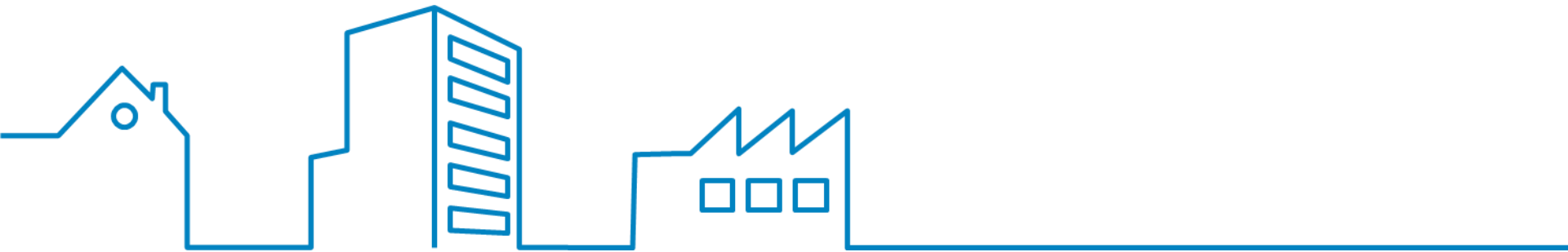


Ventilation and climate control

Market and product development trends

Henk Kranenberg, Daikin Europe NV
13/11/2018



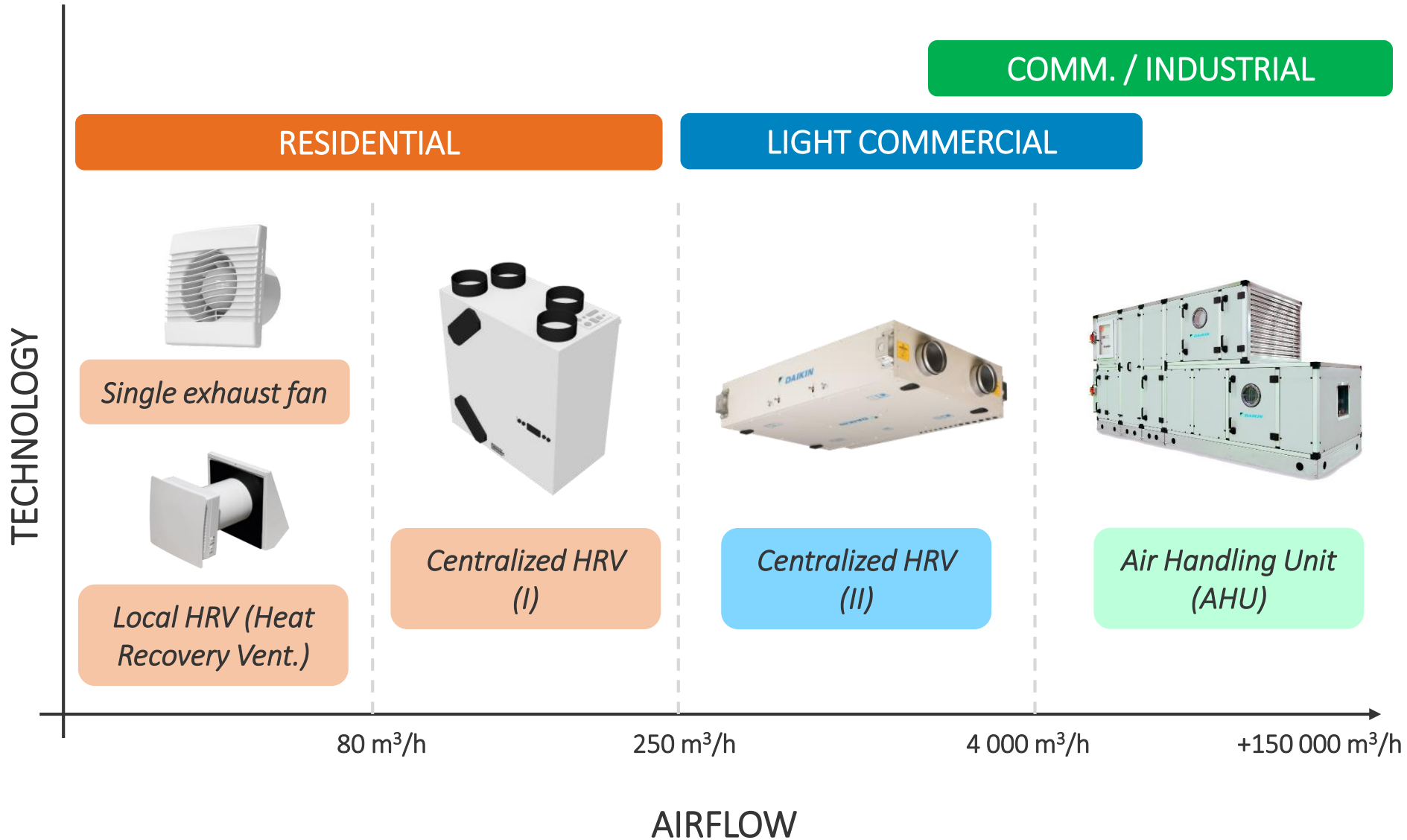
1. Market information
2. Local rules and regulations
3. Market short term stakes
4. Control & Monitoring
5. Conclusions
-
6. EPREL database



A photograph of a large industrial facility, likely a factory or warehouse, featuring extensive ductwork. The ducts are made of shiny, metallic material, possibly aluminum, and are arranged in a complex network. Some ducts are suspended from the ceiling, while others are supported by metal stands on the floor. The background shows a high ceiling with corrugated metal panels and bright industrial lighting. A blue semi-transparent banner is overlaid across the middle of the image, containing the text "01. MARKET INFORMATION".

