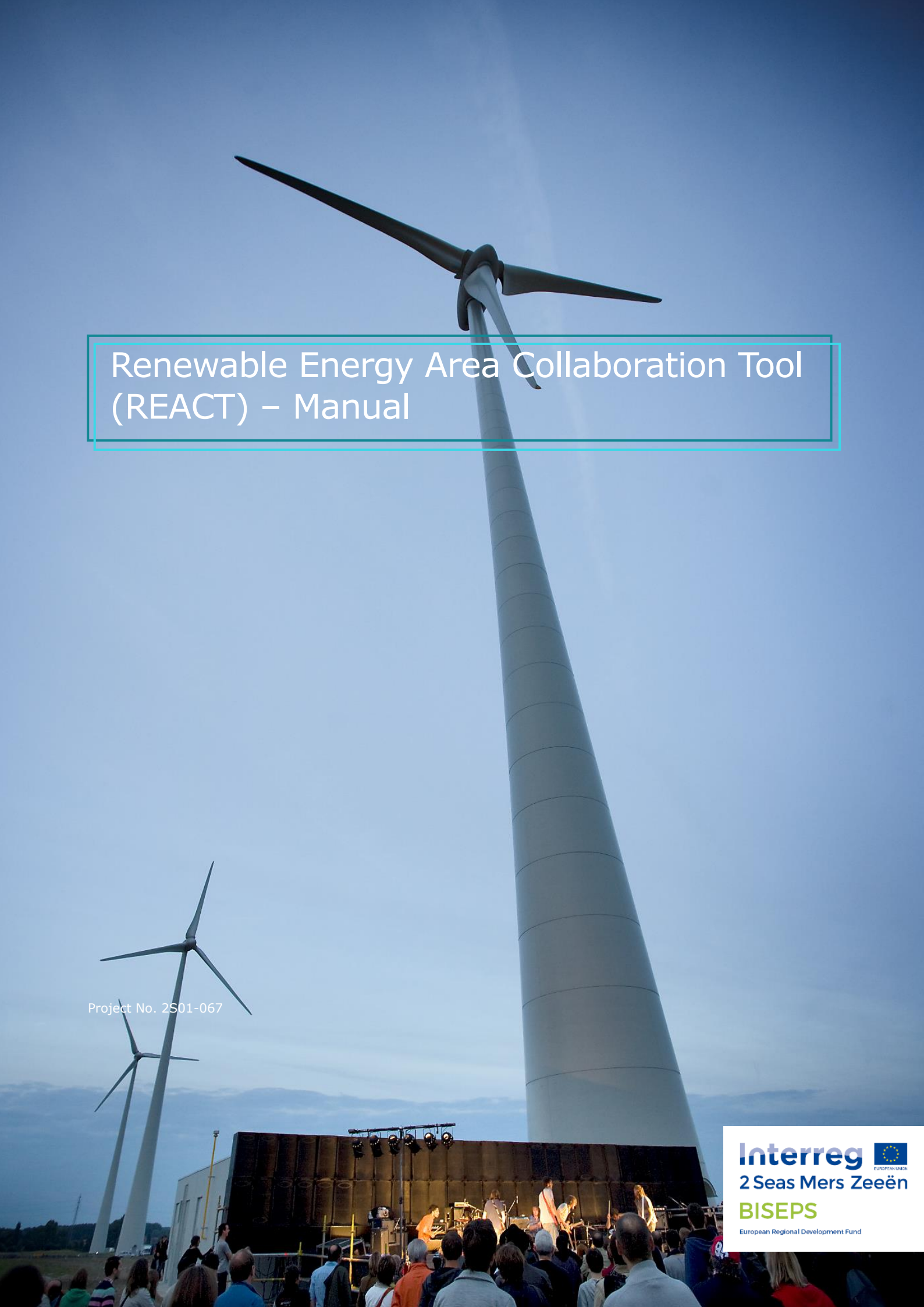
Renewable Energy Area Collaboration Tool (REACT) – Manual



Project No. 2S01-067

Interreg
2 Seas Mers Zeeën
BISEPS
European Regional Development Fund

Introduction

The Renewable Energy Area Collaboration Tool (REACT) is a user-friendly tool that has been developed within the framework of the Interreg 2 Seas BISEPS project. The aim of this tool is to determine optimal low carbon technology solutions for business clusters, exploiting potential energy synergies. The tool has the ambition to (partly) replace expensive and time-consuming energy audits at business cluster level, making energy investment decisions more straightforward and therefore more likely.

The main target group for the tool are business cluster managers aiming to realise money savings and reduce CO_2 emissions within their business cluster(s). General (energy) data from the cluster and the individual companies serve as input for the tool. To keep the tool easily accessible and user-friendly, the required data inputs are kept to a minimum.

This manual will help you to use the tool and get the best results out of it, with practical step-by-step explanations and links to short video tutorials. It will help you to interpret the results and create optimal simulations.

The tool can be reached via https://react.biseps.eu

REACT is an output of the BISEPS-project, a cross-border cooperation project between Belgium, France, the Netherlands and the United Kingdom, within the Interreg 2-Seas Program. More information on www.biseps.eu

The BISEPS-project

Heat and electricity are essential to drive industrial processes and are universal in offices, logistics, shops; everywhere people work. For most businesses, energy is a matter of course, something not to worry about. It might be an important cost item, some businesses require high standards of energy security, others sustainably produced energy with low of zero carbon emissions.

Clusters of businesses, such as business parks, are nucleuses in the energy system. Their use of energy is intensive, the type of energy used is very diverse (low vs. high-temperature heat, kinetic energy, reactive energy, etc.), many types of energy conversions occur and result in substantial waste heat.

Business parks have the potential to become the hotspots in the energy transition. Up to recently they have relied largely on fossil electricity and gas, in future they will be fed by local, renewable solar energy installed on the vast roofs of enterprises, wind energy from shared wind turbines on the business park and district (grid) heating networks. The future energy system in a carbon neutral world will have energy storage using hydrogen and batteries, in combination with a demand/supply response via smart grids and waste heat recovery via intelligent and adaptive district heating systems. The energy transition is an energy infrastructure transition, and business parks will be dedicated energy hubs.

SMEs often lag behind in adopting low-carbon solutions and as they are the majority on business parks, the potential of business parks to become hotspots remains unrealised. An accumulation of barriers is responsible: a lack of knowledge about low-carbon energy solutions, a low sense of urgency, little intention or capacity to invest time or capital, roofs unsuitable for solar power, too complex (energy) regulations, and a lack of effective policies towards business parks…

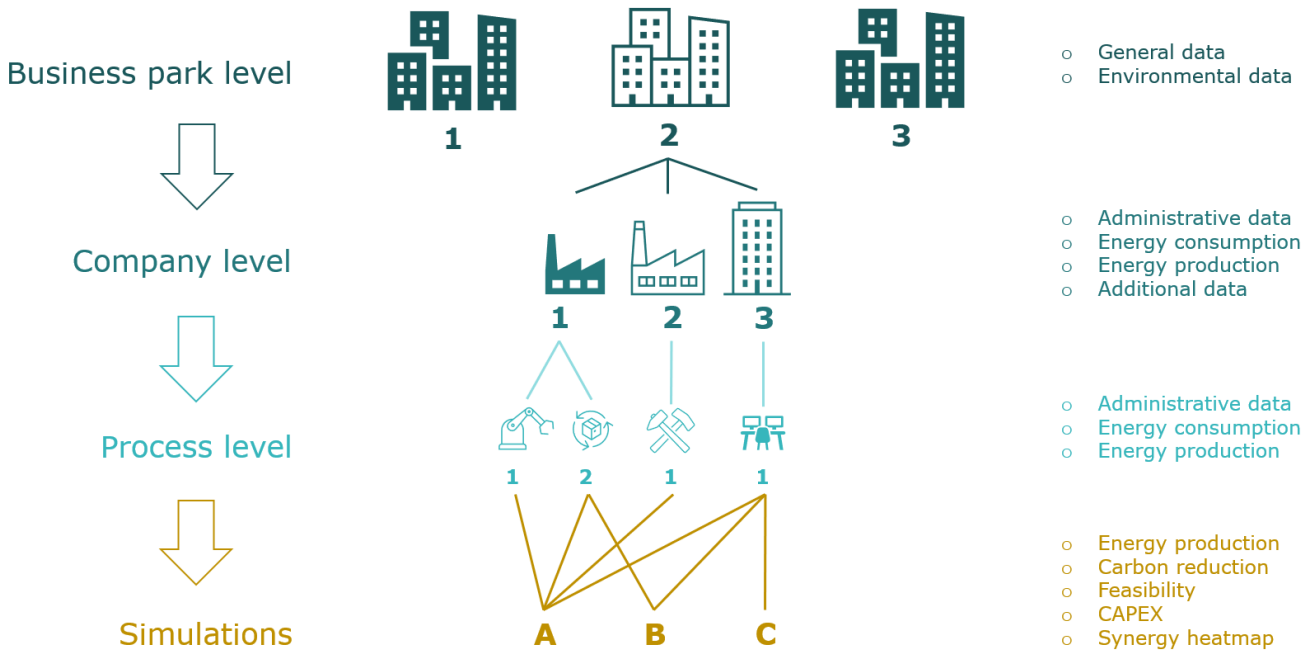
In this context, 8 organisations in Belgium, France, Netherlands and UK tested approaches to activate SMEs in the energy transition via living labs. The concept of “unburdening” was applied: a business park manager, a business support organisation, a BID-manager, a cooperation of businesses or a similar facilitator on a business cluster level supported SMEs in finding sustainable energy solutions. Businesses were supported to work together to achieve economies of scale and other mutual benefits.

Note

REACT is a web based application. You will have the best experience using REACT in the latest version of the Google Chrome browser with version xx of Windows.

REACT allows to create multiple simulations to discover the potential for renewable energy solutions on a business park. REACT needs data to be able to create these simulations. The scheme below shows the architecture of REACT on 4 levels:

- **Business park level.** REACT allows you to create multiple business parks.
- **Company level.** Every business park contains a number of businesses. Every business needs to be created separately in REACT.
- **Process level.** A business contains at least one process. In case there are multiple substantial energy consuming processes in one company, REACT allows to define these (e.g. production, logistics, offices).
- **Simulations**. REACT can generate multiple simulations for one business park. Make multiple selections of processes and businesses.



This manual will take you through these 4 levels (chapter 3-7). In Chapter 1-2 you will learn how to create an account and manage different users.

REACT for greenfields

This manual will focus on the use of the tool for existing parks, explaining how to create and modify business parks, companies, processes and how to generate and understand a simulation. However, REACT can also be used for newly developed business parks ("greenfields"). Data input for these new developments is very similar to the input for existing parks. The tool for "greenfields" is accessible through the button "Add business park: new development" on the business parks overview screen.

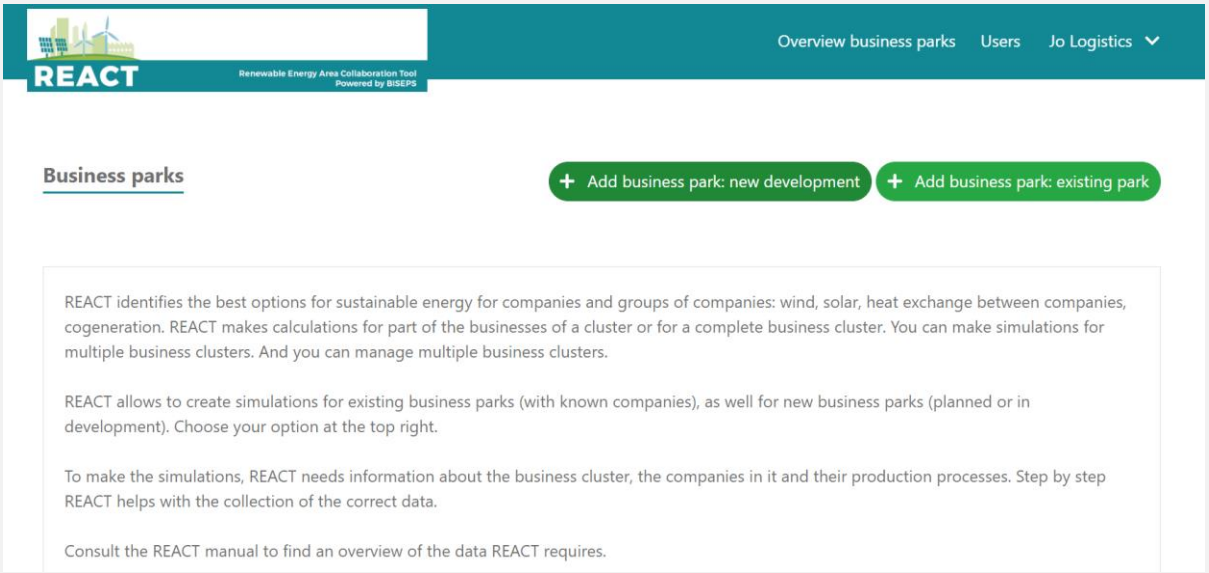


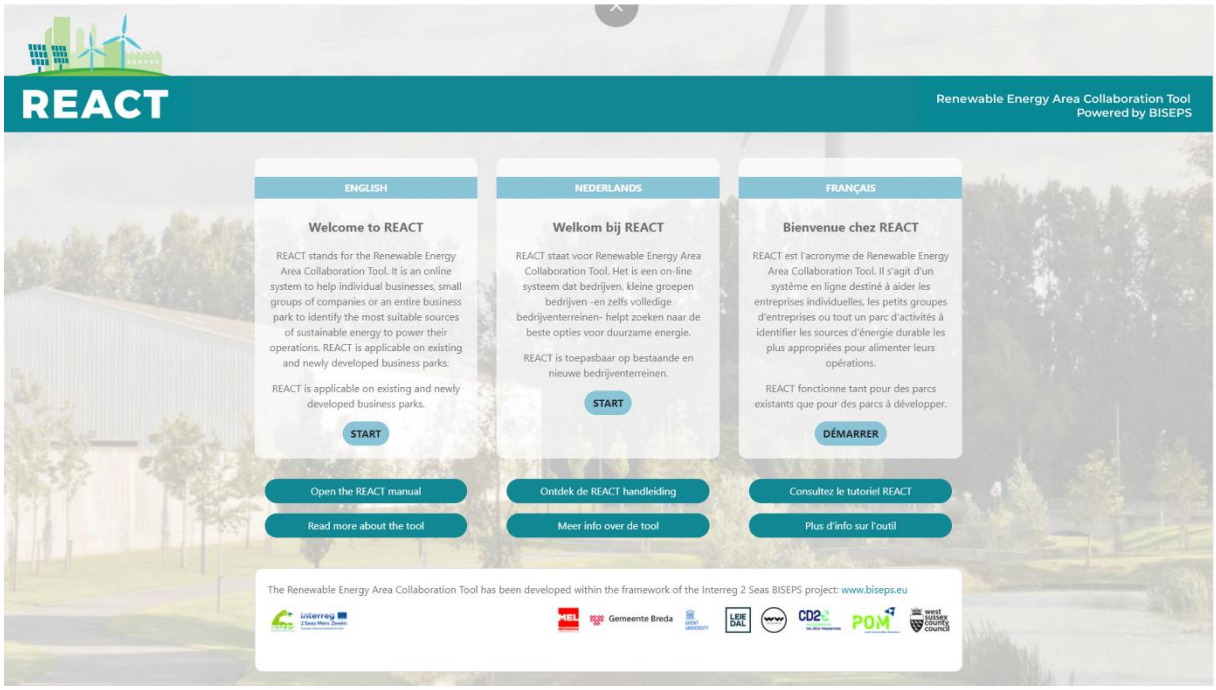
Table of Contents

1 Create an account and login

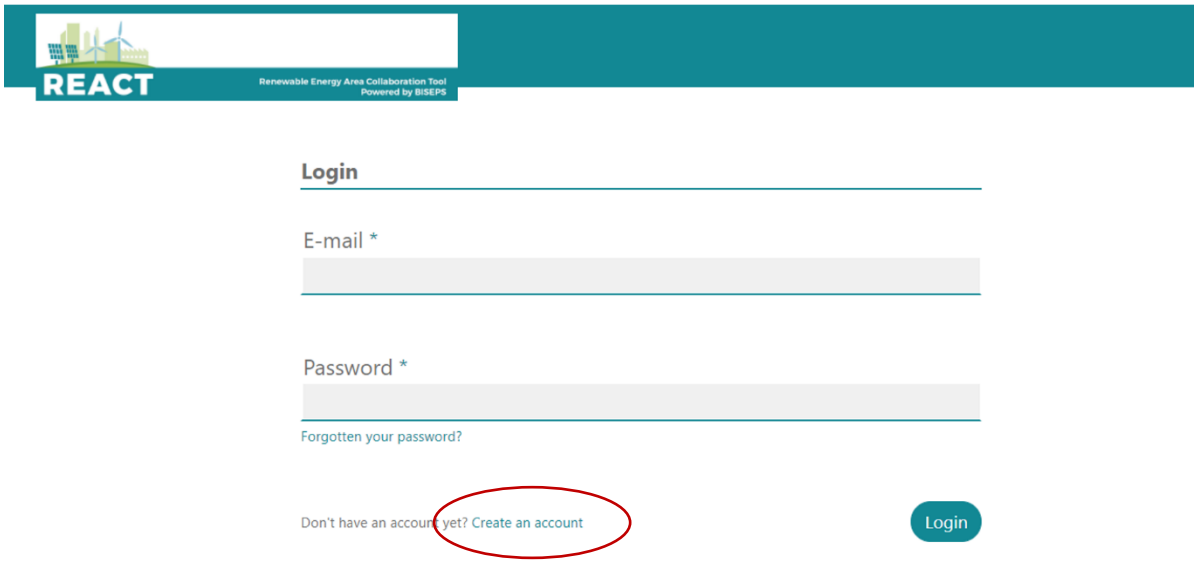
1.1 Create an account

Access to the tool is secured with a user login, so that you can safely input and store the date about your business park(s) and/or company(-ies). Before you can use the tool, you need to create a user account. You will need your email address to do this. Once you have created an account, you can log in to the tool using your email address and password.

