# Community power: why, how and what for?

Case studies report - July 2019

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| Call topic addressed: | **New relationships between energy systems and communities** |
| Project title: | Community power: why, how and what for? |
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## 1. ROBIN HOOD ENERGY (NOTTINGHAM, ENGLAND)

# Robin Hood Energy - Nottingham (England)


## Key facts

**Location :** Nottingham, England

**Type of territory:**
☐ Rural area
☐ Semi-rural
☒ Urban area

**Type of habitat:**
☐ Individual housing
☐ Collective housing
☒ Mix

**Project starting date:** September 2015

**Nb of households concerned:** 130,000 customers in the UK

**Energy sources:** mix renewables (Guarantees of Origin)

**Scope of community project:**
☐ collective RES generation
☒ Supply
☐ collective storage
☐ net metering
☐ others

# Project description

## Local context

Amongst the most committed and advanced city in the field of sustainable development, Nottingham city has a global, holistic and ambitious approach, with, for example, its recent announcement to become the first carbon neutral city in the UK by 2028 and many interconnected strategies, action plans and pilot projects, involving local communities:

- The **largest district heat network in the UK**, serving 5 000 homes and over 100 businesses with low carbon heat and power, powered by the waste incineration plant burning 180,000 tonnes of domestic and commercial waste per annum (and offsetting approximately 27,000 tonnes of $CO_2$ emissions annually that would otherwise be produced by alternative use of gas).

- Policy development on all aspects of energy and sustainability across the city with four core strategies and impressive results:

| Nottingham strategies | Results already achieved |
|---|---|
| ⇨ **Energy Strategy 2010-2020 (to be replaced in 2020)** | On track to meet its target of generating 20% of its energy from low carbon sources by the end of this decade. |
| ⇨ **Community Climate Change Strategy 2012- 2020 (to be replaced in 2020)** | Nottingham city has already achieved its 2020 Energy Strategy goal of cutting carbon emissions by 26% against a 2012 baseline, two years early. Overall, the local authority has helped to reduce the city's carbon footprint by 39% since 2005. |
| ⇨ **Fuel Poverty Strategy 2018-2025** | The city has succeeded in reducing the fuel poverty rate from over 21 % in 2010/2011 to 14,6 % in 2016/2017 but wants to go further with its Fuel Poverty Strategy adopted in 2018. |
| ⇨ **Nottingham Local Transport Plan 2016-2019** | Investing in one of the UK's largest electric bus fleets as well as biogas and retrofitted buses, developing and expanding the tram network that runs on renewable power, improving cycling facilities. |

- Strong involvement and financial investment in European, national and local projects:

❶ Robin Hood Energy (see project background hereafter)

❷ Clean Mobil Energy

CleanMobilEnergy is a three year, European Interreg NWE funded project which involves many partners across North West Europe working together to develop a Smart Energy Management System, integrating Renewable Energy and Electric Vehicles. Nottingham City Council has secured funding to deliver a City Pilot demonstrator as part of the project and will install innovative 'vehicle to grid' (V2G) commercial electric vehicle charging at Eastcroft Depot. The aim of the demonstrator is to maximise use of locally generated renewable generation to cut the carbon emissions and costs associated with charging electric fleet vehicles, as well as reducing peak demand by using vehicles for short-term storage. In 2019, Nottingham City Council owns 60 electric vehicles.

❸ DREeM - Energiesprong homes programme

Nottingham City Council has secured more than £5 million in funding to expand the rollout of its Energiesprong homes programme. The scheme will now see the retrofitting works expanded to more than 150 Nottingham City Homes properties, tackling some of the housing association's oldest and least energy efficient stock. The bulk of the extended rollout is through the Deep Retrofit Energy Model (DREeM) programme, which is a project backed by the European Regional Development Fund to improve energy efficiency in homes and public buildings in Nottingham.

❹ The SENSIBLE/MOZES project

This project aimed to explore the concept of the "Energy Community" and show that using electrical energy storage within a residential community could reduce the energy costs for consumers by:

- helping them consume more of the electricity they generate (free of charge) from their own solar panels (known as "self-consumption");
- reducing the amount of energy they draw from the grid (known as "import") especially at peak demand time (early evening).

For more information concerning this project, click on the two following links:

- https://www.projectsensible.eu/demonstrators/nottingham/
- http://www.mozes.co.uk/

❺ The Trent Basin project (see case study 2)

The Trent Basin project, detailed in case study 2, aims at delivering new models for community energy schemes.

## Robin Hood Energy project background

Robin Hood Energy Limited was launched in September 2015. It is one of the two fully licensed supplier owned by a local authority in the UK, with Bristol Energy Limited.

In the UK as in most other countries, one of the biggest challenges in becoming a licensed supplier (of electricity and/or gas) is the money associated to such a project. It is both a commercial and political decision that Nottingham Council took, aware of the risks, coupled with a good understanding of the energy markets and a social manifesto: tackle fuel poverty[1] within the city and, more widely, in the whole country.

In the first three years of operation, despite losses, the council said: "The money loaned to Robin Hood Energy by Nottingham City Council has had no effect on Council Tax. The City Council has provided financial support to Robin Hood Energy at a commercial rate of interest, which is compliant with state aid legislation and therefore means that the council earns interest on the financial support it provides. The council would have to make more cuts to local services if it hadn't loaned money to Robin Hood Energy and received £2m in interest payments."

In 2018, Robin Hood Energy was break-even (faster than its competitors) and in 2019, it made its first profit.

## Main targets of the project:

Robin Hood Energy is dedicated to offering competitive prices and green electricity to all and fighting fuel poverty. Let's remind that Nottingham City in 2015 had the lowest gross disposable household income in England at £12,779 (33% lower than UK average). Fuel poverty affects around 15% of households in Nottingham and is one of the top five priorities for Nottingham City Council.

[1] The Government definition of fuel poverty has changed over time, from any household having to spend more than 10 % of its income on energy, to any household that has fuel costs above average and would be taken below the poverty line if they spent that amount on energy.

## Key Stakeholders

| Type of actor | Organisation/company | Contact | Function | E-mail address |
|---|---|---|---|---|
| Energy Service Company (ESCo) | Robin Hood Energy | Gail Scholes | Chief Executive Officer | gail.scholes@robinhoodenergy.co.uk |
| Co-financer | Nottingham city council | Councillor Sally Longford | Portfolio Holder for Energy & Environment | Sally.Longford@nottinghamcity.gov.uk |

Nottingham City Council

The City Council's Energy Services department is part of the wider Commercial, Infrastructure and Energy Directorate of Nottingham City Council. Employing over 60 people, this service area provides internal and external energy services, ranging from Solar PV design and installation, to energy efficiency certification. It manages the Council's utilities, delivers energy generation and saving projects across its estate and assets, as well as generating a commercial return to support activities in its service area and wider frontline Council services. The service area is also responsible for coordinating work on domestic energy efficiency and fuel poverty, sustainability action through the Green Partnership, hosting the regional Midlands Energy Hub and leading on all citywide energy, climate change and sustainability policy. This incorporates a range of other strategic roles and delivering outcomes for 330 000 inhabitants.

Robin Hood Energy, a non-for profit licenced supplier

Robin Hood Energy Limited was launched in September 2015. Set-up with an investment of £ 20 million (≈ € 22 million), made up of a combination of loans and share purchases.from the city council of Nottingham, Robin Hood Energy is a not-for-profit ESCo (Energy Service Company) aiming to make energy more affordable for all and, especially for Nottingham people[2].

But, beyond being an ESCo, Robin Hood Energy is one of the two fully licensed supplier owned by a local authority[3] in the UK, with Bristol Energy Limited.

Starting with 30 employees in 2015, it now employs over 200 employees in its Nottingham offices, it doesn't have private shareholders or director bonuses and its primary objective is to become self-sufficient as quickly as possible to pass on the benefits to its customers, which was the case after only 3 full years of existence.

Indeed, Robin Hood Energy managed to reach a break-even position thanks to a regular increase of its customer numbers (+ 30 % in 2018 - 130,000 customers nationwide), to a good quality service and a strict management. In 2018, it succeeded in making a trading surplus of £202,000.

Robin Hood Energy launched a discounted tariff (- 5 % below standard rate), for Nottingham residents. In the last 12 weeks of 2018 it saw customers on that tariff more than double, showing that people in its heartland are backing Robin Hood Energy as a business. In 2019, Robin Hood Energy supply over 1 in 10 households in Nottingham.

[2] Robin Hood Energy launched a discounted tariff for Nottingham residents. In the last 12 weeks of 2018 it saw customers on that tariff more than double, showing that people in its heartland are backing Robin Hood Energy as a business which is vitally important.
[3] Because of the huge efforts, time, money and risks required to establish a fully licence ESCO, many local authorities are put off and rather opt for the white label option.

# Economic analysis

## Short presentation of the electricity domestic prices in the UK

UK domestic electricity prices for the most representative 'typical consumer' band are consistently lower than in Germany, and similar to prices paid by consumers in France. There is a marked difference in the relative contribution that each price component makes to the overall price charged to the consumer, with the energy and supply component being higher in both percentage and absolute terms for the UK. By contrast, UK has the lowest absolute contribution from taxes and levies of the four EU case study countries.

According to 2018, UKERC report, "policy has contributed to increases in domestic electricity prices in the UK and other countries over the past five years. However, domestic electricity bills have not increased at the same rate as prices, due to the effects of energy efficiency policies designed to reduce overall consumption".

Domestic consumer' covers a very wide range of annual consumption levels. In the UK, there are 5 different consumption bands for household domestic consumers. The one corresponding to a typical domestic electricity consumer who consumes 3 900 kWh/year in the UK is the band DC: 2500 -< 5 000 kWh/year.

