

Case Study: small and medium format commercial refrigeration

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Heating systems  
Industrial systems  
Refrigeration systems ◀

## ESyCool green – Integrated Energy System for food retail

26.9.2017

## Key priorities for future sustainable food retail stores



**Architecture with environmentally friendly building material (incl. utilization of natural daylight and rainwater)**

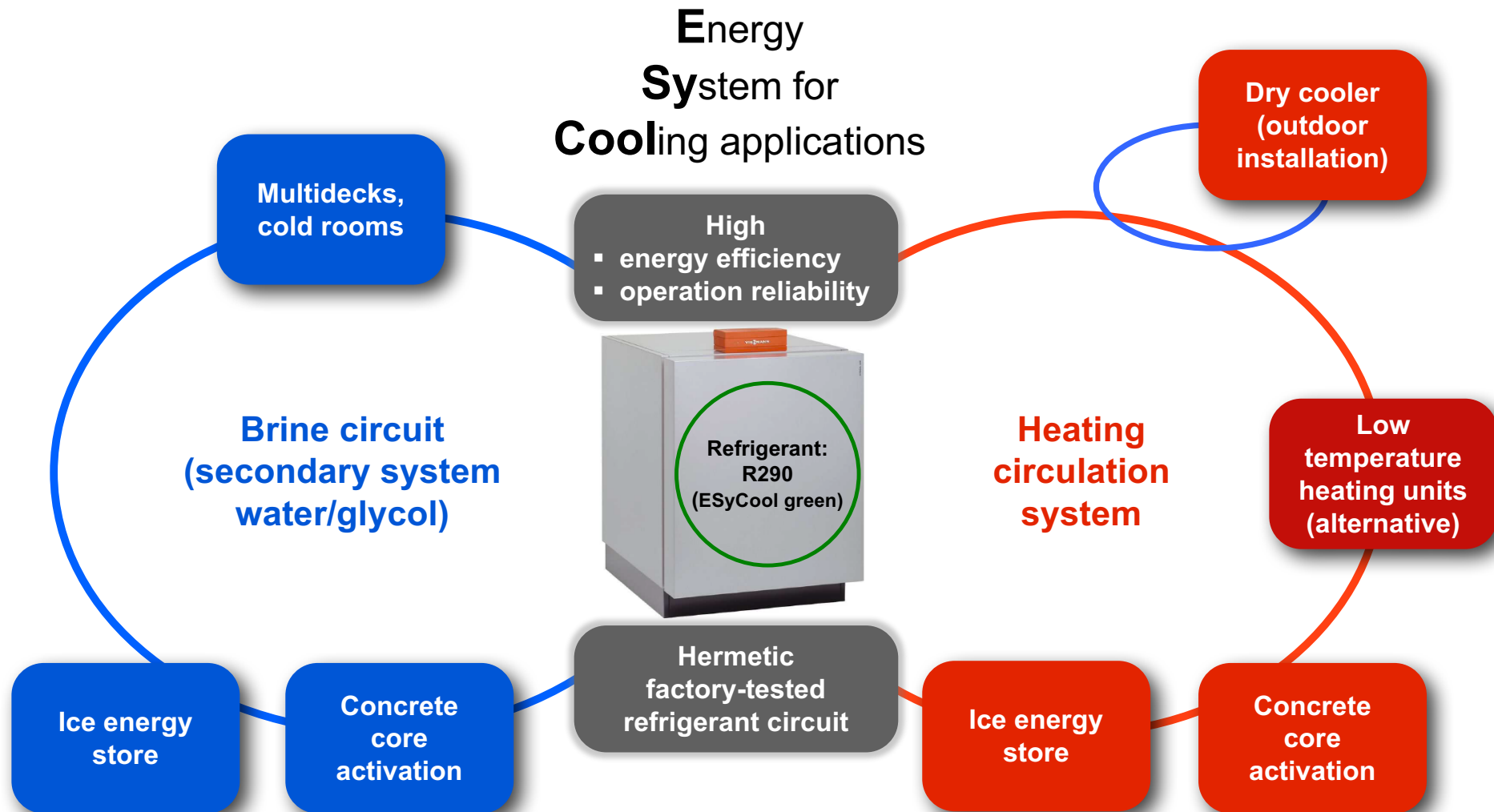


**Energy efficient integration of refrigeration, A/C, heating and ventilation systems w/o CO<sub>2</sub> emission / footprint**