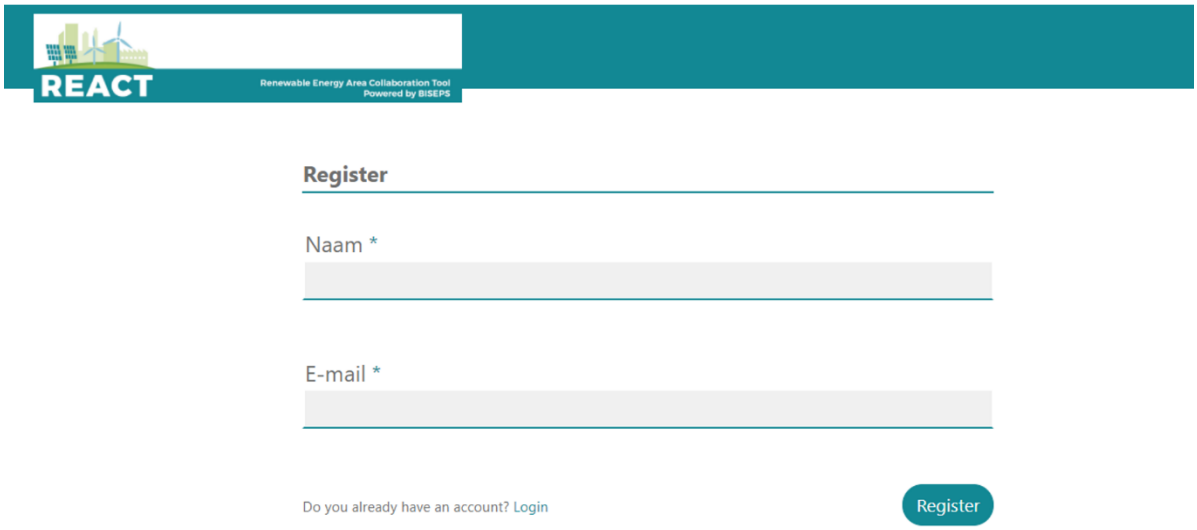
Visit https://react.biseps.eu



Click the "START" button to launch the tool and open the login screen. Click the other buttons to display the REACT tutorial or visit the BISEPS-website (www.biseps.eu) and learn more about this project.



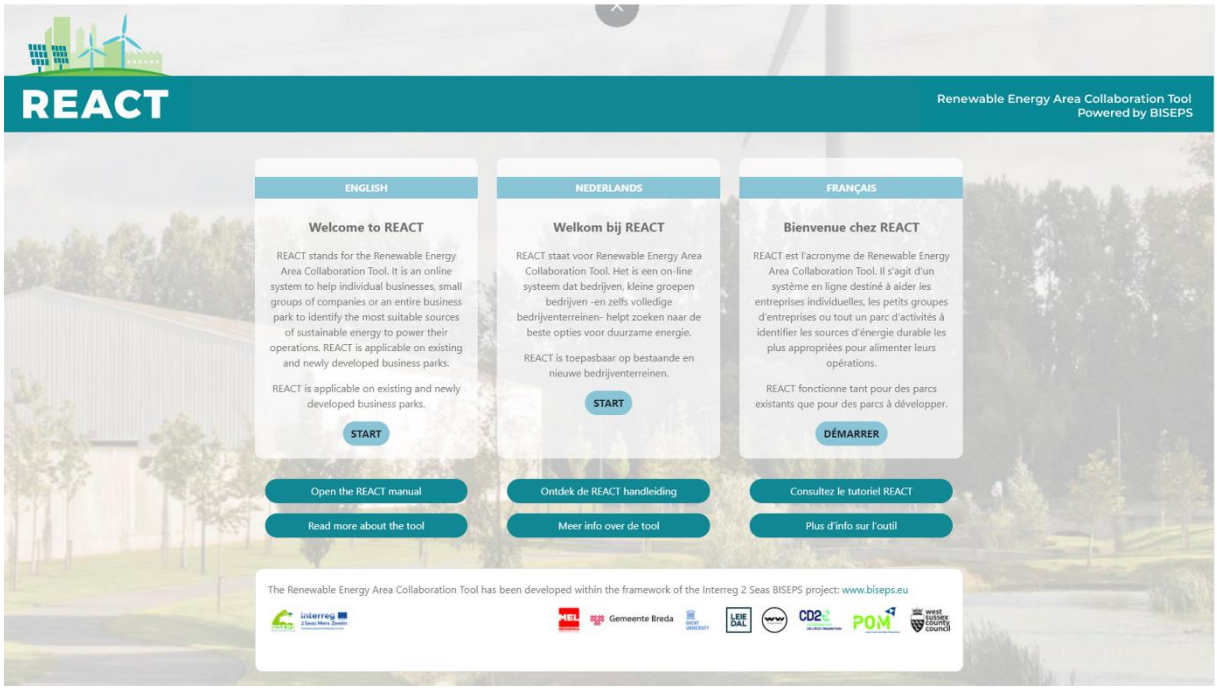
Click "Create an account" next to the login button to start creating your account.



Fill in your name and email address, then click the "Register" button to create your account. You will receive an email to confirm your account has been created? Check the spam folder of your mailbox if you didn't receive an email.

1.2 Log in to the tool

Once you have created a user account (see *Create an account*), you can log in to the tool with the chosen email address and password. Visit https://react.biseps.eu



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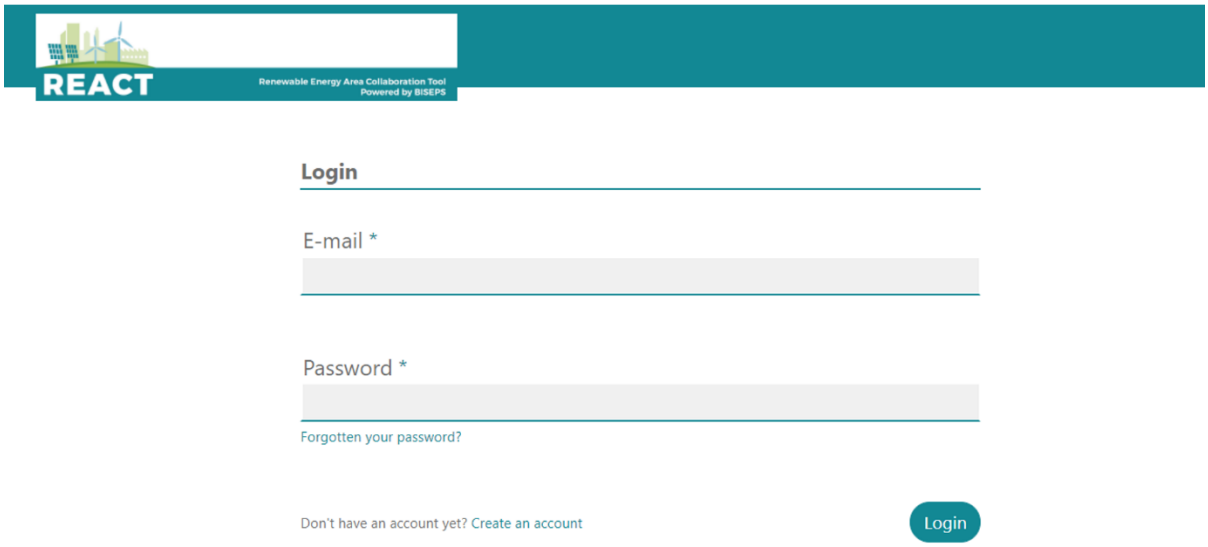


Fill in the email address and password that you registered when creating your account, then click the "Login" button.

2 Manage users

2.1 Manage users

As a business park manager, you might need an overview of the different companies in your business park. However, these data at company level will often be filled out in the tool by different users, each user only inputting the data for his own company.

In order to make this possible, different users can be added to a same account, with specific access to their respective company or companies. Each individual user will only have access to the own company data, while the business park manager will have access to the data for all registered companies in the business park.

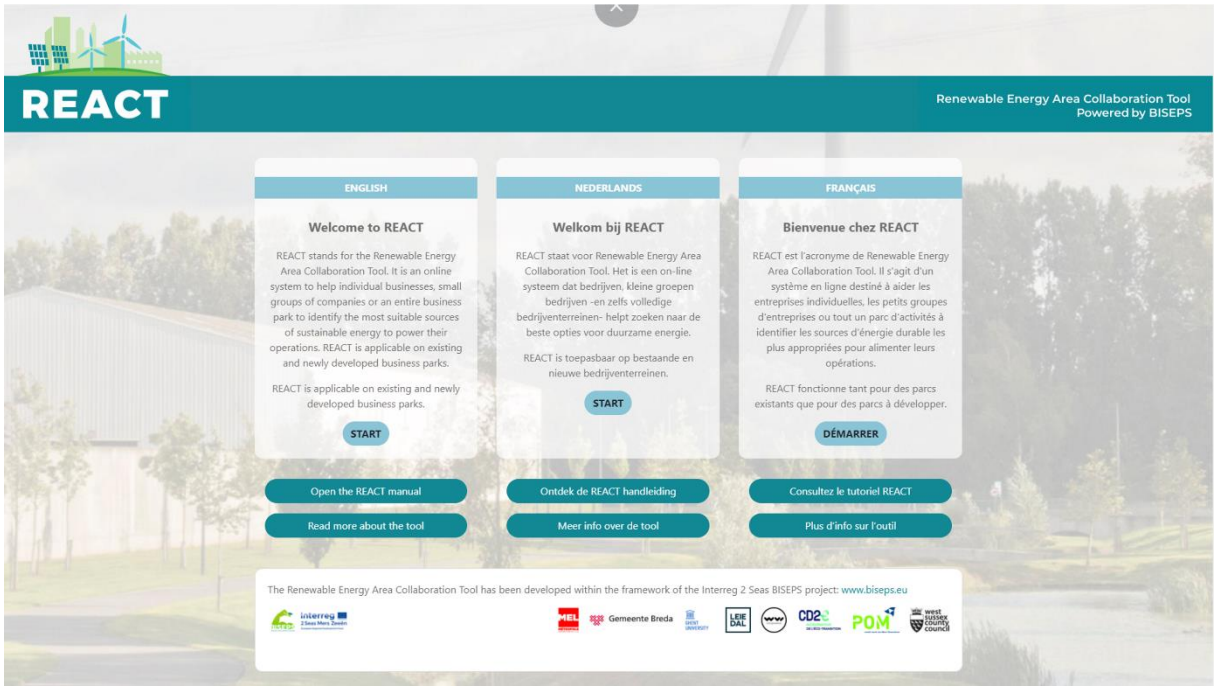
2.2 Add user

In order to give access to other users in your business park, you can add users to your account.

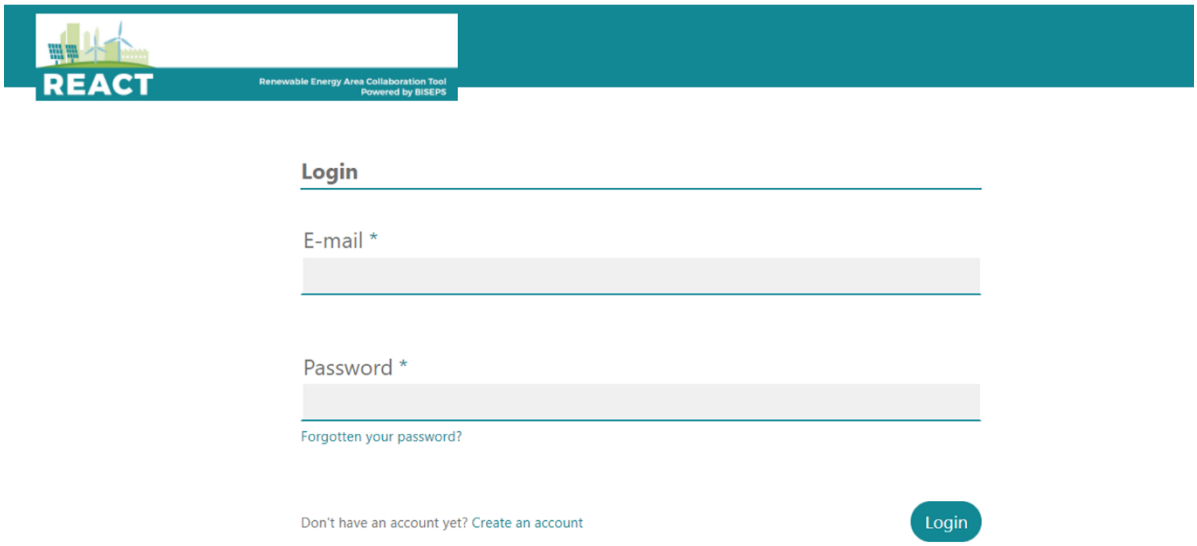
Launch the REACT tool and log in to your account first (see *Create an account*

Access to the tool is secured with a user login, so that you can safely input and store the date about your business park(s) and/or company(-ies). Before you can use the tool, you need to create a user account. You will need your email address to do this. Once you have created an account, you can log in to the tool using your email address and password.

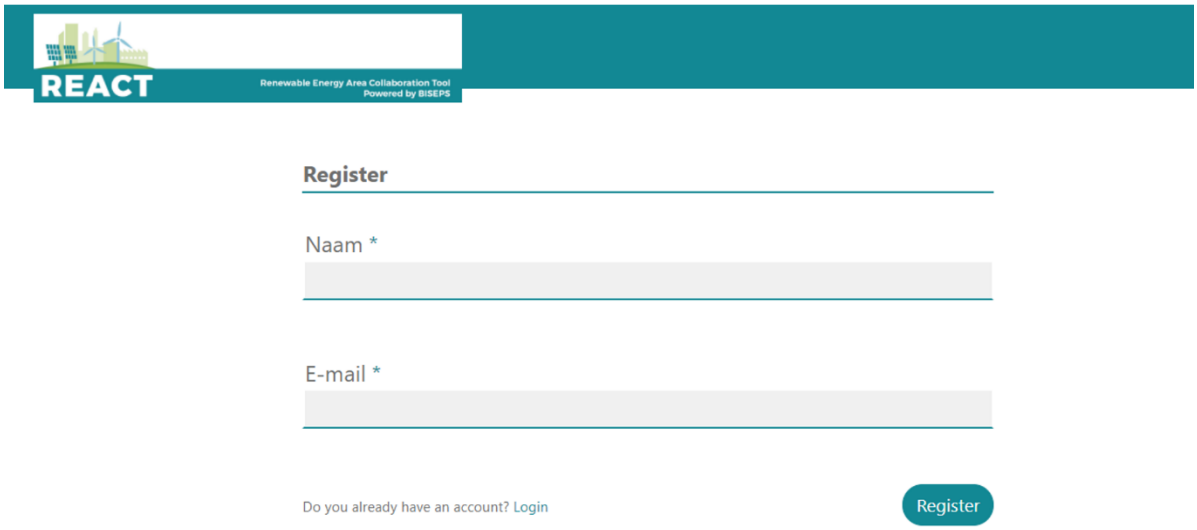
Visit https://react.biseps.eu



Click the "START" button to launch the tool and open the login screen. Click the other buttons to display the REACT tutorial or visit the BISEPS-website (www.biseps.eu) and learn more about this project.



