



**Circular economy ecosystem to Recover, Recycle and  
Re-use F-gases contributing to the depletion of  
greenhouse gases - LIFE Retradeables**

**Deliverable: Transferability and IPR analysis**

**Action C4**

**Responsible for Deliverable: DAIKIN EUROPE N.V.  
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## Abstract

This deliverable focuses both on the **transferability** of the 3R ECOSYSTEM and on **Intellectual Property Rights (IPR)** issues. In the first case, an overview is provided on the potential sectors to which the results of the LIFE Retrtradeables project are to be transferred. Based on the current knowledge, three (3) main sectors have been identified: electronic equipment, automotive air conditioning and commercial refrigeration (wider application of the 3R solution to also include other refrigerants that appear as effective alternatives to HFCs in this sector). Particular emphasis is given to Waste Electrical and Electronic Equipment (WEEE), since this work area appears for the first time in the LIFE Programme. In the second case, the IPR strategy agreed between the partners is summarised. This is directly linked to the commercial launch of the entire 3R ECOSYSTEM across Europe, officially starting in Q2 2023. It is noted that the transferability plan as well as IPR management are considered part of the exploitation strategy developed under the project to ensure its long-term sustainability.



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## 1 Transferability strategy

The applicability of the 3R ECOSYSTEM will not be limited to the recovery and trading of F-gases previously used in conventional HVAC-R systems. Instead, the entire circular economy scheme is planned to be transferred to **three (3) other sectors** by 2025 (i.e., two years after the project). The targeted sectors are listed below:

- Air conditioning for the automotive industry (R134a & R1234yf).
- Commercial refrigeration operating with refrigerants alternative to HFCs.
- WEEE (regarding refrigerants in electrical and electronic devices).

The payment services provided by the Retradeables Marketplace are regarded as the key feature to enable different categories of stakeholders to set up their own recycling business cycle by selling and buying recovered F-gases. In this direction, additional functionalities can be added to marketplace platform depending on the requirements arisen by each of the 3 sectors mentioned above. DENV in cooperation with DACE will lead the transferability plan. NTUA and MAT4NRG will play an advisory role by providing their scientific expertise and knowledge when needed.

### 1.1 Air conditioning for the automotive industry

Local facilities collecting mainly R134a from the automotive industry (both factories and car repair shops) have already been contacted in the three demo countries (SK, HU, CZ). For example, Daikin's local network in Slovakia currently has under its control 30% of the quantities of R134a coming from car shops, equivalent to 800 kg (estimated for 2022). Moreover, there are 4 different car manufacturing plants: VW, KIA, Peugeot and Jaguar Land Rover dealing with total quantities of R134a close to 8-10 tons minimum.

All companies active in the recovery of existing refrigerants from car air conditioning (AC) systems will be able to register in the Retradeables platform, thus representing the supply side just like the installation companies. This will allow them to add the recovered amount in the platform and receive offers over them. No further development is envisaged other than a new user category. However, it should be noted that the EU enforced replacement of R134a with R1234yf in AC systems of new cars is expected to have an impact on the final quantities of R134a available for handling.



## 1.2 Commercial refrigeration

During the roll-out of the project in the demo countries, several meetings were carried out with Daikin's local installer networks as well as with local unions. On the occasion of this interaction, it was clarified that more than 80% of the Commercial Refrigeration Installers also appear as part of the HVAC-R network. Therefore, no specific actions towards this target audience are required. Raising awareness and promoting stakeholder engagement will be achieved through their unions as well as relevant newsletters. Finally, some of the alternative refrigerants recently used in commercial refrigeration applications instead of HFCs are planned to be added to the range of refrigerants that can be traded in the platform.

