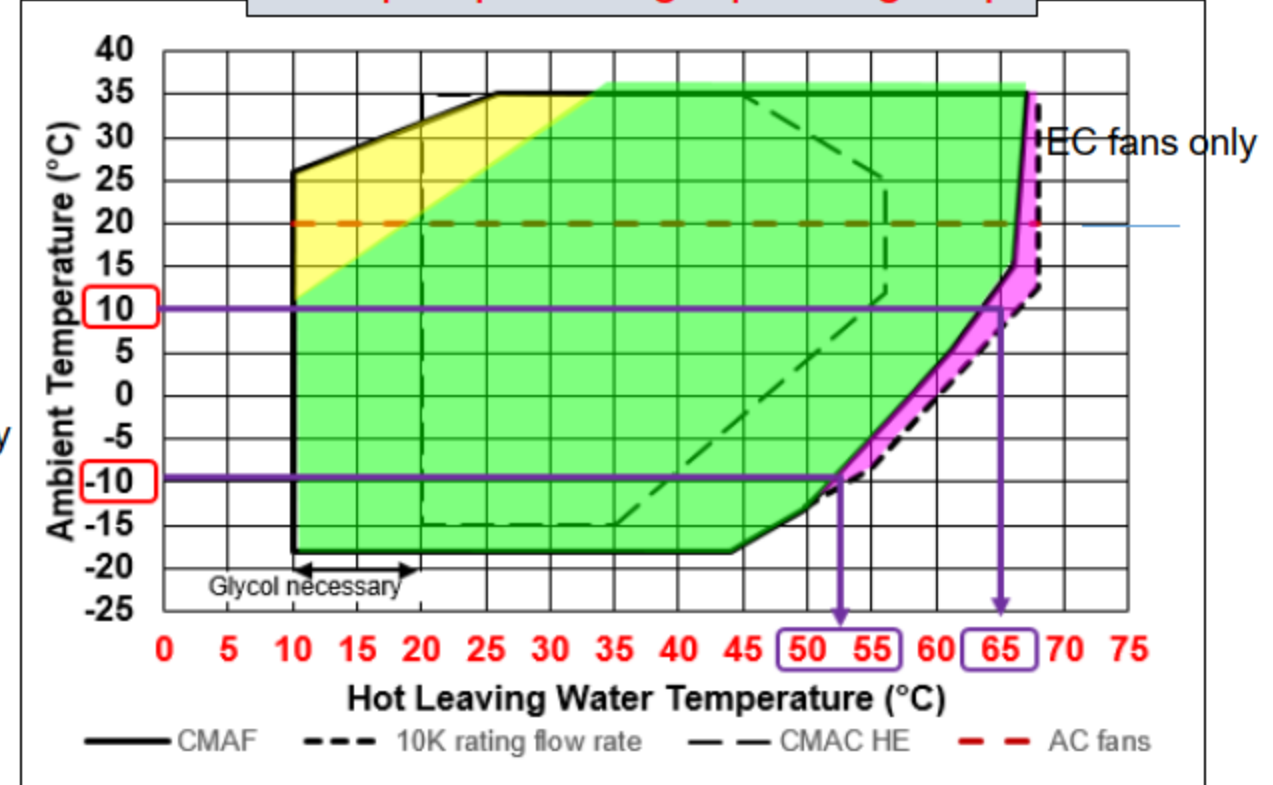
Cascade with Heat pump or 4 Pipe



Cooling Only Operating Map



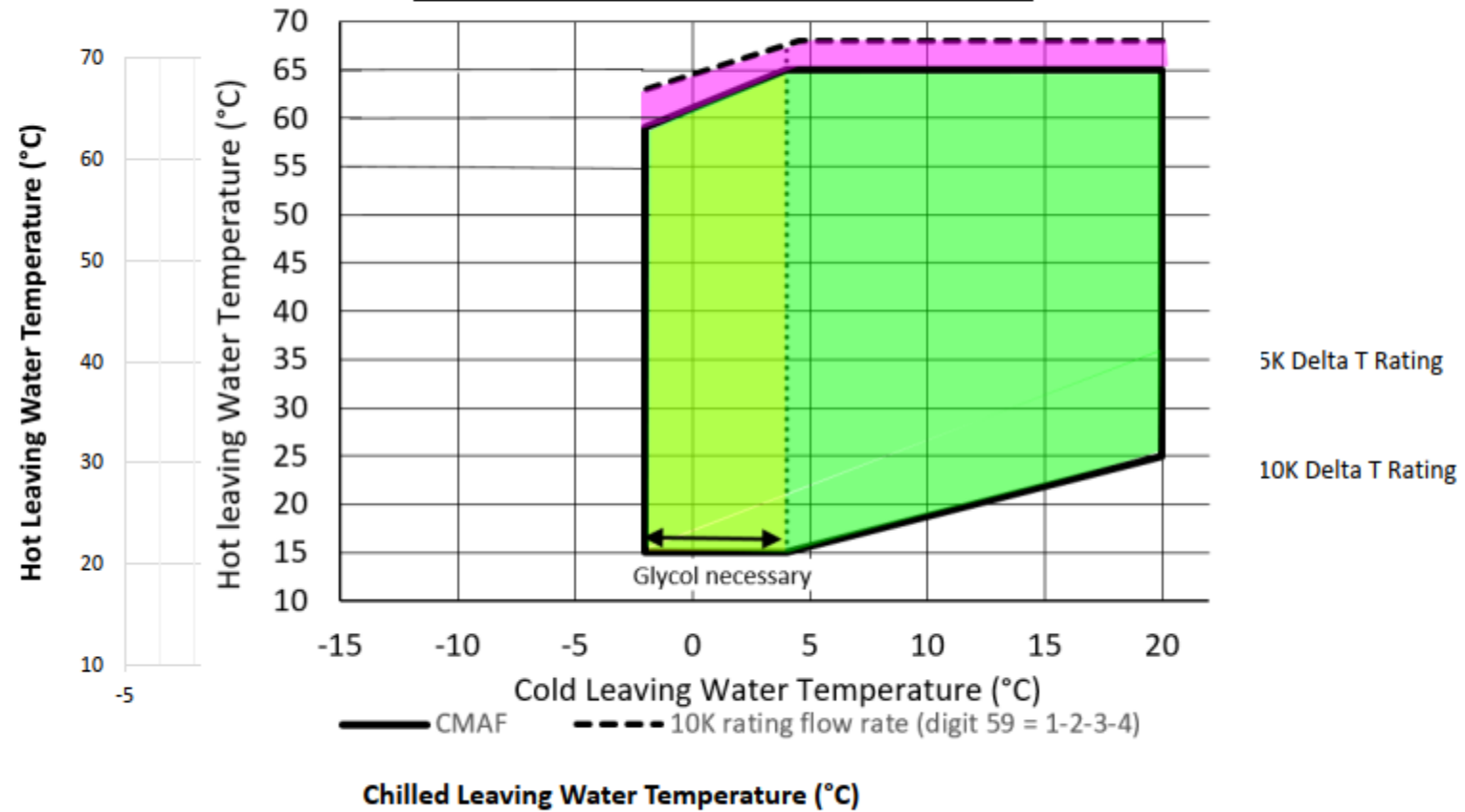
Heat pump/Heating Operating Map



Dynamic receiver optimizes efficiency & extends map up to **+66°C**

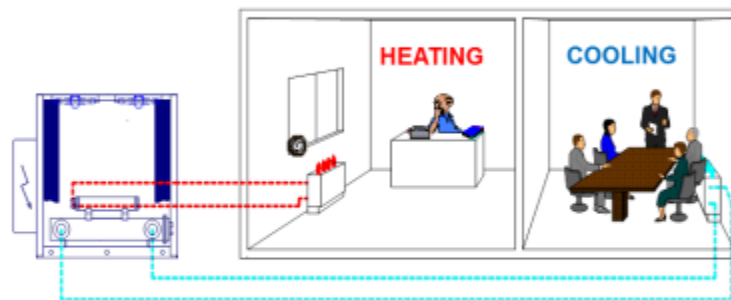
With water flow rate based on 10 K delta T we go up to **+68°C**