**Systems for production and storage of renewable energy (plus minimal share green electricity from national grid)**

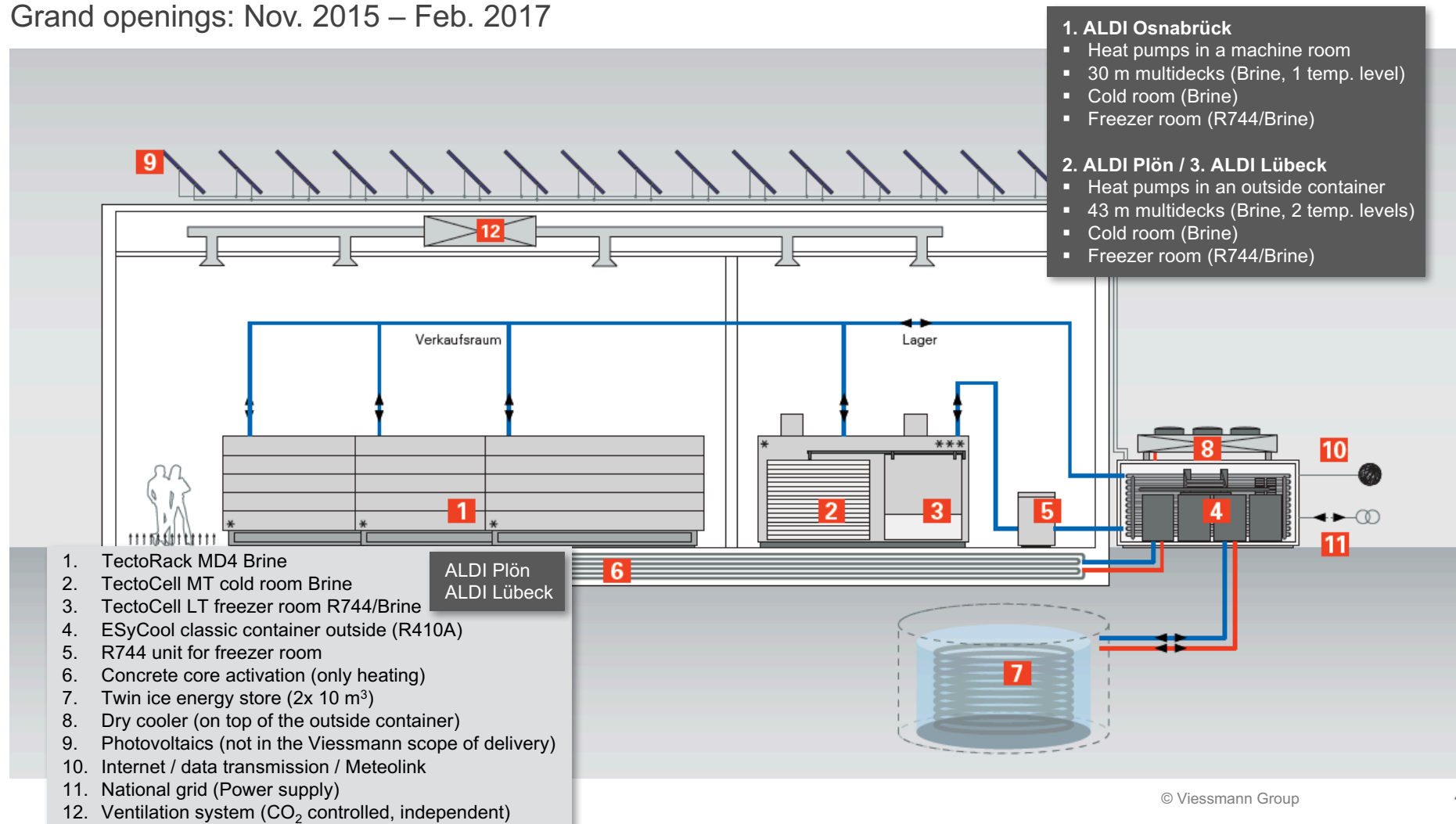
## The "Power Unit" of ESyCool green: Vitocal Heat Pump (R290)



# System configuration, ALDI Nord pilot stores, Germany

Concept proof: 3 test stores with series HP Vitocal 300-G and Vitocal 350-G (R410A)

