



# UNIVERSITÀ POLITECNICA DELLE MARCHE

Dipartimento di Ingegneria Industriale  
e Scienze Matematiche

**TECNOLOGIE MADE IN ITALY  
ALTERNATIVE AGLI HFC E  
OPPORTUNITA' PER IL  
SISTEMA ITALIA**

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[www.univpm.it](http://www.univpm.it)



United Nations  
Environment Programme

# MONTREAL PROTOCOL





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**Scientific  
Assessment  
Panel**

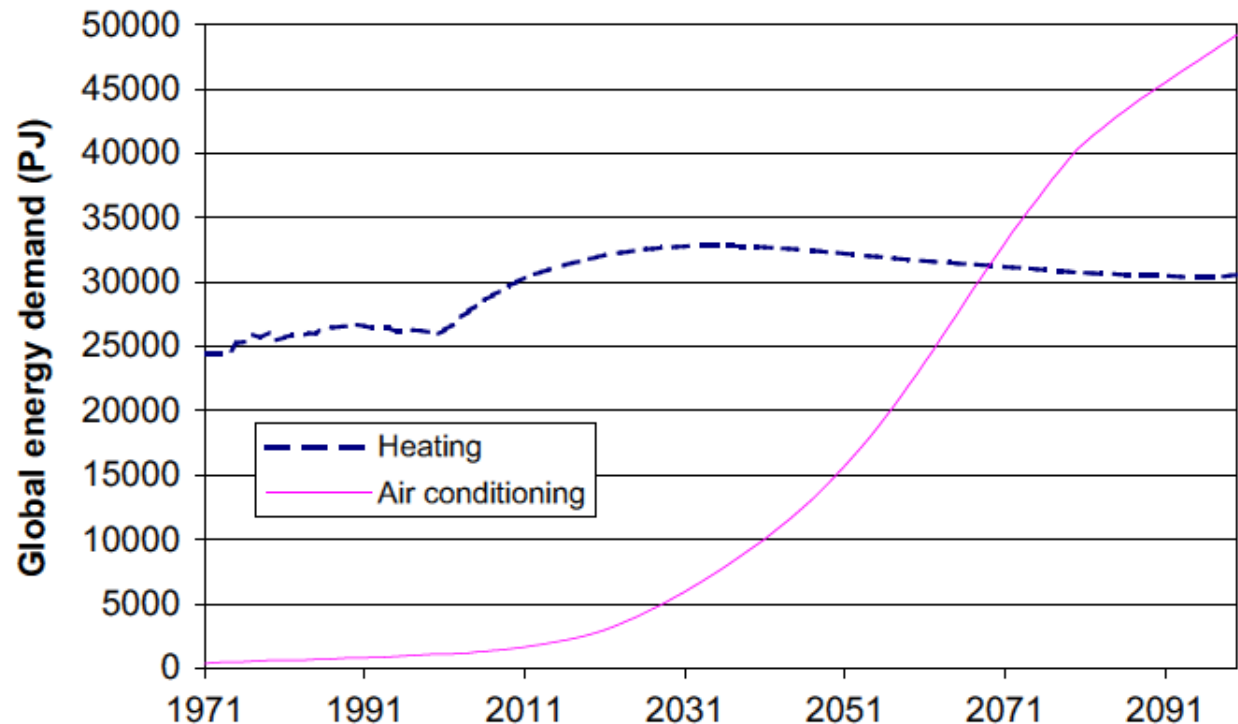
**Technology &  
Economic  
Assessment  
Panel**

**Environmenta  
Effect  
Assessment  
Panel**

<b>REFRIGERATION</b>	<b>FOAMS</b>	<b>HALONS</b>	<b>METHYL</b>	<b>MEDICAL</b>
<b>Technical</b>	<b>T</b>	<b>T</b>	<b>BROMIDE</b>	<b>CHEMICAL</b>
<b>Options</b>	<b>O</b>	<b>O</b>	<b>T</b>	<b>T</b>
<b>Committee</b>	<b>C</b>	<b>C</b>	<b>O</b>	<b>O</b>
			<b>C</b>	<b>C</b>