01. MARKET INFORMATION

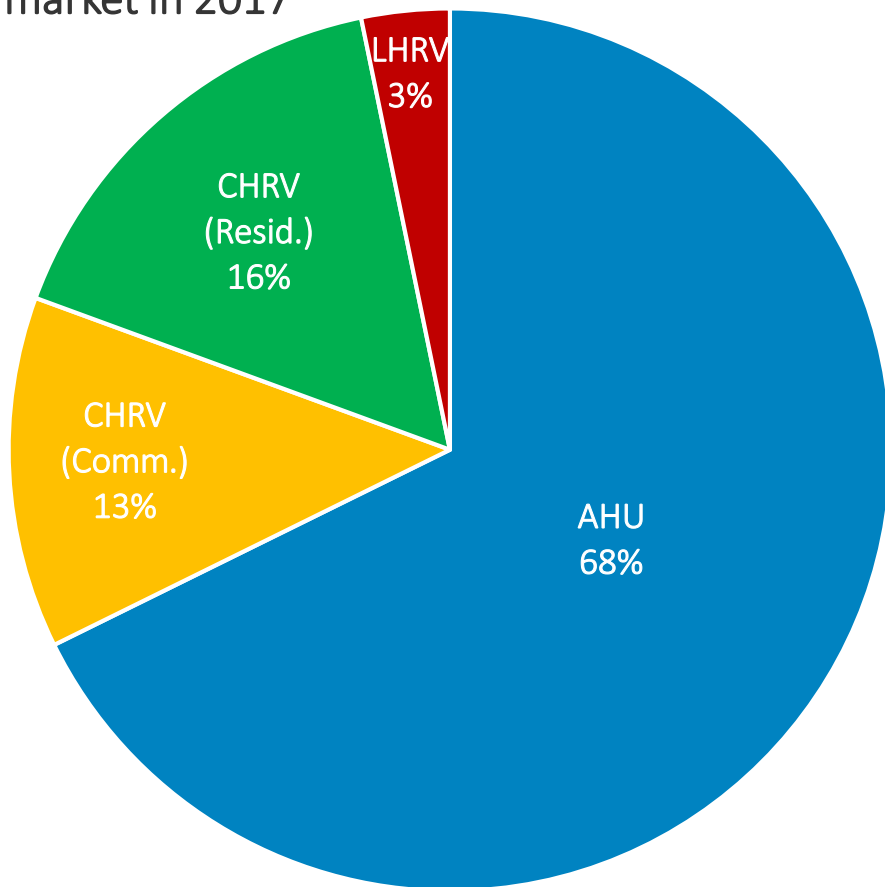
CATEGORISATION BY APPLICATION AND TECHNOLOGY



EUROPEAN MARKET VALUE AND FORECAST*

*Single exhaust fan not included

European heat recovery ventilation market in 2017



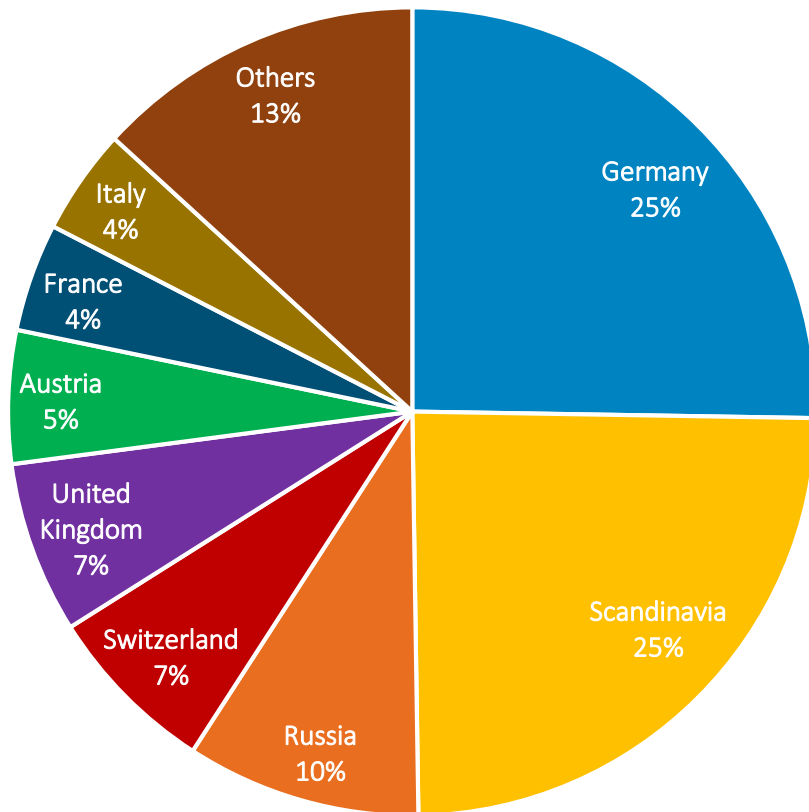
TECHNOLOGY	MARKET VALUE (M€)		GROWTH RATE 2017 - 2020
	2017	2020	
AHU	1 971 €	2 207 €	12%
Centr. HRV (Comm.)	375 €	413 €	10%
Centr. HRV (Resid.)	471 €	570 €	21%
Local HRV	93 €	127 €	36%
TOTAL	2 910 €	3 317 €	14%

