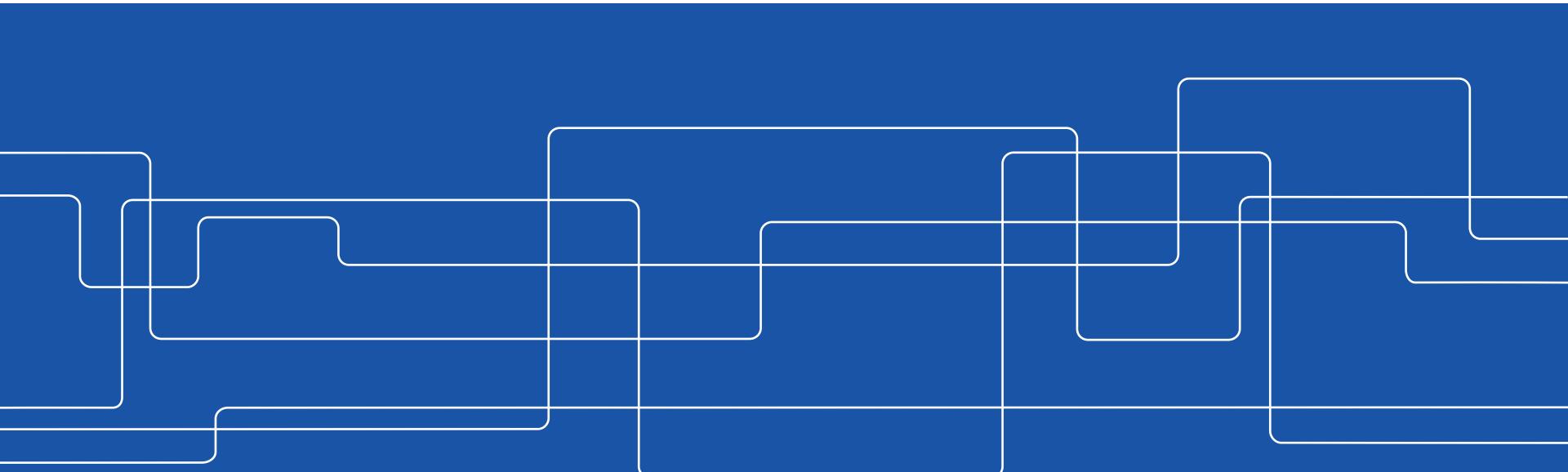




# Energimärkning av butiker ute i Europa

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# Presentation

**1.- Introduktion**

**2.- Blue Angel, The German Ecolabel**

**3.- EU projekt SuperSmart**

**4.- Slutsatser**



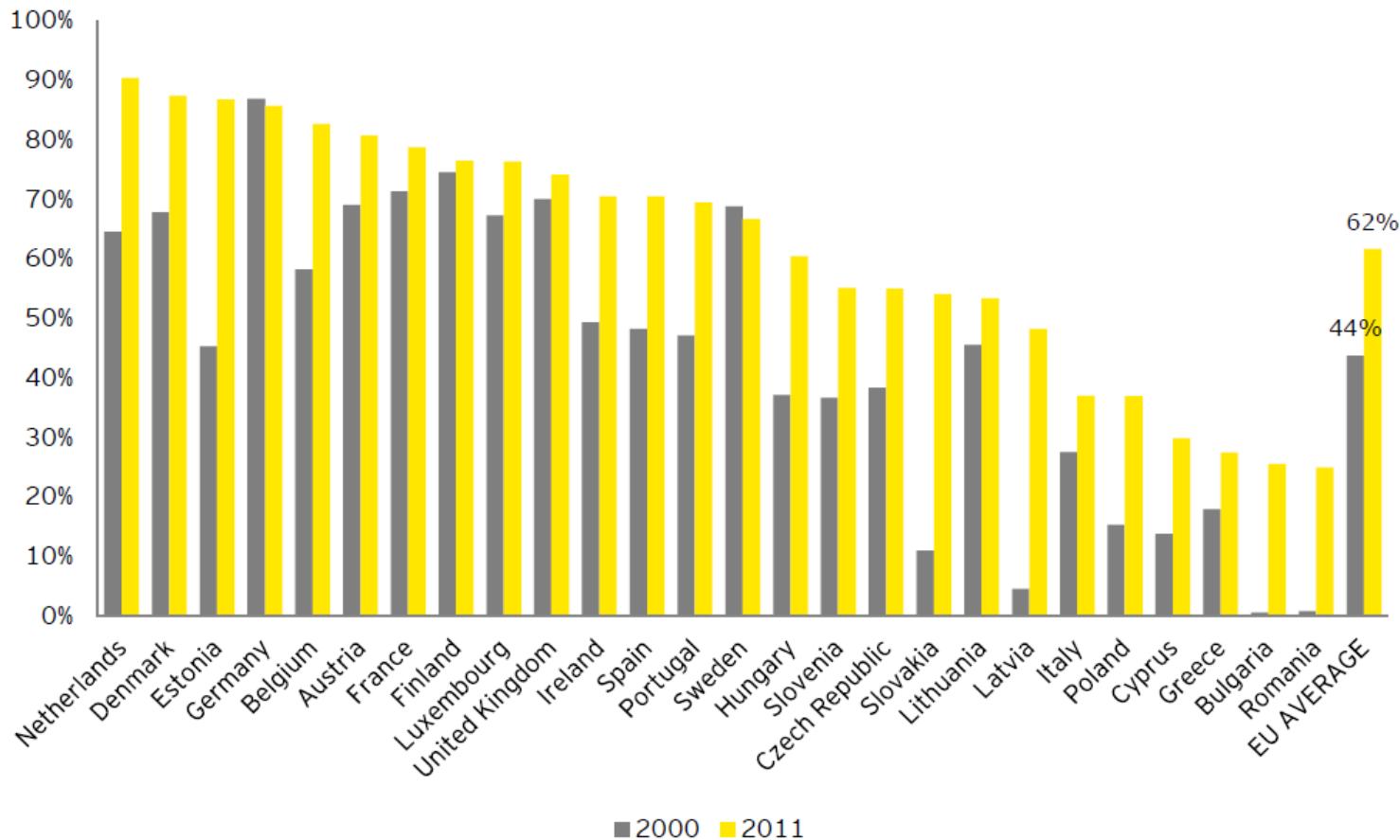
## 1.- Introduktion.

**Statistik visar att antal livsmedelsbutiker ökar i Europa**

**Nya direktiv och förordningar har implementeras i EU för att öka energieffektivisering, minska utsläppen av växthusgaser och stimulera användningen av förnybar energi.**

## 1.- Introduction.

### Increasing number of hypermarkets, supermarkets in Europe



EU average:  
**44% (2000)**  
**62% (2011)**

## 1.- Introduction.

# Energimål inom EU 2030



**Energimål  
inom EU till  
2030**

- Minska energianvändningen med 32,5 procent genom bättre energieffektivitet.
- Andelen förnybar energi ska vara minst 32 procent av energianvändningen.
- Andelen förnybar energi inom transportsektorn ska vara 14 procent.



## 1.- Introduktion.

- Ny EU-direktiv där alla byggnader som byggs från och med 2020 ska vara nära-nollenergibyggnader.
- F-Gasförordning som trädde i kraft 2015 har som mål att minska utsläppen av fluorerande växthusgaser (F-gaser) i Europa.