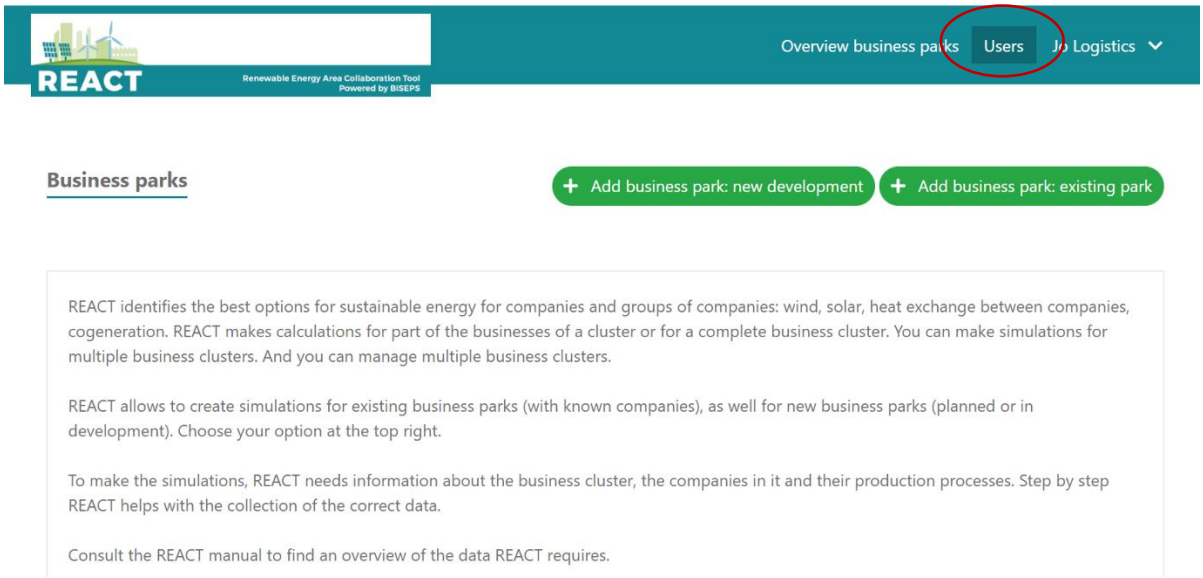
Click "Create an account" next to the login button to start creating your account.

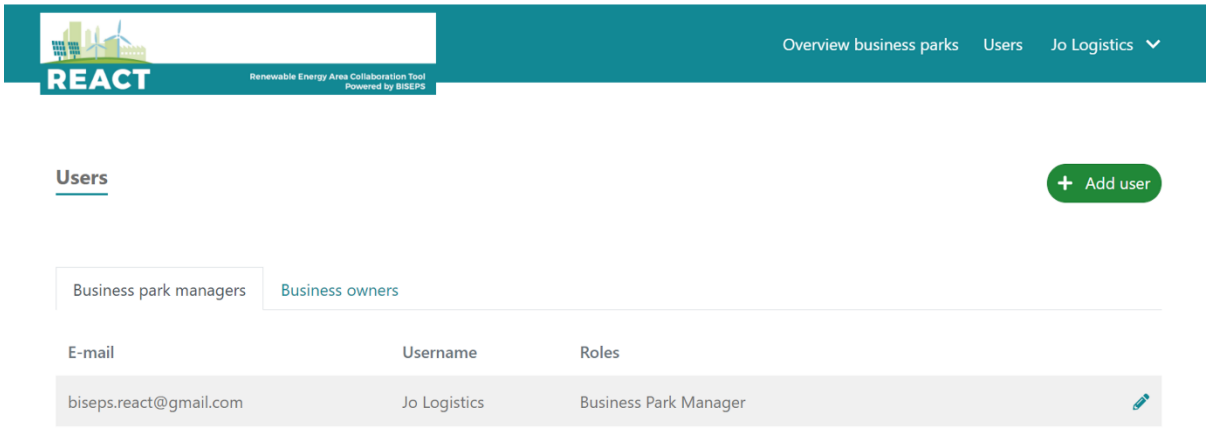


Fill in your name and email address, then click the "Register" button to create your account. You will receive an email to confirm your account has been created? Check the spam folder of your mailbox if you didn't receive an email.

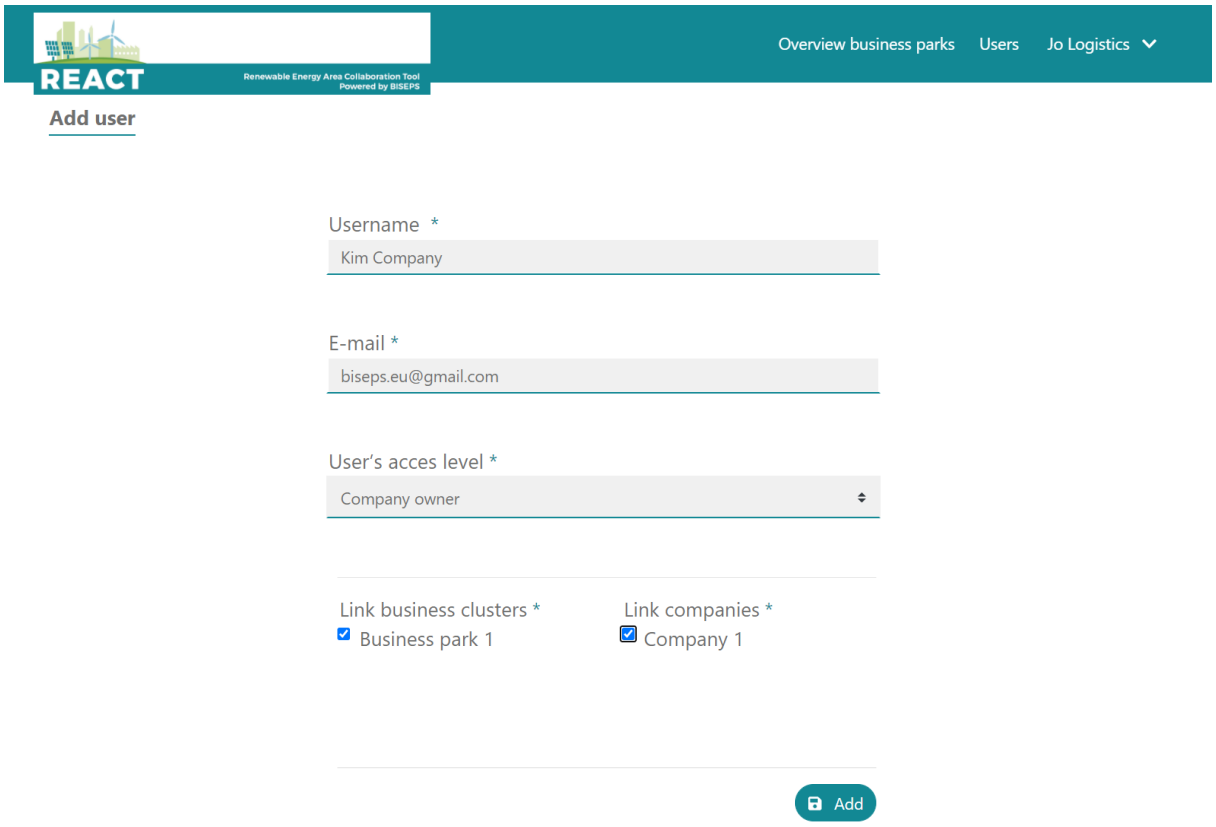
Log in to the tool)

In the overview (home) screen, click the “Users” tab in the upper right corner (next to your account name) to open the user management module.





On the "Users" screen, click the green "+ Add user" button in the upper right corner.



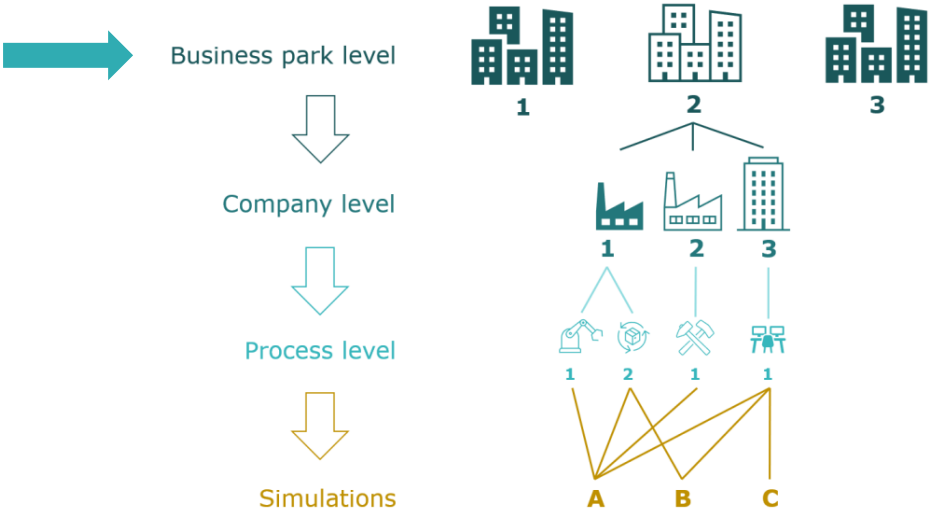
Fill in the Username and email address for the user to be created, then select the "User's access level" from the scroll down list :

- Business Park Manager: this type of user will be able to see all data for the business park and can add company owners
- Company owner: this type of user will be able to fill in and consult data only for the selected company/companies

In the tick box lists at the bottom, select the business park(s) and company(-ies) that you want to assign to the user. The user will only have access to the assigned business park(s) and/or company(-ies). When you select the business park, the user will automatically see all the businesses of that business park too.

The newly created user will get an email with the request to create a password, and will be able to login to REACT.

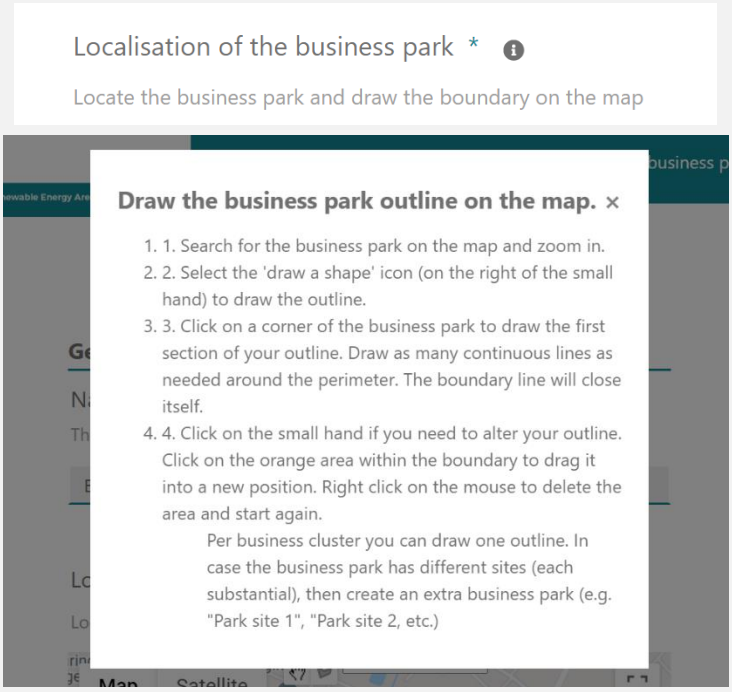
3 Create / edit a business park



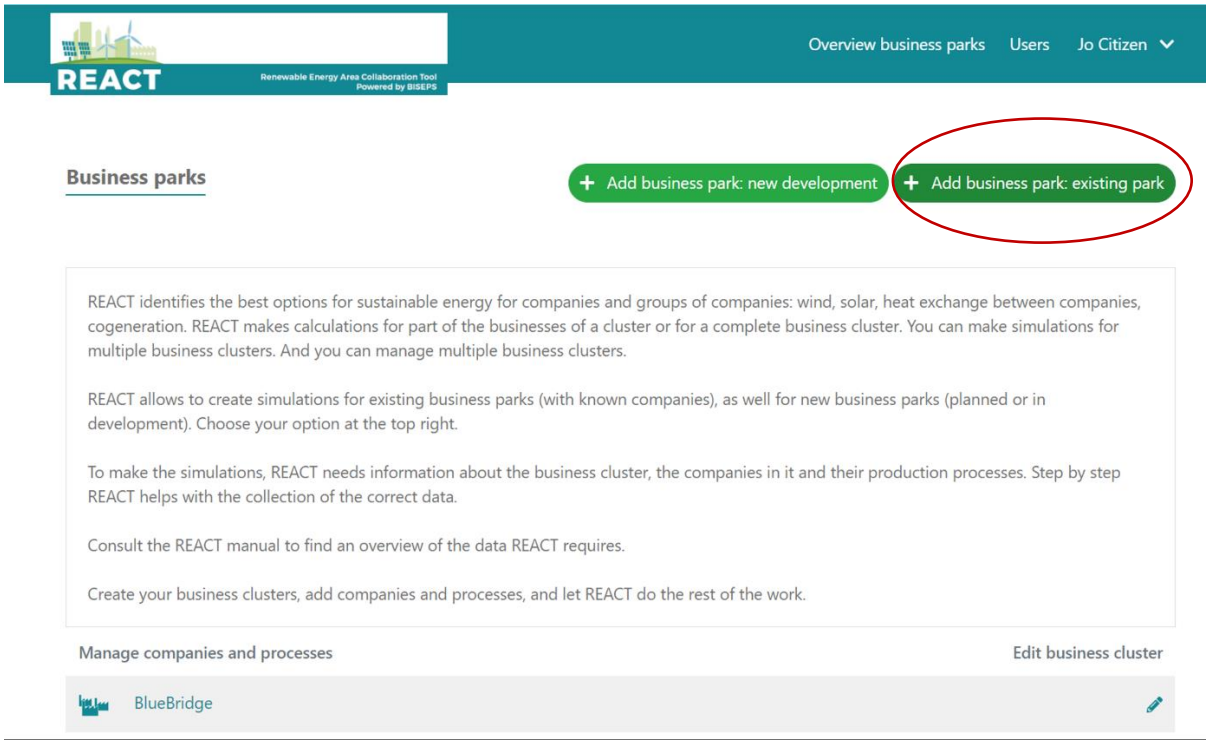
Data can be inputted for business parks, individual companies and processes within a company. In order to do this, the respective entities need to be created first.

Tooltips

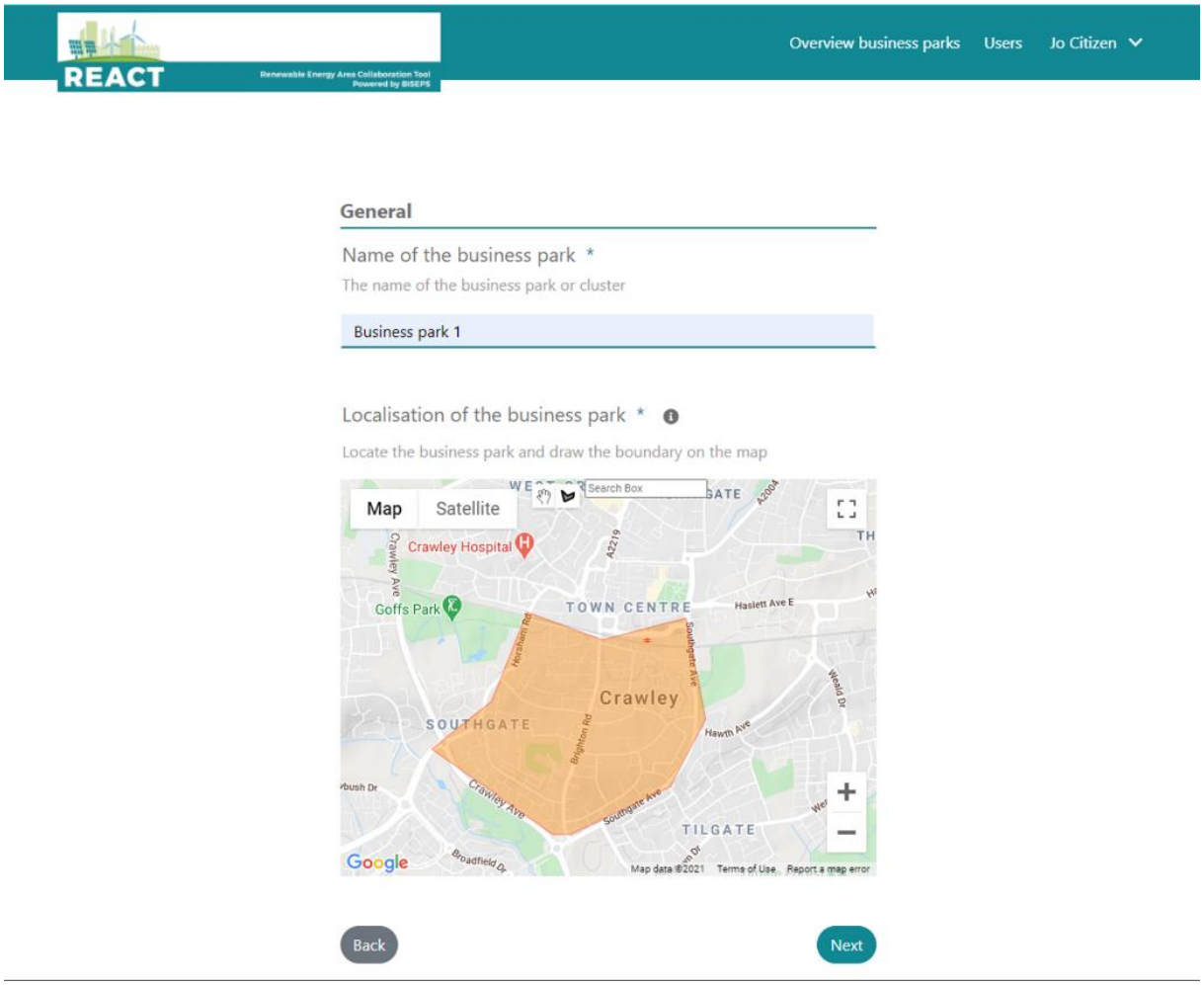
Some questions ask for very specific data or need the data to be inputted in a specific format. For those questions, practical tooltips have been added to explain eg. what data is required, what unit is to be used or where data can be found. The tooltips can be displayed by clicking the ⓘ icon that is shown next to a question.



