What is RED WoLF

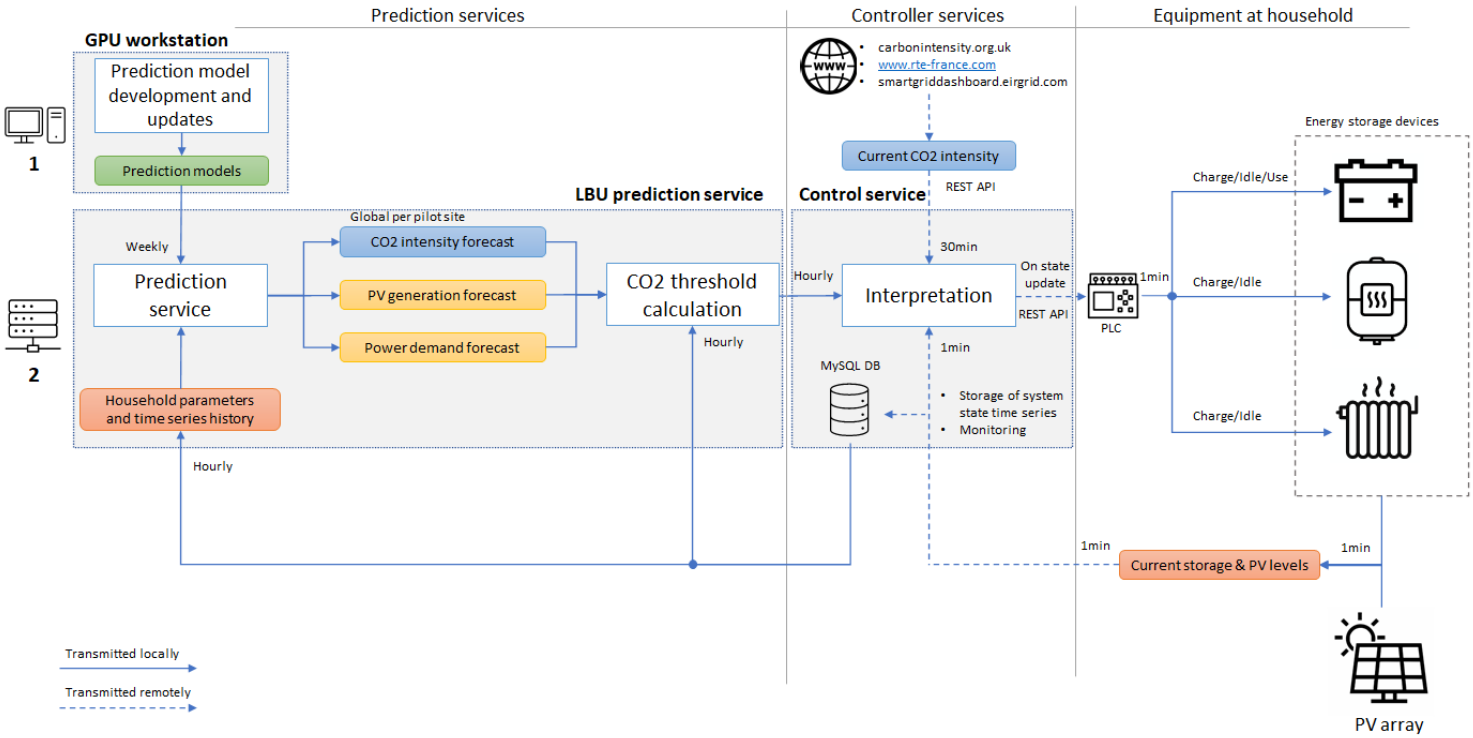
RED WoLF is a three and half year transnational cooperation project aimed at reducing CO2 emissions. It is funded by the Interreg North West Europe (NWE) programme and will be delivered by 13 institutions including universities, local authorities, social housing landlords and private companies.

