# RegEnergy

"An insight into strong urban - rural partnerships across North-West Europe"


# IMPRINT

Published May 2022

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Klima-Bündnis der europäischen Städte mit indigenen Völkern der Regenwälder | Alianza del Clima e. V. Amtsgericht Frankfurt am Main | VR10149 |Ust.IDNr. DE244331692 | Vorstandsvorsitzende: Andreas Wolter & Tine Heys

# FOREWORD

## RENEWABLE ENERGY REGIONS

Maximise the share of renewable energies in the production and consumption mix in 9 regions of North-West Europe – that is our aim. We are 9 project partners from seven counties and seek to improve the region's carbon footprint. An important task considering that NWE is one of the EU's highest energy consuming regions, currently still heavily dependent on non-renewable energy sources.

As different as we are – from metropolitan regions, cities, rural communities, regional agencies, scientific institutions and renewable energy producers - we all adopt one common approach: building strong partnerships that connect the rural production with the urban demand of renewables.

On the following pages, we present our projects and provide insights into the challenges.

We invite you to get inspired by our experiences! Discover possibilities for turning waste into renewable energy, for the active support of municipalities for energy communities, or for smart solutions that can help dealing with limited grid capacity and an intermittent renewable energy supply.

You would like our support or to exchange ideas on how to build up your partnership? Please get in touch with us!

For the whole RegEnergy team,

S. Enke

Svenja Enke
Lead Partner, Climate Alliance

# CONTENT



Ernesettle solar array, Plymouth, United Kingdom

Interreg North-West Europe RegEnergy

European Regional Development Fund

## RENEWABLE ENERGY – URBAN DEMAND & RURAL SUPPY

Urban areas are heavy energy consumers with limited potential for renewable energy production. Rural areas have large capacities to offer renewable energy, but limited energy consumption.

## PARTNERSHIPS FOR RENEWABLE ENERGY – A WIN-WIN SITUATION

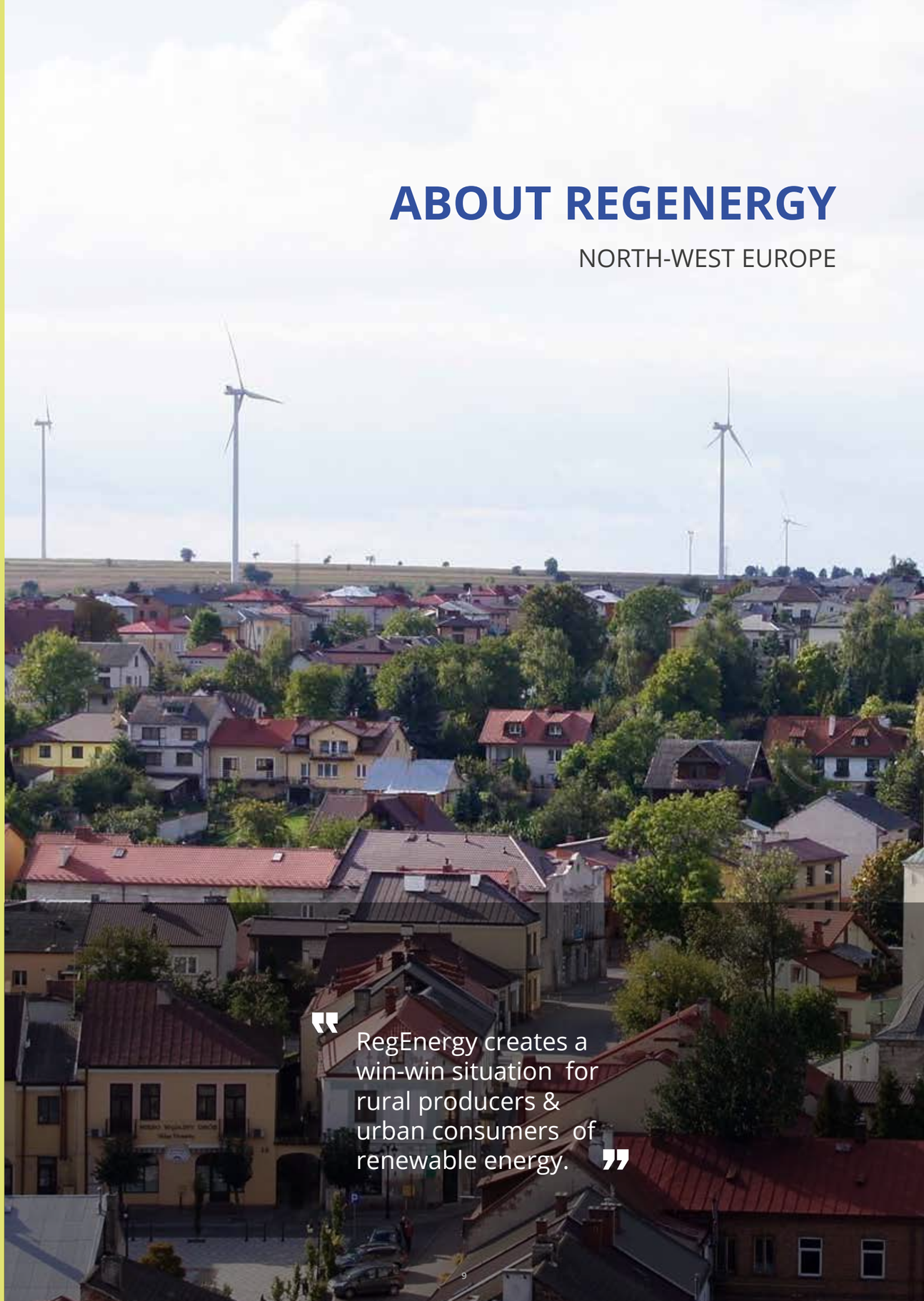
Urban consumers meet their renewable energy demands from reliable regional supplies. Rural renewable energy producers get access to urban consumers.

RegEnergy thus creates a win-win situation for rural producers and urban consumers of renewable energies.



# ABOUT REGENERGY

NORTH-WEST EUROPE



# THREE STRATEGIC FIELDS OF ACTION

Manifold barriers stand in the way of urban-rural partnerships. Bringing together the expertise of Metropolitan regions, cities, rural communities, regional energy agencies, scientific institutions and renewable energy producers can help to tackle those barriers.

You will discover concrete examples of partnerships and projects which address main barriers preventing the urban-rural cooperation in the field of renewable energy:

### Organise urban rural partnerships for renewable energy

The elaboration and implementation of optimal institutional and administrative arrangements - such as cooperation agreements between cities and countryside – is necessary to overcome administrative barriers preventing urban-rural cooperation for renewable energy;

### Connect renewable energy producers and consumers

We observe decentralised and diversified producers of RE. Producers of RE are increasingly diversified and decentralised. The development of infrastructure networks - such as networks for heat and pipelines for transport of biogas from rural to urban areas - is necessary to connect them with consumers of renewable energy;

### Smart solutions for renewable energy growth

The development of technological solutions – such as smart grids or storage capacities – is necessary to manage the intermittent character of electricity production coming from regional wind and PV installations.



# PARTNERS INVOLVED

- Climate Alliance (Lead Partner) | DE
- Brest métropole with Local Energy Agency of West Central Brittany, Kreiz Breizh local authority and City of Brest | FR
- Flux50 with Ecopower and Vrije Universiteit Brussel | BE
- Plymouth City Council with Creacombe Solar CIC | GB
- Waterstromen Etten BV with Waterstromen | NL
- 3 Counties Energy Agency | IE
- PLANAIR | CH
- Waterford Institute of Technology with Údarás na Gaeltachta | IE
- Ormonde Upgrading Limited with Ormonde Organics Holdings Limited | IE

# ORGANISE URBAN-RURAL PARTNERSHIPS FOR RENEWABLE ENERGY

SOLAR WIND BIOGAS BIOMASS WASTEHEAT

# A NATIONWIDE NETWORK FOR RENEWABLE ENERGY REGIONS

GERMANY

**Region**
Rural and urban regions all over Germany

**Consumer / Demand by**
All types

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

Transforming the German energy supply system towards a regional full supply of renewable energies (RE) requires a better connection between urban areas where the energy demand is high, with surrounding rural areas where capacities and land is available to produce renewable energy. To do so, a better networking of decentralized stakeholders from German regions is needed. Due to the important number of different actors with heterogeneous needs that would be involved in a potential RE network, a challenge is to reconcile their different requirements and to find compromise between the actors. Another issue in building a national network for RE is the lack of structures: not every region has a coordination office for urban-rural planning or it is undersized. As a result, there is often a lack of objectives, strategies and concepts for urban-rural projects.

To better connect urban and rural areas for the development of RE, a more precise observation of GHG emissions in both types of areas is also needed, as well as a methodology for „cumulating" urban and peri-urban GHG emissions. Because of the different calculation methods currently used by diverse stakeholders, there is no uniform accounting basis for GHG monitoring. In Germany, the „BISKO" methodology (Bilanzierungs-Systematik Kommunal) is a standardised balancing method for local municipalities. It is recommended and partly used as a basis for subsidies, but it is not mandatory. Internationally, a kind of standard has emerged, but it is still interpreted very differently in some cases. In the GHG assessment of energy production, too, there is as yet no uniform accounting basis. But the greatest difficulty in GHG monitoring is the data acquisition, which is time-consuming and often incomplete, due to the lack of empirical data. Data protection is another issue, as the basis of GHG calculations is municipal data. Often these cannot be assessed at all, or only incompletely, due to data protection reasons.

> A better networking of decentralized stakeholders from German regions is needed.

## THE STRATEGY OF SUCCESS: BUILD A NATIONWIDE RENEWABLE ENERGY NETWORK

Climate Alliance created an initiative, Region-N, a network of German regional actors that promotes the transformation of our current energy system into a renewable, local and citizen-oriented one. The goal is for regions to be supplied 100% from renewables by 2030, to use their energy saving potential and thus strengthen climate protection. The initiative builds bridges between German regional actors through different activities such as providing an exchange platform, developing joint campaigns, exchanging knowledge and experience in expert forums and working groups or developing best practices and implementation tools.

The initiative was launched in late 2018 by using experiences and contacts from the former "100RE regions network" which existed from 2007 to 2016 and which stopped after

public funding expired. Several former partners and network members were reactivated, and together with a core of newly interested representatives from municipal und regional administration and RE associations, a new strategy for rebuilding the network was developed. In 2020 a survey among potentially interested new participants from municipalities and districts was carried out which gave insight into their specific needs, possible offerings and activities supporting RE transition in German regions. As a result, a positioning of the network was developed and agreed in two network meetings in 2020. In addition, the target groups of the network were specified and a marketing strategy was developed to address these potential participants and convince them to join the network.

To make the network more independent from public funding, a business case and an organisational model were developed at the beginning of 2021. This approach included the implementation of the network in the organisational structures of Climate Alliance and was thus discussed with Climate Alliance board members. This helped to promote acceptance within Climate Alliance towards "the network in the network". To avoid misunderstanding in external communications, Region-N has been furthermore labelled "An initiative of Climate Alliance for 100 percent RE in regions by 2030". The CA board also agreed on a proposed growth strategy – focusing on districts which are not CA members yet, winning them as CA members and using a part of the members' fees to finance the running of the initiative. As a result, Region-N activities have been gradually shifted towards the needs of districts which have an important coordination function among municipalities in German regions and have a strong demand for mutual exchange and best practice transfer on a German-wide level.