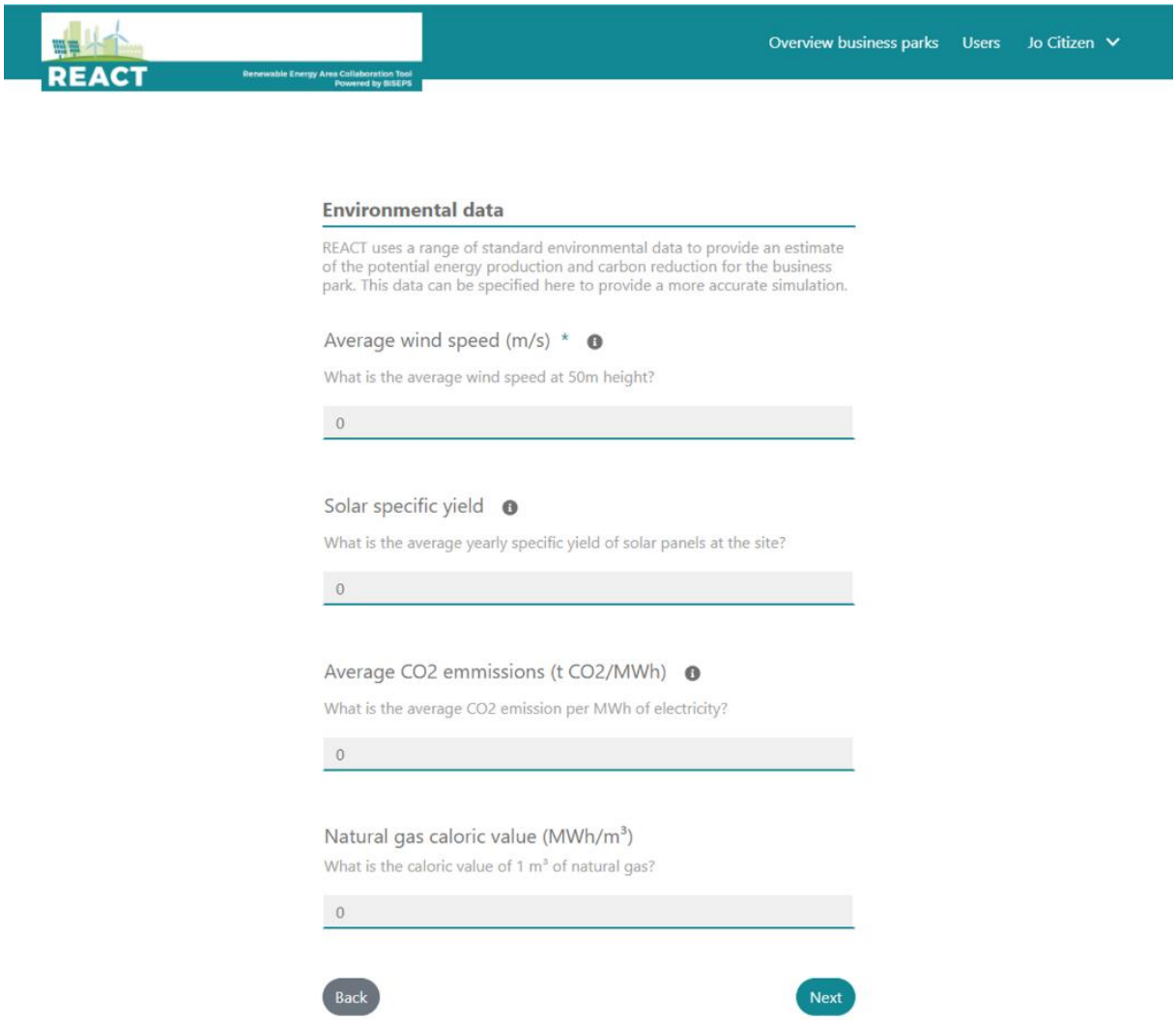
3.1 Create a business park



On the home/overview screen, click the "+ Add business park: existing park" button in the upper right corner.



You can now add all relevant data for the business park to be created, starting with some general data such as the name and location. Fields marked with * are mandatory. Other fields can left blank if no data is available.



Click "Next" to continue to the next screen. Apart from the administrative data, also technological and environmental data about the business park is required. Use the "Next" button to navigate through the different steps until the data input is finished. You will then be taken to the overview screen and see the newly created business park listed.

Pre-fill of values

Some inputs are optional, so these fields can be left blank when data is not known. The required information will then be derived from statistical datasets to estimate the energy consumption and profile of the company. E.g. the specific energy use of different industrial applications can be estimated through life cycle analysis statistics; likewise the energy use per m² of office space can be estimated based on historical datasets. Additionally, the yield of a solar power installation on the roof will be calculated for the given geographic location. In general, it is best to fill in as much exact data as possible, in order to reduce the estimation variance.

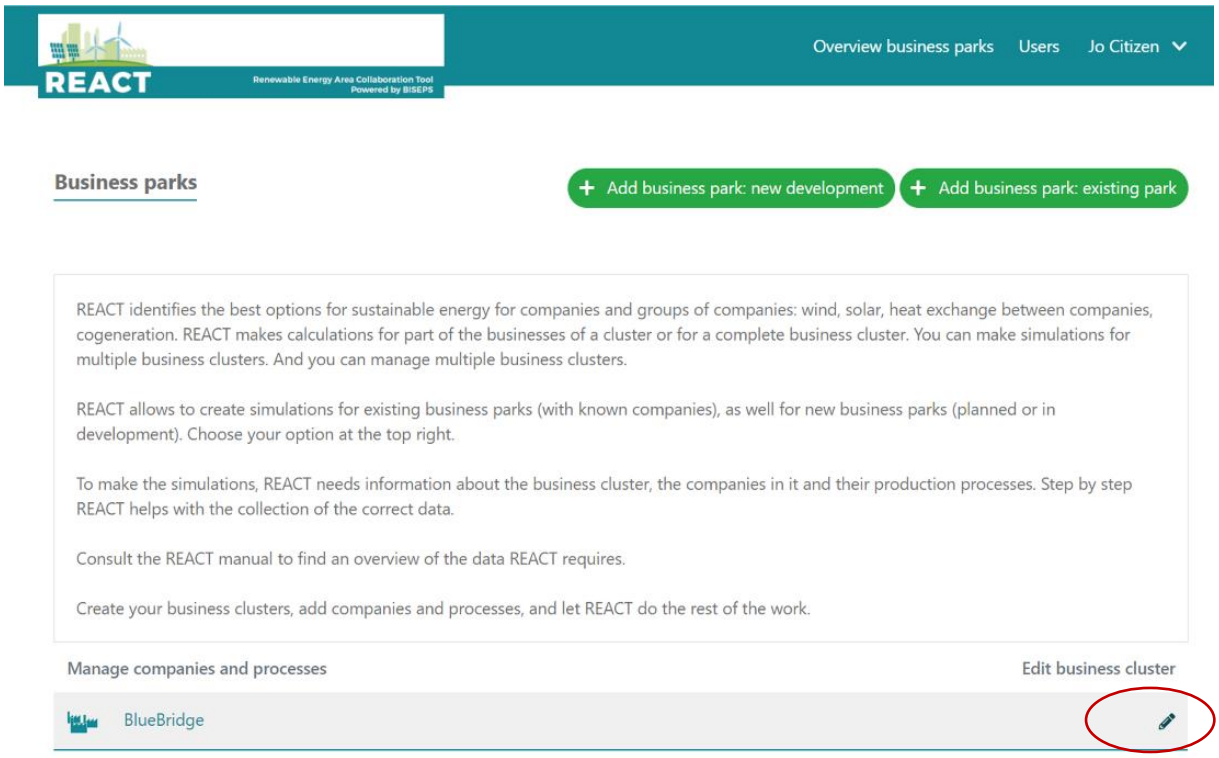
The questions on business park level

REACT uses a range of standard environmental data to provide an estimate of the potential energy production and carbon reduction for the business park. This data can be specified here to provide a more accurate simulation.

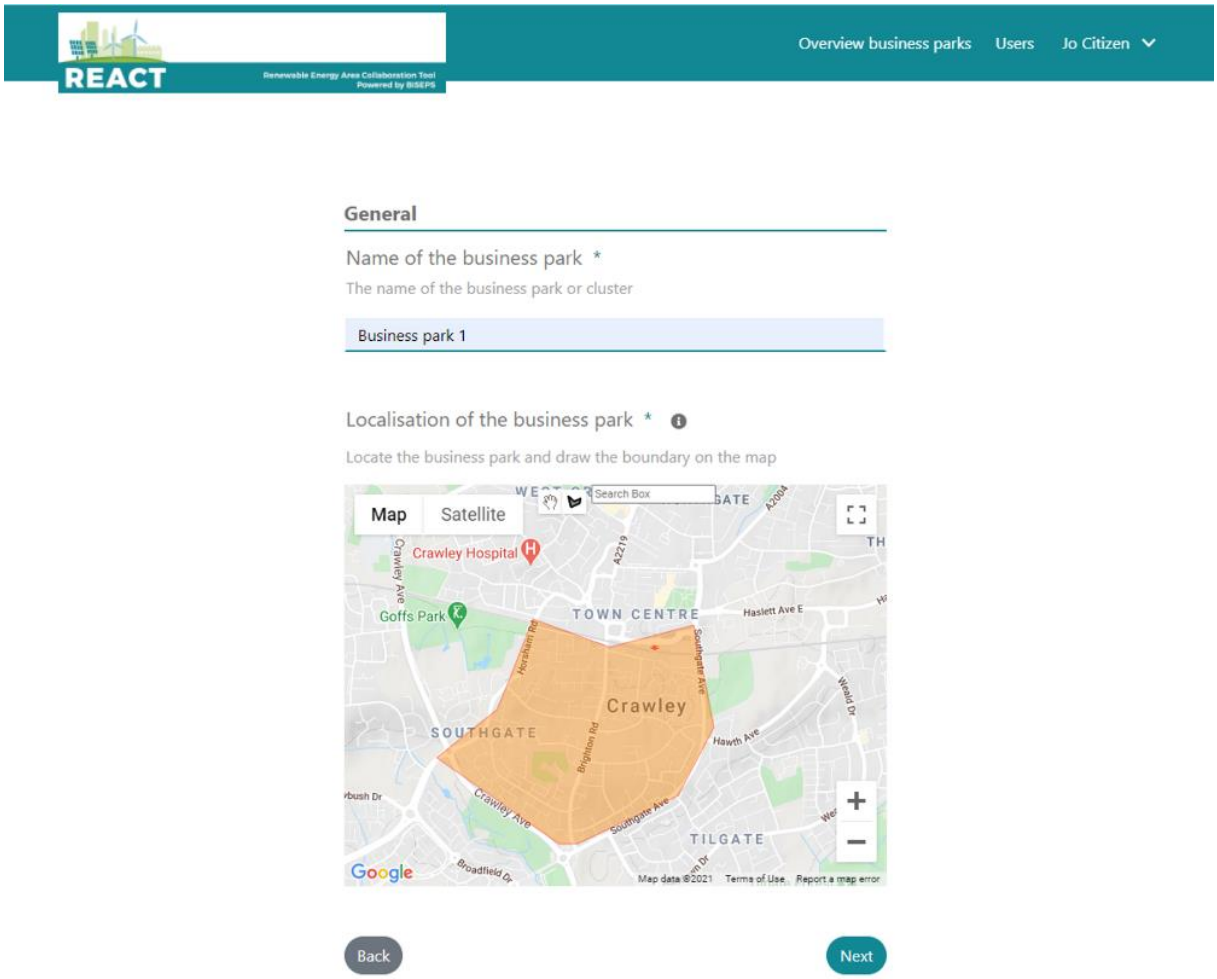
Business park name	The name of the business park or cluster
Localisation of the business park	Locate the business park and draw the boundary on the map
Average wind speed (m/s)	What is the average wind speed at a height of 50m?
Solar specific yield (kWh/kWp)	What is the average yearly specific yield of solar panels at the site?
Average CO2 emissions (tCO2/MWh)	What is the average CO2-emissions factor at the site?
Natural gas caloric value (MWh/m³)	What is the average natural gas calorific value at the site?

3.2 Edit a business park

If a business park has been created, its data can still be modified or completed afterwards.

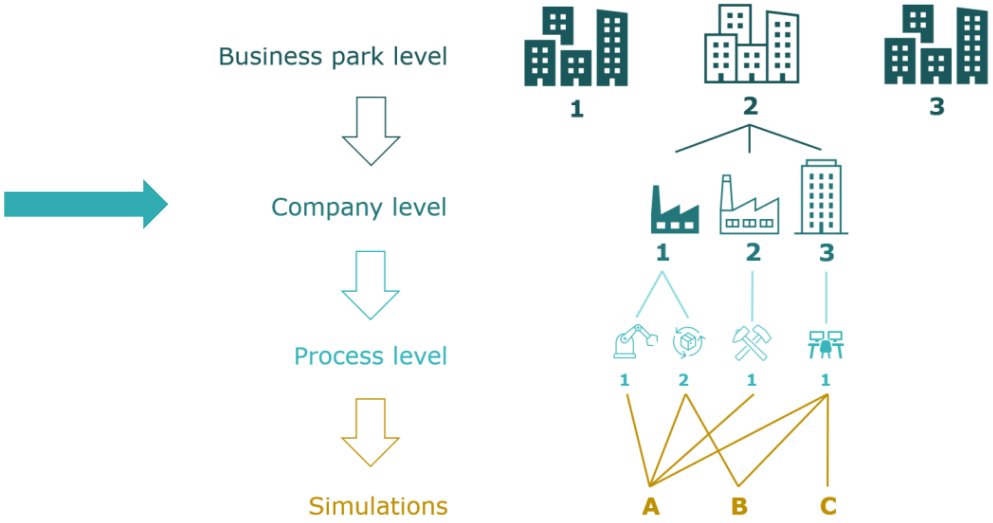


On the "Business parks" overview screen, click the pencil icon next to the name of the business park that you want to edit.



