SOLAR INDUCEed domestic clean efficient cooking and refrigeration for off-grid applications in Africa

SOLAR INDUCE

Carolina Costa
(Northumbria)
on behalf of
Project coordinator:
Jose Ignacio Mujika Odriozola,
COPRECI S Coop,
Spain

LEAP-RE

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

Pillar-1 project

First Pillar1 Projects Meeting

12nd October, 2023

The LEAP-RE project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 963530.

SOLAR INDUCE

LEAP-RE

Consortium

SOLAR INDUCE consortium comprises 7 partners from 2 European countries (UK and Spain), 2 African countries (Egypt and South Africa), with contributing agencies, and 2 African partners from Nigeria that don't have contributing agencies.

There is strong industry/commercial leadership and involvement in this consortium.

SOLAR INDUCE includes industry leader (COPRECI) and technological SME (SPG) with research performing capacity to contribute to technology push.

They are capacitated to contribute to the design and manufacturing effort and are also committed to commercialisation.

Each industry partner has clear expectations and commitments towards commercially using the results of this project in their businesses. This has been important for each industry partner for committing to co-funding this project. This commitment is a solid starting platform towards ensuring the exploitation of the results post-project.

Aim of the project

To develop and demonstrate innovative high-performance and cost-effective **solar off-grid cooking and refrigeration solutions** in African rural and remote communities, focusing upon **local** content of **manufacturing**, **materials**, and local population **employability**. The proposed technology will be **laboratory tested and** undergo **demonstrations** at an allocated site in Africa.

Relevance vs MARs

MAR 6 – Innovative solutions for priority domestic uses (clean cooking and cold chain)

In **Africa**, **700 million people lack access to clean cooking** [1]. In addition, in Africa nearly **40% of food perishes** before it reaches the consumer [2]. It directly impacts the livelihoods of many households and the local economy, on health centers, schools, and food production and storage.

[1] Access to clean cooking – SDG7: Data and Projections – Analysis – IEA, 2020.
[2] Food and Agriculture Organisation of the United Nations, 2020.

SOLAR INDUCE

LEAP-RE

Consortium

Project coordinator:

- *Jose Ignacio Mujika*, COPRECI S Coop (**Spain**).

Project partners:

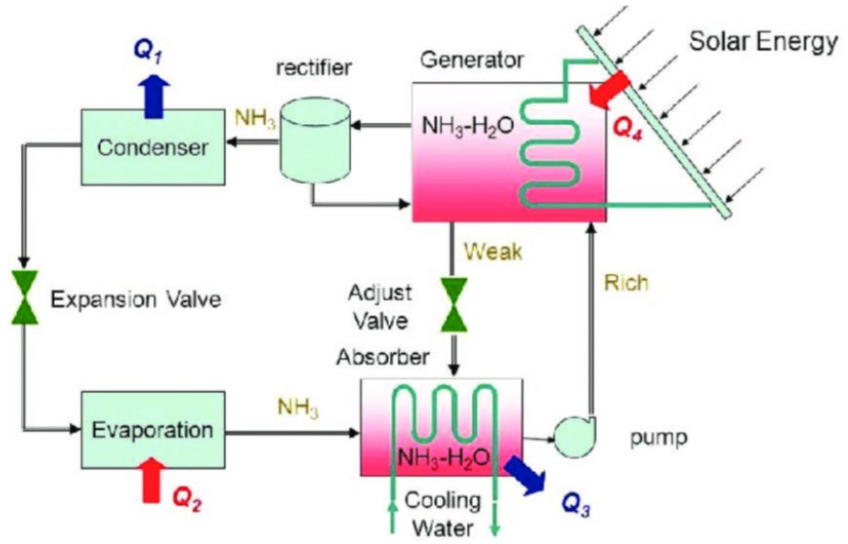
- *Sarah Khalil*, The British University in Egypt (**Egypt**).
- *Raymond Taziwa*, Walter Sisulu University (**South Africa**).
- *Patricia Popoola*, Tshwane University of Technology (**South Africa**).
- *Onyedika Aneke*, S&P Global Resources Nigeria Limited (**Nigeria**).
- *Paul Nnamchi*, Enugu State University of Science and Technology (**Nigeria**).
- *Ulugbek Azimov*, University of Northumbria (**United Kingdom**).