Grand openings: Nov. 2015 – Feb. 2017



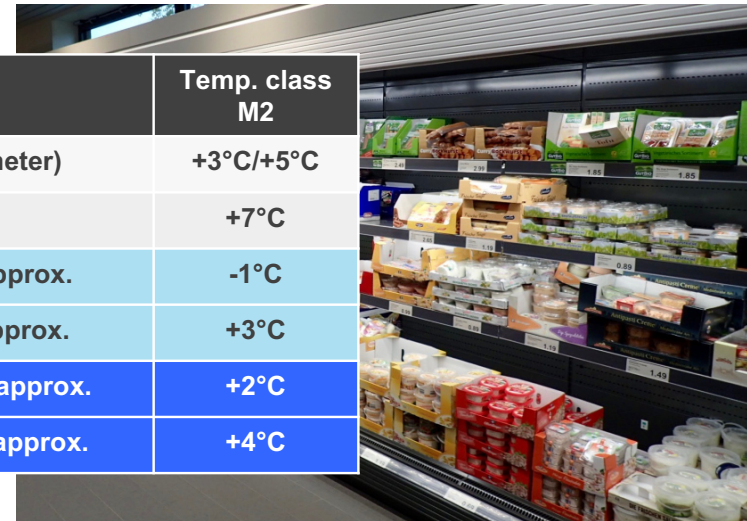
# Optimized TectoDeck MD 4 Brine, ALDI Nord pilot stores

Thermodynamic optimized  
brine heat exchanger  
+  
integrated high-efficiency  
brine pump

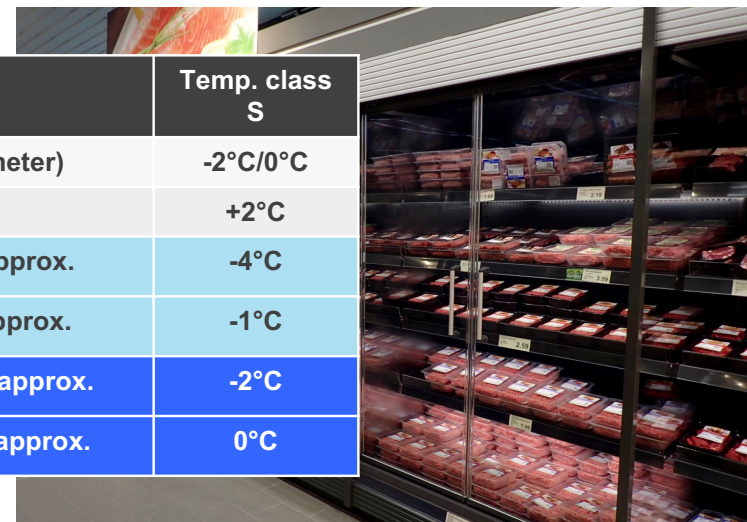
### Advantages:

- **Constant and stable air stream (air curtain) and product temperatures**
- **High operation reliability** due to the cold storage effect of the brine
- **Avoidance of flammable or toxic refrigerants** in the shop

Dairy, sausages, delicatessen	Temp. class M2
Average air temperature (thermometer)	+3°C/+5°C
Maximum product temperature	+7°C
Supply temperature brine (day), approx.	-1°C
Return temperature brine (day), approx.	+3°C
Supply temperature brine (night), approx.	+2°C
Return temperature brine (night), approx.	+4°C

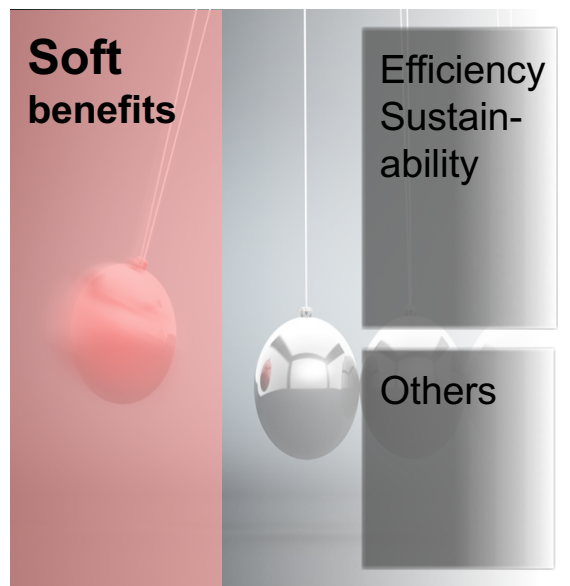


Minced meat, fish	Temp. class S
Average air temperature (thermometer)	-2°C/0°C
Maximum product temperature	+2°C
Supply temperature brine (day), approx.	-4°C
Return temperature brine (day), approx.	-1°C
Supply temperature brine (night), approx.	-2°C
Return temperature brine (night), approx.	0°C