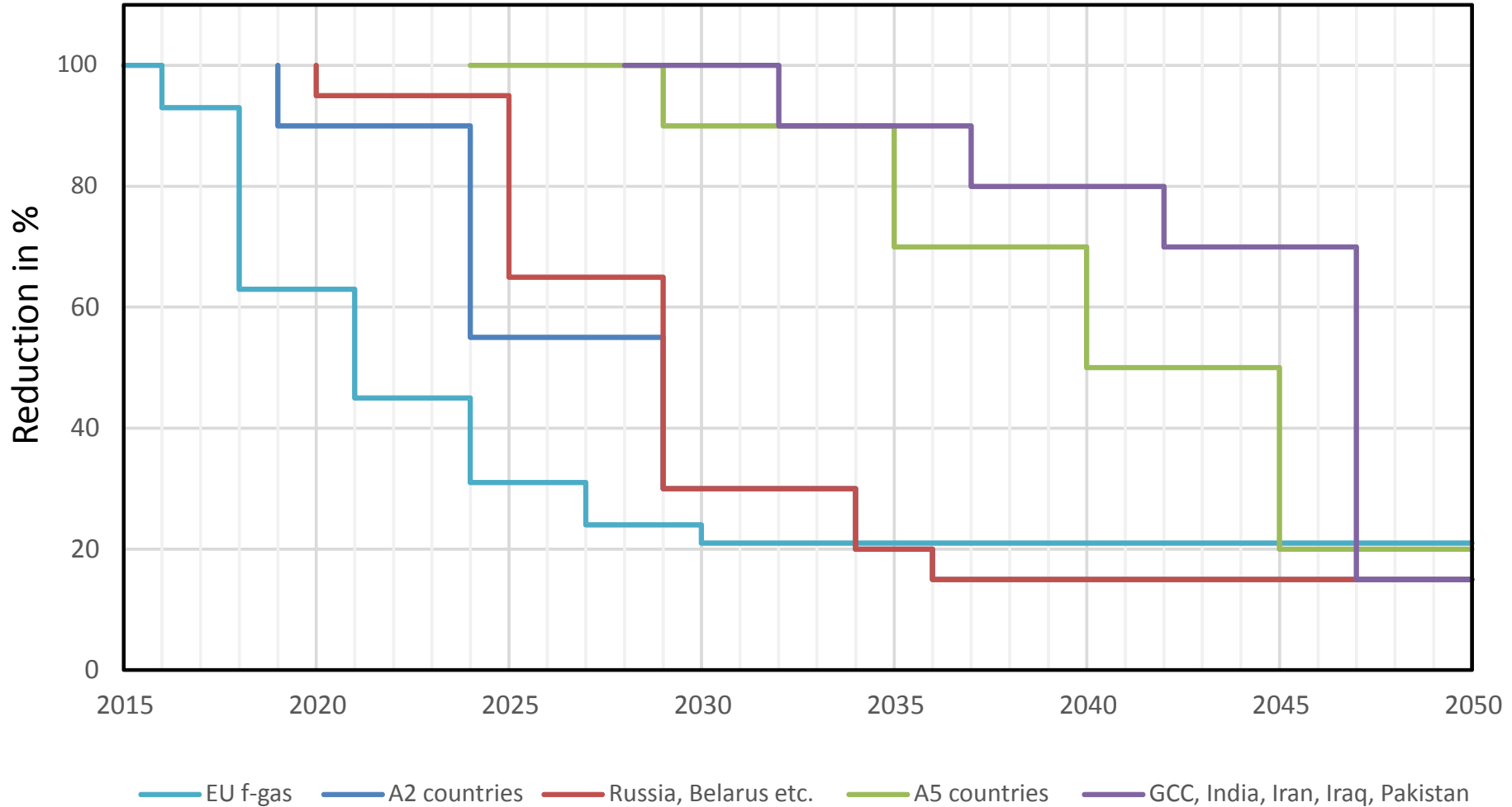
**La domanda globale di AC è destinata ad aumentare nei prossimi anni, a causa della crescita economica e del cambio climatico:**

- **del 2% p.a. nei paesi sviluppati**
- **dell'8% p.a. nei paesi in via di sviluppo (il che significa raddoppio ogni 10 anni circa)**



