



## Next Station in the Urban Cold Chain: FGasFreeLIFE

*International research consortium, with Austrian refrigeration pioneer PBX GmbH as coordinator, launches EU-LIFE project for future-oriented transport refrigeration.*

Transport refrigeration systems that operate with natural refrigerants, cool and heat reliably even at extreme ambient temperatures, and melt operating costs at the same time? Not a vision, but a scenario that could soon become commonplace in European cities. The practical proof for this revolutionary technology, which aims to eliminate F-gases in the urban cold chain, will be provided by 2029 as part of a research project by four partners from Austria and Italy. Comprehensive data from test fleets in Italy, Austria, France, and Sweden aims to show increased economic efficiency and operational performance in diverse climate zones.

Continuous heatwaves of over 40 degrees this summer show once again how much pressure cold chains face when food and medication must be transported safely even in extreme heat. At the same time, global climate phenomena favor the advance of arctic cold air into Europe, which brings increasingly sharp cold snaps even to southern regions.

This increases the requirements for transporting temperature-sensitive goods – both for cooling and heating: narrower temperature windows, multiple zones in the same vehicle, and seamless documentation. At the same time, the direction is clear: electric is more cost- and energy-efficient, and the EU wants to become more independent of imported fossil energies. Conventional transport refrigeration technology is not built for these new tasks. Developed around 50 years ago, it consumes a vast amount of energy, costs driving range, and causes high service costs year after year. Furthermore, it emits exactly what a modern refrigerated vehicle should no longer release: CO<sub>2</sub>, NO<sub>x</sub>, and refrigerants with high global warming potential. High time, therefore, for a refrigeration system that makes it possible to pack climate protection and cost recovery into a refrigerated vehicle.

### **The Last Dirty Link in the Cold Chain**

This is exactly where "FGasFreeLIFE" comes in, which the Institute for Construction Technologies (ITC) of the National Research Council of Italy in Padua (Consiglio Nazionale delle Ricerche) approached PBX GmbH with. The Austrian tech startup specializes in developing zero-emission transport refrigeration systems. Together with two other partners from Italy – the testing and research center Innovhub SSI and the Cluster Lombardo della Mobilità (CLM) – a refrigeration system for electrically powered refrigerated vehicles up to 3.5 tons is to be developed, which operates entirely without fluorinated refrigerants (F-gases) and PFAS. FGasFreeLIFE is co-funded by the European Union under the LIFE program and has been running for 36 months since July 1, 2026.

Transport refrigeration is the last link in the cold chain that still has a significantly negative environmental footprint. Over 95 percent of all insulated commercial vehicles today use

compression refrigeration systems with fluorinated refrigerants – substances with a high global warming potential (GWP) that contribute directly to global warming if leakages occur. If the current state of technology remains unchanged, the global vehicle fleets will contain around 30 million kilograms of PFAS precursor substances within five years, according to project estimates; annual CO<sub>2</sub> emissions from refrigerant leaks and the diesel operation of the cooling units already run into millions of tons today. Regulations such as the EU F-Gas Regulation, REACH, and the CARB-TRU standard in California, USA, further increase the pressure to act.

## **Engineering the Leap: From Kilograms to Grams**

FGasFreeLIFE counters this with a hybrid cooling system that requires only grams instead of kilograms of refrigerant – namely the hydrocarbons propane (R290) and propylene (R1270), respectively, instead of conventional HFCs or HFOs. Demand-optimized, predictive control and sophisticated cold chain management are designed to increase efficiency in partial-load operation by more than 30 percent and halve the system weight. All this with reliable operation from arctic cold to desert heat and specially developed for the current generation of electric commercial vehicles.

The consortium pursues three goals: first, the development of a consistently customer-centric unit based on natural refrigerants that optimally meets the actual requirements of fleet operators in terms of performance, operation, and efficiency. A novelty in transport refrigeration is the integrated heat pump: it cools and heats highly efficiently without an additional electric heater that costs valuable range. Second, the aim is to prove the beneficial environmental impacts in real operation. And third, tangible economic benefits are to be made visible. Low operating and opportunity costs sustainably improve the Total Cost of Ownership.

To collect meaningful practical data, pilot fleets in four different European climate regions (Italy, Austria, France, and Sweden) are continuously monitored and evaluated.