# Nära-nollenergibyggnader i Sverige

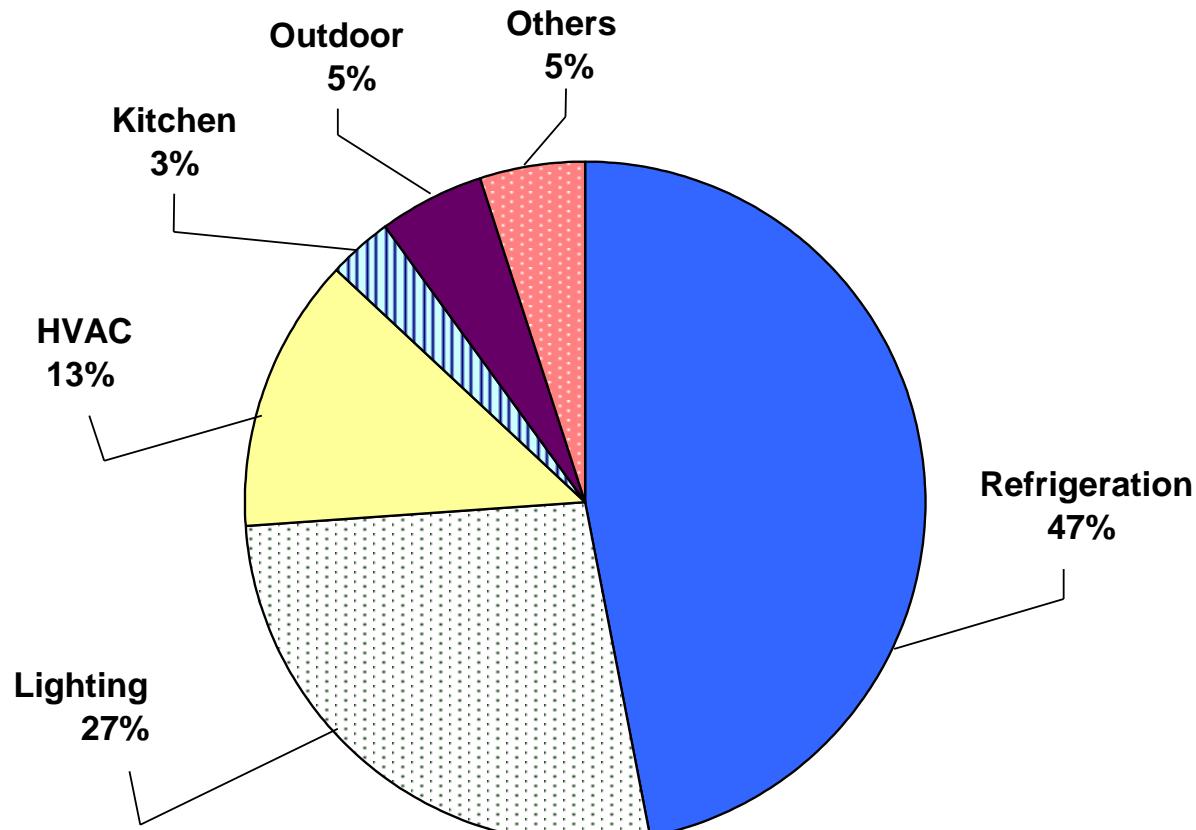
Boverket har tagit fram nya byggregler (BBR) enligt EU- direktivet där alla byggnader som byggs från och med 2020 ska vara nära-nollenergibyggnader.

	Primary Energy (PET) [kWh/m <sup>2</sup> Atemp and year]	U-value Average [W/m <sup>2</sup> K]
Single family houses	90	0.4
Multifamily houses	85	0.4
Facilities	80	0.6

Primärenergifaktorer: 1.6 för elektricitet och 1.0 för alla andra energibärare (fjärrvärme, fjärrkyla, biobränsle, olja, gas)

# 1.- Introduction.

Energy usage in a supermarket in Sweden





## 2.- Blue Angel, The German Ecolabel



**Climate-Friendly Grocery Stores in the Food  
Retail Sector**

<https://www.blauer-engel.de/en>



## 2.- Blue Angel, The German Ecolabel

The requirements have been subdivided into 12 mandatory requirements (M) and 12 optional requirements (O)

### Criterions

- **Energy requirement of the building**
- **Management system**
- **Electricity procurement**
- **Heat Recovery**
- **Energy Efficiency of the Refrigeration system**
- **Refrigeration cabinet covers**
- **Refrigerant**
- **Interior lighting in the store**
- **Daylight**
- **Lighting Concepts**
- **PV**
- **Foaming Agents**
- **Location / accessibility of the food retail store**
- **Recycled paper for printed advertising material**
- **Sustainable Building**

## 2.- Blue Angel, The German Ecolabel

Criterion	Nature of requirement	Requirement
Energy requirement of the building	Mandatory	<p>The Energy Performance Certificate for the building in accordance with §§ 16ff EnEV is to be displayed in a clearly visible position.</p> <p><u>Newly constructed building</u><sup>7</sup>: The calculated primary energy requirement must be at least 30 % less than the primary energy requirement of the reference building according to the Energy Saving Directive (EnEV) 2009<sup>8</sup>.</p> <p><u>Existing or renovated building</u><sup>9</sup>: The calculated primary energy requirement must not exceed the primary energy requirement of the reference building according to EnEV 2009.</p>
		<p><u>Newly constructed building</u>: The calculated primary energy requirement should be at least 50 % less than the primary energy requirement of the reference building according to EnEV 2009.</p> <p><u>Existing or renovated building</u>: The calculated primary energy requirement should be at least 30 % less than the primary energy requirement of the reference building according to EnEV 2009.</p>



