Energy data use cases and needs of European market participants

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Executive summary

This report verifies that there are a considerable number of energy companies in Europe which, through processing metering and other energy data, provide energy products and services that change energy consumption and production behaviour, guide the user to greener choices and, as an added benefit, make it possible to gain economically from being more environmentally friendly and aware. Therefore, the competitiveness and increasing number of these companies plays a vital role in the transition to a sustainable energy system and a carbon-neutral economy, which are the goals of the EU 2050 climate strategy.

However, this report also confirms the well-known but neglected fact that energy data is currently not easily accessible and there is an urgent need to facilitate data interoperability in the EU and work towards a Pan-European energy data access solution, for which a list of the most relevant characteristics is proposed at the end of this report.

Additionally, this report gives an overview of the main use cases of products and services that need energy data, provides a better understanding of what energy data are needed and why and explains how these data are currently accessed and what the main problems are.

The findings presented in this report originate from multiple studies, interviews and meetings (see Annexes 1-4) conducted from summer 2019 to January 2021. Altogether, over 120 companies from more than 14 European countries were analysed, of which 83 were interviewed (Annex 1).

Table 1 below presents a summary of the eight broad use cases identified, the data types that were needed the most and for what purposes.[1] This also gives an insight into what data combinations are needed to enable certain types of energy services. From the table, it is evident that of all of the types of data, metering point master data, historical or near to real-time metering data, person identifier and energy producer and retailer information are among the most needed types of data. The necessity for other more specific data lies in the concrete value offer of the product or service delivered to the user (e.g. electricity retail and market information, industrial energy management and reactive energy, CO_2 calculation and origin and composition of energy).

[1] The need for and relevance of specific data types for certain use cases must be taken with caution because they are based on the perception of the company representatives and, though not marked, it may not state that other types are not needed at all (e.g. consumer type and size for energy retailers or grid contract type for grid analytics and management).

Table 1. Summary of use cases, which data are needed and for what purposes

	1. Electricity retail	2. Energy efficiency solutions	3. Flexibility services, grid analytics and management	4. Renewable energy management, trading and proof of origin platforms	5. Integration simplifiers	6. Renewable energy investment calculators	7. Energy package calculators	8. CO2 emissions calculators
Metering point master data	• For identifying the metering point of the client					• For identifying the metering point of the customer		
Historical hour-based or 15-minute metering data	• For making personalised energy offers • For billing • For portfolio planning and trading • For open supplier accounting	• For calculation, monitoring, analysis, detection and visualisation of consumption and production • For billing • For validating sub-level metering data		• For matching RE production with consumption • For connecting distributed RE assets within communities and optimising energy production and consumption on a household and community level		• For analysing consumption history and recommending an optimised RE installation	• For analysing historical consumption behaviour and offering the most suitable package according to behaviour	• For estimating and displaying CO2 emissions from energy usage
Real-time metering data		• For visualising and analysing, switching on and off devices and having an exact overview of energy consumption in real-time	• For visualising and analysing, switching on and off devices and having an exact overview of energy consumption in real-time	• For transparency on electricity usage and costs • For incentives for local electricity use (discounts and bonuses)	• If their clients want the data and for the purposes their clients need the data			
Appliance level or sub-meter level metering data		• For distinguishing the consumption of a single unit (e.g. appliance, room) from the total consumption	• For distinguishing the consumption and production of a sub-level unit (e.g. appliance, room)					
Person identifier (ID, ETSI, EIC code or other)	• For requesting and receiving the data and linking the data to a specific person					• For requesting and receiving the data and linking the data to a specific person		
Consumer type and size		• For segmenting consumers		• For segmenting consumers				
Energy type (e.g. electricity, gas, district heating and water)		• For accounting for all energy sources relevant for the metered object (e.g. building, industrial device)						

Grid contract type						• To get a better understanding of the suitable RE installation offered and calculate the savings		
Congestion and balancing data and other grid data			• For grid visualisation, management and analytics					
Energy producer and retailer information			• For reporting purposes (e.g. supplier and balance responsible party)	• For calculating and presenting its renewable and non-renewable origin, environmental footprint, CO2 emissions			• For calculating environmental footprint and CO2 emissions	
Origin/source/composition and CO2 intensity of energy				• For calculating and presenting its renewable and non-renewable origin, environmental footprint, CO2 emissions			• For calculating environmental footprint and CO2 emissions	
Other types of energy data, e.g. electricity grid contract information, energy tariff and price data of different pricing zones (electricity, gas, and district heating) and reactive energy	• Numerous market messages, e.g. change of supplier, validity of supply agreements and other data relevant for operating in the energy market	• Energy tariffs, types of grid contract, reactive energy, electricity prices of different pricing zones as well as gas and district heating prices and tariffs • For providing accurate and custom cost calculations, suggesting other consumption behaviours and managing and optimising consumption and production	• Electricity grid contract information, tariff and price data for calculating costs and shifting consumption to a more beneficial time			• Information about the tariff packages of suppliers for providing the renewable energy investment offer		

Source: Author

Currently, this data is accessed in many ways. First, the most common one is to negotiate with the entities that operate metering and other energy data and make interfaces with the existing data management and exchange platforms. For automated data access, consumer consent management systems must be in place that enable identification of the user's metering point(s), selection of the service provider(s) and giving consent to the selected one(s) for processing the necessary data. Second, another well-used alternative is to acquire local companies with existing integrations and client pools in order to speed up market entry. Third, in the case of real-time and sub-level meter data, energy monitoring, benchmarking, remote management and flexibility service providers (use cases 2, 3 and 4) install their own devices for metering, analysing, controlling and switching on and off industrial or home facilities and appliances. Fourth, there are data integrators who build easy-to-use data access tools for their clients (e.g. utilities) who are willing to pay for a third party to resolve the hassle with data access for them. Fifth, in the case of web-based calculators (use cases 6, 7 and 8: renewable energy investment calculators, energy package comparison tools and CO_2 emission calculators), their users have to manually insert their historical metering data and other types of information needed if these data cannot be transmitted in a machine-readable way.

Based on the former, three main problems with data access can be outlined. First, limited competition and higher service prices. Many integrations with a variety of data hubs or data exchange platforms, acquisition of local companies with existing integrations and client bases or installation of own metering devices are all costly. The latter might also make the end user dependent on the physical infrastructure installed and may make the user reluctant to change to another service provider. This generates market barriers that decrease competition and switching of service providers, which might lead to higher prices of energy services for the end user because the cost of accessing data is accounted for in the service. This would not be the case if certified meters were near real-time and access to these meters were regulated at the EU level. Second, limited harmonisation of standards of data formats, access and exchange. For many companies, it is not understandable why the EU is actively pushing the rollout of smart meters but access to the data metered by the devices is not harmonised between member states. Third, without automated data access, users have to know and insert their data manually, which is a hassle (e.g. requires some data management competencies) and might lead to only very dedicated and knowledgeable users continuing the process or in the case of inserting inaccurate data, users receiving an inaccurate service.

The research done for this report, the experience with the European Energy Data Access Pilot Programme 2020 and the experience with the Estonian Estfeed data exchange platform from 2017 argue for the interoperability of European energy data and a Pan-European access solution for energy data. However, it is recognised that a Pan-European energy data access solution might embody many platforms and standards of data formats and exchange and consent management systems, but the critical requirement is that the locally or regionally used solutions are interoperable and harmonised at the European level.

Regarding the former, the following characteristics are seen as essential for a Pan-European energy data access solution:

- Harmonised standard(s) of data formats, access and exchange protocols.
- Security, trust and non-repudiation must be ensured through proper authentication, Public Key Infrastructure, encryption tools and technology as well as clear principles, requirements, regulations and processes.
- Authentication solution(s) for both users of web services and service providers who want to access data through data access technology.
- Identification of the metering point(s) of the user for giving consent and having an overview of the data that is shared.
- Consent management system(s) that allow(s) for granting, synchronising and controlling consent for automated data exchange and data processing.
- According to the GDPR, transparency of data usage/processing history for the end user and the owner of the data must be in control over who has accessed the user's personal data, what data are accessed, when and why.
- As other data types were needed besides metering data, easy integration of additional data sources and information systems must be ensured.
- Cloud-based and cloud-agnostic solutions (capable of operating with any public cloud provider with minimal disruptions) could be used to simplify integration, administration and scaling of business.

Simplifying access to data unlocks the value of processing these data by novel energy services (e.g. users make more sustainable choices, save on energy costs, CO_2 emissions decrease). Through incorporating more renewables, increasing energy efficiency and reducing CO_2 emissions, the widespread use of these services is crucial for enabling the transition of the energy, transport and other energy intensive sectors. Based on the analysis of the business cases of the companies interviewed and their revenue projections, this study argues that the wider socio-economic benefit of an interoperable Pan-European energy data exchange solution might be much higher than previous studies have estimated (Pöyry 2019) and rather in the range of tens to hundreds of billions of euros.

1 Introduction

The broad aim of this report is, first, to convince European grid operators (and other entities who operate and possess energy data) that there is a considerable group of market participants who need access to energy data in order to deliver untapped value in the context of the energy transition. In relation to this, it must be acknowledged that these data are not accessible in a reasonable, economically beneficial, scalable and transparent way. Second, a list of the main characteristics of a Pan-European energy data access solution is offered based on the research done for this report, the experience with the European Energy Data Access Pilot Programme organised by Elering in cooperation with other European grid operators in 2020[2] and the experience with the Estfeed data exchange platform live in Estonia from 2017.

With the opening up of energy data (in accordance with data protection and other associated regulations), we can support new services and products in the energy sector, but also between sectors, which lead to higher competition, more renewable energy production and consumption, more efficient energy use and a more active consumer. In the broad sense, this all facilitates the transition to a greener energy system and a carbon-neutral economy, which is the grand goal of the EU climate strategy and activities by 2050.

The concrete aim of this report is to give an overview of the following:

1) What are the different use cases of energy products and services that need access to energy data (and specifically private metering data) in order to provide a value-added product or service to customers, corporates or end-consumers?
2) What energy data are needed and why?
3) How are these data currently accessed and what are the main problems with data access?

This report is a summary of market studies, a petition letter and interviews and meetings conducted with European market participants from summer 2019 to January 2021 (see Annexes 1-4). Under market participants, we consider companies, which operate in the energy sector and need energy data to provide their product or service to their clients.

Over 120 companies participated in the study from more than 14 countries all over Europe (e.g. Finland, Spain, Belgium, Lithuania, Poland, Norway, France, Estonia, Germany, Denmark, the Netherlands, Sweden, Portugal and the UK). Companies with a product or service that needs energy data were selected for the study, of which:

1) 40 companies were identified and interviewed during the biggest European utility trade show: European Utility Week, held from 12-14 November 2019 in Paris (Annex 1);
2) 23 companies submitted their application to the European Energy Data Access Pilot Programme 2020 and were studied and interviewed during 2020 (Annex 1);
3) 13 clients of Estfeed energy data exchange platform were studied and interviewed during autumn 2020 (Annex 1);

[2] European Energy Data Access Pilots 2020 Final Report - https://elering.ee/en/projects-and-researches.

4) 33 companies were identified and studied from the EIT InnoEnergy ecosystem (Annex 3); and
5) 11 companies were identified through the snowball method and contacts provided by other grid operators and companies operating in the field of energy services (Annex 4).

Regarding all of the companies, a secondary data analysis was conducted, including an analysis of their websites and marketing and technology materials. Interviews were conducted with the representatives of 83 companies (Annex 1).

The following open-ended questions were asked from the representatives of the companies who participated in the interviews in a free format:

1) What is your product/service about (what is it, whom is it aimed at, why)?
2) What energy data are needed for providing your product/service? Why do you need these data?
3) How do you access these data for the time being (any workarounds)? Name the main problems with accessing these data.

Next, the main discovered use cases, energy data needs, ways of accessing data and problems with access are explained, followed by a conclusion, where the summarised findings are presented and a list of the main characteristics for a Pan-European solution is proposed.

This report complements an earlier study[3] conducted in November 2019 by Pöyry (now AFRY) for Elering, TenneT and Energinet, which assessed the socio-economic benefit of a Pan-European data exchange platform in order to support energy business cases and enable market integration and found the benefits to be roughly MEUR 100 per year (the study assessed the benefits for the year 2023 only). The earlier study took a high-level view, while this report delves into detail about the actual experiences of real innovators in energy markets today. Based on the analysis of the business cases of the interviewed companies and their revenue projections for the coming years, this study suggest that the socio-economic benefit of European data interoperability might be much higher than the earlier study suggested and rather in the range of tens to hundreds of billions of euros.

[3] https://elering.ee/sites/default/files/public/tarkvork-konv/tarkv%C3%B5rk/P%C3%B6yry%20-%20Benefit%20Assessment%20of%20an%20EU-wide%20Data%20Exchange%20Platform.pdf

2 Use cases of energy products and services that need access to energy data

The next chapter is divided into eight use cases that need access to metering and other energy data for providing an energy product or service. It must be noted that the list of use cases and the more detailed use cases described under the broad ones are compiled in a flexible manner with the best knowledge available during the study. Therefore, it should not be taken as a final list, but rather as an overview of the most common and prevailing use cases. Additionally, some of the detailed sub-level use cases might fit under more than one broad use case.[4]

Each use case contains:

1) A general description of the use case;
2) More detailed use cases (if there are any);
3) An explanation of what energy data (i.e. specific data types) are critical for business and for what purposes they are needed; and
4) An explanation of how the data are accessed for the time being and what the main problems are with accessing them.

Provided under the general description and detailed use cases are examples of companies who represent these use cases and from whom this input information was collected.

2.1 Electricity retail

2.1.1 General description of the use case

The primary service of electricity suppliers is the sale of energy to consumers, ensuring that the power consumed by the customer has been booked in advance on electricity markets.

Some examples of the companies interviewed are 220 Energia, Entelios, Eesti Energia, Fenieenergia, Centrica and Fortum.

In this study we focused on electricity but this use case can be expanded to include other energy retail such as gas and district heating.