SOLAR INDUCE

LEAP-RE

Key challenges addressed by the project

1. To develop a system for domestic cooking that will be powered by free solar energy.
2. To develop an effective refrigeration cycle powered by solar energy during the day and through passive refrigeration overnight.



Expected results

- Helping to protect women and children form collecting biomass for cooking and becoming ill due to respiratory problems.
  - Pilot in Nigeria
- The main aim of this innovation will be to reduce the actual food losses (by more than 80%), increase food producer/retailer incomes (by 30%) and reduce food spoilage and poisoning.
  - Pilot in Egypt

SOLAR INDUCE

LEAP-RE

Key challenges addressed by the project

3. *To develop a green cooking solution based on induction technology that is more efficient, more economical and more robust, to enable its powering by solar panels and its deployment in rural settings in Africa.*

Expected results

- *A fully functional induction cooker with a 10 % efficiency improvement*
- *A cookware retrofit solution to enable the use of traditional cookware.*
- *A local demonstration pilot in Nigeria to assist in the dissemination and promotion of this technology.*

SOLAR INDUCE

LEAP-RE

- ***Results achieved***
- *Progress on **the extraction of mucilage from agricultural seeds and crops** and **preparation of the hydrogel** from the extracted mucilage*

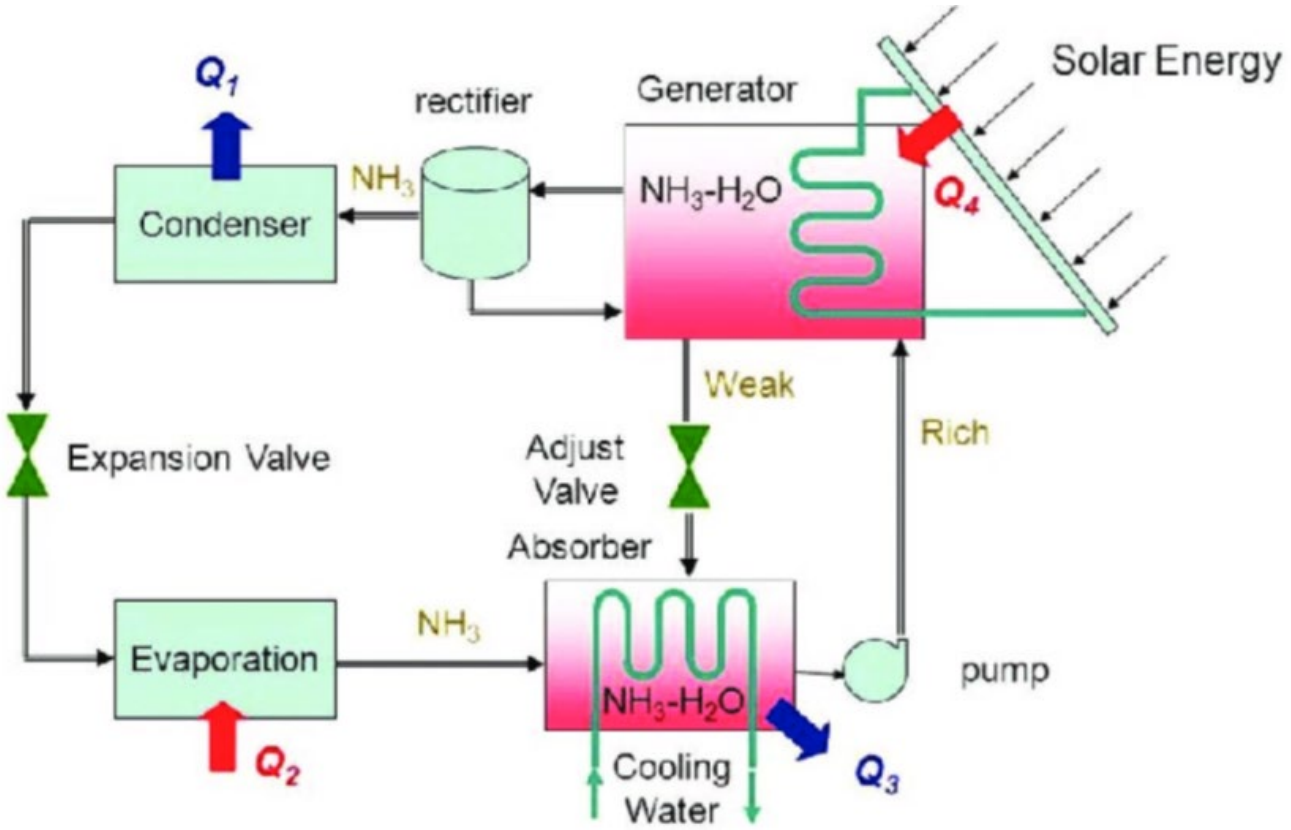
  - Professor Patricia Popoola and her team of researchers from Tshwane University of Technology has visited Newcastle upon Tyne UK during 8th Sept- 16th Sept 2023 and participated in the training programme delivered by researchers from Northumbria University. The training led by Dr Carolina Costa and Dr Ulugbek Azimov covered the testing and analysing the materials for passive refrigeration and discussions on how passive refrigeration could be implemented in Sub-Saharan Africa.