The research and development expertise in the consortium lies in Austria and Italy. At the Construction Technology Institute in Padua (ITC-CNR), the CNR (Consiglio Nazionale delle Ricerche) brings many years of research into refrigeration and heat pump technology as well as the cold chain of perishable goods. Innovhub-Stazioni Sperimentali per l'Industria, the testing and research center of the Milan-Monza-Brianza-Lodi Chamber of Commerce, takes over independent analysis and testing procedures for the newly developed system components. The Cluster Lombardo della Mobilità (CLM), one of nine technology clusters in the Lombardy region, supports the project in networking with industry and funding partners and in communication work accompanying the project.

*"Climate-damaging refrigerants must be taken out of circulation – the sooner, the better. For this, fleet operators need technologies that do not turn into stranded assets within a few years. The future belongs to transport refrigeration that not only offers regulatory security but also opens up new possibilities in terms of usage and economic efficiency. Because exactly that is the decisive lever to accelerate the transition to a resilient and sustainable urban cold chain,"* says Dr. Filip Kitanoski, founder and CEO of PBX GmbH.

## **A Race Europe Can't Afford to Lose**

For the project partners, FGasFreeLIFE is far more than a research project. The consortium wants to use facts and data to demonstrate that the innovative technology offers groundbreaking solutions to overcome the challenges of temperature-controlled transport. The certainty that this system works without harming the climate and environment while simultaneously lowering the

Total Cost of Ownership (TCO) should decisively improve the prerequisites for the electrification of refrigerated fleets.

At the same time, FGasFreeLIFE positions Europe as a pioneer in clean, efficient, and digital refrigeration technologies – in a refrigerated transport market that, according to industry forecasts, is growing from around 113 billion US dollars (2022) to over 360 billion US dollars by 2030.

## Projekt key facts

|                     |                                                                                                                                                                                                                             |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project</b>      | FGasFreeLIFE – Fluorinated GAS FREE LIFE                                                                                                                                                                                    |
| <b>Program</b>      | LIFE Programme of the European Union, Call LIFE-2025-SAP-CLIMA-CCM. Implementation: European Climate, Infrastructure and Environment Executive Agency (CINEA)                                                               |
| <b>Coordination</b> | PBX GmbH (Korneuburg, Austria)                                                                                                                                                                                              |
| <b>Partners</b>     | CNR – Consiglio Nazionale delle Ricerche, Istituto per le Tecnologie della Costruzione, Padua (Italien); Innovhub-Stazioni Sperimentali per l'Industria, Mailand (Italien); Cluster Lombardo della Mobilità – CLM (Italien) |
| <b>Duration</b>     | 36 month, Start: July 1st, 2026                                                                                                                                                                                             |
| <b>Test fleets</b>  | Italy, Austria, France, Sweden                                                                                                                                                                                              |

## Project Partners

### CNR – Consiglio Nazionale delle Ricerche

The CNR is Italy's largest public research institution. The Padua research site of the Institute of Construction Technologies (ITC-CNR) focuses on refrigeration and heat pump technology as well as the cold chain for perishable goods, with an emphasis on natural refrigerants and energy efficiency.

<https://www.itc.cnr.it/>

### PBX GmbH

PBX GmbH, headquartered in Korneuburg near Vienna, is a pioneer in zero-emission transport refrigeration systems. The company develops and manufactures refrigeration systems for light commercial vehicles up to 3.5 metric tons that use natural refrigerants – hydrocarbons such as propane (R290) – instead of fluorinated refrigerants (F-gases). Its flagship product, the ecos M24, thus enables the emission-free transport of temperature-sensitive goods.

<https://www.pbx-cooling.com>

## **Innovhub-Stazioni Sperimentali per l'Industria**

Innovhub SSI, headquartered in Milan, is a research, testing, and innovation center of the Milan-Monza-Brianza-Lodi Chamber of Commerce. It offers independent analysis, testing, and consulting services for industrial companies, including those in the energy and manufacturing sectors.

<https://en.innovhub-ssi.it/>

## **Cluster Lombardo della Mobilità (CLM)**

Der CLM ist einer von neun von der Region Lombardei anerkannten Technologieclustern. Er vernetzt Unternehmen, Forschungseinrichtungen und Hochschulen im Mobilitätssektor und unterstützt europäische Forschungs- und Innovationsprojekte.

<https://clusterlombardomobilita.it/>

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