2.1.2 More detailed use cases

Access to historical smart meter consumption data is only a small part of the IT integrations and data needs of energy suppliers, as suppliers need to exchange market messages, such as change of supplier or meter point information. A data exchange platform would need to encompass all market messages in order to integrate energy retail markets in Europe. However, even access to smart meter consumption history alone can benefit several supply use cases, which are related to onboarding new customers, since many energy suppliers are

[4] If this was the case, the most suitable broad use case was selected. For example, automated and remotely managed appliances for consumption management belong mainly under 2.2. Energy efficiency solutions for energy monitoring, benchmarking and remote management but, in some cases, can also be under 2.3. Flexibility services, grid analytics and management.

broadening their business through offering additional energy efficiency, consumption management, energy monitoring and other services to their clients. Notably, these services do not have to be developed or provided by the suppliers themselves and can be done through partners, which is quite often the case.

According to approximately 70% of the representatives of novel energy services interviewed for this study (presented under Sections 2.2-2.8), their services are offered to customers through energy retailers. This is because suppliers already have a client pool, contact and a trusting relationship with the client, and for them it is much easier to suggest additional energy-related services for their clients who would like to benefit more from the service or simply reduce energy costs. Similarly, as with telecom companies, energy suppliers also see that selling only energy will decrease their profit in the long run; they have to come up with new services that are attractive for their clients.

This kind of business model also has a downside for the companies developing and providing these more innovative energy services because the energy suppliers control which services reach the market and their clients. This is especially the case in countries where the energy supplier is the single contact point of energy-related services aimed at consumers (e.g. in the UK where the energy meter installation and grid connection are organised by the supplier).

Some examples of the energy retailers interviewed and studied are Spotty, Elektrum Tark Kodu, Fortum, Octopus Energy, Bulb and Enefit.

As an example of best practice, Fortum's representative pointed out that in Denmark they are testing a digital retail start-up thanks to the data hub there, which is a great example of the novel energy services enabled by easier access to data.

2.1.3 What energy data are needed and why?

- Metering point master data (i.e. kind, code, address/coordinates, connection state, metering type) for:
    - identifying the metering point (and its characteristics) of the potential/new customer.
- Metering data[5] (i.e. metering point code, value, time period, flow direction, unit) of the potential/new customer for:
    - making personalised energy offers to the consumer based on the actual historical energy consumption of this consumer;
    - billing purposes after the supply agreement has been signed;
    - planning the portfolio and making offers on energy markets; and
    - open supplier accounting/settlements.
- Person identifier[6] for:
    - requesting and receiving the data; and
    - linking the data to a specific person.

[5] Historical time series data, also called metered data.
[6] ID code, ETSI code, EIC code or other standardised identifier of a physical or legal person whose energy consumption or production is metered by the metering device.

- In order to operate in energy markets, a supplier has to be able to send numerous market messages[7], including change of supplier, start and end dates of supply agreements as well as queries for finding a customer's EIC codes. They may also need to be able to interact with distribution network operators in countries without a centralised data hub like Estonia. Access to smart meter data is only one part of the data access needs of suppliers and does not by itself enable energy suppliers to operate in a new market.

2.1.4 How are these data accessed for the time being and what are the main problems with accessing them?

If suppliers want to provide their service in a new country or market, they need to interface with the different metering data and energy market data hubs or data exchange platforms in that region. A centralised data hub simplifies market entry for suppliers (e.g. those existing in Estonia, Denmark, Norway and Italy and in development in Finland, Spain and Sweden), while requiring them to interface with many systems for accessing metering data and operating on the energy market complicates market entry (e.g. Spain). A common alternative model is to buy a local existing company to speed up market entry.

Main problem(s):

- Many integrations needed, which consumes time and resources.

Further effects:

- Complicated access to data can be a market barrier that decreases competition and supplier switching and might also lead to higher energy prices.

2.2 Energy efficiency solutions for energy monitoring, benchmarking and remote management

2.2.1 General description of the use case

This use case converges many of the specific use cases described below. In some cases, it is hard to distinguish whether the more detailed use cases fit better under this section or the next one as they are both related with consumption/production analysis, management and flexibility. A common feature of the use cases under this section is that they are more focused on monitoring and analysing energy consumption and the production of metering points of buildings, both homes and business buildings, but also other administrative units and even on the appliance level. Some of them also allow managing of the metering points (managing consumption) and implicit demand response, where demand is managed against the day-ahead electricity price (e.g. Themo).

[7] See for example Elering's datahub user guide to see the market messages a supplier needs to be able to send and receive in the Estonian electricity market – https://elering.ee/sites/default/files/2020-08/EL_Guide%20for%20Using%20and%20Joining%20Data%20Hub_2020_08.pdf

2.2.2 More detailed use cases

- Monitoring, calculation, analysis and visualisation of the energy management of properties for e.g. energy audits, invoicing and cash flow management, energy forecasting and optimising energy consumption for residential, business and industrial users.

Some examples here are Voltaware, Watty, barry, Watts and efergy, which provide energy monitoring and data analytics solutions to make homes more energy efficient and take control of their energy consumption. Metry, Cloud Energy Optimizer, Hausing, Ento Labs, Sitetracker, metbox and DeltaE offer energy data collection, analytics, asset and project management tools for real estate companies and business buildings (also for critical infrastructures) for asset management, saving energy and lowering energy consumption and carbon footprint. Energiency and Sensorfact provide manufacturing and industrial companies big data analytics solutions through implementing machine learning and predictive analytics for decreasing energy costs. Gulplug offers sensors and data analytics for industrial devices to save on energy costs. Bcheck is another similar solution that reduces the energy bill of building owners and tenants. It connects the heating and cooling systems of buildings through an online platform, proposes energy saving measures and detects unexpected behaviour through alerting. There are also easily embedded software solutions provided by Ubirch for all kinds of energy devices and appliances for making them a source of trustworthy and verifiable data for further data analytics. Coneva offers sustainable energy solutions for businesses, utilities and home users. GreenPocket provides energy data analytics and energy management software for business and residential customers. Ionseed develops an IoT network for distributed energy management and storage where energy retailers agree with the consumer on when, where, how much and what type of energy is used by the consumer.

There are also apps and platforms aimed at energy utilities and retailers to facilitate their digitalisation efforts and develop additional innovative services for higher customer engagement and loyalty, e.g. Fresh Energy, Skybill, Voltaware, Networked Energy Services and Kaluza. These are services provided through or by energy suppliers, from digitalised billing to smart electric vehicle charging, with the main aim to better serve the customers of retailers. Another example is Beedata Analytics, which focuses on customer engagement and business intelligence tools for energy retail and offers a big data analytics system for energy companies. ConnectPoint provides a platform called Smartvee for meter data validation and analysis for billing purposes, anomalies detection and consumption forecasting. GridPocket is another great example that offers a customised 'white label' energy service platform for utilities that connects smart meters, homes, renewables, electric vehicles and other IoT devices and provides increased customer satisfaction and CO_2 reduction for utilities through end-user energy savings and control.

- Monitoring, analysis, intelligent and remote management, control and optimisation systems/tools for households, real estate and industrial facilities.

Good examples under this sub-level use case are DEXMA, EnerKey, R8 Technologies, Smappee, Modio and Enappgy, who integrate AI on top of buildings management and energy systems for monitoring and managing systems remotely. For example, Buildsense, developed by Ecotropy, combines energy modelling with real-time consumption data on site for checking the optimal operation of the entire building, detecting deviations in consumption

and suggesting optimisation plans based on real-time systems control. Lyv Holding offers an advanced energy supply system for non-residential buildings that monitors, stores and optimises energy consumption, increases the use of green energy and incorporates a battery system for peak shaving. IC-Meter provides a Plug 'n' Play concept to measure and analyse the indoor climate of homes and offices.

- Gamified apps for benchmarking energy consumption and improving consumption behaviour in homes.

An example here is Powerdown, which was interviewed as part of this study. Some other examples named by the company Instagib, which provides the former service, are Span, sense and Neur. All of these solutions integrate gamification into data analytics and try to commit the user to change their consumption behaviour and save on energy costs in a more playful way.

- Automated and remotely managed appliances for consumption and energy management.

Companies like AirPatrol, Themo, Calidity, Climy, Ogga, Kusinta, Ngenic and Kibu Energy represent this group of services and provide intelligent management of appliances and devices for better indoor climate, energy savings, temperature control, use of renewable energy, etc.

- Real-time energy labels of buildings that make it possible to see the actual energy label of a building if it is already in use.

These solutions are still in progress and not yet on the market. Therefore, no interviews could be made.

2.2.3 What energy data are needed and why?

- Metering point master data (i.e. kind, code, address/coordinates, connection state, metering type) for:
  - identifying the metering point of the customer.
- Metering data (i.e. metering point code, value, time period, flow direction, unit) for:
  - visualising and analysing consumption and production data; and
  - billing and validating sub-level metering data.
- Person identifier for:
  - requesting and receiving the data; and
  - linking the data to a specific person.
- Consumer type and size (e.g. residential or industrial) for:
  - segmenting consumers.
- Energy type: electricity, gas, district heating and water for:
  - providing a more comprehensive service that accounts for as many energy sources as possible and is relevant for the metered object (e.g. building, industrial device).
- Real-time metering data (i.e. person, code, value, time period, flow direction, unit) for:
  - visualising and analysing;

    - switching on and off devices; and
    - having an exact overview of energy consumption in real-time.
- Historical data are used for:
    - calculation, monitoring, analysis and detection.
- Sometimes appliance level metering data are needed for:
    - distinguishing the consumption of a single unit (e.g. appliance, room) from the total consumption. In the case of appliances, this might also be solved by AI, where consumption of individual appliances is analysed through smart algorithms and the activity of single devices from the central energy meter is detected.
- Regarding other energy data types, the representatives of the companies studied also mentioned energy tariffs, types of grid contracts, reactive energy, electricity prices of different pricing zones as well as gas and district heating prices and tariffs. They emphasised that these data types are relevant for:
    - their specific service, mainly for providing accurate and custom cost calculations in addition to consumed or produced energy calculations;
    - suggesting other consumption behaviours; and
    - managing and optimising consumption and production (e.g. shifting it to a more beneficial time period).

2.2.4 How are these data accessed for the time being and what are the main problems with accessing them?

If data are available, integrations are made with existing systems. If not (like most cases with real-time and sub-level meter data), own devices are installed, which increases the end price of the service, ties the client with the physical infrastructure and limits switching of service providers. For accessing other energy data types (such as energy tariffs and prices), interfaces with the information systems that provide these data must be made.

2.3 Flexibility services, grid analytics and management

2.3.1 General description of the use case

This use case converges products and services that provide flexibility to the grid, e.g. aggregators, vehicle-to-grid solutions, EV charging and a variety of grid management services.

2.3.2 More detailed use cases

- Aggregators provide explicit demand response through aggregating consumers and trading the aggregated load on electricity markets (within balancing, capacity or wholesale energy markets). Consumers receive direct payments to change their consumption upon request (i.e. consuming more or less), which is typically triggered by the activation of balancing services, differences in electricity prices or a constraint on the network.

Examples of companies that fit under this service group are Octopus Energy, Fusebox, Kiwi Power, Smappee and Flexitricity.

However, it must be mentioned that many of the companies that provide consumption management for industrial facilities (e.g. Sympower, Kiwi Power) do not need external access to metering data because they install their own devices that are usually more accurate and capable of more functions compared with the general smart meters installed for consumers. The reason some aggregators still need access to central certified meter data is most likely because of billing or for comparing the certified data with the data measured by their devices.

- Flexibility platforms and marketplaces where it is possible to trade different kinds of energy flexibility services.

A great example here is Piclo Flex – an independent marketplace for trading energy flexibility services online.

- Vehicle-to-grid solutions enable consumption of the energy stored in the vehicle in a household or the sale thereof back to the grid, i.e. when the electricity price is higher compared with the price when charged or flexibility is needed in the grid.

The company moixa represents this group of services well. Besides vehicle-to-grid solutions, they also provide a smart solar energy storage solution. Ossiaco has built an AI-driven sustainable energy technology that leverages solar energy to power customers' cars, homes and lifestyles. It is based on a home EV supercharger that can use EV's battery to sail through days of utility grid outages and leverage the unlimited power of the sun.

- Smart EV charging solutions that tell the customer when it is the right time to charge their car, in terms of price, renewables in the grid, flexibility needed or other defined parameters.

One great example here is Virta, which provides a digital platform for electric vehicle charging, enabling the launch, growth and operation of commercial services in the EV charging ecosystem. Another example is Meshcrafts, which offers a scalable software platform suitable for any charging infrastructure with local and regional load optimisation, peak shaving and energy management. GreenFlux offers an advanced cloud-based platform to charge point operators, electric mobility service providers, utilities, energy and automotive companies. Their platform combines leading industry expertise, state-of-the-art technology and easy-to-use solutions to manage charge point infrastructure via open protocols and systems and to connect every charge point to the platform.

- Automated and remotely managed electrical devices that manage consumption and provide flexibility and demand response services to the grid.

The companies studied under this service group are GridIO, Peeeks and Sympower. The first two provide their service to household consumers by generating revenue through adjusting the electricity consumption of electrical devices without homeowners notice. They optimise energy consumption and aggregate households for flexibility trading. Sympower offers a software platform for industrial consumers that creates flexibility in the power consumption of machines and industrial processes and uses this flexibility to balance the power grid and generate additional income.

- Grid analytics and management, forecasts of energy production and consumption and energy information platforms and solutions for the distributed energy grid that enable utilities, Virtual Power Plants (VPPs) and distributed energy resource owners to optimise behind-the-meter energy generation, storage, usage and trading as well as new energy business models for utilities and ESCOs.

Networked Energy Services offers a variety of smart grid technology solutions, innovative grid modernisation software products and applications for utilities. N-SIDE provides innovative advanced analytics solutions for system and market operators and market actors. FSIGHT and Enervalis are two examples that provide AI agents for distributed energy grids which, through the monitoring, analysing and forecasting of all energy sources and flows, optimise energy generation, consumption, storage and trading. Another example is GreenCom Networks that has developed an energy information brokerage platform (eibp) which provides the possibility to connect and control distributed energy assets, optimise local energy flows and save costs, connect consumers and prosumers to energy communities, create new energy tariffs and leverage the power of distributed assets. Similarly, Stemy Energy has developed a product called Sploder that, first, monitors distributed energy resources, weather conditions, building performance, energy markets and customers' load behaviour; second, it uses several self-learning algorithms for optimising the energy infrastructure of the end user to obtain the most from energy markets (wholesale, ancillary services markets and local markets); and third, the platform sends commands to IoT devices or any other platform to apply the result of the optimisation. Evergreen Smart Power has developed a software platform that acts as a VPP through the integration and real-time management of a wide range of energy technologies, reacting to grid conditions to increase or reduce electricity consumption or generation.

