

HALL 7A

Chillventa Specialist Forums 2022 Chillventa Fachforen 2022

CONNECTING
EXPERTS.





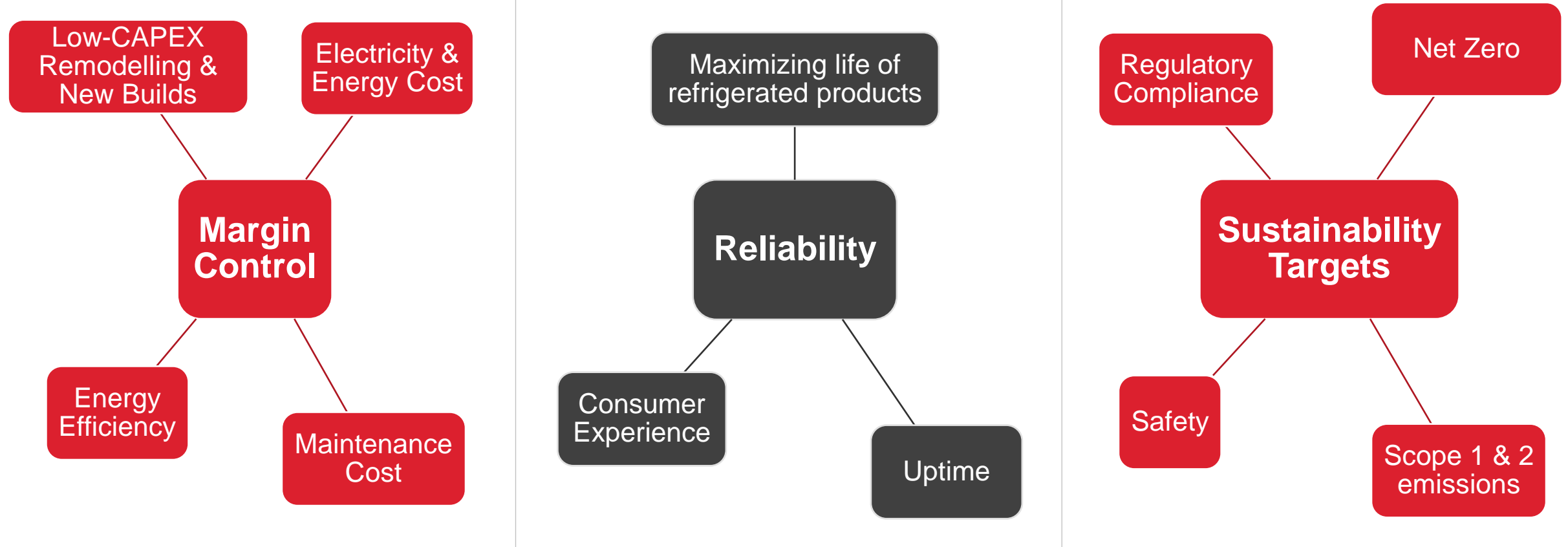
SOLSTICE® FOR RETAIL REFRIGERATION ASSETS | SOLUTIONS PRESERVING ENERGY & MAXIMIZING BOTTOM LINE

SÉBASTIEN CASTERMAN
OFFERING MANAGER REFRIGERATION EUROPE

Chillventa 2022
October 13th

Honeywell

WHAT RETAILERS EXPECT FROM THEIR REFRIGERATION ASSETS



Refrigeration is Critical to Bottom Line

HOW RETAILERS CAN OPTIMALLY MANAGE THEIR REFRIGERATION ASSETS

Existing Stores <10 Years

- Typically, this represents >80% of the estate
- Large range of age (0 to ca. 10 years)
- Various formats (convenience, supermarket, hypermarket...)
- Focus on:
 - Uptime (reliability of operation)
 - Maximization of sales revenue
 - Minimization of OPEX
 - Extension of lifetime



