Innovating for sustainable cities

OFATE

Planification énergétique à l'échelle du quartier et nouveaux réseaux

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28 September 2021

Presentation of Efficacity

Efficacity’s strategy and main activities

Efficacity : the French urban energy transition institute

A public-private institute …

	Etat	Membres privés
Actionnariat :	49%	51%

	Etat	Membres & partenaires
Budget R&D : 6 M€/an dont :	50%	50%

… gathering approximately one hundred researchers and experts working with a multi-disciplinary approach….

… and focusing on urban energy and environmental performances of cites.

Efficacity is located just outside Paris in the Cité Descartes

Research institutes and universities

CSTB, IFSTTAR, Cerema, École des Ponts ParisTech, MINES ParisTech, IGN, ESIEE Paris, Éa v&t, ESTP, EIVP, paris-belleville, Université Gustave Eiffel, Université Paris-Est, UPEM, université Paris-Saclay

Industry and engineering

EDF, ENGIE, VEOLIA, VINCI, setec, suez consulting, INGÉROP, ARCADIS, abmi, tpf-i

8 Institutes for the Energy transition and 8 Institutes for Technological research (~2000 staff)

efficacity, SystemX, Nobatek INEF4, b<>com, VEDECOM, IRT M2P, ines, IRT Saint Exupéry, IPVF, Railenium, France Energies Marines, BIOASTER, SuperGrid Institute, IRT Jules Verne, SAS PIVERT, NanoElec