**Modeled global residential energy demand for heating and air conditioning**

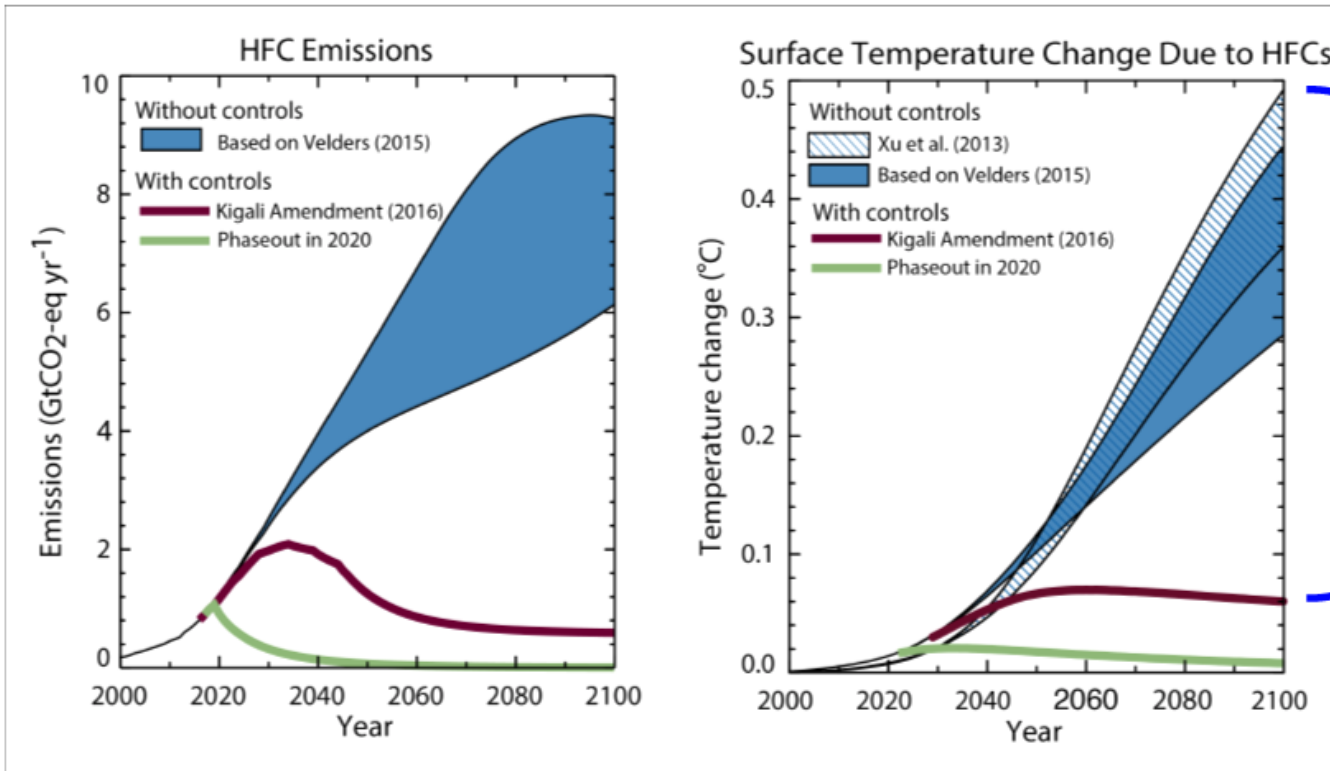
source: M. Isaac & D.P. vanVuuren, *Energy Policy*, vol. 37, 2009



## The phase-down of fluorinated gas consumption (Kigali Amendment)

source: UNEP, RTOC Assessment Report, 2018

## Impact of the Kigali Amendment



The KA is projected to reduce future global average warming in 2100 due to HFCs from a baseline of 0.3-0.5°C to less than 0.1°C

source: WMO-Scientific Assessment of Ozone Depletion: 2018

## **ALTERNATIVE:**

### ✓ **Refrigeranti naturali**

- **Ammoniaca (R717)**
- **Anidride carbonica (R744)**
- **Idrocarburi (R290-propano; R600a-isobutano)**

### ✓ **Refrigeranti sintetici**

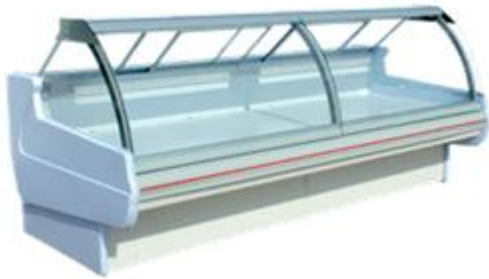
- **HFO (IdroFluoroOlefine)**
- **lower-GWP HFC (HFC32, miscele con HFO)**

