

SUPERMARKET SWEEP

New research by Honeywell highlights the potential impact of the proposed F-Gas Regulation revisions on the supermarket sector, if they are required to replace all HFO refrigerants with less efficient alternatives.



INTRODUCTION

At Honeywell sustainability is at the heart of everything we do. We have a relentless focus on driving the transformation to a sustainable future through ongoing research, innovation and investment. As such we fully support reasonable, well-informed, and coherent regulatory approaches, such as the current F-Gas Regulation, as they support the use of substances that are safer, better performing and are key enablers ambitions to reach net zero emission.

We have historically supported the F-Gas Regulation and view it as an essential tool to reduce emissions of F-Gases by containing and phasing-down the use of HFCs. However, the current proposal raises several significant concerns as it potentially risks the goals outlined in REPowerEU, can increase costs to both industry and the consumer and, ironically, may increase emissions in impacted sectors and applications.

One such sector that will see significant unintended consequences is the supermarket sector. The food supply chain is a critical system which requires a reliable and uninterrupted series of refrigerated production, storage, transportation, and distribution activities. To power these activities, the industry needs high-performing refrigerants to keep food fresh throughout the process – a critical aspect of food supply. Supermarkets have a demand for cooling energy which is required to maintain fresh and frozen foods.

F-Gases are widely used as the chosen refrigerant in commercial fridges, freezers and refrigerated transportation. Refrigeration solutions across the food chain are carefully chosen to help businesses lower their carbon footprint, improve their energy efficiency, increase reliability and ensure high quality and safety standards.

The current proposed changes to the F-Gas Regulation, specifically those proposing to ban the use of ultra-low GWP products, will require a complete overhaul of the food chain refrigeration system – from the farm to the table. The result will be a significant increase in costs (which may be passed on to consumer) and huge disruption – in return for potentially less efficient systems, higher carbon emissions and increased food waste.

To demonstrate this potential impact researchers in Honeywell's R&D team conducted a study to evaluate the energy required for the cooling demand required by stationary refrigeration systems in supermarkets across the EU. Two refrigerant options were considered in this study – the first was a combination of HFO-based blends and the second was a combination of CO₂ and propane.

“THE RESULTS OF OUR RESEARCH ARE SET OUT IN THE FOLLOWING PAGES AND CLEARLY DEMONSTRATE HOW BANNING ALL F-GASES WOULD CREATE SIGNIFICANT UNINTENDED CONSEQUENCES”

To create a fair comparison, all of the existing installed base of the stores in a particular country were assumed to be transitioned completely to the HFO option or the CO₂/propane option. The energy demand for the store was then calculated using representative energy efficiency from compressor models for each technology for the different store sizes.

The results of our research are set out in the following pages and clearly demonstrate how banning all F-Gases would create significant unintended consequences for the operation of stationary refrigeration currently in used by supermarkets and food suppliers across the EU – increasing capital expenditure and ongoing electricity costs, disrupting operations and, ultimately, increasing carbon emissions.

SUPERMARKET LANDSCAPE IN THE EU

The supermarket landscape in the European Union is extremely diverse with just under 218,000 outlets across all Member States. Convenience stores, with an average footprint of 200m², are overwhelmingly the greatest volume with 126,425 outlets. They are followed by small supermarkets, with an average footprint of 500m², at 46,382 outlets. At the larger end there are 37,111 supermarkets, with an average footprint of 1000m² and finally 7,075 hypermarkets with an average footprint of 6,500m² across the EU.



RESEARCH METHODOLOGY

For the purposes of this research, Honeywell assumed the complete replacement of all current installed stores in the EU to HFO-based solution (R445A or 471A) or CO₂ or propane. In supermarkets and hypermarkets across the EU, the HFO-based solution was compared to a CO₂ solution. In small supermarkets and convenience stores the HFO-based solution was compared with propane. Calculations for all countries are based on Frankfurt climate conditions. For warmer locations in the EU, the increase of CO₂ emissions and cost would be higher. Average 12-month carbon intensity of electricity for the EU was applied = 0.43 kg CO₂/ kWh.

WHAT WOULD A BAN ON THE USE OF HFOS MEAN?

A ban on the use of HFOs in refrigeration could add €10-30 billion in electricity costs to the European supermarket sector because of the lower energy efficiency of alternatives, requiring the systems to work harder, therefore consuming more energy. It would also have the unintended consequence of adding up to 24 million tCO₂e in emissions to the environment – the equivalent of nearly 4.7 million petrol-powered cars driven for a year.

Calculation based on Frankfurt climate conditions.
Source: hwl.co/references

Hypermarket	7,975
Supermarket.....	37,111
Small supermarket.....	46,382
Convenience store	126,425

