R-ACES
Energy Cooperation Platform

nal ecoregions

List of seven additional ecoregions

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Technical References

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[1] PU = Public
PP = Restricted to other program participants (including the Commission Services)
RE = Restricted to a group specified by the consortium (including the Commission Services)
CO = Confidential,only for members of the consortium (including the Commission Services)

[2] R = Document, report
DEC = Websites, patent fillings, video, etc.
DEM = Demonstrator, pilot, prototype
OTHER = other

Document history

	Date	Author (name, organisation)	Description
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Project Summary

The R-ACES project is an initiative promoted by 8 partners from 6 European countries, with the vision to support high-potential industry parks and clusters to become fully fledged ecoregions that reduce emissions by at least 10 %. R-ACES means a step-change in the contribution of European Industry to the climate targets of the EU. The industry sector after all represents 25% of all energy demand – and 50% of the total cooling and heating demand on the continent; yet only 16% comes from renewables. By focusing on collective measures and clustering, the efficiency of industry can be drastically increased.

The focus of R-ACES therefore is to turn high-potential, high-impact industrial clusters into ecoregions that achieve at least a 10% reduction in emissions. They do so by exchanging surplus energy, making extensive use of renewables and tying everything together with smart energy management systems. An ecoregion is a geographic area where energy and information exchanges occur between various companies and actors to reduce waste and energy consumption. Ecoregion can be centred on an (eco-)industrial park or (eco-) business park, linked to its surroundings by a 4th/5th generation district heating/cooling network.

R-ACES is the capping stone, condensing the knowledge and experience gathered throughout EU and national projects into a set of three focused tools, namely a self-assessment tool, a legal tool, and a smart energy management platform for clusters. The tools are embedded in support actions built around peer-to-peer learning, more formal coursework and webinars, and serious games. Together they enable a cluster to really become an ecoregion and set up meaningful energy collaboration. The entire package of tools and support is aimed at the high-potential clusters identified in the European Thermal Roadmap. It will be validated in three ecoregions, actively deployed in another seven regions, and disseminated to identified ninety regions European wide. In addition, the tools and support methodology will be made available to third parties in a sustainable way after the end of this project.

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Partners

Institute for Sustainable Process Technology	https://ispt.eu/
Condugo	https://www.condugo.com/
DOWEL MANAGEMENT	https://www.dowel.eu/management_en/
Spinergy	http://www.spinergy.it/
energy CLUSTER DENMARK	https://www.energycluster.dk/
LE2C LOMBARDY ENERGY CLEANTECH CLUSTER	http://www.energycluster.it/en
pom antwerpen	https://www.pomantwerpen.be/
ESCI European Science Communication Institute	https://www.esci.eu

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Executive Summary

The R-ACES project intends to pave the road for effective energy exchange in industrial clusters and business parks in Europe by providing a self-assessment tool, legal tool, and energy management tool. The project aims at implementing the above-mentioned tools in ten high-priority, high-impact regions identified based on the Heat Roadmap Europe. The efforts are focused on regions that have already been identified as exhibiting high potential because of the presence of large amounts of excess heat, the presence of infrastructure or initial efforts to bring stakeholders together. An exhaustive list of such regions has been provided by the Heat Roadmap Europe, which is therefore used as a reference for the RACES project. On this basis there has been conducted a long list of high priority, high impact regions in the countries targeted by the R-ACES project: Belgium, Denmark, Italy, France, and The Netherlands.
In this deliverable a list of seven additional ecoregions has been selected for further implementation of the above-mentioned tools. The selection har been based on a qualitative approach with input from the local partners and their local knowledge and contacts.
In the upcoming months, the selected regions will be the starting point for expanding in WP4 that will develop the roadmap for these regions and for dissemination of the R-ACES outcomes in WP5 aimed at additional replication high priority, high impact regions.

Key Words

R-ACES keywords

Industrial Symbiosis, Energy System Integration, District Heating and Cooling, Energy Cooperation, Ecoregion, Eco-Industrial Parks

Deliverable keywords

Selection criteria, Qualitative criteria, local knowledge, stakeholder, contact,

Disclaimer

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Abbreviations

Abbreviation	Description
CHP	Combined heat and power production
CSA	Coordination and Support Action
DH	District Heating
DHC	District Heating and Cooling
BP	Business park
EBP	Eco-business park
GHG	Greenhouse Gas
HRE4	Heat Roadmap Europe 4
KPI	Key Performance Indicator
LC	Learning Community
RE	Renewable Energy
RES	Renewable Energy Strategy
SME	Small Medium Enterprise
NUTS	Nomenclature of territorial units for statistics

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1. Introduction

1.1 Objective of work package 1 'Condense'

In the scope of Work Package 1, we aim to condense the insights of previous European projects regarding District Heating and Cooling (DHC) as well as academic literature. Hereby, special attention is given to the identification of associated technical and non-technical barriers/drivers and ways to overcome them. The identification process is the start of a longer effort to address barriers in a more effective way. A crucial step within this process is the classification and harmonization of barriers in a single framework. This is done in D1.2 'Harmonization'. Later on in the project, the harmonized knowledge will be used to develop three tools: a self-assessment tool, a legal tool, and an energy management platform. The three tools together form the R-ACES Tool Box that aims to support practitioners in ecoregions to come to energy cooperation. To achieve this goal, the tools have to be tested. Therefore, WP1 also aims to start selecting seven ecoregions in addition to the three regions already selected in the proposal. To that purpose, first, a long list is created within Task 1.3. Afterwards, a short list is defined by using strict selection criteria (Task 1.4).

1.2 Objective of the deliverable

The purpose of the present deliverable D1.4 is to select a list of seven additional ecoregions that are high impact, high priority regions in the countries targeted by the R-ACES project: Italy, Belgium, The Netherlands and Denmark. The list will be used in WP4 – Expand, where the selected ecoregions will be involved in the R-ACES Project.
In line with the R-ACES Description of Work (DoW), the outcome of the Heat Roadmap Europe is used to create D1.3 the long list of high impact, high priority replication regions. The efforts are focused in particular on the regions exhibiting high potential due to large amounts of excess heat and the presence of related infrastructure.
From the long list of regions in the countries of the industrial partners of the consortium we will collect energy related and non-energy related information: technical and non-technical, contact information of the relevant stakeholders (management of industrial sites, DHC, Business parks, policy agents and regional government) having in mind to invite them into the learning community and ecoregions of the projects.