FIT FRENCH INSTITUTES OF TECHNOLOGY

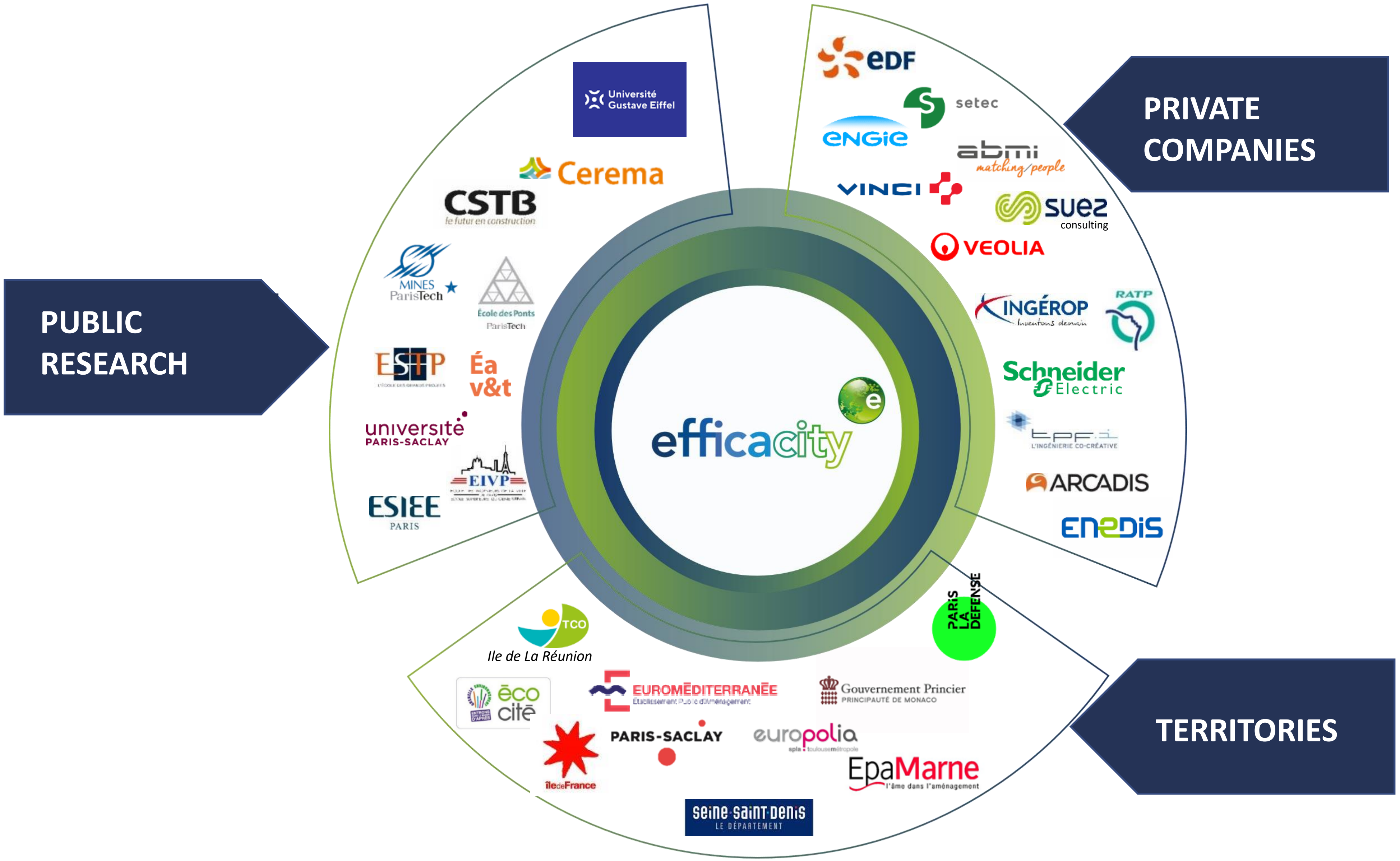
Our mission and three strategic goals

Our mission : accelerate innovation and large-scale deployment of **methods, tools, and solutions for** the energy and ecological transition of cities and neighborhoods.

OUR STRATEGIC GOALS

1. **Low carbon districts:** a chain of software tools for designing districts with very high energy and environmental performance.
2. **Sustainable urban strategies:** low-carbon planning for cities and metropolitan areas; European label "Sustainable and innovative city“.
3. **Urban innovation:** real-scale experimentation of industrial solutions; evaluation and scaling up of innovations.

Our members and partners



Software tools for the design of Low Carbon Districts

Software development strategy for LCD (Low Carbon Districts)

Linkage of Efficacity’s software tools at district scale

For each software tool, Efficacity and its partners develop :

- Geo-databases as well as technical and economic databases ;
- Data completion algorithms ;
- Models and solvers ;
- Validation methodologies .

Available software tool for professional use.

Software tool under development.

Characterization of energy reservoirs (renewable & recovered energy)

EnergyMapper

Recov’Heat

Ranking of local energy strategies (systems)

EnergyScreener

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Dynamic simulations of energy systems

PowerDIS

Evaluation of environmental impacts

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Building/energy, water/waste, outside spaces, mobility

UrbanPrint

Project pre-feasibility (opportunity) and feasibility study phases at district scale…

… Energy performance and energy management at district scale

District-scale Energy Performance Contract

CPE Quartier

PowerDIS

Optimizing the sizing and management of microgrids

OptiSize

OptiGrid

PowerDIS - Urban dynamic energy simulation

PowerDIS : decision support software tool for the choice of the energy strategy of urban development projects. To be used by urban project developers, network operators, engineering firms, etc.

- Functionalities:
  - Building modeling, **simulation of building demand and consumption** from energy systems ;
  - Build and **compare energy scenarios**, centralized (including DHCN -district heating and cooling networks-) or decentralized, using different renewable and recovery energy scenarios, programming scenarios;
  - Cartographic visualization of the results of energy demand and consumption, detailed at **hourly and annual time steps**.

- Use cases:
  - **Mandatory studies** for communities: SRADDET, PCAET, thermal network development studies, renewable and recovery energy supply studies;
  - **Optional studies** for communities: energy master plans, diagnosis of energy needs of neighborhoods ;
  - Calls for tender (urban project developers, operators) in the upstream phase concerning the **energy supply strategy**;
  - **Prospective, pre-feasibility or sensitivity studies** concerning the energy needs and consumption of districts (for design offices, developers or industrialists and R&D teams).

- Added value :
  - **Increased reliability of the results** through the **coupling of the simulation of energy needs and consumption** of the project;
  - **Time saving** thanks to the cross-referencing of georeferenced data (IGN's BD TOPO® and Sirene® database);
  - **Intuitive interface developed** in collaboration **with a group of users** from Efficacity members.