Heat Recovery Map



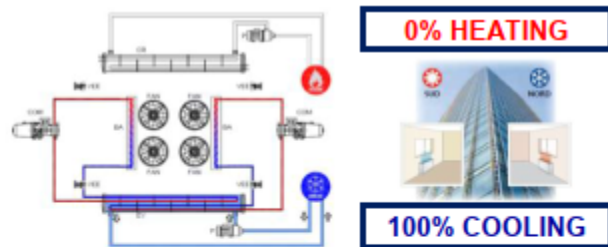
Summary of Operating Principle

**Heating & Cooling
demand at same time**



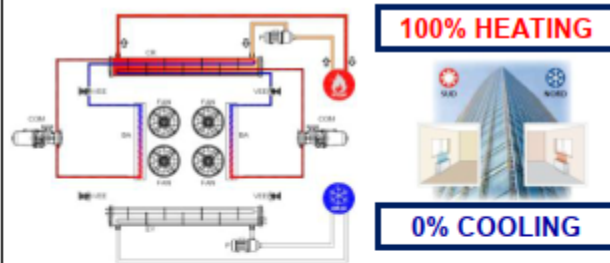
Operating principle

Mode: Chiller



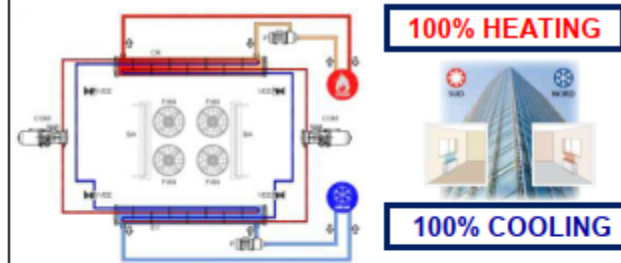
Condensor only disposes of heat

Mode: Heat Pump



**Evaporator not utilized
Separate HX for hot water**

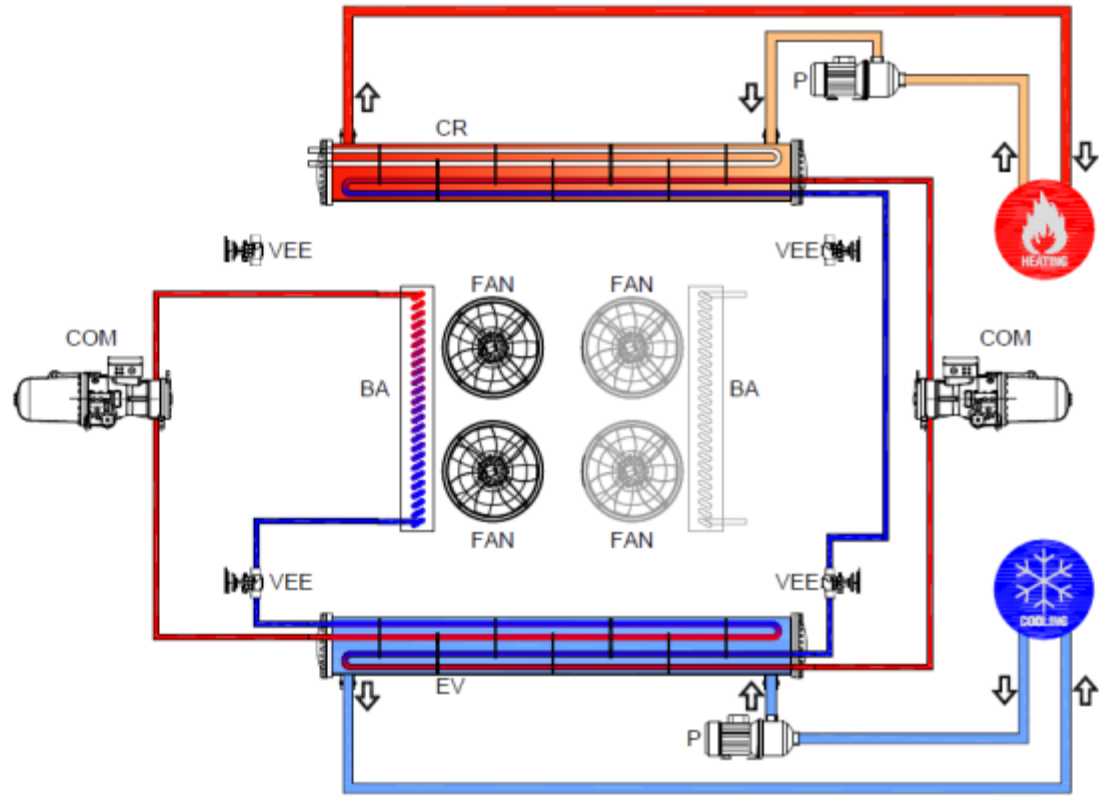
Mode: Chiller + TTL Recovery



**Condenser & evaporator fully
utilized for cooling/heating needs**

- Heating & cooling ranges simultaneously from 0 to 100%, as needed
- Differently from a traditional reversible heat pumps there are 2 separate heat exchangers for chilled and hot water production
- Available sizes: 50 - 800 kW