There are also examples of companies who provide wind and solar power and energy consumption forecasts, such as Greenlytics, Nnergix, energy & meteo systems and Expektra. The first is developing a Distributed Energy Resources Management System (called DERMS) for solution providers, energy communities and consultants to enable the rapid deployment of forecasting and the optimisation of distributed energy resources, whose role and share is increasing with every year in the grid. Nnergix provides renewable energy forecasting and micro smart grid management solutions and Expektra offers a forecasting tool for short-term energy generation and consumption. Energy & meteo systems provide forecasts for wind and solar plants, virtual power plants for the control and marketing of energy portfolios, tailormade platforms for grid operators and research and consultations on the integration of renewable energy.

DCbrain is an artificial intelligence software based on graph models and machine learning tools that visualises energy flows, detects anomalies, predicts incidents and models the evolution of grids. Energiot provides smart grid solutions for electrical grid monitoring and energy harvesters for IoT applications. Enline offers a real-time transmission grid monitoring system for managing transmission grid assets. There are also real-time low voltage network monitoring and optimisation solutions, e.g. Eneida.io has developed a DeepGrid® IoT platform which is critical for the effective roll-out of electric vehicles, renewables and other distributed energy resources for maintaining security of supply. Energyworx provide meter data management for grid companies and forecasting and energy analytics for retailers. Cuculus offers software for critical infrastructure, meter and meter data management

solutions and innovative services and solutions based on smart data analysis. Landis+Gyr develops solutions from advanced smart metering technology to renewables and facilitates the digitalisation efforts of grid operators. There are also research institutions, such as AIT, whice provide consultation and research support for power companies and grid operators in the area of smart grids and power systems.

In light of this study, it is acknowledged that for grid planning and management, metering data is only a small part of the energy data needed.

2.3.3 What energy data are needed and why?

- Metering point master data (i.e. kind, code, address/coordinates, connection state, metering type) for:
  - identifying the metering point of the client.
- Real-time metering data (i.e. metering point code, value, time period, flow direction, unit) for:
  - visualising and analysing;
  - switching on and off devices; and
  - having an exact overview of energy consumption in real time to ensure that the customer did what they promised to do.
- Sub-meter level metering data for:
  - distinguishing the consumption and production of a sub-level unit (e.g. appliance, room).
- Person identifier for:
  - requesting and receiving the data; and
  - linking the data to a specific person.
- Electricity grid contract information, tariff and price data for:
  - calculating costs and shifting consumption to a more beneficial time.
- Congestion, balancing and other kinds of grid data for:
  - grid visualisations; and
  - management and analytics, such as event detection and prediction.
- Information on which company is the supplier and balance responsible party associated with the metering point, which might be necessary for:
  - reporting purposes.

2.3.4 How are these data accessed for the time being and what are the main problems with accessing them?

Most of the service providers install their own devices for metering, controlling and switching on and off industrial or home facilities and appliances. Therefore, the cost of accessing data is already accounted for in their service. Similarly to the previous use case, this increases the price of the service for the end user, makes the user dependent on the installed physical infrastructure and may make the user reluctant to change to another service provider. The former clearly decreases competition and makes it harder for other similar service providers to enter the market. This would not be the case if certified meters were real time and access to these meters were regulated at the EU level.

However, in the case of residential demand response, installing energy measurement devices might be prohibitively expensive. As more and more devices (heat pumps, fridges) are

becoming Internet connectable by default, it is becoming possible to aggregate these devices and provide demand response services without needing to arrange a visit by an electrician. Indeed, needing to send an electrician to each home to install a device to measure energy might invalidate the business case and increase the hassle to the homeowner to the point that residential demand response is unviable. At the moment, this is only speculative, as we are not aware of any aggregators operating in the residential market without needing to install energy measurement devices by electricians, as there are still very few homes with Internet-connected smart devices in regions with access methods for smart meter data.

2.4 Renewable energy management, trading and proof of origin platforms

2.4.1 General description of the use case

Trading platforms and digital marketplaces that enable the purchase and sale of renewable energy and renewable energy certificates and track and document the origin and time of the energy produced and consumed.

The companies that were interviewed under this study include WePower, FlexiDAO, Elertis, Becour and Siemens Energy e-ing3ni@.

2.4.2 More detailed use cases

- Solutions that enable users to buy and sell physical energy and proof of its origin together.

For example, FlexiDAO provides this kind of marketplace for corporate clients where 'brokers' help set up Power Purchasing Agreements (PPAs) or similar and then electricity delivery is ensured by retailers.

- Solutions that enable the purchase and sale of how the energy is produced (i.e. certificates of guarantees of origin – GOs) without real energy. The latter means that the clients of these solutions buy energy from an energy supplier and then buy the guarantee of origin for a specific renewable energy power plant (e.g. Becour).

Under this and the previous service group, there are solutions that use the GO systems established by the EU and TSOs (e.g. Becour), and there are also solutions where the tracking and documentation is done using, for instance, blockchain technology (e.g. WePower, Siemens Energy e-ing3ni@).

Another great example in this area is the EnergyTag initiative that is defining the first standard for 1-hour energy certificates, developing market guidelines for issuing and trading these certificates and coordinating a number of projects around the world to test how the standard works in practice and to showcase technology for 24/7 energy tracking.

- Solutions for (local) energy communities for producing and consuming renewable energy, monitoring and managing the consumption and production of distributed and renewable energy resources, and trading with the produced energy that is not needed.

One example here is BeON energy that provides a complete energy solution (solar kit) which allows their customers to produce energy sustainably as well as monitor and manage their homes and sell excess energy to other members or 'get points' in the BeON community. LO3 energy has developed a technology platform called Pando, which offers a simple way to pool local distributed energy resources and enable customers to buy and sell local energy and optimise the grid at a community level. Another example is the Energy Community web portal developed by GreenCom Networks that gives transparency on the energy use within the home and the community and provides a report and analysis function for the end customer. Ubik Solutions is developing an intelligent energy management platform called FlowEM® that integrates renewables into the grid via on-site PV production and energy storage integration. On the one hand, it is aimed at customers who are or could become energy prosumers, enabling them to monitor, analyse and manage (through utilising weather, production, consumption and various other information) these integrated systems over the cloud and reach informed decisions for optimised household processes, energy efficiency improvements and enhanced user experience. On the other hand, it supports the grid with smart energy management to reach the right consumption and installation decisions and offers aggregation and grid balancing services. Power2U offers residential consumers a solution that connects their properties, energy assets, the cloud, grid and energy markets for trading energy and power flexibility. Wesmart provides an energy community management platform that enables you to share energy with your neighbours. Ilumen has developed a package solution that includes monitoring, charging, storing and real-time data analysis for increasing solar self-consumption.

2.4.3 What energy data are needed and why?

- Metering point master data (i.e. kind, code, address/coordinates, connection state, metering type) for:
  - identifying the metering point of the customer.
- Metering data (i.e. metering point code, value, time period, flow direction, unit) for:
  - matching the renewable production with the consumed consumption;
  - connecting distributed renewable energy assets within communities; and
  - optimising energy production and consumption on a household and community level.
- Real-time metering data for:
  - providing end-users transparency on electricity use (including visualisation of energy flows on a household and community level);
  - transparency on electricity costs (including monthly billing based on actual consumption); and
  - incentives for local electricity use (e.g. consumption discounts, production bonus payments.
- Person identifier for:
  - requesting and receiving the data; and
  - linking the data to a specific person.
- Consumer type and size (e.g. household or industrial) for:
  - segmenting consumers.
- Origin/source/composition and CO_2 intensity of energy for:

    - o calculating and presenting its renewable and non-renewable origin, environmental footprint, CO_2 emission amount.
- Energy origin certifications information, such as the guarantees of origin in Europe for:
    - o proving the origin of energy.
- Energy consumption, contract and other data from the energy supplier's back-end systems.

2.4.4 How are these data accessed for the time being and what are the main problems with accessing them?

The main problems are related to the limited harmonisation of standards of data formats and access. However, there are already EU regulations for GOs and TSOs as neutral bodies are securing the credibility of the system with international standards; there are still problems with the double counting of GOs and the disclosure of the electricity energy mix. If real-time data is needed, own devices must be installed.

A key issue in light of this report raised by the representative of FlexiDAO is that although the EU is actively pushing the roll-out of smart meters, access to the data metered by the devices is not harmonised between member states. FlexiDAO requires access to smart meter consumption history in order to provide its service to customers.

2.5 Integration simplifiers

2.5.1 General description of the use case

API and other software platforms with the main aim to make data access as simple as possible.

2.5.2 More detailed use cases

- API platforms/marketplaces for the digital exchange of energy data and services.

One company interviewed under this study is re.alto energy, which provides an API marketplace for the digital exchange of energy data and services. Another example is Fintricity, which is developing an open source data infrastructure with a non-profit foundation that manages data standards, protocols and software for the stack (a node) and which any party in the ecosystem can use to build applications. There are also more research focused services, e.g. Pikobytes with their SensorHub system that enables a new approach to research on and the analysis of spatially distributed sensor networks of sensor and time series big data and provides a dedicated access control at the level of networks, devices or sensors.

- Software integrators, telecom companies and smart IoT and AI solution providers that simplify data integration for utilities, renewable energy producers and end users with prebuilt integration flows, connectors and other software tools.

Greenbird, Critical Software, Superhands, Telia IoT platform, RAD, opendatasoft, eSoftThings, Sesam, SmartIS and n3rgy serve here as a good examples. These companies

focus to a greater extent on the more conservative part of the energy sector and more widely on smart industry and smart city, on the utilities and energy companies who might not have digitalisation competences in house but want to make better use of the loads of data they collect and manage, quite often for developing new services or optimising processes.

Another initiative worth mentioning here is the OSGP Alliance, which is a global non-profit association dedicated to promoting the adoption of the Open Smart Grid Protocol (OSGP) and infrastructure for smart grid applications towards a future-proof modern smart grid. Their members are key stakeholders of the industry, such as utilities, hardware manufacturers, service providers and system integrators who all share a common goal and vision – to promote open standards for energy demand side management, smart grid and smart metering systems.

2.5.3 What energy data are needed and why?

The business of these companies is to simplify access to whatever energy data utilities, industrial companies or household consumers need. Therefore, they are not the ones who need the data, they are the ones who come up with easy-to-use solutions for how to access and exchange this data. These companies are actually the ones that benefit from the situation in which data are locked and scattered between many actors. They are interesting for this study because their existence proves that for an average utility or service provider, access to data is a hassle and they are willing to pay someone to solve this on their behalf.

2.5.4 How are these data accessed for the time being and what are the main problems with accessing them?

These companies build their own tools and solutions to provide their clients with a comfortable user experience. On one end, they try to develop unified products for their clients but most of the time, on the other end (where the data are stored and obtained), they have to build custom solutions for each case because access to data is not harmonised across Europe. As previously mentioned, it is much easier in countries with central data hubs and challenging in countries like Germany and Switzerland where data is spread between hundreds of DSOs.

2.6 Renewable energy investment calculators

2.6.1 General description of the use case

Calculators which, according to defined parameters, recommend the most suitable (e.g. with the shortest payback time) renewable energy or other energy asset, such as battery, installation investment for the residential or industrial customer.

Sunly Calculator was interviewed under this study but according to their references there are many others working in the field, e.g. PVWatts Calculator, Puget Sound Energy, ConvertCalculator, Cal Calculator, Xcel Energy wind source for residences. EasySolar from the EIT InnoEnergy network provides a simple tool for designing solar installations and their offers, including financial analysis, preparation of a conceptual PV installation project and PV customer proposal.

2.6.2 More detailed use cases

Some of these solutions focus on specific renewable energy installation (e.g. wind, solar, geothermal) but there are also those who consider different sources of energy. Some provide calculations only (e.g. Cal Calculator), while others offer the user a more comprehensive service, including financial analysis and the installation project and financial offer for the defined project (e.g. Sunly Calculator, EasySolar). There are also web calculators for renewable energy companies that allow for custom calculators aimed at their specific interest (e.g. ConvertCalculator).

2.6.3 What energy data are needed and why?

- Metering point master data (i.e. kind/type, code, address/coordinates, connection state, metering type) for:
  - identifying the metering point of the customer.
- Metering data (i.e. metering point code, value, time period, flow direction, unit) for:
  - analysing consumption history; and
  - recommending an optimised renewable energy installation.
- Person identifier for:
  - requesting and receiving the data; and
  - linking the data to a specific person.
- Grid contract type to:
  - get a better understanding of the suitable renewable energy installation offered to the client; and
  - calculate the savings if renewables are installed.

2.6.4 How are these data accessed for the time being and what are the main problems with accessing them?

In most of the web-based calculators, clients have to insert their consumption history and other types of information needed for the calculator manually so that the calculator can analyse the data and put the offer together based on the data provided. This is quite often time and energy consuming for the user, leaving only those who are very dedicated to continue the process or, in the case of inserting inaccurate data, the user will receive an inaccurate offer. In Denmark, Norway, Estonia and a few other countries where central data hubs exist or access to metering data is enabled in some other machine-readable way, and access based on consumer consent is provided to third parties, automated data requests can be developed. For the former, the user has to identify its metering point(s) and allow the service provider to request the necessary data. After that, it is possible to provide a calculation and an offer for the renewable energy installation.

2.7 Energy package calculators/comparison tools

2.7.1 General description of the use case

Calculators and comparison tools that compare the offers of electricity and gas suppliers provided on the market and based on some kind of agreed criteria offer the most suitable option to the customer.

While all price comparison tools that we were able to find in Europe do not take the smart meter consumption data as input and require the consumer to insert their consumption data manually, there would be a clear use case of an automated price comparison tool that matches a customer's consumption history with the most suitable price tariff for this customer.

2.7.2 More detailed use cases

- Tools offered by the private sector that compare the packages of energy suppliers based on the package information provided by the energy suppliers and the consumption history estimate provided by the consumer. One uncertainty with these solutions is that as the criteria for comparison is based on commercial purposes, which might not be independent from market participants, equal treatment of electricity undertakings might not be ensured in the search results.

The Estonian examples studied here are Elektrihind.ee, Gaasihind.ee and Energiaturg.ee.