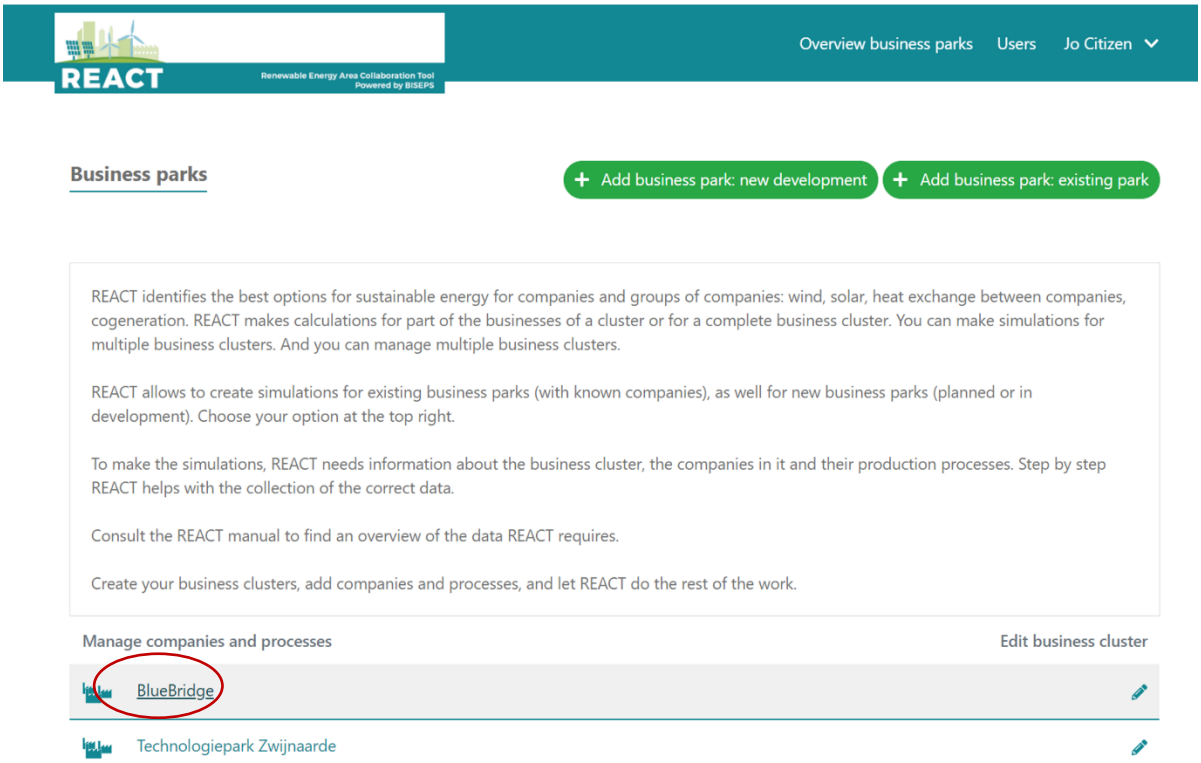
All previously inputted data can now be changed/completed. Click the “Next” button at the bottom of the screen to save your changes and continue to the next screen, until you reach the end of the data input forms.

4 Create / edit a company

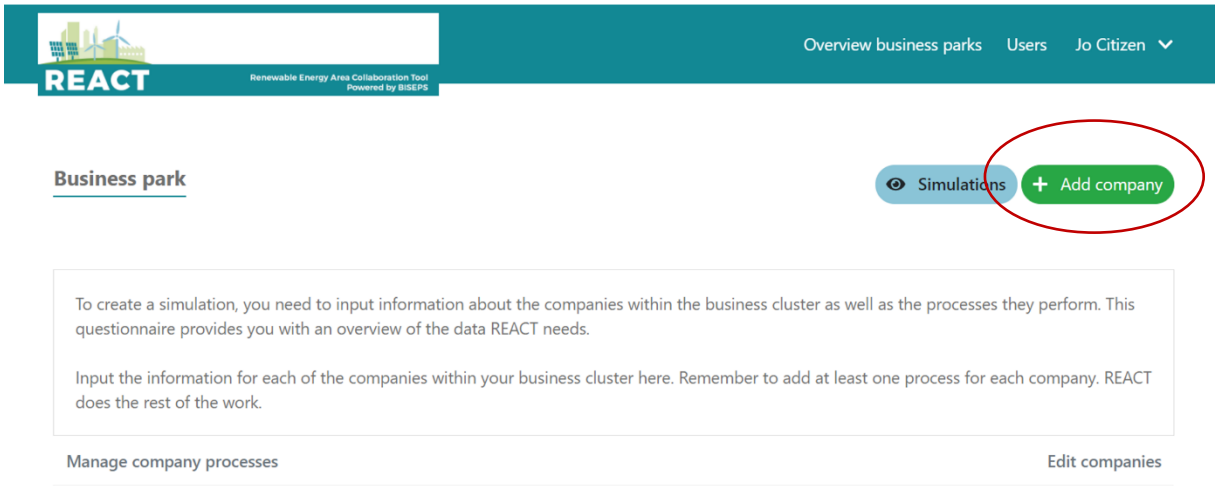


4.1 Create a company

For each business park, several companies can be created.



On the overview screen, select the business park you want to create a company in, by clicking on the name of the business park.



Click the "+ Add company" button in the upper right corner of the screen to add a company in the business park.

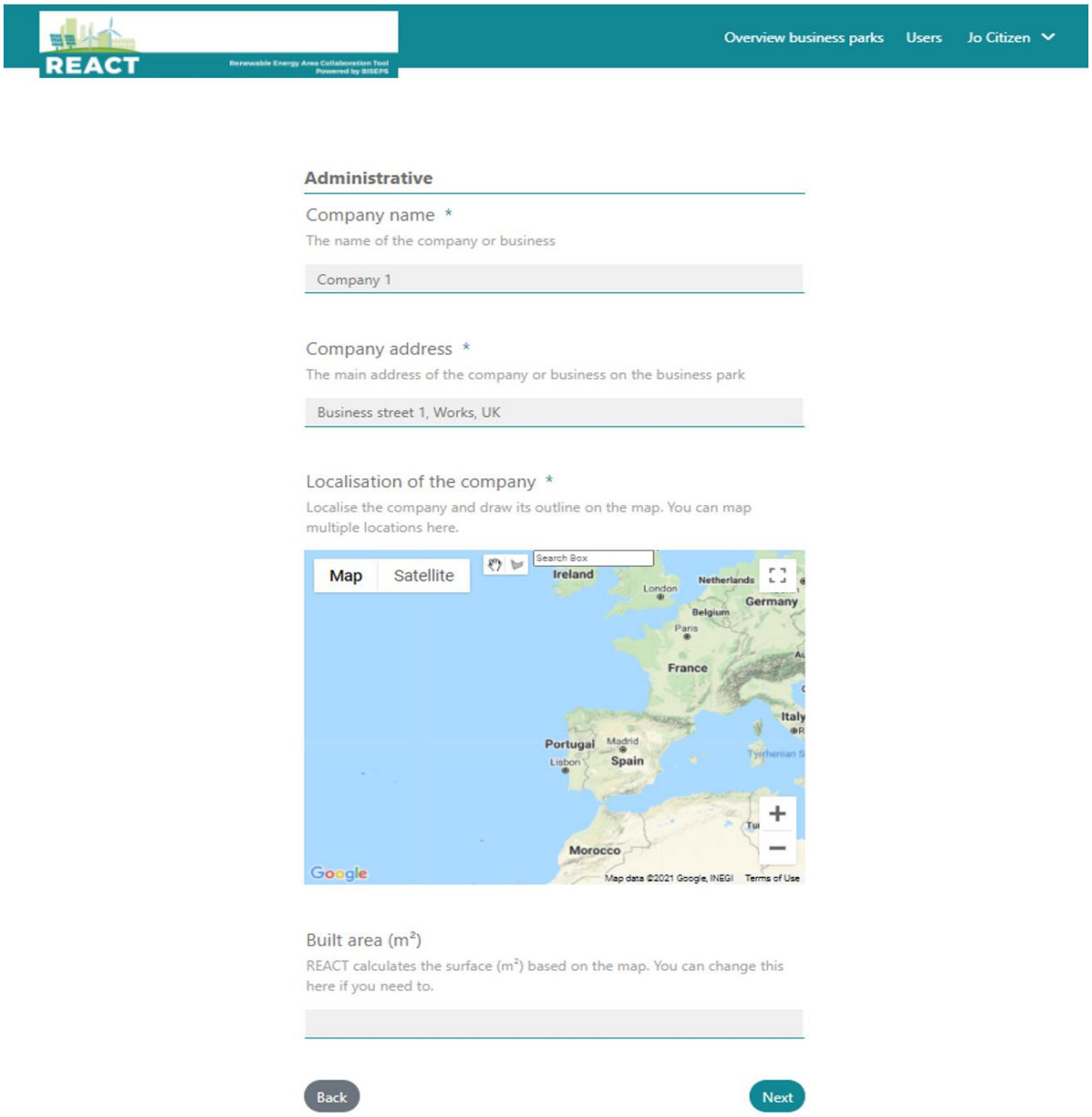
The questions on company level

For each company, a set of questions need to be answered. The table below shows all questions. There are 3 categories:

1. **Energy consumption data.** REACT needs to know how much energy the company uses based on actual consumption in recent years. Enter your data as accurately as possible in this section. If the company anticipates significant changes to its business (expansion, change of business process etc.), an estimate of future energy consumption should be provided.
2. **Energy production data.** REACT needs to know how much energy the company produces based on actual production figures in recent years. Enter your data as accurately as possible in this section. If the company anticipates significant changes to its business (expansion, change of business process etc.), an estimate of future production should be provided.
3. **Additional information**. Other information about the renewable energy potential for the company site and business park.

Company name	The name of the company or business.	
Company address	The main address of the company or business on the business park.	
Localisation of the company	Locate the company and draw its outline on the map. You can map multiple locations here.	
Built area (m²)	REACT calculates the surface (m²) based on the map. You can change this here if you need to.	
Electrical energy: total yearly consumption (MWh)	The total amount of electricity consumed each year measured in MWh.	
Type of connection to the electrical grid	Is the company connected to the high or medium voltage grid (requiring on site transformers), or directly connected to the low voltage grid?	• High voltage (transport grid) • Medium voltage (distribution grid) • Low voltage (distribution grid) • Unknown
Natural gas: total yearly consumption	The total amount of natural gas consumed each year. This can be input in m³ or ft³ and REACT will recalculate to MWh.	
Natural gas: unit of consumption		• MWh • m³ • ft³
Type of connection to the natural gas grid	Is the company connected to the high or medium pressure grid (requiring on site expanders) or directly connected to the low pressure grid?	• High pressure (transport grid) • Medium pressure (distribution grid) • Low pressure (distribution grid) • Unknown
Hot water : total yearly consumption	The total amount of hot water consumed each year. Only to be filled in if the business is connected to a low-temperature heat exchange grid. Needs to be the hot water consumption after the heat exchanger, if present.	
Hot water: unit of consumption		• MWh • m³ • ft³ • l • gal

Type of hot water connection		• No connection • High temperature (>80°C) • Low temperature (<60°C) • Unknown
Steam: total yearly consumption	The total amount of steam consumed each year.	
Steam: unit of consumption		• MWh • Kg • ton
On site energy production	Is electrical energy produced on site?	• No • Solar PV • Solar thermal • Small wind turbines • Medium wind turbines • Large wind turbines • Biomass • Other
Amount of production (MWh)	If so, enter the total amount of electricity produced each year measured in MWh.	
Emergency power	Is there an emergency power supply on site?	• No • Diesel genset • Gas turbine • UPS (battery) • Other
Are vehicles for on-site transportation present?	If so, which fuel do they run on?	• No • Diesel or petrol • battery powered • hydrogen • compressed air • Other
Car park	Is there an outdoor car park? If so, for how many vehicles?	
Electric cars	Is your company interested in using electric vehicles?	• No or not now • Yes • Do not know



Input all relevant data for the company to be created, starting with some administrative data. Fields marked with * are mandatory. Other fields can be left blank if no data is available.

Apart from the administrative data, data about energy consumption, energy production and some additional data about the company are required. Use the "Next" button to navigate through the screens until all data is filled out.

Click "Next" to proceed to the next screen.

REACT

Renewable Energy Area Collaboration Tool
Powered by BISEPS

Overview business parks Users Jo Citizen

Energy consumption

REACT needs to know how much energy the company uses based on actual consumption in recent years. Enter your data as accurately as possible in this section. If the company anticipates significant changes to its business (expansion, change of business process etc.), an estimate of future energy consumption should be provided.

Electrical energy: total yearly consumption *

The total amount of electricity consumed each year, required in MWh

0

Type of connection to the electrical grid

- ○ High voltage (transport grid)
- ○ Medium voltage (distribution grid)
- ○ Low voltage (distribution grid)
- ○ Unknown

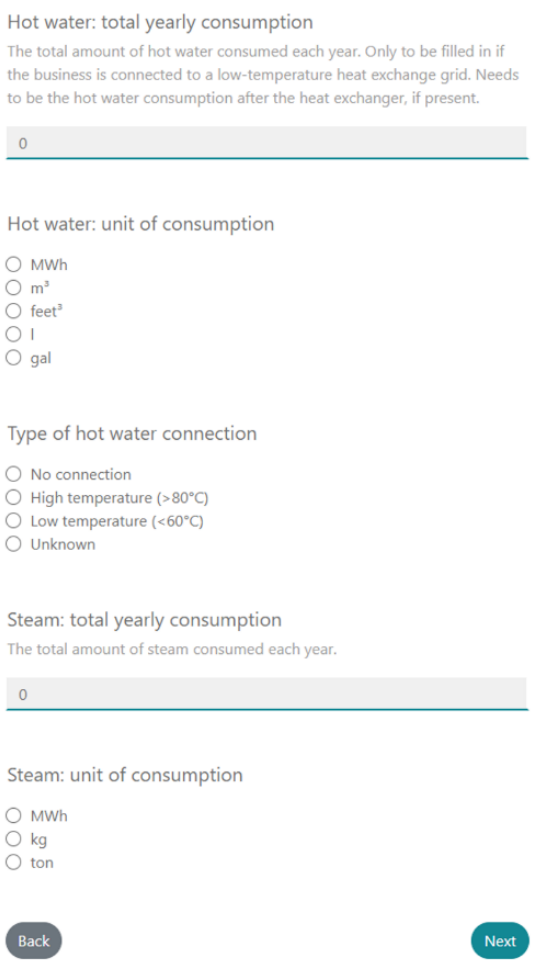
Natural gas: total yearly consumption

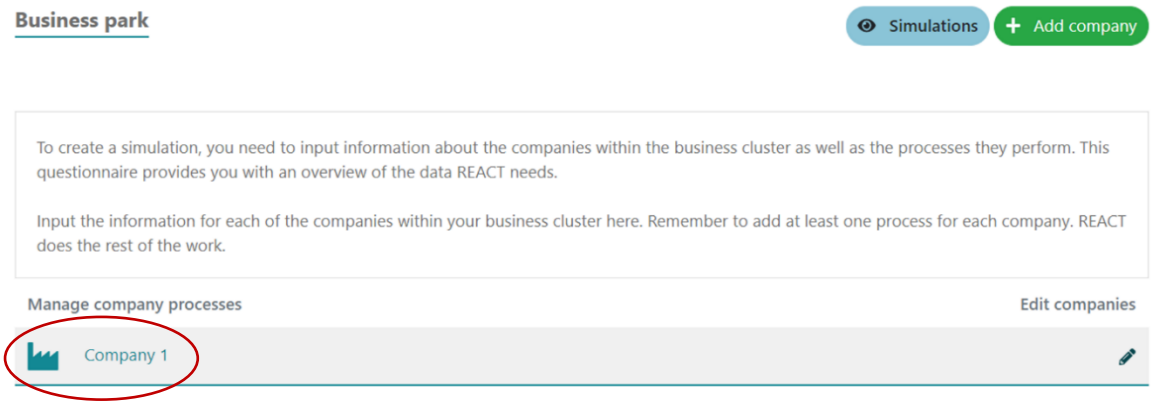
The total amount of natural gas consumed each year. This can be input in m^3 or ft^3 and REACT will recalculate to MWh.