# Targets/benefits: ESyCool vs. Direct Expansion (DX) Systems

<b>Hard benefits</b>	541654	12354	CapEx
	14561	32165	
	102346	3211654	
	5878651	8454845	
	1879	9854	
<b>OpEx</b>	7894651		OpEx
	965	8544562	
	12314	95154	
	968745	951753	
	36985	6312145	

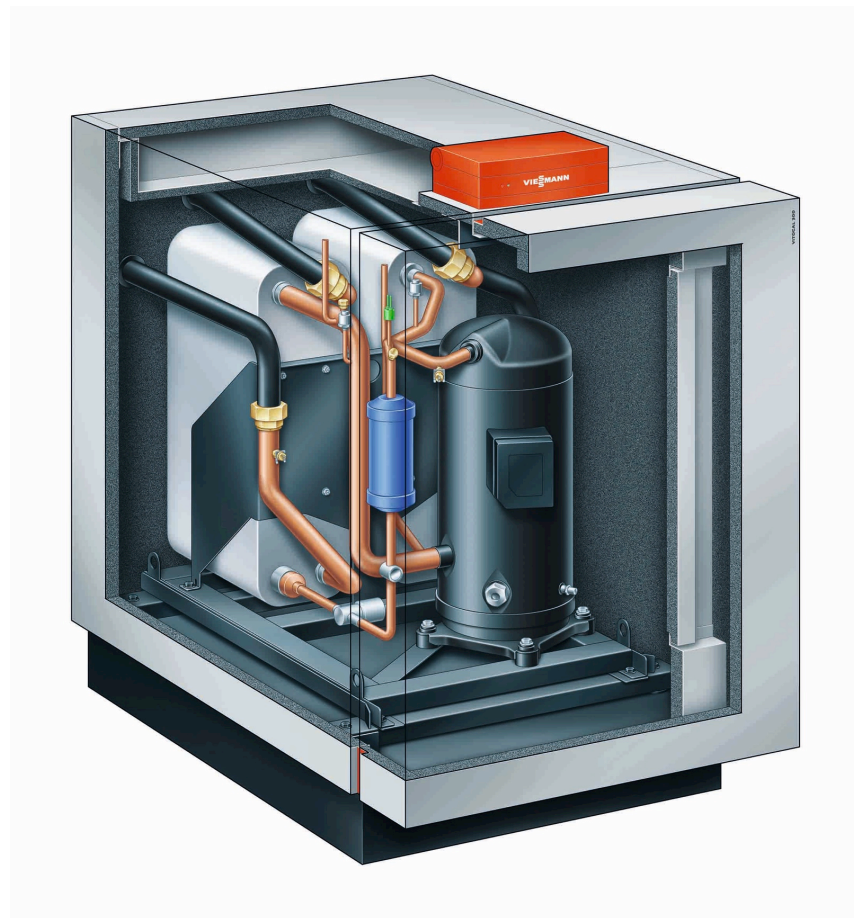
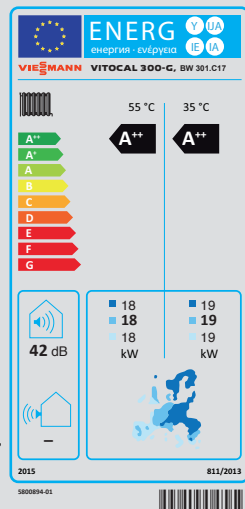


With regard to the cooperation contract ALDI Nord/Viessmann (signed at EuroShop 2017) the 1st ESyCool green (R290) store will open end of Q1.2018