  - The mucilage and hydrogel are expected to be obtained and tested for performance by the end of October

SOLAR INDUCE

LEAP-RE

- ***Results achieved***
- *Progress on the development of an* ***innovative absorption – refrigeration cycle using the developed hydrogel:***



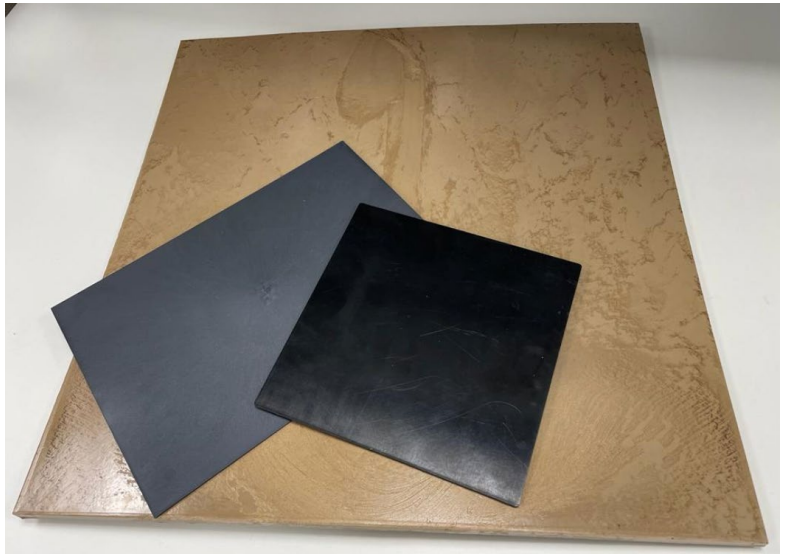
SOLAR INDUCE

LEAP-RE

- ***Results achieved:***
- *Progress on the development of a more efficient, more economical and more robust **green cooking solution based on induction** technology:*

  - Definition of requirements for the new induction cooking system, based on safety, health, climate and enviromental standards

  - Definition of requirements for the worktop material. Research and selection of 3 high-temperature resistance thermoplastics