1.2.1 Ecoregion per country

The target KPI3 that corresponds to this deliverable states that the additional seven ecoregions should be within the same three countries that already facilitate the three ecoregions within the project: Antwerp, Nyborg and Lombardy that correspond to Belgium, Denmark and Italy.
The target for The Netherlands for involving regions in their country are in the proposal focused on the second wave of involvement, however ISPT has been active in engaging regions in The Netherlands and multiple regions have expressed positive interest in the R-ACES project. It has been decided that they should be included and the selected regions for the expansion is therefore exceeding the targets.
The reason to overperform the targets at this point correlates with previous experiences from other projects where companies tend to drop out for several reasons and including another is a hassle.

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Table 1: KPI target - number of ecoregions in each country

	Facilitate (short-term, project duration)	Involve (short-term, project duration) Proposal	Involve (short-term, project duration) Actual target	Scaled-up (Long-term)	Trigger (long-term)
Belgium	1	2	2	3	Not defined yet
Italy	1	6	6	12	Not defined yet
Denmark	1	2	2	3	Not defined yet
The Netherlands	0	0	2	1	Not defined yet
Total:	**3**	**10**	**12**	**23**	**90**

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2. Methodology

This section presents the methodology elaborated to establish the list of seven additional ecoregions based on the D1.3 – the long list of high priority, high impact replication regions. The long list was a first step in creating the short list of regions, i.e. a list of regions selected from the long list on the basis of (strict) selection criteria.
From previous tasks the concept of 'ecoregion' and of 'high priority, high impact region' was defined in collaboration with WP1 leader (S-ISPT). A methodology to select the regions was implemented to set up the long list. From the long list of potential high priority, high impact regions, the selection of the seven additional ecoregions took its starting point.

2.1 Definitions of 'ecoregions', and 'high priority, high impact regions'

Within Task 1.3 common R-ACES definition of 'ecoregion', and 'high priority and high impact' region. The following definitions were agreed-upon[1]:

- *Ecoregion: Within the R-ACES project an ecoregion is a geographic area where energy and information exchanges occur between stakeholders of various types to reduce energy consumption. Geographical size does not matter (the size of an ecoregion can be as small as a business park or as large as a city). Important is that an ecoregion relies on an anchor organization responsible for managing the area (for example park management). Another aspect is the proximity of stakeholders in order to ensure interconnected energy flows (continuity of supply, quality of supply, quantity). Within an ecoregion, a wide range of assets could be involved: office parks, data centers, multimodal centers, technological centers, agro-centers, science parks, brain parks, lighthouse parks, chemical parks, eco-industrial parks, and cluster/business parks. For the demand of heat, also residential areas could be taken into account. As such, the term ecoregion functions as an 'umbrella term'.*
- *High priority region: A high priority region is an Ecoregion, as defined above, that has balanced potential match of heating/cooling supply and heating/cooling demand in both quantitative (amount of heating/cooling) and qualitative (temperature, form of heat) terms. The region should be identified by heat roadmap studies (for example, the Heat RoadMap Europe or Stratego) or other research activities. In addition, the regions should have networking possibilities. The regions can include industrial sites, business parks and residential areas.*
- *High impact region: Regions that have a high potential impact on the R-ACES KPIs. More specifically, regions are meant that have a high potential impact on KPI 1: Primary energy savings, and KPI 3: Number of plant sites and number of industrial parks where businesses commit to energy cooperation.*

Other relevant concepts defined are the following:

- Business park: An area of land in which many office buildings are grouped together with a common infrastructure (Wikipedia). Business parks, like industrial sites, often have similarities in heating and cooling demand. Certain businesses may even have residual energy streams, for example data centers. As such, business parks may also organize as an ecosystem or eco business park (EBP) and become an important stakeholder within an ecoregion.
- Eco Business Park: *"An eco-industrial park is a community of businesses located on a common property in which businesses seek to achieve enhanced environmental, economic and social performance through collaboration in managing environmental and resource issues. This is known as industrial symbiosis, which is a means by which companies can gain a competitive advantage through the physical exchange of materials, energy, water and by-products, thereby fostering inclusive and sustainable development."* (United Nations Industrial Development Organization)
- Industrial site: An area zoned and planned for the purpose of industrial development. An industrial site can be thought of as a more "heavyweight" version of a business park or office park, which has offices and light industry, rather than heavy industry. They may contain oil refineries, ports, warehouses,

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distribution centers, factories, and companies that provide manufacturing, transportation, and storage facilities, such as chemical plants, airports, and beverage manufacturers (Wikipedia).

- DHC Abbreviation of District Heating and Cooling. A system for distributing heating/cooling generated in a centralized location through a system of insulated pipes for residential and commercial heating requirements such as space heating/cooling and water heating/cooling.

2.2 Developing the methodology to select the 7 additional ecoregions

Two approaches can be used to sort data and select a targeted number out – The quantitative and the qualitative approach. Both approaches have their pros and cons. The following sections will elaborate on the considerations behind the selecting of the seven additional ecoregions.

2.2.1 The quantitative approach

A top-down approach which was used to establish the long list of potential high priority, high impact regions, was relying on the Heat Road Map 4 (HRE4) from the webpage: https://heatroadmap.eu/peta4/, using the so-called 'Heat Synergy Regions'. The objective of the maps of the heat synergy regions is to identify regions with a high synergy between excess heat and heat demand, as well as regional heat balances and pinpointing regions with a high excess heat ratio in the Member States that are addressed in HRE. This approach could be applied for the countries targeted by R-ACES, i.e. Italy, Belgium, The Netherlands, apart from Denmark.

The comprehensive methodology applied for creating the long list included several numbers of databases, multiple filtering criteria and selection parameters. This task of selecting seven additional ecoregions for expand of the R-ACES project will build upon the long list but further include the local knowledge from the partners within the R-ACES project. The local knowledge and the partners network create a solid foundation for the next work packages.

The long list is based upon the NUTS3 regions, which in most cases are very large regional areas that can be divided into smaller regions based on economic activities that have been identified as high priority, high impact regions.

2.2.2 The selected qualitative approach

One of the keys to selecting "the right" ecoregion is the willingness and the engagement from the ecoregions. This is very hard to find in databases or through internet search. Instead, direct contact with regions that are interesting based upon e.g the long list or based upon the local knowledge of the partners within the project is absolutely essential.

The qualitative approach used to further narrow down the ecoregions to be selected was divided in 4 steps to be executed in each partner country by the R-ACES partners and that stepwise process is elaborated in the following.

Step 1 is selection of the technical best options by choosing ecoregion that are technically best feasible by facts like MWh surplus heat, Heat demand and distance to DH network. This very much relies on the data from the longlist, compared to national databases and information gathered e.g. from DH companies and the municipality's webpages. This steps

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also include to focus into specific local regions and finding possible areas that might not be included in the HRE4.

