

FlexRICAN EU Project

Flexibility for Research Infrastructures for global CArbon Neutrality

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September 26, 2024 – ESSRI @ Madrid, Spain



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FlexRICAN@ess.eu

FlexRICAN brings together:

➤ 3 Landmark ESFRI infrastructures



- the **Extreme Light Infrastructure (ELI)**,
 - ELI Beamlines facility in Prag, Czech Republic
 - ELI Alps facility in Szeged, Hungary



- the **European Magnetic Field Laboratory (EMFL)**
 - DC field facilities in Nijmegen, the Netherlands
in Grenoble, France
 - Pulsed field facilities in Dresden, Germany
in Toulouse, France

Running facilities



- the **European Spallation Source** in Sweden →
 - to open to users starting from 2027

FlexRICAN in a Nutshell

- FlexRICAN: **Flexibility in RIs for global Carbon Neutrality**
- Topic: HORIZON-INFRA-2023-TECH-01-01 - New technologies and solutions for **reducing the environmental and climate footprint of RIs**
- Type of Action: **HORIZON-Research and Innovation Action**

- Duration: **36 Months**, Budget: **5 MEUR**
 - **1st March 2024** Kickoff meeting at ESS, Lund
 - **19 & 20 of Sept. 2024** 2nd plenary meeting in ELI-Beamlines (Prague)
 - **April/May 2025** 3rd plenary meeting in EMFL-LNCMI (Grenoble)
- 8 Partners

Climate/Carbon Footprint at RIs

The carbon print of a Research Infrastructure depends on numerous factors.

For most RIs, the most important ones are

- **energy supply,**
- **logistics & procurement**
- **travels.**

The RIs involved in FlexRICAN developed their own travel, user access and procurement policies to reduce their emissions.

...Ris have different energy usages



maintaining the indoor environment of the buildings (air controlled condition for laser stability)



a rather uniform consumption along the year at ELI facilities (CZ and HU), highest priority set on regulation & securing the quality of electricity,



powering the high field magnets



a hyper-variability of electrical consumption with peaks up to 30 MW at the two EMFL DC facilities (FR and NL),



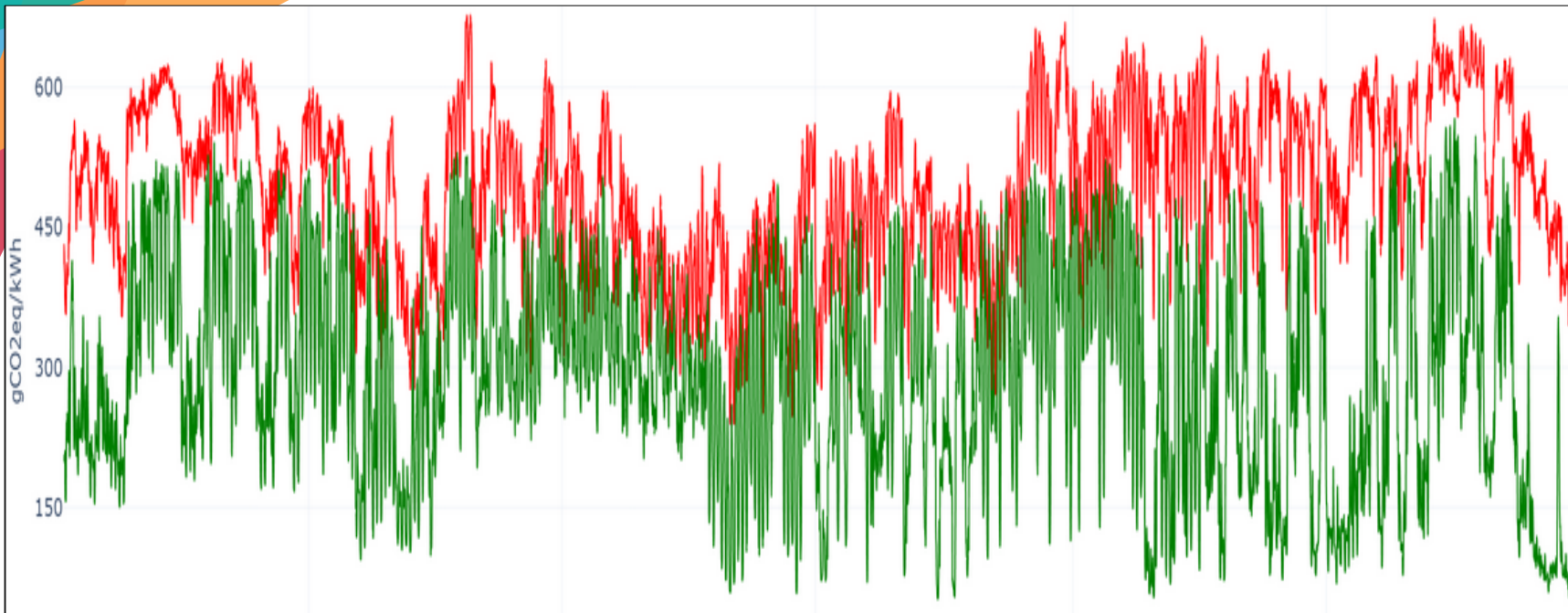
the main energy will be the accelerator and target