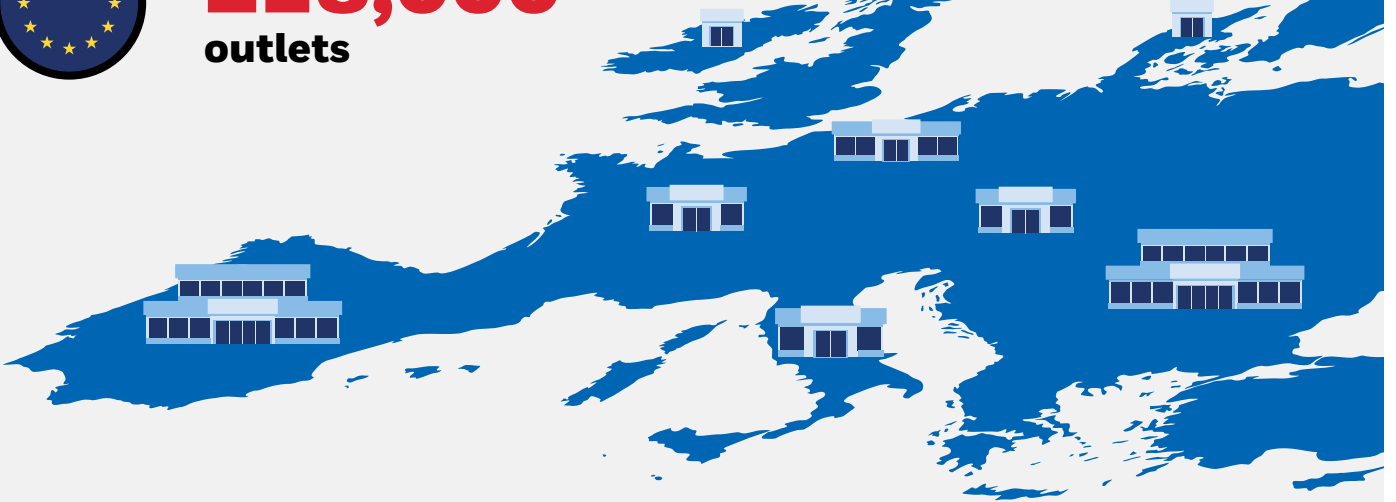
Total bill

Electricity costs.....	€10-30 Billion
Extra emissions	24 (million tCO ₂ e)





218,000
outlets



126,425
convenience stores
average footprint of 200m²



37,111
supermarkets
average footprint of 1000m²

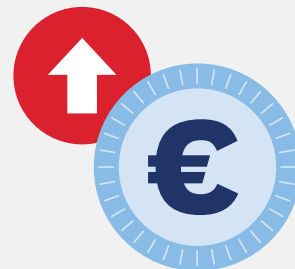


46,382
small supermarkets
average footprint of 500m²



7,975
hypermarkets
average footprint of 6,500m²

ADDING
€10-30 BILLION
in electricity costs



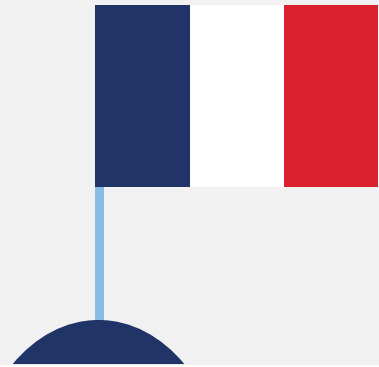
ADDING
24 MILLION
tCO₂e in emissions



EQUIVALENT TO MORE THAN
4.7 MILLION
petrol-powered cars

SUPERMARKET LANDSCAPE IN FRANCE

In France there are 35,357 supermarket in total. convenience stores are the greatest volume at about 24,000 outlets, followed by small supermarkets with 5,275. At the larger end there are approximately 4,510 supermarkets and about 1,500 hypermarkets.



RESEARCH METHODOLOGY

For the purposes of this research, Honeywell assumed the complete replacement of all current installed stores in France to HFO-based solution (R445A or 471A) or CO2 or propane. In supermarkets and hypermarkets, the HFO-based solution was compared to a CO2 solution. In small supermarkets and convenience stores the HFO-based solution was compared with propane. Calculation is based on Frankfurt climate conditions. For warmer locations in the EU, the increase of CO2 emissions and cost would be higher. Average 12-month carbon intensity of electricity for France was applied = 0.103 kg CO2/ kWh.

WHAT WOULD A BAN ON THE USE OF HFOS MEAN?

A ban on the use of HFOS in refrigeration could add €1-4 billion in electricity costs to the French supermarket sector because of the lower energy efficiency of alternatives, requiring the systems to work harder, therefore consuming more energy. It would also have the unintended consequence of adding up to 1 million tCO2e in emissions to the environment – the equivalent of more than 195,000 petrol-powered cars driven for a year.

Calculation based on Frankfurt climate conditions.
For warmer locations in France, the increase of CO2 emissions and cost would be higher.
Source: hwl.co/references

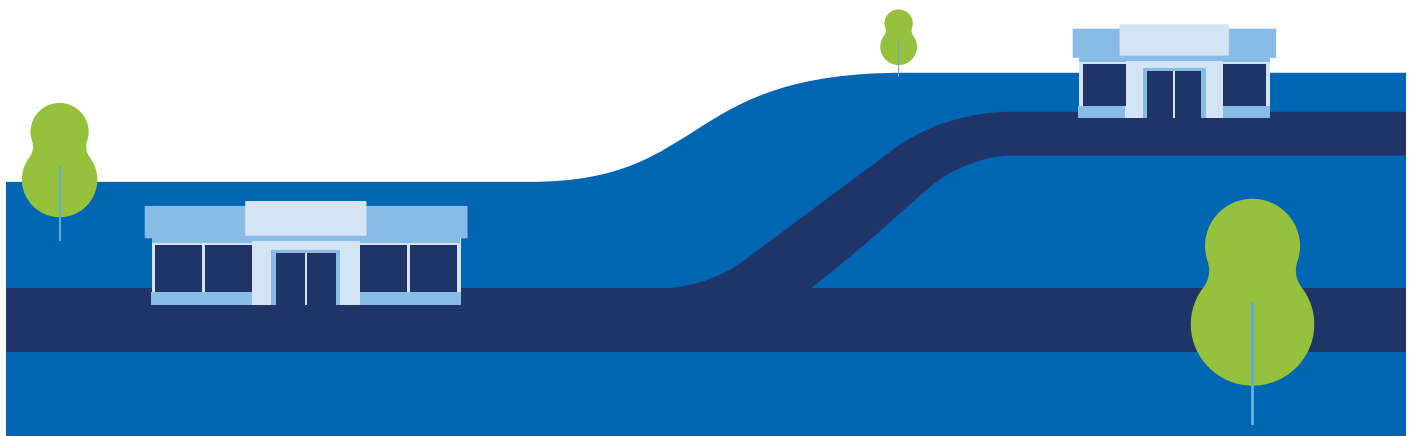
Hypermarket	1,458
Supermarket.....	4,510
Small supermarket.....	5,275
Convenience store	24,114