Average price of electricity for households in the UK (first half 2018) - Eurostat

| | |
|---|---|
| Average domestic electricity consumption (kWh/year) | 3,900 |
| *Energy and supply (c€/kWh)* | *10.18* |
| Network costs (c€/kWh) | 4.61 |
| *Average price of electricity (excluding taxes* - c€/kWh) | *14.79* |
| Taxes (c€/kWh) | ~3.6 |
| Average price of electricity for households (Taxes included - c€/kWh) | 18.39 |

Then, electricity tariffs vary according to the geographical area where you live (with discounted tariffs for households living in Nottingham, for example), the supplier you choose (E-on, Scottish Power or Robin Hood Energy, for example), the meter type you have (single rate or two rates: electricity + gas), the tariff type (Fixed price tariff, Standard variable tariff) and the payment methods: monthly payment debit, quarterly by bill or prepayment meter).

## Key aspects of the domestic electricity market

Some companies at the top of the comparison sites are using their large Standard Variable Tariff bases, of whom pay the most expensive prices and generally haven't switched for years if at all, to subsidise cheaper prices for new customers.

In fact, in Feb 2019, the Competition and Markets Authority (CMA) published a paper called "Consumer vulnerability: challenges and potential solutions", focused on how longstanding customers pay more than new customers for the same services, and found that these longstanding customers can often be vulnerable people. In their investigation of the energy market, the CMA found that over 50% of people who had been on an expensive default tariff for more than three years either did not have access to the internet or did not feel confident using price comparison websites.

In addition, those suppliers offering very cheap deals on price comparison sites also have the highest amount of customers on Standard Variable Tariffs.

### Energy Utility Company (EUCo) business model versus Energy Service Company (ESCo) business model

Currently, the UK's energy market is dominated by six large utilities: British Gas, EDF, E.ON, RWE, Scottish Power and Scottish and Southern Electric, known as the 'Big Six'. These companies referred to as the 'Energy Utility Company (EUCo)' business model, charge customers for the number of energy units (e.g. gas and electricity) sold.

Whereas ESCos - that can be commercial or non-profit businesses - provide energy services instead of providing solely fuels or conversion equipments. They are intrinsically incentivised to meet people's needs for energy in a more efficient way and, by guaranteeing savings on energy bills, using local resources and focusing on innovative financing methods, they also contribute to fuel poverty alleviation and energy security.

ESCos can belong to utilies to manufacturers, wholly or partly to communities or they can be independent.

Currently, the UK's energy market is still dominated by six large utilities (i.e. British Gas, EDF, E.ON, RWE, Scottish Power and Scottish and Southern Electric), known as the "Big Six"). However, since 2014, all six suppliers have been in steady decline, a change that's been counterbalanced by the progress of smaller suppliers like Robin Hood Energy.


**Figure 1: UK's electricity suppliers market share**

As part of their investigation, the Competition and Markets Authority- also found that there were potential savings of up to £160 a year if you switched from one of the Big Six to a smaller, independent supplier. At the heart of the financial criticisms of the Big Six are their Standard Variable Tariffs[4] (SVTs), a default rate on which over 60 % of their customers are, because they have not bother or have simply forgotten to renew their subscription to the initial 12 months fixed tariffs deal.

## Differences between Robin Hood Energy and the big six:

In Robin Hood Energy, as in any other supplier of electricity, there is a default tariff for those customers, who, after one year of electricity consumption don't renew their deal to the initial fixed tariffs (Ofgem Obligation) but, unlike the big six, Robin Hood Energy contacts each of its new customers a minimum of three times before the end of their first year contract in order to remind them not to forget to renew their subscription under the cheapest tariff. As a result, **Robin Hood Energy now has one of the lowest SVT bases in the industry** and still work hard to ensure they can drive that base even lower, compared to upwards of 60% for the majority of the Big 6.

Robin Hood Energy is not on price comparison websites because suppliers have to pay a commission to be on these sites, from £45 to £80 per switch customer. The organization rather looks for new "good quality" customers through establishing partnerships with other like-minded councils that share the same social goals and pass the savings onto its customers (Cf. section "Ten white labels partners for a win-win strategy".)

[4] Ofgem regularly records the prices of Britain's biggest energy providers. Data from September shows that the SVTs from the Big Six are hundreds of pounds more expensive than the cheapest alternative on the market.

# Community benefits/local impacts:

Robin Hood Energy' operating principles make a real difference on communities through its three main strategic lines.

**❶ Offering most competitive prices and green electricity to all[5]**

As explained in the economic analysis, Robin Hood Energy offers one of the lowest electricity tariffs in the country.

Furthermore, Robin Hood Energy has a range of channels where customers can come and talk to employees about their energy needs. The organisation doesn't solely rely on the internet for sales, it also has a community and face to face presence.

Finally, all of the electricity provided to UK homes and businesses is green since July 2018 (Renewable Energy Guarantees of Origin + a very tiny bit of Power Purchase Agreement supply with Smartest Energy), at no extra cost.

**❷ Fighting against fuel poverty**

- Warm home Discount

The Warm Home Discount Scheme is a government scheme that gives extra help to people struggling with their energy bills. It consists in allowing eligible consumers to get a one-off payment of £140 off their electricity bill between October and April.

As a rule, any energy supplier with more than 250,000 customers must offer the scheme to the core group eligible for it, but some smaller suppliers, such as Robin Hood Energy, who do not meet that criteria voluntarily participate, before obligation.

- Protecting tariff rates for prepayment customers

At the end of December 2015, there were four-and-a-half million prepayment electricity accounts and three-and-a-half million gas accounts - representing 17% and 15% respectively of all accounts in the UK.

According to Ofgem, competition among suppliers for prepayment customers is less developed than for those who pay by direct debit, cash or cheque. This means that there are fewer tariffs available and they are generally more expensive. Figures published in the end of 2015 showed that prepayment customers paid an average of £220 a year more than those on the cheapest deals,

This extra expense is made worse by the fact that 80% of households with prepayment meters are already in debt. Prepayment customers tend to be less well-off households and those in rented accommodation. They pay in advance for their gas and electricity rather than after it has been supplied.

Since 2015, Robin Hood Energy, very concerned by this unfair situation, fought hard in favor of a new system that would protect the most vulnerable consumers against fuel poverty. This battle waged in partnership with the energy regulator Ofgem and the Competition and Market Authority, was won two years after and resulted in the adoption of a temporary Prepayment Meter Price Cap[6] that came into force on 1 April 2017. It applies to prepayment meter customers on a non-fixed deal and without an interoperable smart meter. Suppliers can price to the level of the cap or below it, but cannot charge more. The levels of the cap vary for gas and electricity by meter type and region. It will be updated every six months and is expected to stay until 2020, when the roll-out of smart meters is set to be completed, which will benefit prepayment customers who have a smaller choice of tariffs available to them.

[5] All customers, whether they are existing customer or new customers, since July 2018 for 100 % green electricity..

6 A separate price cap applies, since the 1st of January 2019, to customers on a standard variable or default energy tariff.

- The Energy Company Obligation (ECO) scheme

Since its launch in January 2013, 2.3 million energy efficiency measures have been installed in approximately 1.8m homes, helping to reduce people's energy bills, making homes more energy efficient, saving carbon and making energy system more resilient. A new obligation has been outlined under the Electricity and Gas (Energy Company Obligation) Order 2018 (referred to as the 'ECO3 Order'), and the scheme that runs during that period is called 'ECO3'. The ECO3 scheme that will run until March 2022, will mainly focus on low income and vulnerable households, helping to meet the Government's fuel poverty commitments.

The Energy Company Obligation (ECO) scheme requires larger energy companies to supply heating and energy efficiency measures to domestic properties. Each supplier has an overall target based on its share of the domestic energy market in Britain. Robin Hood Energy will become one of those obligated supplier in 2020.

### ❸ Ten White Labels partners for a win-win strategy

- For customers first, by expanding the fight against fuel poverty beyond Nottingham area and allow people from Derbyshire and Yorkshire, amongst others, to benefit from fair and lower tariffs;
- For Robin Hood Energy itself, as it contributes to grow the number of its customers who trust their organisation and who won't switch to another supplier.

In many countries, local authorities are looking at the potential for establishing an Energy Services Company (ESCO) so as to provide to their inhabitants better services in the field of energy, social advantages and a local solution. In the UK, those authorities have three basic choices:

- the fully licensed ESCO, in similar vein Bristol and Nottingham;
- some form of white label[7] arrangement;
- or the route of License Lite (Cf Great London Authority - GLA)

But "*Most authorities are put off by the huge time, effort and risk required to establish a fully licensed company, even if the several million pounds of investment capital can be found. The struggles of the GLA to establish a License Lite arrangement, which have still not borne fruit after a number of years, are also leading to that avenue being rejected. So this leaves the white label option, with a private sector company (cf. OVO Energy), or with a civic ESCO, that is reflected in practice by a local authority to local authority deal*." S. Cirell.

In 2019, Robin Hood Energy is the licensed supplier to the following councils or private businesses:

- Angelic Energy (Islington Council)
- Beam Energy (Barking and Dagenham Council)
- CitizEN Energy (Southampton City Council & neighbouring councils)
- Ebico (Private Not-For-Profit business)
- Fosse Energy (Leicestershire County Council & Leicester City Council)
- Great North Energy (Doncaster Council & Barnsley MBC)
- The Leccy (Liverpool City Council)
- RAM Energy (Derby City Council)
- White Rose Energy (Leeds City Council )
- Your Energy Sussex (West Sussex County Council & local authorities)

[7] A 'white label' is an organization that does not hold a supply license, but instead works in partnership with a licensed 'partner supplier' to offer tariffs under the white label brand.

# Appendices

## List of interviews/meetings:

- Gail Scholes, Robin Hood Energy Chief Executive Officer
- Jonathan Ward, Nottingham City Council, Principal Energy Policy Officer.