INTERMEDIATE OPERATING MODE



50% HEATING

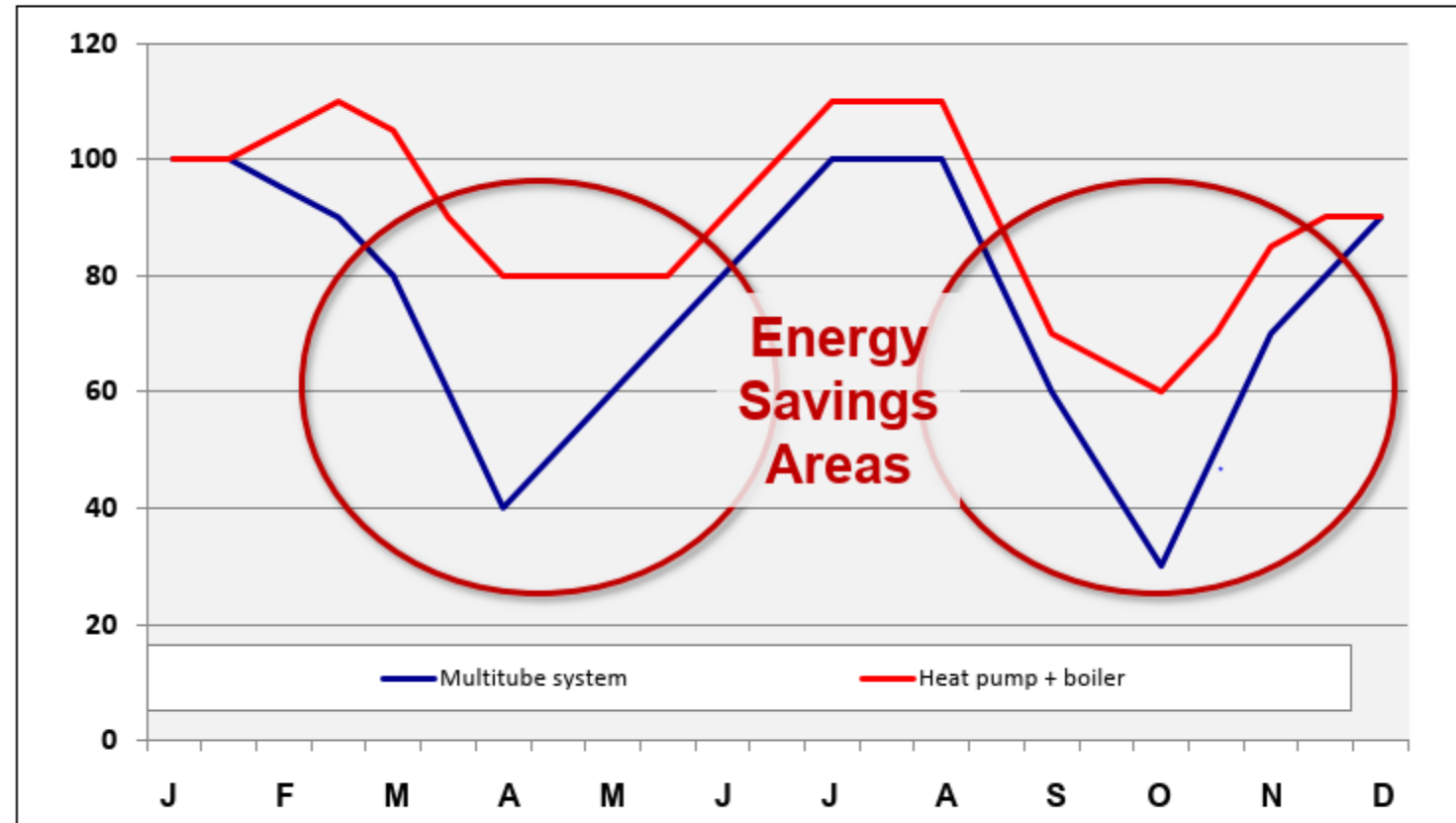


100% COOLING

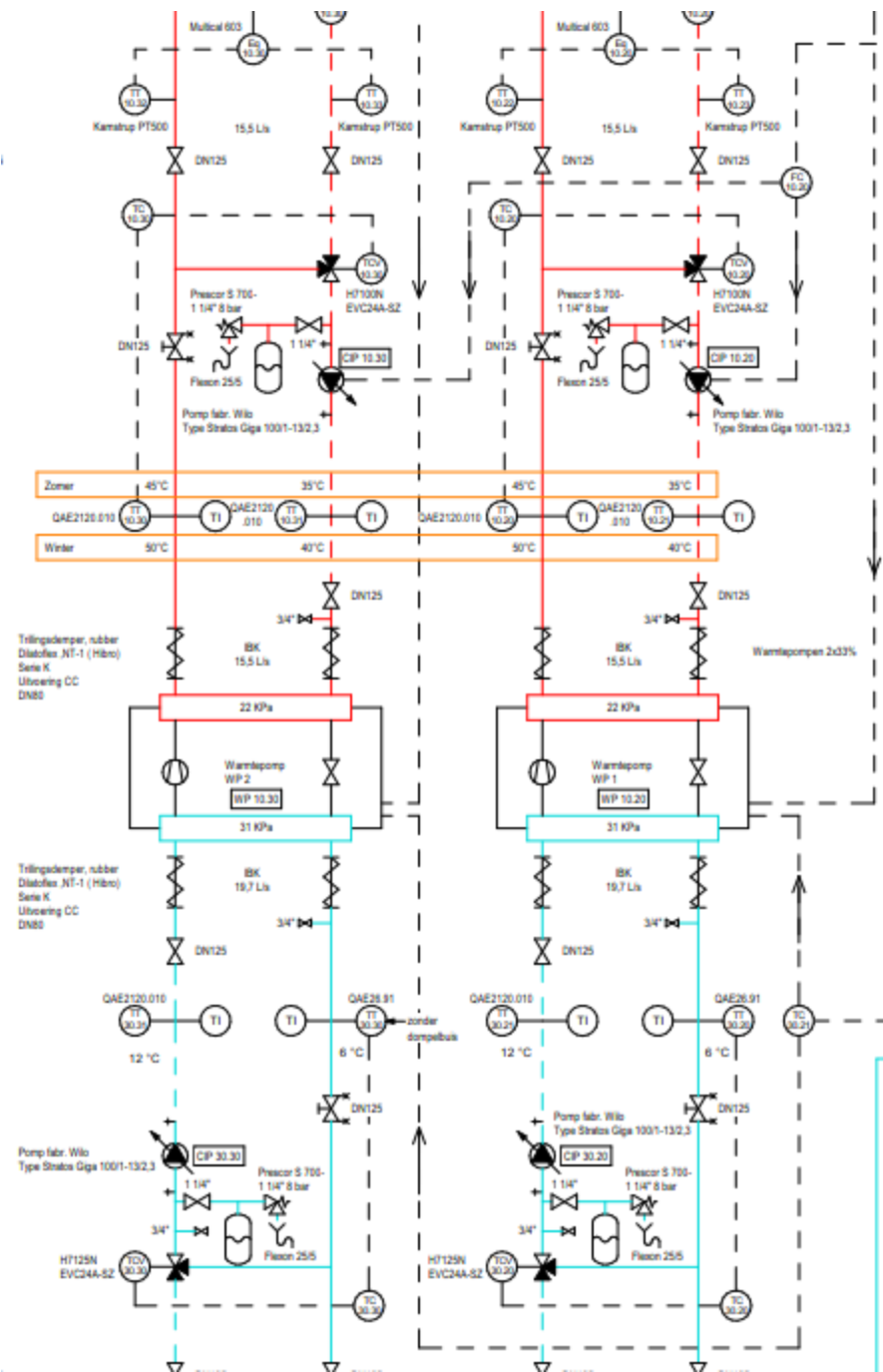