Total bill

Electricity costs.....**€1-4 billion**

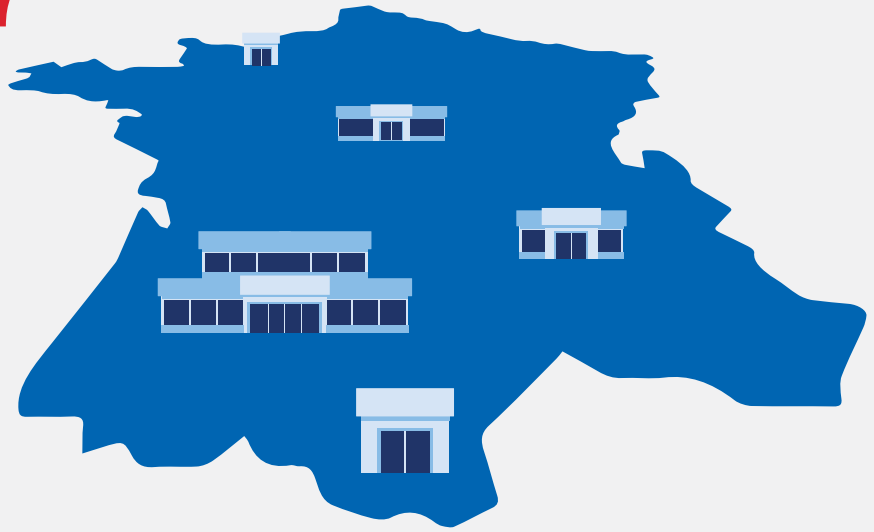
Extra emissions

1 (million tCO2e)





35,357
outlets



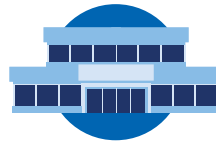
24,114
convenience stores
average footprint of 200m²



4,510
supermarkets
average footprint of 1000m²



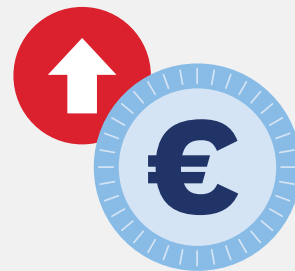
5,275
small supermarkets
average footprint of 500m²



1,485
hypermarkets
average footprint of 6,500m²

ADDING

€1-4 BILLION
in electricity costs



ADDING

1 MILLION
tCO₂e in emissions



EQUIVALENT TO MORE THAN

195,000
petrol-powered cars

SUPERMARKET LANDSCAPE IN GERMANY

There are 47,709 supermarkets in Germany. In Germany convenience stores and small supermarkets dominate the supermarket sector with over 40,000 out of a total of 47,709 outlets. Germany has 1,862 hypermarkets and 4,644 supermarkets.



RESEARCH METHODOLOGY

For the purposes of this research, Honeywell assumed the complete replacement of all current installed stores in Germany to HFO-based solution (R445A or 471A) or CO2 or propane. In supermarkets and hypermarkets, the HFO-based solution was compared to a CO2 solution. In small supermarkets and convenience stores the HFO-based solution was compared with propane. Calculation is based on Frankfurt climate conditions. For warmer locations in the EU, the increase of CO2 emissions and cost would be higher. Average 12-month carbon intensity of electricity for Germany was applied = 0.504 kg CO2/ kWh.

WHAT WOULD A BAN ON THE USE OF HFOS MEAN?

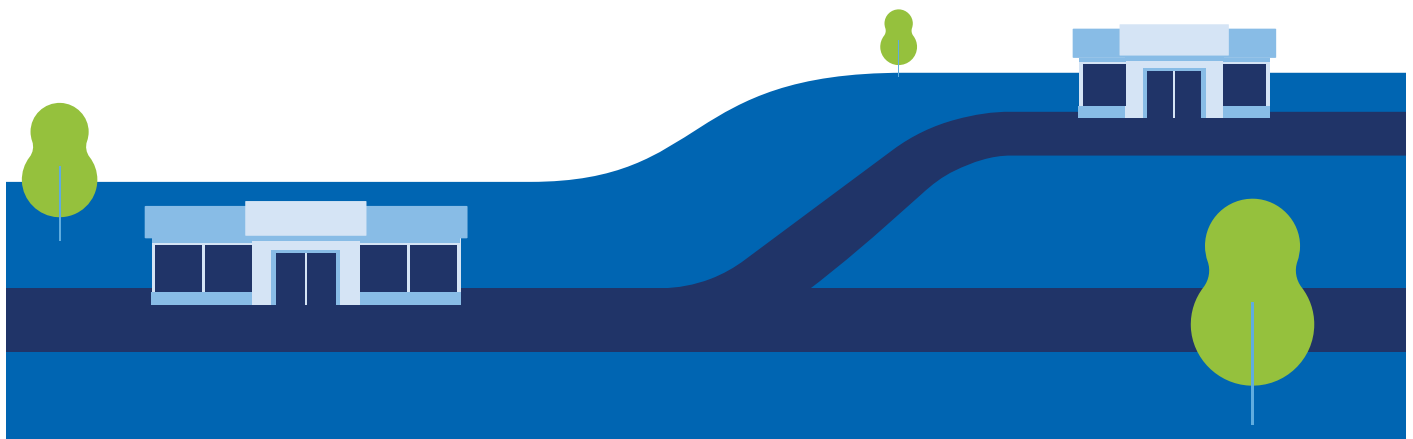
A ban on the use of HFOS in refrigeration could add €2-5 billion in electricity costs to the German supermarket sector because of the lower energy efficiency of alternatives, requiring the systems to work harder, therefore consuming more energy. It would also have the unintended consequence of adding up to 5.5 million tCO2e in emissions to the environment – the equivalent of more than one million petrol-powered cars driven for a year.