Regular events and meetings between members were organised and two working groups were established: the first is developing components of a campaign called "Roof PV for power, heat and mobility" aimed at SMEs. The second works on a planning and implementation guide for "regional heat supply".

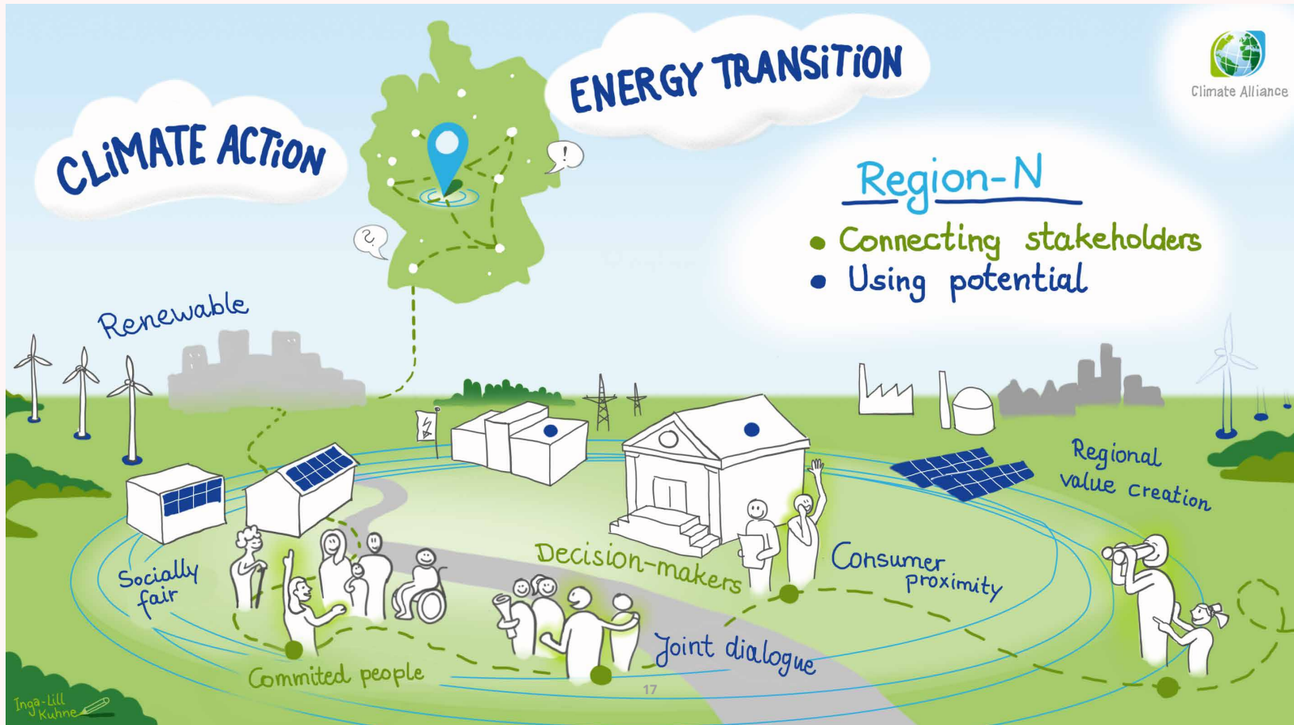
Moreover, Climate Alliance improved its $CO_2$ monitoring tool, the „Climate Protection Planner", with new functions to evaluate regional RE potential. The tool allows to model scenarios in which rural production and urban consumption of renewable energy are set in relation to each other. To get a better understanding of the actual user requirements in this respect, a survey among 8 users in charge of regional RE scenarios was carried out. As a result, a set of new indicators were identified, e. g. Share of RE in total energy consumption, Share of RE in heat, Share of RE electricity and Renewable generation by energy source, which are now implemented in the Climate Protection Planner and shall support municipalities in their decision-making processes with regard to RE expansion.



## OUTLOOK FOR THE FUTURE

The network is intended to grow and is everyday including new members such as administrative districts. The network will develop further its own business model in order to reach an independency from public funding and both communication and marketing activities will improve visibility and to attract further members, especially thanks to the creation of a newsletter and an official website.

Region-N mission



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## REGIONAL PARTNERS INVOLVED

- Representatives in the field of climate action and energy transition from municipalities and districtsrepresentatives from science and the administrations of districts and municipalities.
- Representatives from RE associations, regional / district associations, and public benefit oriented local companies

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK IN GERMANY

(As of 2022)

Positive trends

- Abolishment of the limitation of the expansion of PV (“PV Deckel”: Compensation for solar electricity fed into the grid for new photovoltaic systems drops to zero) by July 2020
- Implementation of a building energy law (Gebäudeenergiegesetz / GEG) strengthening RE by October 2020
- Abolition of the limit on PV expansion („PV cap“: feed-in tariff for new photovoltaic systems drops to zero) (July 2020)
- Decision by the federal government to make improvements to the Climate Protection Act (12.05.2021): In 2030, Germany is to emit 65% less $CO_2$ than in 1990 (instead of 55% so far)
- Plans of the new federal government (coalition agreement, Dec. 2021)
- 80% of electricity demand is to be covered by RE by 2030; agri and floating PV are also to be strengthened in order to achieve the target of a total of 200 GW of photovoltaics by 2030.
- Two percent of the state’s land area is to be designated for wind energy. Repowering projects are to be possible without major approval efforts.
- Municipalities are to benefit appropriately financially from wind energy plants and larger ground-mounted solar plants, also for existing plants.
- Acceleration of the switch to renewable energies also in the heat sector (target: 50 percent of heat should come from renewable energies by 2030).
- From 2022, the use of solar energy is to become mandatory for new commercial buildings throughout Germany.

Ongoing challenges:

- Distance rule of wind turbines (1.000 meters away from residential buildings)
- NIMBY resistance by citizens to RE (e.g. in the expansion of wind energy)
- Lack of financial and human resources for climate action in municipalities – also due to the Covid situation

WIND SOLAR BIOMASS

# MULTIFACETED AGREEMENT BETWEEN CITY AND COUNTRYSIDE

FRANCE

**Region**
Brest métropole and the surrounding rural areas, Brittany, France

**Renewable Energy Type**
Photovoltaic, Wind, Wood

**Consumer / Demand by**
Public Service Buildings

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

Brest métropole has been created in 2015. As an intercommunal structure, it gathers 8 communes representing around 207,000 inhabitants. Brest is a harbour city located on the Atlantic coast in Brittany, western France. In 2015, France launched an experimental scheme to promote inter-municipal cooperation, called 'city-countryside reciprocity contracts' (in French: "contrat de réciprocité ville-campagne"). The aim is to close the gap between urban and rural areas by promoting win-win partnerships in areas such as the environment and energy transition, or the economic development.

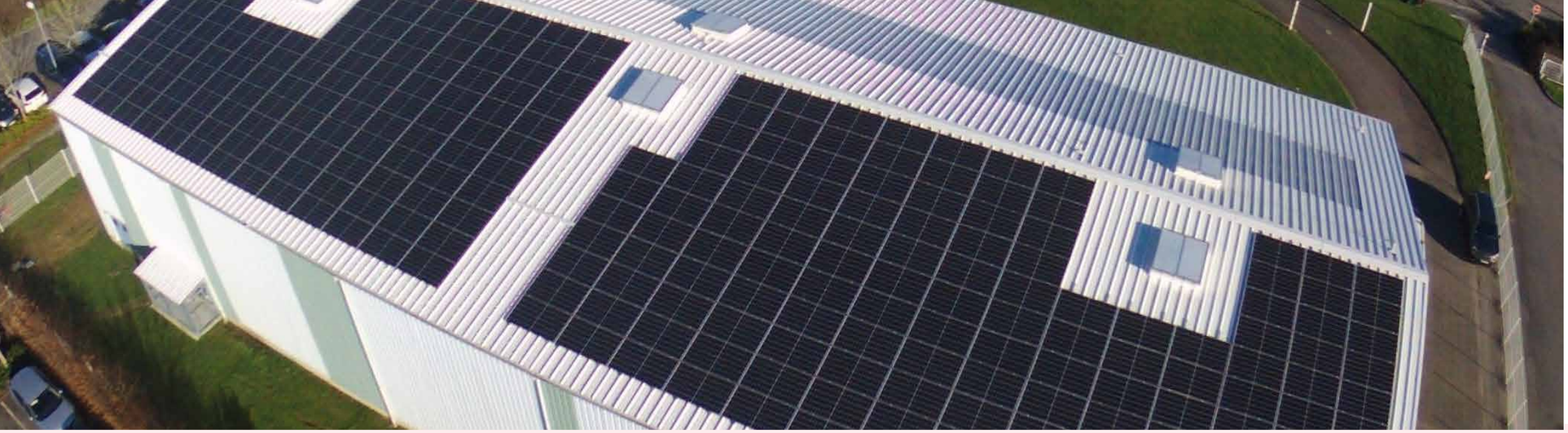
The Brest metropolitan area and the county of Central West Brittany (COB) represent the first urban-rural partnership to have officially signed a contract in 2016, defining joint workflows for economic development, culture, health, energy and the environment. The city-countryside reciprocity contract wants to valorise the complementary differences of the two territories: Brest métropole is marked by the presence of managerial staff and a high youth index offers services. It offers equipment and engineering which should be able to feed the COB. Reciprocally, the COB (97,000 inhabitants) is marked by the presence of farmers and workers within an overall ageing population and is mainly oriented towards production and processing. It has a preserved nature and environment that can benefit the territory of the metropolis. The cultural richness of the two territories represents an important potential for exchanges and cooperation.

The urban area of Brest métropole addresses issues preventing the significant development of renewable energies (RE), especially because the general development of RE in France faces several constraints:

- Slowness of procedures, lack of social acceptance and of space;
- Administrative processes, jurisdictions and economic models are often complex;
- Common treatment of the differing solar gain of northern and southern parts of the country, making projects in the northern part less interesting (higher tariffs) for the Energy Regulation Commission (CRE), which, in turn, launches calls for tenders for the production of RE;
- In terms of investment, local authorities are not allowed to engage outside their territory, a challenge which is being tackled via the reciprocal institutional agreement.

## THE STRATEGY OF SUCCESS: URBAN-RURAL CONTRACTS ACROSS ADMINISTRATIVE BOUNDARIES

Brest métropole (BM) and the county of Central West Brittany (COB) are part of a reciprocity contract allowing them to establish a new form of inter-municipal collaboration and to overcome the institutional and administrative barriers. Brest métropole had the idea to link the production of RE in rural areas with the consumption of heat and electricity of buildings in urban areas. To do this, contractual and financial agreements were developed and implemented between the urban consumers from the one hand and the local and regionally centralised electricity producers of the rural territory on the other hand. The aim is to achieve the region as a regional "prosumer" involving regionally centralised and decentralised production and consumption and matching of rural wood production and urban heat production through the use of wood.