Source: BRG study "The European Ventilation Product Markets", November 2015

- Huge potential **all over Europe**, for both new construction and refurbishment.
- **Double digit growth** (2017 to 2020) for all types of ventilation solutions and applications: residential, light commercial and industry.

VENTILATION MARKET VALUE PER COUNTRY

European heat recovery ventilation market in 2017

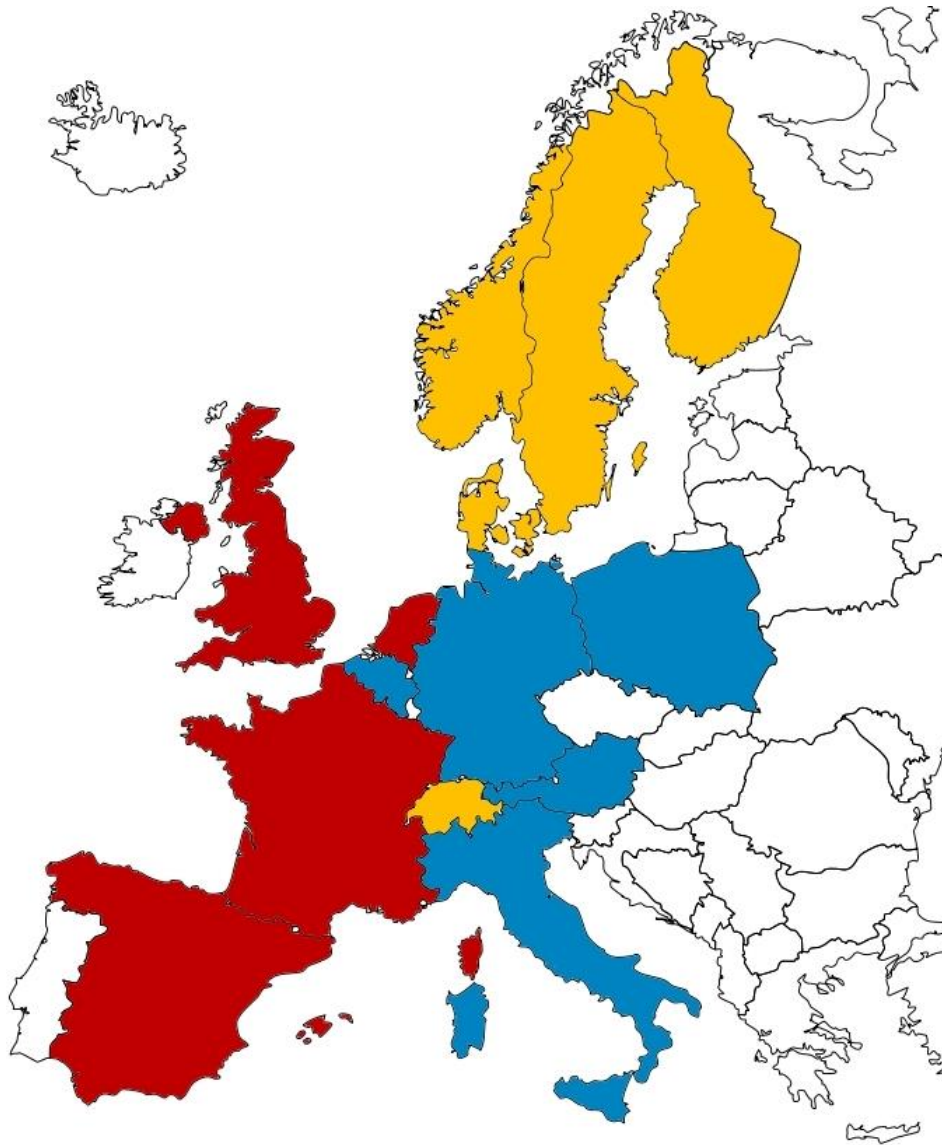


MARKET	MARKET VALUE (M€)		GROWTH RATE 2017 - 2020
	2017	2020	
Austria	155 €	179 €	15%
Belgium	97 €	111 €	15%
Czech Republic	47 €	56 €	19%
Denmark	143 €	162 €	13%
Finland	177 €	186 €	5%
France	126 €	147 €	17%
Germany	735 €	887 €	21%
Italy	123 €	147 €	19%
Netherlands	113 €	147 €	30%
Norway	122 €	129 €	6%
Poland	59 €	66 €	11%
Russia	273 €	219 €	-20%
Spain	67 €	81 €	21%
Sweden	271 €	325 €	20%
Switzerland	201 €	232 €	15%
United Kingdom	200 €	242 €	21%
TOTAL	2 910 €	3 317 €	14%