0

Natural gas: unit of consumption

- ○ MWh
- ○ m^3
- ○ $feet^3$

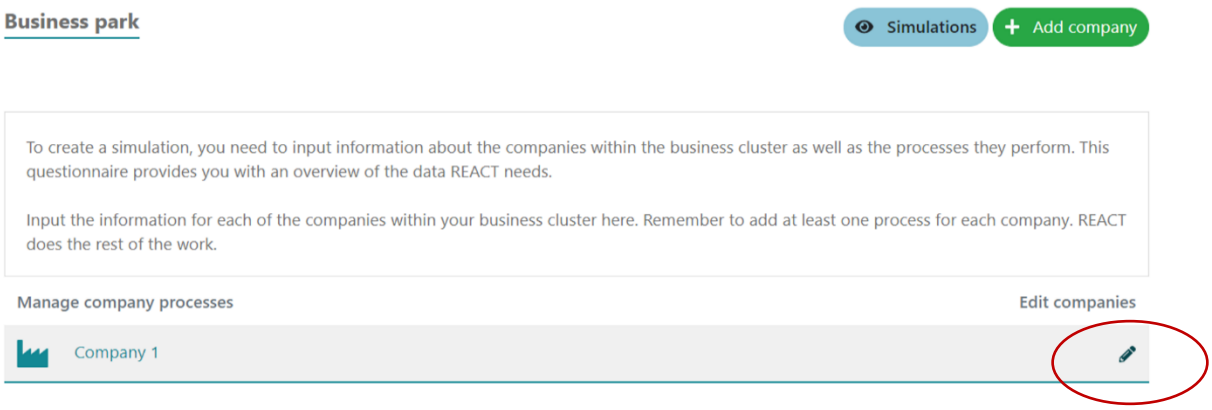




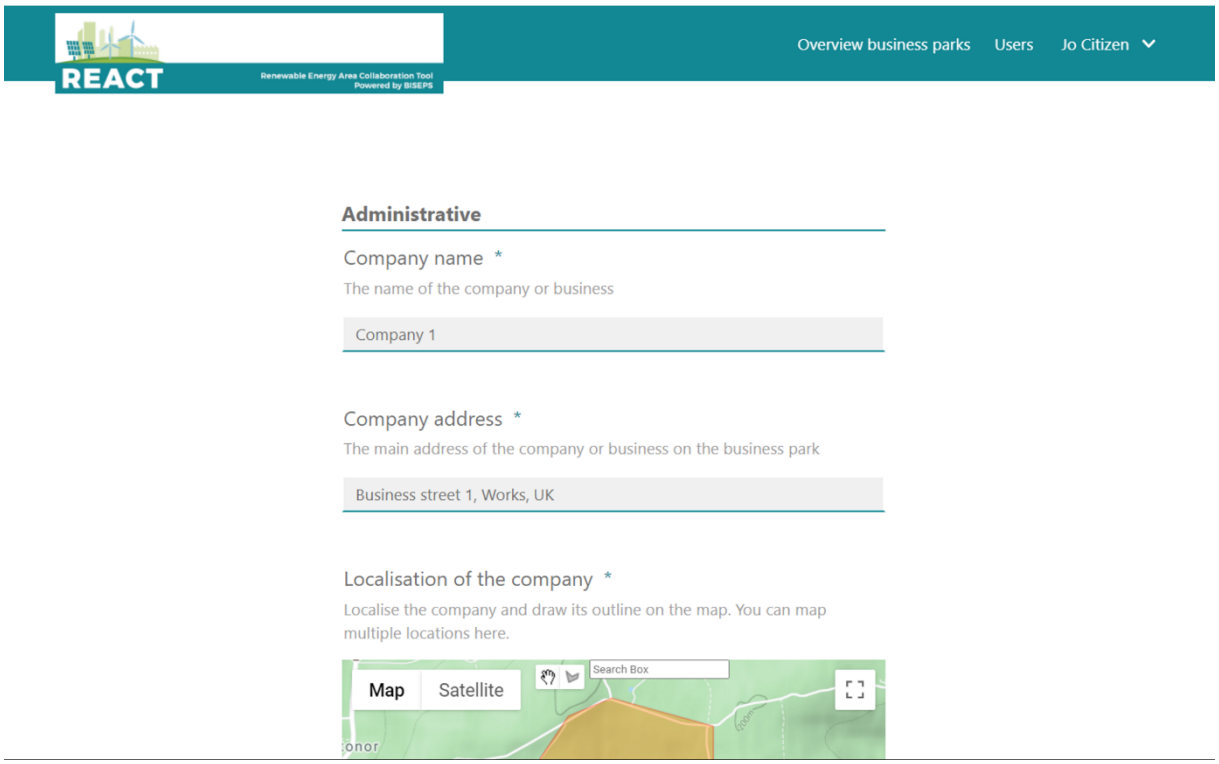
The company will now appear in the "Companies" overview screen of the business park.

4.2 Edit a company

After a company has been created, its data can still be modified or completed afterwards.

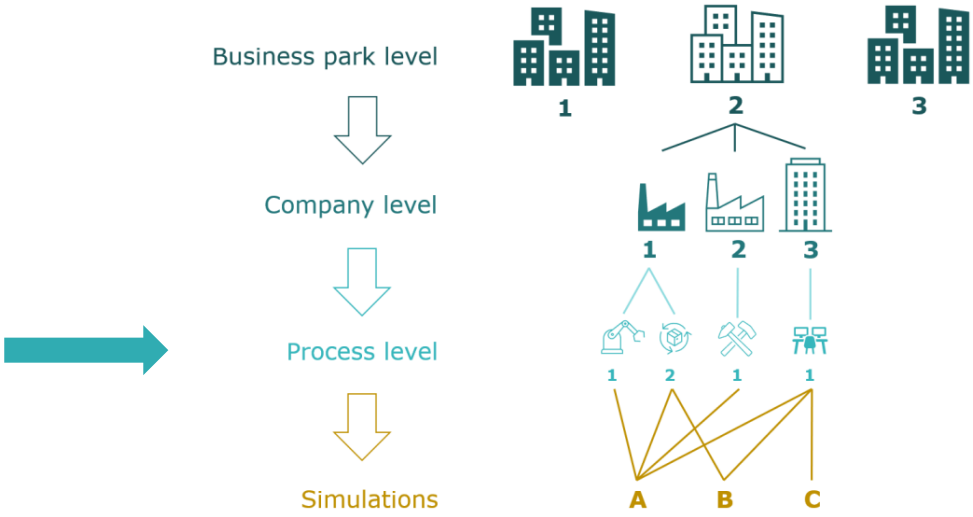


On the "Companies" overview screen, click the pencil icon next to the company that you want to edit.



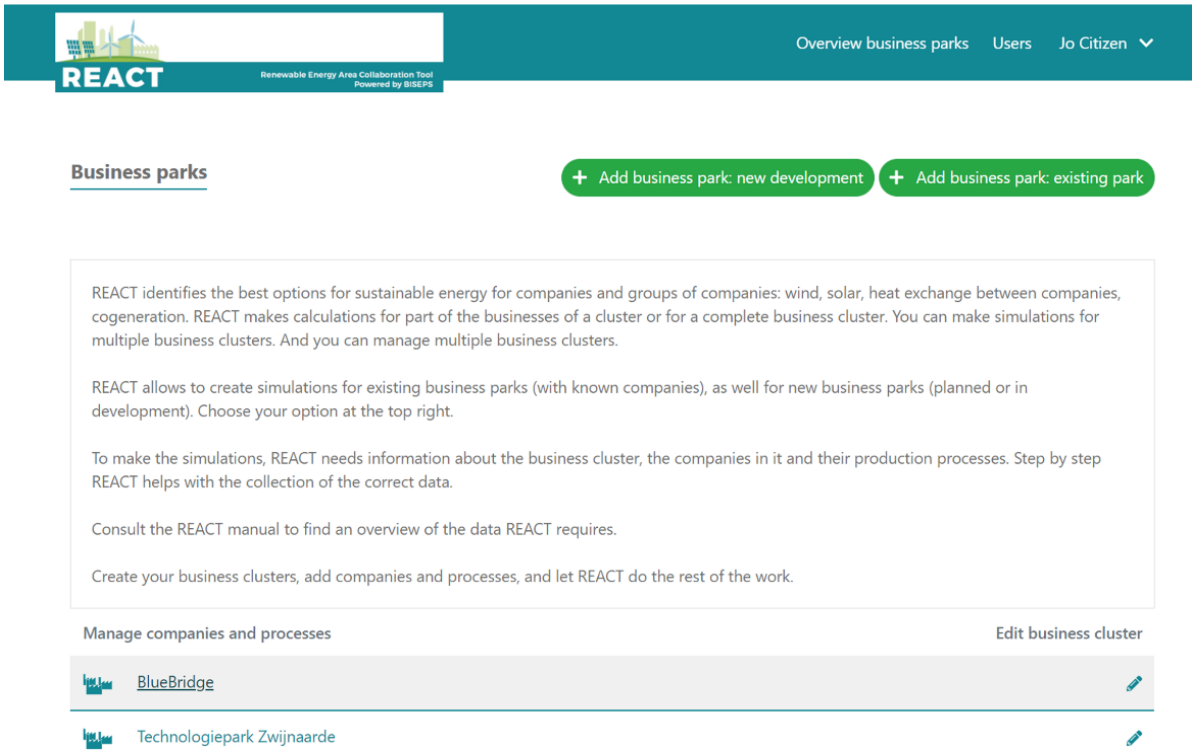
The inputted data (starting with Administrative data) can now be changed/completed. Click the "Next" button at the bottom of the screen to save your changes and continue to the next screen. Once you've finished the last screen, click "Next" again to save the changes and close the editing mode.

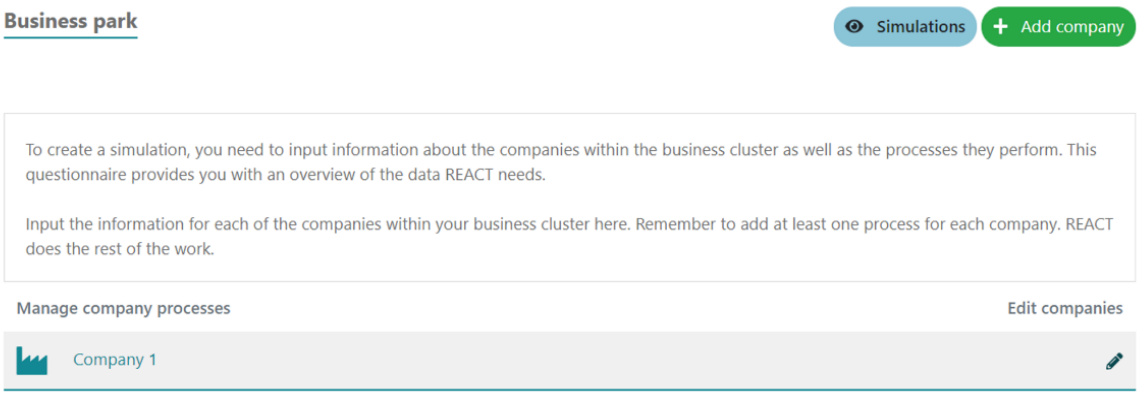
5 Create / edit a process



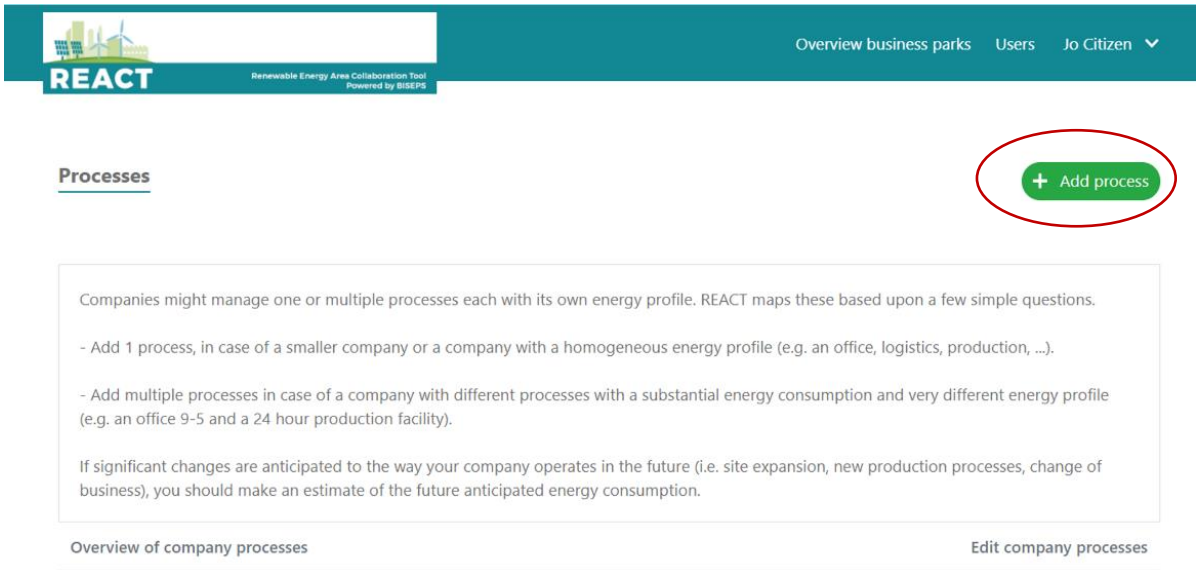
5.1 Create a process

Within a company, different processes or activities are possible, such as office activities, production, logistics, cooled logistics… In order to make simulations as accurate as possible, data can be filled out for various processes.





Select the business park and then the company you want to add a process for, by clicking on the business park name and then on the company name in the list of companies. The "Processes" screen will show.



Click the "+ Add process" button to start adding a process.

The questions on process level

Per process, a set of questions need to be answered. The table below shows all questions. There are 3 categories:

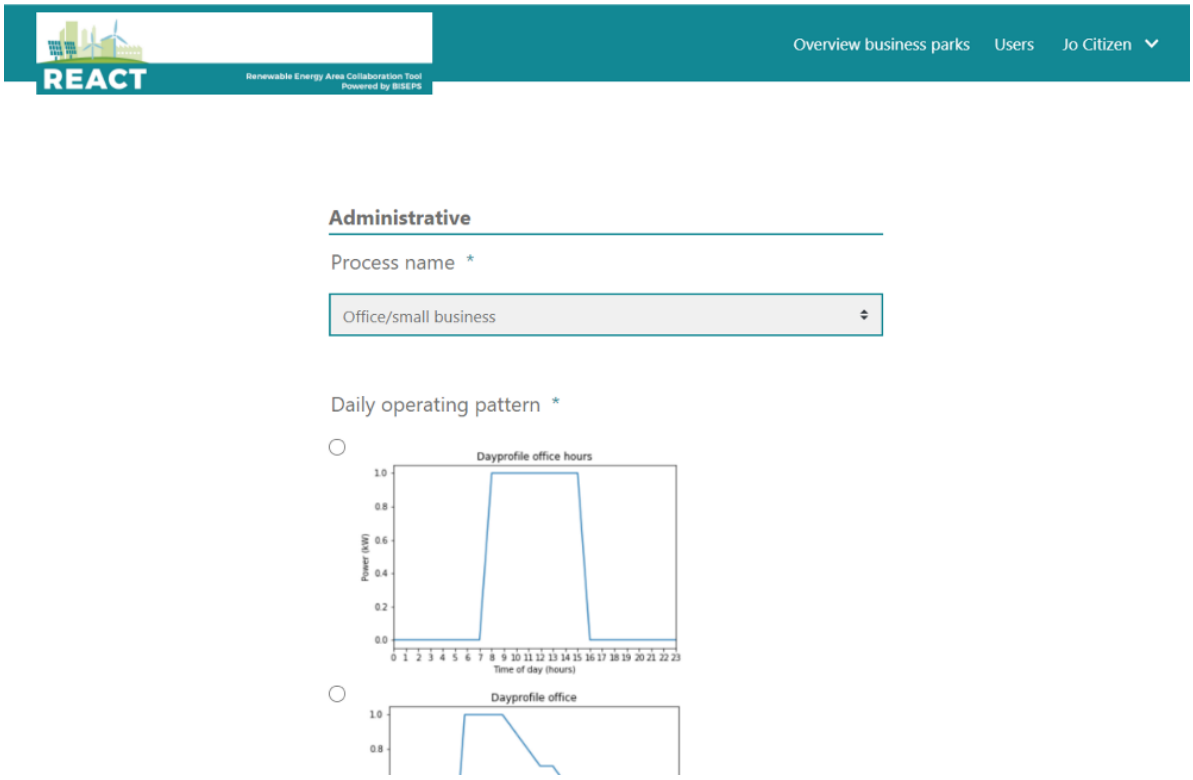
General process data: When do the company processes take place? Select the profile that fits best with the process. REACT couples the right energy profile to the process.

Energy consumption: You have already completed the energy consumption data for the company. Now input the energy consumption data for this process.