Step 2 is finding contact information for the municipalities/authorities, DH companies and key industries in the local region – for this the deliverable was relying on the R-ACES partners contacts and local knowledge.

Step 3 is important! This is where the R-ACES partners contact the regions and depending on how they reply the regions will by classified as "green", "yellow" or "red" (or similar) according to their engagement and willingness to participate.

Step 4 is to get them to commit to the project. For this deliverable the commitment that is needed is limited and a positive feedback and/or possibly an email confirmation of interest is enough. For the WP4 – expand the commitment needs to be more formalized and among the project partners several approaches have been discussed. The process of commitment from the involved ecoregions follows the list below, where the commitment is formalized accordingly to the development of the tools and the offers of support from the R-ACES project.

Figure 1: Step 4 – Process of commitment from additional ecoregions

Other qualitative selection criteria that are relevant to select region based upon:

- **Established set-up/collaboration**
- **Ambitious energy strategy in the region/city**
- **One lead contact / access point**
- **Use the letter "what's in it for the regions" to motivate**

In the WP1 partner group it was discussed how to know when a selected region is motivated and will be engaged. This is difficult to measure, but the above listed criteria are some of the indicators that could underline a level of seriousness regarding an active participation.

2.2.3 Prioritized list

In order to ensure a continuous flow from this deliverable to the WP4 – expand and the target KPI3 is met – a modular list for selecting the seven additional ecoregions is developed. The idea of having a modular list is to select the top seven – the most relevant and evaluated "green" by the local partner.
The rest of the list is kept for the second wave for the expansion and to have possible prospect or pending participants in case some of the other ecoregions drop out.
Hopefully by "overperforming" in this task the expansion and link to the next WP is smoother and will ensure the outcome is successful.
To illustrate the coloured modular list, the following figure was made as an example:

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1									demand
62	FR	FR104	Essonne	1 279 864	1 804,40	31,2	3,97	2,38	0,08
63	FR	FR103	Yvelines	1 424 411	2 284,40	34,49	11,73	5,33	0,15
64	FR	FR107	Val de Marne	1 372 018	245,00	33,67	14,27	7,32	0,22
65	FR	FR102	Seine et Marne	1 391 429	5 915,30	34,46	24,1	9,77	0,28
66	FR	FR105	Hauts de Seine	1 603 379	175,60	39,18	15,89	8,43	0,22
67	FR	FR106	Seine Saint Denis	1 573 959	236,20	38,67	6,5	3,9	0,1
68	FR	FR246	Loiret	670 906	6 775,20	16,31	6,16	2,52	0,15
69	FR	FR242	Eure et Loir	435 171	5 880,00	10,39	3,11	1,86	0,18
70	FR	FR231	Eure	599 518	6 039,90	14,3	3,75	1,53	0,11
71	FR	FR251	Calvados	693 277	5 547,90	16,19	6,37	2,06	0,13
72	FR	FR514	Sarthe	572 135	6 206,00	13,32	1,77	1,06	0,08
73	FR	FR523	Ille et Vilaine	1 039 983	6 774,70	23,81	2,96	1,64	0,07
74	FR	FR522	Finistere	907 423	6 733,00	20,67	2,17	1,3	0,06
75	FR	FR213	Marne	572 968	8 161,60	14,6	18,86	4,44	0,3
76	FR	FR263	Saone et Loire	555 840	8 574,70	13,76	5,83	2,4	0,17
77	FR	FR261	Cote d'Or	533 023	8 763,20	13,47	1,68	1,01	0,07
78	FR	FR431	Doubs	536 474	5 233,60	13,85	37,54	9,56	0,69
79	FR	FR724	Puy de Dome	646 537	7 969,70	15,11	12,18	6,21	0,41
80	FR	FR532	Charente Maritime	639 596	6 863,80	14,29	8,21	2,32	0,16
81	FR	FR612	Gironde	1 542 964	10 000,10	33,42	25,34	8,92	0,27
82	FR	FR615	Pyrenée Atlantique	670 434	7 644,80	13,76	5,38	2,72	0,2
83	FR	FR812	Gard	748 509	5 852,90	16,06	12,75	3,73	0,23
84	FR	FR826	Vaucluse	554 619	3 567,10	11,97	1,92	1,15	0,1
85	FR	FR823	Alpes Maritimes	1 081 821	4 298,60	23,22	13,64	5,3	0,23

*Figure 2: **Example** of the **indicative** color to evaluate the contacted ecoregion and to select the most interesting*

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3. Selection process per country

In the following section each R-ACES partner has provided valuable input from their contacts with local stakeholders and the feedback provided from those. The qualitative evaluation has been based upon the previous elaborated criteria.

3.1 Belgium

Considering the top-down approach as proposed in D1.3, Ghent was, after Antwerp, ranked second on the priority list. There are several excess heat points, such as Arcelor Mittal (steel production) and IVAGO (waste incineration), that are coupled to heat demand regions, mainly the city center of Ghent, via a DHS.

The region was earlier involved in the DOEN project. This Interreg project focuses on the utilization of industrial excess heat in Belgium and The Netherlands. This is done by developing a new methodology for energy cooperation projects. In the DOEN-project, Ghent is actively involved in the exchange of heat across different parties, thus clearly showing their incentive for a carbon neutral economy by coupling different energy flows and by facilitating collaboration. In line with the DOEN-project, the coordinators of the province Oost-Vlaanderen have explicitly expressed their interest in the R-ACES toolbox, thus making this an ideal Ecoregion to consider in the expansion phase.

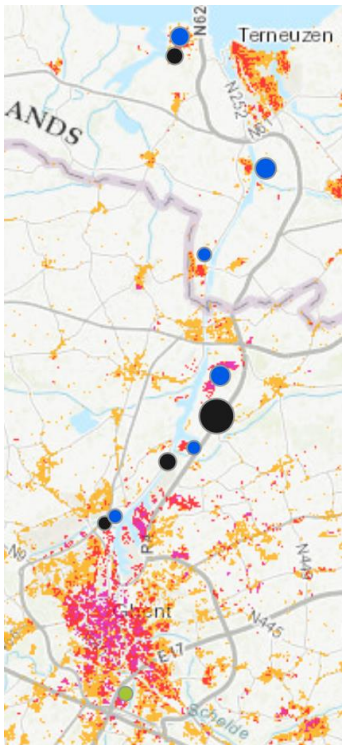

Figure 3: Screendump of Ghent from HRE4

An additional opportunity can be found in the coupling of Ghent (Belgium) to the neighbouring industrial region of Terneuzen (The Netherlands), where there is both heat excess and demand. Along the Canal Ghent-Terneuzen, there are 2 more heat excess activities, opening opportunities to connect them as well and create 1 large Ecoregion.

