







# SMART BORDER INITIATIVE: A FRANCO-GERMAN CROSS-BORDER ENERGY OPTIMISATION PROJECT

Project Promoters	Project Partners
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Project design and management	
 	

# 1. EXECUTIVE SUMMARY

## 1.1 Context

Integrated and optimised local energy systems will play a key role in **achieving the energy transition objectives** set by France and Germany, in line with the Energy Union's goals, and contribute to ensuring a secure, affordable and climate-friendly energy supply in the EU.

In order to **capitalise on the French and German expertise and experiences** in developing such systems and to continue strengthening the cross-border cooperation towards a fully integrated European energy market, both Governments have decided to launch a common initiative to identify and structure a cross-border energy optimisation project. Tilia and dena have undertaken this mission to jointly develop the Smart Border Initiative (SBI).

The SBI will, on the one hand, connect policies designed by France and Germany in order to support their cities and territories in their energy transition strategies and European market integration. It is currently a paradox that, though more balanced and resilient energy systems build up, bottom-up, at the local level, borders remain an obstacle to this local integration, in spite of the numerous complementarities observed in cross-border regions, and of their specific needs, in terms of smart mobility for example. The SBI project aims at enabling European neighbouring regions separated by a border to jointly build up optimised local energy systems, and jointly develop their local economies following an integrated, sustainable and low-carbon model.

On the other hand, this **showcase project** will initiate a **new stage in the EU electricity market integration**, by completing high voltage interconnections with local, low voltage integration at DSO level, opening new optimisation possibilities in managing the electricity balance, and enabling DSOs to jointly overcome some of the current challenges, notably the increased share of renewable energy (RE) and ensuring Europe's security of supply.

## 1.2 Objectives and approach

Highlighting the added value of a Franco-German approach and driven by practical needs, the main objective of the SBI is to design a **replicable European project** that paves the way for more cross-border cooperation in optimising energy systems. This project will offer a field of experimental **smart grid use cases for cross-border optimisation of the electricity distribution systems, smart mobility solutions and multi-energy sub-systems**, aiming at improving the energy efficiency, security of supply and resilience of the covered areas.

It will provide an opportunity to assess the **socio-economic benefits** of these use cases following a cost-benefit analysis (CBA) approach. It will also enable stakeholders to identify regulatory hindrances to a better DSO integration and possible solutions to adapt the existing **regulatory patterns** to allow an enhanced and fully integrated EU energy market.

**Tilia and dena have steered this first phase of project design in close cooperation with the identified key partners** who have provided highly valuable inputs to this SBI project description and are committed to work on its implementation. This group of key partners includes French and German DSOs, TSOs, regional and local authorities, technology providers, research centres and other relevant local actors working on the energy and mobility fields.

### 1.3 SBI Project description

#### 1.3.1 Cross-border region

The geographical scope of the project concerns the **cross-border region of Saarland - Lorraine** (which is part of the Grand Est region).

The SBI project will be composed of 3 main modules, which are closely interconnected, as illustrated in the figure below.