PARIS-SACLAY

La Transition Energétique de la Principauté de Monaco

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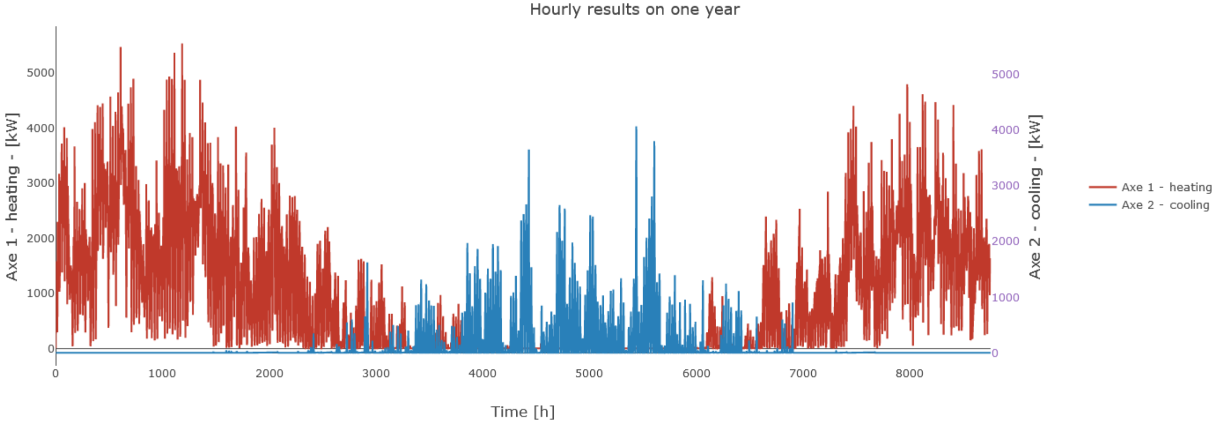
PowerDIS - Examples of simulation results

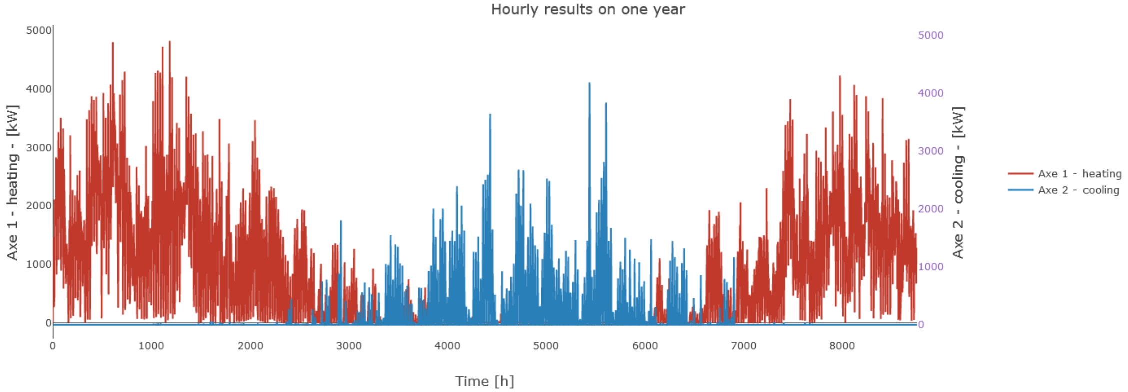
Scenario 1: non-renovated district

Sum of energy loads	Mean surface loads wighted by their surface	Maximal power load	Mean max. surface power load wighted by their surface
8915	94	6510	86
MWh per year	kWh/m$^2_{useful}$ per year	kW	W/m$^2_{useful}$



Scenario 2: recently-renovated district

Sum of energy loads	Mean surface loads wighted by their surface	Maximal power load	Mean max. surface power load wighted by their surface
7560	80	5799	78
MWh per year	kWh/m$^2_{useful}$ per year	kW	W/m$^2_{useful}$