### ✓ **Tecnologie non tradizionali (Not In Kind, NIK)**

- **Raffreddamento evaporativo (evaporative cooling)**



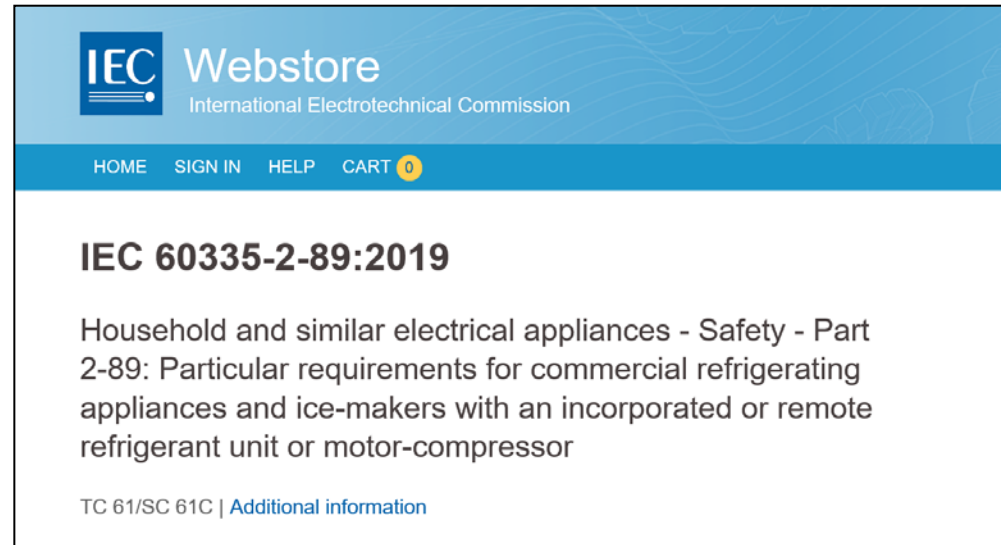
## REFRIGERAZIONE COMMERCIALE:





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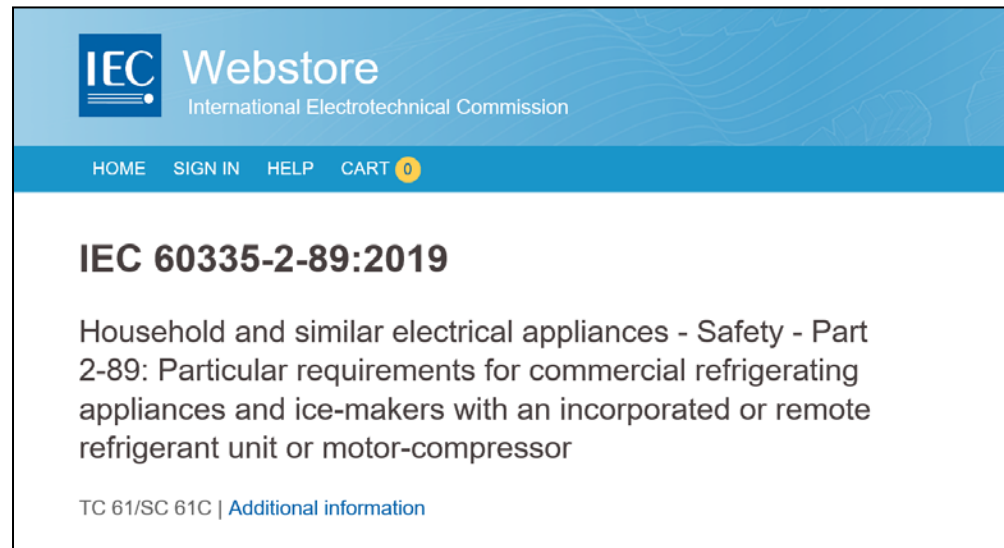
- ***L'International Electrotechnical Commission (IEC) sviluppa e pubblica le norme internazionali che riguardano le tecnologie elettriche ed elettroniche.***
- **Nel Maggio 2019, il Sottocomitato (SC) 61C della IEC (Safety of refrigeration appliances for household and commercial use) ha approvato per la pubblicazione il “final draft international standard” (FDIS) che revisiona la norma IEC 60335-2-89**



The screenshot shows the IEC Webstore interface. At the top, there is a blue header with the IEC logo and the text 'Webstore International Electrotechnical Commission'. Below the header is a navigation bar with links for 'HOME', 'SIGN IN', 'HELP', and 'CART' (with a '0' icon). The main content area displays the title 'IEC 60335-2-89:2019' and a description: 'Household and similar electrical appliances - Safety - Part 2-89: Particular requirements for commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or motor-compressor'. At the bottom, there is a link for 'TC 61/SC 61C | Additional information'.