Calculation based on Frankfurt climate conditions.
Source: hwwl.co/references

Hypermarket	1,862
Supermarket.....	4,644
Small supermarket.....	17,755
Convenience store	23,448

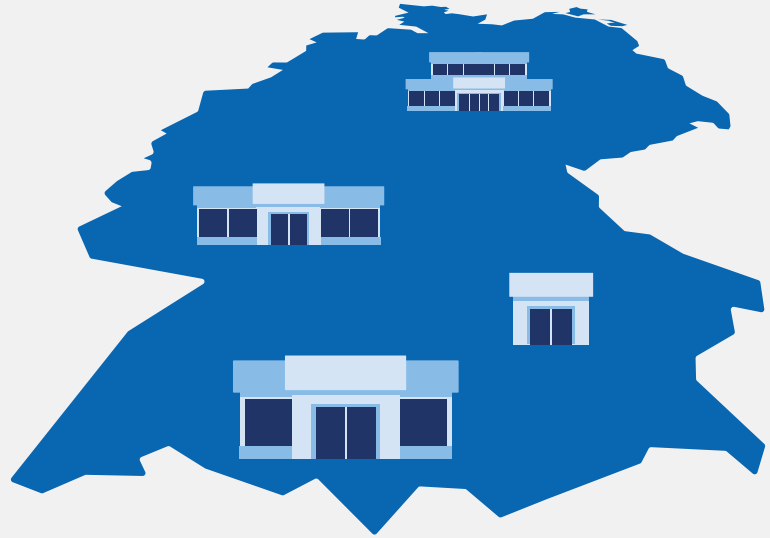
Total bill

Electricity costs	€2-5 billion
Extra emissions	5.5 (million tCO2e)





47,709
outlets



23,448
convenience stores
average footprint of 200m²



4,644
supermarkets
average footprint of 1000m²

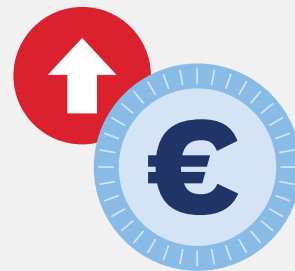


17,755
small supermarkets
average footprint of 500m²



1,862
hypermarkets
average footprint of 6,500m²

ADDING
€2-5 BILLION
in electricity costs



ADDING
5.5 MILLION
tCO₂e in emissions



EQUIVALENT TO MORE THAN
1 MILLION
petrol-powered cars

SUPERMARKET LANDSCAPE IN SPAIN

In Spain there are 19,297 supermarket outlets. Unlike Germany there is a much more even distribution of supermarkets, small supermarkets and convenience stores. Convenience stores have the highest volume with 8,241, followed by supermarkets with 5,781. Smaller supermarkets account for 4,450 outlets and at the much larger end hypermarkets are more limited with 825 outlets across Spain.



RESEARCH METHODOLOGY

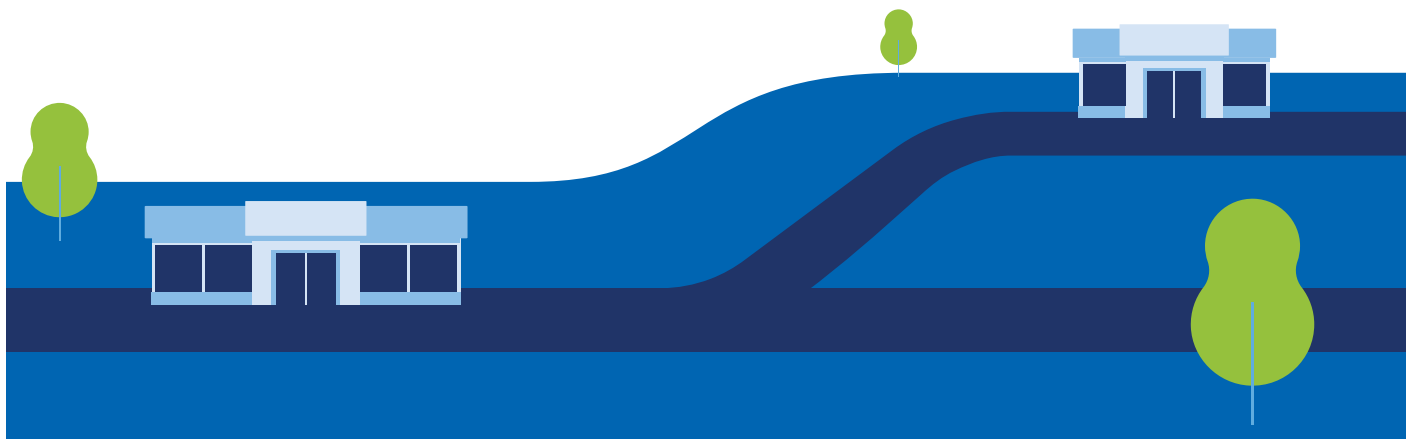
For the purposes of this research, Honeywell assumed the complete replacement of all current installed stores in Spain to HFO-based solution (R445A or 471A) or CO₂ or propane. In supermarkets and hypermarkets, the HFO-based solution was compared to a CO₂ solution. In small supermarkets and convenience stores the HFO-based solution was compared with propane. Calculation is based on Frankfurt climate conditions. For warmer locations in the EU, the increase of CO₂ emissions and cost would be higher. Average 12-month carbon intensity of electricity for Spain was applied = 0.185 kg CO₂/ kWh.