distinct levels of consumption including a full operation mode during 240 days a year up to 35 MW

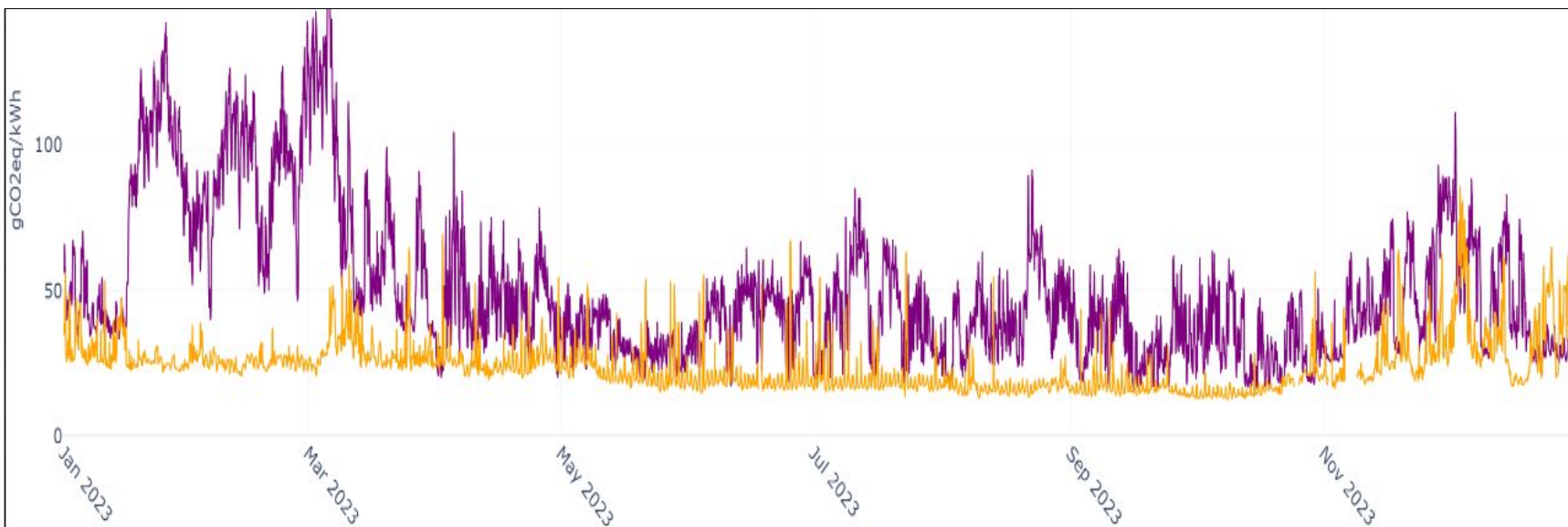
➤ **FlexRICAN consortium** includes RIs with **different energy needs** and thus cross-sectionally represents a broad implementation range within the RIs.