- **Similar to port of Antwerp**
- **Heat demand density in Ghent city center**
- **Excess heat from industrial activity (ArcelorMittal, Alco Bio Fuel, EDF Luminus)**
- **2 DHs present**
  - **EDF Luminus to Ghent city center**
  - **Ivago to UZ Ghent**
  - **1 additional DHS planned**
- **1 industrial region (Port of Ghent) + 1 business park**

3.2 Denmark

Denmark has a strong heat planning tradition as well as a well-established DH network throughout the country. In the R-ACES project the regions that are interested in support from the project are the regions where district heating is now seen as a medium to integrate and exchange even more renewable energy. In areas like the Nyborg ecoregion that are a part of R-ACES, the amount of excess heat extends by far the total heat demand. The next step is to convert energy supply for the industrial sector where heat is used for process purposes.

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Looking at the D1.3 and the areas where there is massive excess heat, the NUTS3 region DK022 – Vest- og Sydsjælland is interesting, more specifically the municipality of Kalundborg. The local knowledge within Energy Cluster Denmark also brought up the region because of previous projects regarding the industrial collaboration around energy synergies that already exist.
Upon contact the symbiose secretariat expressed strong interest in the R-ACES project and especially the support to include more stakeholders.

Some keys facts:

- **48.982 citizens within the 575 km2 municipality**
- **546.032 ton of CO2 emissions every year**
- **1,9617 PJ excess heat that could be utilized**
- **Ambitious target to be world's leading industrial symbiosis**
- **1,5698 PJ total heat demand**

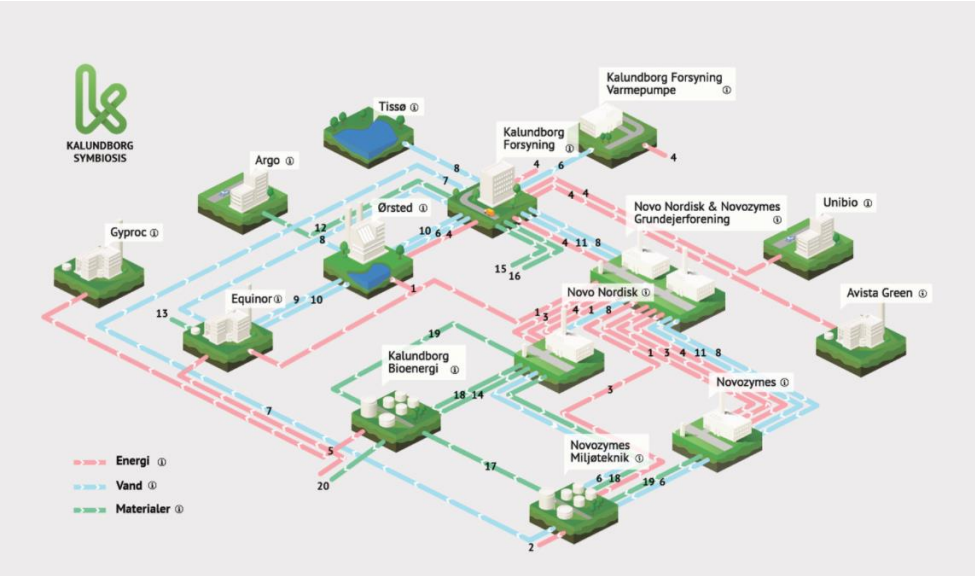

Figure 4: Screendump from http://www.symbiosis.dk/

There has been initial contact with other regions. One is the collaboration between 4 municipalities in the Southern part of Denmark, where the project SEP Sønderjylland[1]collaborates on mapping the excess heat potential for the region and develops business models for utilization this and they could be interested as well, but at the moment of writing this deliverable they have not come back with positive feedback yet.

3.3 Netherlands

For the selection process in the Netherlands, the top-down approach of D1.3 was coupled with additional desk research, after which several stakeholders were contacted for the qualitative approach. The Netherlands has an active agenda for an 'energy transition' making plans across 5 sectors ('industry', 'residential', 'agriculture', 'transport' and 'electricity') as part of a national climate agreement. An activity from this agreement is to develop energy strategies in 30 predefined regions, in order to efficiently plan the

[1] SEP stands for Strategic Energy Planning. Sønderjylland is Southern Jylland – the south part of Denmark.

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infrastructure of the future. Therefore, there is a lot of momentum for energy planning and system integration.

In the following sections the two most interesting regions are elaborated. In Annex 01 there is additional information for the following two regions.

3.3.1 Opportunity 1: NL412- Midden-Noord-Brabant

The NUTS3 region NL412 – Midden-Noord Brabant receives a HRS priority of 0 in the HRE4, indicating that there would be limited excess heat activity. Nevertheless, the region is interesting as an ecoregion considering there is one of the largest district heating systems in the Netherlands and there is experience with energy scans and planning on a business park level in the DOEN project, especially centered around the municipality of Tilburg.

Background and analysis of the region

NUTS 3 region

NUTS3 region: NL412 – Midden-Noord-Brabant
HRS Priority: 0 = No priority. Reason: no data available about excess heat.