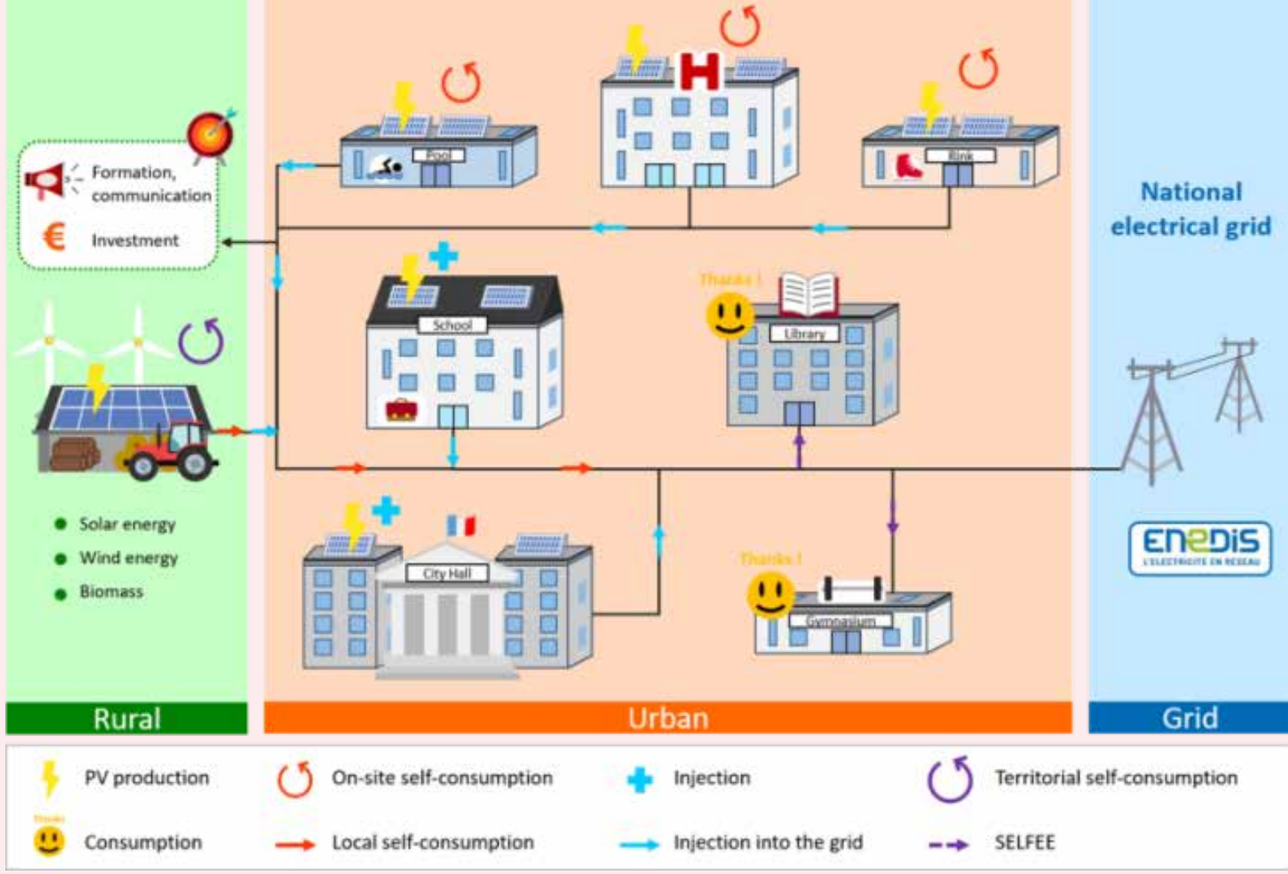
Gymnasium Le doaré,
Brest, France

This collaboration is embodied by working together across administrative boundaries help the territories to operationalize their cooperation by conducting concrete actions regarding RE production and the joint use of technology and know-how.

Each type of energy leads to the elaboration of a specific type of contract or agreement:

- wood energy: BM is developing projects on wood-fired heating and heating networks, fuelled by wood from the forestry sector in COB. This gives rise to wood supply contracts;
- wind power: BM supports the Kreizh Breizh Community of Municipalities in its wish to take part in the governance of wind farms, directly by taking a financial stake but also by encouraging citizen financing. BM would like to bring this type of action to other local authorities in Brittany in order to territorialise energy production;
- photovoltaic energy: BBM has developed a regional development strategy and tools such as the solar cadastre, which enables people to identify the sunlight potential of their roof, and thus to understand the relevance of installing solar panels. Within the framework of RegEnergy, not only solar plants are built, but BM also passes on its knowledge to the rural COB, where a solar cadastre is also being developed and further PV projects are being promoted;
- towards territorial self-consumption through the purchase of direct short-circuit electricity: BM is taking part in an experiment on the electricity market. The aim is to link the RE production and consumption of public buildings in the metropolitan area and the city of Brest, thereby avoiding the challenges of access to the grid and storage. A first contract is already in place concerning the production from waste-to-energy conversion in the Brest metropolitan area and the consumption of two buildings. In a second step, 30 buildings (4,000 Mwh) will be supplied with electricity (waste and PV from Brest métropole). A third phase could make it possible to purchase on the market a share of the electricity produced in COB from RE sources, thereby increasing the share of RE in the energy mix consumed in the metropolitan area.

> "The aim is to achieve the region as a regional "prosumer" involving regionally centralised and decentralised production and consumption and matching the production and consumption of electricity."




The system of urban rural territorial self-consumption

**Brest métropole**

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## OUTLOOK FOR THE FUTURE

In the short term, the Brest métropole would like to be able to continue cooperating with its local partners (urban/rural cooperation), notably through a joint feasibility study to develop the wood/energy link, heating network in the territories. Brest métropole will continue the development of territorial self-consumption and within this framework, the third phase of the planned system of urban rural territorial self-consumption – consisting in transforming this project into concrete actions - would turn into real with the collaboration of COB. Finally, actions will continue on photovoltaic energy and a regional roadmap on solar will reinforce them.

Gymnasium Foch, Brest



## REGIONAL PARTNERS INVOLVED

- Brest métropole (association of local authorities);
- City of Brest;
- County of Central West Brittany (COB);
- Local agencies: Ener'gence (Energy and Climate Agency of Brest), ALECOB (Local Energy Agency of West Central Brittany);
- Kreiz Breizh local agency;
- Public energy provider SOTRAVAL;
- Operator of territorial electricity consumption of local authorities, SELFEE.

## RENEWABLE ENERGY: THE FRENCH LEGAL FRAMEWORK

(As of 2020)

Electricity from RE sources:

- Feed-in tariff scheme (20 years), degressive price fixed by law, below 100 kW on buildings;
- Premium tariff "compensation mechanism" for some RE producers;
- Tax incentives (income tax, reduced VAT rate);
- Costs borne by end consumer;
- Collective Self Consumption & Energy Communities are still in their infancy. The development of PPAs (power purchase agreement), a purchasing agreement between existing production and consumers. Difficult to implement for local authorities but under consideration.

SOLAR

# COMMUNITY-OWNED RENEWABLE ENERGY

UNITED KINGDOM

**Region**
South West England, United Kingdom

**Renewable Energy Type**
Solar farms owned by energy communities in rural areas

**Consumer / Demand by**
Large consumers in the city of Plymouth

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

Plymouth City Council has established an independent community energy organisation, Plymouth Energy Community (PEC) that is developing new approaches to local energy generation, ownership and use. It has successfully secured over £1m (about 1,2 m EUR) in investment through crowdfunding for rooftop solar PV installations on city schools. These provide the schools with energy cost savings and surpluses are reinvested in projects that have community benefit, such as fuel poverty reduction initiatives. As the landscape of subsidies in the UK has changed, PEC has needed to explore alternative business models for developing solar projects on a commercial basis, including selling electricity by private wire where possible. Incorporating battery storage and smart metering are also now included as part of the business model assessments, as they allow for aggregation of usage, purchasing, sales and demand response where sufficient scales can be achieved.



Supplying Plymouth's energy needs with renewable energy requires more space than is available within the city boundary. Whilst there is still significant potential to exploit opportunities for commercial solar rooftop systems, more sources of renewable energy are needed. The rural hinterland provides opportunity, but the networks and partnerships that would link renewable energy generators/ suppliers with consumers needs to be developed, along with relevant business models. Grid constraints are also a significant barrier to the installation of new renewable energy capacity in the South West of England. As the energy sector continues to undergo a phase of intense innovation and market reform, creating networks between consumers and rural community energy organisations is supporting them to explore new opportunities to overcome the market constraints.

## THE STRATEGY OF SUCCESS: SOLUTIONS TO MATCH SUPPLY AND DEMAND

Through the RegEnergy project, Plymouth City Council has worked with two rural energy communities to explore practical ways to overcome the barriers. Plymouth Energy Community has been a pioneer in securing community finances to invest in renewable energy projects, the profits from which go back to support the community. And the City Council has also worked closely with Creacombe Solar Community Interest Company (CIC) to explore the business models for using Power Purchase Agreements to create a commercial business model to support investment in new renewable energy schemes.

> "Plymouth Energy Community has been a pioneer in securing community finances to invest in renewable energy projects"

## Creacombe solar farm:

Creacombe Solar CIC has worked with Yealm Community Energy, a member-owned Community Benefit Society established to bring local renewable energy installations into community ownership. It is clear that support for renewable energy projects in rural areas is enhanced by retaining a strong local economic benefit while contributing to local and national carbon-reduction targets. The Creacombe solar farm has been developed with a capacity of 7.3MWp, generating enough electricity to power the equivalent of 2,160 typical homes and saving an estimated 3,100 tonnes of carbon dioxide annually. The site comprises three fields (approximately 11 hectares) at Creacombe Farm, which is owned by Gnaton Farms, located 9 miles from Plymouth.

Solutions have been explored to match supply and demand through contractual agreements and battery storage:

- Battery storage to maximise income from local and national flexibility markets;
- Power Purchase Agreements or Contract for Difference (synthetic PPA) approach with a large urban energy consumer;
- Using procurement to ensure local benefit for public sector consumers;
- Different tariff structures depending on the matching of supply and demand.

## Ernesettle Community Solar:

In 2016, 8 hectares of derelict land in Ernesettle (north-west Plymouth) were transformed into a ground-mounted solar array, using £1m in community shares and providing huge benefits for the wider community. 16,000 solar panels were implemented, generating 4.1MW of clean renewable energy, enough to power over 1,000 homes.

Solutions have been explored to match supply and demand through private wire and battery storage:

- Physical private wire to reduce grid charges and maximise on-site consumption;
- Battery storage used to match solar generation and onsite consumption;
- Securing a long-term off taker and increasing income to a community benefit fund;
- Early engagement with distribution system operator to identify technical solutions.