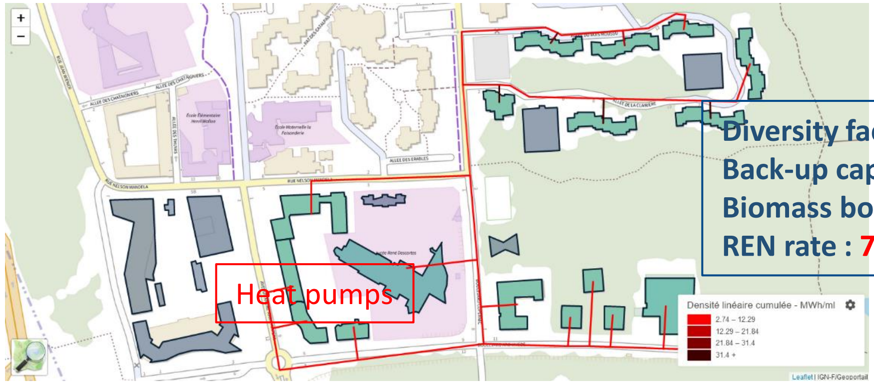


PowerDIS - Examples of simulation results

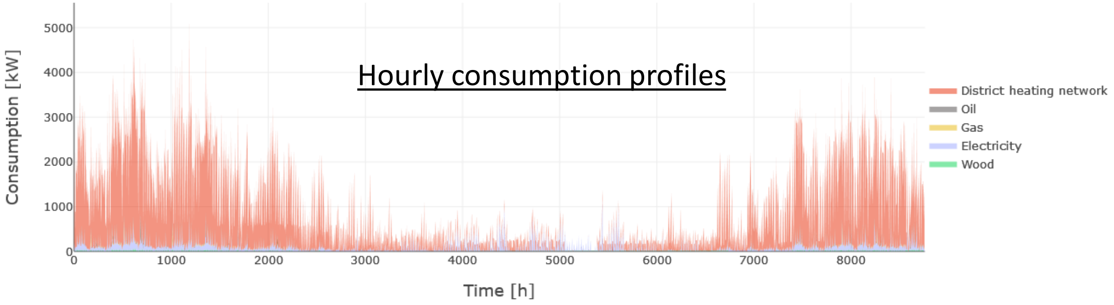
Scenario 1: extended heating network

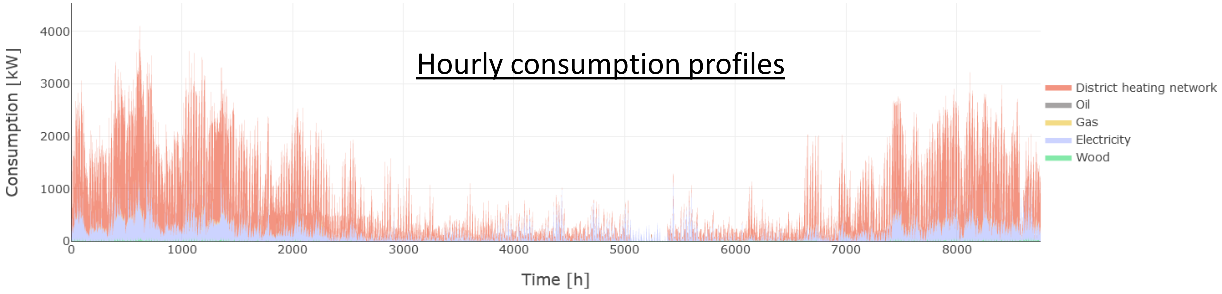
Diversity factor : 69.3 %
Back-up capacity : 7.62 MW
Biomass boiler capacity : 3.81 MW
REN rate : 72.4 %

Scenario 2: heating network supplying a smaller amount of buildings



Diversity factor : 86.2 %
Back-up capacity : 5.38 MW
Biomass boiler capacity : 2.69 MW
REN rate : 75.9 %





- A less extensive DHN (district heating network) results in a **higher diversity factor**, which in turn avoids an **oversized biomass boiler**.
- A less extensive DHN results in a higher **REN (renewable energy) rate**.
- Dynamic simulations at hourly step explain this difference : in scenario 2, heat pumps are used for buildings not connected to the DHN (which limits their impact on the DHN as observed in scenario 1).

UrbanPrint : environmental evaluation of urban projects

- A software tool for the **quantitative assessment** of the **Energy / Carbon and environmental performance** of a development project ;
- Which considers the **characteristics of the development project**, the **local context** and the **urban strategies** and **environmental levers** activated or not by the project managers ;
- And based on the principles of a **life cycle assessment.**

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UrbanPrint is today the reference tool for the operational implementation of the “Quartier Energie Carbone” method co-developed by CSTB and Efficacity and supported by ADEME.

- The tool is suitable for completely new neighborhoods (Version 1 - summer 2020) and including existing buildings and fabric (Version 2 - in development for end of 2021).