## List of documents studied:

- Energy Strategy 2010 – 2020, Nottingham City Council
- The Nottingham Community Climate Change Strategy 2012-2020; Nottingham City Council
- Fuel poverty strategy 2018-2025, Nottingham City Council
- Tapping the Potential for Energy Storage in Community Energy Initiatives, L. Kiamba, L. Rodrigues, J. Marsh – University of Nottingham

## Other sources of information:

- https://robinhoodenergy.co.uk/
- https://www.nottinghamcity.gov.uk/information-for-business/environmental-health-and-safer-housing/the-commercial-infrastructure-and-energy-directorate/
- http://www.mozes.co.uk/

## 2. THE TRENT BASIN PROJECT (NOTTINGHAM, ENGLAND)

# Trent Basin - Nottingham (England)


## Key facts

**Location:** Trent-Basin - Nottingham, England

**Type of territory:**
☐ Rural area
☐ Semi-rural
☒ Urban area

**Type of habitat:**
☐ Individual housing
☐ Collective housing
☒ Mix

**Project starting date:** June 2018

**Nb of households concerned:** 46 in 2019 and ~ 250 when completed

**Energy sources :**
☒ solar PV
☐ wind
☐ micro-hydro

**Scope of community project :**
☒ collective RES generation
☐ collective RES distribution
☒ collective storage
☐ net metering
☐ others

# Project Description

## Local background

The project is located within Nottingham Waterside, an area widely acknowledged as one of Nottingham's greatest but least developed assets. The Trent Basin site has long waterside frontage both to the River Trent and an inland harbor that in its heyday was a busy inland port. The site is no more than 10 minutes by bike from the Nottingham City Centre and even closer to the Nottingham train station.

This innovative project, already today in its second stage (out of five), arises from the work developed by Project SCENe's consortia, enabled by Innovate UK funding and the Energy Research Accelerator ERA.

Project SCENe (Sustainable Community Energy Networks) looks to accelerate the adoption of Community Energy Systems, a different way of generating and supplying locally generated heat and electricity to homes and commercial buildings.

This project is fully in line with the community climate change and energy strategies of Nottingham Council and its specific objective of improving energy efficiency in homes.

## Main targets of the project:

The Trent Basin project brings together companies involved in the energy supply chain with key industry players, academics and buyers of energy efficient homes on site to deliver new models for community energy schemes. Using novel consumer engagement tools and a focus on business model development the consortium is developing and testing business model templates that could be used by other developers of large scale housing projects all over the UK.

When completed, it will consist in providing around 250 contemporary, high quality, low energy homes, a new kind of sustainable neighborhood with a strong sense of place, underpinned by research and innovation.

The aim of the Trent Basin Community Energy project is to demonstrate how it is possible to provide a practical solution which can minimize the use of fossil fuel generated energy, lower energy costs, smoothing out the load curve and reduce carbon emissions. The data gathered will enable the energy system to be optimized and made ready for widespread deployment in community energy schemes. This unique project, the first of its kind in the UK, has the potential to make a huge impact on the country's energy sector, by providing cheap renewable energy to communities. ERA's aim is to demonstrate that the technology and associated business models are commercially viable, acting as a blueprint for other community energy schemes around the UK.

More specifically, the expected benefits of Trent Basin project are:

⇨ reduced cost and more efficient use of distributed renewables to reduce the overall carbon emissions from the energy system ;

⇨ a better management of the electricity request thanks to the community storage battery, in order to smooth the curve of consumption and reduce the peak load (keep the UK power networks more robust and stable) ;

⇨ learning and improving the community energy consumption habits thanks to the monitoring equipments ;

⇨ a development of social bonds within the Trent Basin future inhabitants by involving them in the energetic choices for their local area and, more widely by letting them decide how they want the money of their Community Fund to be spent (Cf. section "Community benefits/impacts for more details) ;

⇨ the testing of a new business model and the demonstration of how to make a return for developers to encourage them to invest in other similar projects for replication at the national level (as today, most of the necessary technologies are available but too expensive for consumers to invest in themselves).

## Key figures:

| Indicators | Unit | When completed | End of Phase 1 |
|---|---|---|---|
| **Households comprised in the project** | Number | 250 | 45* |
| **School** | Number | 1 | 0 |
| **Area of the Community beneficiaries** | Acres | ~20 acres | ~4 acres |
| **Average annual electricity consumption/households, beneficiaries of the project (estimates)** | kWh/year | (- 3 to 10 %)? | 2 774** |
| **Production capacity of the PV solar panels** | kW | 2 000 | 2 000 |
| **Annual production of the PV solar panels (the first year)** | kWh | 416 MWh | |
| **Storage capacity of the 500 kW battery** | kWh | 2 100 | 2 100 |
| **Cost of the battery** | €/kWh | Confidential | |
| **Average solar price of the solar kWh sold to the grid** | c€/MWh | 64,20 | |

* 45 households = 37 individual homes + 8 apartments amongst which a Community hub
** Annual electricity consumption already below the UK average value.

## Map of the project:

## Key stakeholders:

| Type of actor | Organisation/company | Contact | Function | E-mail address |
|---|---|---|---|---|
| Founder/ Investor | Innovate UK /The Energy Research Accelerator (ERA) + Project SCENe | Dr Derek Allen<br>Dr Emma Kelly | Innovation Lead for Energy<br>Chief Operating Officer | |
| Co-financer | Nottingham city council | Councillor Sally Longford | Portfolio Holder for Energy & Environment | Sally.Longford@nottinghamcity.gov.uk |
| Coordinator | University of Nottingham | Mark Gillott | Professor of Sustainable Building Design | Mark.Gillott@nottingham.ac.uk |
| Setup and design of the ESCO serving the Trent Basin development | SmatKlub Ltd | Charles Bradshaw-Smith | CEO | charlesbs@smatklub.org |
| Property Developer | BluePrint/igloo Regeneration/Nottingham Council | Nick Ebbs | Vice Chairman | nick.ebbs@igloo.uk.net |

**Description of the role of the main stakeholders:**

The Trent Basin community energy initiative benefits from £6m investment through two Innovate UK funded programmes, with support from Nottingham City Council.:

- the Energy Research Accelerator (ERA) and
- Project SCENe (Sustainable Community Energy Networks).

In addition, it includes a consortium of partners, including the following 4 key players:

1. The University of Nottingham
2. Blueprint/Igloo
3. SmartKlub-ESCo
4. The new Trent Basin residents

1. The project is headed up by the academic lead Professor Mark Gillott, from the Faculty of Engineering, **University of Nottingham**.
Professor Gillott also runs the **Creative Energy Homes**: a seven-house living test site on University Park campus, investigating energy-efficient technology use in homes and smart grid – heat network applications. The community energy scheme at Trent Basin has been directly informed by the research undertaken at the Creative Energy Homes.
As a start, the University of Nottingham owns all the assets and lent them to the ESCo.
Furthermore, the University is in charge of the monitoring and sharing of all the energetic data collected thanks to the sensors and monitoring appliances installed in each home:

- Thermostats,
- Evohome controllers to schedule heating in the different parts of home,
- Sensors in every rooms
- Display systems with real-time information (room temperature, energy consumption, $CO_2$ emissions, etc.)
- Electric and gas smart meters
- A voice-activated Amazon Eco Spots (to give real-time updates on electricity use and helpful suggestions on greener energy settings).
- A specific phone/internet application for residents for access to live data on energy generated and consumed

Finally, as communication and benchmarking against national average is considered as being an important factor for changing behaviors and teaching Trent Basin residents to become more and more energy efficient users, the Nottingham University has developed a Trent Basin's on-site Community Hub facility, where a

dedicated giant interactive screen-wall has been developed to visualize energy data and to educate homeowners. The software developed especially for the project offers two options:

- a full total access for global data that allow to compare the Trent Basin data against regional or national averages (Community Hub interactive wall)
- a confidential access for private data (individual mobile phones/website).

2. **Igloo Regeneration** manages **Blueprint** and qualifies itself as "UK's leading responsible real estate business". Igloo/Blueprint is a developer specialized in the development of sustainable homes and sustainable workspaces. It has a track record of delivering low energy, design led development projects (i.e: Green Street and Hobart & Pitcairn in The Meadows). It intervenes all over the UK but, more specifically in the Midlands as Blueprint is a public-private partnership between the city council of Nottingham and the private investor Aviva Igloo Regeneration.
It is managing the Trent Basin development and is selling energy efficient homes (double or triple glazed windows), fully equipped rated A+ or more appliances: hob, oven, cooker hood, fridge, freezer, dishwasher and washing machine as well as LED downlighters.
Blueprint also designed a 90 pages "Guide to your new home", distributed to all new Trent Basin inhabitants, that not only contains essentials and important things residents must know and do to keep the building and its systems working as intended but also lots of Best Practice and practical advices to optimize the heating, ventilation, water, gas and electricity consumption of your house, without forgetting tips related to smarter daily journeys (located cars, electric vehicles, bikes, and charging points, etc.), to waste and recycling or to electricity tariffs and payment methods.

3. **SmartKlub Ltd**, provides a wealth of experience in the Community Energy and Smart Cities sectors. The founders noticed that, despite local authorities across the UK looking for alternative ways to meet their unique energy needs that directly benefits citizens, the market was failing to provide integrated community energy projects.
SmartKlub's role is to develop the new business models required and create a viable Energy Service Company (ESCo) to operate the low carbon money saving offer on behalf of the residents. In that respect, the ESCo makes it much easier for the developer to help the Trent Basin residents save energy, carbon and money.

4. Once assets are operational and returns are established (after finance and operational costs), the new **Trent Basin residents** will be co-owners of the ESCo. They will get involved with project decision-making and will be entitled to an agreed share of any surplus income. They will also take part in two key aspects of the project:

- They will sign a hassle free roof lease for the solar panels on all homes that will be installed by experts and maintained free of charge
- Through a separate agreement, homeowners will be given a suite of equipments including an Amazon EchoSpot, Honeywell Evohome heating system, in home monitoring with data accessible through a bespoke energy application.

## How does it work?

As most demonstrator projects, the Trent Basin project is being implemented in several stages.

Phase one provided 46 low-energy family homes when completed in spring 2016.

Phase two consists in building a further 31 homes, and should be completed by the end of 2019.

By the end of phase five, 250 households and one school should benefit from this promising innovative project.