## 2.- Blue Angel, The German Ecolabel

Criterion	Nature of requirement	Requirement
Refrigeration cabinet covers	Mandatory	<p>Equipment and refrigeration cabinets used for deep freezing food must be fitted with glass covers or glass doors.</p> <p>All normal refrigeration points (including service counters) without permanent covers must be fitted with covers at night.</p>
	Optional	<p>Equipment and refrigeration cabinets used for the normal refrigeration of food should be fitted with glass covers or glass doors.</p>
Refrigerant	Mandatory	<p>The refrigeration systems and the connected refrigeration equipment and refrigeration cabinets in the food retail store must exclusively use natural refrigerants.</p> <p>A maximum of 5 % of the plug-in refrigeration equipment and refrigeration cabinets not connected to the compound refrigeration system may contain fluorine refrigerants.</p>
Refrigerant	Optional	<p>In addition to the compound refrigeration system, all other systems and equipment that use refrigerants (air-conditioning systems, heat pumps, cold storage containers and rooms and plug-in refrigeration equipment and refrigeration cabinets) should exclusively use natural refrigerants.</p>

### 3.- SuperSmart



## SUPERSMART

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*Expertise hub for energy-efficient cooling & heating in  
European supermarkets*



### 3.- Project SuperSmart.

**SuperSmart was a EU funded Horizon 2020 Project**

- Started: 1<sup>st</sup> of February 2016
- Project Partners:
  - SINTEF (coordinator)
  - Shecco
  - CNR
  - Umweltbundesamt
  - KTH
  - TUBS
  - CIRCE
  - Energija doo
  - IIR



**SINTEF**



Technische  
Universität  
Braunschweig

**Energija**





### 3.- Project SuperSmart.

**SuperSmart had three main objectives:**

- 1. Remove non-technological barriers to efficient heating & cooling in the European food retail sector**
- 2. Raise the expertise level for energy-friendly supermarkets among technical and non-technical staff members, through promotion and training**
- 3. Support the introduction of a new EU Ecolabel for food retail stores, by developing draft criteria for such a label**



# SUPERSMART

*Expertise hub for energy-efficient cooling & heating in  
European supermarkets*

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## Part I: Improving Supermarket Energy Efficiency



## 3.- Project SuperSmart.

Mapping and segmentation of barriers & description of supermarket sector

Report 1

How to refurbish a supermarket

Report 4

Eco-friendly supermarkets - an overview

Report 2

Computational tools for supermarket planning

Report 5

How to build a new eco-friendly supermarket

Report 3

Eco-friendly operation and maintenance of supermarkets

Report 6

### 3.- SuperSmart



## SUPERSMART

*Expertise hub for energy-efficient cooling & heating in  
European supermarkets*

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**Part II:  
EU Ecolabel for Food Retail Stores**



### 3.- Project SuperSmart.

#### EU Ecolabel



- EU Ecolabel är EU:s miljömärkningssystem. Det är ett certifieringssystem som hjälper konsumenter att välja miljöanpassade produkter och tjänster
- Det är Miljömärkning Sverige AB som ansvarar för EU Ecolabel i Sverige



### 3.- SuperSmart EU Ecolabel.

Proposal for the  
Development of  
the EU Ecolabel Criteria  
for Food Retail Stores

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Preliminary Report

Proposal for the  
Development of  
the EU Ecolabel Criteria  
for Food Retail Stores

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Technical Report

Source: <http://www.supersmart-supermarket.info>



### 3.- SuperSmart EU Ecolabel.

#### Proposal for the point system

In total, 15 criteria were identified:

- Area “HVAC&R” 4 criteria
- Area “Building” 6 criteria
- Area “Operating of the store” 5 criteria.

The requirements of each criterion were split into two categories, mandatory and point score requirements.

The applicant must fulfil all 41 mandatory requirements.



### 3.- SuperSmart EU Ecolabel.

#### Proposal for the point system

- A maximum of 215 points can be scored
- Area “HVAC&R” 81 points (38 %)
- Area “Building” 80 points (37 %) and in the
- Area “Operating of the store” 54 points (25 %) .
  
- In order to be awarded the EU Ecolabel, the store must score at least 54 points (25 %), but it is freely selectable in which areas the points are scored.