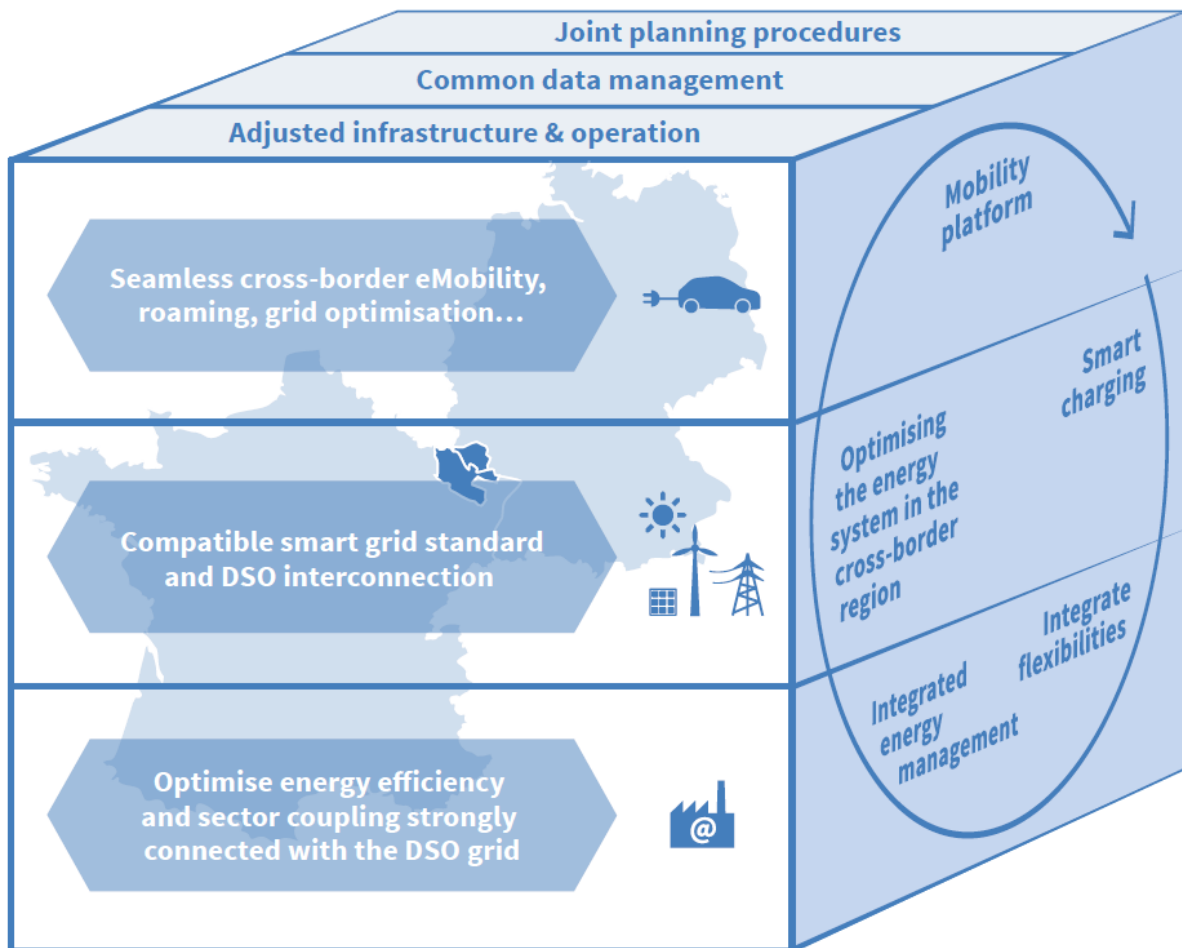


Figure 1 The Smart Border Initiative: a multi-energy and low-carbon smart system

#### 1.3.2 Module 1: Joint optimisation of the cross-border electricity distribution systems

The energy transition has a significant impact on the electricity system's operation, mainly due to the introduction of higher shares of decentralised generation, intermittent renewable electricity and new loads for electric vehicle (EV) charging.

The first project module aims at **optimising the development and operation of the electricity distribution systems in the cross-border area** (ca. 1 million people) through an improved match of local electricity production and consumption at DSO level and the integration of flexibilities, following a bottom-up approach. It will build on lessons and experiences gathered from previous smart grid projects in both countries, and will focus on **delivering real value to end users, communities and system operators**.

#### Module 1 Key activities:

- Developing a **cross-border grid model** allowing to analyse different grid development scenarios until 2030;
- Creating a **compatible mechanism** that would be the basis for a joint French-German (and eventually EU) standard for the optimisation of the cross-border electricity distribution systems;
- Optimisation of the electricity distribution systems in the cross-border area, by designing and implementing a **cross-border interconnection of the distribution grids**;
- Using and controlling **flexibilities** in the cross-border region - including those provided through sector coupling (i.e. mobility, district heating and cooling systems, industries, buildings...) - in order to achieve the needed amount of dispatchable load to optimise the system's operation;
- Developing a cross-border **data management system** able to monitor and optimise in real time the operation of the smart grid;
- Investigating the **regulatory issues** associated to the project, in particular the compliance with current and future European market rules and regulations and the impact of the cross-border interconnection at DSO level on the overall system balancing.

### 1.3.3 Module 2: Smart mobility and integration into the smart grid

Cross-border journeys in the Saarland-Lorraine region concerns around 20,000 people daily. This second module aims at developing and implementing a **smart and low-carbon strategy to cross-border mobility** and at **optimising the development and operation of EV charging infrastructure**, taking into account the electricity grid constraints.