In April 2019, in addition to the 46 energy efficient homes built and monitored, the project includes an urban solar panel farm[8]. As houses are built, these panels will be transferred from the solar farm to the roof of each home.

Renewable energy, generated by solar panels located throughout the Trent Basin neighborhood, is then stored in Europe's largest community energy battery (supplied by Tesla and switched on June 2018). The 500 kW battery with a storage capacity of 2.1 MWh was sized to be pragmatic: not so big and expensive that it does not need support from the grid.

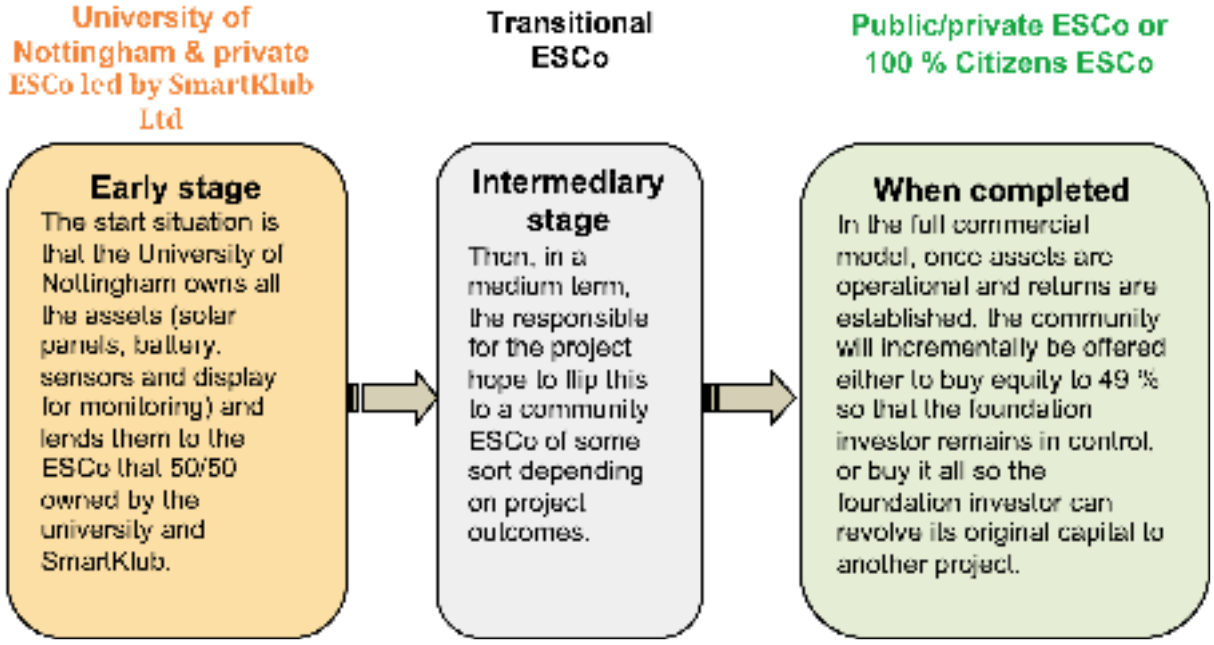
[8] The decision of installing a solar farm prior to the construction of new houses was an informed choice just in time to benefit from the end of the feed-in tariffs in December 2018.

Trent Basin Energy Services Company (ESCO) Ltd - the company set up to run the project – then decides whether to use the electricity generation and storage to sell it to the grid or to the residents, the idea being to base its decision on financial and carbon saving objectives in real time. The ESCo, not having the status of a licensed supplier, should be limited by law to onsite generation of 2.5 MW or less to domestic consumers but has received a special allowance from Ofgem[9] within the project as a potential effective way of stabilizing the grid (the community battery will be used to provide services to benefit the national grid, such as feeding energy into the grid to meet demand at peaks times).

The ESCo sells to the grid and can, in the future, help the residents buy both sides of the meter. Residents will then be free to buy as standard from the grid through their official MPAN supply meter or buy from the ESCO direct from Trent Basin local private wires that is separately metered and does not go through the standard MPAN settlement process.

As the project matures it will start to draw an income from selling surplus power back to the National Grid and allow the ESCO to share surplus with residents (after finance and operational costs).

Initially founded as a limited private company by SmartKlub who manages it, the ESCo is intended to be co-owned by Trent Basin residents, who will be invited to get involved with project decision making and will be entitled to an agreed share of any surplus income. Once assets are operational and returns are established, the community will incrementally be invited to buy equity to 49% so that the foundation investor remains in control, or, although less likely, decide to buy it all so the foundation investor can redirect its original capital to another project.




As well as the energy equipment on the development, the Trent Basin project is also making use of cutting-edge smart home technologies. A suite of in-home energy monitoring devices will allow residents access to the information they need to make informed choices about their energy use. These include voice-activated Amazon Eco Spots with on screen messages to give real-time updates on electricity use and helpful suggestions on greener energy settings. The research team has also co-developed a 3D interactive map of the Trent Basin development available on an app for residents. Live energy data on individual properties can be viewed and compared to their Trent Basin neighbors and benchmarked against the national average.

Although in its early days, the project is capable of yielding large data sets on consumer behavior regarding energy use. The researchers hope their findings will inform an innovative business model that can be rolled out nationally to increase the take up of community energy schemes across the UK.

Finally, community being an important part of Trent Basin, the community energy hub includes seminars for current residents and people interested in moving to the community, with a physical space for them to interact and discuss energy and sustainability.

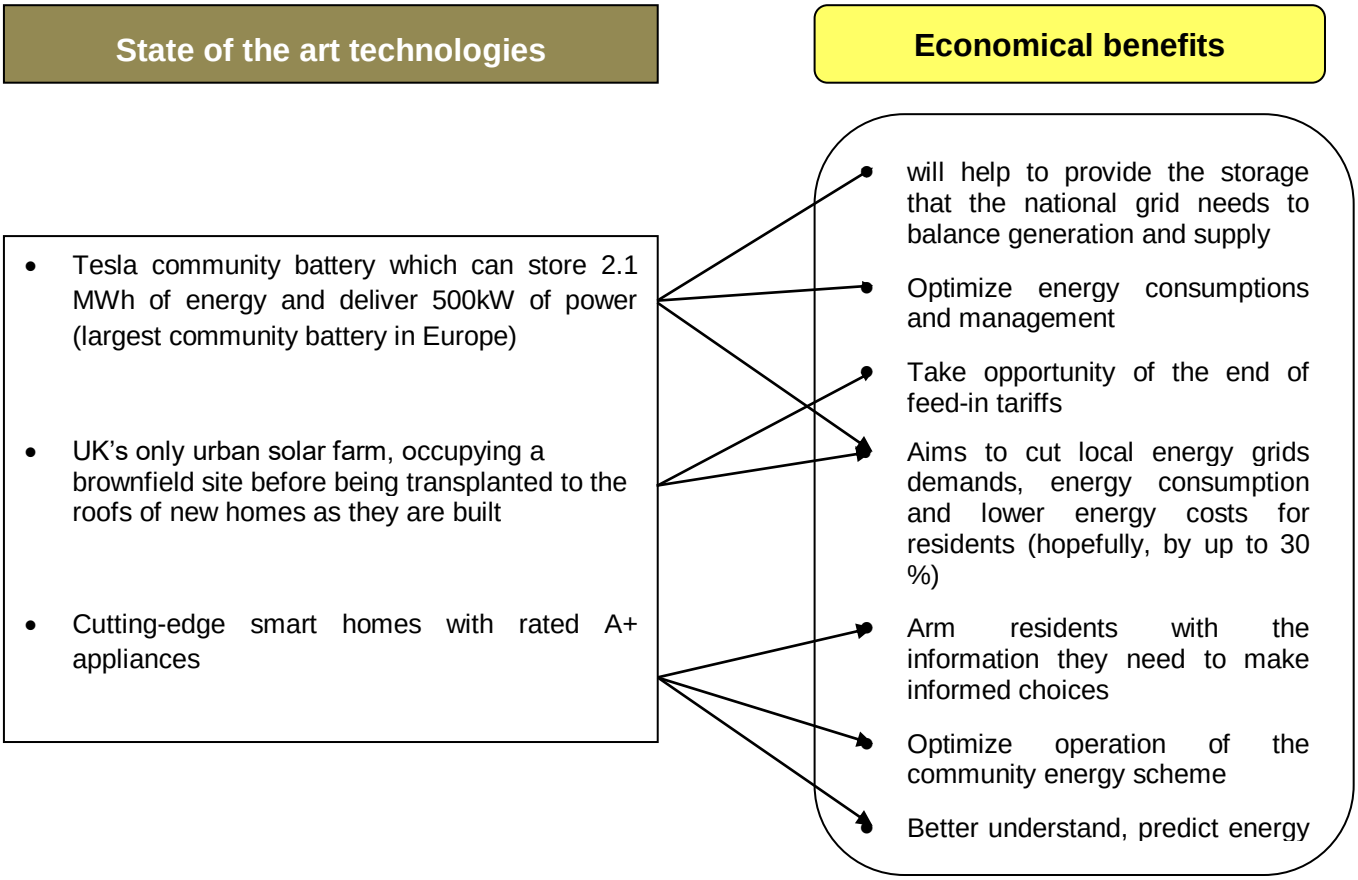
[9] Cf. “Eanbling trials through the Ofgem regulatory sandbox”: https://www.ofgem.gov.uk/system/files/docs/2019/02/enabling_trials_through_the_regulatory_sandbox.pdf

# Community benefits/local impacts:

As already detailed in the previous pages, the Trent Basin project is the first of its kind in the UK. Not only, it is an innovative project in terms of technology, but beyond this, it appears to be promising in terms of business model, energy efficiency and consequent savings, learning of energy consumption behaviours and social cohesion.

### Technico-Economical benefits:

Technologically, the Trent Basin project benefits from several state of the art appliances that should allow economical benefits to both the community and, to the whole country for potential replication:



## Social impacts

Thanks to original and innovative tools, the Trent Basin project fosters a sense of community ownership of energy systems and demonstrates how a socialized sense of responsibility can influence individual attitudes to energy use and sustainability.