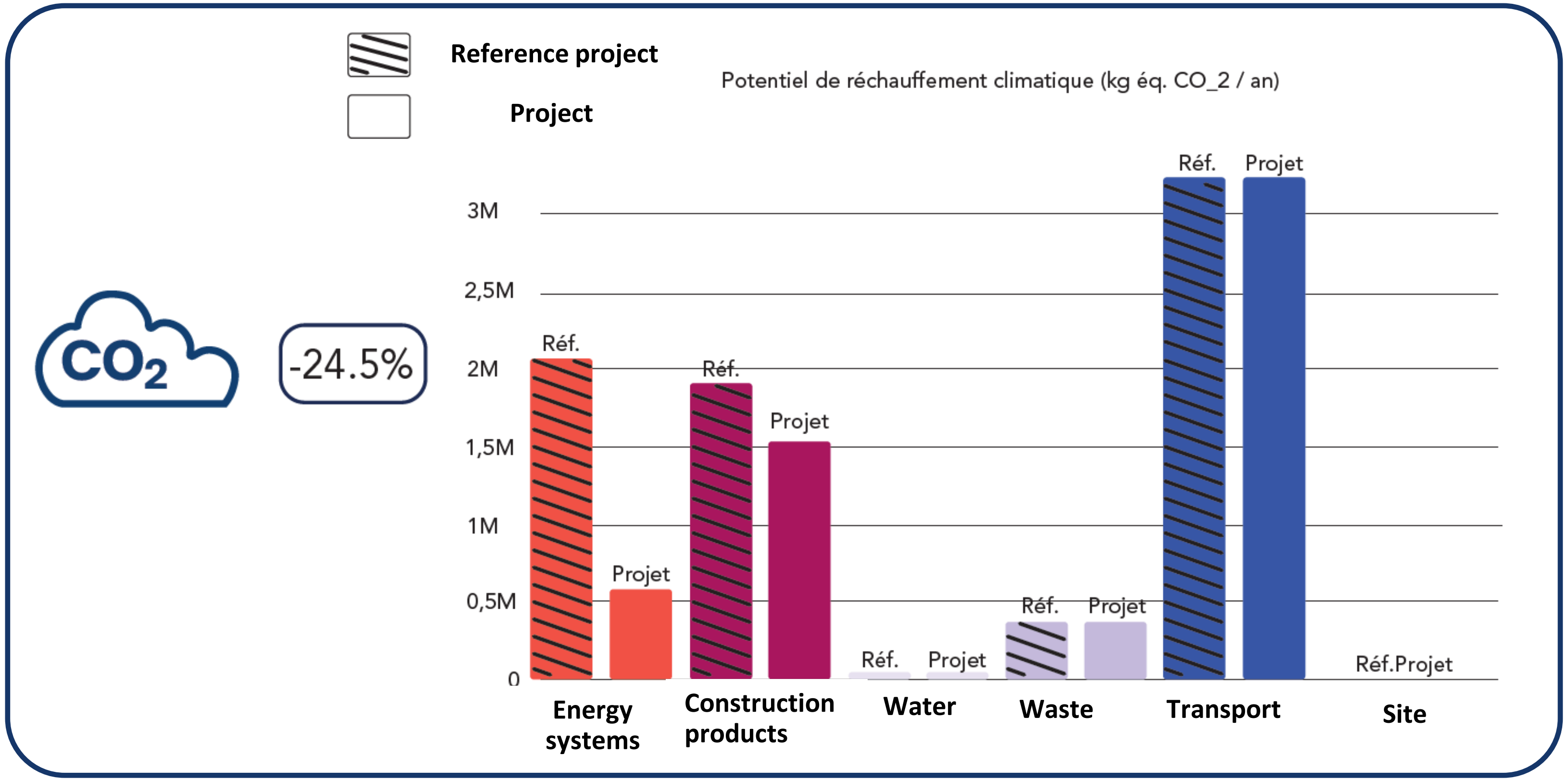
Exemple of outputs : calculation of the Energy and Carbon scores

Project to be evaluated: defined by the user with the activation of 1st levers

Reference project: calculated by the tool with the same location, same program and same urban form as the project, but with "business as usual" project, but with "business as usual" performance levels or respecting the regulatory minimum.

Energy score - Percentage difference between the primary non-renewable energy consumed by the project and that of the reference project.

Carbon score - Percentage difference between the CO2eq emissions of the project and that of the reference project.