- Independent and objective comparison tools required by the Electricity Market Directive Article 14 "*Member States shall ensure that at least household customers, and microenterprises with an expected yearly consumption of below 100,000 kWh, have access, free of charge, to at least one tool comparing the offers of suppliers, including offers for dynamic electricity price contracts…"*

Comparison tool websites run by national authorities in the EU can be found here.

2.7.3 What energy data are needed and why?

- Metering point master data (i.e. kind, code, address, connection state, metering type) for:
  - identifying the metering point of the customer.
- Metering data (i.e. metering point code, value, time period, flow direction, unit) for:
  - analysing the historical consumption behaviour of this customer; and
  - offering the most suitable package according to the customer's behaviour.
- Person identifier for:
  - requesting and receiving the data; and
  - linking the data to a specific person.
- Information about the tariff packages of suppliers for:
  - providing the offer.

2.7.4 How are these data accessed for the time being and what are the main problems with accessing them?

Similarly to renewable energy investment calculators, users usually have to insert their data manually into the web applications. If smart meter data is collected by DSO, TSO or another assigned party, interfaces to the information systems (where this data is stored) can be made and a consent management system exists for the consumer to allow the comparison tool to access their historical data; historical metering data can also be accessed in a machine-readable way. If the data are located in many data hubs, different interfaces with different systems have to be made, which in most cases does not pay off and leaves the user to insert their data manually.

2.8 Tools which estimate CO2 emissions from energy usage

2.8.1 General description of the use case

These use cases cover apps and software tools that calculate the amount of CO_2 emissions from the client's energy usage.

Zerofy was interviewed under this study. Many others can be found with a simple search, such as RenSMART Carbon Emissions Calculator, Powershop Carbon Calculator, Carbon Independent.org and GenLess.

2.8.2 More detailed use cases

The main difference between the solutions lies in one main aspect, similar to the other previous three calculators: whether basic information (consumption history, address of the metering point, supplier information) is inserted manually or requested by the application in a machine-readable way. The tools can also be differentiated based on the energy source from which they calculate the CO_2 emissions (e.g. electricity, heating, transportation).

2.8.3 What energy data are needed and why?

- Metering point master data (i.e. electricity/gas/district heating, code, address/coordinates, connection state, metering type) for:
  - identifying the metering point of the customer.
- Metering data (i.e. metering point code, value, time period, flow direction, unit) for:
  - the purpose of estimating and displaying CO_2 emissions from the customer's energy usage.
- Person identifier for:
  - requesting and receiving the data; and
  - linking the data to a specific person.
- Energy producer and retailer information, electricity source, composition and CO_2 intensity for:
  - calculating environmental footprint and CO_2 emissions.

2.8.4 How are these data accessed for the time being and what are the main problems with accessing them?

To access data, negotiations with the entities who operate metering data are needed and, if an agreement is reached, interfaces with the data hubs and data management systems are needed.

Main problems are the same as those for the other calculators discussed previously. Users have to insert manually as much or as little data as there are machine-readable solutions available for acquiring said data. As many and as technically different and custom interfaces have to be developed as there are data sources available. To operate in different countries, interfaces with different data hubs and platforms are needed.

3 Summary and conclusions

This report has two broad aims. First, to convince European grid operators that there are a considerable number of energy companies that need access to energy data and that this data is currently not easily accessible. Second, based on previous research and experience, a list of characteristics relevant for an interoperable and Pan-European energy data access solution is proposed.

Under energy companies, this study addressed companies that develop and provide innovative and greener energy products and services which aim for more renewables, energy efficiency and less greenhouse gases in addition to enabling the user to benefit economically from a greener choice. Therefore, the competitiveness and growth of these companies plays a vital role in the crucial socio-technical energy transition we are facing.

In addition, this report has three specific aims that provide input for the broad aims. First, to give an overview of the main use cases of products and services that need energy data. Second, to gain a better understanding of what energy data are needed and why. And third, how these data are accessed and what are the main problems with access.

Studies, interviews and meetings (see Annexes 1-4) for this report were conducted from summer 2019 to January 2021. Altogether, over 120 companies from 14 European countries were explored, of which 83 companies were interviewed (Annex 1).

In total, eight broad use cases were identified. These are as follows:

1) Electricity retail
2) Energy efficiency solutions for monitoring, benchmarking and remote management
3) Flexibility services, grid analytics and management
4) Renewable energy management, trading and proof of origin platforms
5) Integration simplifiers
6) Renewable energy investment calculators
7) Energy package calculators/comparison tools
8) Tools which estimate CO_2 emissions from energy usage

Regarding the needs of data, the following types of energy data were identified along with the reasons access is needed:

- Metering point master data (i.e. kind, code, address/coordinates, connection state, meter type) for:
    - identifying the metering point (and its characteristics) of the (new) customer/client.
- Metering data (i.e. metering point code, value, time period, flow direction, unit) of the (new) customer for:
    - making personalised energy supply and other service offers to the client based on the actual historical energy consumption and production of this client;
    - billing purposes;
    - planning the supplier portfolio and making offers on energy markets;

  - open supplier accounting/settlements;
  - visualising and analysing consumption and production;
  - validating sub-level metering data;
  - matching the renewable production with the consumed consumption;
  - analysing consumption history and recommending an optimised renewable energy installation;
  - analysing the historical consumption behaviour of customers to offer the most suitable package according to the customer's behaviour;
  - estimating and displaying CO_2 emissions from the customers energy usage;
  - connecting distributed renewable energy assets within communities and optimising energy production and consumption on a household and community level;
  - real time and granularity, i.e.:
    - Real-time metering data (i.e. person, code, value, time period, flow direction, unit) is needed for:
      - services that offer real-time automation and management for visualising and analysing, switching on and off devices and having an exact overview of energy consumption in real-time; and
      - services that provide end users real-time transparency on electricity use and costs.
    - Historical hour-based or 15-minute data is used for:
      - calculation, monitoring, analysis and detection.
  - appliance level or sub-meter level metering data for:
    - distinguishing the consumption and production of a single or sub-level unit (e.g. appliance, room) from the total consumption. In the case of appliances, this might also be solved by AI, where the consumption of individual appliances is analysed through smart algorithms and the activity of single devices from the central energy meter is detected.
- Person identifier (standardized identifier of a physical or legal person) for:
  - requesting and receiving the data; and
  - linking the data to a specific person.
- Consumer type and size (e.g. residential or industrial) for:
  - segmenting consumers.
- Energy type (e.g. electricity, gas, district heating and water) for:
  - providing a more comprehensive service that accounts for as many energy sources as possible and is relevant for the metered object (e.g. building, industrial device).
- Grid contract type for:
  - getting a better understanding of the suitable renewable energy installation offered to the client; and
  - calculating the savings if renewables are installed.
- Congestion and balancing data for:
  - balancing local power production and consumption because more and more distributed and renewable energy resources are added to the grid.
- Other kinds of grid data for:

    - grid visualisations and analytics such as event detection and prediction.
- Energy producer and retailer information, origin/source/composition and CO_2 intensity of energy for:
    - calculating and presenting its renewable and non-renewable origin, environmental footprint, CO_2 emissions.
- Regarding other energy data types, representatives of the companies studied also mentioned electricity grid contract information, the energy tariff and price data of different pricing zones (electricity, gas and district heating) and reactive energy. They highlighted these data types as relevant for:
    - their specific service, mainly for providing accurate and custom cost calculations in addition to consumed or produced energy calculations; and
    - suggesting other consumption behaviours and managing consumption and production (e.g. shifting it to a more beneficial time period).

Currently, this data is accessed in the following ways:

- Energy services that need historical metering data (energy suppliers, energy monitoring, benchmarking and remote management services, integration simplifiers, energy packages, renewable energy investment and CO_2 calculators) first have to negotiate with the entities who operate metering data. If an agreement is reached, interfaces with the existing metering data and energy market data hubs or data exchange platforms in the countries/regions needed are made. Additionally, for automated data access, consumer consent management systems must be put in place (identification of user's metering point(s), selection of service provider(s) and consent for the selected one(s) for processing the necessary data).
- Alternatively, these companies can acquire local ones (through M&A) with existing integrations and an existing client base in order to speed up market entry. However, here, the primary target is not to acquire data access capacity but rather to acquire the client's pool.
- In the case of real-time and sub-level meter data, energy monitoring, benchmarking, remote management and flexibility service providers install their own devices for metering, analysing, controlling and switching on and off industrial or home facilities and appliances.
- For accessing other energy data types (i.e. energy tariffs and prices), interfaces with the information systems that provide these data are made.
- ICT and data integration service providers build easy-to-use data access tools for their clients, who can be representatives of all of the use cases presented in this report. However, these solutions for simple integration and data access are usually built on top of custom-developed solutions for each data source because accessing data from different sources is not harmonised across Europe.
- In the case of web-based renewable energy investment calculators, energy package comparison tools and CO_2 emissions calculators, their clients have to insert their consumption history and other types of information needed for the calculator manually if data cannot be accessed in a machine-readable way.

Problems with data access can be summarised as follows.

- First, if a central or limited number of data hubs or data exchange platforms do not exist, then many integrations are needed. An alternative solution is the acquisition of local companies with existing integrations and an existing client base or the installation of own devices. The latter option might make the end user dependent on the physical infrastructure installed and may make the user reluctant to change to another service provider and contract. This is all time and resource consuming. The former generates market barriers that decrease competition and switching of service providers and might lead to higher prices of energy services for the end user because the cost of accessing data is accounted for in the service. This would not be the case if certified meters were real-time and access to these meters were regulated at the EU level.
- Second, there is limited harmonisation of standards of data formats, access and exchange. To many companies, it is not understandable why the EU is actively pushing the roll-out of smart meters but access to the data metered by the devices is not harmonised between member states. Here, the new Electricity Market Directive 2019/944 may solve part of the problem, as it requires network operators to allow consumers and, with consumer consent, third parties to access their metering data. However, it is still unclear how well coordinated and harmonised the data access solutions will be in practice.
- Third, without automated data access, users have to know and insert their data manually, which is a hassle and might lead to an inaccurate service. Additionally, it quite often requires some data management competencies, which might not be common with household customers. This is quite often time and energy consuming for the user, leaving only those who are very dedicated to continue the process or, in the case of inserting inaccurate data, the user will receive an inaccurate offer.

The research done for this report, the experience with the European Energy Data Access Pilot Programme organised in 2020[8] and the experience with the Estfeed data exchange platform working live in Estonia from 2017 claims that there is a clear need for European energy data interoperability and a Pan-European energy data access solution. The wider need for interoperability in the European energy sector recognises the complexity and variety of existing solutions (e.g. data hubs, data exchange protocols, data formats) and the independence of countries to design and develop the best solutions for their home markets. Therefore, a Pan-European energy data access solution for the European energy market might embody many platforms and standards of data formats and exchange. However, the critical necessity here is that locally or regionally used solutions have to be interoperable and agreed on at a European level.

Regarding the former, the following characteristics are seen as essential for a Pan-European energy data access solution:

- Harmonised standard(s) of data formats, access and exchange protocols.

[8] European Energy Data Access Pilots 2020 Final Report - https://elering.ee/en/projects-and-researches.

- Security, trust and non-repudiation must be ensured. This can be solved with proper authentication, Public Key Infrastructure and encryption tools and technology as well as proper principles, requirements, regulations and processes.
- Authentication solution(s) for both users of web services and service providers who want to access data through data access technology.
- Identification of the metering points of the user for giving consent and having an overview of the data that can be shared.
- Consent management system(s) that allow(s) for giving, synchronising and controlling consent for automated data exchange and data processing.
- According to the GDPR, transparency of data usage/processing history for the end user and the owner of the data must have control over who has accessed the user's personal data, what data are accessed, when and why.
- As other data types were needed besides metering data, easy integration of additional data sources and information systems must be enabled.
- Cloud-based and cloud-agnostic solutions (capable of operating with any public cloud provider with minimal disruptions) that simplify integration, administration and scaling of business.

Simplifying access to data unlocks the more specific value of processing these data by novel energy services, which, through incorporating more renewables, energy efficiency and less CO_2, are vital for enabling the transition of the energy, transport and other related energy intensive sectors. Based on the analysis of the business cases of the companies interviewed and their revenue projections over the coming years, this study suggests that the wider socio-economic benefit of an interoperable Pan-European energy data exchange solution might be much higher than the earlier study by Pöyry (2019) suggested and rather in the range of tens to hundreds of billions of euros.

The studies and analyses done for this report also call for future research. More detailed analysis is needed on matching use case groups with certain metering data. For example, how many companies are there in each use case and, as a result, how many companies need which kind of data in terms of source, format, granularity, accuracy (e.g. real time, historically validated, from smart meter or from sub meter, from SCADA, household data, industrial site data)? The aim of this report was to define the main use cases and their general data needs per use case. However, getting an even better understanding of how many companies need which kind of data and how this differs across use cases might serve as a useful input for designing and implementing the data access solutions in terms of priority and budget.

Another relevant topic to examine further is the cross-border data access element in terms of how many of these companies are operating in different countries and would therefore benefit from interoperable and Pan-European energy data access platforms. Thus, it could be argued that as many of the companies studied were start-ups and growth companies, in essence, they already aim for markets other than just the local one. The previous claim would still need to be tested in a proper scientific setting. Furthermore, it would be interesting to compare the operational locations of companies that need meter data with the maturity of countries in the area of smart meter data access and management. It would be interesting to know the relationship between smart meter rollout and an existing data hub and the number of energy companies operating in this country that need access to this

data, linking the former with the turnover of these companies from this country and the decrease in CO_2 emissions. If clear relationships between simple data access, the high number of companies providing greener energy products and services that need this data, the high demand and consumption of these services and the decrease in CO_2 could be connected and scientifically confirmed, it would encourage other countries that are lagging behind.

More analyses are also needed in the area of problems with data access, as this report focused on the more general issues. Insights on the specific difficulties companies experience with acquiring data access, apart from the fact that they need to source data from different entities, and how data is transferred (e.g. as a flat file, API, decentralised access) would be useful to know. Additionally, what their experience is with consent management and whether they or their consumers consider it a barrier.

Future studies could also focus more on the consumer point of view. The analysis showed that for energy service providers, getting access to data in different countries is a complex exercise, but how poorly organised data access – locally and across countries – affects the consumer was out of the scope of this study. The benefits and losses for the consumer in terms of the number and variety of energy services available, the complications and costs of companies acquiring data access and the simplicity and control over giving access to data (incl. as a multinational) could be further assessed.