First, the community hub consisting in a physical small apartment, located on the ground floor of the 8 apartments building is a convivial place where residents can meet to share a cup of tea and discuss about their community development while consulting all the up to date energy data and ratios related to their neighborhood, freely accessible on one of the wall-screen of the apartment. This dedicated physical area, specifically dedicated at encouraging the dwellers to fill concerned about their energy, water and general consumption habits, is supported by a battery of sensors in each rooms of the dwellings and interactive applications, that, not only help the residents to learn and better understand energy and climate issues but also to change their behaviors. Clearly informed, they will become fully responsible for their consumer choices, for the amount of savings they might get on their energy bills and, in the end, for the greater or lesser success of the project for themselves as for other communities in the UK and even in other countries.

Second, a strong sense of community is also established through the Community Fund that has been created as soon as the first Trent Basin residents arrived to live in their new dwellings. The arrangement put in place by igloo[10] (the developer) in partnership with the residents, consists in allocating a small element of the Service Charge in the lease to continue feeding the Community Fund that was initially established with £ 5 000. The Community Fund is to be used for the marketing, animation and promotion of the Trent Basin development and area in ways that make a contribution to the wider neighbourhood and community.

As residents and members of the Management Company, residents have a role to play in deciding how the Community Fund is spent. It has been set up in association with Trent Basin Resident's Association and will be distributing grants to groups and individuals through a democratically elected committee.

Not only the Trent Basin project is increasing in community resilience and social cohesion, providing opportunities to meet, debate and share ideas between neighbours, it units residents around a common energy project, making them proud of being direct stakeholders of an innovative project, good for them (as a local community), good for the environment (green energy) but also very useful for others (wonderful energy database for academics, great experimentation of new business models for replication on national or international levels).

It will inevitably increase knowledge, understanding and awareness of energy issues in general, bringing people closer together while reducing energy expenses for residents and improve their quality of life.

## Environmental impacts

The association of solar panels for the production of local non-fossil electricity with energy efficient appliances and sensitization means of decreasing the global energy consumption of residents (guide, hub, interactive applications, monitoring display), will inevitably allow a reduction of $CO_2$ emissions.

[1010] Igloo has always been clear in its commitment to the communities and already has several experiences in establishing Community Funds. For example, the Bermondsey Square Community Fund Chest has resulted in £ 169 000 being awarded to community projects from October 2010 to Decmeber 2014 through 84 awards paid to 57 different organisations. Amongst others, this has enables 33 community events, 8 education and traing projects and 18 projects providing resources for local clubs and societies.

# Outcome and future prospects

## Key strengths/success factors of the project:

- Strong involvement of the community residents all along the project
- An innovative business model designed in 3 stages by SmartKlub whose aim is to switch cities on to new, collaborative ways of powering themselves:
    - a limited company ESCo managed by SmartKlub with assets owned by Nottingham university and lent to the ESCo in the first phases of the project
    - an intermediary stage with shared decision process between the residents and the ESCo
    - and a final stage with possibility of even further commitment of the community within the ESCo (citizen cooperative?)
- A great public/private partnership of complementary skills, all committed to a common objective of shaping community energy for more sustainable built environment
- A strong technical and social expertise of Nottingham University with the provision of cutting-edge smart technologies and the involvement of multidisciplinary expertise, such as:
    - Mark Gillott**,** Professor of Sustainable Building Design, Research and Project Manager for the Creative Energy Homes
    - Lucelia Rodrigues, Associate Professor in Sustainable and Resilient Communities
    - Mark Sumner, Professor of Electrical Energy Systems, leading energy research in the areas of demand side management, microgrid stability and the deployment of batteries for energy storage
    - Julie Waldron**,** Community Energy Manager Project SCENe at Trent Basin, whose main research focus is on user engagement and community energy, human behaviour, urban design and built environment.
    - Dr. Lewis Cameron**,** Community Energy Manager, whose work focuses on social and technological interactions and development and how methods of co-design and social science informed approaches can improve these and their impacts over diverse scales
- The involvement of a real estate developer clearly committed to the communities and sustainable development: igloo/Blueprint
- The risk-taking of initial investors: Innovate UK, Energy Research Accelerator and Nottingham Council, trusting this participative and innovative project to become a catalyst for change and demonstrate that the technology and associated business models are commercially viable, acting as a blueprint for other community energy schemes around the UK

## Main difficulties/weaknesses:

- Innovating legal agreements on land use and solar roof leases (now completed)
- Unpredictable energy policy by UK Government
- Unpredictable pricing and availability of Ancillary Services from national Grid

## Projected development:

Other community energy schemes similar to Trent Basin, around the UK,

# Appendices

### List of interviews:

- Professor Mark Gillott, University of Nottingham
- Mr C.Bradshaw-Smith, CEO SmartKlub
- Mr Nick Ebbs, vice-chairman igloo/Blueprint

### List of documents studied:

- Trent Basin, a guide to your new home (Blueprint)
- Trent Basin leaflet, How does it work

### Other sources of information:

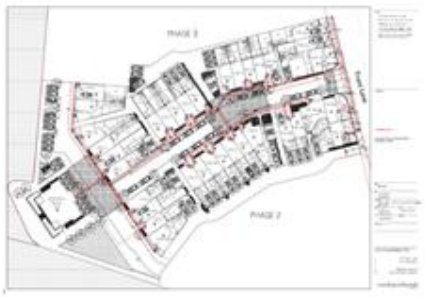
⇨https://scene.stickyworld.com/room/presentation?roomid=12#landing/home

⇨https://www.nottingham.ac.uk/news/pressreleases/2017/june/pioneering-community-energy-pilot-underway-at-nottingham-development.aspx

⇨https://www.era.ac.uk/News-and-blogs/trent-basin-community-energy-system-goes-live/201669

⇨ https://www.projectsensible.eu/

### Additional photos:



Private wire – generation only

Urban solar farm

Sub station

Energy Centre


2.1 MWh Battery

Battery

## 3. WILDPOLDSRIED (GERMANY)

# Wildpoldsried - Germany


## Key facts

**Location:** Wildpoldsried - Bavaria, Germany

**Type of territory:**
☒ Rural area
☐ Semi-rural
☐ Urban area

**Type of habitat:**
☒ Individual housing
☐ Collective housing
☐ Mix

**Project starting date:** 2010 (phase II)

**Nb of households concerned:** over 250 households equipped with RE and ≈ 900 citizens invested in a local RE project

**Energy sources :**
☒ solar PV
☒ wind
☒ micro-hydro
☒ biogas

**Scope of community project :**
☒ collective RES generation
☒ collective RES distribution
☒ collective storage
☐ net metering
☐ others

# Project description

## Project background

Wildposdried is a village with 1,200 households in Bavaria, Germany. It is recognized for its exceptional achievements in renewable energy production.

In 1999, Arno Zengerle, Mayor of Wildpoldsried started a residents' participation process in his community. People were asked: how would you like to live in the year 2020? What are your ideas? What is missing in our village?
One issue was renewable energy and climate protection. The villages's commitment to renewable energy therefore began with a document titled "Wildpoldsdried Innovativ Richtungsweisend" (WIR-2020, or Wildpoldsdried Innovative Leadership). The document looked at how the town might encourage growth and invest in new community facilities without incurring debt. The WIR-2020 contained three main areas of focus:
1) Renewable Energy and Saving Energy;
2) Ecological Construction of Buildings Using Ecological Building Materials (mainly wood-based);
3) Protection of Water and Water Resources (both above and below ground) and Ecological Disposal of Wastewater."

## Main targets of the project:

Through these three areas of focus, Wildposdried sought to produce 100 percent of their electricity from renewable energy sources by 2020. But in a relatively small, engaged community where there is a notion of thriftiness, the projects advanced much faster than anyone might have expected. By 2011, the village was producing 321 percent of the electricity it needed, and was receiving $5.7 million in payments for the surplus. Not only all Wildposdried inhabitants are consuming electricity from renewable sources but also the fire-station, the school, the old gym and new sports hall, the town-hall, the recycling yard, the parking-garage, the bathhouse, the day-nursery and the curling lodge, all have roofs equipped with solar panels.

## Key figures:

The entire list of Wildpoldsried's projects is pretty impressive for such a village: in addition to the five biogas plants, 5,350 kWp of photovoltaic, 9 wind turbines and the hydropower system, the town is also home to several municipal and residential biomass heating systems and 2,100 m² of solar thermal systems. Five private residences are heated by geothermal systems and passive house techniques have been used in some new construction. One is also likely to see a fair number of electric cars dotting about.

With such a diversity of renewable energy sources, the town operates a smart grid that maintains the balance between energy production and consumption and keeps the power grid stable.

| Indicators | |
|---|---|
| Total inhabitants in Wildpoldsried | 2,567 |
| Total inhabitants investors in one or several RE | ~900 |
| Total households in Wildpoldsried | 1,200 |
| Households equipped with RE (solar, hydro) | > 250 |
| Households equipped with both the Sonnen Battery & solar PV panels | ~30 |
| Area of the community | 5,275 acres (= 21,35 $km^2$) |
| Total annual electricity consumption in 2018 | 6,131 kWh |

| Facilities | Capacity | Annual production (kWh) |
|---|---|---|
| 2 intercommunal wind turbines (capacity) | 6,000 kW | 36,670,360 |
| 7 wind turbines on the ridge (capacity) | 12,100 kW | |
| PV solar panels capacity | 5,350 kWp | |
| 2 hydropower generators (capacity) | 50 kW | 125,000 |

## Map of the project:

## How does it work?

During the first years, from 2000 until 2009, many projects were initiated, financed and managed by citizens as individuals but not all. The local heating network was managed and owned by the municipality, 200 solar PV panels were privately owned by private inhabitants of the village, whereas 30 additional PV panels were installed on municipal roofs and a few citizens participated financially in the construction of 9 windmills, as participants in the GmbH & Co.KG.
Numerous houses get their heat from a 4.7-kilometer district grid that local citizens built and financed through a cooperative established for this purpose whereas other inhabitants also owns shares in a network that delivers gas to three co-generation plants.
At that time, when the feed-in tariffs were very favourable (over 54 cts/kWhe for solar PV) and that self-consumption wasn't developed, all citizens were selling 100 % of the electricity produced from their solar panels and were receiving two separate invoices, one for the electricity sold to the grid and one from their conventional supplier, for the electricity consumed.