Keep the asset and replace the current refrigerant in the system

Stores >10 Years & New Stores

- Typically, up to 10-20% of store newbuilds each year (retiring stores being remodelled or brand-new stores)
- Some stores are being replaced by warehouses for online shopping delivery / pickup
- Focus on:
 - CAPEX minimization, including the possibility to re-use available equipment / components
 - Ensuring that the new assets will generate minimum OPEX during operation
 - Making sure that the new assets will run reliably and maximize uptime

Decide for new asset using a refrigerant supporting reliability, energy preservation and minimum CAPEX

Refrigeration Assets Require Specific Solutions Based on Format & Age

NEW ASSETS & REMODELLING | SOLSTICE® L40X (R-455A) & SOLSTICE N71 (R-471A)

Food Service & Small Independent Stores



Solstice L40X (R-455A)
Condensing Units,
Integral Systems
(Medium + Low Temp)

Convenience Stores (<600 sqm.)



Solstice L40X (R-455A)
Condensing Units,
Integral Systems
(Medium + Low Temp)

Small & Medium-Size Stores (600-2,000 sqm.)



Solstice L40X (R-455A)
Semi-Centralized
Condensing Units
(Medium + Low Temp)

Large Stores (>2,000 sqm.)



Solstice N71 (R-471A)
Centralized Rack
(Med Temp) +
Solstice L40X (R-455A)
(Low Temp)

Solutions for Reliable & Sustainable New Stores

SOLSTICE® L40X (R-455A) | THE PROVEN SOLUTION FOR MEDIUM & LOW TEMP. IN NEW SYSTEMS

Features	Applications	Installations
<ul style="list-style-type: none"> • Composition : R-1234yf / R-32 / R-744 (75,5 / 21,5 / 3%) • GWP = 148 (IPCC4), 146 (IPPC5) • A2L • Medium & Low Temperature • COP 6% to 10% higher than R-404A • T (critical) = 85,6°C (+14,4°C vs R-404A) 	<ul style="list-style-type: none"> • Butcheries, Bakeries, Groceries (display cabinets, cold rooms) • Restaurants & Food Service • Convenience Stores, Supermarkets • Warehouses • Laboratories • Food processing... 	<ul style="list-style-type: none"> • Condensing units & semi-centralized systems • Plug-ins, integral systems • Monobloc systems • DX Racks • Waterloop-condensing systems • Chillers...



REFERENCES IN FOOD RETAIL STORES

Solstice® L40X
(R-455A)

Central England Co-Op

- 280 m²
- All refrigeration systems on Solstice® L40X (R-455A) incl. coldrooms
- 13% lower lifetime emissions vs. CO₂ transcritical system, at 23% lower TCO (total cost of ownership)



Sorli (Spain)

- 1200 m²
- 30 kW total capacity covered by 3 condensing units (scroll)
- 13% lower lifetime emissions vs. CO₂ transcritical system, at 16% lower TCO (total cost of ownership)



Edeka Group (Germany)

- 1200 m², 30m of display cabinets, 20 plug-in hybrid freezers, 2 cold rooms
- Heat recovery: 40% lower energy consumption than plug-in systems without heat recovery
- Decentralized modules: Highly reliable and flexible system, 35% lower investment costs than CO₂ system



Delhaize (Belgium)

- 1600 m²
- 10 kW total capacity (20m MT cabinets)
- Store owner: "Low GWP (<150) solution is considered future-proof; CO₂ not an option due to high cost."