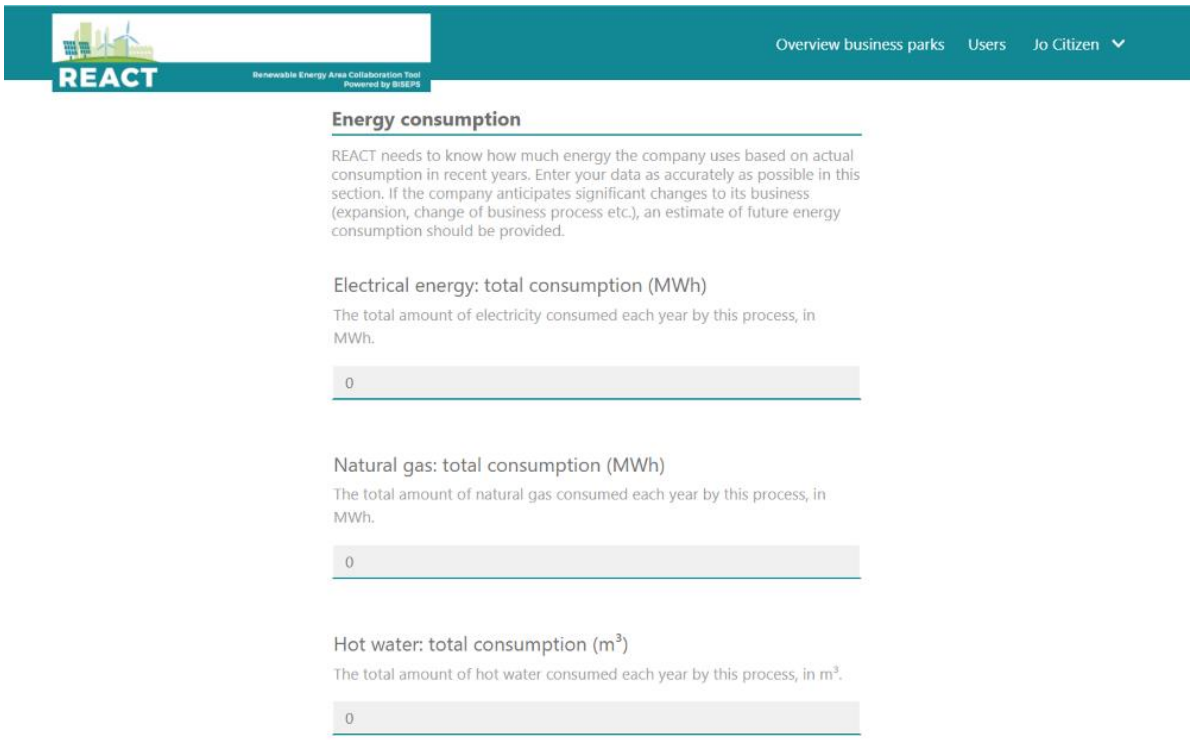
Potential heat recovery: REACT checks whether there is substantial waste heat present that can be used by another company or in another production process.

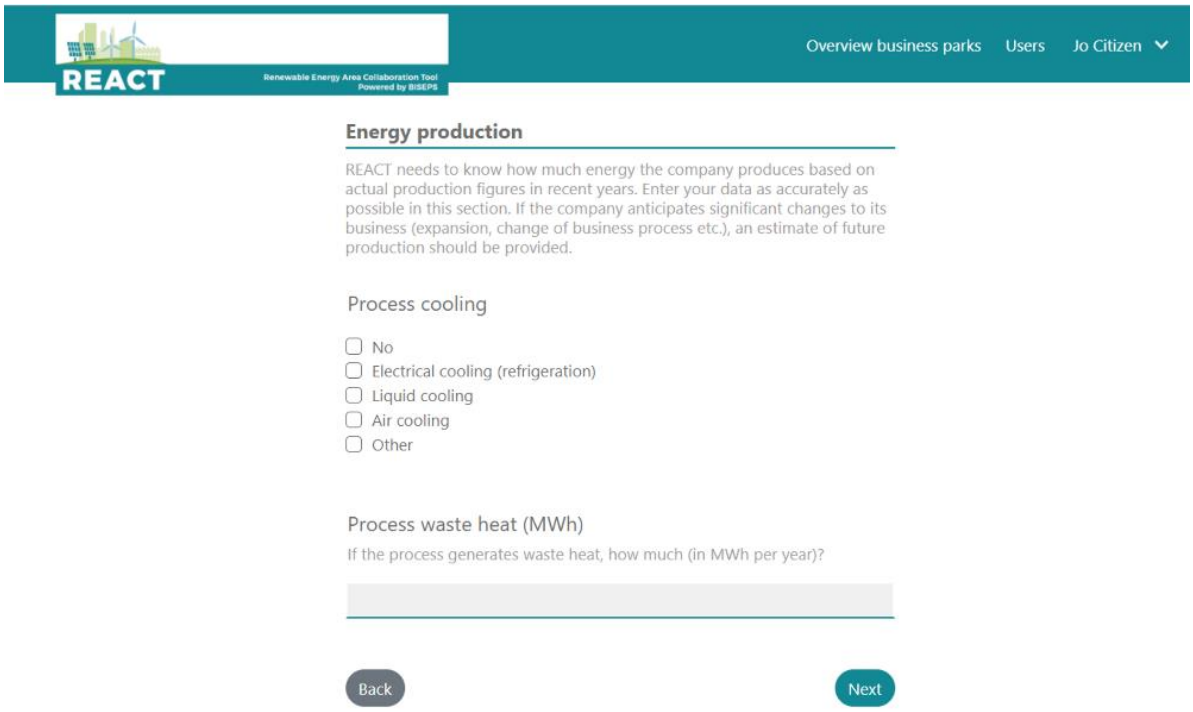
Process name	Select the process from the list or select 'other' to add your own	• Office/small business • Industrial • Tertiairy / residential • Logistics • Other
Daily operating pattern	When do the daily company processes take place? Select the profile that fits best with the process. REACT couples the right energy profile to the process.	• Dayprifile office hours (7-16h) • Dayprofile office (5-20h) • Dayprofile industry (5-22h) • Dayprofile 2 shifts (4-21h) • Dayprofile fully continuous (24/24) • SLP small business/office • SLP large business / industry • Dayprofile residence • SLP residential
Weekly operating pattern	Which days of the week do your processes take place? Select the profile that fits best with the process. REACT couples the right energy profile to the process.	• Continuous (7/7) • SLP small business/office • SLP large business / industry • SLP residential
Process area (m^2)	How much surface area does this process take up in the company, in m^2?	
Electrical energy (MWh)	The total amount of electricity consumed each year by this process, in MWh.	
Natural gas (MWh)	The total amount of natural gas consumed each year by this process, in MWh.	
Hot water (m^3)	The total amount of hot water consumed each year by this process, in m^3.	
Type of hot water	Type of hot water required?	• High temperature (>60°C) • Low temperature (<60°C) • Unknown
Hot water preparation	How is this hot water prepared?	• Gas boiler • Electric water heater • CHP • Heat pump • Other
Steam (tons)	The total amount of steam consumed each year by this process, in tons.	

Click "Next" to proceed to the next screen. You will now be asked to input data about energy consumption and energy production from the process. Click "Next" to navigate through the screens.



First fill in some administrative data about the process. Fields marked with * are mandatory fields.

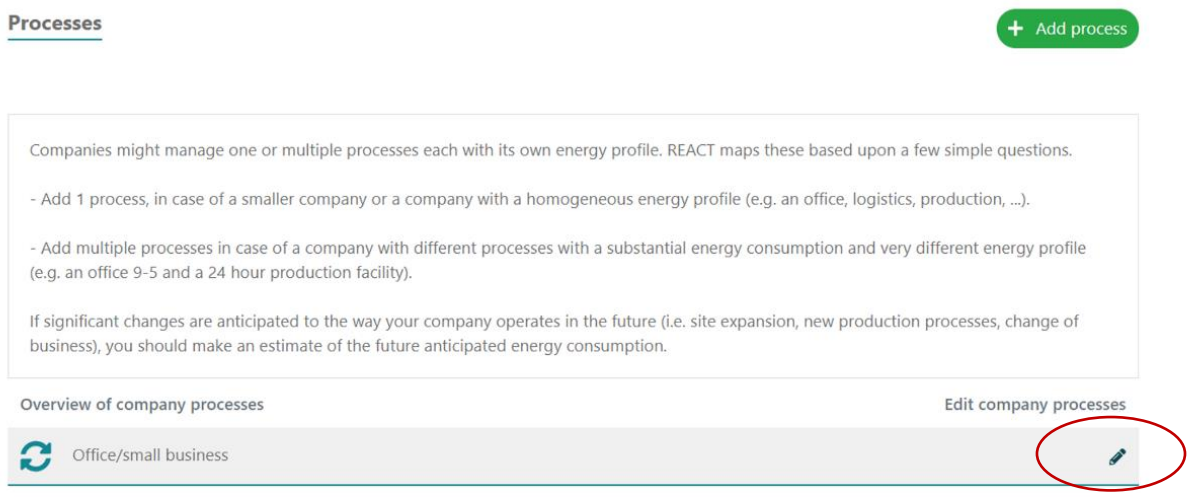




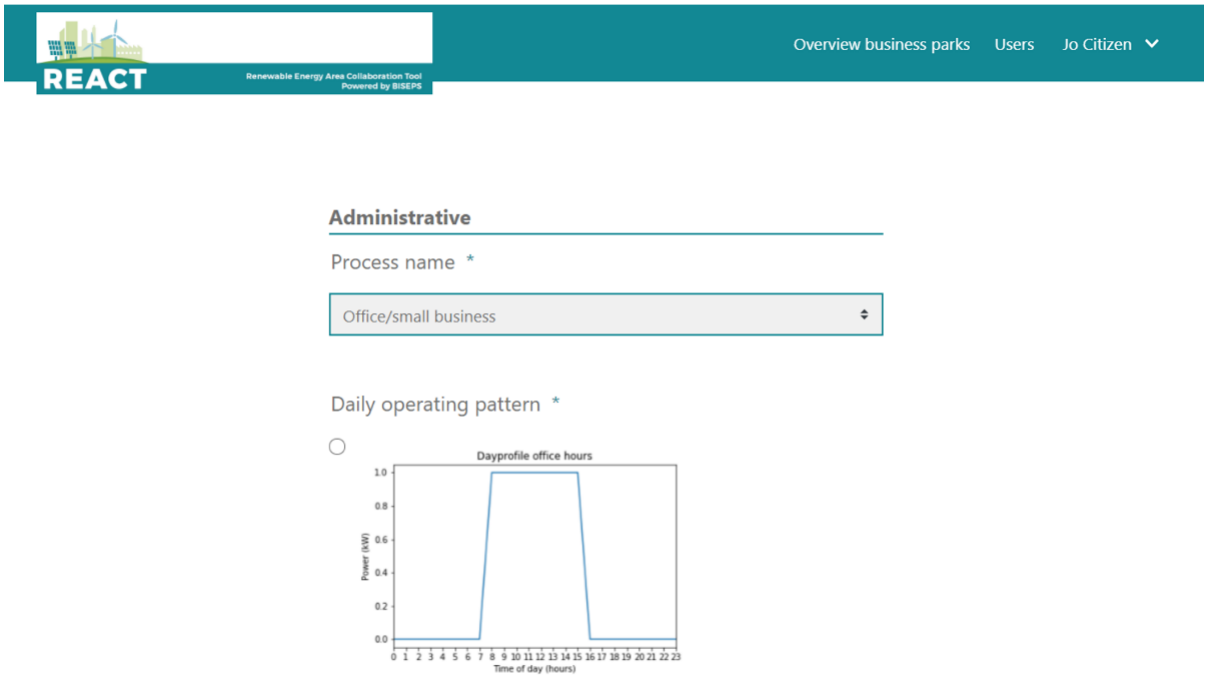
On the last screen, click "Next" again to save the data input and continue to the process overview screen. The process will now appear in the "Processes" overview of the company.

5.2 Edit a process

After a process has been created, its data can still be modified or completed.

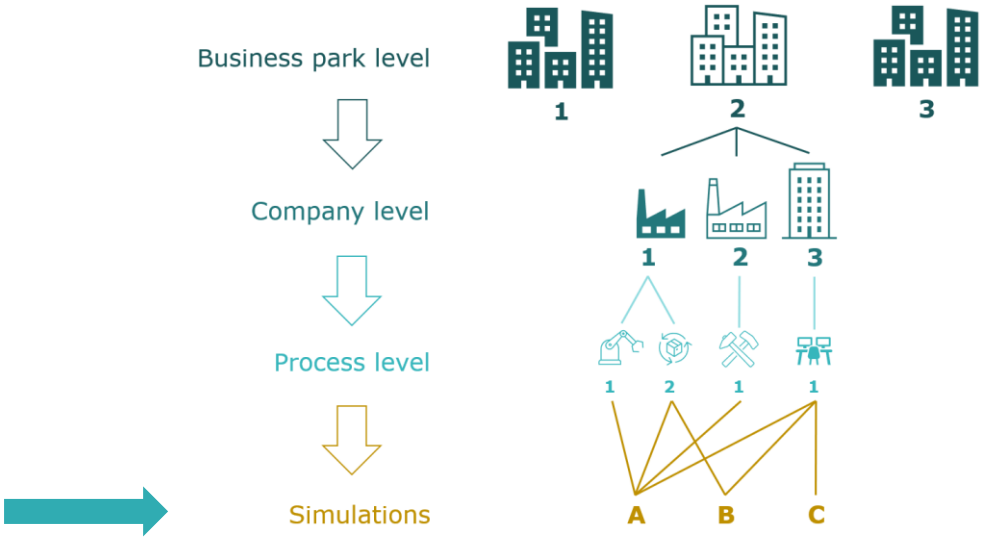


On the "Processes" overview screen, click the pencil icon next to the process that you want to edit.



The previously inputted data (starting with the Administrative data) can now be changed/completed. Click the "Next" button to save your changes and proceed to the next screen. Once you've finished the last screen, click "Next" again to save the changes and close the editing mode.

6 Generate a simulation



Based on the data inputs, REACT is able to generate a simulation of optimal energy solutions for the companies in the business park. This optimal configuration will be the result of a combination of technical, economic, financial, legal, spatial and organisational parameters.

The REACT tool simulations can not fully replace feasibility studies, but can certainly serve as a good basis to determine useful solutions for further investigation.

6.1 Guide to a good simulation

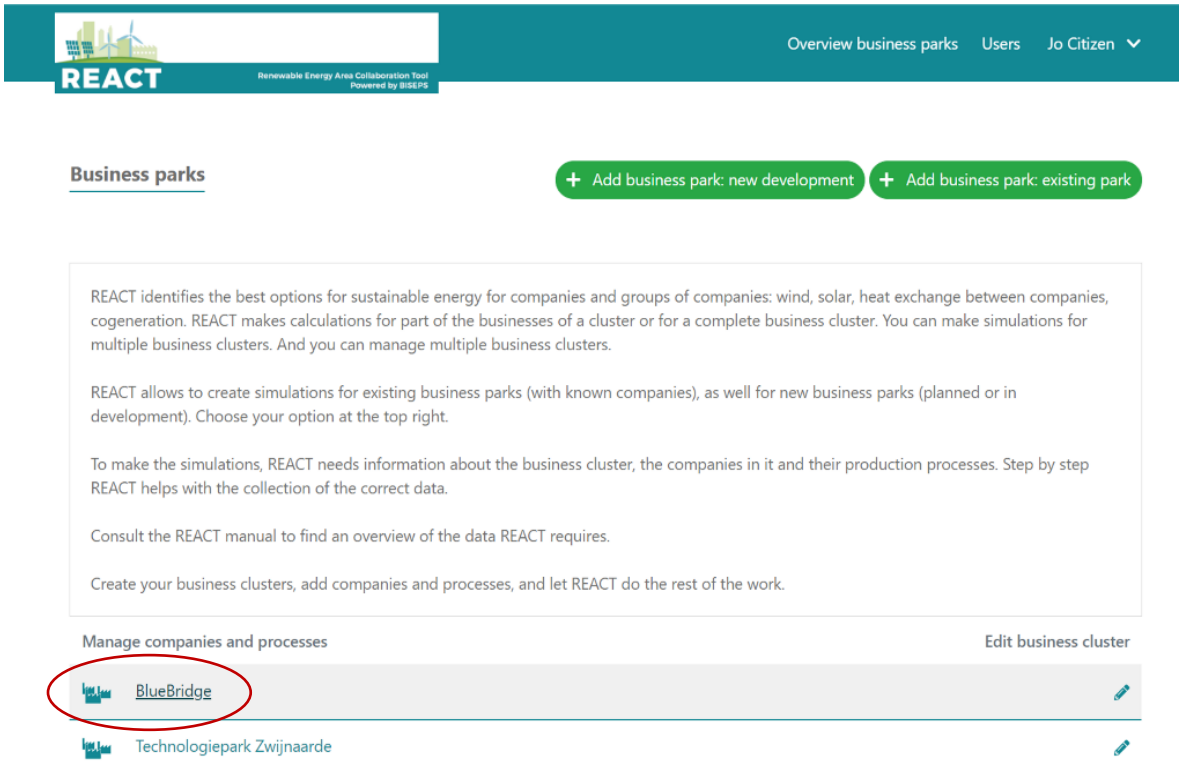
In order to generate a useful simulation, we advise to provide as much accurate information as possible about the different companies and processes. The simulation can be tailored to your needs, by including or excluding individual companies and/or processes in/from the simulation. If accurate data for a specific company or process is missing, we advise to exclude this company/process from the simulation. For a more general simulation on business park level, try to include as many companies (with relevant data) as possible.