WHAT WOULD A BAN ON THE USE OF HFOS MEAN?

A ban on the use of HFOs in refrigeration could add €1-3 billion in electricity costs to the Spanish supermarket sector because of the lower energy efficiency of alternatives, requiring the systems to work harder, therefore consuming more energy. It would also have the unintended consequence of adding up to 1.3 million tCO₂e in emissions to the environment – the equivalent of more than 250,000 petrol-powered cars driven for a year.

Calculation based on Frankfurt climate conditions. For Spain, the increase of CO₂ emissions and cost would be higher.

Source: hwl.co/references



Hypermarket	825
Supermarket.....	5,781
Small supermarket.....	4,450
Convenience store	8,241

Total bill

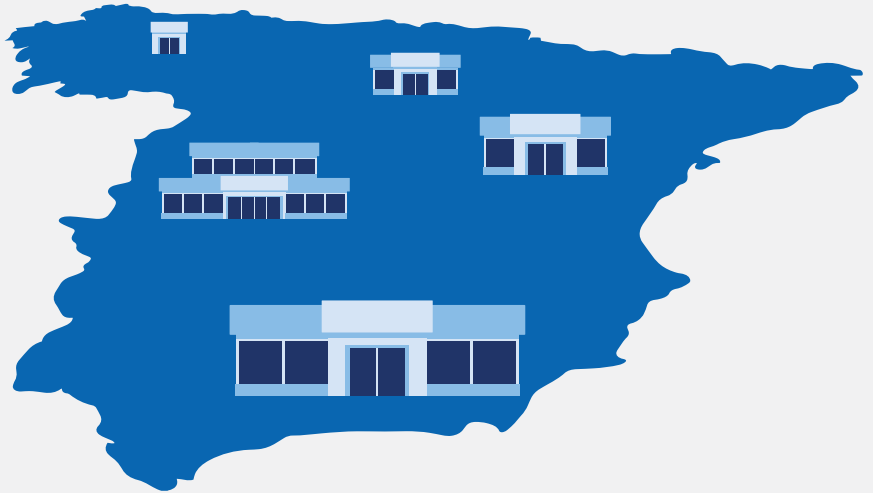
Electricity costs.....**€1-3 billion**

Extra emissions

1.3 (million tCO₂e)



19,297
outlets



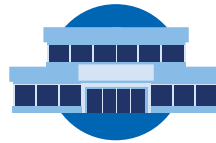
8,241
convenience stores
average footprint of 200m²



5,781
supermarkets
average footprint of 1000m²

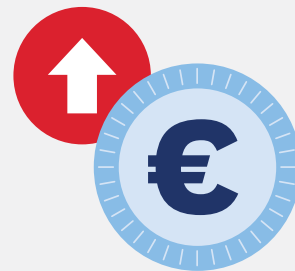


4,450
small supermarkets
average footprint of 500m²



825
hypermarkets
average footprint of 6,500m²

ADDING
€1-3 BILLION
in electricity costs



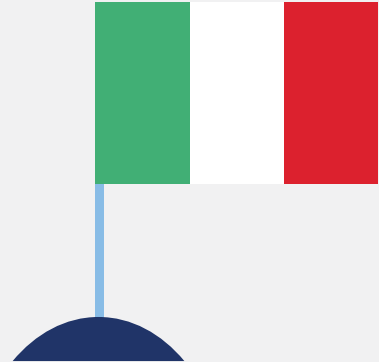
ADDING
1.3 MILLION
tCO₂e in emissions



EQUIVALENT TO MORE THAN
250,000
petrol-powered cars

SUPERMARKET LANDSCAPE IN ITALY

In Italy there are 13,733 supermarket outlets. Like Spain the spread between supermarkets, small supermarkets and convenience stores is flatter than in Northern European countries like Germany and the UK. Convenience stores have the highest volume with 7,948, followed by small supermarkets with 3,417. Supermarkets account for 1,925 outlets and at the larger end there are only 448 hypermarkets across the whole of Italy.



RESEARCH METHODOLOGY

For the purposes of this research, Honeywell assumed the complete replacement of all current installed stores in Italy to HFO-based solution (R445A or 471A) or CO2 or propane. In supermarkets and hypermarkets, the HFO-based solution was compared to a CO2 solution. In small supermarkets and convenience stores the HFO-based solution was compared with propane. Calculation is based on Frankfurt climate conditions. For warmer locations in the EU, the increase of CO2 emissions and cost would be higher. Average 12-month carbon intensity of electricity for Italy was applied = 0.4 kg CO2/kWh.

WHAT WOULD A BAN ON THE USE OF HFOS MEAN?

A ban on the use of HFOS in refrigeration could add €0.5 - 2 billion in electricity costs to the Italian supermarket sector because of the lower energy efficiency of alternatives, requiring the systems to work harder, therefore consuming more energy. It would also have the unintended consequence of adding up to 1.3 million tCO2e in emissions to the environment – the equivalent of more than 250,000 petrol-powered cars driven for a year.

Calculation based on Frankfurt climate conditions. For Italy, the increase of CO2 emissions and cost would be higher.