### 3.- SuperSmart EU Ecolabel.

Criteria areas	Criterion
HVAC&R	Criterion 1: Energy efficiency of the refrigeration system
	Criterion 2: Heat recovery
	Criterion 3: Display cabinets
	Criterion 4: Refrigerants
Building	Criterion 5: Energy consumption of the building
	Criterion 6: Energy and environmental management systems
	Criterion 7: Lighting
	Criterion 8: Use of renewable energy sources
	Criterion 9: Building materials and resources
	Criterion 10: Location and accessibility of the store
Operating of the store	Criterion 11: Waste
	Criterion 12: Water consumption and wastewater management
	Criterion 13: Labelled products sold in the store
	Criterion 14: Store's use of goods and services
	Criterion 15: Information to customers

### 3.- SuperSmart EU Ecolabel.

Criteria areas	Criterion	Mandatory requirements	Point score requirements	Max. points per requirement	Max. points per criterion
HVAC&R	Criterion 1: <b>Energy efficiency of the refrigeration system</b>	1) Average power input of LT, MT and AC (if integrated) not higher than 5.0 times the ideal power (Carnot) for newly built systems and 5.5 times the ideal power (Carnot) for existing systems	1) MT unit evaporation temperature higher than -10°C	10	36 of which 18 (50%) must be achieved
		2) Evaporation temperature of the refrigeration unit not lower than -10°C for MT units and -33°C for LT units	2) Staged compression (parallel compression, two-stage compression, economiser, ...)	6	
		3) Active control of high pressure (condenser, gas cooler); minimum condenser pressure not higher than 20°C	3) Subcooling, internal heat exchanger or staged expansion	3	
		4) Active control of evaporation pressure	4) Water spray or adiabatic saturation on condenser/gas cooler	2	
			5) Electronic expansion valves on 100% of the equipment	2	
			6) Expansion work recovery (ejector or expander)	6	
			7) Minimum partialization of the refrigeration units	6	
			8) High efficiency fans (condenser/gas cooler)	1	
	Criterion 2: <b>Heat recovery</b>	1) Installation of a heat recovery system from the refrigeration system	1) Direct heat recovery (via refrigerant) into shopping area, parking, etc. 2) Water temperature required for heat recovery < 45°C 3) Utilisation of low-grade heat for auxiliary heating (parking ice melting, etc.) or thermal storage (energy wells, etc.)	12 6 4	22