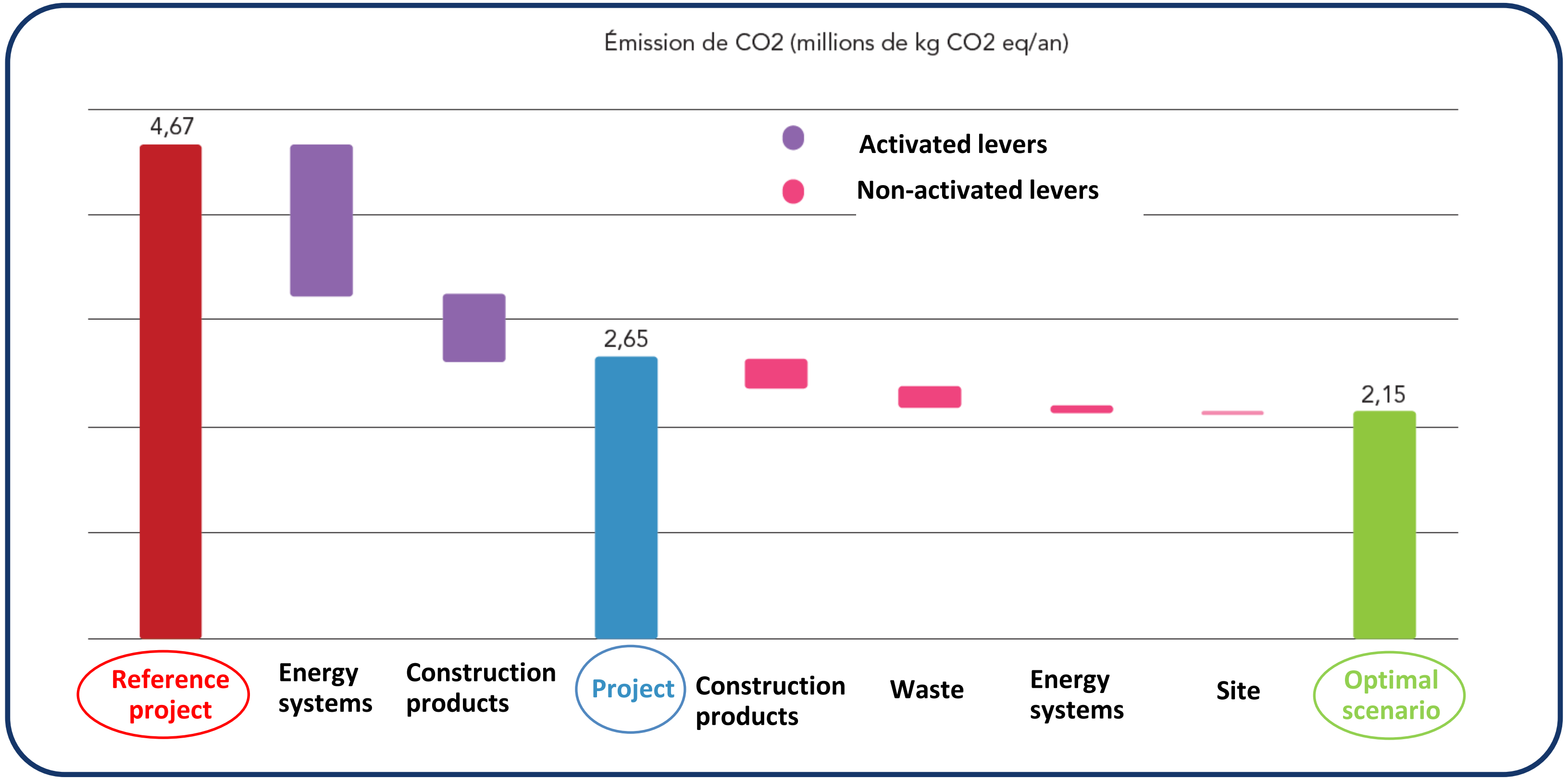
Identification des leviers d'action à mobiliser

Project to be evaluated: defined by the user with the activation of 1st levers

Optimal scenario - Calculated by the tool that identifies the combination of actions still available to achieve an optimum in terms of carbon score.

Potential for improvement of the initial project

UrbanPrint makes it possible to identify the impact of the levers activated and not yet activated by the user.