Convincing Retailers on Cost, Reliability & Sustainability

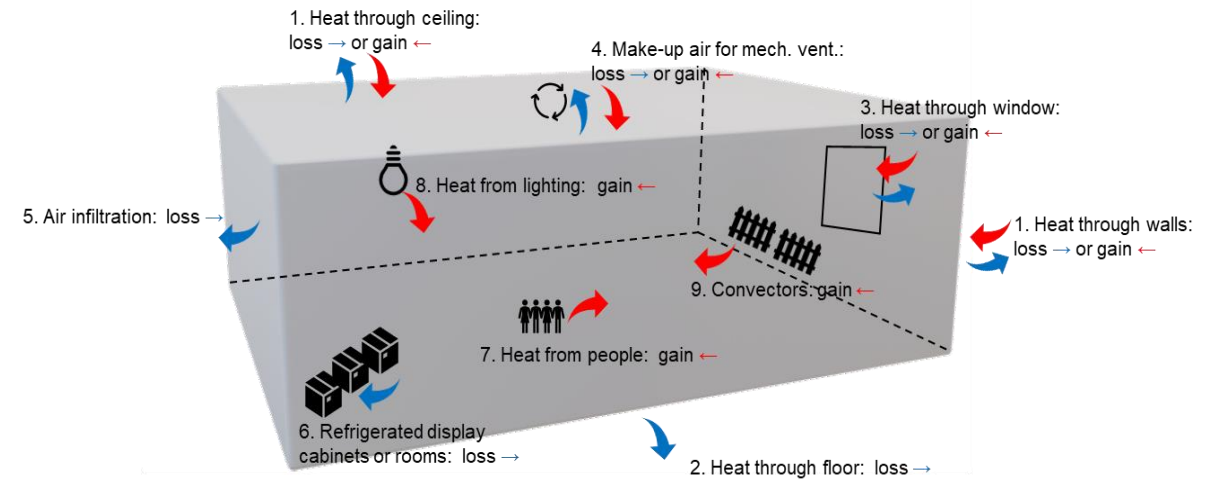
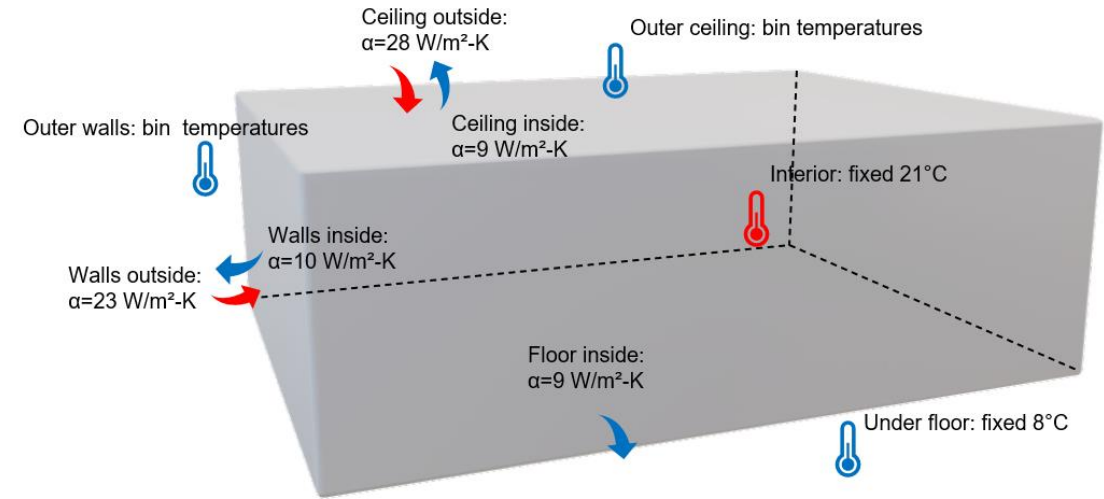
HEAT RECOVERY WITH SOLSTICE® L40X (R-455A) | CASE STUDY ON 1,000 SQM. STORE

Store Details

- London, UK
- Installed cooling capacity: MT 100 kW, LT 14 kW
- Heating needs: 209,818 kWh | Water network 35/30°C
- Hot water needs: 119,866 kWh
- Water inlet 5°C / outlet 60°C
- Life cycle: 15 years

Heat Recovery Scenario

- Covering hot water needs first
- Remaining available heat is used for heating needs
- Gas boiler is used to cover the remaining needs