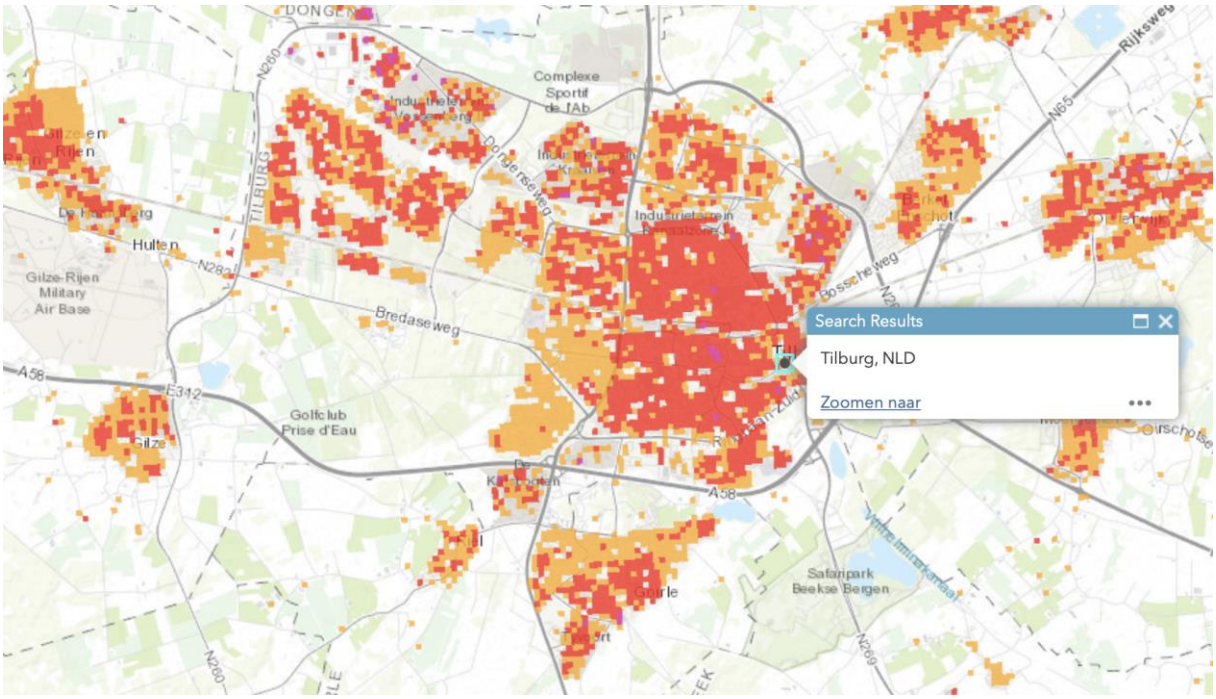

Figure 5: Screendump of Tilburg from HRE4

Further analysis reveals that there is actually a lot of heat activity in the region, albeit not centered around residual heat.

Existing district heating networks

District Heating Company Ennatuurlijk has a district heating network in the region with 46.000 households and 375 companies connected to the grid in the municipalities Breda, Tilburg, Oosterhout, Geertruidenberg, Drimmelen and Made, with a total heat supply of 2.700.000 GJ / year. See below for the district heating network in Tilburg:

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Figure 6: Tilburg DH network and info

In 2019, the majority of the heat is produced by a CHP called the Amercentrale that is fueled by coal and biomass. The national government is working on regulations that may impact the use of coal as a fuel in power plants. Therefore, Ennatuurlijk is currently working together with the municipalities, the province and grid operators to plan and design a futureproof and sustainable district heating network[2].

In order to do so, some things are considered:

- **Incorporate local, sustainable heat sources. See Annex 01 for further analysis of available residual heat sources and business parks.**
- **Replacing coal by more biomass, bio-oil and natural gas as fuel for the CHP. The latter may also be subject to regulations in the future since it is considered a fossil fuel as well.**
- **Improve the efficiency of the district heating network**

Status of the contact

Interreg project DOEN[3] (https://www.energie-makelaar.net) develops a new methodology under the name of 'energy matchmaker', an agent who helps to identify opportunities for energy savings and exchange and partners to capture those opportunities. The Dutch partners "Stichting MOED"[4] and "BOM"[5] have applied their methodology to several cases in Brabant. This was our initial avenue of contact.

The status of the contact is green:

- **Stitching MOED has so far shown interest in R-ACES and on 20-11 has been asked a formal response on the following R-ACES offerings:**
  - **Include, mention and promote Midden-Brabant as an ecoregion on the R-ACES website.**
  - **Include cases in the use case library as well as additional promotional or communication materials.**

2 https://ennatuurlijk.nl/sites/default/files/documenten/Notitie%20Toekomst%20warmtenet%20regio%20Midden_West%20Brabant.pdf

3 This project is already mentioned before in section 3.1 Belgium

4 Stichting MOED is a public-private organization that promotes energy reduction measures among companies & people

5 BOM is an abbreviation for Brabantse Ontwikkelingsmaatschappij. It is an department of the Dutch province Noord-Brabant.

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- **Organize 'learning community' meetings, e.g. together with the 'energy matchmakers' to capture best practices and reflect on R-Aces tools.**
- **We have received positive feedback from MOED**

3.3.2 Opportunity 2: Industriepark Kleefsewaard

The NUTS3 region NL226 – Arnhem/Nijmegen receives a HRS priority of 1 in the HRE4, which is a very high priority region. There is a conventional excess heat ratio of 1.40. The opportunity focuses on the business park Kleefsewaard, that aims to be the most sustainable business park of the Netherlands by 2025.

Background and analysis of the region

NUTS 3 region
NUTS3 region: NL226 – Arnhem/Nijmegen
HRS Priority: 1 = Very high priority. Conventional excess heat ratio of 1.40.

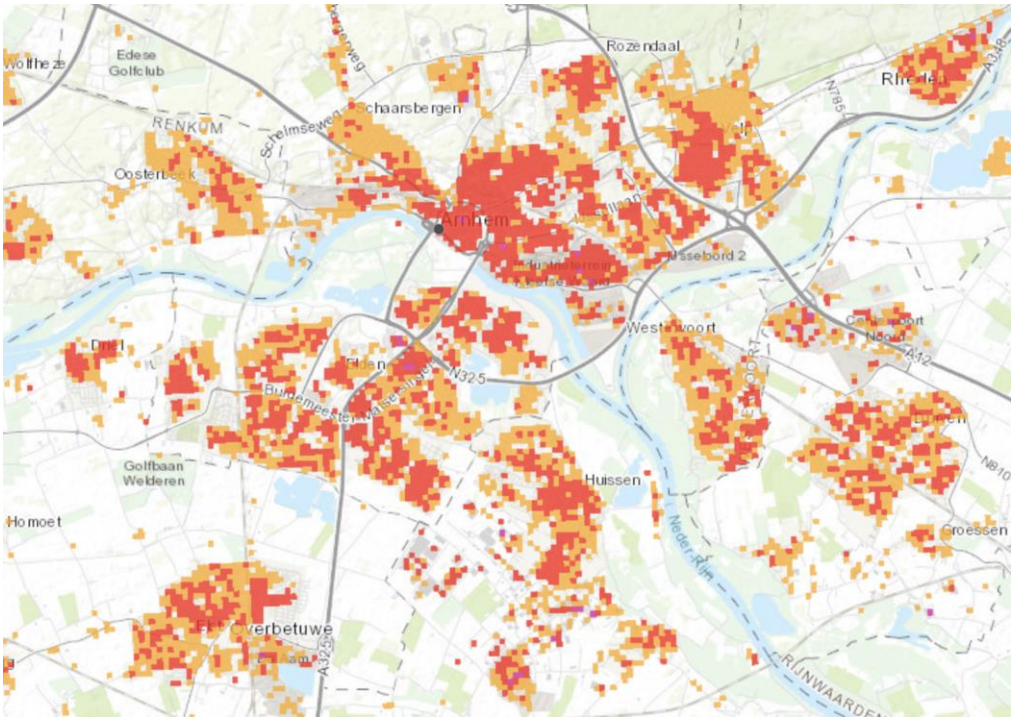

Figure 7: Screendump af Arnhem/Nijmegen from HRE4

Existing district heating networks

Vattenfall in Nijmegen: 6549 households and 11 business clients.
Vattenfall in Arnhem: 25.938 households and 293 business clients

Status of the contact
As mentioned earlier, Industriepark Kleefsewaard (short: IPKW) wants to become the most sustainable business park of the Netherlands by 2025. There are a lot of energy focused companies on the campus as well as several projects and even an innovation lab called Connectr.