- **Capital investment** on a comparable level
- **Lower electrical energy consumption**  
Savings defined by ALDI Nord: >10% per year
- **Service costs** (full service contract) now projectable
- Maximum use of **renewable energy**
- **Natural refrigerant** (in future with ESyCool green)
- 90-95% less **refrigerant charge** (w/o leakages)
- Smoother **loading profile** with lower peaks
- Higher **flexibility** to optimize the functionality (energy management)
- Improved **future orientation** (smart meter, smart grids etc.)
- Higher **temperature stability**/higher **food quality**
- Higher **reliability of operation**/less losses of goods
- Higher comfort by using **natural cooling** in the building
- Higher **flexibility** to change/extend multideck length
- **Avoidance of flammable or toxic refrigerants** in the shop

# Vitocal 300-G, brine/water HP, R290 (Propane)

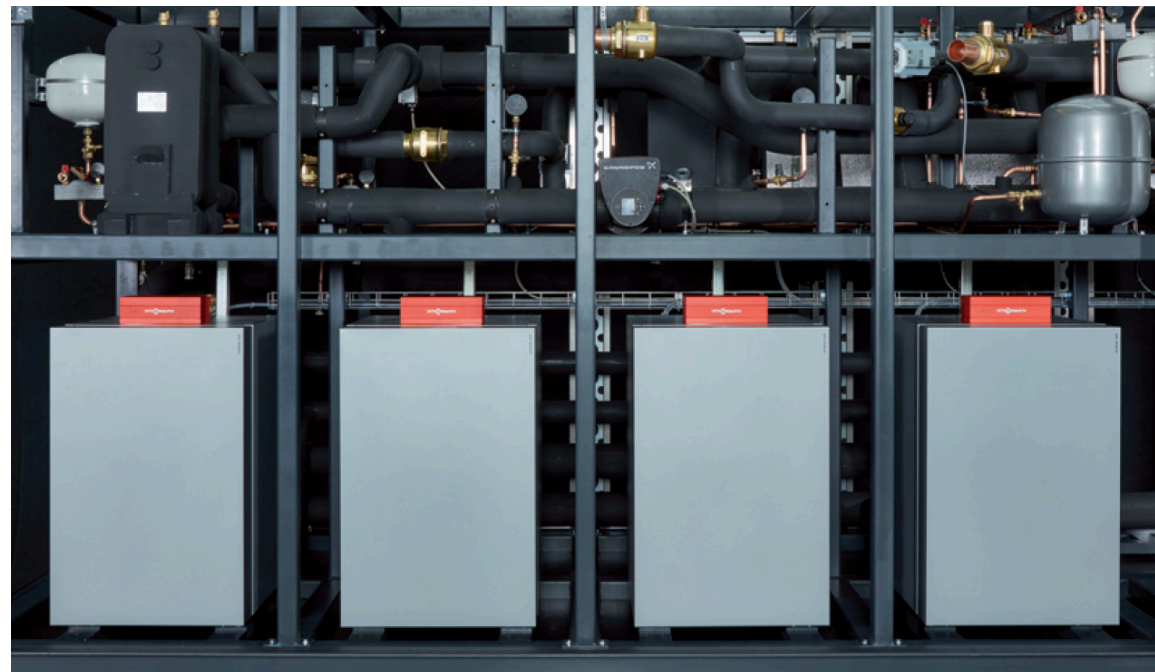
- **Vitocal 300-G**
  - Type: BW 301.C17
- **Energy efficiency category**
  - A++
- **Technical data (0°C/35°C, EN 14511 )**
  - Refrigeration capacity: 14.57 kW
  - Heating capacity: 18.33 kW
  - Performance number (COP): 4.47
  - Refrigerant charge: 1.2 kg
- **Main changes (vs. R410A)**
  - Scroll Compressor (R290 approved)
  - Condenser
  - Internal heat exchanger
  - Internal electric
  - Case sealing
  - Explosion-protected refrigeration components
  - System controller
- **Development / certification of ESyCool green container**  
by Viessmann in cooperation with TEKO, Germany



# Future ESyCool green structure

ESyCool green Basic	ESyCool green Integral	ESyCool green Integral + Solar Storage
Refrigeration	Refrigeration	Refrigeration
	Space heating	Space heating
		Photovoltaics + Energy storage („Power2Ice“ / „Power2Battery“)