Finally, some broader conclusions and needs for future research can be drawn from the studies. First, the motivation for the consumer to procure greener energy services (any of the use cases from above) has not yet reached full maturity in the EU. It can be argued that the main incentive for the user is still saving costs, followed by being green. To encourage uptake of these services, a faster smart meter rollout, regulations on green tracking and easier access to data could play an essential role.

Second, while solving data access issues for energy services, we also have to consider the complexities and problems of giving consent for data access in different countries, specifically with data owner authentication, identification and how to solve the issues for multinationals who want to give access in different countries. A multinational consumer is still confronted with a multitude of portals and ways to provide consent. A common data access tool will also depend on the consent given in the different countries, which therefore requires at least a minimum level alignment.

Acknowledgements

Our gratitude goes to the representatives of European grid operators and innovation communities who provided useful comments and suggestions for improving this report: Ariette Franke-Sluijk from TenneT, Lesław Winiarski from PSE, Chiara Adriaenssens from 50Hertz Transmission GmbH, Emilien Simonot from EIT InnoEnergy, Kalle Kukk and Georg Rute from Elering. The interviews with company representatives were conducted with the help of Elering colleagues Martin Vohla and Georg Rute in addition to Geoffrey Riggs from Catapult Labs.

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Annex 1. List of interviewees

1. Representative of ADEME. Meeting at the European Utility Week, 12-14 November 2019, Paris.
2. Representative of Austrian Institute of Technology (AIT) GmbH. Meeting at the European Utility Week, 12 November 2019, Paris.
3. Representative of Becour AS. Application for European Energy Data Access Pilots 2020, April 2020. Web meeting, 28 September 2020, and e-mail correspondence during October-November 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021.
4. Representative of BeON energy. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April-May 2020.
5. Representative of Centrica. Interview for Pöyry report[9], 17 October 2019. Meeting at the European Utility Week, 12-14 November 2019, Paris.
6. Representative of coneva GmbH. Meeting at the European Utility Week, 13 November 2019, Paris. Application for European Energy Data Access Pilots 2020, April 2020.
7. Representative of Critical Software. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April-May 2020. Web meeting, 25 November 2020.
8. Representative of Cuculus GmbH. Meeting at the European Utility Week, 12-14 November 2019, Paris.
9. Representative of DeltaE Inseneribüroo (MeasureWay application). E-mail correspondence during September 2020. Estfeed client.
10. Representative of Drawings OÜ. E-mail correspondence during September 2020. Estfeed client.
11. Representative of Eesti Energia AS. Calls and e-mail correspondence during October-November 2019.
12. Representative of Enefit. Interview for Pöyry report, October 2019.
13. Representative of Energinet. Web meeting on sharing experience on Danish and Estonian use cases of energy data access, 27 October 2020, and e-mail correspondence during October-November 2020.
14. Representative of Energy & Meteo Systems. Meeting at the European Utility Week, 13 November 2019, Paris.
15. Representative of Energyworx. Meeting at the European Utility Week, 12-14 November 2019, Paris.
16. Representative of Entelios Nordics. Interview for Pöyry report, 17 October 2019.
17. Representative of eSoftThings. Meeting at the European Utility Week, 12-14 November 2019, Paris.
18. Representative of ESRI. Meeting at the European Utility Week, 12-14 November 2019, Paris.
19. Representative of Evergreen Smart Power. Meeting at the European Utility Week, 13 November 2019, Paris.
20. Representative of Fenieenergia. Interview for Pöyry report, 17 October 2019.

[9] https://elering.ee/sites/default/files/public/tarkvork-konv/tarkv%C3%B5rk/P%C3%B6yry%20-%20Benefit%20Assessment%20of%20an%20EU-wide%20Data%20Exchange%20Platform.pdf.

21. Representative of Fintricity Group Limited. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April-May 2020.
22. Representative of FlexiDAO. Application for European Energy Data Access Pilots 2020, April 2020. Web meeting and European Energy Data Access Pilot demo, 15 October 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021.
23. Representative of Flexitricity. Interview for Pöyry report, 17 October 2019.
24. Representative of Fortum. Interview for Pöyry report, October 2019.
25. Representative of Fresh Energy. Meeting at the European Utility Week, 12 November 2019, Paris.
26. Representative of FSIGHT. Web meeting, 27 November 2019, and e-mail correspondence during November 2019.
27. Representative of FuseBox OÜ. E-mail correspondence during November 2019. Estfeed client.
28. Representative of Greenbird. Meeting at the European Utility Week, 14 November 2019, Paris. Application for European Energy Data Access Pilots 2020, April 2020.
29. Representative of GreenCom Networks. Meeting at the European Utility Week, 12 November 2019, Paris. Application for European Energy Data Access Pilots 2020, April 2020.
30. Representative of GreenFlux. Meeting at the European Utility Week, 12 November 2019, Paris.
31. Representative of Greenlytics. Meeting at the European Utility Week, 12-14 November 2019, Paris. Application for European Energy Data Access Pilots 2020, April 2020.
32. Representative of GridIO. Meeting and interview at the Tallinn Energy Data Conference, 28 November 2019.
33. Representative of GridPocket SAS. Meeting at the European Utility Week, 12-14 November 2019, Paris. Application for European Energy Data Access Pilots 2020, April 2020.
34. Representative of Informant OÜ. E-mail correspondence during March 2020. Estfeed client.
35. Representative of Kaluza. Meeting at the European Utility Week, 12-14 November 2019, Paris.
36. Representative of Kibu.energy and Chief Operations Officer at UBIK Solutions. Meetings during June to October 2019. E-mail correspondence during October-November 2020.
37. Representative of KiWi Power. Web meeting, 24 January 2020.
38. Representative of LO3. Meeting at the European Utility Week, 12-14 November 2019, Paris.
39. Representative of Metbox. Meeting at the European Utility Week, 12-14 November 2019, Paris.
40. Representative of Metry. Interview for Pöyry report, 17 October 2019.
41. Representative of Moixa. Meeting at the European Utility Week, 13 November 2019, Paris.
42. Representative of n3rgy data ltd. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April-May 2020. Web meeting, 25 November 2020.
43. Representative of Networked Energy Services. Meeting at the European Utility Week, 12-14 November 2019, Paris.

44. Representative of N-side. Meeting at the European Utility Week, 13 November 2019, Paris.
45. Representative of Octopus Energy. Interview for Pöyry report, October 2019.
46. Representative of Opendatasoft. Meeting at the European Utility Week, 12-14 November 2019, Paris.
47. Representative of OSGP Alliance. Meeting at the European Utility Week, 12-14 November 2019, Paris.
48. Representative of Ossiaco. Meeting at the European Utility Week, 13 November 2019, Paris.
49. Representative of Peeeks. Meeting at the European Utility Week, 12 November 2019, Paris.
50. Representative of Piclo. Presentation and interview at the Tallinn Energy Data Conference, 28 November 2019.
51. Representative of Pikobytes GmbH. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April 2020.
52. Representative of Powerdown.tech at Instagib OÜ. E-mail correspondence during August 2020. Estfeed client.
53. Representative of RAD Data Communications. Meeting at the European Utility Week, 12 November 2019, Paris.
54. Representative of re.alto energy SRL. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April 2020. Web meeting and European Energy Data Access Pilot demo, 24 September 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021.
55. Representative of SAP at Schwabe Group. Meeting at the European Utility Week, 12-14 November 2019, Paris.
56. Representative of Schneider Electric. Meeting at the European Utility Week, 13 November 2019, Paris.
57. Representative of Sesam io. Meeting at the European Utility Week, 12-14 November 2019, Paris.
58. Representative of Siemens, S.A. Application for European Energy Data Access Pilots 2020, April 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021.
59. Representative of Skybill. Meeting at the European Utility Week, 12-14 November 2019, Paris.
60. Representative of Smappee. Meeting at the European Utility Week, 12-14 November 2019, Paris.
61. Representative of SmartIS. Meeting at the European Utility Week, 12-14 November 2019, Paris.
62. Representative of Sunly. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April 2020. Meeting in Tallinn, 12 August 2020, and e-mail correspondence during August and September 2020. Estfeed client.
63. Representative of Superhands EE. Application for European Energy Data Access Pilots 2020, April 2020.
64. Representative of Sympower. Interview and e-mail correspondence during October-November 2019.
65. Representative of Telia Eesti AS. E-mail correspondence during September 2020. Estfeed client.

66. Representative of UBIK Solutions OÜ. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April-May 2020.
67. Representative of Virta Ltd. Meeting at the European Utility Week, 12 November 2019, Paris. Presentation and interview at the Tallinn Energy Data Conference, 28 November 2019.
68. Representative of Voltaware. Meeting at the European Utility Week, 12-14 November 2019, Paris. Application for European Energy Data Access Pilots 2020, April 2020.
69. Representative of WePower Network. Application for European Energy Data Access Pilots 2020 and e-mail correspondence during April 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021. Estfeed client.
70. Representative of zerofy at Quack Ventures OÜ. Web meeting, 14 April 2020 and e-mail correspondence during September-October 2020. Estfeed client.
71. Representatives of Calidity. E-mail correspondence during August and September 2020. Estfeed client.
72. Representatives of Climy. Meeting at the European Utility Week, 12-14 November 2019, Paris.
73. Representatives of DEXMA Energy Intelligence. Meeting at the European Utility Week, 13 November 2019, Paris. Application for European Energy Data Access Pilots 2020, April 2020. Web meeting, 10 December 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021.
74. Representatives of Elektrum Eesti. Meeting in Tallinn, 9 January 2020.
75. Representatives of Elertis. Application for European Energy Data Access Pilots 2020, April 2020. Web meeting and European Energy Data Access Pilot demo, 3 December 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021.
76. Representatives of EnerKey. Web meeting, 12 April 2019, and e-mail correspondence during September-October 2019. Meeting and interview at the Tallinn Energy Data Conference, 28 November 2019.
77. Representatives of GreenPocket. Meeting at the European Utility Week, 12 November 2019, Paris.
78. Representatives of Hausing Technologies OÜ. Meeting in Tallinn, 18 August 2020. Previous Estfeed client.
79. Representatives of Landis+Gyr. Meeting at the European Utility Week, 12-14 November 2019, Paris.
80. Representatives of R8 Technologies. Application for European Energy Data Access Pilots 2020, April 2020. E-mail correspondence during September 2020. Demo at the European Energy Data Access Final Webinar, 20 January 2021.
81. Representatives of Sitetracker. Meeting at the European Utility Week, 12 November 2019, Paris.
82. Representatives of Spotty Smart Energy GmbH. Previously Members of the Management Board at 220 Energia OÜ. Application for European Energy Data Access Pilots 2020, April 2020. E-mail correspondence during September 2020. Estfeed client.
83. Representatives of Themo. Application for European Energy Data Access Pilots 2020, April 2020. E-mail correspondence during September 2020. Estfeed client.

Annex 2. Petition letter

Petition letter

December 2019

Access to smart meter data and services across the EU

Our petition: EU citizens and businesses are entitled to a choice of energy management services that make use of their smart meter data. Energy users are able, if they wish, to dispose of their data freely and securely and have the possibility to share it with the companies and services they trust. The energy management services will enable customers and enterprises to reduce their energy bills, commit to cleaner energy, improve grid reliability and offer many other advantages and innovative services, such as smart charging of electric cars and flexibility to the grid. Today, smart meters have been rolled out across Europe, but the data from these smart meters is not easily available.

We, the undersigned:

1. Highlight that providing and obtaining access to certified and authorised smart meter data in Europe today is a competitive barrier; and
2. Request that sharing and access to smart meter data be simplified and unified in Europe in accordance with data protection laws and Articles 23 and 24 of Directive 2019/944 (the Clean Energy Package, rules for internal market for electricity).

Background

With the rollout of smart meters in Europe, valuable energy consumption and production data will become available for all market participants. A supplier or a flexibility or efficiency provider needs access to smart meter data for their day-to-day business providing value to consumers. However, in order to operate across Europe, we need to integrate several thousand data information systems to obtain meter data, which is a real challenge.

One of the pillars of the European Energy Union is a fully integrated internal energy market: enabling the free flow of energy throughout the EU through adequate infrastructure and without technical or regulatory barriers. With this main goal in mind, Directive (EU) 2019/944 on the internal electricity market under the Clean Energy package regulates data access and interoperability in the EU. The aim is to remove the barriers for access to energy data and enable consumers to share their energy data with third parties.

Article 23 of Directive (EU) 2019/944 regulates the need for transparency and non-discriminatory access to data. Within these boundaries, Member States are left sovereignty to develop their own data management system. Some countries have already implemented a legislative basis for data management, introducing national data management systems and central data hubs; other countries potentially have to alter their current regulatory framework in order to be compliant.

Article 24 of Directive (EU) 2019/944 underlines that data interoperability is key to materialising non-discriminatory data access. In order to promote competition in the retail market, Member States must

facilitate the full interoperability of energy services in the Union. Interoperability requirements and non-discriminatory and transparency procedures for, inter alia, access to meter data and consumption data should be drafted by the European Commission in implementing Acts.

In line with the above and in the spirit of the Clean Energy package, we, the undersigned, petition that smart meter data be accessible with similar methods and across Member State borders in all European regions. Such European collaboration can be established between those parties appointed by national law to develop and operate the national data management systems, be they TSOs, DSOs, data hub operators or independent third parties.

Signatures

Moixa

GreenPocket

WePower

Virta Ltd.

EnerKey

Greenbird

Piclo

Spotty

DEXMA

GridIO

FSIGHT

Greencom Networks

Coneva

FuseBox

KIBU.energy

UBIK Solutions

Metbox

Greenlytics

Esri

Themo

GridPocket

Annex 3. One pagers of EIT InnoEnergy Ecosystem companies (33) that process energy data (as of October 2020)

One-pagers will start on the next page.

Beedata Analytics S.L. · *Spain*

Product: Beedata services

Customer engagement and business intelligence tools for energy retail

CHALLENGE TO BE SOLVED.

There is a requirement to offer a point of differentiation that allows end users to add value to their energy consumption. New products must be developed in a way that meets customers' specific needs.

THE SOLUTION.

Beedata Analytics offers an open, cost effective, flexible and easy to integrate solution that is able to work with all granularity and types of data, from monthly to real time data. An omnichannel integrated system, it offers step-by-step implementation that is adapted to all types of small and medium companies. This solution provides useful information exactly when it is required.