The project will develop a hybrid storage system which will be installed within 100 homes across the partner regions (UK, France and Ireland) which draws down electricity when greener. Our Artificial Intelligence-driven system combines Grid electricity with PV panels, batteries and thermal storage.

SCIENCE & TECHNICAL ASPECTS OF THE PROJECT - As well as being the lead partner on this project, Leeds Beckett University (LBU) is responsible for the mathematical and machine learning aspects of RED WoLF, and for the physics underpinning the Project idea and implementation.

LBU has designed the algorithm that drives the uptake of electricity to reduce CO_2 emissions from residential buildings. This reduction is obtained by storing "low price" Grid energy at time of low demand. This energy is usually green and is often being curtailed. RED WoLF homes create the demand by storing this energy for later use. The algorithm will be the "mind" of the Smart Storage Driver, the "brain" running the RED WoLF system in the Pilot houses. This algorithm is described in ***Shukhobodskiy & Colantuono, Applied Energy 2020, 274s***

The LBU team has developed software to estimate the RED WoLF system performance and a simulation environment which analyses the performance sensitivity to the various factors including on-site equipment parameters and accuracy of CO2 intensity, power demand and PV generation predictions. This methodology will be used to analyse the data from the Pilot houses to represent and convey the results to different audiences: industry, public authorities, the scientific community, and the general public.



LBU has been working in collaboration with University of Lorraine to define the system control architecture and is currently working on its implementation with a particular focus on the prediction services, necessary for system operation.
Université de Lorraine (UoL), France, is primarily contributing to the architectural design choices regarding the "communication network" to be set up in pilots. In this respect, UoL takes into account various environmental and applicative constraints in order to meet quality of service and reliability requirements (eg network delays, security, etc). In addition, UoL started to explore various home consumption datasets from the literature in order to be compared with RED WoLF and evaluate the benefits arising from our project.

The overall RED WoLF infrastructure can be declined into four functional layers, namely:

1. Data Monitoring & Uniformization Layer
2. Data Storage Layer
3. Intelligence & Control Layer
4. User interface Layer

To support the above functional layers, the RED WoLF infrastructure is divided into three main parts, namely:

- **Electrical wiring network** (cf. blue lines/arrows in Figure 1);
- **Communication network architecture** (cf. gray/dashed lines in Figure 1);
- **SSD** ("Smart Storage Driver"cf., green frame in Figure 1), which takes as inputs three types data:
  - ***Manufacturer data****:* technology dependent (eg capacity of the battery);
  - ***On-site real-time/monitored data****:* measured via sensors;
  - ***Predicted data****:* either computed locally or via Cloud platforms;