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Based on the first contact we scheduled a videocall on 25-11 to discuss synergies / opportunities with R-ACES. The following opportunities were discussed and are the motivation for the green status:

- **ISPT / R-ACES will be included in the contact of Radboud University with IPKW where we can position the R-ACES offer as follows:**
    - **R-ACES can offer to promote the business park and all its initiatives with instruments such as the pledge and the use case library.**
    - **We can contact Connectr and see if we can help organize / facilitate meetings to share best practices and/or reflect on the R-ACES tools.**
    - **For more project related support we will explore if R-ACES can help with the Radboud Center of Green Information Technology.**
- **Contacts with IPKW will be set up at the end of November to explore the opportunities.**

3.4 Italy

Within Italy, the goal is to select 4 additional ecoregions. In this chapter, some more information is given on the selection process of these ecoregions.

3.4.1 Splitting up Lombardy in three ecoregions

In the preparation phase of the R-ACES project, the focus of contact has been with the large Italian regions and their energy clusters. The existing ecoregion within the R-ACES project is Lombardy which actually consists of multiple NUTS3 regions. During the first few months, the experience was that it is hard to activate stakeholders in ecoregions that have a big territory. Due to the fact that various stakeholders were very remoted from each other, it was hard to develop concrete energy cooperation projects.

Therefore, it was decided that the size of an ecoregion should enable the promotion of local energy cooperation. Accordingly, it was decided that the bigger Lombardy ecoregion should be divided into three regions: Milano, Brescia and Bergamo, corresponding to NUTS3 regions anyways. All three ecoregions are high priority, high impact regions and all have existing DH infrastructure. In the table below, you find some key facts about these regions:

Ecoregion	Heat supplied[6] [TWh]	Heated volume[7] [Mm3/year]	Network[8] [km]
Milano (additional)	1,2	42,5	317
Brescia (additional)	1,3	42,2	671
Bergamo	0,2	6,8	75

(Data is provided by R-ACES partner Spinergy)

[6] Heat supplied is the amount of heat that the system transport and deliver to the costumers.
[7] Heated volume is the total volume of water that the DH system transport pr. year.
[8] Network is the DH system length in km

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3.4.2 Search for additional ecoregions

As the division of the Lombardy ecoregion resulted in two additional ecoregions, two other ecoregions were still needed. Within Italy, there are several options.

First of all, partners of the R-ACES project are actively participating in a working group for industrial symbiosis. The R-ACES project was presented during one of the working group meetings and the cluster managers of Piedmont, Tuscany, and Emilia-Romagna were positive regarding eventual participation in the R-ACES project. Below, some more information is given regarding the respective ecoregions:

- **Piedmont: There are two district heating development areas around Torino and Alba. Both local regions might be interesting**
- **Tuscany: The area around Pisa and/or Grosseto might be interesting to establish a R-ACES ecoregion, since both areas have a lot of affinity with district heating.**
- **Emilia-Romagna: The most suitable areas for developing a district heating network are around Ferrara and/or Imola.**

However, before to proceed forward, the cluster managers reported that they need some more information on the tools. Therefore, it was decided that these regions could only be involved in the project at a later stage (after some of the tools are ready).

Next to the contacts through the national platform, also other contacts were established. Contact was established with the smaller region Castegnato. Within this area, there is a district heating network available. Due to some circumstances the network is not optimally used. The R-ACES partners contacted the local energy manager to investigate the potential involvement of Castegnato as an ecoregion. It was decided to involve the Castegnato ecoregion as soon as the self-assessment tool is ready in the R-ACES project.

Contact was also established with the potential ecoregion Trentino Alto Adige. The local managers showed general interest, in particular to the possibility of innovation. It was indicated that more information on the tools was required, before giving a definitive feedback.

3.5 The seven selected ecoregions

From the feedback from each partner country the prioritized list below shows 8 main regions (NUTS3 level) and in total of 11 local ecoregions that have given positive indications to participate in the next phase of the project – WP4 expand.
The detailed contact excel file is in annex 02 – Table for contact.

The selected regions are listed below:

Table 2: The selected seven additional regions

Country	**NUTS3 region**	**Local ecoregion**	**Explanation of status**
Netherlands	**Midden -Noord - Brabant**	**Tilburg**	**Ecoregion is involved**
Netherlands	**Arnhem/Nijmegen**	**Kleefsewaard**	**Contacts have been established**
Italy	**Lombardy**	**Milano**	**Ecoregion is involved**
Italy	**Lombardy**	**Brescia**	**Ecoregion is involved**

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Italy	**Lombardy**	**Castegnato**	**Contacts have been established**
Italy	**Tuscany**	**Pisa and/or Grosseto**	**Positively interested, final confirmation after more is known about the R-ACES tools**
Italy	**Piedmont**	**Torino and/or Alba**	**Positively interested, final confirmation after more is known about the R-ACES tools**
Italy	**Emilia Romagna**	**Ferrara and/or Imola**	**Positively interested, final confirmation after more is known about the R-ACES tools**
Belgium	**Ghent**	**Ghent**	**Contacts have been established**
Denmark	**Østsjælland**	**Kalundborg**	**Contacts have been established**
Netherlands	**Groot-Rijnmond**	**-**	**Not interested to participate at this moment**
Italy	**Trentino Alto-Adige**	**-**	**Interested, but more information on tools is required**

4. Conclusion

Based on key reference sources, we established a long list of replication high potential, high impact regions providing a broad perspective that will be the starting point for downstream tasks and Work Package 4 that will develop the roadmap for these regions, and WP5 aimed at disseminating R-ACES outcomes to additional replication high priority, high impact regions.
In this deliverable a list of 11 additional ecoregions in 8 main regions has been selected. The selection har been based on a qualitative approach with input from the local partners and their local knowledge and contacts. The number of selected ecoregion exceeds the target which has been evaluated as positive due to final success of the R-ACES project.
The deliverable's outcome represents an important step forward in the R-ACES project, since it enables the identification of high priority, high impact regions. Another key result is the developed heuristic harmonized approach to define inclusion criteria of regions for the countries targeted by R-ACES.

