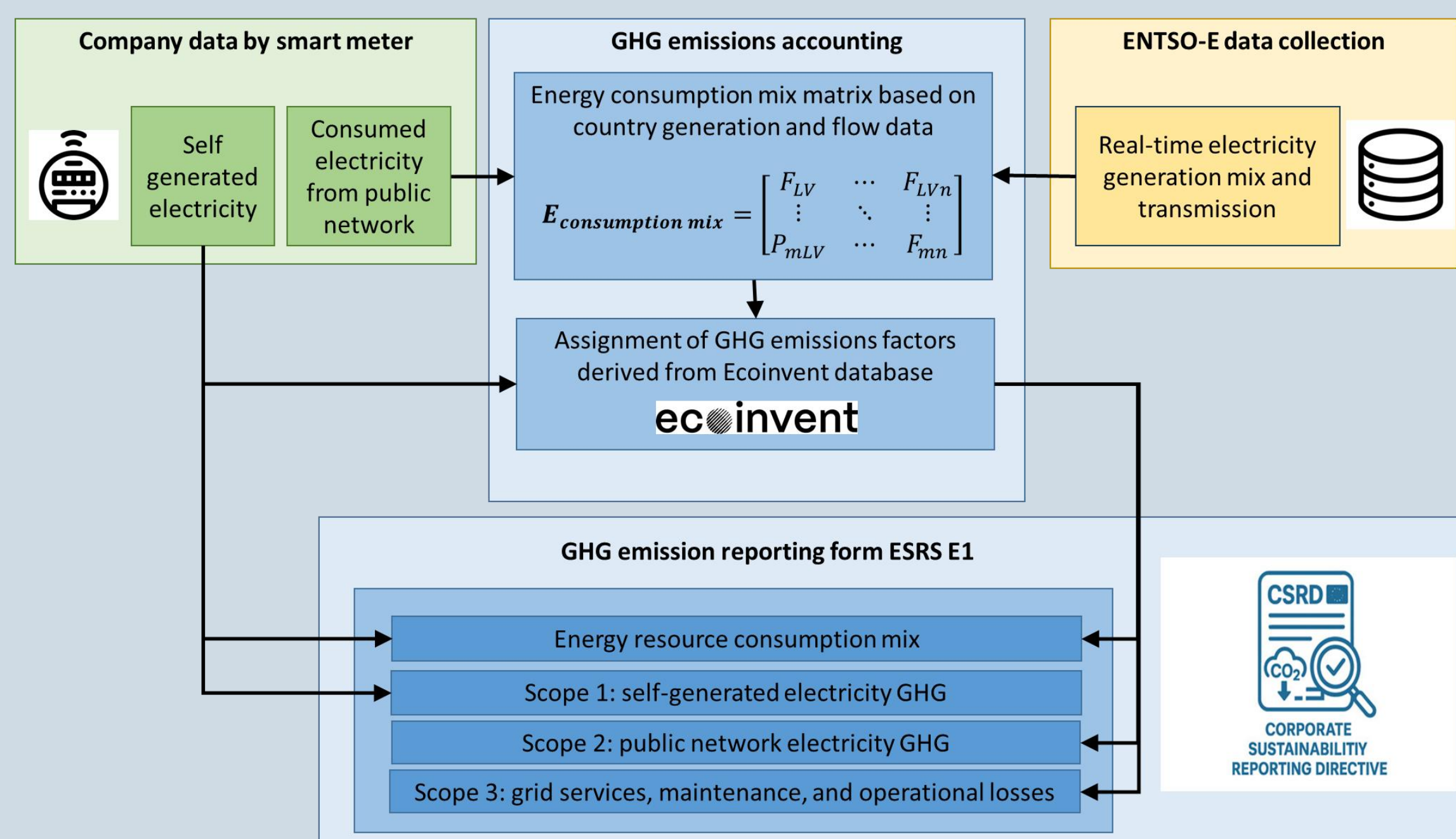


Highlights of developed tool

- ✓ Introduces temporal resolution into carbon accounting
- ✓ Links LCI data with real system operation
- ✓ Addresses burden shifting between scopes
- ✓ Enables physically consistent and EU reporting-aligned GHG accounting.
- ✓ Moves toward digital, automated sustainability reporting



Introduction

Currently, corporate sustainability reporting assumes:

- constant carbon intensity in electricity,
- ignores temporal variability,
- ignores interconnected grids.

In reality electricity flows dynamically across countries and generation mix changes hourly, hence:

- **Reported emissions ≠ actual emissions**

The aim of this research project is to develop a time-resolved electricity carbon accounting platform that integrates power system data and LCA emission factors for accurate corporate GHG reporting.