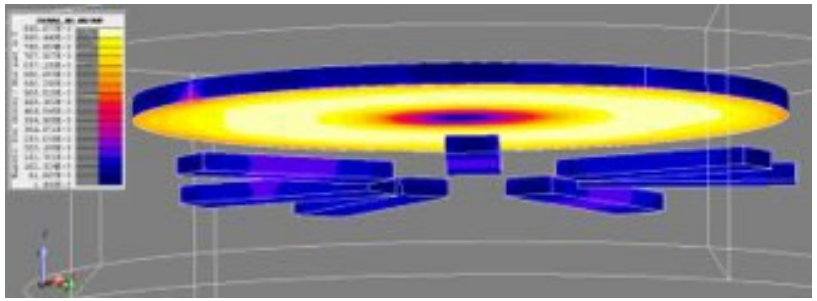
SOLAR INDUCE

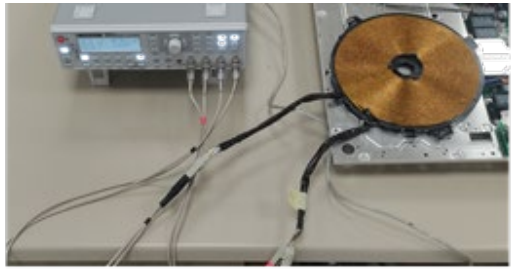
LEAP-RE

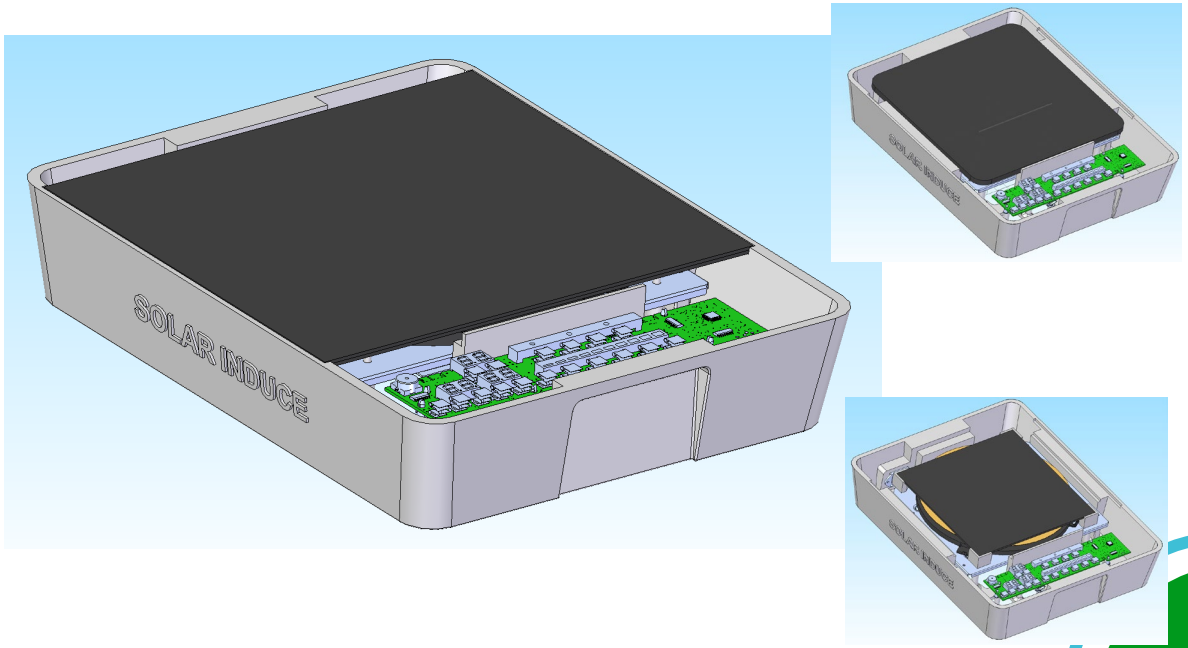
- ***Results achieved:***
- *Progress on the development ofa a more efficient, more economical and more robust* ***green cooking solution based on induction*** *technology:*

  - Development of an induction virtual model validated against experimental measurements

  - Design of the prototype of a cooking system to implement and test the 3 selected materials







SOLAR INDUCE

LEAP-RE

- ***Possible evolutions of the objectives in progress of the project (explain), problems encountered during the project***
  - *The objectives of the project remain the same, but the project is facing many difficulties.*
    - *Late start of the project due to late approval of funds from Spanish funder → This has meant a delay of 6 months in the beginning of the project.*
    - *A partner has not yet signed the contract with its local founder, others obtained it late or has no founds (UK)*
    - *An extension will be request for the deadline of the project.*

- ***Specify whether the project has resulted in new products or developments (instruments, methods, software, etc.)***
  - *Hydrogel obtained from the mucilage from cacao, dika nut and some local crops based on sugar*
  - *A development of a numeric model of induction cooker.*

SOLAR INDUCE

- ***End of project expected results (2025)***

- ***New collaborations initiated thanks to the results of the project (following publications, conference presentations, etc.)***

As a result of Networking at LEAP-RE Stakeholder Forum in Pretoria 2022.