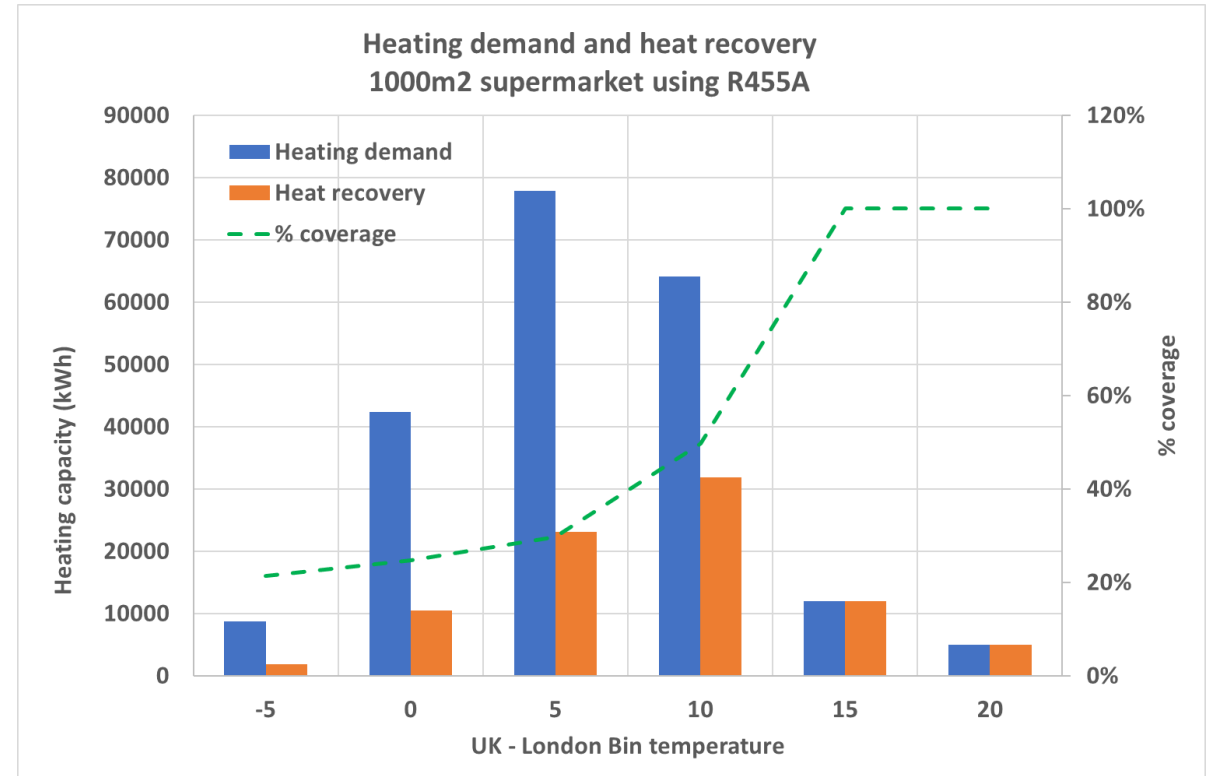


HEAT RECOVERY WITH SOLSTICE® L40X (R-455A) |

CASE STUDY ON 1,000 SQM. STORE

Consumption *	w/o Heat Recovery	with Heat Recovery
Electricity (kWh elec.)		
MT	2,119,000	
LT	670,000	
Gas Boiler (kWh heat)		
Heating	209,815	125,000 Coverage 40%
Hot water	119,866	0 Coverage 100%

* Honeywell simulation based on assumptions listed on previous slide



Coverage of heating demand by heat recovery decreases at lower ambient temperature

Heat recovery can cover full heating demand at 15°C ambient or higher

NEW ASSETS & REMODELLING | SOLSTICE® L40X (R-455A) & SOLSTICE N71 (R-471A)

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Centralized Rack (Med Temp) +
Solstice L40X (R-455A)
(Low Temp)

Solutions for Reliable & Sustainable New Stores

SOLSTICE® N71 (R-471A) | SNAPSHOT

Features & Benefits

GWP<150: Compliant with international regulations

Class A1 / Non-flammable:

- Possibility to use in DX systems w/o charge limitation on flammability
- Same handling, storage & transportation as other low-pressure, A1 refrigerants

High efficiency i.e. lower electricity consumption:

- Similar to R-134a
- 15-30% improved energy efficiency vs. R-404A*
- 20-30% improved energy efficiency vs. CO₂*

Low pressure: Low leaks, minimal recharge volumes

Similar system technology to R-134a:

- Standard service practices
- Traditional contractor base

* Calculations based on bin temperatures for representative cities for low-, medium- and high-ambient conditions to calculate annual weighted COP. Example architecture utilized R-471A in medium temperature with cascaded R-455A in low temperature.