#### Module 2 Key activities:

- Developing a **smart mobility strategy for the cross-border region**, taking into account the expected increase of electric, hydrogen and other low-carbon vehicles;
- Developing **cross-border mobility services** such as roaming solutions for paying and charging (e.g. location and availability of parking and charging infrastructure), smart parking or low-carbon transport services;
- Planning the optimal design and location for the future EV and hydrogen **charging infrastructure**. This activity will target both existing and new infrastructure, which will be integrated into a cross-border back-end system;
- Using EV charging as a source of flexibility to the electricity grid (**smart charging**), integrating these charging facilities into the electricity management system operated by the DSOs;
- Incentivising a **higher use of EV** in the cross-border region, through common initiatives undertaken with vehicle manufacturers, regional agencies promoting electro mobility, etc.;
- Creating a **cross-border mobility platform** integrating the mobility services developed by the project and other mobility services as relevant.

### 1.3.4 Module 3: Energy efficiency and sector coupling

One of the key aspects of the SBI is its **multi-energy dimension**. While most of the existing smart grid pilot projects have focused on the electricity grid, new generation smart grids such as this project aim at developing **integrated and optimised local energy systems**, taking into account all kind of energy supply (notably heating, cooling and electricity).

#### Module 3 Key activities:

- **Coupling the electricity and heating sectors through district heating and cooling (DHC) systems** to efficiently manage the intermittency from RE at an affordable cost through the optimised use of thermoelectric equipment like heat pumps, electric boilers, CHP plants and thermal storage. Those models have proved to be a powerful, cost-efficient tool for decarbonising the energy supply in cities of some Member States such as Sweden or Denmark;
- **Integrating existing energy efficiency initiatives in buildings and public lighting** to improve the accuracy of the energy models developed by the project, to share best practices in both countries and to implement demand management solutions, e.g. peak-shaving;
- Assessing the potential **flexibilities provided by buildings and industries** in the region to integrate them in the smart grid when relevant (either as a source of surplus heat to DHC systems or as a source of flexibility for the electricity system).

### 1.3.5 Socio-economic cost-benefit analysis (CBA)

The project aims at developing real life business models for multi-energy smart grids. It foresees the performance of a **long-term CBA**, taking into account socio-economic externalities (CO<sub>2</sub> emissions saved, balancing services provided to the electricity system, impact on local employment, etc.). The SBI will capitalise on existing methodological tools developed by some of the project partners, notably those that have been developed by TSOs and DSOs.

### 1.3.6 Project design and management

The overall **joint project design and management team** will work on the detailed design and implementation of the project and negotiate with stakeholders (local partners, industrial partners, technology providers, financing institutions...). It will secure the coherence between the cost-benefit evaluation and modelling output and the project features, and will also be responsible for the overall project planning and monitoring, coordination of project partners, development of project management procedures and managing the budget and funding sources.

A **Steering Committee** will be established within the project governance structure involving representatives of the ministries, national energy agencies, regional ministries, DSOs and TSOs.

## Some characteristics of the involved institutions

### Amprion

- German Transmission System Operator
- Highest extra-high voltage transmission system in Germany with a length of around 11.000 kilometres and some 160 substations between Lower Saxony and the border to Switzerland and Austria
- Close partnership with RTE on Security of Supply across national borders and contributions to the integration of the European Internal Electricity Market

### ARGE Solar/GReNEFF-Project

- Association with the objective to foster renewables and energy efficiency in the region
- Leads Interreg VA - project GReNEFF, a cross-border network to promote innovative projects within the scope of sustainable development and energy efficiency in the Greater Region.

### CASC - Communauté d'Agglomération Sarreguemines Confluences

- Conurbation Community in Sarreguemines area with 28 cities and 66.000 inhabitants.
- Has taken initiatives for the energy transition on its territory since 2009 and has developed internal competences to lead related projects (sustainable mobility, energy sobriety in buildings, ...).
- Is a founding member of the EuroDistrict Saarland Mosel (European Grouping of Territorial Cooperation – EGTC) and has already led several projects in cooperation with its German neighbours.

### EDF Deutschland GmbH and EIFER

- EDF Germany is a subsidiary of the French company Électricité de France
- The working field is the energy transition in Germany
- EIFER (European Institute for Energy Research) is the a energy institute of EDF
- The main working field is the sustainable development of cities and regions
- The speciality is innovative power supply in the field of biomass, biogas and geothermal sources
- Particular expertise in spatial data management and analysis in GI Systems and simulation of hybrid local energy systems (thermal and electric).