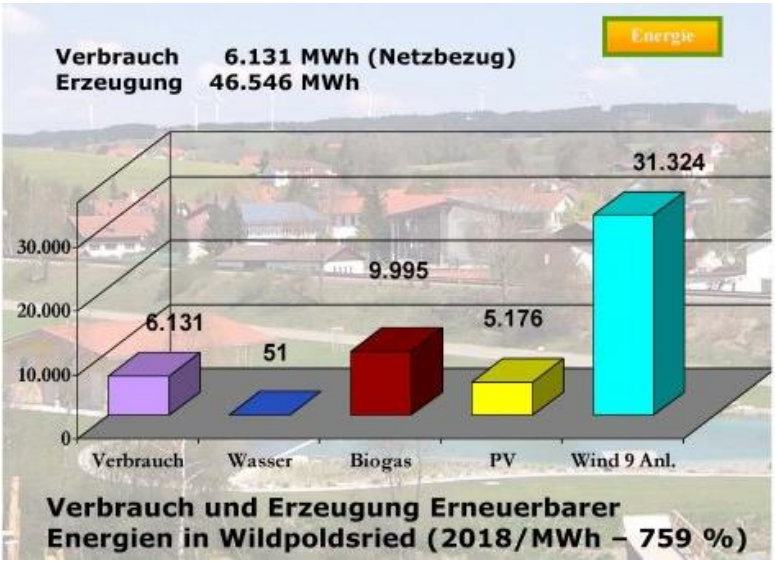
Then, from 2010, a second period started with additional renewable plants and innovative solutions. Allgäuer Überlandwerke (AÜW) GmbH & Co. KG, which operates the local grid and Wildpolsdried started to encounter a problem many community would like to have: they had far too much electricity. Wildpoldsried was therefore selected as the site for an ambitious experiment that involved establishing a smart grid that automatically stabilizes the power network and the village became a testing ground for experiments, financed by the German Ministry of Economic affairs and Energy (BMWi). IREN[11]s smart grid research projects, with Siemens as a leader, were launched to maintain a balance between energy production and consumption.

In 2015, two additional communal windmills were commissioned, which took only three years, all together, to be developed (carrying out the environmental impact assessments, obtaining the permits and the funding). A total investment of € 26.6 million was made in 2015, over 500 Wildpoldsried residents and of the neighbouring village invested € 9.9 million whereas the remaining € 16.7 million was financed through a bank loan. These two wind turbines are operated by WildKraft GmbH & Co.KG.

[11] IRENE is a €6 million investment project. One third of the money is being contributed by the two partners; the rest comes from Germany's Ministry of Economics and Technology.

In 2018, 46,546 MWh of electricity were regeneratively generated in the municipality, more than seven times the local consumption (6,131 MWh).

And amongst this total, the 9 wind plants on Wildpoldsried corridor produced a total of 31,324,000 kWh of electricity, representing, alone, 5 times the electricity consumption of all the inhabitants, hence allowing 5 to 6 millions of € in payments from sales of the surplus power back to the grid and, as a result, low local taxes for all inhabitants. This good value investment is obviously very much related to the fixed FiT system that will last until 2020 but is less from year to year.




Total investment for the 2 inter-communal wind turbine = 10,5 M€, including 3 M€ from 220 participating citizens of Wildpoldsried and Kraftisried (the neighbor village) and 7,5 M€ loan.

Total investment for the 7 neighbor wind turbines = 16,1 M€, including 6,9 M€ from 300 participating citizens of Wildpoldsried and 9,2 M€ loan.

In 2018, the 9 wind mills on Wildpoldsried corridor produced a total of 31,324,000 kWh of electricity, representing, alone, 5 times the electricity consumption of all the inhabitants.

Wildpoldsried is finally the village where Sonnen[12] has decided to established its headquarter. Although confidential, the number of Wildpoldsried households equipped with Sonnen solar batteries is estimated to 30.

[12] Sonnen is the German market leader in home energy storage systems for private households and small businesses. It has developed a sonnenCommunity solution consisting in sharing solar self-production of electricity with other members of the sonnenCommunity. (Cf. https://sonnengroup.com/sonnencommunity/).

# Community benefits/local impacts:

## Technico-economical benefits:

The development of community energy projects in Wildposdried is clearly the result of the will of the mayor and the inhabitants but could not have happened without the existence of feed-in tariffs.

Wildposdried residents who have invested in wind turbine construction get about 6% return each year. This profit comes from the sale of surplus energy produced by the wind turbines to the local electricity supplier.
All public buildings in the municipality are self-sufficient and several even produce more energy than they consume. Annual profits for the city after the sale of the electricity surplus amount about six million euros, resulting in very low local taxes.

## Social impacts

Wildposdried, thanks to its leading role in the development of renewable energies became famous and attractive not only for tourism but also for energy companies and pilot projects financed at both European and national levels. It received numerous awards at regional, national and international levels, amongst which the European Gold Energy Award for the second time. Environment Minister Marcel Huber stated: "While there is still some thought at the international level, there is already action on the ground: Small communities show the big world how it's done." Wildpoldsried is rightfully Europe's most successful commune, and I hope that will soon be copied by others. "

- In the last years more than more than 670 visitor groups from all over the world have visited Wildpoldsried. Visitors can stay in Wildposdried ecological and educational hotel KULTIVIERT.
- Innovative companies have come to settle, such as Sonnen GmbH, a manufacturer of batteries for storing excess power produced from wind and sun, is one of them.
- As already mentioned, Wildposdried has become a testing ground for most advanced energy technologies. Cf. IREN's frame hereunder.

IREN's projects:
200 measurement devices — black boxes with mobile communication links — at solar and biogas plants and in transformers were installed. Weather measurement data and Webcams are also being used to monitor cloud movements. The goal is to gain an overview of who's feeding power into the grid or extracting energy from it, when and where they do it, and how all of this affects the network's stability. Siemens has installed a variable transformer that offsets voltage fluctuations — a device that is normal in high-voltage grids but is a complete novelty in secondary-voltage local networks. Also new is a system for remotely controlling the inverters in photovoltaic units. When the sun shines over the Allgäu mountains, the solar modules there collect so much electricity that the resulting output of alternating current is too high. Managing inverters from a central location safeguards voltage quality and stabilizes the grid. The problem is that Germany's Renewable Energy Act requires all power generated from renewable sources to be taken in by grid operators. But IREN partners were able to obtain an exemption from this stipulation, and they now expect that precise data collection and their system's sophisticated controls will keep losses to a minimum for Wildpoldsried's energy farmers.

The centerpiece of Wildpoldsried's smart grid is Self-Organizing Energy Automation System (SOEASY) software, which cleverly balances supply and demand and keeps the grid stable. Another special feature of the project is the fleet of 32 electric vehicles that are available to Wildpoldsried residents. The cars are already integrated into the village's smart grid and serve as a buffer for electrical energy. If there's an energy surplus, the vehicles' batteries will be given recharging priority.

For more information concerning IREN2, cf. https://new.siemens.com/global/en/company/topic-areas/iren-2.html

Furthermore, Wildpoldsried inhabitants being directly involved in all local decisions related to energy have gained a good knowledge and understanding of the electricity market and challenges.

### Environmental impacts

Wildposdried residents are proud to participate actively to climate protection and $CO_2$ emission savings and to innovative experiments in the field of grid optimisation, that are not only good for them today but that will be beneficial for the whole of Germany in the coming years.

# Outcome and future prospects

### Key strengths/success factors of the project:

- The prominent role of Wildpoldsried mayor, A. Zengerle, since 1999 in favour of renewable energies development
- The democratic functioning in the village
- Involvement of Wildpoldsried citizens

### Main difficulties/weaknesses:

Thanks to its early commitment, at a time when the Feed-in tariff system was fully incentive, the village of Wildposdried has not met any real difficulties. The only constraint that its energy and climate protection coordinator, S. Vogl, could think of was the adoption, since November 17, 2014, of the “10-H” rule in Bavaria. Accordingly, the distance of a wind turbine from houses must be at least ten times as far as the plant is high. With a 200-meter high wind turbine - that is standard today - would have to be located 2,000 meters away from dwellings. This rule has made it a bit more complex to develop wind turbines in the region.

### Projected development:

Since renewables are subject to market mechanisms such as the tendering process, environmental protection associations and renewable energy professionals fear for the energy transition in Germany. "Renewable energies are at risk of going backwards," said Mr Zengerle, mayor of Wildpoldsried, even if, for his municipality, the system does not change. The new rules will only be valid for new installations.

Today, in 2019, the bulk of the effort is focused on energy savings - for example with the switchover from lighting to LED lighting three years ago, on electricity storage and on grid optimization.

# Appendices

### List of interviews:

- Susi Vogl, Wildpolsdried Energy and Climate change coordinator

### Other sources of information:

⇨ https://www.wildpoldsried.de/index.shtml?homepage

⇨ https://sonnengroup.com/

⇨ https://www.wildpoldsried.de/index.shtml?irene

## 4. ALCOLEA DEL RIO (SPAIN)

# Vallehermoso I (Alcolea del Rio, Spain)

## Key facts

**Location:** Alcolea del Rio, Andalusia, Spain

**Project leader**: Som Energía (RES co-op)

**Project launch date:** April 2016

**Nb of citizens holding shares:** 2.182

**Scope of community project:**
☒ collective RES generation
☒ collective RES distribution
☐ collective RES self-consumption
☐ net metering
☐ others

**Energy sources :**
☒ solar PV
☐ wind
☐ micro-hydro

**Production capacity**: 2,160 kW

**Annual production**: 3,400 MWh/year

**Equivalent electricity consumption**: 1,300 households

**Surface area**: 38,000 m 2

# Project description

## National background

In Spain, unlike in other European countries, the community energy movement is at an early stage of development. Renewable energy sources (RES) cooperatives are the main form of community energy projects. There have been two periods of creation of RES cooperatives in the country:

**1. First stage: late nineteenth and early twentieth centuries**

In this first phase, over 2,000 energy cooperatives were set up in many areas of Spain especially in rural areas to alleviate the lack of public investment in the energy sector. Among those energy cooperatives there were many RES co-ops, based on hydroelectric power. After the Civil War, most of them disappeared. Nowadays only about 15 companies from this first wave still exist.