...and a variety local electrical mix « shaping » these priorities



CZ: Heavy carbon intensity
→ Electricity production and stabilization

NL: High intermittency
→ Implementation of batteries for power increase



FR: Season dependent
→ Annual replanification

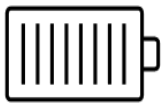
SE: Almost Flat profile
→ Waste heat valorization

FlexRICAN Objective: Valorizing Multi-Energy Flexibility



Photovoltaics

Quantify the net production & histogram of production



Electricity Storage

Quantify the net and modulation capacity



Waste heat recovery

Manage intermittency
Manage low temperature
Test machines with moderate TRL



Flexibility

Quantify the flexibility of RIs
Multi-energy modelisation
Towards services to the grid

Implementation of flexibility & carbon reducing solutions in RI's

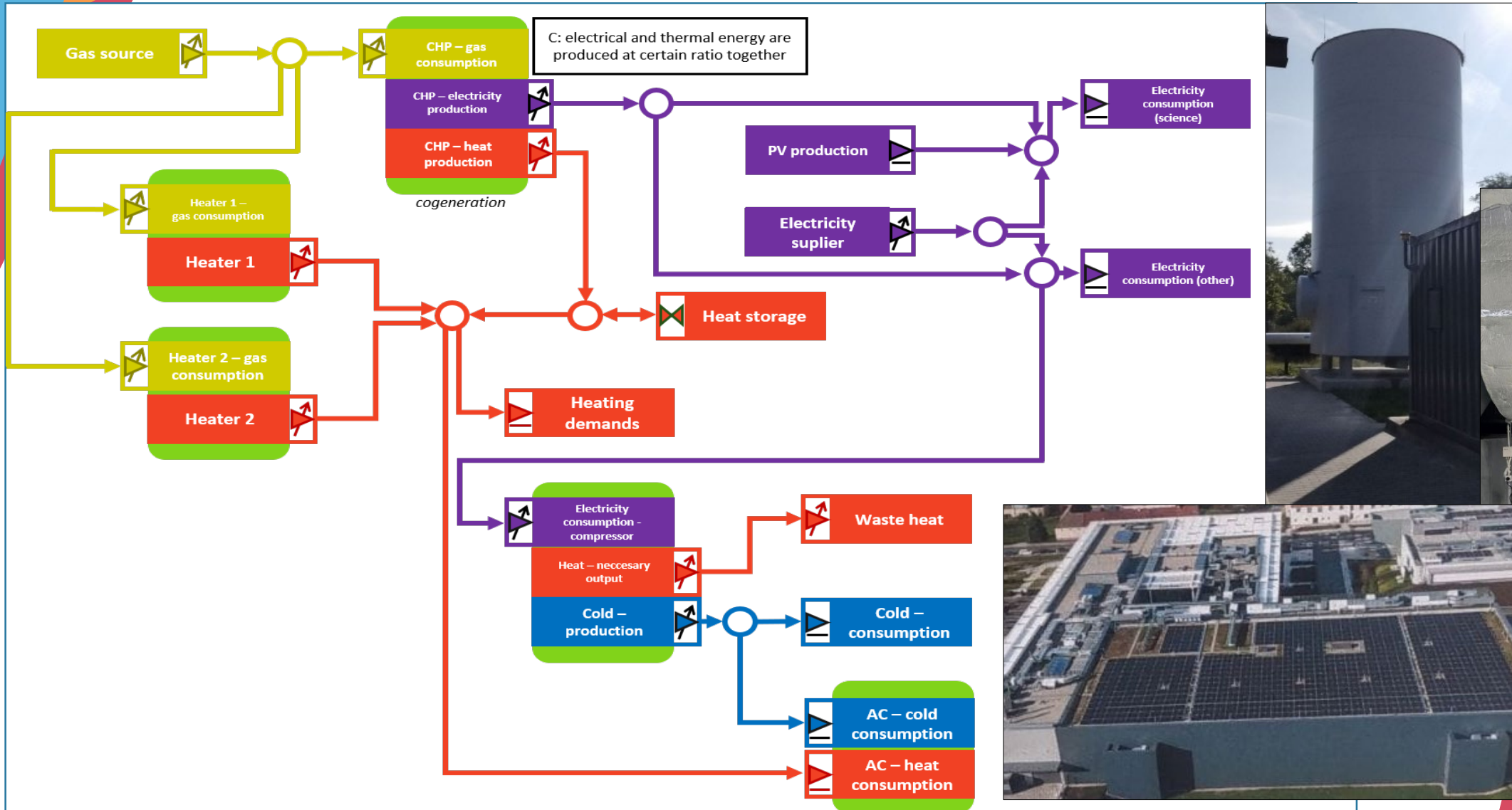
Instrumentation & mode of energy consumption by integrating the flexibility, LCA ...