Source: hwl.co/references

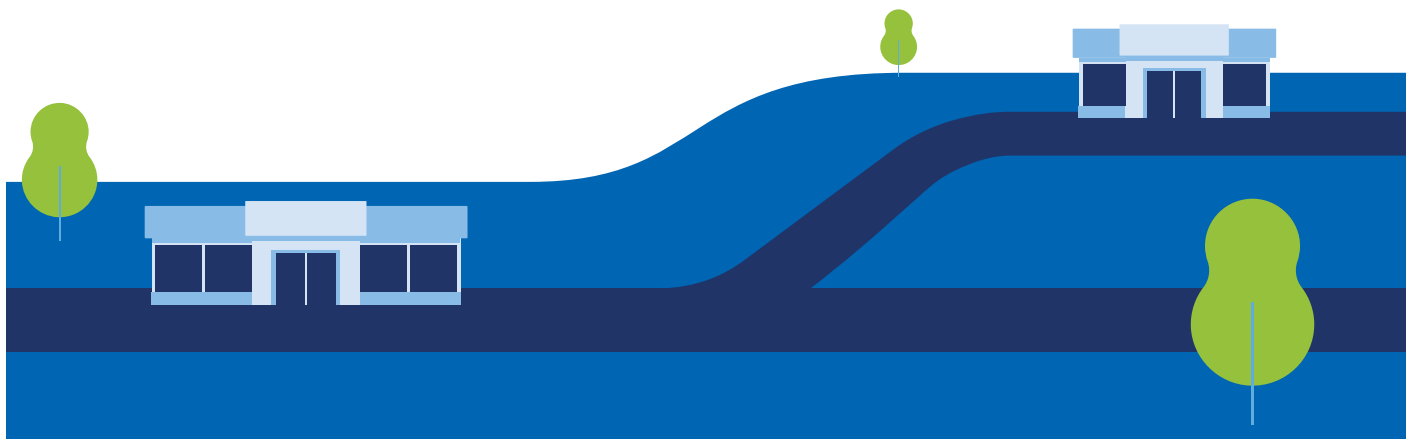
Hypermarket	448
Supermarket.....	1,925
Small supermarket.....	3,417
Convenience store	7,948

Total bill

Electricity costs.....€0.5-2 billion

Extra emissions

1.3 (million tCO2e)





13,733
outlets



7,948
convenience stores
average footprint of 200m²



1,925
supermarkets
average footprint of 1000m²



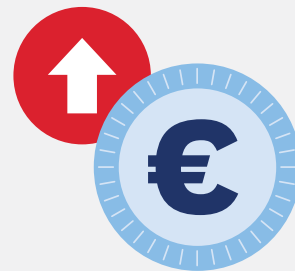
3,417
small supermarkets
average footprint of 500m²



448
hypermarkets
average footprint of 6,500m²

ADDING

€0.5-2 BILLION
in electricity costs



ADDING

1.3 MILLION
tCO₂e in emissions

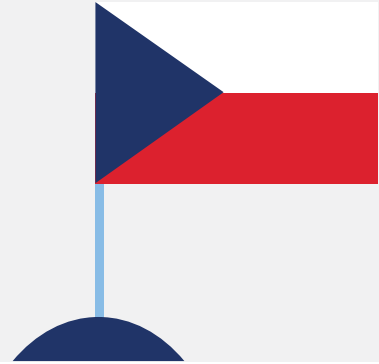


EQUIVALENT TO MORE THAN

250,000
petrol-powered cars

SUPERMARKET LANDSCAPE IN CZECHIA

In Czechia there are a total of 5,299 supermarket outlets across the country. Convenience stores dominate the market with 3,553 stores with supermarkets and small supermarkets each having 724 and 685 respectively. Hypermarkets represent less than 10% of the overall supermarket footprint with 337 stores across Czechia.



RESEARCH METHODOLOGY

For the purposes of this research, Honeywell assumed the complete replacement of all current installed stores in Czechia to HFO-based solution (R445A or 471A) or CO₂ or propane. In supermarkets and hypermarkets, the HFO-based solution was compared to a CO₂ solution. In small supermarkets and convenience stores the HFO-based solution was compared with propane. Calculation is based on Frankfurt climate conditions. For warmer locations in the EU, the increase of CO₂ emissions and cost would be higher. Average 12-month carbon intensity of electricity for Czechia was applied = 0.536 kg CO₂/ kWh.

WHAT WOULD A BAN ON THE USE OF HFOS MEAN?

A ban on the use of HFOs in refrigeration could add €200-700 million in electricity costs to the Czech supermarket sector because of the lower energy efficiency of alternatives, requiring the systems to work harder, therefore consuming more energy. It would also have the unintended consequence of adding up to 0.8 million tCO₂e in emissions to the environment – the equivalent of more than 150,000 petrol-powered cars driven for a year.

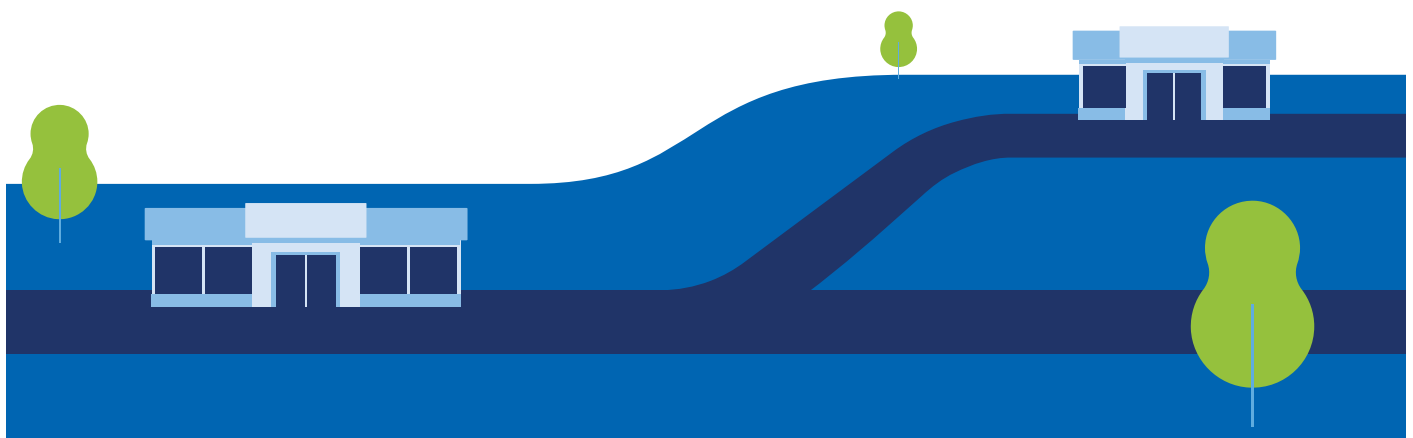
Calculation based on Frankfurt climate conditions.
Source: hwl.co/references