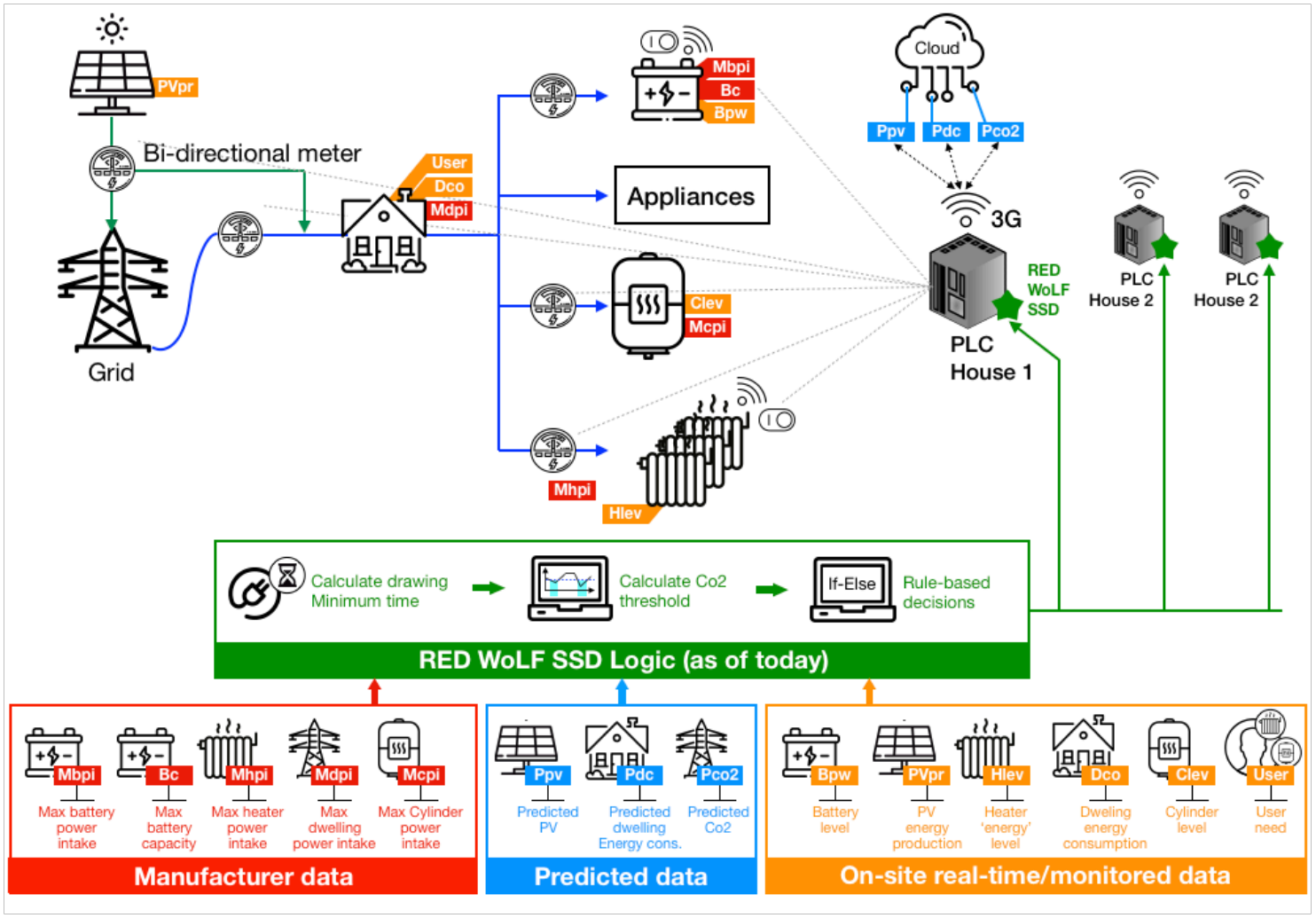


Figure 1: Overall overview of RED WoLF infrastructure

On-site sensor-generated data are monitored and communicated to a PLC (Programmable logic controller) equipment, which is in charge of applying the RED WoLF logic that has been implemented in the SSD.

Volta, Belgium, is leading the electrical engineering efforts towards the design of the wiring of the Pilot houses (to make them compatible with the RED WoLF Hybrid Storage System) and towards the selection of compatible devices. This implies also interfacing with the algorithmic aspects of the project and so Volta is liaising with the LBU-team to make sure that the modelling of the system reflects the real nature of the equipment and Volta interacts with the pilot consultants to make sure that the equipment is in line with the project requirements.

RED WoLF PARTNERSHIP MEETING, JANUARY 2020 -

the RED WoLF partners met up in Germany in January 2020. This meeting, one of a number which will be held throughout the project, involved discussions on project activities, key outputs and objectives.

PILOT SITE ACTIVITY

- Following the Covid 19 lockdown, work has now re-started on the 10 apartments being built by First Choice Homes in UK which will feature in the RW pilot phase. The installation of the PV panels and electrical wiring of the properties is well underway. It is anticipated that the properties will be completed in September/October 2020, with residents and pilot trials following soon afterwards.

FOR MORE INFORMATION –

https://www.nweurope.eu/projects/project-search/red-wolf-rethink-electricity-distribution-without-load-following/ or g.colantuono@leedsbeckett.ac.uk