Community ownership of the Ernesettle solar array, Plymouth

**Plymouth City Council**

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## OUTLOOK FOR THE FUTURE

Plymouth City Council will continue to work closely with Plymouth Energy Community and other community energy groups to explore commercial opportunities to develop new renewable energy projects. The two organisations are presently assessing the potential for a 13.2MWp community-owned solar farm on an old landfill site at Chelson Meadow, which will incorporate 33,000 panels, covering approximately 15 hectares.

Creacombe Solar CIC, Plymouth



## REGIONAL PARTNERS INVOLVED

- Energy communities including Plymouth Energy Community;
- Distribution system operator: Western Power Distribution;
- Large consumers: Plymouth City Council;
- Licensed energy supplier: Npower;
- Legal advisors: Stephens Scown;
- Battery consultant: Argand Solutions.

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK IN THE UNITED KINGDOM

- Ending of the feed-in-tariff for solar installations;
- Need for a subsidy free model to increase uptake of renewable energy;
- High grid connection costs for generators and usage costs for customers;
- Regulation dictates the need for a licensed energy supplier;
- Virtual trading of energy is difficult under existing regulation.

BIOGAS WIND BIOMASS SOLAR

# TOWARDS A NET ZERO CARBON SOCIETY

IRELAND

**Region**
Carlow, Kilkenny and Wexford regions, Ireland

**Renewable Energy Type**
Biogas, Wind, Biomass, Solar

**Consumer / Demand by**
Local Authority/Municipal Buildings, Citizens and Community groups

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

Ireland is currently launching an energy transition into a framework for an Energy policy to 2030 and outlines a transition to a low carbon energy system for Ireland by 2050. The Government has also recently detailed its commitments to transition Ireland to a low-carbon and climate-resilient society in the National Development Plan 2018-2027. A Sustainable Energy Authority of Ireland (SEAI) report summarised 52% of all renewable energy in Ireland for period 2010 – 2017 was from wind, and 39% was from bioenergy (SEAI, 2020).

GHG emissions from agriculture represent over 35% of Irish national emissions and are expected to increase further due to a projected increase in dairy cow numbers and proposals to increase food production and exports, as set out in Food Harvest 2020. Therefore, agriculture, the food and beverage industry and the rural communities have a vital role in aiding the decarbonising of the heat, transport, and electricity energy sectors.

Another challenge is to remove financial and institutional barriers to support communities in participating in the energy transition. Citizens and communities need to be supported both financially and technically and to be guided through the minefield of legislation and regulations around implementing energy projects. In Ireland, there is no easy way to organise citizens who want to cooperate in an energy sector for the betterment of their local communities.


## THE STRATEGY OF SUCCESS: 2-FOLD APPROACHES

The South-East is a predominantly rural region, and it has a significant bioenergy potential in the form of agricultural land, forestry, and waste residues from municipal, agricultural, and industrial sources. 3cea have identified available energy supplies from variable RE sources in the 4 counties (Kilkenny, Carlow, Wexford, and Waterford) with highlight of high production of biogas in the region. Bioenergy is likely to play a significant role in the growth of the renewable energy industry in South-East region of Ireland, particularly in the heating and electricity sectors.

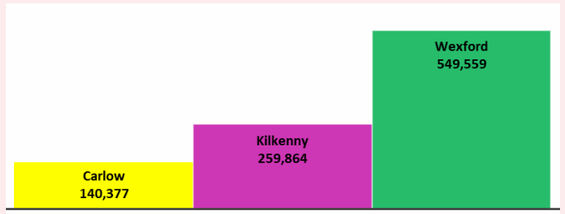
The 3-counties region has the potential to produce 752 GWh of biogas from different feedstocks currently available. The potential production of biogas can supply 8% overall energy demand in the 3-counties region. This potential can increase to about 5,088 GWh or 54.1% of the overall energy demand, with a different management of the land and of the livestock. The potential biogas production

Machinery Yard Kilkenny, Ireland

aligns with the availability of the feedstock with grass silage at 20% availability and is similar to the potential biogas production for the other feedstocks if available at 100%.

In 2020, 3CEA team conducted an analysis of the potential receptacle sites in the 3-counties region (Carlow, Kilkenny, and Wexford). The selection criteria for the demand sites are based on high visibility for the public, high $CO_2$ emissions reduction, SEAI's Monitoring & Reporting, and the decarbonisation of the natural gas grid.

3CEA aims to support the counties of Kilkenny, Carlow, Wexford and Waterford to reduce their $CO_2$ emissions by contributing to the implementation of best practices in the field of sustainable energy. As the project progressed, 3cea worked with RegEnergy partner, Ormonde Organics, to supply the biomethane for the gas fuelled heating boilers in the Machinery yard (Kilkenny) and Fire Station (Wexford).



AVERAGE HEAT CONSUMPTION OF THE TOP10

To create a net-zero carbon society a 2-fold approach is required: energy inefficiencies in our built environment must be eliminated and secondly, we must utilise renewable energy technology wherever possible. As an example, reducing Ireland's $CO_2$ requires the creation of a business model and a route to market for renewable biogas, which can be produced in rural locations to supply urban needs. An assessment and analysis of the renewable energy production and consumption within the 3 counties area is necessary to optimise the connection between rurally produced energy and urban consumers.

The regional agency wishes to elaborate a trusted approach to e-communities and citizen participation to achieve a net-zero carbon society e.g. through a REScoop as described by the European Federation of citizen energy cooperatives: REScoops are energy cooperatives, a business model where citizens jointly own and participate in renewable energy or energy efficiency projects. It also supports the citizens in better understanding the financial subsidies landscape, especially by deepening the state-of-the-art solutions to overcome financial barriers or by referencing innovative financial models and EU-funded projects.



## OUTLOOK FOR THE FUTURE

The long-term vision is to drive forward technology advancements to support efficient conversion of local energy supply to clean energy for the region. Displacing imported fossil fuels, creating local sustainable employment, increasing this regions contribution to the Climate Challenge.

Concrete Actions:

- Policy inputs to support decarbonisation at local, regional and national climate action planning towards 2030 emissions reductions targets.
- Use the science to demonstrate the capacity – technical actions.
- Annual reporting on the reduction of imported fossil with locally produced clean energy as gap to target for 2030.

RegEnergy will support rural RE supply meeting Urban energy demand:

- E-communities stream
- Biomethane through Virtual Pipeline for Public Sector Heat via SSRH
- Mapping available resource for BioEnergy from local supply chains
- Minimises transport carbon
- RES, REH, RET (Irish support schemes for renewable electricity, heat and transport).


Wexford Fire Station, Ireland

**3 Counties Energy Agency**

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## REGIONAL PARTNERS INVOLVED

- Ormonde Upgrading Ltd.
- Carlow County Council
- Wexford County Council
- Waterford City Council
- Kilkenny County Council
- City of Callan (Kilkenny's Energy Town)
- BioXL
- Community Renewable Energy Supply (CRES)/ Community Power
- MullanGrid
- Waterford Institute of Technology

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK FOR THE CASE STUDY IN IRELAND

(As of 2020)

Ireland is committed to a low carbon and climate resilient future by 2050 and meeting the targets of the EU Framework for climate and energy. Ireland is currently launching an energy transition into a framework for an Energy policy to 2030 and outlining a transition to a low carbon energy system for Ireland by 2050. The Government has also recently detailed its commitments to transition Ireland to a low-carbon and climate-resilient society in the National Development Plan 2018-2027.

By 2030, 32 % of average gross final consumption of energy of the EU member states should be covered from renewable sources, with the option to revise the target upwards after a review in 2023. Ireland's national Renewable Energy Action Plan (NREAP) intends to achieve individually binding national Renewable Energy targets of 16% of energy demand by 2020, through 40% of electricity consumption, 10% of transport energy and 12% of heat energy being obtained from renewable sources.

The Climate Action Plan 2021 sets out a detailed roadmap designed to deliver 51% reduction in greenhouse gas (GHG) emissions by 2030. Ireland already started on the transition with significant progress over the last two years. Massive capital investment programs are under the National Development Plan (NDP) which includes:

**Electricity**

- First Renewable Electricity Support Scheme (RESS)
- Community benefit funds and community energy projects support under first renewable electricity auction

**Transport**

- New grant scheme launched to assist in purchase of more sustainable trucks, buses, vans and coaches
- €360 million granted to support the delivery of improved walking and cycling infrastructure
- New Scheme for 200 on-street public charge points per year for electric vehicles

**Public Sector**

- New regulations to phase out fossil fuel vehicles in public fleets

**Buildings**

- Development of 'One-Stop-Shop' mode for residential and commercial energy efficiency upgrades
- Establishment of a dedicated training centre for upskilling construction workers to near zero energy building standards

# CONNECT RENEWABLE ENERGY PRODUCERS AND CONSUMERS

BIOGAS

# BIOGAS FROM WASTE WATER SUPPLIES INDUSTRIAL CONSUMER

NETHERLANDS

**Region**
Province of Gelderland, Netherlands

**Renewable Energy Type**
Biogas, biomethane

**Consumer / Demand by**
Large industrial consumer, small consumers

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

Doetinchem is a city located in the Province of Gelderland, in eastern Netherlands, which comprises around 60,000 inhabitants. A paper mill is situated in the centre of Doetinchem, producing annually more than 1 million cubic metres carbon rich water as a by-product. This water is currently transported together with communal wastewater from Doetinchem city over a distance of 5 km to the waste water treatment plant (WWTP), located in the rural surroundings of the city.

This situation has different challenges and opportunities:

- By using anaerobic water treatment technology for the treatment of the carbon rich water of the paper mill biogas could be produced instead of electricity consumption for the aerobic treatment in the current situation. As the paper mill is located in the centre of Doetinchem, it is however not possible to do this at the premises of the paper mill.
- To make anaerobic treatment possible at the WWTP separate piping is necessary between the city and the WWTP, which is complex because it is a city area with many existing pipes, crossing of roads, railways, rivers and private land.
- Biogas produced at the WWTP can not be efficiently used at the WWTP location as there is almost no heat demand at this location. A biogas pipe between the WWTP and the paper mill would make it possible to supply biogas to the paper mill where it can be used for steam production.
- Biogas produced at the WWTP could also be supplied to households by upgrading the biogas to biomethane and making a connection to the grid.
- Existing tariff structures with low tariffs for large industrial consumers, high investments for piping, tax regulations and regulations for trading energy makes the supply of biogas to industrial consumers and households complex and the financial feasibility a challenge.

> In 2020, the paper mill of Doetinchem, Waterstromen and Waterschap Rijn en Ijssel signed an agreement to sustainably treat residual water from the paper mill and generate biogas in the process.