- ***Membership in the Community of Practice (CoP) for electric cooking in Kenya.***
- ***Two research projects applied for in collaboration with:***
  - ***Kenya, UK, Spain, (Low cost connected Induction cookers)***
  - ***Angola, Turkey, Spain, Uk (Low cost DC Radiant electric cookers)***

Visit of Copreci to AFRICAN CENTRE FOR TECHNOLOGY STUDIES (ACTS)
www.acts-net.org
Karasani, Nairobi, Kenya

SOLAR INDUCE

LEAP-RE

- ***End of project expected results (2025)***

  - ***New collaborations planned for the future (to answer what problem? Industrial or other perspectives?…)***

    - ***Solid contact for clean energy cooking establish in east Africa. (Utilities, manufacturing companies, local area developers…)***
    - ***Industrial activity contacts for induction cookers with local manufacturers have been established in Kenya.***
    - ***Possible interest in establishing key agreement for replicating the model in other countries with other technologies. (Angola, South Africa)***
    - ***Indirectly new contacts have been established with companies working on clean cooking in India.***

  - ***New funded projects and/or funding applications (what type(s) of funding?)***

    - ***Considering to apply to Africa-EU CO-FUND action HORIZON-CL5-2024-D3-01-09***

SOLAR INDUCE

LEAP-RE

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

1. Economic:

1. *SOLAR INDUCE is estimated to create more **than 30 direct jobs** directly on the pilot sites.*
2. *It will also create **jobs indirectly** by increasing business operation hours through income generation from the energy solutions, energy cost savings or less time spent on cooking.*
3. *By assisting communities to expand electricity-powered productive activities, a virtuous cycle will be created in which electricity consumption will increase alongside increasing household incomes.*
4. *The final element of this virtuous cycle is that increased consumption will eventually allow companies to reduce electricity prices.*
5. *The project will **help communities expand** renewable electricity-powered **cooking activities**, which will reduce expenses for collecting charcoal and firewood, as free solar energy will always be available.*

2. Environment:

1. *SOLAR INDUCE will make an impact on **reducing GHG** emissions, as a result of the replacement of inefficient fuel production and consumption, by renewable solar energy,*
2. *It will help **preventing forest degradation** and deforestation due to fuel collection and production,*
3. *and **improving agricultural productivity** as a result of preventing habitat degradation and combustion of dung as fuel.*

3. Creation of new market opportunities for both EU and African companies on the African continent

1. *By the provision of electricity and electrical equipments, SOLAR INDUCE will lay the ground for the development of many electricity-powered cooking businesses such as for agriculture (food dryers, incubators, etc.), food industry (catering, restaurants, community dining, etc.), and social (education, health devices, etc.).*
2. *In addition, the mini-grid and off-grid solar systems as well as induction cooking will pave the way for partnerships **between local and international firms.***

SOLAR INDUCE

LEAP-RE

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

- The project will improve the international EU-Africa cooperation by creating liaisons with green energy sector-related stakeholders from renewable energy and clean cooking and refrigeration solution providers, SMEs, technology suppliers, energy professionals and policymakers. The network will extend to potential investors and finance organisations.
- The close collaboration, know-how, and knowledge transfer between EU-African partners envisaged in project work packages will strengthen the visibility of EU Cooperation, Partnership and Diplomacy actions in Africa.
- It is hoped that the collaboration between universities and technology centres will be strengthened and that it will last beyond this project and become a regular feature.

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

1.-Mapping joint research and innovation actions for future RES development – Consolidation of detailed map of R&I initiatives in Europe and Africa per technology, application etc. type with the aim to support the RE industry to prioritize and contextualize target areas of RES deployment

2. **End-of-life and second-life management and environmental impact of RE components** - Map the component value chain, identification of key stakeholders & successful business models promote replicability scenarios of operational models and standard operating procedures in concerned regions

3. **Smart stand-alone systems (SAS)** - Promote the development of RE-SAS demonstrator(s) considering the diversity of potential local RE sources and the local effective environment

4. **Smart grid (different scale) for off grid application** - Development of new tools for optimizing capacity in planning and dispatching strategies based on people's needs with the aim to reduce the energy dependence on fossil fuel and increasing the share of RES use including electricity storage solutions such as batteries, hydrogen…

5. **Processes and appliances for productive uses (PRODUSE)** – Improvement and Promotion of wider use of PRODUSE appliances for Cold chain and thermal tools and equipment's (healthcare and agriculture - livestock, fisheries and farming)

6. **Innovative solutions for priority domestic uses (clean cooking and cold chain)** - Improving, managing and maintaining solar photovoltaic systems, cookstoves and cold chain components for clean cooking and food storage. Supporting interactions with policymaking to foster fast market uptake considering the macro socio-economic and gender impacts

THANK YOU

CONTACT US FOR MORE INFORMATION

www.leap-re.eu

contact@leap-re.eu

@leapRE_EU

The LEAP-RE project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 963530.