Source: BRG study "The European Ventilation Product Markets", November 2015

MOST USED VENTILATION TECHNOLOGY PER MARKET

Source: BRG study "The European Ventilation Product Markets", November 2015



AHU

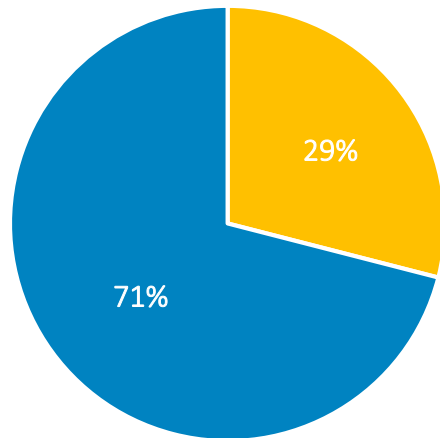
HRV (*Local + Centralized*)

Single exhaust fan

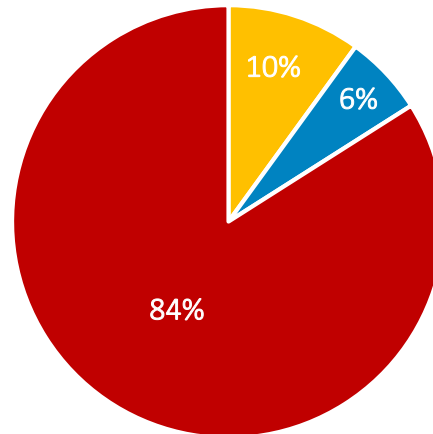
The share of 'AHU / HRV / Single exhaust fan' (in quantity) strongly differs from a country to another.

⇒ *Discrepancies on local rules and regulations*

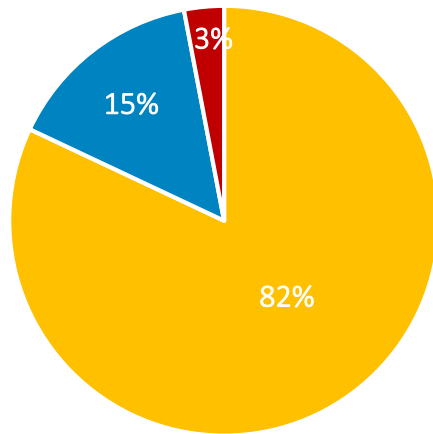
VENTILATION TECHNOLOGY PER MARKET



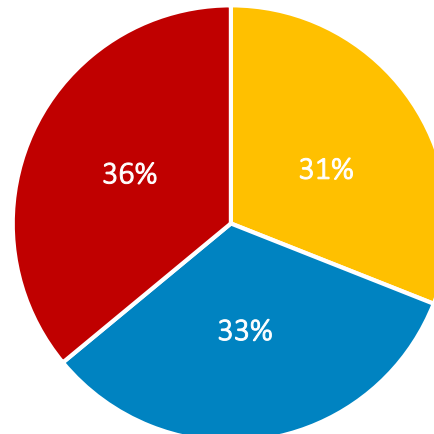
Germany



France



Denmark



UK

AHU

HRV (Local + Centralized)

Single exhaust fan

A photograph of a large industrial facility, likely a factory or warehouse, featuring extensive ductwork. The ducts are made of shiny, reflective metal and are arranged in a complex network, with some running horizontally and others curving. The background shows a high ceiling with structural beams and bright industrial lighting. A blue semi-transparent banner is overlaid across the middle of the image, containing the section header text.

02. LOCAL RULES AND REGULATIONS

VENTILATION STANDARDS IN NEW DWELLINGS

Source: BPIE "Indoor Air Quality, Thermal comfort and Daylight", March 2015

COUNTRY	STANDARD REFERENCE	WHOLE BUILDING VENTILATION RATES	LIVING ROOM	BEDROOM	KITCHEN	BATHROOM + WC	WC ONLY
BELGIUM (BRUSSELS)	NBN D 50-001	3,6 m ³ /(h.m ²) floor surface area	Minimum 75 m ³ /h (limited to 150 m ³ /h)	Minimum 25 m ³ /h (limited to 72 m ³ /h)	Open kitchen, minimum 75 m ³ /h (exhaust)	Minimum 50 m ³ /h (limited to 75 m ³ /h)	Minimum 25 m ³ /h
DENMARK	BR10	Minimum 0,3 l/(s.m ²) (supply)	Minimum 0,3 l/(s.m ²) (supply)		20 l/s (exhaust)	15 l/s (exhaust)	10 l/s (exhaust)
FRANCE	Arrêté 24.03.1982	10-135 m ³ /h depending on room number and ventilation system			Continuous: 20-45 m ³ /h		Minimum 15 m ³ /h
GERMANY	DIN 1946-6	15-285 m ³ /h			45 m ³ /h (nominal exhaust flow)	45 m ³ /h (nominal exhaust flow)	25 m ³ /h (nominal exhaust flow)
ITALY	Legislative Decree 192/2005, UNI EN 15251	Naturally ventilated: 0,3-0,6 vol/h	0,011 m ³ /s per person for an occupancy level of 0,04 person/m ²			4 vol/h	
POLAND	Art 149 (1) - Journal of Laws 2002 N°75, item 690, as amended, and PN-B-03430:1983/Az3:2000	20 m ³ /h for each permanent occupant	20-30 m ³ /h for each permanent occupant		30 to 70 m ³ /h without windows	50 m ³ /h	30 m ³ /h
SWEDEN	BFS2014:13-BBR21	Supply: minimum 0,35 l/(s.m ²) floor area					
UK	Approved document F	13-29 l/s depending on bedrooms			13-60 l/s (extract)	8-15 l/s (extract)	6 l/s (extract)
EN 15251 EN16798-1		0,35 - 0,49 l/(s.m ²)	0,6 - 1,4 l/(s.m ²)		14-28 l/s	10-20 l/s	7-14 l/s