## REFRIGERAZIONE COMMERCIALE:

- **La revisione è stata pubblicata alla fine di giugno 2019**
- **La versione precedente limitava la carica di refrigerante nelle applicazioni di refrigerazione commerciale a 150 g, senza tener conto della infiammabilità del refrigerante, che fosse A2L, A2 o A3**
- **La versione attuale aumenta la carica massima per i refrigeranti infiammabili nelle applicazioni di refrigerazione commerciale a 500 g per i refrigeranti A3 a fino a 1'200 g per i refrigeranti A2 e A2L**



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## REFRIGERAZIONE COMMERCIALE:

- Il rispetto delle norme IEC è volontario
- In certi paesi diventa obbligatorio se la versione nazionale viene tramutata in legge
- Per un quadro complete e aggiornato della situazione delle norme sulle norme di sicurezza dei refrigeranti si può fare riferimento al documento dell'Ozone Secretariat:
- “Information on the tabular overview of safety standards for refrigeration, air-conditioning and heat-pump systems and appliances”. [http://conf.montreal-protocol.org/meeting/oewg/oewg-40/presession/backgroundnote/safety-standards\\_tabular-overview\\_background-note.pdf](http://conf.montreal-protocol.org/meeting/oewg/oewg-40/presession/backgroundnote/safety-standards_tabular-overview_background-note.pdf)



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## **BENEFICI DI UNA EFFICACE MANUTENZIONE**

- ✓ **Reduced energy costs;**
- ✓ **Improved safety by eliminating risks;**
- ✓ **Better temperature control and thermal comfort for occupants;**
- ✓ **Improved occupant productivity by maintaining a good indoor environmental quality;**
- ✓ **Deferred capital expenditure for replacement and repair cost by extending the useful life of equipment;**
- ✓ **Compliance with regulation on minimum efficiency requirement for both new build and existing buildings.**

## EFFETTI DI UNA IMPROPRIA MANUTENZIONE

Improvement	Measures to be taken	Effect on Rated EE	Maintenance Cost Level
Appropriate refrigerant and oil charge	Check charge periodically and refill up to the recommended levels	Up to 50%	very low
Air recirculation into condenser	Reduce recirculation by cleaning filters and removing obstacles	Up to 25%	very low
Increase air flow through the evaporator	Cleaning filters and removing obstacles	Up to 10%	low
Adjustment of temperature sensors	Check temperature sensor; correct of change sensors	Up to 15%	low
Adjust thermostatic expansion valve (TEV) settings	Check and make set point adjustments	Up to 10%	medium
Condenser pressure control	Check and make set point adjustment	Up to 10%	medium



## **DIRETTIVA F-GAS EU:**

### ✓ **Containment**

- **Emissions prevention**
- **Mandatory leak checks depending on equipment charge in CO<sub>2</sub>-eq**

### ✓ **Reporting**

- **Producers, importers and exporters  $\geq 100$  t CO<sub>2</sub>-eq**
- **Destruction facilities and feedstock users  $\geq 1\ 000$  t CO<sub>2</sub>-eq**
- **Pre-charged equipment importers ( $\geq 500$  t CO<sub>2</sub>-eq) covered since 2015**



## **DIRETTIVA F-GAS EU:**

### ✓ **Training and certification**

- Required for servicing of equipment based on charge
- Similar to previous regulation but in CO<sub>2</sub>-eq
- Scope: Stationary refrigeration and air conditioning and mobile refrigeration equipment in trucks and trailers

### ✓ **Type of certificate:**

- Installation and servicing require certified personnel and certified company
- Leak checks and recovery require certified personnel only

### ✓ **Mobile air conditioning**

- Covered by EU MAC Directive
- F-gas Regulation requires training attestation for recovery from vehicles covered by MAC Directive

## DIRETTIVA F-GAS EU:

### INSPECTIONS OF CERTIFIED PERSONNEL AND COMPANIES

Check among others

- certificates and validity
- activities undertaken
- availability of tools
- recording of recovered refrigerant
- purchase of F-gases exclusively by certified companies
- sale of non-hermetically sealed equipment only when installation by certified personnel

### INSPECTIONS OF EQUIPMENT

Check among others

- availability of logbook in vicinity of equipment
- charge size and associated requirements for leak check frequency
- date of most recent leak check
- type of refrigerant
- information regarding servicing undertaking
- overall quality and completeness of logbook entries for leak detection system for additional leak prevention measures



## PROMETTENTI MA NON TROPPO!

# Condizionatore Portatile Mini

Risparmi in bolletta Centinaia di Euro e lo Porti Dove Desideri!

- ✓ Adatto fino a 80Mq
- ✓ Aria Depurata
- ✓ Basso Consumo

to alla Consegna e Spedizione gratuita



**59€**

**invece di 109€**



**59€**

**invece di 109€**



**grazie per l'attenzione**