VALUE PROPOSITION.

- Big data and massive treatment of all type of clients, granularity and different nature of data (scalability).
- Company, user and client-friendly approach.

User engagemnet tools and business intelligence

CUSTOMER REFERENCES.

Som Energia (Spain); Holaluz (Spain); UTE (Uruguay); Estabanell Energia (Spain); SEV (Italy); PEUSA (Spain)

MAIN MARKET. Power DSO

COMMERCIAL STAGE. Consolidated Sales

CONTACT

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08224 Terrassa
Spain

xcipriano@beedataanalytics.com
www.beegroup-cimne.com/beedata

CaCharge AB · *Sweden*

Product: CaCharge

Convert parking lots into profitable charging spots

CHALLENGE TO BE SOLVED.

There is a need to develop a mass market for EVs by providing a cost-efficient charging solution that is profitable for both real estate and parking lot owners.

THE SOLUTION.

CaCharge has developed a complete system based on a unique business model that enables clients to charge electric vehicles in parking lots located at home or at work. The solution includes an AI cloud charging service, a mobile app and a charging box and uses the entire time that a vehicle is parked to efficiently distribute power between cars. As a result, many cars can be charged without expensive load peaks.

VALUE PROPOSITION.

- Efficient: cars are charged efficiently based on user needs and available electrical power capacity.
- Profitable: a unique business model that makes the initial investment required low, and enables energy costs to be cut.
- Scalable: new stations can be easily added.
- Simple: cars are charged wherever they are parked, at home or at work.

CUSTOMER REFERENCES.

Fabege AB, Stena Fastigheter AB

MAIN MARKET. Transport & mobility

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Finlandsgatan 12
16474 Kista
Sweden

kurhog@cacharge.com
www.cacharge.com

Cloud Energy Optimizer · *Netherlands*

Product: Cloud Energy Optimizer

A shell over existing building management systems that provides energy forecasting

CHALLENGE TO BE SOLVED.

Building energy management systems (BEMS) have significant limitations. The cost to install, maintain and utilise them is high, and there should be smart building technologies in place to ensure that energy is being used efficiently in a building.

THE SOLUTION.

The Cloud Energy Optimizer (CEO) is a cloud based add-on to building energy management systems (BEMS) which, based on the weather forecast, predict the energy needs of the building (zones). Easy to install, it leads to energy savings of 10% to 50% and cost reductions, as well as improved indoor comfort. Applicable to existing buildings.

VALUE PROPOSITION.

- Contribution to sustainability goals.
- Enhanced indoor comfort.
- Extends the lifespan of technical installations.
- Instant and significant energy and cost reduction by 10% to 40%.
- Use of the most sustainable and/or cheapest energy available.
- No adaptations required for heating, ventilation, and air conditioning (HVAC) system or building.

CUSTOMER REFERENCES.

City Counsel Groesbeek, Provincial house Overijssel, Zwolle, Wehkamp, Zwolle

MAIN MARKET. Non Residential building

COMMERCIAL STAGE. Starting Sales

CONTACT

Jan Tinbergenstraat 396
7559 ST Hengelo
Netherlands

info@cloudenergyoptimizer.com
https://www.cloudenergyoptimizer.com

ConnectPoint · *Poland*

Product: Smartvee

Meter data quality assurance as a service for utilities and energy

CHALLENGE TO BE SOLVED.

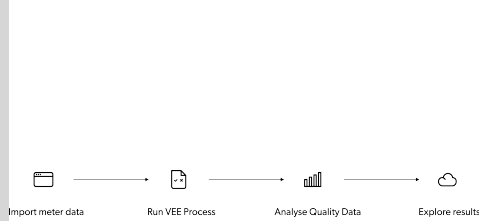
The energy and utilities industry needs a prime quality of meter data for its operations, especially for billing purposes.

THE SOLUTION.

Smartvee is a platform for meter data validation (VEE) and analysis that solves the issues of data quality assurance for billing purposes, anomalies detection and consumption forecasting. Smartvee takes an innovative approach to VEE process
and meter data insights - data quality assurance as a service. Smartvee combines hands-on industry expertise and exceptional user experience with timeline-based data processing management.

VALUE PROPOSITION.

- Flexible and efficient data framework.
- Higher accuracy of demand and consumption forecasting.
- Higher efficiency of accounting processes (meter-to-bill).
- Lower number of frauds and losses.



CUSTOMER REFERENCES.

ConnectPoint delivers solutions to leaders in utilities, power and manufacturing industries such as E.On, RWE, PGE, Twinings, Veolia, Stadtwerke Leipzig.

MAIN MARKET. District Heating Grid

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Zagadki 21
02-227 Warsaw
Poland

wiktoria.kwapisz@connectpoint.pl
connectpoint.pl

DC Brain · *France*

Product: DC Brain

AI tool for complex networks (gas, electricity, heat, supply chains)

CHALLENGE TO BE SOLVED.

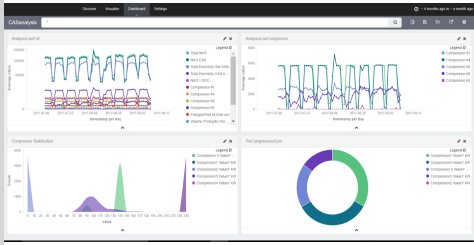
Complex network managers face 3 main difficulties: the need to control and optimise flows and consumptions, an increased pressure on maintenance costs and the evolution from traditional to “smart” infrastructure and grid.

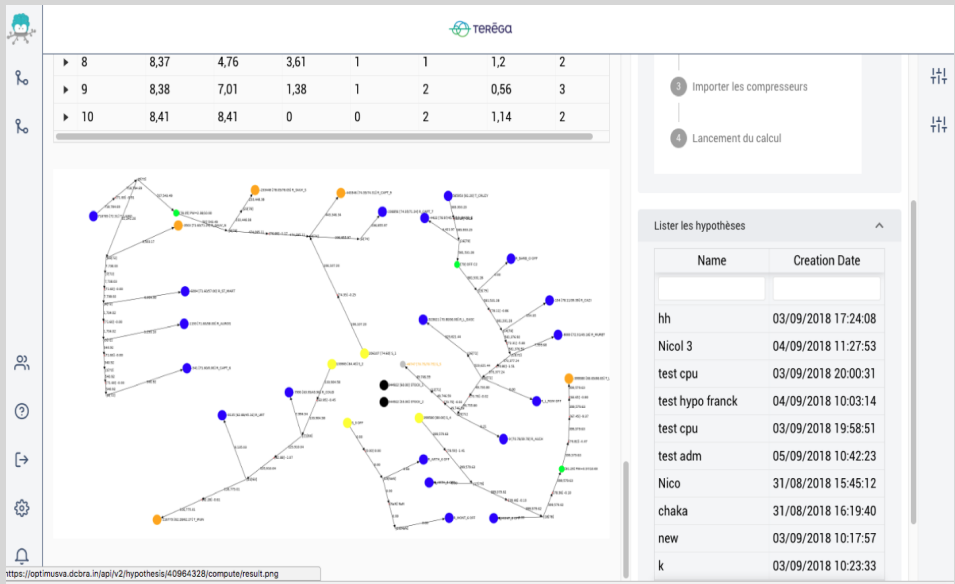
THE SOLUTION.

DCbrain is an artificial intelligence software (based on graph models and machine learning tools) that is able to visualise flows very easily, detect anomalies, predict incidents and model the evolution of networks (resilience test).

VALUE PROPOSITION.

- Data reconciliation (optimisation of data mining processes).
- Increase of asset life expectancy.
- Optimisation of engineering processes.
- Optimisation of exploitation processes.





CUSTOMER REFERENCES.

TOTAL, ENEDIS, GRDF, ORANO, DALKIA, SOLVAY, VINCI, ID LOGISTICS...

MAIN MARKET. District Heating Grid

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Avenue d'Italie 23
75013 Paris
France

aymeric.toubeau@dcbrain.com
www.dcbrain.com

EasySolar · *Poland*

Product: EasySolar app

Photovoltaic software to design and sell solar panels

CHALLENGE TO BE SOLVED.

The design and selling process of rooftop solar panels is comprised of several phases which involve the use of various types of software. There is a requirement to simplify the process and make it more accessible to customers.

THE SOLUTION.

The EasySolar system is a professional tool that has been created to simplify, accelerate and streamline the PV installation sales process. It includes financial analysis, preparation of a conceptual PV installation project and enables the generation of a PV customer proposal.

VALUE PROPOSITION.

- A “one-stop-shop" with all necessary functions integrated into one software.
- Easy to use.
- Time saving.

CUSTOMER REFERENCES.

Available on request.

MAIN MARKET. Solar PV

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Fredry 2/5a
61-701 Poznan
Poland

marcin.dolata@easysolar.pl
easysolar-app.com

Ecotropy · *France*

Product: BUILDSENSE

Simulation and measurements for better energy efficiency in buildings

CHALLENGE TO BE SOLVED.

While billions of euros are spent every year on energy conservation measures in buildings, the energy gains obtained are on average 50% below target.

THE SOLUTION.

Buildsense combines energy modelling of the building and real-time consumption data collected on site. Based on this data, Buildsense checks the optimal operation of the entire building, detects any discrepancies leading to unnecessary consumption and suggests optimisation plans based on real-time systems control.

VALUE PROPOSITION.

- Avoids undue over-consumption that today amounts to 40% to 100% above the target rate.
- For a medium-sized building of 10 000 m2, energy savings can represent up to 20 k€/year.
- Secures energy savings in the long term.

CUSTOMER REFERENCES.

T4M, Solamen

MAIN MARKET. Non Residential building

COMMERCIAL STAGE.

CONTACT

Campus Ifsttar, Route de Bouaye CS4
44 344 Bouguenais cedex
France

contact@ecotropy.fr
http://www.ecotropy.fr/

ENAPPGY (fkna Energetika NL B.V) ·
Netherlands

Product: Enappgy

The Energy Intelligence objective is to achieve maximum energy savings

CHALLENGE TO BE SOLVED.

Sustainable strategies are currently being seen as costs with a return on investment (ROI), and are therefore not prioritised and/or implemented on a small scale. Energetika simplifies this for customers by significantly reducing energy consumption.

THE SOLUTION.

Energetika significantly reduces energy consumption while helping to improve primary processes and activities (safety, logistics efficiency, occupancy, climate comfort, predictive maintenance and location services). The system is designed to customise and easily expand the network of lighting nodes with smart sensors and software. There is the application of advanced controls, facility-wide analysis, and data-driven operational insights to create new value for customers across the globe.

VALUE PROPOSITION.

- Facilitates sustainable initiatives (fine avoidance/image/maximum subsidy).
- Maximum energy savings (+light).
- PR; waste project upcycling / market reporting.

ENAPPGY
Smart & Sustainable Buildings

CUSTOMER REFERENCES.

Commercial real estate with a minimum of 5000 m2. Some of our customers are: Schneider electric, Honeywell, Reginox

MAIN MARKET. Industry

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Databankweg 26, 3821 AL, 26
3821AL Amesfoort
Netherlands

avega@enappgy.com
https://www.enappgy.com/

ENEIDA (Eneida Wireless & Sensors, SA) ·
Portugal

Product: Eneida - Deep Grid

Collaborative energy IoT platform for the optimisation of the low voltage network

CHALLENGE TO BE SOLVED.

The use of renewables, electric vehicles, growing energy demand, regulation and an ageing infrastructure is forcing distribution system operators to search for new optimisation solutions.

THE SOLUTION.

Eneida's highly-efficient electric grid's optimisation platform is based on a specially designed suite of wireless smart sensor networks. It is integrated with specific machine learning algorithms and a collaborative software platform.

VALUE PROPOSITION.

- Allows for a higher penetration of renewables, electric vehicles, distributed energy resources.
- Distribution and Transportation Network Operators increase their quality of service.
- Explicit learning mechanism for continuously improved recommendations.
- Improves asset productivity: does more with less.
- Increases efficiency, security and safety, reducing risk.

CUSTOMER REFERENCES.

EDP; SSEN; ENEL; Enexis; Naturgy

MAIN MARKET. Power DSO

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Edif. E – IPN, R. Pedro Nunes Instituto Pedro Nunes
3030-199 Coimbra
Portugal

cpt@eneida.io
www.eneida.io

Energiency · *France*

Product: Energiency

Cloud software that enables disruptive big data analytics solutions for the energy industry

CHALLENGE TO BE SOLVED.

Industrial manufacturers lack energy competitiveness resulting in high energy bills. Operational teams cannot easily manage this problem as they lack relevant key performance indicator (KPI) analytical means, even though data is all around them!

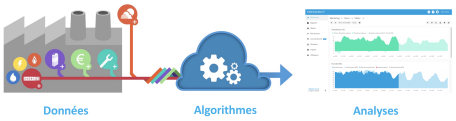
THE SOLUTION.

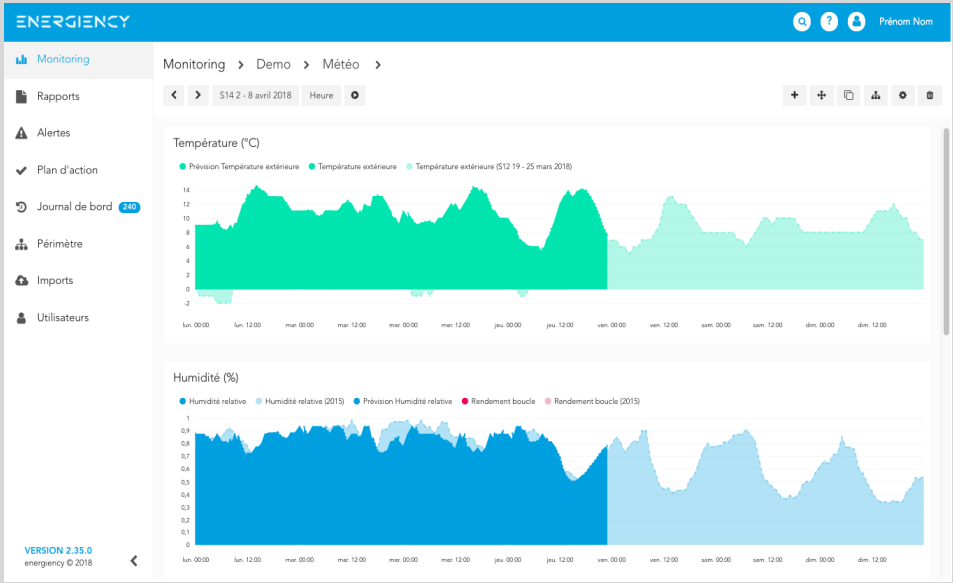
Energiency helps industrial companies save energy thanks to machine learning and predictive analytics that continuously scan data related to energy and fluids. Data is available in relation to production, maintenance and weather conditions.