Methods

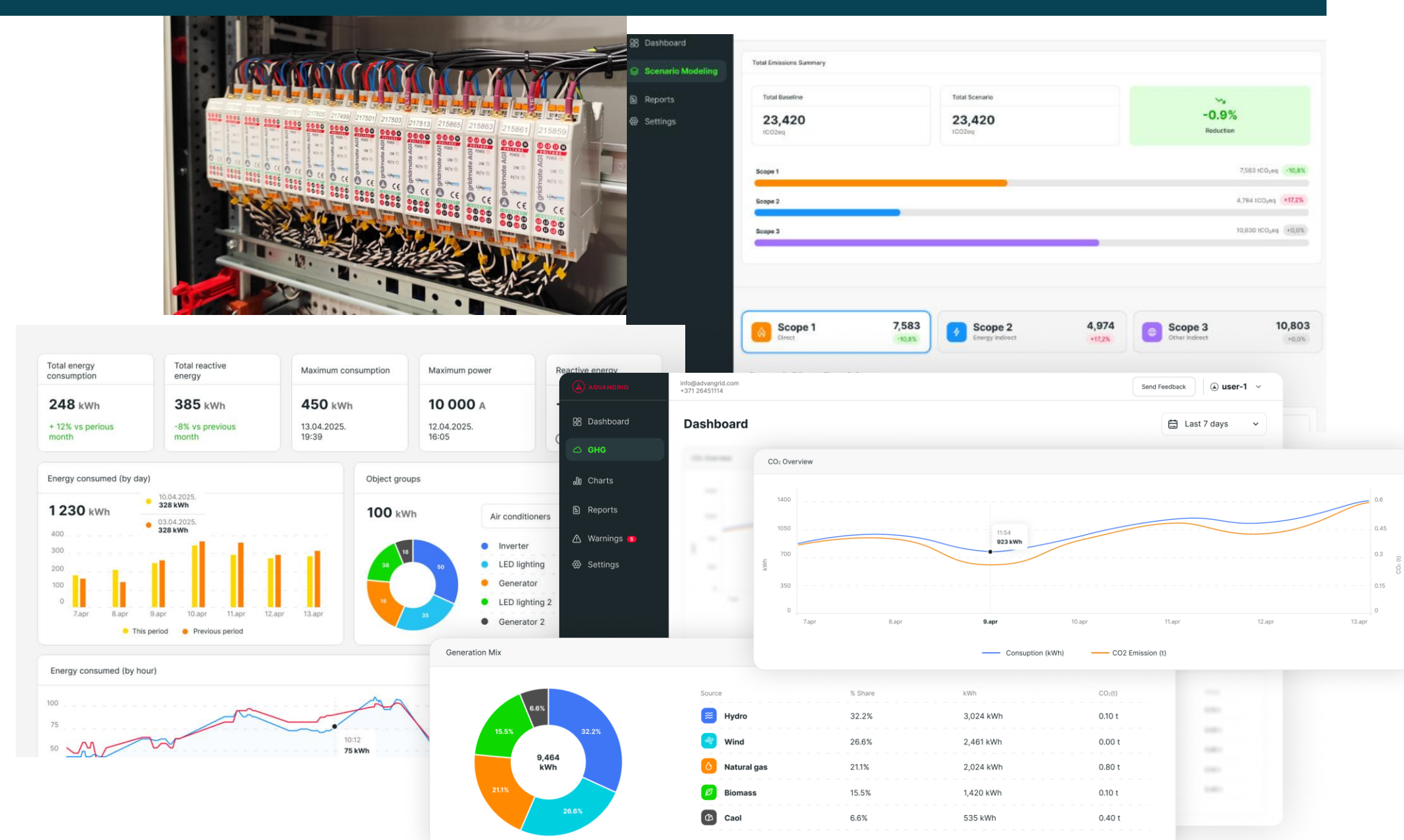
- **Electricity data** retrieved via ENTSO-E API (hourly generation and cross-border flows)
- **Flow tracing model** applied to allocate electricity from generation sources to final consumption
- **AdvanGrid sensor data** used for high-resolution electricity consumption measurement
- **Emission factors** derived from ecoinvent database using IPCC GWP100, aligned with GHG Protocol (Scopes 1, 2, 3) across ENTSO-E electricity generation technologies
- **Automated workflow** implemented in online platform for data integration and processing
- **Output: time-resolved GHG emissions** structured according to ESRS E1 standard under CSRD

Results

Developed a working tool named **Carbongrid** is available online for hourly Scope 1, 2 and 3 GHG emission assessment and reporting, as an alternative to the use of annual average emission factors at the company level.

This enables for enterprises:

- ✓ Identification of low-carbon electricity consumption periods
- ✓ Support for data-driven decarbonisation strategies
- ✓ Reduced manual work in GHG accounting workflows



Conclusions & Future Outlook

Moving from static and manual work-intensive to dynamic and automated carbon accounting is essential for reliable, transparent, and scalable corporate sustainability reporting. Future development of the platform will address:

- Integration of automatic sustainability reporting based on invoice and operational documentation
- Use of Large Language Models for data extraction and classification for reporting automation
- Expansion toward fully digital ESG reporting systems with minimal manual input