Hypermarket	337
Supermarket.....	724
Small supermarket.....	685
Convenience store	3,553

Total bill

Electricity costs.....**€0.2 - 0.7 billion**

Extra emissions.....**0.8** (million tCO₂e)





5,299
outlets



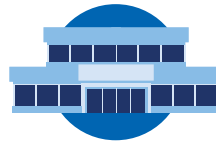
3,553
convenience stores
average footprint of 200m²



724
supermarkets
average footprint of 1000m²



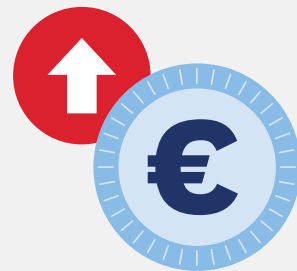
685
small supermarkets
average footprint of 500m²



337
hypermarkets
average footprint of 6,500m²

ADDING

€0.2 - 0.7 BILLION
in electricity costs



ADDING

0.8 MILLION
tCO₂e in emissions

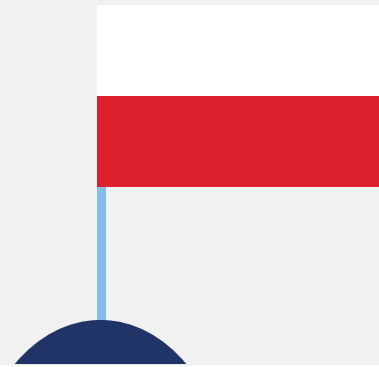


EQUIVALENT TO MORE THAN

150,000
petrol-powered cars

SUPERMARKET LANDSCAPE IN POLAND

In Poland there are a total of 24,627 supermarket outlets across the country. Convenience stores dominate the market with 16,282 stores with supermarkets and small supermarkets each having 4,421 and 3,183 respectively. There are 741 hypermarkets in Poland.



RESEARCH METHODOLOGY

For the purposes of this research, Honeywell assumed the complete replacement of all current installed stores in Poland to HFO-based solution (R445A or 471A) or CO₂ or propane. In supermarkets and hypermarkets, the HFO-based solution was compared to a CO₂ solution. In small supermarkets and convenience stores the HFO-based solution was compared with propane. Calculation is based on Frankfurt climate conditions. For warmer locations in the EU, the increase of CO₂ emissions and cost would be higher. Average 12-month carbon intensity of electricity for Poland was applied = 0.768 kg CO₂/ kWh.

WHAT WOULD A BAN ON THE USE OF HFOS MEAN?

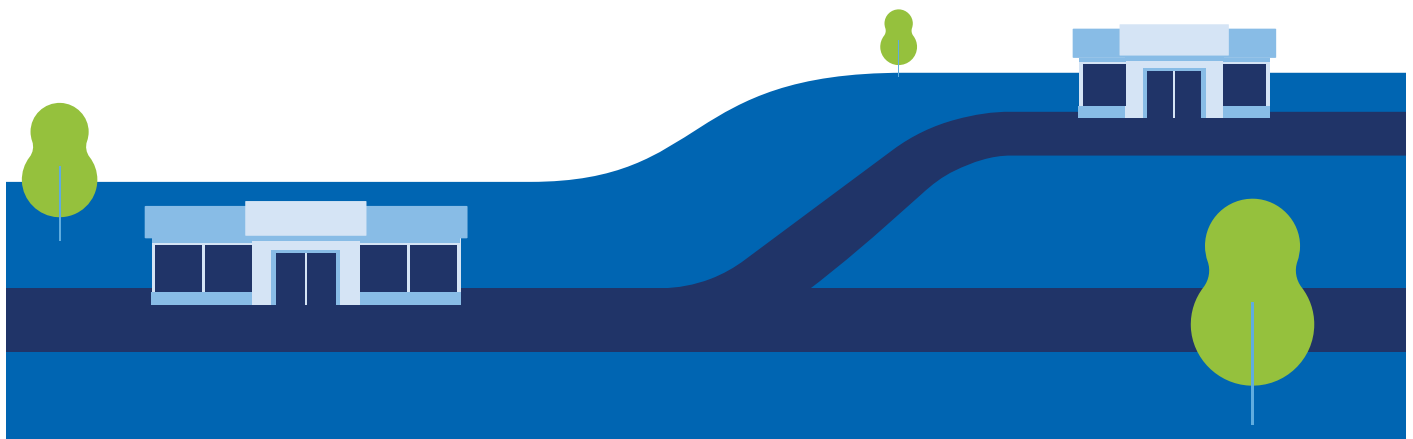
A ban on the use of HFOS in refrigeration could add 4-12 billion złoty in electricity costs to the Polish supermarket sector because of the lower energy efficiency of alternatives, requiring the system to work harder, therefore consuming more energy. It would also have the unintended consequence of adding up to 4.1 million tCO₂e in emissions to the environment – the equivalent of more than 800,000 petrol-powered cars driven for a year.