4.1 Link to WP4

The contacts with the regions and discussions amongst the different countries helped shape the requirements for the selection of the regions in WP4 – Expand as well as define what R-ACES can offer for ecoregions.

Suggestions for further involvement of the ecoregions:

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- **At least one of our tools is used in a number of business park cases and for a number of cases on industrial sites**
- **The stakeholders in the ecoregions attend at least two learning community meetings**
- **The ecoregion fulfills one of the criteria below**
    - **There is a heat network within the region, and the further development of this heat network must certainly be planned**
    - **There is not yet a heat network within the region, but there are concrete plans to develop a heat network in the region (meaning that there is already a map of the potential future heat network/ a first feasibility study has been conducted).**
- **Somewhere a form of their ambition has been expressed, albeit on our site via a pledge, albeit in a different way to which R-ACES can then refer**
- **R-ACES has a contact person within the region but later also with the individual industrial sites**

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5. Annexes

5.1 Annex 01 – Further details and analysis of the Netherlands

Opportunity 1: NL412- Midden-Noord-Brabant

Background and analysis of the region

NUTS 3 region
NUTS3 region: NL412 – Midden-Noord-Brabant
HRS Priority: 0 = No priority. Reason: no data available about excess heat.

Medium-High temperature residual heat sources
Medium-high temperature residual heat sources are obtained from the National Heat atlas of the Netherlands.

Municipality	Name	Heat source temp	Capacity	Availability class*
Tilburg	Agristo NV	Unknown	14.5 MW	C
Tilburg	Essent Stadsverwarming Tilburg	Unknown	Unknown	B
Tilburg	Fujifilm Manufacturing Europe BV	Unknown	Unknown	B
Tilburg	IFF Nederland BV	Unknown	Unknown	B
Dongen	Trobas Gelatine BV	Unknown	Unknown	B
Alphen-Chaam	Gasunie Alphen en Riel	Unknown	Unknown	B

* Availability classes: A = Planned realization by 2030. B = Available and remains available in 2030. C = Available, but not available after 2030.

Low temperature residual heat sources
Low temperature residual heat sources produce heat at a low temperature and can sometimes be used to directly heat buildings and indirectly produce warm tapwater (using a heatpump to increase the temperature). For industrial processes, the temperature is usually too low for direct heating, but may be subject to heat recovery. These sources are often prevalent in 4th generation district heating when buildings are better insulated, thermal grids are smart and localized. The capacity can add up, some examples using the National Heat atlas of the Netherlands[9]:

- **Slaughterhouses, e.g. in Tilburg there are a few with capacity of 3 MW each.**
- **Water management facilities for 'aquathermal heat', heat recovery from waste water, surface water or drink water. E.g. in Tilburg there is a water pump station with a capacity of 3 MW.**

[9] For a full list, https://www.expertisecentrumwarmte.nl/documenten/documentenpagina+uitvraag+warmtebronnen+proeftuine/handlerdownloadfiles.ashx?idnv=1518609.

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- **Supermarkets, often clustered in mall centers and collectively may have enough capacity for a small localized low temperature district heating system.**
- **Data centers, e.g. there is a data center in Loon op Zand (near Tilburg) with a capacity of 13 MW (Alticom Loon op Zand).**

Business parks

The region of Midden-Noord-Brabant has 132 business parks registered in the national database IBIS (1-1-2019), of which 40 are located in the municipality of Tilburg, an area of about 1600 gross acres. 32 business parks have a maximum 'environment category' of 3, which CE Delft considers as the minimum category of interest for residual heat[10] for low temperature district heating.
14 business parks have a maximum of 4 or 5. These business parks may be interesting for higher temperature district heating. See list below:

Municipality	Name	Location
TILBURG	VOSSENBERG	A
TILBURG	LOVEN	C
TILBURG	KRAAIVEN	B
TILBURG	WIJKEVOORT	M
TILBURG	VOSSENBERG WEST II	A
TILBURG	VOSSENBERG-WEST I	A
TILBURG	KATSBOGTEN	F
TILBURG	KANAALZONE	D
TILBURG	HET LAAR	E
TILBURG	BEDRIJVENPARK SCHEPERSVEN	K
TILBURG	ALBION	H
TILBURG	VOSSENBERG SCHEG	A
TILBURG	PIUSHAVEN	Not indicated on the map
TILBURG	VOLTCOMPLEX	Not indicated on the map

[10] https://www.rvo.nl/sites/default/files/2019/04/Functioneel%20ontwerp%20LT-warmtenetten.pdf; functional requirement for the VESTA/MAIS model, which underlies the national model 'Startanalyse' of PBL and ECW.

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Energy-related initiatives

- **Wijkevoort (M) is a new development business park of 80 acres that will be energy neutral.**
- **Branche organization Vitaal Kraaiven-Vossenberg participates in the green deal to accelerate energy transition in the region. MOED contacts individual businesses to explore the opportunities, which starts with an Energy Scan.**
- **Agreement between Ennatuurlijk, grid operator Enexis, province and municipalities to improve the energy mix of the district heating grid.**
- **The region is part of the Regional Energy (and climate) Strategy of 'Hart van Brabant'[11], currently in concept stage. Part of the strategy is to see whether the green deal business parks can be expanded to other business parks in the region. Furthermore, wind power is being explored for businesses together with OMWB, BOM and the region.**
- **At the municipality level, local governments develop the Transitievisie Warmte by 2021. Currently in research stage and with a focus mostly on the residential areas. Furthermore, the municipality of Tilburg has the ambition to become climate neutral in 2045. Furthermore, the municipality participates in 10 European projects, for example in Interreg and H2020.[12]**
- **At the province level, the regional government has the ambition to become energy neutral in 2050. [13] Part of the strategy is the use of 30 MW residual heat in EnergywebXL (in neighbouring NUTS3 NL411).**

Opportunity 2: Industriepark Kleefsewaard

Background and analysis of the region

[11] https://www.regio-hartvanbrabant.nl/images/dowloads_in_teksten/REKS/concept-bod-2020-03/20200324-concept-bod-reks-hvb.pdf
[12] https://www.tilburg.nl/stad-bestuur/bestuur/europese-projecten/
[13] https://www.brabant.nl/onderwerpen/energie/energiebeleid

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NUTS 3 region

NUTS3 region: NL226 – Arnhem/Nijmegen
HRS Priority: 1 = Very high priority. Conventional excess heat ratio of 1.40.