First urban pilot projects since mid-2020

Ordener-Poissonniers - Paris
SNEF

Parc d'activité des Portes de Paris
ICADE

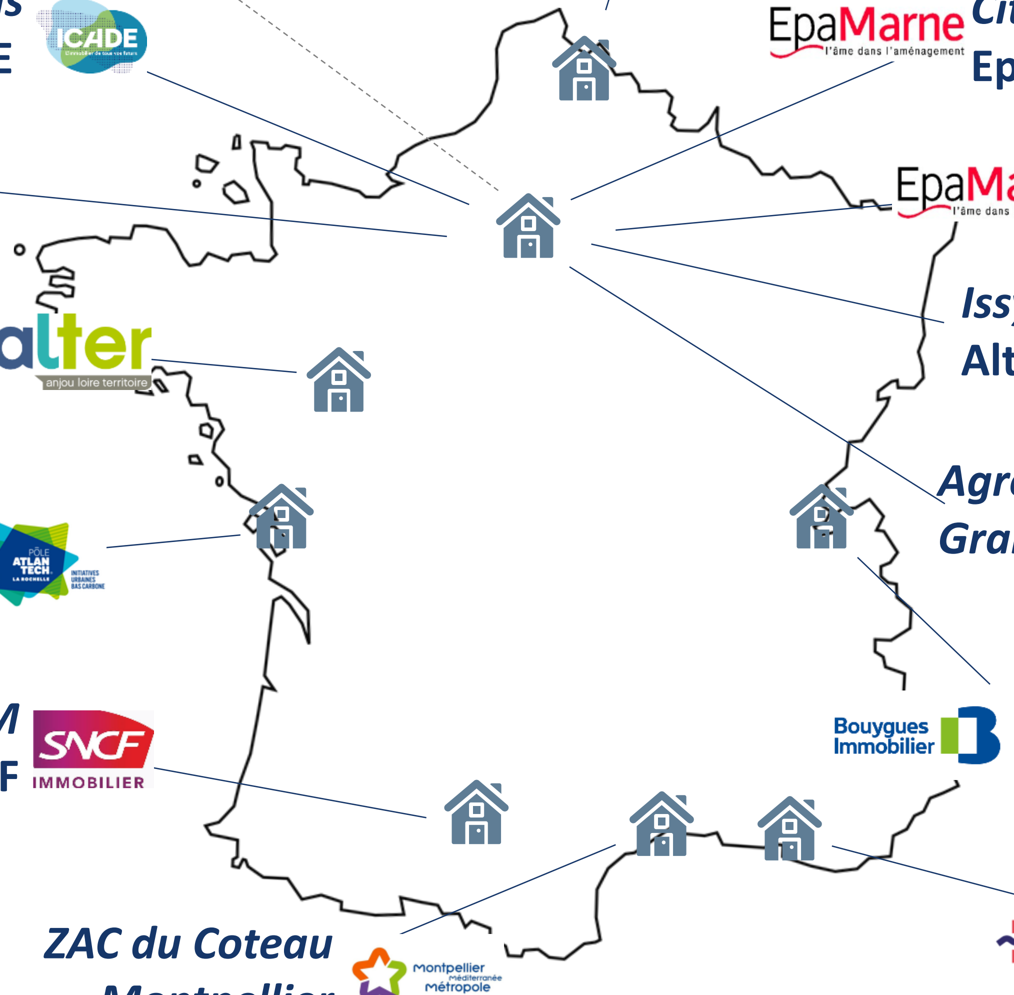
17&Co - Paris
BNP Paribas

Les nouveaux Echats - Beaucouzé
Anjou Loire Territoire

Quartier Bas Carbone - La Rochelle
Atlantech

Opération Toulouse Raynal SERNAM
SNEF

ZAC du Coteau
Montpellier



La Maillerie - Croix et Villeneuve d'Ascq
Bouygues Construction / LinkCity

Cite Descartes - Champs-sur-Marne
EpaMarne

Marne Europe
EpaMarne & Villiers-sur-Marne

Issy Cœur de Ville - Issy-les-Moulineaux
Altarea Cogedim

Agroquartier de Montjean Est - Rungis
Grand Paris Aménagement

Saint-Julien-en-Genevois
Bouygues Immobilier / UrbanEra

Les Fabriques - Marseille
Euroméditerranée

Thank you for your attention