VALUE PROPOSITION.

- 20% energy savings without additional investments.
- Competitive.

ENERGIENCY
ENERGY INTELLIGENCE FOR MANUFACTURING





CUSTOMER REFERENCES.

20 direct customers in various market segments (paper, food and beverages, chemistry, mineral and mining, automotive, water...).

MAIN MARKET. Industry

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Avenue Jules Maniez 22
35000 Rennes
France

thierry.dallance@energiency.com
www.energiency.com

ENERGIOT DEVICES SL · *Spain*

Product: Energiot Cube

Self-powered Internet of things (IoT) device that transforms ambient energy into autonomous smart networks

CHALLENGE TO BE SOLVED.

There is a necessity to avoid the maintenance associated with charging or replacing batteries in sensor networks, especially when there is a great number of sensors or access is difficult.

THE SOLUTION.

This product can harvest residual ambient energy present in the application environment by way of vibrations, electromagnetic fields associated with current carrying cables and the flux of a gas or a liquid inside a pipe. This allows for the deployment of autonomous wireless sensors that makes the concept of a "self-powered Internet of things" possible.

VALUE PROPOSITION.

- Cost reduction.
- Green solution.
- Install and forget, maintenance-free.
- Predictive analysis with big data.
- Smarter grid.

CUSTOMER REFERENCES.

Available on request.

MAIN MARKET. Power TSO

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Rambla de Mercedes 16-18, 3° 2ª
08024 Barcelona
Spain

pablo.ribeiro@energiot.com
www.energiot.com

Enervalis · *Belgium*

Product: Enervalis

Cloud-based software that allows electricity producers, storage providers and consumers to save or make money

CHALLENGE TO BE SOLVED.

Due to a global shift towards sustainable energy sources, there is an increased demand for energy supply security and independence from current energy supply models. More efficient management of all energy supplies, storage and demand is also required.

THE SOLUTION.

A cloud-based suite of software that offers production and consumption forecasting for optimal green-energy utilisation; wholesale energy market integration for the lowest energy purchase cost and extensive interoperability; security, and app and user interface layers: all of which can be combined as needed.

VALUE PROPOSITION.

- Maximised local electrical connection capacity to minimise or avoid costly upgrades.
- Minimised EV charging costs, maximised EV availability, range and overall user experience.
- Partial or full (micro-/off-grid) independence from the grid or diesel generators.
- Peak-shaving and reduced net operators' CAPEX into infrastructure maintenance and upgrades.
- Trading energy on the wholesale market or building-to-building.

CUSTOMER REFERENCES.

Available on request.

MAIN MARKET. Power DSO

COMMERCIAL STAGE.

CONTACT

Greenville Campus; Centrum-Zuid 1111
3530 Houthalen-Helchteren
Belgium

info@enervalis.com
www.enervalis.com

Enline Digital Twin · *Portugal*

Product: Real-time transmission line monitoring system

A simple and extensive way to manage the transmission line asset

CHALLENGE TO BE SOLVED.

Utilities are constantly seeking opportunities to improve operations, increase availability and manage variations in market conditions to improve profitability. There is a need for a comprehensive solution with value-added insights that favour better business decisions.

THE SOLUTION.

ENLINE is a state-of-the-art technology based on solid physics principles and advanced analytics, combined with sophisticated AI and a powerful calculation capacity used to model the present state of every transmission asset. This increases the overall efficiency and profitability of transmission assets.

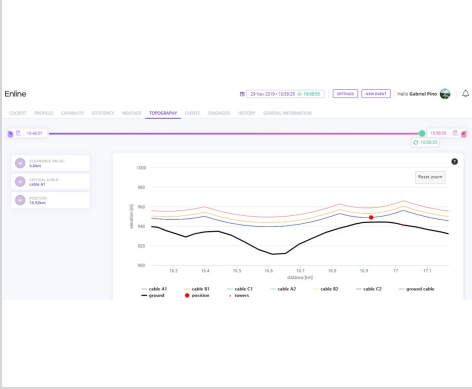
The software can be easily implemented remotely anywhere on the planet within a few days, without need of sensors, hardware installation or even face-to-face meetings.

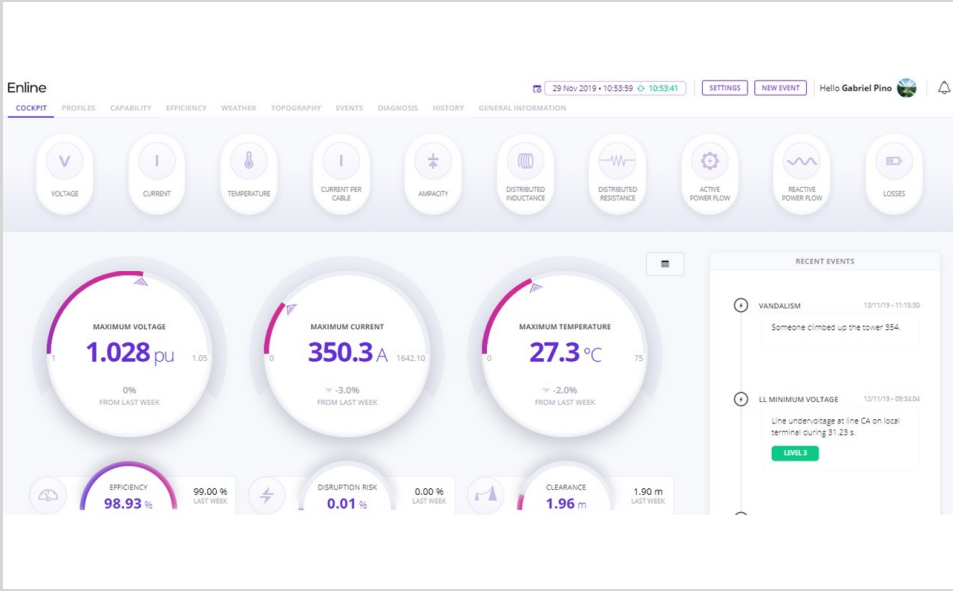
VALUE PROPOSITION.

- Intelligent analytical system to increase overall asset performance and business profitability.
- Real-time monitoring and predictive diagnosis of the transmission line.
- Up to 25% of transmission losses reduction.
- Operation and maintenance cost reduction.
- Improved availability and reliability.
- Evaluation of asset health and expected lifetime.

Enline

powered by





CUSTOMER REFERENCES.

Corumbá Concessões, ElectroDunas, ISA REP, State Grid Brazil, REE

MAIN MARKET. Power TSO

COMMERCIAL STAGE. Starting Sales

CONTACT

Rua Combatentes da Grande Guerra 14
Mirandela
Portugal

info@enline-transmission.com
https://www.enline-transmission.com/

Entech smart energies · *France*

Product: ESS (Energy Storage System)

Smart energy storage system for on-grid / off-grid management

CHALLENGE TO BE SOLVED.

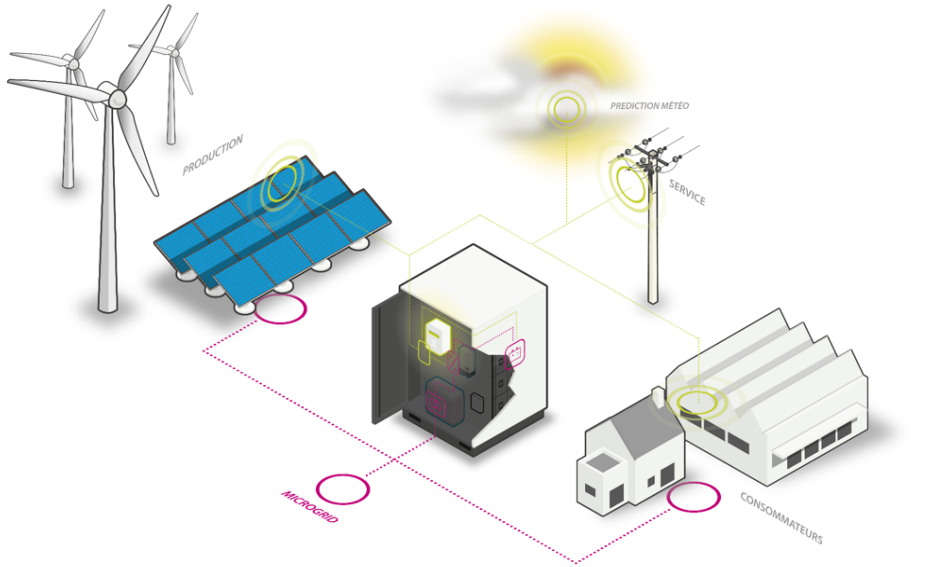
Existing solutions based on conventional energy sources are very well installed. ESS needs to demonstrate its reliability to perform for decades and its ability to adapt to all situations, from energy consumer behaviour to changing environmental conditions (sun, wind, etc).

THE SOLUTION.

The ESS product provides 24/7 energy from different sources in an integrated solution that is easy to deploy. It offers a complete package covering storage, conversion, control, supervision, thermal management, integration and services for operation. Conversion architecture is efficient and cost effective and it is flexible in that it adapts to energy sources and energy consumption.

VALUE PROPOSITION.

- Decarbonates energy.
- Decreases energy expenses.
- Makes energy more reliable.
- Reduces oil dependency.



CUSTOMER REFERENCES.

Bolloré, EDF, PSA, SPIE, Bouygues, Kemiwatt, Sabella, Guinard, JPEE, Legendre energies, Geps Techno

MAIN MARKET. Off GRID

COMMERCIAL STAGE. Consolidated Sales

CONTACT

route de l'innovation 13
29000 QUIMPER
France

laurent.meyer@entech-se.com
https://entech-se.com/

Expektra · *Sweden*

Product: Expektra Predict

Enabling efficient short-term power trading and improved balance management

CHALLENGE TO BE SOLVED.

Renewable power generation increases the costs of balancing the grid. Predicting near future electricity consumption or production is a large part of utilities' daily operations, striking directly at operating costs.

THE SOLUTION.

Expektra Predict is a forecasting tool for short-term energy generation and consumption that has 10 to 20% better accuracy than conventional methods. A unique implementation of artificial neural networks, it is able to detect complex patterns in input data. It includes an app for monitoring, back up power and over-the-air wireless updates. Provided as software as a service, non-linear relations between input and output data can be recognised. Remote maintenance is also available.

VALUE PROPOSITION.

- 100% capacity guarantee.
- All-in-one system.
- Fully recyclable.

VOLTSTORAGE

CUSTOMER REFERENCES.

Vattenfall, Sandvik, Ustekveikja, Storuman Energi, Kalmar Energi, Hydro

MAIN MARKET. Power DSO

COMMERCIAL STAGE.

CONTACT

Vendevägen 89
182 32 Danderyd
Sweden

info@expektra.se
http://expektra.se/

Ferroamp Elektronik AB · *Sweden*

Product: EnergyHub

Power control by integrated and future proof DC nanogrids.

CHALLENGE TO BE SOLVED.

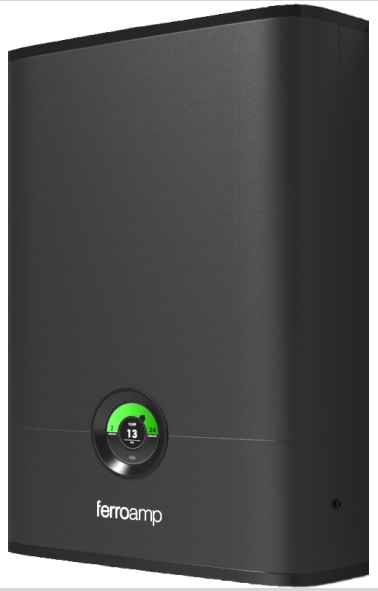
As a response to the increasing proportions of intermittent and low marginal cost electricity generated from renewable resources, future power markets will also price the capacity demand of consumers in addition to electricity consumption.

THE SOLUTION.

SOLUTION. A DC nanogrid integrating - PV, storage and EV chargers - with the grid, optimised for medium-sized buildings and adapted to future needs. It enables increased self-production/consumption of electricity. The concept is expanded to connect different buildings with the DC net through a PowerShare concept.

VALUE PROPOSITION.

- Increased self-consumption from behind the meter storage and DC distribution.
- Life cycle cost efficient.
- Low conversion and transmission losses by only one inverter.
- Modular scalability and future proof - from 7 kW to MW range.
- Powerful DC charging of EVs.



CUSTOMER REFERENCES.

Vattenfall, Fortum, Riksbyggen, Skanska, Vasakronan

MAIN MARKET. Residential Building

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Domnarvsgatan 16
16353 Spånga
Sweden

mats.karlstrom@ferroamp.com
www.ferroamp.se

FlexiDAO S.E.S. (Smart Energy Services) · *Spain*

Product: Respring

A digital experience of renewable energy procurement

CHALLENGE TO BE SOLVED.

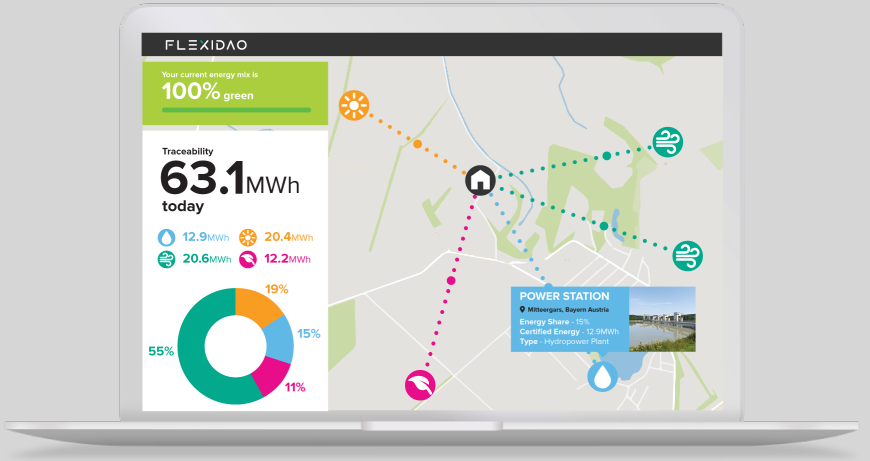
Energy retailers are suffering decreasing margins from renewables and self-consumption. Moreover, it is hard to acquire customers as they complain of high costs and require additional services to energy procurement.