Waterschap Rijn Ijssel
pipeline construction and
wastewater treatment plant

# THE STRATEGY OF SUCCESS: CONNECTION BETWEEN INDUSTRY, WWTP AND ENERGY CONSUMERS

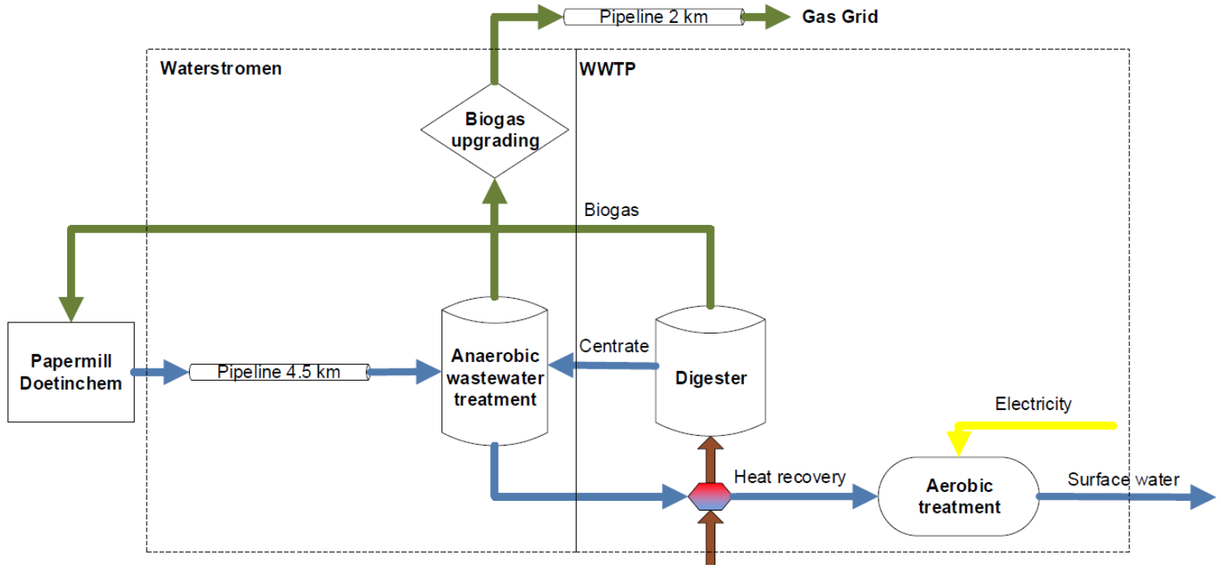
In this project Paper Mill Doetinchem, Waterstromen and Waterschap Rijn IJssel work together in this project aiming to treat the water of the paper mill in an innovative water treatment installation at the WWTP generating renewable energy and supplying energy back to the papermill and inhabitants of Doetinchem. To reach this goal piping is realized between the Paper Mill and the WWTP for transporting the water from the Paper Mill separate from the communal waste water to the WWTP location. By keeping it separate, it is possible to treat the water with anaerobic technology, for which a new anaerobic treatment installation is realized at the WWTP site. Biogas produced in the anaerobic treatment installation and biogas from the existing sludge digestion installation at the WWTP is supplied to the Paper Mill and to households. To make it possible to supply the biogas to the Paper Mill a biogas pipeline is realized in the same trench as the water pipeline between the Paper Mill and the WWTP. To make it possible to supply biogas to households a biogas upgrading unit is realised in which biogas is converted to biomethane. A connection to the natural grid is realized to inject the biomethane in the natural grid, which makes it possible to supply the biomethane to households.

This project is a big improvement in sustainability as biogas is produced instead of electricity consumption for the treatment of the industrial water. The produced biogas is efficiently used by supplying it to industry and households as alternative for natural gas. By producing biogas instead of using electricity and using the biogas as alternative for natural gas a total saving of 2,300 tonnes of $CO_2$ per year is realized, representing the natural gas consumption of around 1,000 households per year.

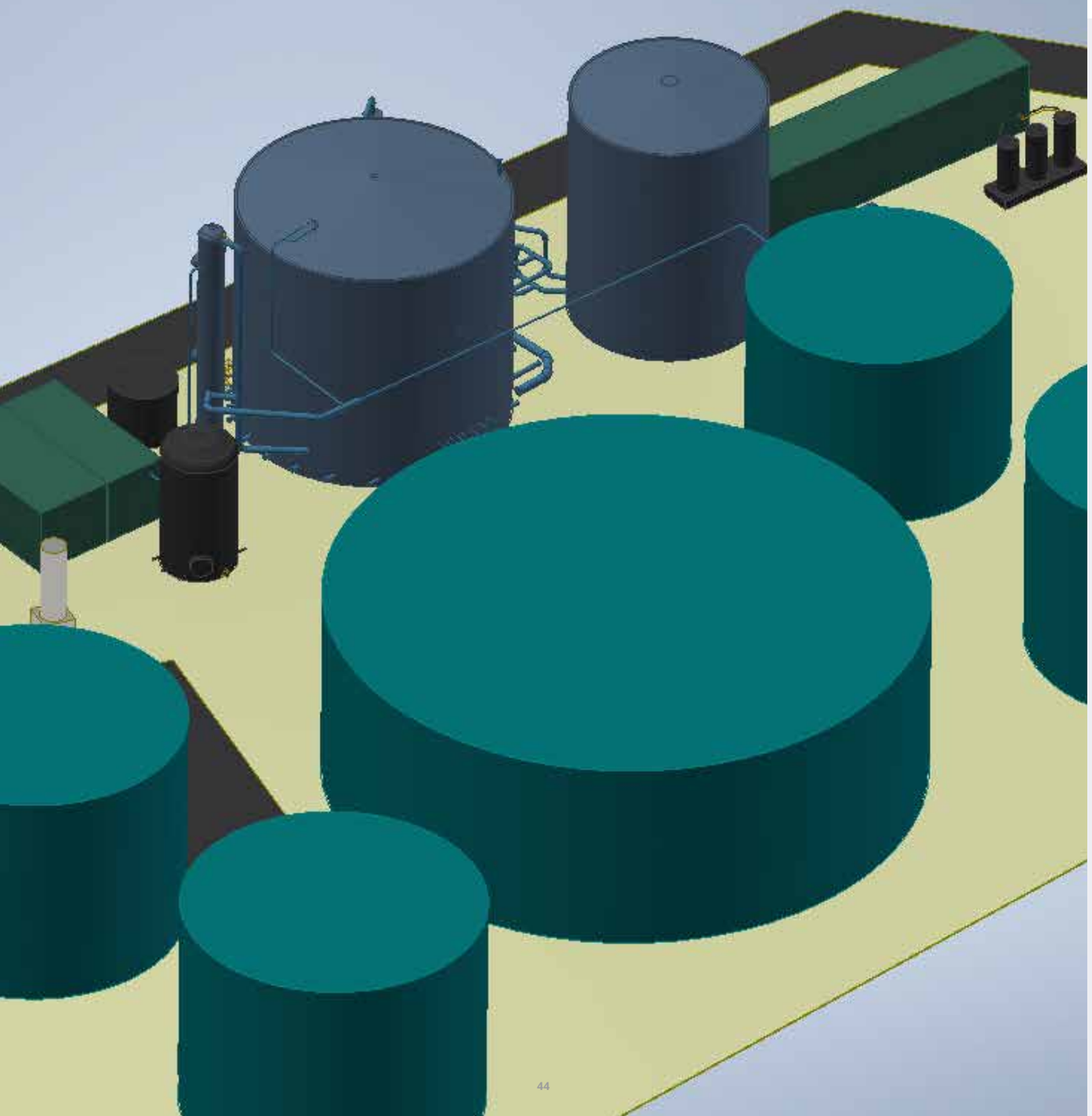
# OUTLOOK FOR THE FUTURE

The partners will work together to investigate and realize options to increase the biogas production at the WWTP and to connect more biogas producers and consumers along the pipeline. The combination of direct supply of biogas to large industrial consumers and the injection into the natural gas grid, is expected to give opportunities to come to an optimal balance between demand and supply of sustainable energy to replace natural gas.

It is the intention to implement the learnings in this projects to other industries with carbon rich water. Carbon rich water should be treated separately from communal waste water to make it possible to produce biogas. Produced biogas should be used as alternative for natural gas instead of using it for electricity production. In each situation an optimal situation of demand and supply of biogas and/or biomethane can be found, where the combination of different producers and different consumers on the same network leads to an optimal balance between demand and supply and also the possibility to make biogas production feasible for smaller producers of biogas.



Waterschap Rijn Ijssel
wastewater treatment plant,
future installation  (cutout)





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## REGIONAL PARTNERS INVOLVED

- Waterschap Rijn en Ijssel;
- Waterstromen;
- Papierfabriek Doetinchem;
- Provincie Gelderland;
- Land owners, consumers, infrastructure providers, maintainers, biogas suppliers.

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK IN THE NETHERLANDS

(As of 2020)

- Feeding bio methane in natural gas system permitted;
- Premium feed-in scheme Stimulation of sustainable energy production (SDE++ funding programme) for renewable energy used for electricity, renewable gas (only when injected into the grid as biomethane) and heat;
- Loans, tax benefits.

BIOGAS

# BUILD A SUPPLY-DEMAND CHAIN FOR BIOMETHAN

IRELAND

**Region**
Waterford, Kilkenny and Wexford regions, Ireland

**Renewable Energy**
Biomethane (purified renewable biogas)

**Consumer / Demand**
Heat and transport applications

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

The biogas/ biomethane industry in Ireland is underdeveloped when compared to its EU peers. Currently, in Ireland, biogas does not make a substantial contribution to the energy mix. However, the Sustainable Energy Authority of Ireland (SEAI) in its report entitled "Assessment of the Benefits of Biogas and Biomethane in Ireland" highlighted the significant potential for biogas production in Ireland. In this report, the SEAI estimates that if its potential is fully realised, biogas has the potential to displace up to 26.3% of Ireland's natural gas consumption by 2035. This biogas could be produced from a variety of sources including food waste, agri-food waste, sewage sludge, manure and grass silage. Biomethane is biogas which has been upgraded in a manner which allows this renewable gas to be used as a direct substitute for natural fossil gas.

Hence, whilst urban consumption currently relies on natural fossil gas, it is clear that the enabling of the renewable biogas industry in Ireland has the potential to displace fossil natural gas and make a significant contribution to Ireland's decarbonisation. However, in order to achieve this, a number of barriers need to be overcome including the absence of a clearly proven business model for the sector. At present the cost of biogas production is greater than the market value of natural fossil gas. Consequently, a support scheme is required to enable the development of the biogas sector. However, whilst a number of support measures have been put in place to encourage the production of renewable electricity and heat, no specific scheme has been introduced to encourage the development to the biogas sector in Ireland. In addition, the cost of connecting biogas production facilities to the national gas grid are high and the time required to obtain a connection agreement is significant. The foregoing factors mean that producers of biogas face significant challenges in getting their product to market.



## THE STRATEGY OF SUCCESS: A REGIONAL OFF-GRID SUPPLY-DEMAND CHAIN

In this context, there is a specific need to demonstrate the ability of renewable biogas to make a significant contribution to achieving Ireland's decarbonisation targets by implementing renewable energy partnerships between consumers of natural fossil gas and producers of biogas. The successful implementation of such a partnership could trigger a wider impact by raising awareness and by enhancing the confidence of consumers in the ability of biomethane to meet their energy needs.

The development of such a renewable energy partnership is enabled by leveraging existing infrastructure and by the development of

> "A viable off-grid solution is created through agreements and investments between the diverse producers, the supplier and the consumers in areas where it is difficult to create a local renewable energy network."