HEATING ENERGY 100% FREE OF CHARGE

BA: COILS AND FANS OF THE SECOND CIRCUIT ARE NOT WORKING

Energy Consumption



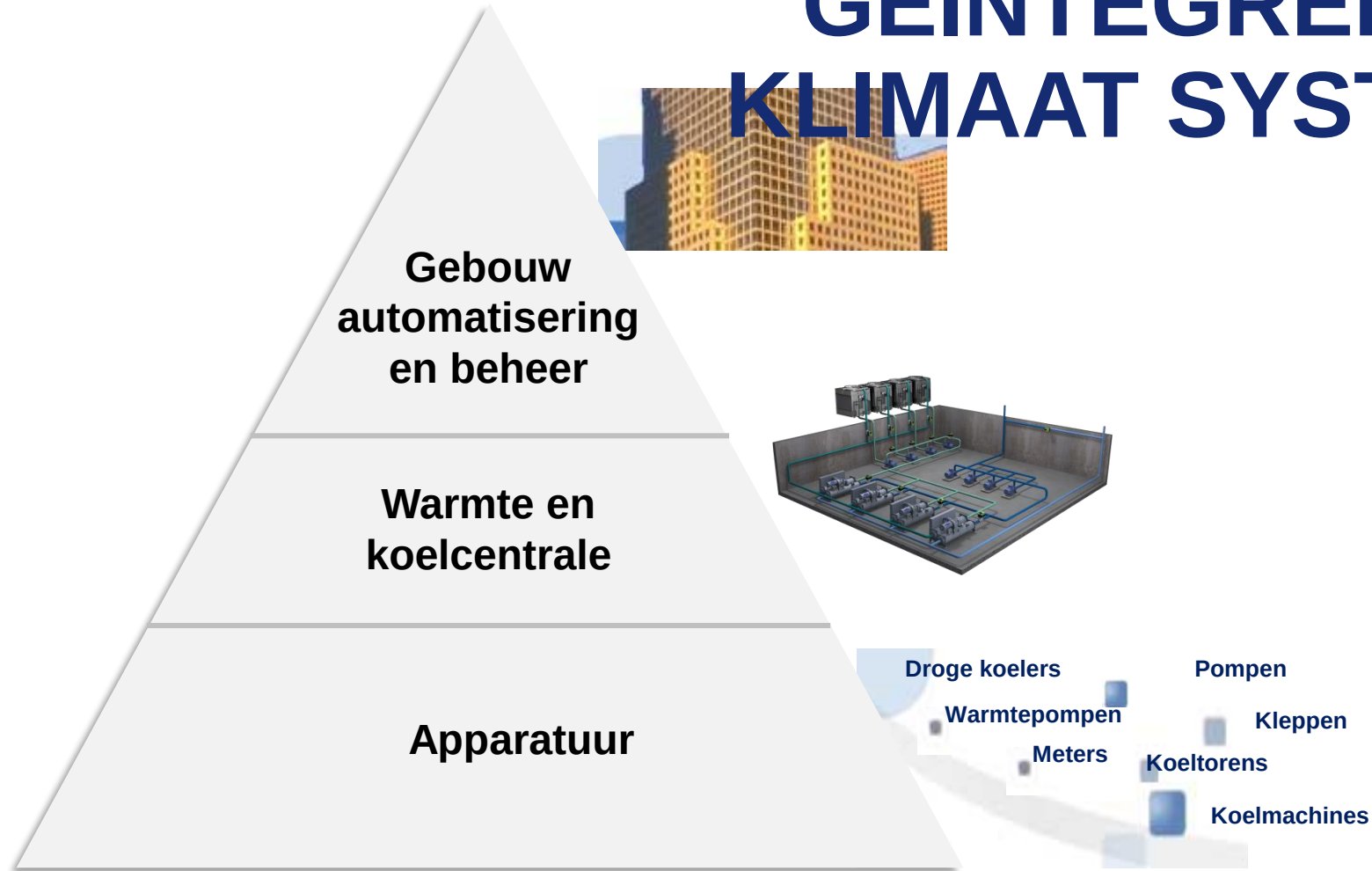
Annual energy consumption for multi-pipe systems is lower than those of comparable conventional systems