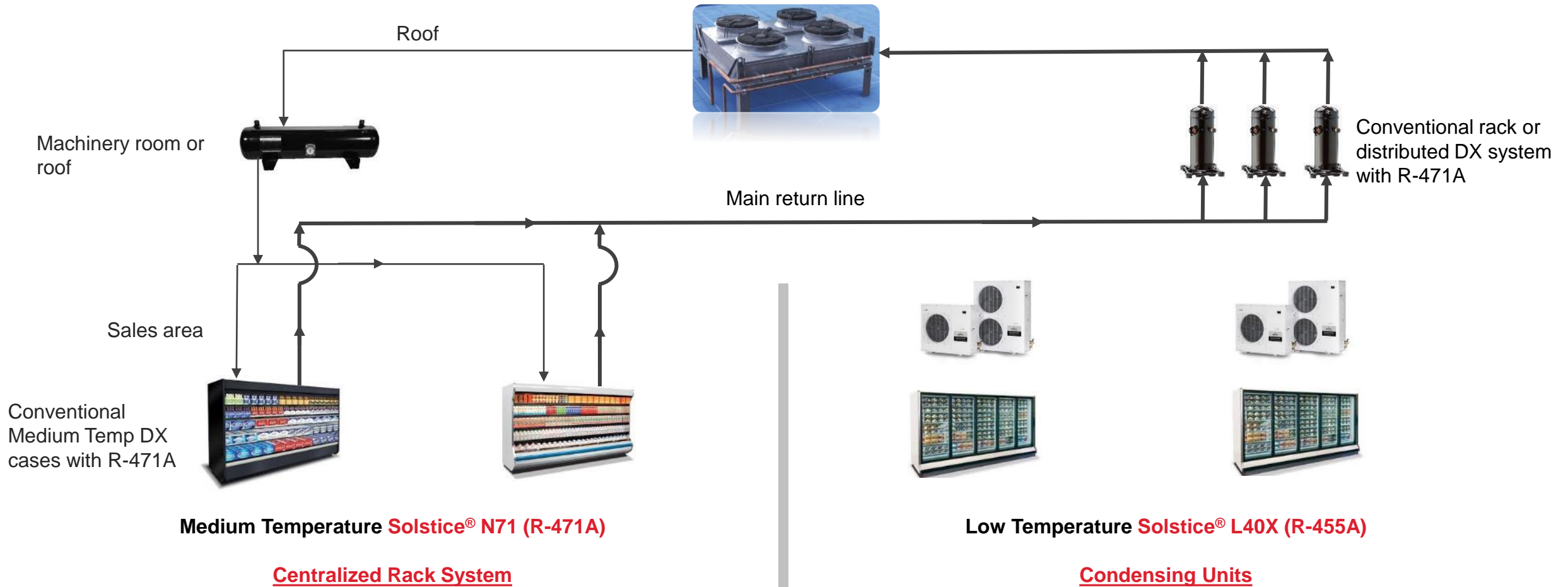
Ready for Store Trials

- On track for commercialization in 2023
- Qualification ongoing with OEMs & component manufacturers
- Available for sampling and store pilot trials

