RESTART

RECYCLING OF SPENT LI-ION BATTERIES AND END-LIFE PHOTOVOLTAIC PANELS: FROM THE DEVELOPMENT OF METAL RECOVERY PROCESSES TO THE IMPLEMENTATION OF A START-UP

LEAP-RE

Long-Term Joint EU-AU Research
and Innovation Partnership on Renewable Energy

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Consortium

Project coordinator:

- Ismael Saadoune
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Project partners:

- King Salman International University (**Egypt**),

- Aalto University (**Finland**),

- Centre Européen de Recherche et d'Enseignement en Géosciences de l'Environnement - CEREGE (**France**),

- Cadi Ayyad University, Mohammed VI Polytechnic University - UM6P, and Green Energy Park (**Morocco**),

- Babeș-Bolyai University (**Romania**)

Aim of the project *: The main objective of RESTART Project is to implement a full value chain for recycling End-of-Life (EoL) LiBs and PV, shifting from linear economy to circular economy, thus reducing waste disposal as well as minimizing dependence on important primary materials. The specific objectives are :* ***collect ; recycle ; implement; coordinate***

Relevance vs MARs : RESTART project's deliverables are in accordance with the following outcomes and impacts of MAR 2:

- **Map of the EoL/OoS component value chain**
- **Proposal of methods for EoL/OoS component recycling**
- **Identification of second life components with a benefit for African countries**
- **Dissemination of acquired knowledge**
- **Creation of jobs**
- **Promotion of environmental and ecological sustainability**

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Key challenges addressed by the project

1. Collection, disassembling and characterization of EoL LiBs and PV
2. **Technology Development and scale-up** of metals recovery processes
3. **Demonstration** of fresh Batteries build-up from recovered chemical elements
4. **Sustainability**: Life Cycle Assessment; assessment of Modules collection and handling protocols
5. **Economy Business** Plan based on the best cost performing recycling processes
6. **Dissemination** of the Project's outreaches for identification of key stakeholders
7. **Implementation** of a Start-up

Expected results :

- ***Mid-term expected results (end 2023)***
  - *Characterization, speciation of metals & products*
  - *Development of efficient metal extraction processes*
  - *Development of fresh LiBs and thermo-electrics*
- ***End of project expected results (2025)***
  - *Proof of concept, simulation & development of large-scale reactor*
  - *Analysis of Impacts: Life Cycle Assessment*
  - *Technico-Economic Assessment*
  - *Development of the Business Model*

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Expected outcomes in case of success of the project (2030)

What could be the impact of the project at 2030 on the economy and/or society in case of scaling up the results of the project ?

1. ***Creation of a startup devoted to recycling activities***
2. ***Possibility of replication in Africa***
3. ***Creation of Jobs***
4. ***Boosting the international visibility (recognition) of the consortium***
5. ***Promotion of environmental and ecological sustainability***

Which main risks of failure during project implementation ?

Describe the main risks identified for project implementation

1. ***Delays in or low quality of input from project partners (Discrepancy in the availability of funds by the funding agencies)***
2. ***COVID-19 pandemic affecting the ability of the consortium to deliver on the project objectives***
3. ***One or more partners leave the Project***
4. ***Scientific and technologic issues related to the project***

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Contribution of the project to AU – EU R&D cooperation

In term of reinforcement of scientific or innovation cooperation, capacity building…

- ***RESTART** concerns R&D activites in relation with **Climate change and sustainable energy***
- ***Capacity for joint research**: Complementary expertise to conduct high quality joint research*
- ***Scalability of R&I impact at national or regional scales:** RESTART implements a holistic approach that combines technical and business development that will ensure the scalability and replicability of the process*

Interest of Consortium members in participating in LEAP-RE clustering activities

- *Development of Li-ion Batteries starting from African Mineral resources,*
- *Some processes of e-waste recycling*
- *Co-supervision of PhD students (Energy Storage)*
- *Sharing the issues related to projects management (LEAP RE)*