Co. Waterford, Ireland

the biogas upgrading facility required for the production of necessary amounts of bio-methane. The biomethane can then be delivered to the consumers by implementing an off-grid model which sees biomethane delivered by biogas producers directly to customers using specialist gas transportation and storage equipment.

The challenge is on one hand to outline to energy users (such as local government agencies) the benefits of decarbonising their energy consumption by transitioning from using natural gas to using renewable biomethane. On the other hand, it is to show to rural biogas producers (including farm enterprises) that it may be economically and technically feasible to upgrade rural biogas produced by them and to transport the resultant biomethane to consumers within the region. This exchange enables an entirely new value chain for renewable energy production and consumption, as currently farm/rural enterprises have no way of valorising the energy production potential of farm residues (manure, slurry) and other biomass (organic waste, surplus grass/crops). This new value chain can help in reducing GHG emissions for the farm sector in Ireland.

In this way, a viable off-grid solution can be investigated and implemented through agreements and investments between the diverse producers, the supplier and the consumers in areas where it is difficult to create a local renewable energy network. The implementation of a pilot site in the regions help to raise awareness of consumers on renewable energy, to elaborate a new distributed business model which could address the issue of finding a relevant economic model for the biomethane production, and to establish a value chain for biomethane.

## OUTLOOK FOR THE FUTURE

Ormonde Upgrading Limited (OUL) has installed the equipment necessary to purify 22.000 MWh/y of biogas, The purification of the biogas is necessary to allow the storage and transport of the biomethane and to allow customers to use this energy without making any significant alterations to their existing energy infrastructure. As OOL is now able to supply this biomethane customers wishing to decarbonise their energy needs, it has engaged with a number of customers to make them aware of its capabilities and has commenced the supply of biomethane to them. Additionally, the 3 Counties Energy Agency (3CEA) continues to work with the relevant local authorities and has identified a number of high frequency sites to which the biomethane can be supplied. This integrated approach on the supply and demand side has facilitated the implementation of renewable energy partnerships by enabling consumers access the renewable energy being produced in the rural surroundings, leading to large $CO_2$ emission reduction. These new renewable energy partnerships underpin the implementation of the project into the future.


Equipment to purify biogas, OUL, Ireland

Co. Waterford, Ireland


Equipment to purify biogas, OUL, Ireland

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## REGIONAL PARTNERS INVOLVED

- 3 Counties Energy Agency (3CEA)
- Kilkenny Council City
- Wexford Council City

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK FOR THE CASE STUDY IN IRELAND

(As of 2020)

- Biogas/Biomethane – whilst support schemes have been put in place for renewable electricity, renewable heat and renewable transport fuels at the date hereof a specific support scheme has yet to be put in place for biogas/ biomethane production;
- Other forms of renewable energy are considered to be less costly;
- Given the absence of a proven economic model, the value chain necessary to realise the potential for biogas production identified by the SEAI has not been put in place.

# SMART SOLUTIONS FOR RENEWABLE ENERGY GROWTH

SOLAR WIND WASTE**HEAT**

# RELIABLE SUPPLY FOR HIGH DEMAND CONSUMERS

BELGIUM

**Region**
Flanders, Belgium

**Renewable Energy Type**
Wind, Solar, Waste heat

**Consumer / Demand by**
Business Park, Hospital

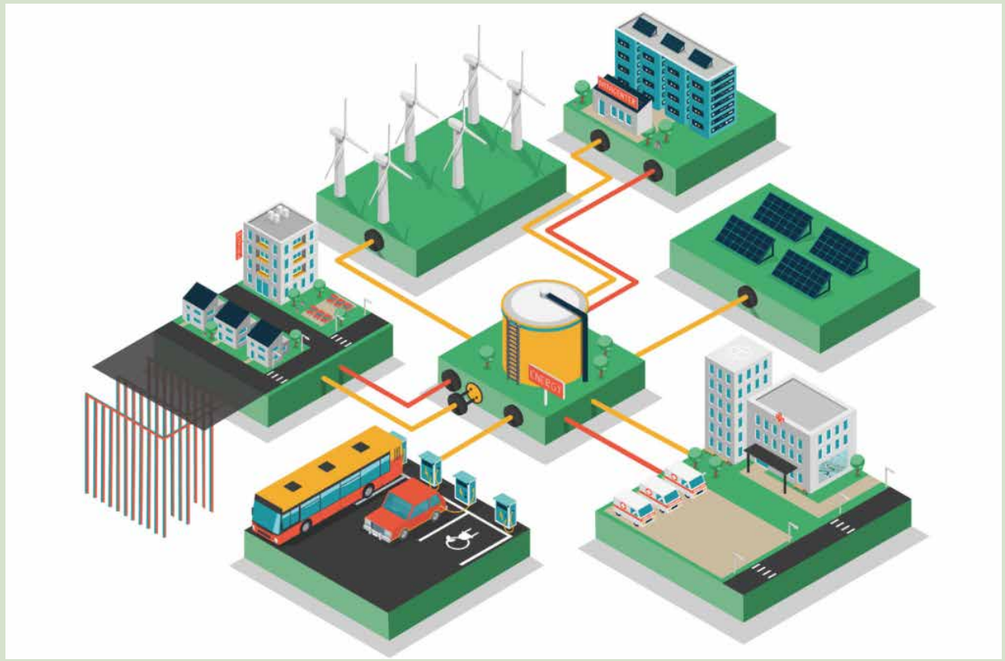
## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

The Green Energy Park (GEP) is located in Zellik, Flanders, in the countryside surrounding Brussels. It aims at stimulating collaboration between companies, knowledge institutions, governments and end users by offering a living lab where innovative technology and forms of cooperation can be tested in a realistic environment. The research park focuses on three areas: Energy and mobility transition, Hospital of the future and Smart regions.

The park will be equipped with a multi energy grid that consists of a (mainly) low temperature thermal grid and a large electric grid. The idea is to generate solar and wind energy directly on the Green Energy Park and use it as much as possible within the business park. All buildings of the Park can participate in the "$CO_2$ neutral smart multi energy grid" by supplying and consuming energy. Due to the park's location nearby a residential area, the thermal part of the grid can be extended to the residential development and to the adjacent existing business area. The system can supply electricity and thermal energy to more than 70 neighbouring companies. This creates a bi-directional interaction between the business park and the residential area.

The challenge of the project is both a technical challenge to establish a micro grid, and a social challenge to persuade the companies to actively participate in the project by connecting to the micro grid. The purpose is to offer a product to the companies, which is environmentally and economically interesting for them. Other challenges need to be overcome, such as:

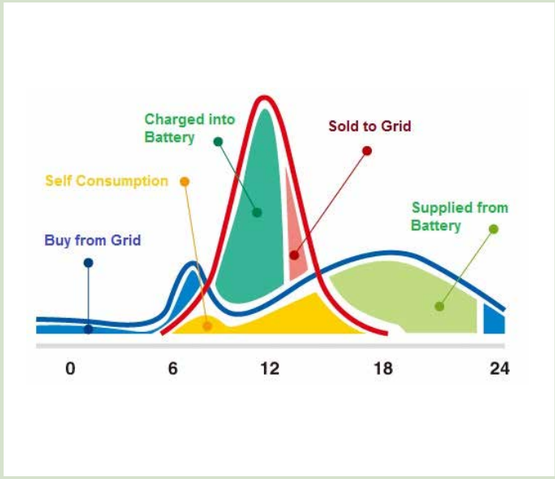
- Finding technical solutions: in order to cope with the intermittence of renewable energy sources and provide a stable energy supply throughout the year (also in case of outage in DSO network);
- Peer-to-peer energy exchange: sharing of electricity between companies in a business area is not yet allowed according to Flemish regulation. The pricing scheme in Flanders




The Smart Village Lab,
Zellik, Belgium

triples the price for peer-to-peer energy exchange over public networks – adapted cost reflective pricing is needed for shared distribution networks. Transferring electricity from one entity to another is subject to grid costs and as such it is very difficult to create a profitable business case for electricity transfer;

- High requirements for the battery: the energy consuming applications (data centre, data communication) need a reliable power supply. The amount of data that needs to be transmitted, processed and stored is very large.




## THE STRATEGY OF SUCCESS: IMPLEMENT AN INNOVATIVE MICRO GRID STORAGE TECHNOLOGY

The success of the Green Energy Park lies in the important teamwork between the GEP's stakeholders. Each stakeholder is involved in this big living lab project and brings its own contribution (e.g the data centre provides waste heat). Moreover, GEP has built good relationships with the responsible Distribution System Operator (DSO) of the site, who is interested in exploring the possibilities for similar situations, e.g. for the re-use of the existing grid as micro-grid. The municipality of Asse, the province of Flemish Brabant and the Flemish government are interested to position this project as strategic and to enable international parties to visit the area as one of the flagship innovation centres of Flanders.

The aim is to supply the Green Energy Park with electricity and heat through a bi-directional multi-energy grid. It includes the development of energy storage systems, the integration of hybrid and electrical mobility as well as a thermal distribution grid on ultra-low temperature. This is where its strength lies, in its holistic approach. All companies located at the park are connected and can inject into or consume from the electrical and the thermal grid. Excess heat from the data centre, heat pumps, cogenerations and different renewable energy sources will be added to the grid. Energy will be stored in multiple batteries, electrical cars, heat buffers and underground storage.

An innovative living lab can accommodate a wide variety of technologies, allowing testing them in real life situations. Large renewable energy sources (in total 18 MW) are being developed and connected to the business park as well as to the test facilities. To test and start on a smaller scale the Smart Village Lab is created, based on the concept of residential houses and an SME building, interacting with collective neighbourhood services. The Smart Village Lab contains 6 houses with typical technical installations such as digital meter, PV, inverter, electric switchboard, home battery, physical and power-simulated consumer devices, heat pump and electric vehicle (EV) chargers. The collective systems are a new digitalised distribution cabin, two neighbourhood batteries (each 350kWh/150kW), collective PV and a collective parking with 16 EV-charging outlets.

> "The success of the Green Energy Park lies in the important teamwork between GEP's stakeholders."

The battery systems allow stabilising the grid and optimise self-consumption. Work is done, for example, on the matching between the requirements of intermittent renewable energy systems with the specifications of the e-storage systems, or on the development of accurate, reliable and precise power electronics systems and algorithms. The Smart Village Lab investigates how living can become smart, sustainable and energy efficient in the future. The homes can exchange electrical and thermal energy via a smart energy grid, to which collective energy systems such as neighbourhood batteries and collective charging infrastructure for electric cars are connected.

A green data centre is under construction, to which the Green Energy Park will be attached and supported with the necessary computing power needed to develop sustainable, high-tech solutions. A micro grid powered by the residual heat of the data centre will be implemented. The University of Brussels and the University Hospital of Brussels are moving their data centre to this new infrastructure and are open to provide the waste heat to neighbouring companies and residential areas.