Scability & Dissemination Roadmap

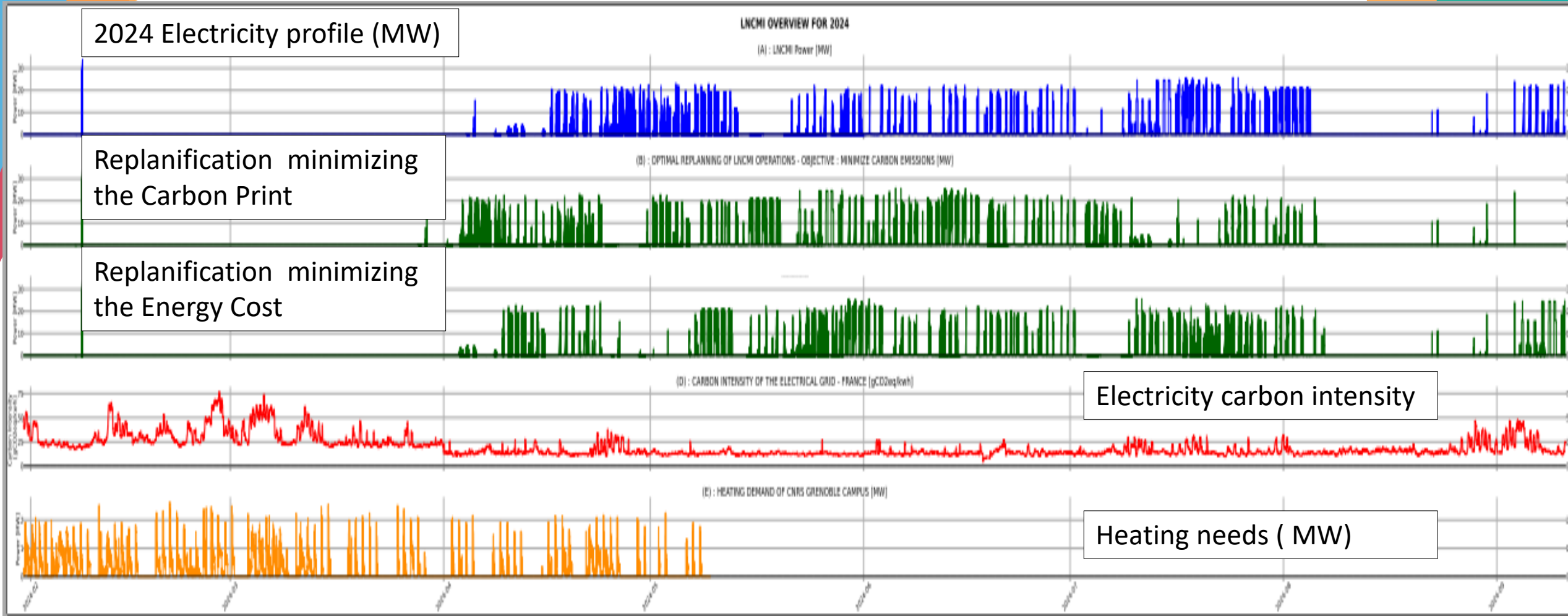
To project stakeholders city district, public structure, to other RIs and to user communities

OMEGAAlpes, an open access optimization modeler, is used for creation of dedicated Notebooks for each RI to accumulate knowledge and disseminate the method to other RIs

Example of OMEGAAlpes use : 1st representation of the energy systems on ELI Beamlines allowing future energy optimizations



Example of a posteriori re-planifications under different constrains for the EMFL Grenoble



FlexRICAN Main Concept

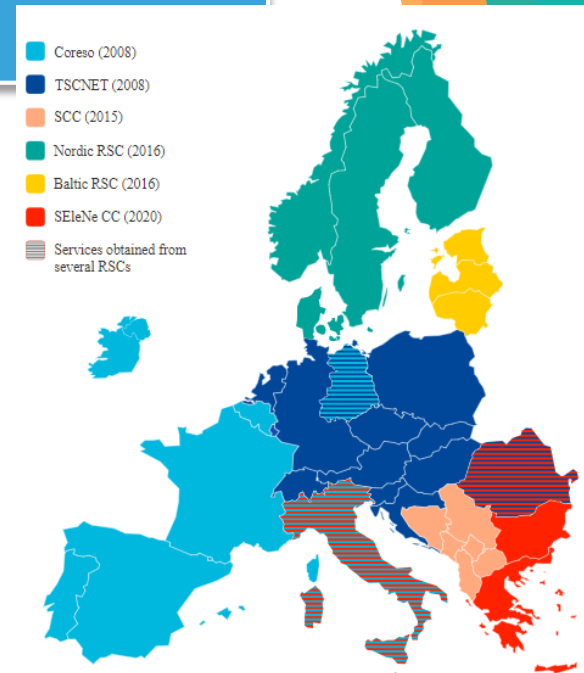
Research infrastructures are at the meso-scale between