## 3.- SuperSmart EU Ecolabel.

**Criterion 1:**  
**Energy Efficiency of the refrigeration system**

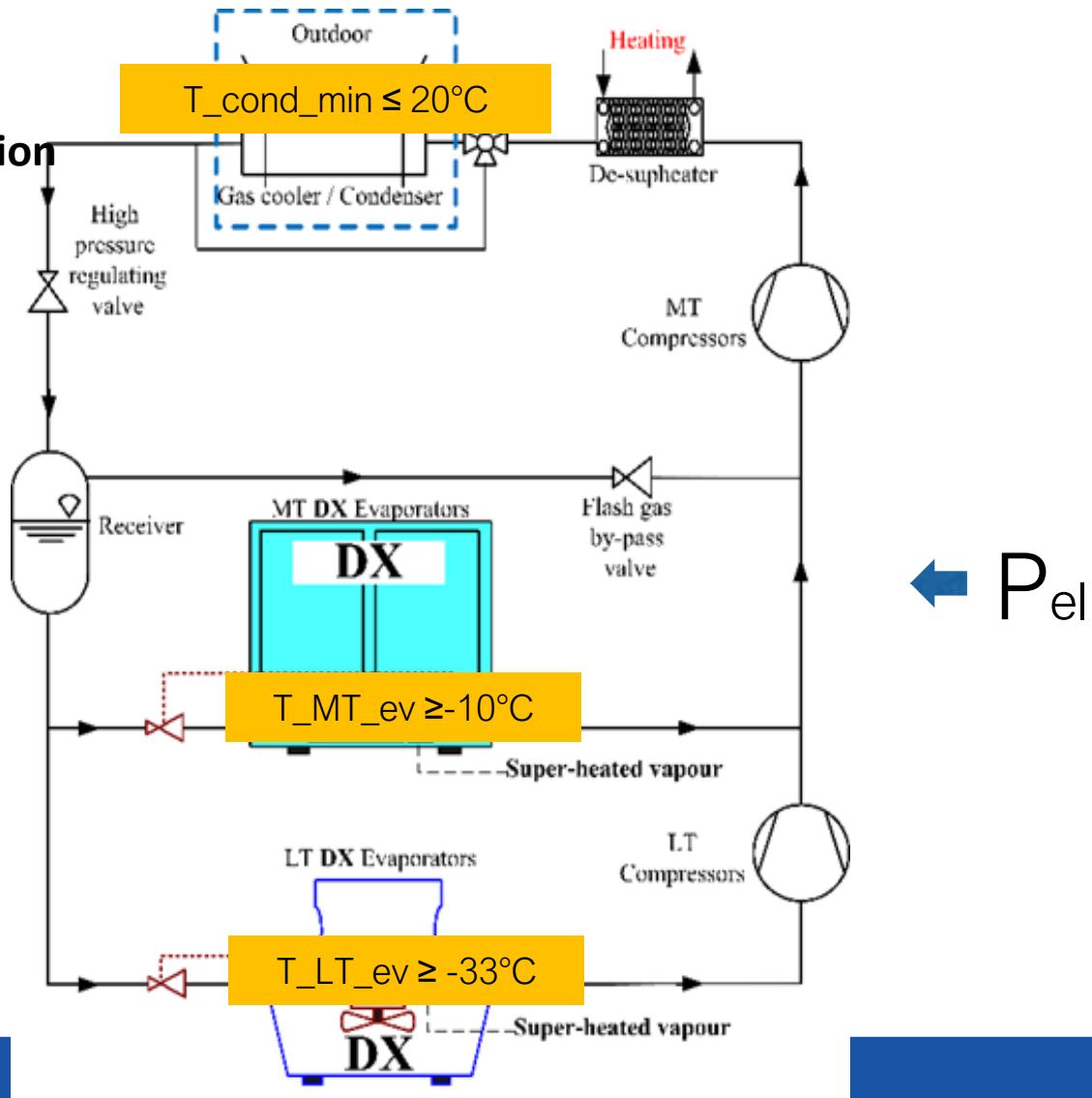
### Mandatory Requirements

#### Evaporation temperature

- Minimum limit
- Active control

#### Condensing temperature

#### Power consumption compared to ideal cycle



### 3.- SuperSmart EU Ecolabel.

**Criterion 1:**  
**Energy Efficiency of the refrigeration system**

#### Points collection

Evaporation temperature

Parallel compression