Some general tips & tricks:

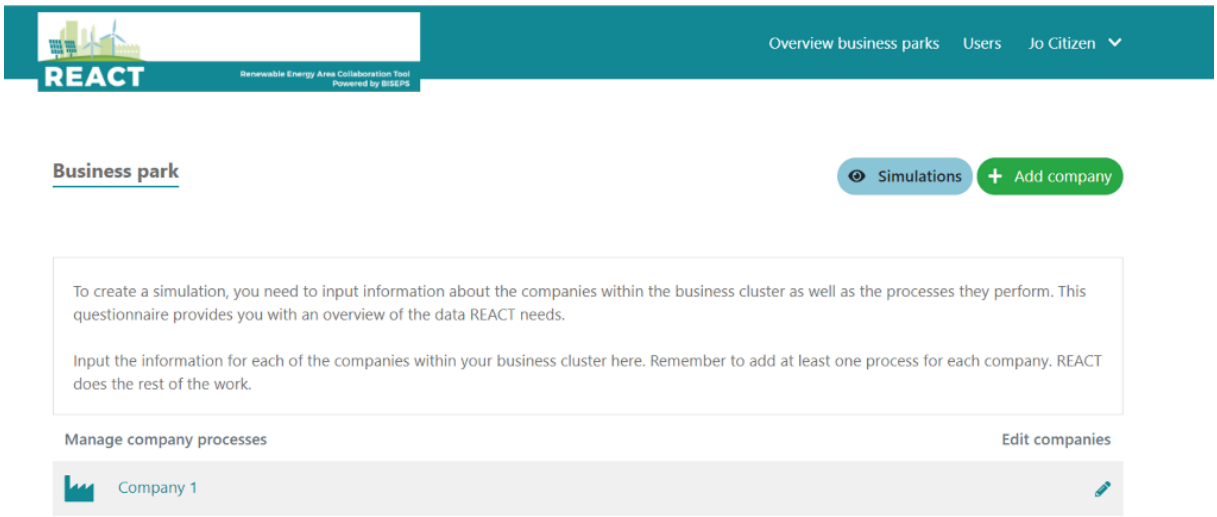
- Use the synergy maps to filter simulation results and get a clear view on specific aspects.
- Cluster companies/processes with electricity demand & potential for solar PV.
- Cluster heat intensive businesses.
- For heat exchange / district heating: keep in mind geographic location of companies (the closer the better).
- Combine high energy & heat demand with CHP.
- Combine wind energy potential with all electricity demand.

6.2 Generate a simulation

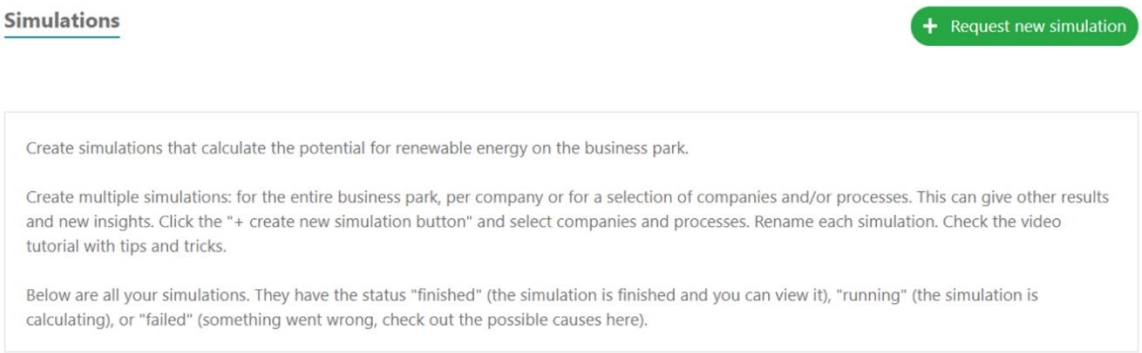
Once all data for a business park and for the companies and processes in the business park have been inputted, a simulation of suited energy solutions can be generated.



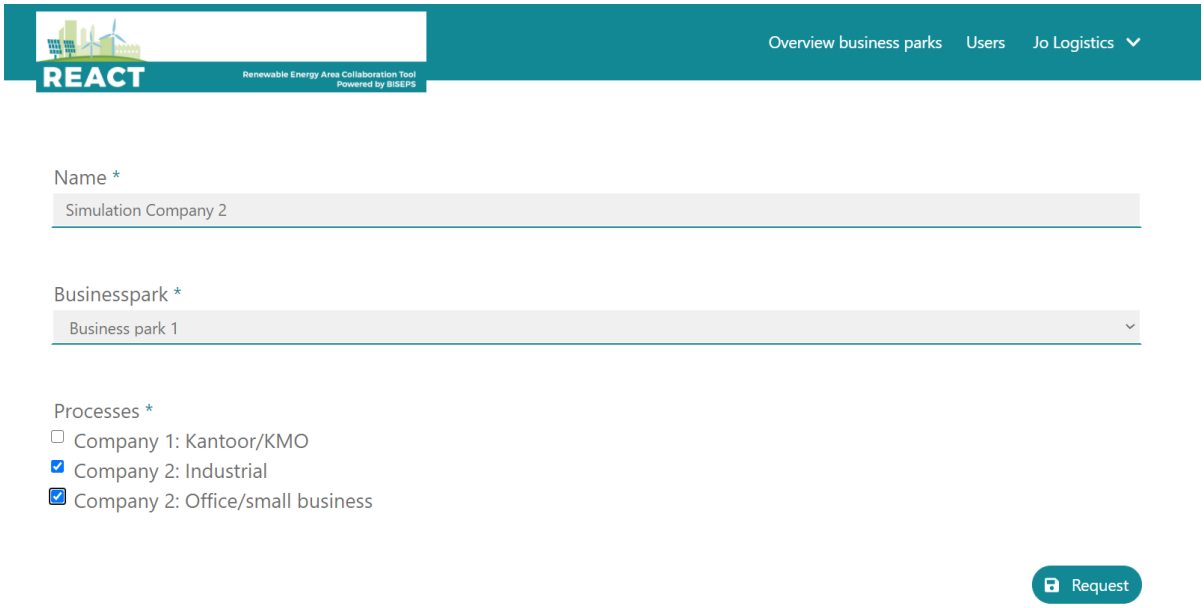
In the "Business parks" overview, click on the name of the business park you want to run a simulation for.



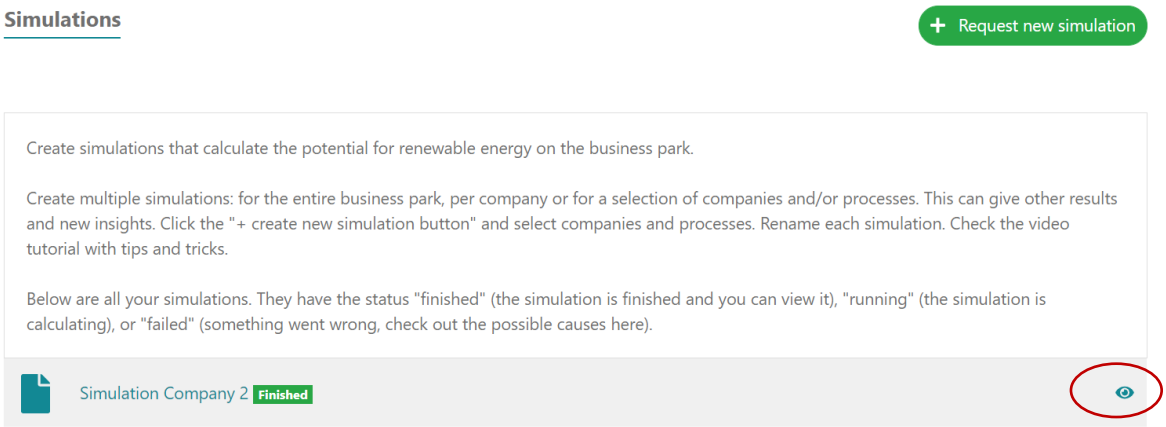
On the companies overview screen, click the "Simulations" button to load the "Simulations" screen



Click the "Request new simulation" button to launch your simulation.



Fill in a name for the simulation, select the business park from the dropdown list and select the processes to be included in the simulation. Click the "Request" button to launch the simulation.



A notification will pop up to confirm that the request was submitted successfully, and the status of the simulation will appear next to the name in the simulations overview. Use the refresh button of your web browser to update the status. Once the simulation is ready (this may take a few minutes), its status in the overview will change to "Finished". If the simulation did not succeed, it will appear with a red tag "Failed" in the overview.

Click on the name of your simulation (or the little "eye" icon) to display the results.

REACT
Renewable Energy Area Collaboration Tool
Powered by BISEPS

Overview business parks | Users | Jo Logistics

Simulation results for "Simulation Company 2"

Here are the simulation results for your group of businesses or business park. They set out the potential benefits of sustainable energy technologies such as wind, solar, district heat or combined heat and power (CHP).

You can explore these results further by running another simulation with a different combination of companies and/or processes. This will help you to identify the most suitable technology options for each area of your business park or group of companies. The video tutorial features tips and tricks to help you with this.

Companies included in the simulation

The companies and processes included in this simulation are identified with a tick. Those that have not have been marked with a cross.

Company 1

Company 2

- Industrial ✓
- Office/small business ✓

Most suitable technologies

REACT has identified wind, solar, heat network and combined heat and power (CHP) as suitable technologies for this group of businesses and/or processes. The technologies are ranked according to their feasibility, with the most feasible solution at the top.

PV

Overall score	Co2 savings	Capex (capital investment)	Technical feasibility
100	32 kton	€86,860	High

Extra information

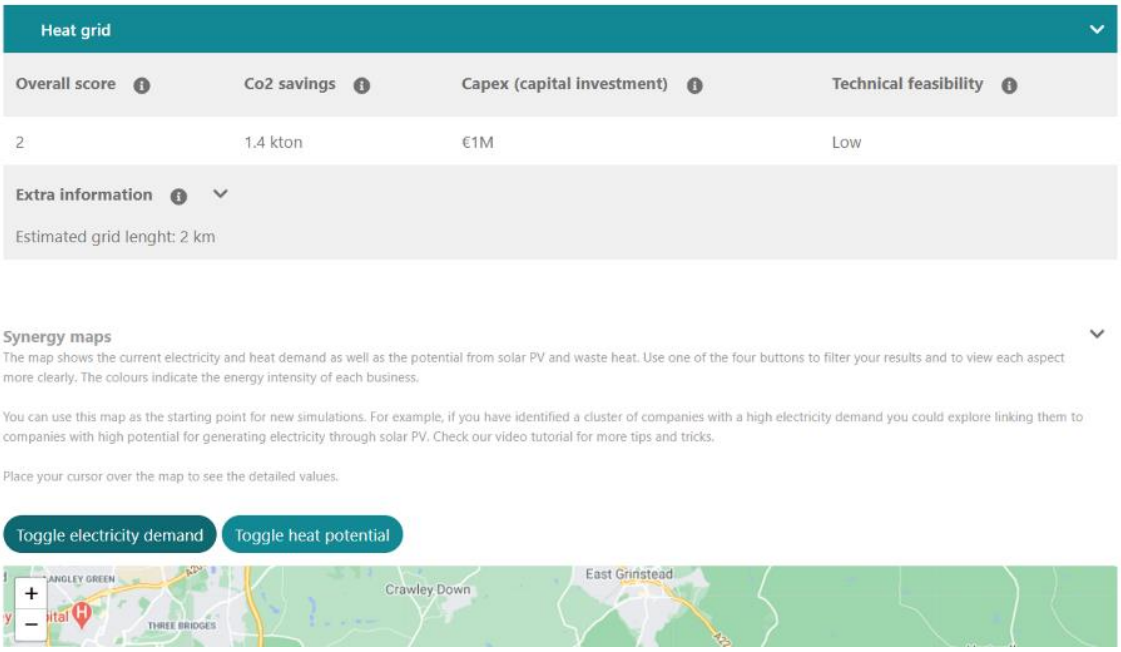
Estimated available capacity: 86 kWp
Estimated yearly energy: 81.7 MWh
Estimated self consumption ratio: 76.8%

Wind

Overall score	Co2 savings	Capex (capital investment)	Technical feasibility
81	1.59 kton	€2.4M	Medium

Extra information

Estimated available capacity: 2.3MW (1 turbine)
Estimated yearly energy: 4.03 GWh
Estimated self consumption ratio: 66.8%



The "Simulation results" screen will show the names of the companies in the simulation, as well as the best suited technologies, with a rating on different aspects per technology. For more information on this rating, see

Interpretation of simulation/results.

If you want to download or share the simulation, use the “Print as pdf” function of your computer to save the simulation as a pdf file.

7 Interpretation of simulation/results

7.1 Overall score

The higher the overall score (up to 100) the more suitable the technology. REACT will register a high score for technologies

- that are highly feasible from a technical perspective;
- that have a favourable investment cost, and;
- where a high percentage of energy generated on the business park will be consumed there.

7.2 CO2 savings

REACT projects annual carbon savings based on the maximum potential energy produced by the group of businesses and the relevant carbon emissions factor (tonnes CO2 per MWh).

7.3 Capex

Capex is the capital investment of the project. REACT forecasts the level of capital expenditure (CAPEX) needed to install the technologies, but not the operating costs. REACT uses average costs per kW installed. Costs are provided in EUR.

7.4 Technical feasibility

REACT estimates technical feasibility based on industry expertise.

- Solar PV (high technical feasibility): roof quality, condition and load capacity are the main barriers.
- Combined Heat and Power, (average technical feasibility) - matching the qualitative (temperature) and quantitative (volume and time) aspects of electricity and heat supply and demand can be challenging.
- Wind energy (average technical feasibility) - spatial and environmental constraints can make delivery difficult. A detailed spatial study would need to be carried out as a next step if wind energy is identified as an option.
- Heat network (low technical feasibility) - matching the supply and demand for heat energy between business and / or processes can be difficult. Delivering an integrated pipe network between heat source and heat demand can also be a limiting factor.

7.5 Extra information

For solar PV

- The estimate assumes 60% solar PV coverage of all roof surfaces within the group of businesses.
- Ground-based PV installations are not considered.
- The estimated available capacity (the rate at which a system generates energy at peak performance i.e. noon on a sunny day) is expressed in kilowatts peak (kWp).
- The estimated yearly energy is equivalent to the number of megawatt hours (MWh) produced by all the solar PV in the group of businesses.

- The estimated self-consumption ratio is the yearly estimated energy production divided by the yearly electricity consumption of the group of businesses.

For wind

- The estimated available capacity is expressed in megawatts (MW).
- This is the rate at which a turbine generates energy at peak performance, for example during the most windy part of the day.
- The estimated yearly energy is the megawatt hours (MWh) produced. The estimated self-consumption ratio is the yearly estimated energy production divided by the yearly electricity consumption of the group of businesses.

For combined heat and power

- - The estimated optimal capacity is the amount of heat / electricity produced by the CHP at full load (expressed in megawatts). REACT optimises the capacity of the CHP on the heat demand, and considers electricity as by-product.
- The estimated yearly electricity is the megawatt hours (MWh) produced.- The estimated self-consumption ratio of electricity is the yearly estimated electricity production of CHP divided by the yearly electricity consumption of the group of businesses
- The estimated yearly heat is the megawatt hours (MWh) produced. The estimated self-consumption ratio of heat is the yearly estimated heat production of CHP divided by the yearly electricity consumption of the group of businesses.

For heat network

- The estimated grid length is the distance to connect businesses/processes through an integrated pipe network along public roads.

7.6 Synergy maps

At the bottom of the simulation you find a map. The map shows the current electricity and heat demand as well as the potential from solar PV and waste heat. Use one of the four buttons to filter your results and to view each aspect more clearly. The colours indicate the energy intensity of each business.

You can use this map as the starting point for new simulations. For example, if you have identified a cluster of companies with a high electricity demand you could explore linking them to companies with high potential for generating electricity through solar PV. Check our video tutorial for more tips and tricks.

Place your cursor over the map to see the detailed values.

Colofon

Renewable Energy Collaboration Tool (REACT). The Manual.

Output 4 of the BISEPS-project.

Authors

Dominiek Vandewiele (Intercommunale Leiedal), Elke De Neve (POM West-Vlaanderen), Eveline Huyghe (West-Vlaamse Intercommunale), Evelien Bolle (West-Vlaamse Intercommunale), Marianne Vancleemput (West-Vlaamse Intercommunale), Sandrine Musa (Metropole Européenne de Lille), Arjan Rook (Gemeente Breda), Ingrid Bennett (West Sussex County Council), Andrew Tolfts (West Sussex County Council), Dirk Hoet (Universiteit Gent), Joannes Laveyne (Universiteite Gent) Alexandre Pauvert (CD2E)

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Project No. 2S01-067

The BISEPS-project is supported by the Interreg Va 2-Seas program of the European Regional Development Fund of the European Union and the Province of West Flanders.

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