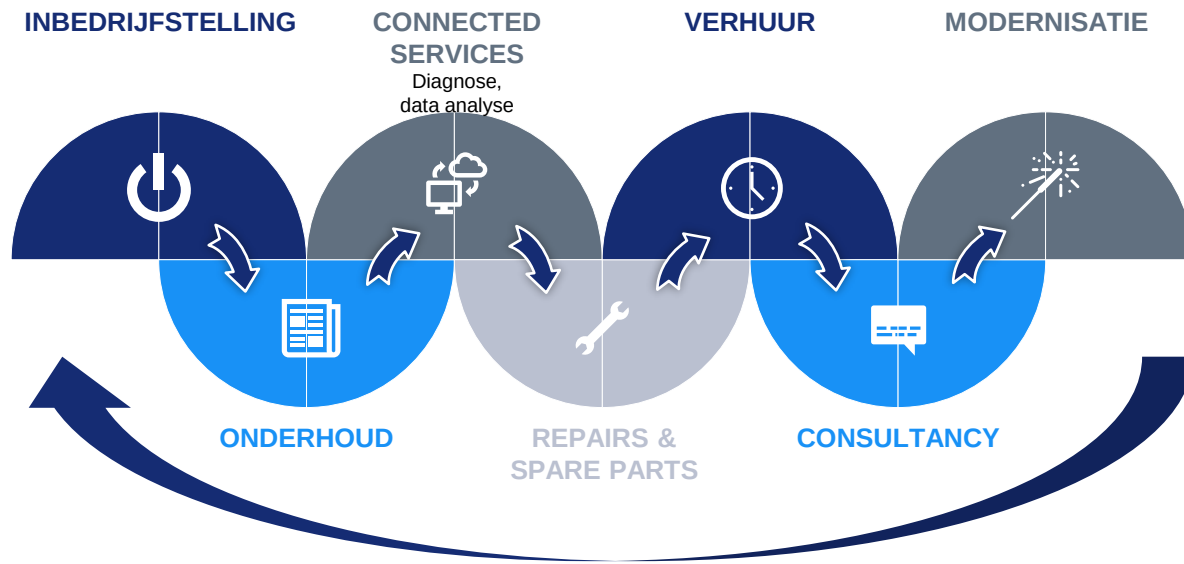
Conclusie en aanbeveling

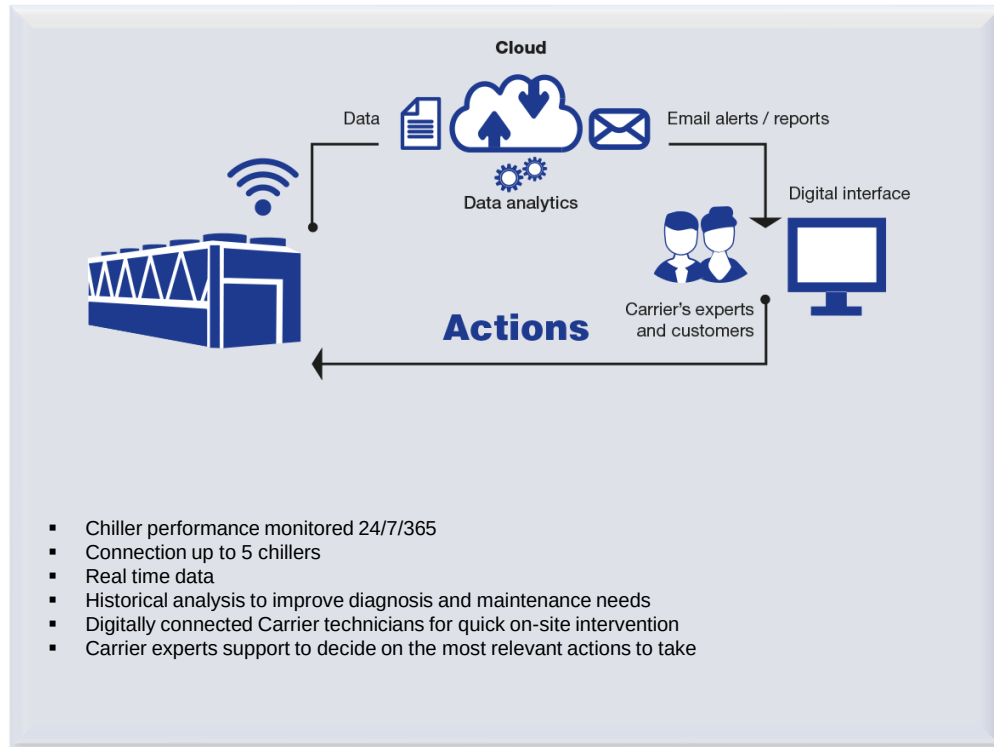
Vind een betrouwbare bron, bepaal je temperatuurniveau voor de toepassing van je nieuwe energie besparende verwarming (en gelijktijdige koeling) systeem en start met kostenbesparing.

VOOR UW GEINTEGREERDE KLIMAAT SYSTEEM



EEN OPLOSSING VOOR ELKE SITUATIE...