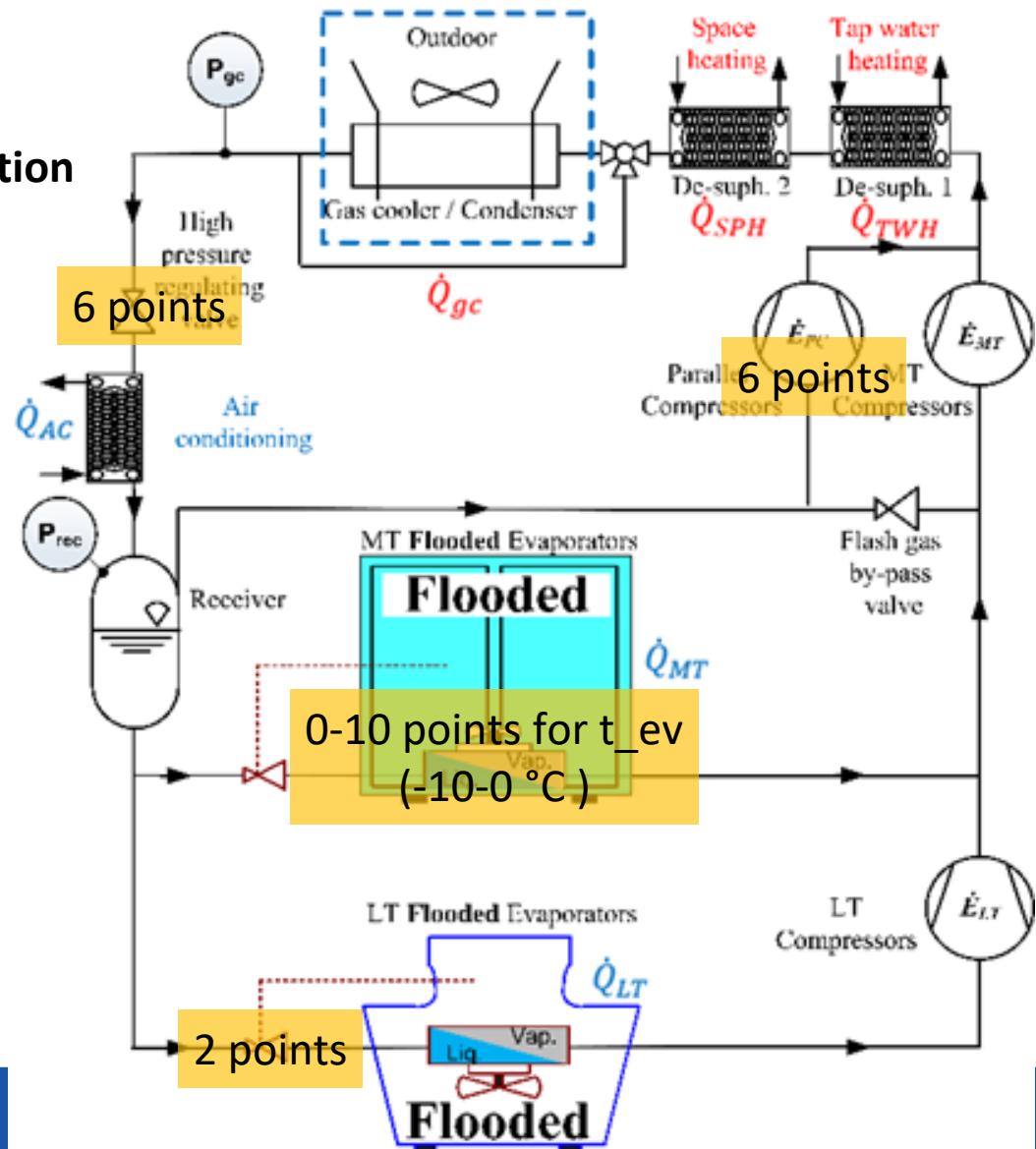
Electronic expansion

Valves

Expansion work recovery  
(ejector or expander)

....

At least 50 % of the available points for this criterion must be fulfilled,  
i.e. 18 points





### 3.- SuperSmart EU Ecolabel.

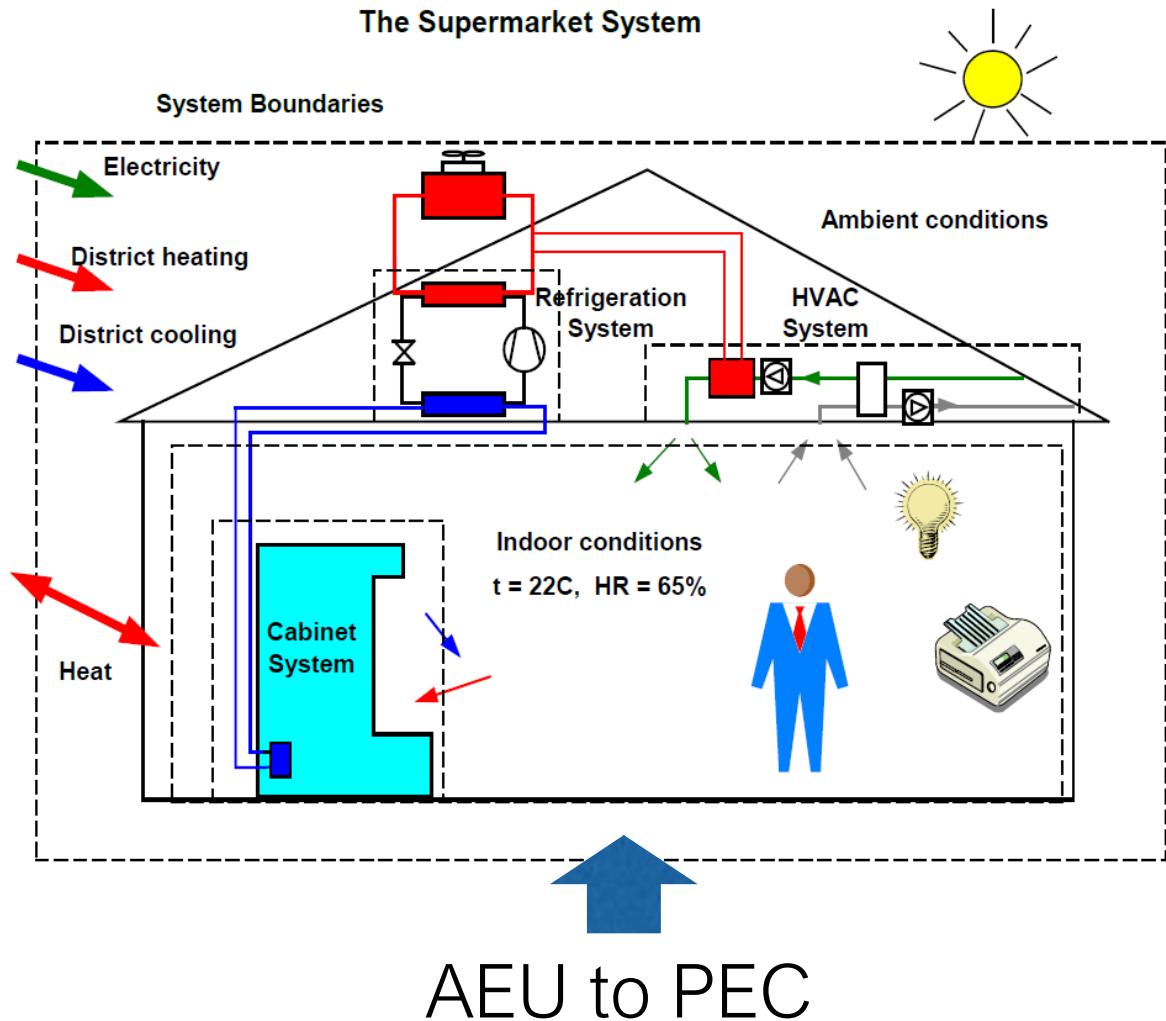
Criteria areas	Criterion
HVAC&R	Criterion 1: Energy efficiency of the refrigeration system
	Criterion 2: Heat recovery
	Criterion 3: Display cabinets
	Criterion 4: Refrigerants
Building	Criterion 5: Energy consumption of the building
	Criterion 6: Energy and environmental management systems
	Criterion 7: Lighting
	Criterion 8: Use of renewable energy sources
	Criterion 9: Building materials and resources
	Criterion 10: Location and accessibility of the store
Operating of the store	Criterion 11: Waste
	Criterion 12: Water consumption and wastewater management
	Criterion 13: Labelled products sold in the store
	Criterion 14: Store's use of goods and services
	Criterion 15: Information to customers