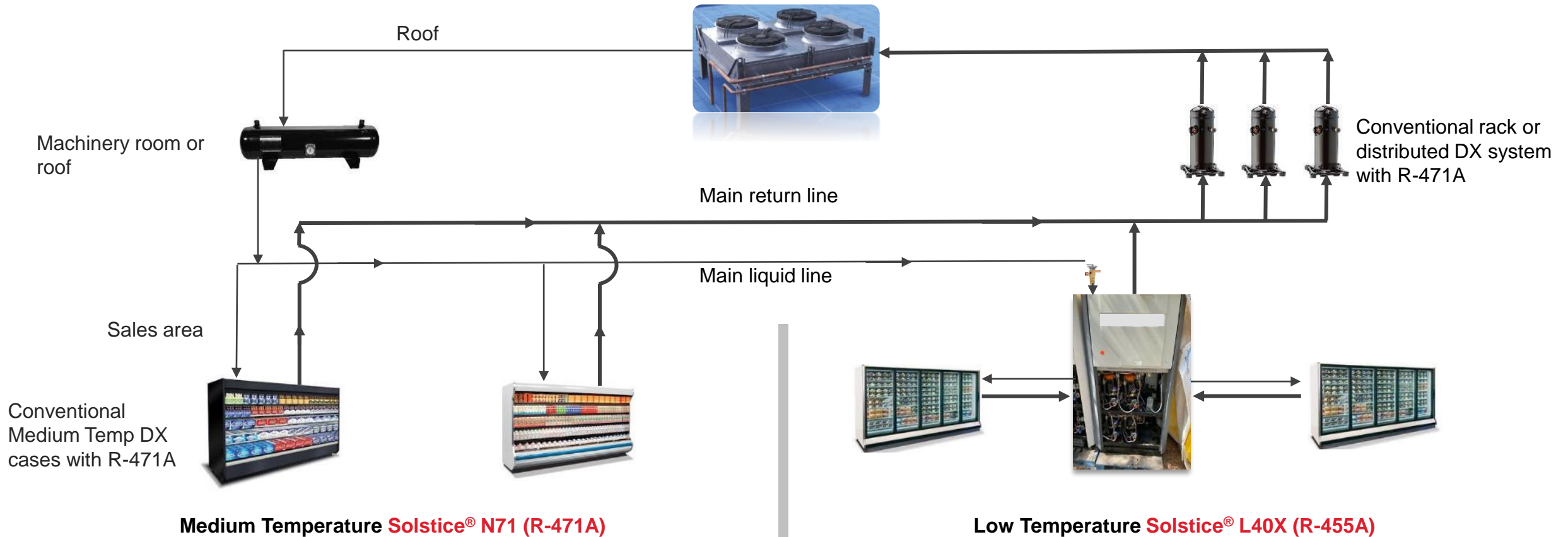
Properties	R-471A
Composition (by weight)	R-1234ze / R-1336mzzE / R-227ea (78.7 / 17 / 4.3 %)
GWP	148
Safety class	ASHRAE A1
Critical temperature	112°C
Discharge temperature	79.1°C
Glide at 1,013 bar	3.3 K
Boiling point	-16.9°C

These are just some of a mosaic of properties that must be considered in selecting a refrigerant

ARCHITECTURE (A) FOR LARGE RETAIL STORE



ARCHITECTURE (B) FOR LARGE RETAIL STORE



Centralized Rack System

Micro-cascade System

- Self-contained or distributed systems reject heat to medium temp circuit
- Low charge systems
- Cascade concept typically helps improve efficiency
- Systems can be optimized for one operating condition year-round

ECO-EFFICIENCY SIMULATION* | 2,000 SQM.

Solution	CAPEX (kEUR)	OPEX Electricity + Service (kEUR)	TCO CAPEX + OPEX (kEUR)	Energy Consumption (millions of kWh)	Total Carbon Footprint (t CO ₂ e)
<u>R-471A (N71)</u> Centralized Rack (Med Temp) + <u>R-455A (L40X)</u> Condensing Units (Low Temp)	248	973	1,226	1.92	838
<u>R-744 (CO₂)</u> Transcritical Booster System	317	1,145	1,466	2.25	969
Delta in favour of R-471A	69 kEUR	172 kEUR	240 kEUR	0.33 million kWh	131 t CO₂e

* Simulation conducted with the Eco-Efficiency Model, based on specific assumptions (see back-up) and 10-year system operating period. Honeywell can conduct a simulation reflecting accurately your own situation and investment options.

ECO-EFFICIENCY SIMULATION* | 8,000 SQM.