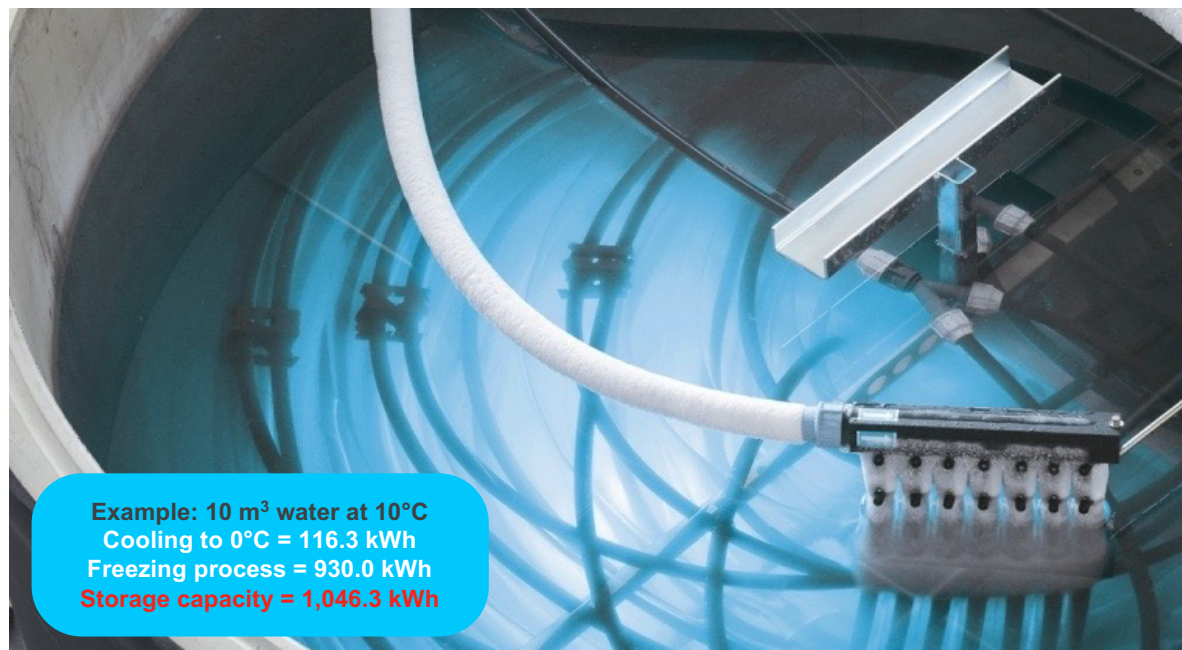
- Parallel connection of **hermetic series heat pumps** with a low charge of **natural refrigerant Propane** (R290).
- **Hydraulic module** to distribute cold brine medium for the refrigerated cabinets and cold rooms and to supply warm water for heating (concrete core activation) or for heat release (dry cooler).
- **Switchboard with electronic control system** to operate efficient and reliable (including data transmission via Internet for monitoring).
- **Factory assembled and certified outside container** (including automatic propane supervision) ready for connection on-site.





## Ice energy store as a "thermal battery"

- Ice energy store as a „**heat battery**“ (heat source) for the building in winter operation. HP-cascade extract thermal energy from the water tank, if heat requirement is higher than the available heat from cabinets and/or cold rooms.
- Ice energy store function as a „**cooling battery**“ (heat sink) for the building in summer operation. Cold water circulation without HP operation („natural cooling“ of the building).
- Ice energy store function as a „**cooling battery**“ (heat sink) for the cabinets and cold rooms. Cold water circulation without HP operation („natural cooling“ of the cabinets and cold rooms, especially during the night when the MD are closed).
- It's also possible to buffer solar power by loading the ice energy store with the HP powered by PV („**Power2Ice**“).