- **The local energy networks**
 - mainly heating network today's, micro-grid in the future
- **The European Electrical Grid**
 - 36 countries interconnected & interdependent.

The project aims at

→ implementing methods and interdependent technologies capable of producing services to these networks

with a special focus on assessing the value of the flexibility
(environmental and cost models)



Map source: **ENTSOE**

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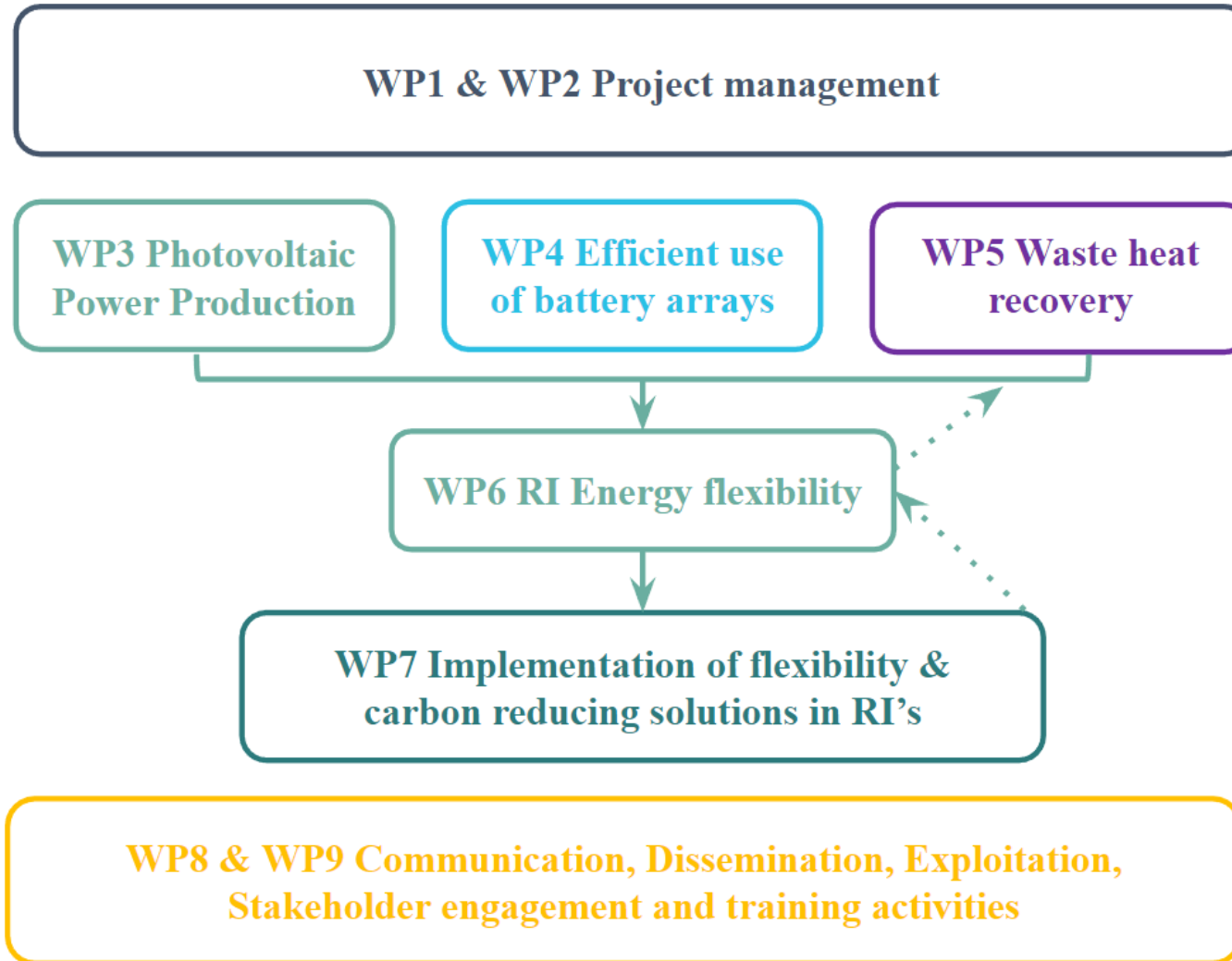
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8 Partners