Requirement

Recommendation

European standard

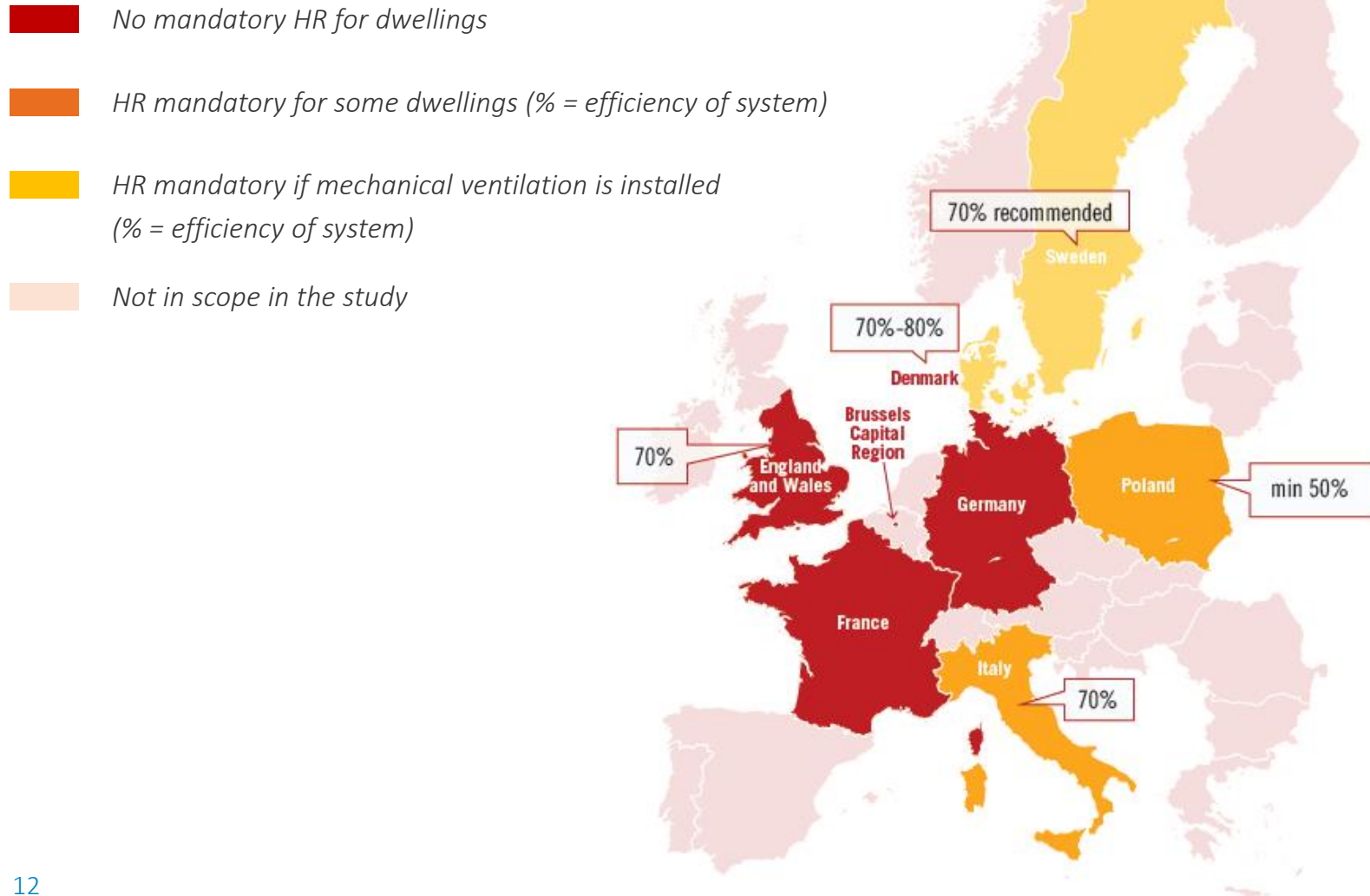
VENTILATION STANDARDS IN LIGHT COMMERCIAL APPLICATIONS