Medium-High temperature residual heat sources

Medium-high temperature residual heat sources are obtained from the National Heat atlas of the Netherlands. Selected on Arnhem, Nijmegen and Duiven (near district heating network).

Municipality	Name	Heat source temp	Capacity	Availability class*
Arnhem	De Kleef BV	Unknown	Unknown	B
Arnhem	Titan Wood	Unknown	Unknown	B
Arnhem	Teijin Aramid BV	Unknown	Unknown	B
Duiven	Nuon HWC Westervoort (STEG)	Unknown	Unknown	B
Duiven	AVR Afvalverwerking BV (AVI)	Unknown	Unknown	B
Nijmegen	ENGIE Energie Centrale Gelderland (STEG)	Unknown	Unknown	B
Nijmegen	Nijmegen IJzergieterij BV	Unknown	Unknown	B
Nijmegen	ARN BV	Unknown	Unknown	B
Nijmegen	UMC St Radboud en Radboud Universiteit Nijmegen	Unknown	Unknown	B

* Availability classes: A = Planned realization by 2030. B = Available and remains available in 2030. C = Available, but not available after 2030.

Low temperature residual heat sources

Low temperature residual heat sources produce heat at a low temperature and can sometimes be used to directly heat buildings and indirectly produce warm tapwater (using a heatpump to increase the temperature). For industrial processes, the temperature is usually too low for direct heating, but may be subject to heat recovery. These sources are often prevalent in 4th generation district heating when buildings are better insulated, thermal grids are smart and localized. The capacity can add up, some examples using the National Heat atlas of the Netherlands[14]:

- **Water management facilities for 'aquathermal heat', heat recovery from waste water, surface water or drink water. E.g. in Duiven there is a sewage treatment facility RWZI Nieuwgraaf with a capacity of 25.89 MW.**
- **Supermarkets, often clustered in mall centers and collectively may have enough capacity for a small localized low temperature district heating system.**
- **Data centers, e.g. there is a data center cluster in Arnhem (Akzo Nobel, Datacenter Arnhem, Dataplace Arnhem) with a capacity of 13 MW each.**

Business Parks

The region Arnhem/Nijmegen has 119 business parks registered in the national database IBIS (1-1-2019), of which 34 are located in the municipality of Nijmegen, Arnhem and Duiven, an area of about 1371 gross acres. 17 business parks have a maximum

[14] For a full list, https://www.expertisecentrumwarmte.nl/documenten/documentenpagina+uitvraag+warmtebronnen+proeftuine/handlerdownloadfiles.ashx?idnv=1518609.

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'environmental category' of 3, which CE Delft considers as the minimum category of interest for residual heat[15] for low temperature district heating.
17 business parks have a maximum of 4, 5 or 6. These business parks may be interesting for higher temperature district heating. See list below:

Municipality	Name
Arnhem	Rijnpark
Arnhem	Het Broek
Arnhem	IJsseloord II
Arnhem	**Industriepark Kleefsewaard**
Arnhem	Kleefse Waard BASF
Arnhem	Kleefse Waard Westervoortsedijk
Duiven	Innofase
Duiven	Innofase uitbreiding
Nijmegen	Bijsterhuizen (Nijmegen/Wijchen)
Nijmegen	Oost-Kanaalhaven
Nijmegen	West Kanaaldijk
Nijmegen	Winkelsteeg NXP
Nijmegen	Noord-Kanaalhaven
Nijmegen	Winkelsteeg Compaq
Nijmegen	Industrieplein
Nijmegen	Brabantse Poort

Industriepark Kleefsewaard was selected as an interesting business park for R-ACES, see energy-related initiatives.

Existing district heating networks

Vattenfall in Nijmegen: 6549 households and 11 business clients.
Vattenfall in Arnhem: 25.938 households and 293 business clients.

Energy-related initiatives of Industriepark Kleefsewaard

1) 'Cleantech campus of the future', ambition to become the most sustainable business park of the Netherlands by 2025. [16]
2) IPKW is partnered with Veolia and working on valorizing waste energy streams on the campus as well as solar roofs/fields, regeneration of heat from cooling installations, installation of a biomass boiler and connection to district heating network and 4 wind turbines.
3) Regional Energy Strategy Arnhem-Nijmegen.
4) Innovation lab 'Connectr' on the campus aims to become 'the place where innovations in the field of new energy are born and nurtured'.[17]
5) Radboud Center for Green Information Technology focuses on innovations and information technology that safeguard a sustainable future for us and the planet. [18]

[15] https://www.rvo.nl/sites/default/files/2019/04/Functioneel%20ontwerp%20LT-warmtenetten.pdf; functional requirement for the VESTA/MAIS model, which underlies the national model 'Startanalyse' of PBL and ECW.
[16] https://www.ipkw.nl/future-map/
[17] https://connectr-lab.nl
[18] https://www.ru.nl/science/research/green-information-technology/

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5.2 Annex 02 – Table for contact

This has been prepared by task leader Energy Cluster Denmark for the partners to fill in the contacts with the local regions.

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Country** (choose from drop down list)		**NUTS3 region name** (choose from drop down list)	**Type of contact** (choose from drop down list)	**NAME of company**	**NAME of contact**	**Role in the company**	**Contact information**	Evaluate and classify as "green", "yellow" or "red" according to their engagement and willingness to participate (paint the cell)	Notes from contact e.g. "Green strategy", Established collaboration, interest, expression of willingness to participate,	Date for last contact	Date for follow up actions
2	Netherlands		West -Noord -Brabant	Other...			Project advisor and director				17-nov	30-nov
3	Netherlands		Arnhem/Nijmegen	Other...			Associate professor				25-nov	30-nov
4	Italy		**Toscany**	Business Parks			cluster manager				11-nov	jan-21
5	Italy		**Piedmont - Turin**	Business Parks			senior expert				13-nov	jan-21
6	Italy		**Emilia Romagna**	Business Parks			cluster manager				13-nov	jan-21
7	Italy		**Lombardy - Castegnato**	District Heating Company			Energy Manager					
8	Belgium		Gent	Other...			Project coordinator DOEN					
9	Denmark		**Østsjælland**	Business Parks			Senior Symbiose Developer				25-11-2020	january 2021
10	Netherlands		**Groot-Rijnmond**	Local or regional government			Policy maker Business Parks				16-okt	
11	Italy		**Piedmont - Alba**	Business Parks			Sales manager					
12	Italy		**Trentino Alto Adige**	Business Parks			Member Service				27-nov	jan-21
13	Netherlands			Industrial Excess Heat facili			Sr. process automation specialist					

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