CONNECTED SERVICES

24/7 afstand monitoring



Proactief en vooruitkijkend onderhoud



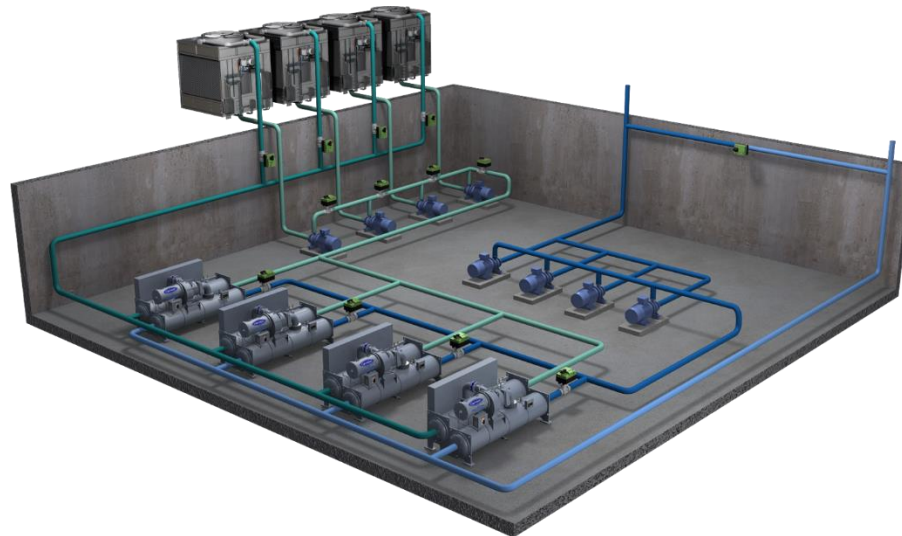
Constance monitoring



Bewezen onderhouds impact

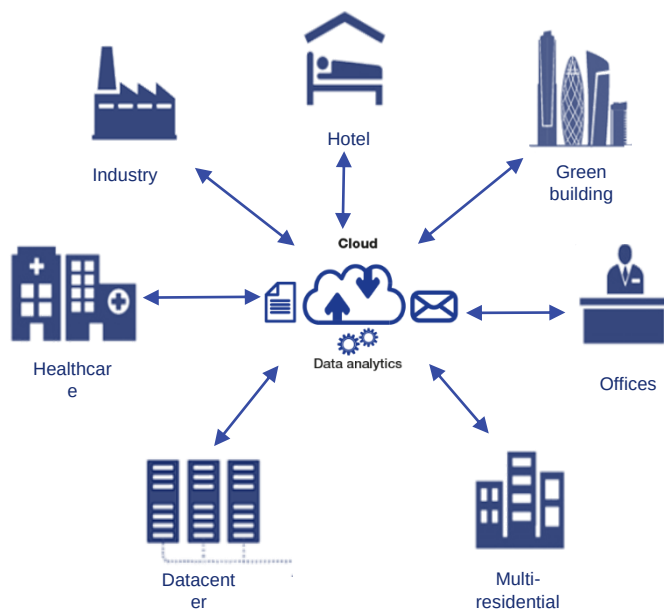


Gemakkelijke en beveiligde toegang



CONNECTED SERVICES

VOOR ALLE SOORTEN TOEPASSINGEN



Actionable reports
Voor dagelijkse sturing

Fact-based analysis
Om optimaal de centrale te blijven gebruiken

Directe en nauwkeurige data
om problemen te onderzoeken

Kaarten en diagrammen
Voor rapportage naar gebruiker

DIGITAL OFFERS

Connect your equipment to Carrier's cloud-based IoT platform, securely sharing real-time data to visualize, analyze and optimize machine health and life cycle outcomes.



PREVENTATIVE — FULL COVERAGE

CORE	ENHANCE	ELITE
An economical solution for customers with IoT-enabled equipment that collects real-time data to improve staff efficiency and reduce unplanned downtime.	Complete preventive maintenance and technical expertise including proactive monitoring of health, efficiency and performance with actionable insights to identify opportunities for reducing operating costs and avoiding failures.	Our Elite plan is the ultimate worry-free, peace of mind program for clients. Realizing building comfort, efficiency and operational goals with Carrier turn-key solutions powered by predictive analytics and OEM expertise.
BluEdge Digital*	✓	✓
24/7 Emergency Support & prioritisation	✓	✓
F- Gas compliance	✓	✓
Seasonal start up	✓	✓
Operational Inspection	+	—
Annual Preventative Maintenance	✓	+
Predictive maintenance (FPP)	+	✓
Unscheduled Repairs Parts and Labor	—	✓
Local programs	+	+

✓ INCLUDED + ADD ON — NOT INCLUDED

BLUEDGE DIGITAL

	CORE	ENHANCE	ELITE
Equipment connected to our portal	✓	✓	✓
Prioritized alarm and alert notifications	✓	✓	✓
Web/mobile real-time chiller dashboards access	—	✓	✓
Remote support on demand/request	+	✓	✓
Monthly trend report in Portal	+	✓	✓
Yearly Remote Inspection by Technician (health)	—	✓	✓
Proactive maintenance recommendations*	—	+	✓
Equipment performance & energy reports*	—	+	✓
Vibration report**	—	+	✓

BluEdge Digital Core is included with all service agreement levels.

*Availability based on product model

**Availability on request