COUNTRY	NORM / REGULATION	APPLICATION	FRESH AIR MIN. REQUIREMENT
FRANCE	Règlement Sanitaire Départemental Type (RSDT) Articles 64.1 et 64.2 Code du Travail - Titre 1er, Chapitre II	Educational facilities Library, post offices, bank offices, etc. Selling facilities: shops, supermarkets, etc. Food facilities: bars, restaurants, etc. Offices building ...	18 m ³ /h per occupier 18 m ³ /h per occupier 22 m ³ /h per occupier 22 m ³ /h per occupier 25 m ³ /h per occupier ...
SPAIN	Reglamento de Instalaciones Térmicas en los Edificios (RITE) Instrucción Técnica 1.1.4.2.2 y 1.1.4.2.3	Hospitals, clinics Offices Educational facilities Hotel rooms Restaurants, cafeterias, bars ...	72 m ³ /h per occupier 45 m ³ /h per occupier 45 m ³ /h per occupier 28,8 m ³ /h per occupier 28,8 m ³ /h per occupier ...
ITALY	UNI 10339/1995	Offices Hospitals, clinics, etc. Library Restaurants Shops ...	39,6 m ³ /h per occupier 39,6 m ³ /h per occupier 19,8 m ³ /h per occupier 36 m ³ /h per occupier 41,4 m ³ /h per occupier ...
UK	Building Regulations 2010 - Approved Document F, section 6 CIBSE Guide B2 - Ventilation and ductwork CIBSE Guide A - Environmental design	Hospitals, health care buildings Hotels: bedrooms Offices Restaurants, dining rooms Shopping malls, small shops, supermarkets ...	36 m ³ /h per occupier 36 m ³ /h per occupier 36 m ³ /h per occupier 36 m ³ /h per occupier 36 m ³ /h per occupier ...
GE	DIN EN 13779* (replaced from 11/2017 by DIN EN 16798-3:201711. Data to be updated)	IDA 1 IDA 2 IDA 3 IDA 4	> 54 m ³ /h per occupier 36 - 54 m ³ /h per occupier 22 - 36 m ³ /h per occupier < 22 m ³ /h per occupier

Source: own

HEAT RECOVERY REQUIREMENTS IN NEW DWELLINGS

Source: BPIE "Indoor Air Quality, Thermal comfort and Daylight", March 2015



HEAT RECOVERY REQUIREMENTS IN LIGHT COMMERCIAL APPLICATIONS

COUNTRY	BUILDING REGULATION / STANDARD	DESCRIPTION
SPAIN	RITE (Reglamento de Instalaciones Térmicas en los Edificios)	A/A AC systems with more than 70 kW Cooling capacity, require a freecooling system (1.2.4.5.1). If extraction airflow > 1.800 m ³ /h --> HR is compulsory (1.2.4.5.2)
BELGIUM (BRU)	Arrêté du Gouvernement de la Région de Bruxelles-Capitale du 21 décembre 2007 déterminant des exigences en matière de performance énergétique et de climat intérieur des bâtiments	If the nominal airflow of the ventilation unit is superior to 5.000 m ³ /h and the annual operating time is superior to 2.500 h/year, heat recovery (with automatic bypass) is compulsory.
ITALY	DPR 412/93. Regolamento recante norme per la progettazione, l'installazione, l'esercizio e la manutenzione degli impianti termici degli edifici ai fini del contenimento dei consumi di energia	Heat recovery is required (paragraph 13) depending on the airflow and annual operating time. Values in Allegato C (starts with 2.000 m ³ /h)
FRANCE	Règlementation Thermique 2012 (RT2012)	-
UK	Building Regulations - Part L	-
GERMANY	EnEV §15	AHUs (> 4000 m ³ /h) must be equipped with a heat recovery system
IRELAND	Part F, Part L	-
SWEDEN	Boverket's Building Regulations, BBR18 - (BFS 2011:26) - Article 9:4	Only if the alternative validation method95 of the energy demand for buildings is used and if the heated floor area is between 60 – 100 m ² , must the building be equipped with a heat recovery system or heat pump.
NETHERLANDS	Bouwbesluit 2012 - Chapter 5 (NEN 7120:2011)	-
DENMARK	Bygningsreglementet 2010, BR10	Ventilation installations must include HR with a dry temperature efficiency of at least 70%. Rooms in childcare institutions and teaching rooms in schools must be ventilated by ventilation installations comprising both forced air supply and exhaust and heat recovery.
POLAND	Dz.U. 2002 nr 75 poz. 690 z późniejszymi zmianami	Mechanical ventilation with a capacity of ≥ 500 m ³ /h should be equipped with heat recovery from exhaust air or recirculation. It is not required for installations that are used less than 1 000 hours per year.
EU	ErP (1253/2014) - Annex III	All double flow ventilation unit must have a heat recovery system

Requirement

Recommendation

European standard

Source: own

RULES AND REGULATIONS DISCREPANCIES...