- ❑ 3 RIs,
- ❑ 3 supporting institutions,
- ❑ 2 industrial partners



Overview of WP Structure



Initial Energy Survey & Methodology of data treatment

- ✓ Energy related data query
 - ✓ Questionnaire (large and generic)
 - ✓ Personalized and tailor-made study
- ✓ Load curves
- ✓ Inventory of electricity high consuming equipments
- ✓ Electricity bills
- ✓ Procurement contract

Data collection

Flexibility potential assessment

Country electricity market analysis

Battery sizing & market adequation

- ✓ Electricity consumption analysis
 - ✓ Recommendations for load occurrence optimization
- ✓ Flexible power assessment vs building & equipments utilisation habits
- ✓ Demand Response scenarii and turnkey report
- ✓ Valuation model based on Demand Response scenarii
- ✓ Recommendations for revenue optimization

- ✓ Market organisation analysis, identification of key actors (interactions, prerogatives)
- ✓ Demand Response Mechanisms analysis
- ✓ Procurement contract and supplier conditions/boundaries to market access

- ✓ **Installed battery:** valuation sizing based on existing battery & electricity market access conditions
- ✓ **In study battery:** battery sizing based on Business Plan & electricity market access conditions

RI site data

Deliverables

Questionnaire debrief

FLEXRICAN: collecting energy related data of Research Infrastructures

Provided data will be only distributed to FlexRICAN Group and will be used only for the purpose of the FlexRICAN project.

Objective of the questionnaire:

In order to perform the work planned in WP3 (PV), WP4 (batteries), WP6 (flexibility) your data is necessary.

It will be used WITHIN THE FLEXRICAN CONSORTIUM only, and only in order to perform the work described in the proposal. In particular simulations of optimal PV, battery, flexibility size, potential and usage in order to minimize costs and or CO2 emissions of the RI.

How to use the questionnaire?:

The questionnaire consists of 38 questions divided in 5 sections (general information about the site, consumption data, production, storage and procurement contract/network configuration).

An approximative or partial answer is preferred to no answer at all.

How to send additionnal data that is required?:

You can send your additionnal data (consumption time series, energy contract, site map etc...) to the following email address: flexrican@ess.eu

Section 1

...

General description of your RI



1

What is the RI address?

Ultimate Objectives

Technical

1. Provide **efficient (solar) power generation** through the optimization of equipment
2. Ensure **powerful energy storage system**
3. Develop a methodology to **optimize waste heat recovery** projects
4. Provide **multi-energy flexibility solutions** to the European RIs
5. Implement **new solutions** at RIs

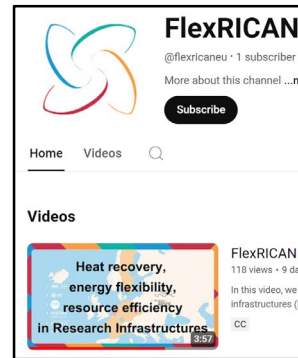
Societal

- **Train (internal & external) RIs' researchers and technicians** to maximize the effectiveness of the energy measures implemented and have onboard in terms of direct & indirect flexibility
- Accelerate **dissemination** of the on-going project activities to
 - (i) ensure a further implementation of the project solutions to the project RI stakeholders as **municipalities, electricity providers and regional and national electricity networks**
 - (ii) fostering **synergies amongst RIs** to ensure the use of the developed methodology

Impact

- **Exploitation:** Open source/reusable energy modeling environment notebooks, workshops
- **Dissemination:** FlexRICAN stakeholders, scientific journal publications toward technical and academic audiences; specialized magazines, workshops, expo-technical events, conferences, technical visits. Public data archive.
- **Communication:** FlexRICAN training program, workshops project's website, videos on social media, video platforms.

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Questions, Remarks, Reflections?