**2. Second stage: from 2010**

The emergence of the second wave of RES cooperatives coincided with the impact of the global financial crisis in the country, the increasing social awareness around energy issues and the modification of the regulation in 2010 that allowed cooperatives to retail electricity. Som Energía (the biggest RES co-op in Spain, funded in 2010 in Gerona) and Goiener (funded in 2012 in the Basque country) have played a very important role in paving the way for the emergence of other more recent and smaller RES co-ops.

Spanish RES cooperatives are mainly focused on the electricity market, the only sector where the regime has to date engaged in the promotion of RES in the country. Most RES cooperatives in Spain currently deal exclusively with the retailing (and to a lesser extent also with the generation) of renewable electricity (mostly solar electricity). Unlike other European countries, no cooperative focusing on RES generation was created in Spain during the period favourable to RES deployment (before 2012).

The PV sector is highly atomized: numerous installations exist and many facilities with power capacities below 100 kW are owned by small individual investors.

For wind, there is a high degree of ownership concentration (in 2014, 10 large energy companies owned approximately 73% of the installed wind power capacity). To date there is only one wind power community project led by EOLPOP with the contribution of Som Energía (among other participating entities) : “viure de l’aire”, a 2.350 kWp wind turbine built in the rural town of Pujalt (Anoia, Catalunya) and financed through a citizens’ shared ownership model.

The growth of RES cooperatives in Spain is also closely linked to public policies related to renewable energy sources. Spain’s policy regarding the development of renewable energy sources in the electricity sector can be split in 3 periods:

1. **1997-2012: active promotion of RES** with the set up of the Special Regime (“Régimen Retributivo Específico”) including RES technologies (i.e. wind power, solar photovoltaic, solar CSP, small hydropower and biomass), energy recovery from waste and cogeneration. Electricity generation under the Special Regime had priority access and financial incentives (combined system of feed-in-tariffs and premiums) that made investment in these technologies attractive. Under this framework, the contribution of RES to the electricity generation of the country increased substantially.

2. **From 2012: regime resistance to RES.** The economic crisis from 2007 combined with an increase in installed gas combined cycle (GCC) capacity from the early 2000s led to a situation of large over-capacity. Moreover, since 2001, although the costs of the electric system started to increase, the Government decided to freeze the regulated tariffs while acknowledging the debt with the utilities. This situation led to an accumulated deficit, known as Pricing Deficit, that reached 26,000 million € in 2013 (UNESA, 2013). RES power plants (mainly those based on solar PV) were accused of being responsible for this Pricing Deficit due to the system of subsidies. As a consequence, a set of Royal Decrees was approved that deeply affected the Spanish RES sector. From 2012, subsidies to new RES installations were suppressed and the Special Regime was finally abolished in 2014. The subsequent legislation strongly limits the economic feasibility of new RES projects and includes moratoriums and retroactive reductions on the existing incentives. One of the most unpopular measure was the “sun tax”, a 7% tax on

electricity production that the owners of self-consumption PV installations over 10 kW had to pay even for the electricity they produce for their own use and don't feed into the grid (in addition to the access toll paid by everyone who consumes electricity from the conventional grid). The new law also prohibited PV systems up to 100 kW from selling electricity, requiring their owners to donate the extra electricity to the grid for free.

RES cooperatives had to adapt to this new hostile context. For example, in 2015 Som Energía launched the "Generation kWh" project, an innovative project allowing cooperative members to make investments on "energy-shares", where the investment is returned in the form of energy consumption reduction in the energy bill (see project background below).

3. **From 2019: a new start?** At the beginning of October 2018, the Royal Decree 15/2018 related to urgent measures for energy transition and consumer protection was approved. Among other measures, it suppresses the charges on existing and new self-consumption RES plants, simplifies the procedure to apply to the self-consumption scheme for RES plants until 100kW and allows shared self-consumption. The law is already fully in force, it has been validated in Congress and now the implementation of the regulation will foreseeably be done by September 2019.

## Project background

Alcolea del Rio's solar plant has been the first community power project 100% financed by a consumer cooperative in Spain (without requiring any subsidy or bank loan). It is part of Som Energía's « Generación kWh » initiative, a program based on an innovative investment model: consumers (members of the cooperative) that participate in the investment scheme supply a free 25-year loan to Som Energía to help finance the construction of new community-owned RES plants. In exchange, they receive « energy interests » rather than financial interests. In concrete terms, each participant decides to invest an amount based on his annual electricity's consumption (1 share = € 100). For a 100 euros share, each shareholder benefits each year during 25 years from about 200 kWh at cost price which allows a significant reduction on the electricity bill compared to market price. This innovative model is like a "virtual self-consumption" scheme.

2 182 persons participated to the financing of Alcolea del Rio's solar plant for a total investment of 2.041.025 €. Som Energía guarantees that the loan is fully paid back by the end of the 25 years period.

The plant was constructed in the last months of 2015 and started operating in 2016, after the government announced the sun tax and the withdrawal of incentives to the production of renewable energy. Since then it has already generated more than 10 GWh with an annual production of about 3,4 GWh.

The production of the plant is equivalent to the electrical use of approximately 1,300 homes, and allows to save around 1,500 tonnes of $CO_2$ each year.

## Main targets of the project:

The "Generación kWh" plan was launched to demonstrate that it was possible to create profitable community-owned RES generation projects despite the hostile national context through an innovative investment model.

## Key figures:

| | Unit | 2018 |
|---|---|---|
| Number of PV panels | Nb | 8,640 |
| Total area | Ha | 3.8 |
| Production capacity of the PV solar plant | kWpk | 2,160 |
| Effective production of the solar PV plant | MWh | 3,400 |
| Equivalent electricity consumption | Nb households/year | 1,300 |

## Key stakeholders:

| Type of actor | Organisation/company | Contact | Function | E-mail address |
|---|---|---|---|---|
| Initiator, coordinator, owner and electricity trading | Som Energía (RES cooperative) | Nuri Palmada | Project developer | nuri.palmada@somenergia.coop |
| Design, construction and maintenance | Energés Gestión Medioambiental S.L. | Juan Lora | Project developer | **T** +34 955 72 37 97<br>**M** info@energes.net |
| Investors | Members of Som Energía cooperative | - | - | |
| Environmental NGOs (plantation of native plants) | Ecologistas en Acción<br>Red Andaluza de Semillas, | | | |
| Local authorities | Alcolea del Rio's town council | Carlos Lopez Barrera | Mayor | |

## Description of the role of key partners:

- **Som Energía: RES Cooperative**

Som Energía is the owner of the PV installation. Founded in 2010 in Girona, it has grown quickly to become the biggest RES co-op in Spain with more than 58,900 members and about 99,500 contracts. Som Energía sells electricity from renewable energy sources bought from the market (with guarantees of origin certificates) and also owns several RE power plants – 9 operational PV plants plus 3 under construction, 1 hydraulic plant and 1 biogas plant - that produce a total of 13,5 GWh/year. Som Energía has financed the whole project through a subscription program called "Generación kWh". Members of the cooperative can invest in "energy shares" and get a return in terms of energy bill savings. Each share has a nominal value of 100 euros. To cover 70°% of its electricity consumption, a typical Spanish household (consuming about 3.500 kWh/year) has to invest about 1.400 euros.

2.182 members of the cooperative have financed the construction of Vallehermosa PV plant, the first RES installation developed by the Generación kWh programme. A second PV plant (Fontivsolar, near Avila) started producing in January 2019 and third project is in administrative processing. So far, nearly 4 million € have been invested by 4,000 cooperative members.

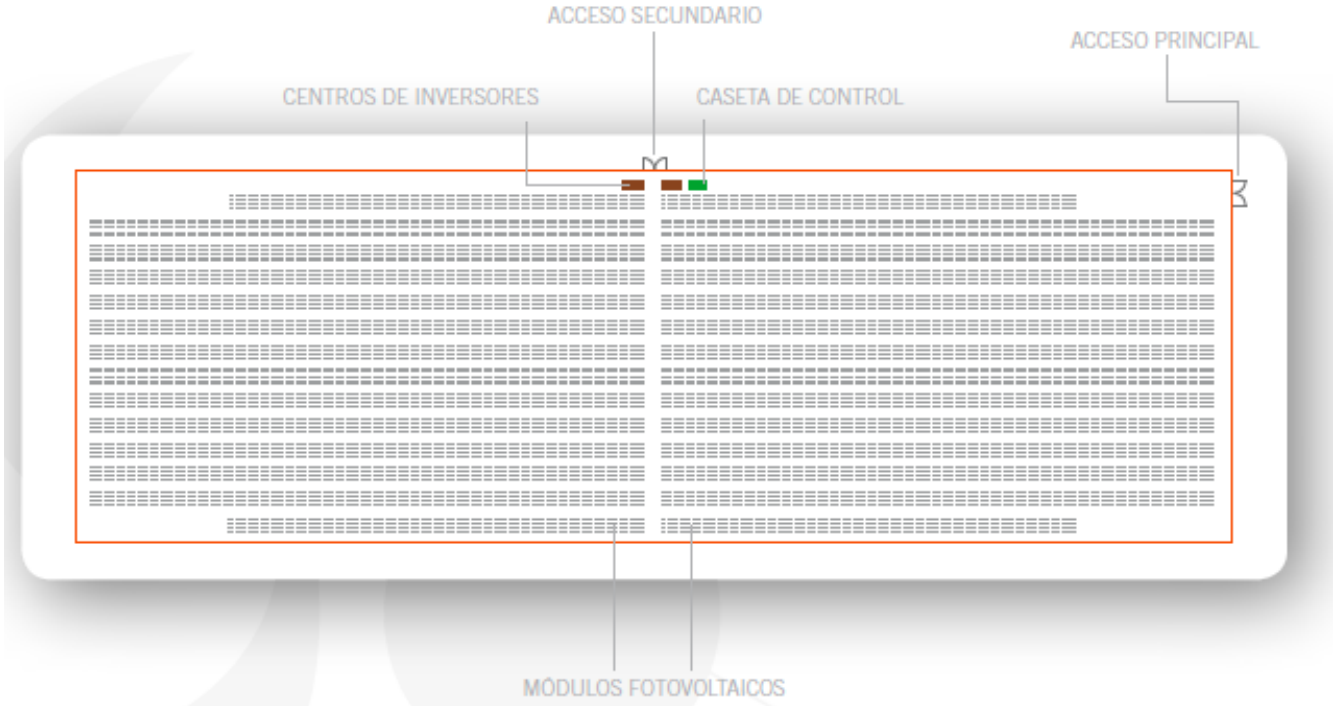
The plant is connected to the grid: the power produced on Vallehermosa plant is sold on the pool market (no self-consumption).