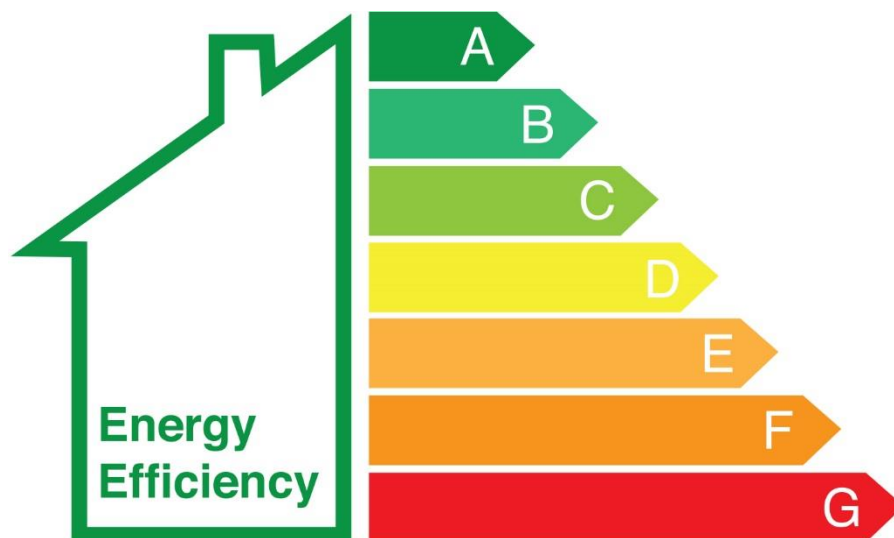


A photograph of a large industrial facility, likely a factory or warehouse, featuring a complex network of large, silver, corrugated metal ducts for heating, ventilation, and air conditioning (HVAC). The ducts are arranged in a series of parallel rows, some running horizontally and others curving. They are supported by metal brackets and hangers. The background shows the interior of a large building with a high ceiling and industrial lighting. A blue semi-transparent banner is overlaid across the middle of the image, containing the text '03. MARKET SHORT TERM STAKES' in white. The DAIKIN logo is visible in the bottom right corner.

03. MARKET SHORT TERM STAKES

TOMORROW... EVERYTHING WILL BE LINKED AND CONNECTED





ENERGY EFFICIENCY is already at the centre of...

- ...all regulations*
- ...all product developments*
- ...all global worldwide agreements*

ENERGY EFFICIENCY + INDOOR AIR QUALITY



Efficient fan



Efficient heat exchanger

‘EFFICIENT’ VENTILATION



Efficient “free” cooling

Efficient...



Efficient control & monitoring



Next **Challenge** for the Ventilation industry:
integration of IAQ not only as “nice-to-have”
but as standard feature.



*What is a (good) IAQ? How to measure it? How to act on it?
Are Energy Efficiency and IAQ compatible?
(nZEB = minimize energy consumption)*

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05. CONTROL & MONITORING

CONTROL AND MONITORING

Integrating IAQ into Ventilation means to be able to **control** and **monitor** it.

CONTROLS	VENTILATION	Air flow
		Heat recovery
	INDOOR AIR QUALITY	CO ₂
		VOC
		PM
		NO _x ...
	INDOOR COMFORT	Set point temperature
		Humidity
		Air velocity

Monitoring not only in schools or hospitals, but also in any home, offices or light commercial application.

What is high end feature today, must become a standard tomorrow

CONTROL AND MONITORING

Need to comply with both **ENERGY EFFICIENCY** and **IAQ** requirements:

1. Integration of Ventilation with Heating and Air Conditioning
2. Think as a single and global system
3. Merging at **CONTROL** level → **BEMS** (Building and Energy Management System)



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05. CONCLUSIONS

CONCLUSIONS

IAQ: How to act on it?

1. Standardization on IAQ
2. **CONTROL** of IAQ (adequate sensors)
3. Actions through analysis: smartness

Combine Energy Efficiency with IAQ

1. Merging of Heating, Air Conditioning and Ventilation
CONTROLS
2. Application of new technologies to mass industry through clear common standards and regulations

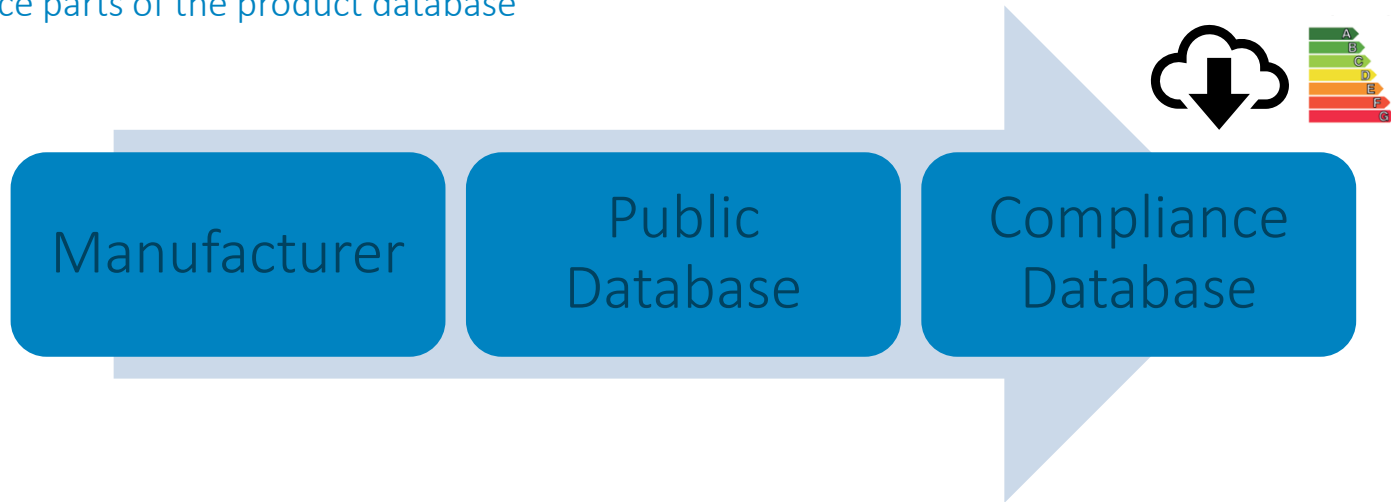
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06. EPREL DATABASE