Calculation based on Frankfurt climate conditions.
Source: hwl.co/references

Hypermarket	741
Supermarket.....	3,183
Small supermarket.....	4,421
Convenience store	16,282

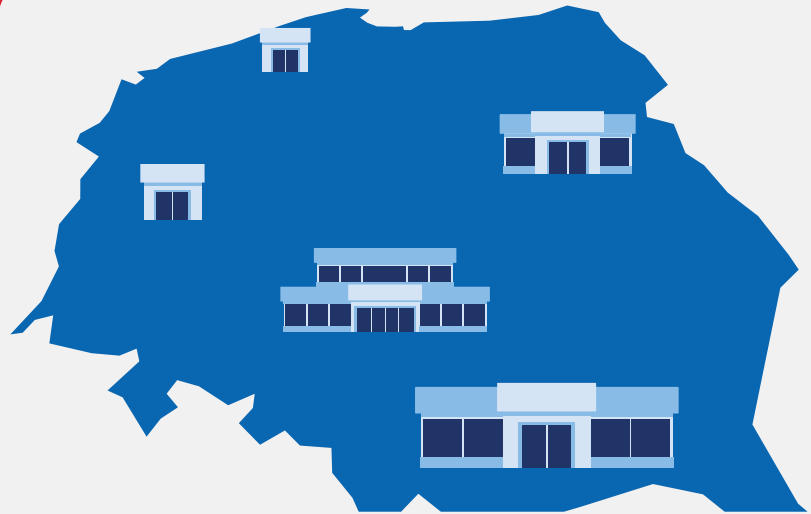
Total bill

Electricity costs	€0.8-2.6 billion
Extra emissions	4.1 (million tCO ₂ e)





24,627
outlets



16,282
convenience stores
average footprint of 200m²



3,183
supermarkets
average footprint of 1000m²



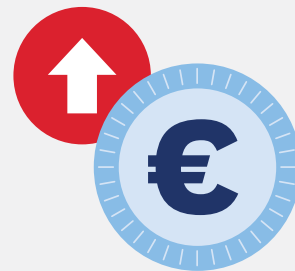
4,421
small supermarkets
average footprint of 500m²



741
hypermarkets
average footprint of 6,500m²

ADDING

€0.8-2.6 BILLION
in electricity costs



ADDING

4.1 MILLION
tCO₂e in emissions



EQUIVALENT TO MORE THAN

800,000
petrol-powered cars

CONCLUSIONS

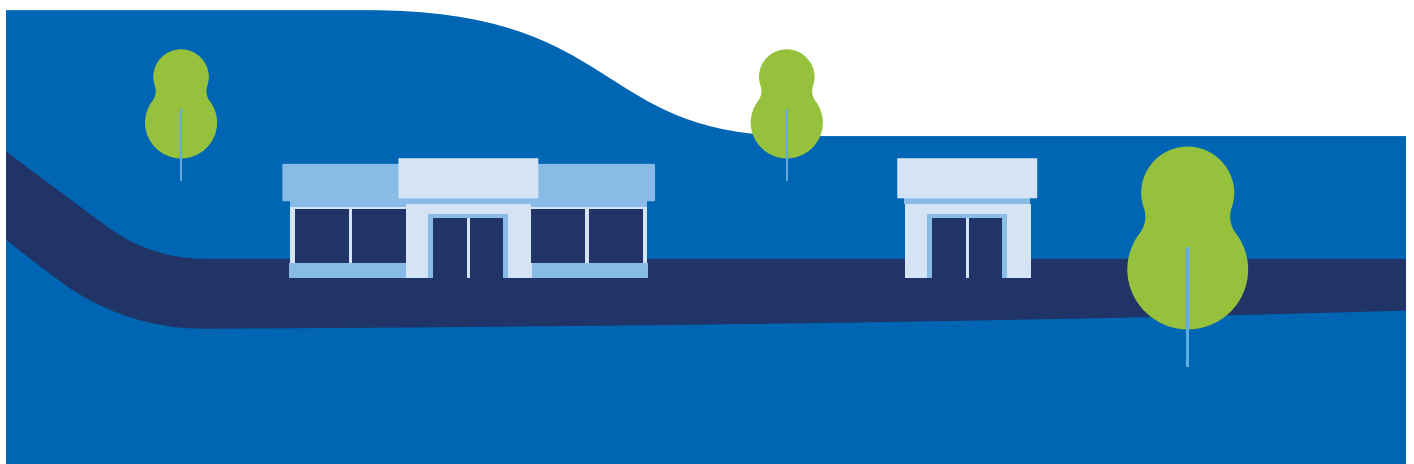
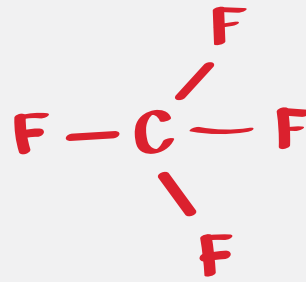
The revision of the F-Gas Regulation, as adopted by Parliament, will have consequences for the climate, for European businesses and for the day-to-day lives of Europe's citizens.

This research only looks at one application of HFOs - in stationary refrigeration in supermarkets - but the impact of the extreme position of the ENVI report is wide ranging and will impact all parts of the food chain.

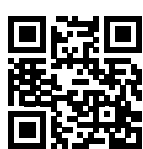
For example, the proposed regulations will impact temperature-controlled transport used to chill (at 0 to 4°C) and freeze food products (at -18°C), ensuring produce and food products get to supermarkets and their consumers fresh.

Honeywell, along with 28 European trade associations that represent millions of jobs across the EU, is concerned about the potential negative consequences these proposals could have across multiple sectors and industries - from refrigeration, to insulation, to Europe's ambitious heat pump rollout.

We therefore urge European policy makers and regulators to consider the economic, social and environmental impact of the Parliament's F-Gas report in its current form.



For more information:
advancedmaterials.
[honeywell.com/be/en/
hfo-facts](https://honeywell.com/be/en/hfo-facts)



References:
hwl.co/references

Honeywell

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