Battery systems, the Smart Village Lab, Zellik, Belgium

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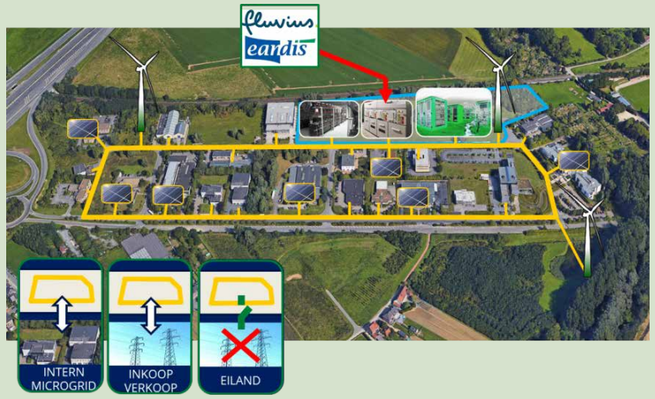
## OUTLOOK FOR THE FUTURE

The buildings blocks, delivered by the project, will continue to be used. The battery systems will be used, integrated in a real-life test setups in the living lab, in new research and demo projects, to test, learn and showcase. One challenge is to assess the role the battery can play in environments with optimised energy management. Another one is testing the interaction between home batteries, neighbourhood batteries and batteries-on-wheels (EV's). When the data center is operational the batteries will be used to deliver green energy to the data center even at night.

The peer-to-peer trading system for electricity and heat will be further developed and tested with the ever growing dataset collected at the actor's premises in the Research Park. It is the goal to switch the platform to real life operation, depending on the moment regulatory options become available.

A new co-operative innovation project uses the results from this project to further investigate technical and business options to bring 5G district heating into practice for local district heating networks, mainly based on waste heat from the data center.

The site is used as a showcase that attracts people from similar industrial areas to replicate lessons learned. The living lab is organised to attract visitors to learn, see demonstrations, get trainings, get inspiration and to use the built infrastructure in their own innovation projects.






## REGIONAL PARTNERS INVOLVED

- Flux50 (business support organisation, working on regulation aspects of the project);
- Vrije Universiteit Brussels (technical specifications and monitoring of the batteries);
- EcoPower (energy community working on the heat network);
- Green Energy Park (living lab; providing the business case);
- Fluvius (district system operator enabling the reuse of infrastructure);
- Province of Flemish Brabant, Municipality of Asse (administrative location of Green Energy Park).

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK IN FLANDERS

(As of 2022)

For peer-to-peer trading of electricity:

- In general allowed but data systems (DSO/ energy suppliers) are not able to implement the concept;
- Exceptions granted by the regulator for peer-to-peer direct lines;
- Closed distribution lines under very specific conditions;
- No support for energy communities;
- Regulatory sandbox possible but cumbersome;
- Pricing system focuses on self-consumption, discontinuation of the net metering scheme;
- Lack of consistency in legal and pricing system support scheme between the different regions of Belgium.

SOLAR

# INTERCONNECT PHOTOVOLTAIC ENERGY AND ELECTRIC MOBILITY

SWISS

**Region**
Yverdon-les-Bains, Swiss

**Renewable Energy**
Solar

**Consumer / Demand**
Business park (15 GWh per year (2019); 28 GWh per year (estimation 2025)

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

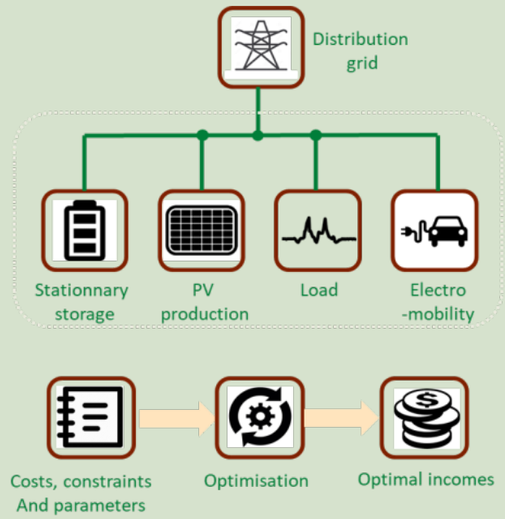
The Canton de Vaud, Swiss, is experiencing an important economic and demographic boom. The science and technology park Y-PARC, based in Yverdon-les-Bains, is part of it: center of expertise for cybersecurity, medtech and robotics, the park comprises 70,000 m2 of offices, laboratories and production halls in 16 buildings and gathers 200 companies representing 1.800 employees. In the long term, 10.000 jobs should be created by several hundreds of companies.

The Swiss policy of self-consumption, in conjunction with the ongoing developments of e-mobility (Vehicle to Grid), offers a unique opportunity to develop business models for the coordinated use of photovoltaic (PV) and electric mobility. As Yverdon-les-Bains fosters the use of renewable energy, the city implemented in 2015 its two first public charging stations for electric vehicles, in addition to the private charging station of the Y-PARC. Important for the local Distribution system operator (DSO) is to assess the impact on the grid of the development of photovoltaic energy production on one hand, and electric vehicle stations on the other hand.

Integrating the electric mobility in the equation of self-consumption helps to determine the value of its flexibility as a final consumer, to answer to important questions and to take the right decisions. For example, fast charging electrical vehicles in microgrid architectures are difficult to implement, while slow charging ones offer more flexibility for the grid. In 2021, 22.5% of new vehicle matriculation in Switzerland are electric (BEV and PHEV) and the country expects that electric vehicles (EV) will represent 37% of all cars in 2035. The goal is to find the best solutions and business models for integrating a large amount of EVs and renewable energy into the grid.

## THE STRATEGY OF SUCCESS: JOINT DEVELOPMENT OF PHOTOVOLTAIC PRODUCTION AND ELECTRIC MOBILITY

At Y-PARC, the aim of the project is to determine the impacts of a large joint increase in photovoltaic production and in electricity needs for mobility. In partnership with the School of Engineering and Management of the Vaud Canton and the city's industrial services, Planair developed business models applicable to this infrastructure. The aim is to initiate a demonstration project to test these results in a real context and on a large scale. Planair elaborated a theoretical study on the role of stationary and mobile storage in integrating high photovoltaic shares in a microgrid to balance supply and demand. It has shown amongst other things that even the highest possible photovoltaic potential on this industrial zone does not represent a problem




for the grid of Y-PARC, and the introduction of mobile or stationary batteries reduces the risk even more and creates interesting synergies. The possibility to facilitate self-consumption with the prediction and optimization of systems is studied as well as how to make this a central pillar of local energy communities.

So far, the study underlines several outstanding results:

- The potential of 6 GW PV is within the grid's limits;
- The photovoltaic installation produces excess energy during the day, when employees' vehicles are parked in the industrial area. This synergy is used to increase self-consumption of photovoltaic energy, decrease pressure on the grid and thus improve its profitability;
- The car's batteries can be valued for peak shaving or ancillary services, in particular V2G vehicles;
- The local Distribution System Operator is at the centre of these developments but many companies cooperate in the business model to make the idea work;
- Several pricing systems are developed to integrate the flexibility of end-consumers (companies and vehicles);
- The legal and economic framework has a dominant impact on the solutions that are implemented. and market actors need to learn more about the potential before implementing these smart solutions.

A feasibility study of the microgrid piloted at the SunnYparc has been led by Planair in coordination with local partners. The idea of the microgrid is to group consumptions of building, photovoltaic production and include the central parking with a high number of electric vehicles and vehicle-To-Grid technology. The study has been done thanks to several workshops with different market players.

So far, the study underlines several outstanding results:

- Sizing of the microgrid solution on the basis of a concrete case,
- Definition of technology solutions needed,
- Evaluation of the necessary investment costs,
- Definition of the contours of the pilot project.

The Swiss Center for Electronics and Microtechnology (CSEM) has carried out a study on the impact of V2G on the ageing of electric vehicle batteries. More specifically, the study has provided an overall and specific understanding of the state of the art, and map R&D work and pilot projects in the field.

The School of Engineering and Management of the Vaud Canton has completed its work on business models by carrying out a survey of Y-PARC users with the aim of analysing the potential for the deployment of electric vehicles and particularly V2G on the Swiss technology park site.



## OUTLOOK FOR THE FUTURE: SUNNYPARC PILOT PROJECT

The SunnYparc microgrid project, designed and studied with RegEnergy partners and local actors, has been able to attract the attention of the Swiss authorities for a pilot project. The project is financed by the Swiss Federal Energy Office, the canton of Vaud and the municipality of Yverdon les Bains and has started in December 2021.

SunnYparc project is a microgrid demonstrator integrating the future shared parking of Y-PARC Swiss Technopole in Yverdon-les-Bains. This microgrid includes a local production with photovoltaic solar energy, a stationary storage system, office buildings, a significant number of charging stations including bidirectional and an innovative microgrid management system.

This involves testing in a real case the integration of mass electric mobility and demonstrating the optimization of renewable energy penetration thanks to Vehicule2Grid technology and thanks to a smart control system. The control system will be coupled with the Swiss electric service market. The objective is to test new business models backed by these new technologies and usages incorporating different pricing, in order to demonstrate the economic potential of this type of advanced, modular and replicable microgrid in Switzerland.

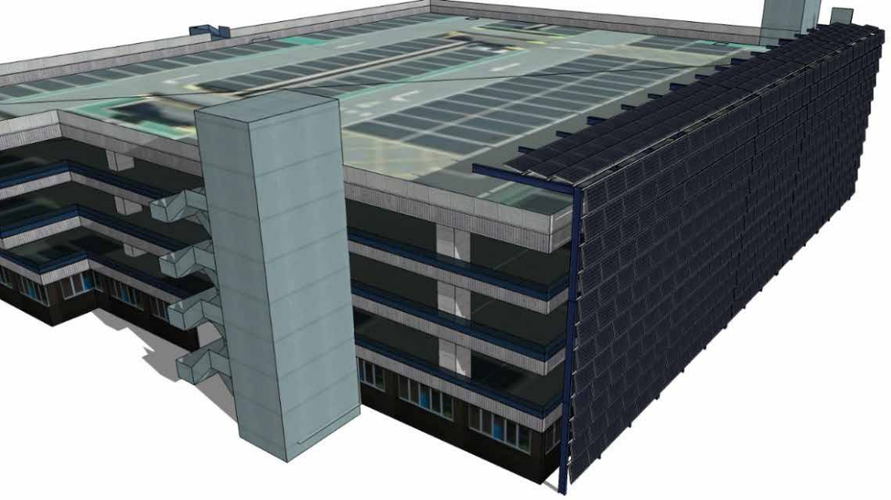
### Photovoltaic, roof and facade system

The construction of the photovoltaic installations is planned on the roofs of the buildings and on the car park facade. The installations will be equipped with intelligent inverters capable of controlling electricity production. The future annual consumption of these buildings is estimated at 1075 MWh, so the planned PV production corresponds to 35% in phase 1, 135% in phase 2 and 185% in phase 3 on the annual balance sheet. The high rate of electrification of the vehicles will make it possible to considerably increase self-consumption and avoid peaks in production being sold to the network. The microgrid will make it possible to demonstrate the possible integration of a high rate of local renewable energy without difficulty for the grid in such an area thanks to intelligent management and the deployment of electromobility.