A few words on EPREL

European Product Registration Database for Energy Labelling (EPREL):

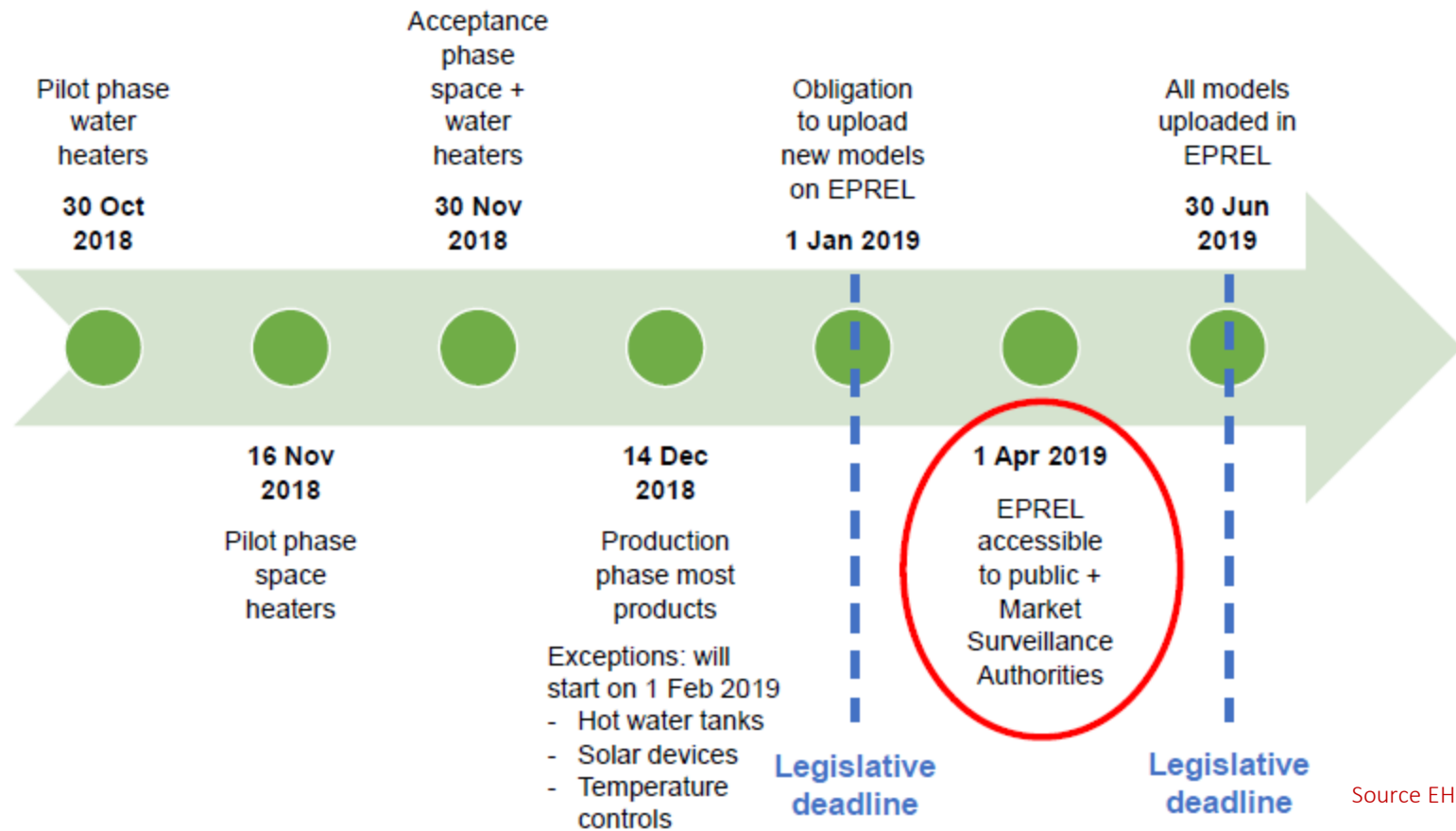
Articles 4 and 12 of the Energy labelling directive EU 1369/2017: ask for the implementation of a Product database. From 1 January 2019, the supplier shall enter information for each model into the public and compliance parts of the product database



What products?

- EPREL applies to models in scope of Energy Label delegated Regulations, therefore models with Energy Label –*Reference Regulation EU 2017/1369*
- EPREL does not apply to models that are covered by Ecodesign only (no Label);
- Includes packages created by suppliers and included in catalogues / ads.

A few words on EPREL



Source EHI

Future developments ?

- Inclusion products out of Energy Label requirement?
- Source of data for EPBD standards – energy performance calculation

Thank you!