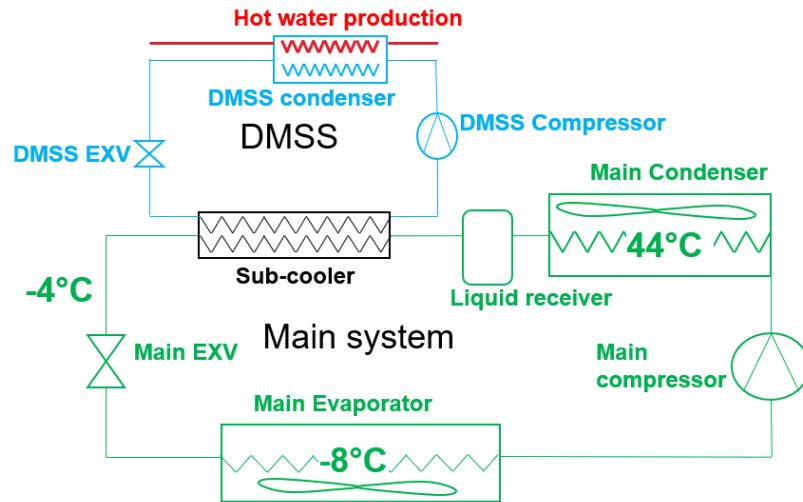
Solution	CAPEX (kEUR)	OPEX Electricity + Service (kEUR)	TCO CAPEX + OPEX (kEUR)	Energy Consumption (millions of kWh)	Total Carbon Footprint (t CO ₂ e)
<u>R-471A (N71)</u> Centralized Rack (Med Temp) + <u>R-455A (L40X)</u> Condensing Units (Low Temp)	1,155	5,344	6,526	10.62	4,640
<u>R-744 (CO₂)</u> Transcritical Booster System	1,259	6,388	7,670	12.68	5,453
Delta in favour of R-471A	104 kEUR	1,044 kEUR	1,144 kEUR	2.06 million kWh	813 t CO₂e

* Simulation conducted with the Eco-Efficiency Model, based on specific assumptions (see back-up) and 10-year system operating period. Honeywell can conduct a simulation reflecting accurately your own situation and investment options.

FURTHER DEVELOPMENTS AROUND SOLSTICE® N71 (R-471A)

Deep-Subcooling

- **Dedicated Mechanical Sub-Cooling System (DMSS):**
 - sub-cools liquid in the outlet of the liquid receiver of the main system
 - increases cooling capacity of the main system without increasing the mass flow
 - drives system performance in function of the cooling demand
 - represents an additional opportunity for heat recovery
- **Preliminary Results*:**
 - DMSS can increase initial cooling capacity by up to 64%
 - COP can be increased by a factor between 10 and 30% (there is an optimum subcooling to get maximum COP)
 - DMSS can produce hot water with a higher COP than the main system



* Properties at -8°C / 45°C

Low-CAPEX Store Remodelling

- Remodelling of existing stores to R-471A with minor and low-CAPEX modifications (operating conditions, system enhancements, re-use of components & equipment)
- Indirect systems using chiller technologies, covering refrigeration + HVAC
- Plug&Play / Rental models

SOLSTICE® ENGINEERED REFRIGERANTS IN RETAIL | WHY?

Energy Preservation

For each format and age of asset, there is a Solstice solution ensuring minimization of energy consumption.

- Primary energy need & heat recovery
- Alternative models like Cooling-on-demand / CaaS will favor most efficient technologies
- Critical to use technologies which support further significant efficiency gains

Cost Minimization

For each format of asset, there is a Solstice solution ensuring minimization of the Total Cost of Ownership – the only valid reference for cost-effectiveness.

- CAPEX minimization thru retrofits of assets & remodelling with re-use of components
- OPEX minimization thru low energy consumption & low maintenance cost (simplicity of system design & availability of large contractor base)

Revenue Maximization

Solstice solutions make systems operate reliably, safely and maximize uptime.

- Low working pressure levels
- Reduced time needed to remodel and re-open an asset
- Minimum risk of system failure and food loss (and related CO₂ emissions), even at high ambient temperatures
- Critical to use resilient technologies: What happens in case of power outage?

Solstice® Helps Preserve Energy & Maximize Bottom Line

THANK YOU

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