The parking will be equipped with a photovoltaic infrastructure in the south facade. In order to meet the constraints of the site, a modular solar installation concept between the façade and the roof is proposed. This means that the system can be easily dismantled / moved to the façade or roof.

### Charging station for electric vehicles system

The charging points will be installed in the shared car park currently under construction. It is planned to install up to 250 charging points by 2026, including 50 bi-directional charging points to accommodate V2Gs. Loads are controlled



Parking equipped with a photovoltaic infrastructure, Yverdon-les-Bains, Swiss

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by a piloting system in order to charge and discharge electric vehicles intelligently according to the desired use cases (maximisation of self-consumption, maximisation of the integration of photovoltaic energy, minimisation of cost and maximisation of income in the case of coupling with the electricity market). The project will test a strong deployment of charging stations at one point in the grid to analyse the consequences on the distribution system, user behaviour, business models for selling electricity to smart grid charging stations, the interest of V2G options for system services, the combinations between possible production and consumption flexibilities and to determine the value of this flexibility.

## REGIONAL PARTNERS INVOLVED

- City of Yverdon- and Canton de Vaud (RE policy objectives);
- Yverdon Energies (DSO – operator, investor, contractor);
- Green Motion (supplier of charging stations);
- Grid Steer (grid optimisation solutions);
- Centre Suisse d'électronique et de microtechnique (CSEM).

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK IN SWISS

(As of 2021)

Energy policy on self-consumption since 2018:

- It is economically more interesting to self-consume then to sell back to the grid;
- Local producers and consumers can create a self-consumption group to increase self-consumption;
- The law is in constant evolution to adapt to the reality of projects (use of existing cables, pricing allowed, market liberalisation…) but the aim is clear: increase decentralized production and consumption of renewable electricity.



Under today's regulatory framework, the DSO must pay a non-discriminatory compensation to their clients to make use of the clients' flexibility (demand response). The possible blocking point for the flexibility from V2G is now that the client (the EV owner) is free not to provide this flexibility to the grid, if he or she does not want to offer it.
With the market place for flexibility (available in the near future), we could connect existing flexibility with all the vehicle to grid charging stations, or the client could connect their flexibility to the market place to the shared grid and this could become the new way of the demand response - Demand response 2.0. This kind of marketplace for flexibility in the distribution network is not developed yet in any country, but this is one option for operations here in Switzerland if the evolution of the market and the regulations for energy flexibility permitted such a marketplace. In one business scenario which is already emerging today among the most innovative DSOs in the country, the DSO can obtain the flexibility from a platform and pay the end customer for this flexibility.
However, as a temporary arrangement, the continued use of ripple control technology by DSOs remains permitted. Consequently, DSOs using ripple control may collectively disconnect appliances of customers (such as tumblers, washing machines, dishwashers, stoves, etc.) in predefined times of high network load (e.g. 12-1 pm). Under art. 31f the customer may opt-out. However, there is no opt-in or compensation requirement when using existing ripple control technology. Therefore, in the case V2G, charging stations would be forced to connect EVs to the grid where there is V2G capability.
In the future, once the old ripple control technology has phased-out, the regulatory authorities may require all DSOs to provide marketplaces for flexibility in their distribution networks. Customers would then receive a market compensation for the use of their batteries or other sources of stabilizing and controlling the grid.
Another topic of discussion regarding future regulatory framework conditions for V2G concepts is that of storage. Today the issue of how to treat storage is a highly debated topic in the energy industry. Today we lack a clear storage regulation. Therefore, the regulatory authority follows the industry guideline which differentiates between pure storage (somewhere in the distribution network) and storage in combination with final use of the electric energy (e.g. a battery in the basement of a final consumer). The unclear situation makes it unattractive to go for certain business models based on storage solutions.
Finally, there is the ancillary service market and the regulations for this market influence the potential of new business models for V2G as well. FOR EVs, it is even a current option to provide value to this market from the V2G concepts, and also meet the pre-qualification criteria. However, it may be hard to meet the criteria because an investor may have to create something like a swarm intelligent system where you have a large number of EVs such as 100 EVs combined with one control option, to provide jointly some energy to the ancillary service market. Nevertheless, if one would have hundreds of cars connected to the grid, it would indeed be a profitable venture to provide ancillary services to the grid from these connected vehicles.

# A SMART PLATFORM TO OPTIMISE SUPPLY AND DEMAND

IRELAND

**Region**
Dingle area, Ireland

**Renewable Energy**
Solar, Battery

**Consumer / Demand**
Industrial and Commercial Consumers

## THE REGIONAL SETTING: CONTEXT AND CHALLENGES

In the rural Dingle area, on the western coast of Ireland, industries and offices of the regional authority Údarás na Gaeltachta (UnG) add up to a substantial electricity consumption. To facilitate the integration of renewable energy (RE) at these distributed sites, innovative smart grid processes and a legislative framework are necessary, enabling the regional actors to function as Energy Communities and take control of their energy use as prosumers. The energy industry is going through a paradigm shift from a unidirectional, demand driven model with large centralised power generation to a market driven by smart grid concepts where supply and demand will be balanced with variable and intermittent renewable energies in a more regionalised manner. The Waterford Institute of Technology (WIT) designed a software platform to optimise RE production, battery storage and consumption with variable market prices.

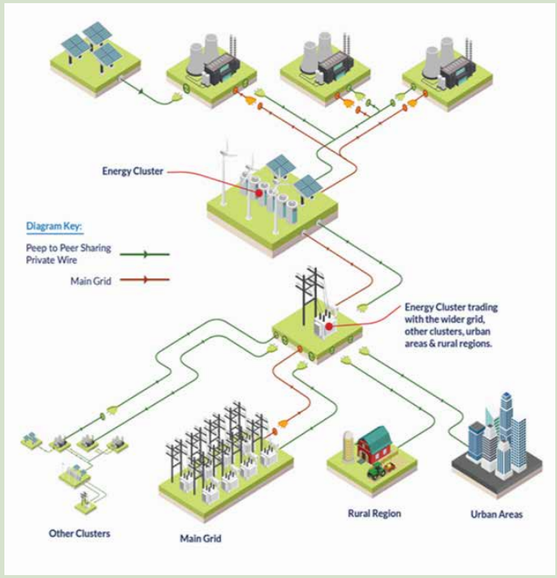
However, in order to establish this smart energy community, and as the concept of Energy Communities is still in its infancy in the region, incentives and tariff structures to enable smart grid technologies are required, as well as a regulatory framework to implement EU Directives. Smart Metering is also necessary to acquire granular data and enable cluster load models.



## THE STRATEGY OF SUCCESS: FROM ENERGY CLUSTER TO LOCAL COMMUNITY

The Waterford Institute of Technology developed an optimisation platform and coordinates the implementation of smart grid technologies with the potential of being the hub of energy clusters. The grid architecture is based on peer to peer sharing within the industrial cluster and optimisation of RE, storage and flexible loads with time of use market tariffs. Supply and demand can be better managed within a region when accurate data is available to facilitate the models. As the regulatory environment is still evolving, intelligent systems can enable scenarios, particularly at end user level, to balance supply and demand within the peaks and troughs of the market.

Renewable energy clusters such as the UnG offices and industries can act like micro grids, trade with each other and eventually roll up to a regional and then national level to form the smart grid. These networks are based on distributed, local generation resources such as solar, wind and battery storage which can be shared in a peer to peer environment, allowing the integration of RE in local communities. The implementation of battery storage technologies



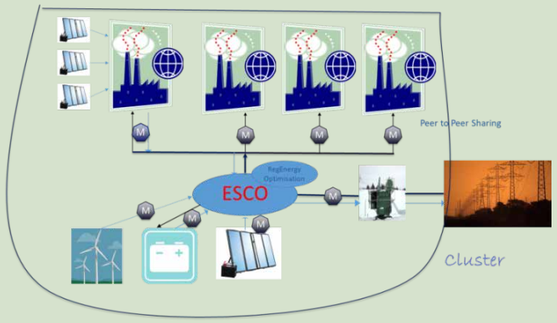

Battery System incorporated into the RegEnergy Platform, Waterford, Ireland

assists in balancing local clusters, while modelling the potential of renewable energy technologies in a cluster of industrial clients helps to optimise the cluster load with the market and available on-site technologies, and thus to reduce the risk for the cluster as a whole.

In this way, energy clusters help to improve regions security of supply, reduce carbon footprint and give the opportunity for energy consumers to control their energy use and become 'prosumers'. It also facilitates peak shaving, time of use tariffs and ancillary services with the wider grid. The clusters can ultimately then trade with the surrounding rural region, urban areas and other clusters. A transposition of the European Energy Policy for 2020–2030 "RED II" in the Irish context is under discussion to make the clusters function as an energy community. Data from the 'Scenarios' module of the Optimisation Platform is being used to develop models to outline the value Energy Communities bring to the wider grid. This data is being used in discussions with the Irish Regulatory authorities such that an informed decision can be made in the Irish transposition process.

## OUTLOOK FOR THE FUTURE

The RegEnergy platform has the ability to manage the flows of energy within a cluster and maximise its sustainability by leveraging all its assets. As the EU Directives are transposed into law, it will enable these Energy Communities to play a significant role in the Clean Energy Transition. WIT is working closely with the Irish Regulator and Government bodies in the process and plan to continue the trials as part of other projects. This work will entail how these micro Energy Communities can be expanded out geographically to the wider region and assessing what sustainability levels can be achieved in the wider region by leveraging these new mechanisms.






**Renewable energy cluster or renewable energy community?**

The **renewable energy clusters** emerging now in the context of the Energy Transition are built on the complementarity of different energy sources, flexibility, as well as interconnectivity of all sorts of different actors – be they small or large, professional or not – requiring bi-directionality of energy flows.

The **renewable energy communities** are defined in the EU Renewable Energy Directive (RED II, 2018). They involve groups of citizens, social entrepreneurs, public authorities and community organisations participating directly in the energy transition by jointly investing in, producing, selling and distributing renewable energy. The definition is flexible according to local contexts and recognising that different legal and economic models abound.

If renewable energy communities and renewable energy clusters may have slightly different definitions, they are both socio-technical mirrors of the same concept: the energy clusters offer an engineering model while communities do provide a governance model, necessary in a renewable energy transition

"Renewable energy communities under the 2019 European Clean Energy Package – Governance model for the energy clusters of the future?", J.Lowitzsch, C.E.Hoicka, F.J.van Tulder


Waterford Institute of Technology
Picture of Battery install at site

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## REGIONAL PARTNERS INVOLVED

- Údarás na Gaeltachta
- Industrial and Commercial tenants
- Local Energy Communities, DSO, Regulator (CRU)

## RENEWABLE ENERGY: THE LEGAL FRAMEWORK FOR THE CASE STUDY IN IRELAND

(As of January 2022)

- Feed in tariff for RE for rooftop solar has just been introduced
- Regulatory framework for mechanisms such as peer to peer energy trading under review.
- Incentives and tariff structures to enable smart grid technologies not yet available.
- Energy Community concept still in its infancy
- Regulatory Sandbox process to trial new concepts not likely in the near term

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