### ENEDIS

- Main Distribution System Operator in France (manages 1.3 million km of electric lines i.e. 95% of the electricity distribution network in continental France) and is the DSO in the area Moselle (Lorraine)
- Is responsible for a continuous public electricity service and ensures a non-discriminatory access to the distribution network
- Maintains and develops its network but also innovates in the areas of information systems and metering.

### **ENOVOS Deutschland SE**

- Subsidiary of Enovos Luxemburg also present in France and Belgium
- Natural gas and electricity supplier for industry and public services
- Actively engaged in the development of intelligent services and products in the domains of eco-mobility, energy efficiency, smart applications and distributed energy services.

### **Energis Netzgesellschaft**

- Regional grid operator responsible for the planning, operation and marketing of electricity and gas distribution grids with around 10.000 renewable energy producers connected to the electricity distribution grid
- Covers a electricity distribution grid with a length of 6.600 km and a gas distribution grid with a length of 1.500 km. Around 1.120 gigawatt hours electricity and around 1.100 gigawatt hours gas are being transported per year
- Approximately 230.000 people are supplied with electricity and gas

### **Grid Solutions**

- A GE and Alstom Joint Venture
- Helps its partners to effectively manage energy from the point of generation to the point of consumption, helping to maximise the reliability, efficiency and resiliency of the grid (power electronics, high voltage equipment, automation and protection devices, software solutions, etc.

### **Hubject**

- With more than 240 partners, the Hubject platform is the biggest international digital B2B market place for services related to the charging of electric vehicles dedicated to the concept of customer-friendly charging.
- Shareholders include Siemens, Bosch, Daimler, innogy and EnBW
- Almost 40,000 charge points on three continents are connected to the open Hubject platform.

### **Innogy**

- Innogy SE operates as an European energy company.
- Innogy plans, builds, and manages plants to generate power and extract energy from renewable sources, as well as retails electricity and gas. It also manages power lines and gas lines around the world.

### **IZES gGmbH**

- Institute for Future Energy Systems gGmbH founded in 1999
- The IZES is researcher in the field of future energy systems and energy markets and mobility
- IZES supports environmental and climate protection by initiating and conducting application-oriented research in this field

### **MHyRABEL Project**

- Project led by a consortium comprising territories, industrials and researchers.
- Aims at experimenting the energy transition through a multi-usage valorisation of hydrogen: mobility, heating grid, electricity production, injection in the gas grid, methanation, ...
- Is located in a 4-border region, close to Germany, Luxembourg and Belgium.

### **Regionalverband Saarbrücken**

- Regional association /administrative district representing 5 cities (Saarbrücken, Völklingen, Püttlingen, Sulzbach and Friedrichsthal) as well as 5 municipalities (Heusweiler, Riegelsberg, Quierschied, Kleinblittersdorf and Großrosseln)
- Responsible for climate protection in the region, balancing regional disparities, strengthening the region as a location for industry/business, fostering relationship with France as part of the Franco-German border area (Eurodistrict SaarLorraine).

### **RTE**

- French Transmission System Operator
- Operates and maintains 105 000 km of power lines and 2 710 substations
- Designs and develops market mechanisms in France and Europe with its European counterparts.

### **STEAG Netz GmbH**

- STEAG Netz GmbH is a subsidiary of the STEAG Power Saar GmbH
- Operates and maintains an electricity grid on the middle and high voltage level.

### **STEAG Technischer Service GmbH**

- STEAG Technischer Service GmbH is a subsidiary of the STEAG
- The working area is technical and commercial services for energy industry and municipalities
- Services are provided in the field of equipment service, energy facilities and electricity grid.

### **Verteego**

- French data management technology startup, founded in 2008
- Specialises in descriptive analytics and predictive analytics
- Is a Board Member of the FrenchTech #cleantech cluster Durapole and presides the global performance and corporate social responsibility commission of Tech in France. Laureate of the French Prime Minister's Investissements d'Avenir instructed by ADEME.

### **VSE (as part of Innogy)**

- German energy supplier and distribution grid operator in the region
- Offers technical solutions and energy services.