## 1.3 WEEE

During the compliance audit of the platform in the demo countries, the WEEE route was also reviewed in detail. Currently, there is no common approach and therefore each country is implementing its own strategy and scheme. In addition, no separation of recovered refrigerant is conducted in the recycling plants. As a result, different refrigerants are mixed in the same bottle and also hydrocarbons in some cases (e.g., R600a from domestic refrigerators). This practically means that the final recovered product cannot be recycled/reclaimed but can only be destructed. Thus, the use of the platform will not make any sense for the relevant category of stakeholders, given that the WEEE facilities are already implementing destruction processes on their own. As part of the project, it is planned to assess the additional investments needed in each recycling facility to perform appropriate separation, in cooperation with local authorities. If such a practice eventually turns out to be a reality, then the WEEE plants can be potential users of the platform.

## 2 IPR strategy

After the trials in Hungary, Slovakia and Czech Republic, the 3R ECOSYSTEM will be scaled up in several countries in parallel in EU and outside EU according to Step 1 of the replication plan. The ultimate goal is to make the final version of the 3R ECOSYSTEM available to the entire European market. To this end, IPR and knowledge management strategies have already been considered.

Basically, LIFE Retradeables proposes a complete range of activities that are supposed to lead to an optimal dissemination of the project results, ensuring the smooth handling of the individual IPR of all partners involved and thus paving the way for knowledge transfer. Overall, the project partners will benefit from a **solid individual IPR strategy**, the key principles of which are summarized below.



## 2.1 IPR declaration towards European Commission (EC)

**Table 1** indicates the most critical points of the proposal agreed between the 3 project partners (DAIKIN EUROPE N.V, MAT4NRG & NTUA) with regard to the clarification of all IPR issues related to the different developments during the project.

*Table 1: Intellectual property ownership of the different developments during the project.*

	<b>Developments during the LIFE Retradeables project</b>	<b>Owner</b>
1.	Gas Chromatography Method for refrigerant composition analysis	MAT4NRG
2.	Prototype development for refrigerant composition analyser	MAT4NRG
3.	Retradeables Registration and Trading Platform	Daikin Europe
4.	Recovery and Recycling unit with IOT equipment	Daikin Europe
5.	Tracking of recovery refrigerant bottle	Daikin Europe

### Assumptions

- The owners of the different developments will receive only written requests to provide access to one or more of these.
- The consultation of the Consortium of the project will be requested, as advice only.
- The owner will decide on providing access and the requested fee.

## 3 Conclusions

As part of the actions foreseen in the exploitation plan, the transferability and IPR issues have been significantly settled to enable a long-term strategy from the beginning of the project. In terms of transferability, a roadmap of the key areas in which the results of the project will be transferred has been drawn up. The transfer of 3R ECOSYSTEM to the automotive air conditioning and commercial refrigeration sectors is currently underway.

Nevertheless, the real challenge area is considered to be **Waste Electrical and Electronic Equipment (WEEE)**; the reduction, reuse and recycling of which is a key EU priority. Therefore, proper management of Electrical and Electronic Equipment (EEE) after its lifetime is more than critical as the refrigerants injected in EEE are a potential source of Greenhouse Gas (GHG) emissions. Against this background, the circular economy ecosystem proposed by the LIFE Retradeables project can serve as a powerful tool to add tracking and trading of F-gases recovered by old or used electronic equipment on the European markets, thus benefiting the electronics industry, the EU and local governments, too. At this stage of the project, the



barriers acting as limiting factors for the sustainable development of such an innovative business model are mapped in order to provide appropriate transfer measures to be implemented after the end of the demos. Adaptations to the 3R ECOSYSTEM to fully comply with the WEEE regulation are possible, but the basic operating principles are expected to be the same as those for the HVAC-R sector.

Finally, the outline of the IPR strategy, including patents, trademarks, copyrights and trade secrets, has been predefined. Ownership allocation has also been agreed, thus providing an appropriate basis for the project partners to establish stable business relationships with customers, vendors, distributors and other third parties that may be interested in the commercial (outside) use of the scalable version of the 3R ECOSYSTEM.