## 3.- SuperSmart EU Ecolabel.

**Criterion 5:**  
**Energy consumption of the building**

$$PEC_{store} \leq PEC_{exp}$$

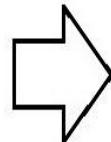
All energy saving measures should result in overall energy use savings



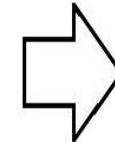
### 3.- SuperSmart EU Ecolabel.

#### Required data for PECexp estimation:

1. Sales area of the store [ $m^2$ ]
2. Height of the ceiling [m]
3. Opening hours [h]
4. Indoor temperature (summer) [ $^{\circ}C$ ]
5. Indoor temperature (winter) [ $^{\circ}C$ ]
6. Electric power of medium temperature (MT) plug-in cabinets[W]
7. Electric power of low temperature (LT) plug-in cabinets[W]
8. Number of MT remote display cabinets (1.875 m) [-]
9. Number of MT remote display cabinets (2.500 m) [-]
10. Number of MT remote display cabinets (3.750 m) [-]
11. Number of LT remote display cabinets (1.952 m) [-]
12. Number of LT remote display cabinets (2.500 m) [-]
13. Number of LT remote display cabinets (3.750 m) [-]
14. Volume air flow HVAC system  $\left[\frac{m^3}{h}\right]$
15. Lighting power  $\left[\frac{W}{m^2}\right]$



$$f_1(cost_1, x_1, \dots, x_{15})$$



$$E_{exp,electricity} \text{ [kWh]}$$

$$f_2(cost_2, x_1, \dots, x_{15})$$

$$f_3(cost_3, x_1, \dots, x_{15})$$

$$f_4(cost_4, x_7)$$

$$Q_{exp,heating} \text{ [kWh]}$$

$$Q_{exp,cooling} \text{ [kWh]}$$

$$Q_{exp,DHW} \text{ [kWh]}$$



## 4.- Slutsatser.

- **Gemensam miljöcertifiering för livsmedelsbutiker i Europa.**
- **Kriterier som ska granskas.**
- **Bedömning av den totala energianvändningen i livsmedelsbutiker.**
- **Bedömning av energianvändningen i kyldisken**



# Frågor?