- **Energés: constructor and operator of the plant**

Created in 2004, Energés is now a diversified engineering and construction company operating in several international markets, including Chile, South Africa and Uruguay, working with electricity generation technologies including photovoltaic and wind power. Energés has constructed projects totalling more than 20 MW of installed power, and participated in the construction of other projects amounting to more than 130 MW.

Energés integrates the entire value chain of the photovoltaic business; from the project (design), to the construction, commissioning and maintenance of the generation plants.

## Map and photos of the installation:




# Economic analysis

## Community energy legal and economic context:

**Key features of the electricity market in Spain**: Spain has the fourth highest electricity price for household consumers in the EU-28 (Eurostat, 2018). Electricity prices have increased by 70% since the liberalization process started in 1997.

Since 2014, the price of kWh on the regulated electricity market is established through the wholesale market (pool). Previously, it was done through auctions. On the other hand, the price of kWh on the free market is established by each marketer, which acquires energy at the same cost. The customers can decide with which marketer to contract their supply. Since 2010, RES co-ops are entitled to sell electricity.

In Spain, RES co-ops (like other operators) guarantee the renewable source of electricity through Guarantee-of-Origin Certificates. These certificates allow RES co-ops to sell the energy consumed by its members as RE, even though other producers may produce it.

**Incentives for community-owned RES projects:** none during the 2012-2018 period.

**Legal or economic barriers**: from 2012 to 2018 the legal framework of the electricity system in Spain was very unfavourable to RES co-ops. These small organizations have a large entry barrier to access to the public energy purchasing markets, because the public bidding documents establish a series of criteria such as technical solvency and financial guarantees that most RES co-ops cannot achieve.
The regulation also strongly limits the installation of new RES power capacity (including restrictions to self-consumption, which obstruct the decentralization of generation). Moreover, most of it is backed by RE Certificates that, to date, lack demand and are currently transferred at a nearly negligible cost.
Moreover, the profit margin of retailing electricity in Spain is generally rather low (≈5%), since most of the electricity bill is directed to covering regulated costs and taxes.

**Financial aspects (tariffs, taxes and subsidies)**

Average prices of electricity for households in Spain (2018) – contracts <15 kWh (“tarifa 2.0”)

| | |
|---|---|
| Average retail prices for households - all taxes included[13] | 0,238 €/kWh |
| Retail prices for households - without tax and levies<br>- Standard market price<br>- Generación kWh price | <br>0,139 €/kWh<br>0,116 €/kWh |
| Annual fixed subscription for households (for contracts up to 15 kW) | 38,043426 €/kW/year |

Amount paid for energy exported to the grid:

Grid access costs - fixed term of the electricity bill: 38,043 €/kW/year

Grid access costs - variable term: 0,044€/kWh

[13] *Source : Eurostat*

## Economy of the project

### Costs analysis

| | |
|---|---|
| **Investment costs** | |
| Total investment costs | 2,041,021 € |
| Payback period | 25 years |
| Annual depreciation | 81,641 €/year |
| **Exploitation costs** | |
| Total production costs (including annual depreciation – excl. taxes) | ≈ 0.033 €/kWh |
| Total production costs – including taxes (7% IVPEE)[14] | ≈ 0.035 €/kWh |
| **Standard electricity price on wholesale market (<10 kW)** | 0,059 €/kWh |
| **Grid tolls** | 0,044 €/kWh |
| **Standard retail price for Spanish households (<10 kW)** | 0,139 €/kWh |

### Project financing

| Sources of funding | Total amount (in €) | Type of costs concerned | % of total |
|---|---|---|---|
| European subsidies | 0 | - | |
| National/regional subsidies | 0 | - | |
| Tax credit for investments | 0 | - | |
| Bank loans | 0 | - | |
| Self-financing | 2.041.021 € | Investment costs | 100% |

# Community benefits/local impacts:

## Economical benefits:

**Reduction of energy bills for consumers supporting the Generación kWh program**: the difference between the market price and the Generation kWh price (cost price) has allowed savings of € 19 in 2017 (for a typical investment of 10 energy shares = 1 000 €). For 2019, with the current prices, the savings shall increase and reach about € 36 (taxes included).

## Social impacts

« Generación kWh » is a non-place-based community model: any member of the cooperative can invest in the scheme whatever his/her location is. In Alcolea del Rio's case, being a small village, few local citizens have invested in the programme. The project itself generated some local economic benefits especially during the construction phase. Som Energía also pays a rent for the land to the municipality. Since the electricity produced is sold to the grid (due to the legislation), the direct economic impacts are now more limited as the exploitation and maintenance does not require many local jobs (about 1-2 persons). However Som Energía's approach generates indirect community impacts as the cooperative's benefits are reallocated to finance local groups' activities including local meetings and presentations, awareness raising about energy efficiency measures, training sessions, initiatives fighting fuel poverty in partnership with local authorities and associations, joint buying of solar panels… Currently Som Energía has 53 active local groups in different regions of Spain.

In addition, being the first project of its kind in Spain, Alcolea del Rio's solar plant has attracted many visitors and generated a lot of media impact (television reports, press articles, official visits…).

[14] tax on the value of electricity generation

### Environmental impacts

The production of the plant is equivalent to the electrical use of approximately 1,300 homes, and allows to save about 1,500 tonnes of $CO_2$ each year.

# Outcome and future prospects

### Key strengths/success factors of the project:

The innovative financing scheme developed by Som Energía allowed to set up a profitable production plant despite the lack of subsidies or feed-in-premiums. The commitment of the members of the cooperative made the financing possible by providing zero-interests loans.

This project demonstrated that is possible to produce energy from renewable sources at a cost slightly below the standard market price. This first success paved the way to new projects based on the same scheme.

### Main difficulties/weaknesses:

The administrative procedures took a little longer than expected in the final phases: the plant was ready at the end of December 2015 but Som Energía had to wait 5 month to get the plant connected to the grid.

Provided there is no subsidy or specific support measure, the profit margins are quite low.

### Projected development:

Som Energía's target is to cover 100% of the energy consumed by its members by its own production plants. Currently the operational production plants only cover between 3% and 5%. Reaching this target is a key challenge for the cooperative.

# Appendices

### List of interviews:

- Nuri Palmada, project developer at Som Energía
- Meritxell Bennasar, Fundación Renovables

### Main information sources:

- Som Energía's website: https://blog.somenergia.coop/
- Generación kWh website: https://www.generationkwh.org/
- Project's website: https://www.generationkwh.org/los-proyectos/alcolea-del-rio/
- Website of Red Eléctrica de España (Spain's TSO): https://www.esios.ree.es/es
- General context and legal framework: http://www.res-legal.eu/search-by-country/spain/summary/c/spain/s/res-e/sum/196/lpid/195/

## Som Energía's electricity prices for Generación kWh projects

**Selling prices from January 2019**

| Contracted power | Tariff | Period | Price of contracted power (€/kW/year) | Energy price (€/kWh) Standard price in Spain | Energy price (€/kWh) Generation kWh price |
|---|---|---|---|---|---|
| < 10 kWh (households) | 2.0A | - | 38,043426 | 0,139 | 0,116 |
| | 2.0DHA | P1 (peak) | | 0,161 | 0,135 |
| | | P2 (off-peak) | | 0,082 | 0,065 |
| | 2.0DHS | P1 (peak) | | 0,160 | 0,133 |
| | | P2 ((peak) | | 0,091 | 0,069 |
| | | P3 (super off-peak) | | 0,073 | 0,061 |
| 10-15 kWh | 2.1A | - | 44,444710 | 0,152 | 0,129 |
| | 2.1DHA | P1 (peak) | | 0,172 | 0,146 |
| | | P2 (off-peak) | | 0,093 | 0,076 |
| | 2.1DHS | P1 (peak) | | 0,173 | 0,146 |
| | | P2 ((peak) | | 0,106 | 0,084 |
| | | P3 (super off-peak) | | 0,078 | 0,066 |
| > 15 kWh | 3.0A | P1 (peak) | 40,728885 | 0,121 | 0,092 |
| | | P2 (normal) | 24,43733 | 0,105 | 0,081 |
| | | P3 (off-peak) | 16,291555 | 0,079 | 0,064 |
| | 3.1A | P1 (peak) | 59,173468 | 0,106 | 0,077 |
| | | P2 (normal) | 36,490689 | 0,097 | 0,072 |
| | | P3 (off-peak) | 8,367731 | 0,078 | 0,063 |

**Taxes and additional costs**

| Taxes | Rate |
|---|---|
| VAT | 21% |
| Electricity tax | 5,11269% |
| Bono social (for low-income consumers) | 0,02 €/day |