# Future energy solutions for food retail stores



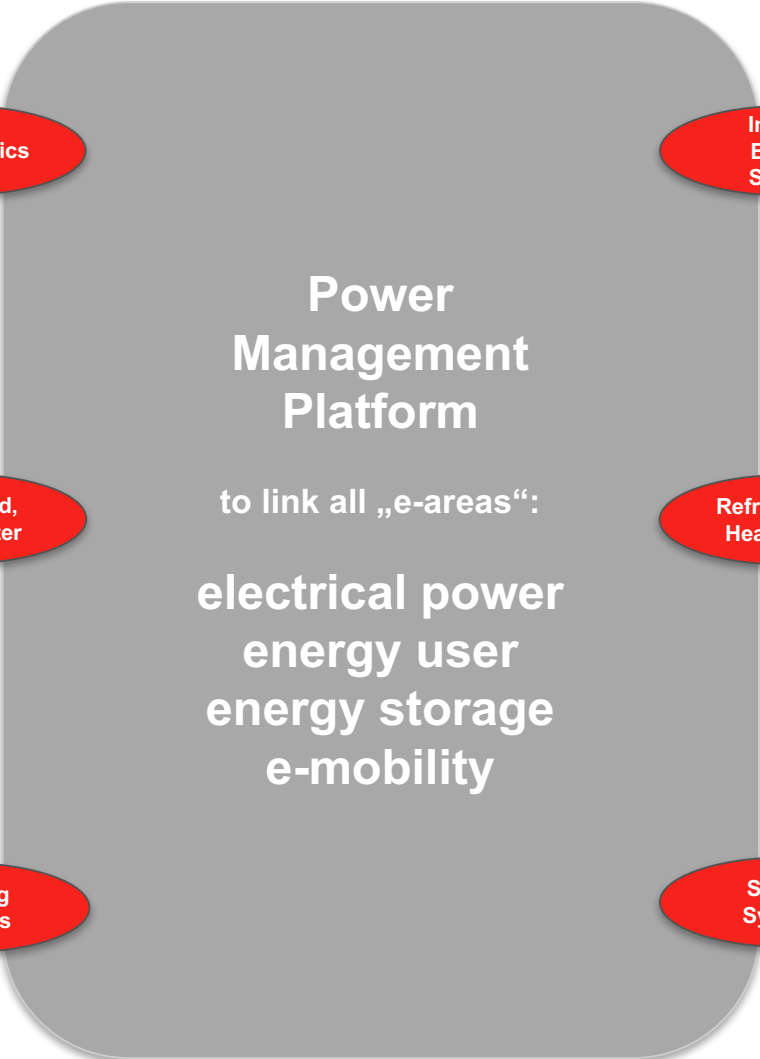
**Photovoltaics**



**Smart Grid,  
Smart Meter**

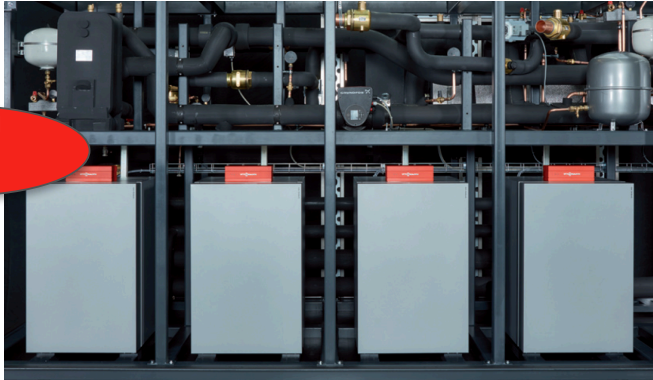


**Charging  
Solutions**



**Power  
Management  
Platform**

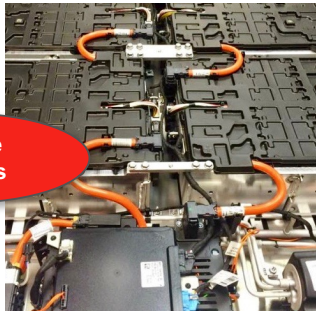
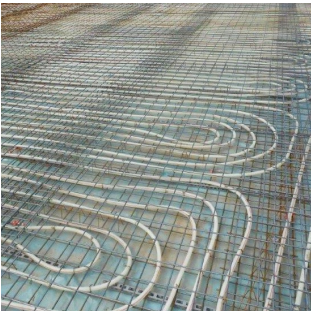
to link all „e-areas“:  
electrical power  
energy user  
energy storage  
e-mobility



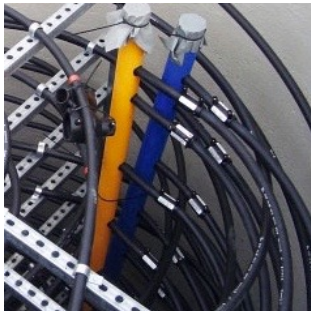
**Integral  
Energy  
System**



**Refrigeration,  
Heating etc.**



**Storage  
Systems**





**Thank you very much!**