THE SOLUTION.

This software tracks the origin of renewable energy in real time and matches production data to each consumption point. Sustainability managers can visualise and download this data and claim certificates from the plant source. Automatic reports with critical KPIs are produced for sustainability reporting, plus a live map showing source data including technology type, location, age of the plant and hourly CO2 emissions with a 24/7 green energy match.

VALUE PROPOSITION.

- Automated CSR tool for corporate consumers.
- Link with GoOs and I-REC mechanisms.
- Near real-time traceability of energy consumptions.
- Auditable in Blockchain.
- One-stop shop for end-users with the ability to select their tariffs based on their preferred



CUSTOMER REFERENCES.

More than 7 TWh tracked per year in 9 countries. Utilities: Iberdrola, Total, Acciona, EDP, EON, Alperia, Orsted, Tauron and more. TSO: Red Eléctrica de España. 20 corporate consumers including Unilever, El Corte Ingles or Kutxabank. The United Nations Development Programme

MAIN MARKET. Power DSO

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Carrer de Bruc 143
08037 Barcelona
Spain

info@flexidao.com
flexidao.com

gulplug · *France*

Product: E-Cube, E-Case and connected services

An integrated solution that enables a decrease of electricity consumption by 10%

CHALLENGE TO BE SOLVED.

There is a requirement to provide energy managers with a simple solution with fast payback to decrease the electricity consumption in manufacturing plants.

THE SOLUTION.

The product offer consists of both hardware and software. The hardware is the "E-case" comprising 20 E-cube sensors, an access device and a data logger. E-cube sensors are wireless, self-powered and easily clamped individually on one phase of a machine. Electricity consumption data is retrieved, logged and sent to the software, a "save-it-yourself" platform that produces savings recommendations and offers connected services.

VALUE PROPOSITION.

- Connected services.
- Fast payback (less than one year).
- Installation in one day.
- No downtime costs for the plant operator.
- No need for specific training: a DIY approach.

CUSTOMER REFERENCES.

Bonduel, Fenwick, Schneider-Electric plants

MAIN MARKET. Industry

COMMERCIAL STAGE. Consolidated Sales

CONTACT

rue des Berges 32
38 000 Grenoble
France

contact@gulplug.com
www.gulplug.com

Ionseed · *Portugal*

Product: Ionseed

IoT network for distributed energy management and storage

CHALLENGE TO BE SOLVED.

New energy tariffs linked to spot market prices and the need to optimise energy acquisition costs by retailers open the door to new business models and optimisations based on time-of-use, storing energy for future use when it is cheapest.

THE SOLUTION.

With Ionseed, end users reduce energy consumption and cost, and energy retailers decide when, where, how much and what energy type is used by the consumer. This is done by defining energy management rules targeting energy storage devices in an Internet of things (IoT) platform that communicates with proprietary hardware embedded in several consumer products that store energy. These include water heaters and heat pumps, cold stores, chemical batteries and electric vehicles.

VALUE PROPOSITION.

- Enables service and energy providers to develop new products and add more value to clients.
- Enables service and energy providers to reduce costs and increase revenues.
- End users benefit from reduction of energy bills, more information and better maintenance services.
- Manufacturers transform a traditional passive device into a cutting-edge intelligent appliance.

CUSTOMER REFERENCES.

EDP, VPS, Simples Energia

MAIN MARKET.

COMMERCIAL STAGE. Starting Sales

CONTACT

Rua Luis Braille n19 4D
2410-371 Leiria
Portugal

info@ionseed.eu
www.ionseed.eu

Kusinta · *Sweden*

Product: Kusinta

Energy efficient housing through temperature optimisation

CHALLENGE TO BE SOLVED.

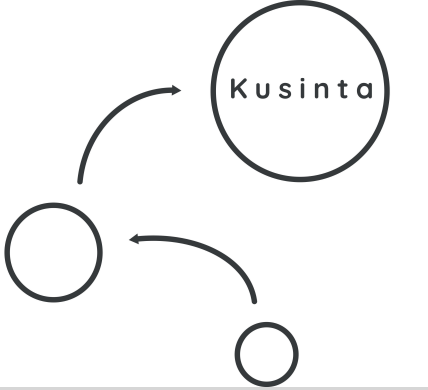
Many apartments have a higher than necessary energy usage for heating. This adds up to high energy bills and a negative environmental impact.

THE SOLUTION.

The solution consists of software with the ability to control local smart thermostatic valves in all rooms with the aim of optimising the indoor temperature. The input parameters are individual preferences as well as outdoor weather and behavioural patterns, such as the usual arrival time home. Machine learning feedback loops optimise the energy use over time. The solution enables the tenant to increase the level of comfort, while reducing energy usage.

VALUE PROPOSITION.

- Increases indoor comfort.
- Minimises energy for heating.
- Economic savings and environmental benefits.



CUSTOMER REFERENCES.

Available on request.

MAIN MARKET. Residential Building

COMMERCIAL STAGE. Early Stage

CONTACT

Torsgatan 11
11123 Stockholm
Sweden

martin.eckerwall@kusinta.com
www.kusinta.com

Lyv Holding B.V. · *Netherlands*

Product: LYV

Autonomous and reliable energy transition for companies with a smart battery solution for professional use

CHALLENGE TO BE SOLVED.

Centralised fossil energy production is being transformed into decentralised sustainable energy production, which relies on sun and wind. Sustainable energy generation, however, does not match demand, creating imbalance and the overloading of the network.

THE SOLUTION.

An advanced energy supply system for monitoring, storing and optimising energy that enables customers to receive up-to-date consumption information and insights to reduce costs; increases the use of green energy; incorporates a battery system that reduces costs by peak shaving, maintains reliability and operates for hours without external power; and includes smart modules: custom AI-driven optimisers automated to maximise on energy efficiency.

VALUE PROPOSITION.

LYV energy monitoring.
Insights on saving opportunities and reports on progress.
Real-time monitoring.
A real-time view on consumption recorded every 10 seconds.
Standardised energy reporting.

CUSTOMER REFERENCES.

Available on request.

MAIN MARKET. Non Residential building

COMMERCIAL STAGE. Starting Sales

CONTACT

Binnendelta 7C
1261 WZ Blaricum
Netherlands

brendan@getlyv.com
https://getlyv.com/

Meshcrafts AS · *Norway*

Product: SmartCharge®

The turnkey software solution for EV-charging

CHALLENGE TO BE SOLVED.

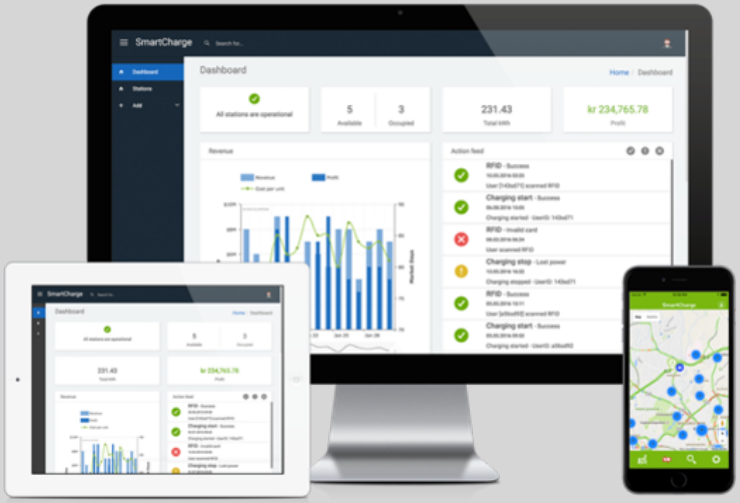
EV market growth is strong, but there are challenges: firstly, a lack of charging infrastructure with some 50-60 million charging points required by 2025 to handle growth; secondly, load growth leads to constraints in the energy grid, with high growth in chargers provoking capacity issues.

THE SOLUTION.

A scalable software platform suitable for any charging infrastructure. It incorporates charge point management with significant value to all stakeholders in the value chain; hardware that is independent through open standards; an app with navigation, payment, service and support, customer relationship management (CRM), and reporting and maintenance technology, bringing significant value to grid operators. Load optimisation is local and regional, there is also peak shaving and energy management.

VALUE PROPOSITION.

- Turn-key solution, a one-stop shop.
- Reliability, 99.9% uptime.
- Price advantage.
- Scalability and stability.



CUSTOMER REFERENCES.

Available on request.

MAIN MARKET. Transport & mobility

COMMERCIAL STAGE. Starting Sales

CONTACT

Gaustadalléen 21
0349 Oslo
Norway

paal@meshcrafts.com
https://meshcrafts.com/

MODIO AB · *Sweden*

Product: Modio IoTOS™

The enabler of secure, open and updated IoT solutions

CHALLENGE TO BE SOLVED.

Energy systems in buildings have traditionally been built as stand alone systems, making it difficult to monitor them, manage them remotely, as well as ensure that they are energy efficient. The hardware also makes such systems proprietary.

THE SOLUTION.

By integrating the Modio IoTOSTM into a building's energy system it becomes possible to monitor and manage systems remotely and share data, regardless of the existing hardware. Big data and AI can start to be used even in existing buildings and systems.

VALUE PROPOSITION.

- Buildings can be integrated with each other and third party solutions enabled.
- Enables energy monitoring and management in everyday usage.
- Suitable for strategic planning purposes.

CUSTOMER REFERENCES.

More than 500 installations are already up and running.

MAIN MARKET. Non Residential building

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Sankt Larsgatan 15
582 24 Linköping
Sweden

mathias@modio.se
www.modio.se

Ngenic · *Sweden*

Product: Ngenic Tune

Increased comfort, consistent temperature and complete control

CHALLENGE TO BE SOLVED.

The built environment accounts for 40% of the world's energy consumption. Efficient energy management in buildings is key to sustainable development.

THE SOLUTION.

Ngenic Tune is a smart thermostat that enables house and villa owners to save energy and money. Combining three small devices and a mobile app, it collects accessible data – indoor temperature, outdoor temperature, and weather – and allows the user to choose and control the desired indoor temperature, while keeping track of the heating patterns and following up on energy savings at the same time.

VALUE PROPOSITION.

- Easy to install: plug and play system sets up in just 20 minutes.
- Easy to use and control via a mobile app, regardless of where the user is.
- Environmentally aware heating: enables both energy savings and cost reductions.
- Increased comfort with a more uniform indoor temperature.
- Supports today's hydronic heating systems.

CUSTOMER REFERENCES.

Available on request.

MAIN MARKET. Residential Building

COMMERCIAL STAGE.

CONTACT

Kungsgatan 41
753 21 Uppsala
Sweden

info@ngenic.se
https://ngenic.se/

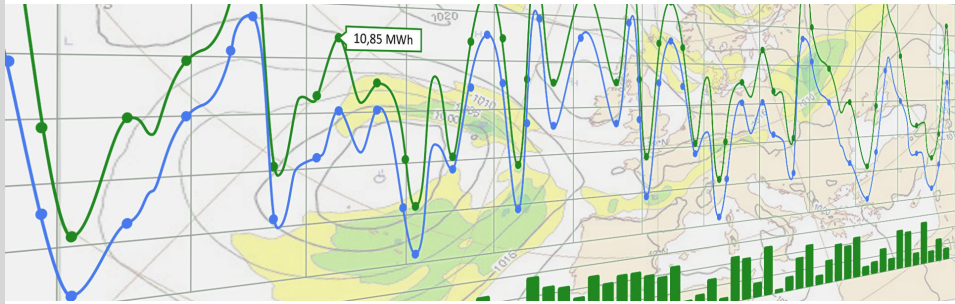
Nnergix ▪ *Spain*

Product: Sentinel Weather

Renewable energy forecasting and micro smart grid management solutions

CHALLENGE TO BE SOLVED.

Due to the complexity of renewable energy resources and their dependence on changeable weather conditions, companies need to predict their energy production in order to integrate it correctly and efficiently, while also reducing economic costs.



THE SOLUTION.

Sentinel Weather combines satellite weather data and real time data assimilation, offering a high resolution weather forecast and a web platform with scalable functionalities. Weather data (historical, current and forecast) is collected from many different sources and multiple statistical algorithms such as machine learning, neural networks and others are run to generate weather-based business decision tools.

VALUE PROPOSITION.

- Reduces costs of operation of solar power plants.
- Connects different actors.
- High accuracy forecasts and customisation.
- Meteorological data for infrastructures.
- Monitoring solutions for electricity grid integration purposes.

CUSTOMER REFERENCES.

Transport System Operators / Distribution System Operators / Independent Power Producers

MAIN MARKET. Solar PV

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Esteve Terradas 1 Parc UPC - RDIT. Parc Mediterrani de la Tecnologia (PMT)- Oficina 015
08860 Castelldefels-Barcelona
Spain

info@nnergix.com
www.nnergix.com

OGGA · *France*

Product: Eco Touch & Smart Building

The most viable solutions for the intelligent energy management of housing

CHALLENGE TO BE SOLVED.

There is a need to address high energy bills derived from overconsumption, a lack of vision of the current state and energy consumption of building stock and the fact that energy saving and home automation solutions are still too costly and difficult to use and install.

THE SOLUTION.

The product Ogga learns the life habits of owners and is then able to anticipate energy needs and automatic heating management. It allows lighting and stand-by mode cut-off during absences and offers consumption monitoring and display.

VALUE PROPOSITION.

- A connected solution (thermostat, energy meter and circuit breaker).
- Adopts a first level of home automation that is available to all.
- Easy to install (no configuration) and use (self-learning).
- Saves energy (reduced rental charges).

CUSTOMER REFERENCES.

Eiffage, Bouygues, BPD Marignant, Grand Lyon Habitat, Alliade Habitat among others.

MAIN MARKET. Residential Building

COMMERCIAL STAGE.

CONTACT

Boulevard Vivier Merle 96
69003 Lyon
France

contact@ogga.fr
www.ogga.eu

Power2U · *Sweden*

Product: Local system operator (LSO)

Designing, building and operating sustainable local energy systems

CHALLENGE TO BE SOLVED.

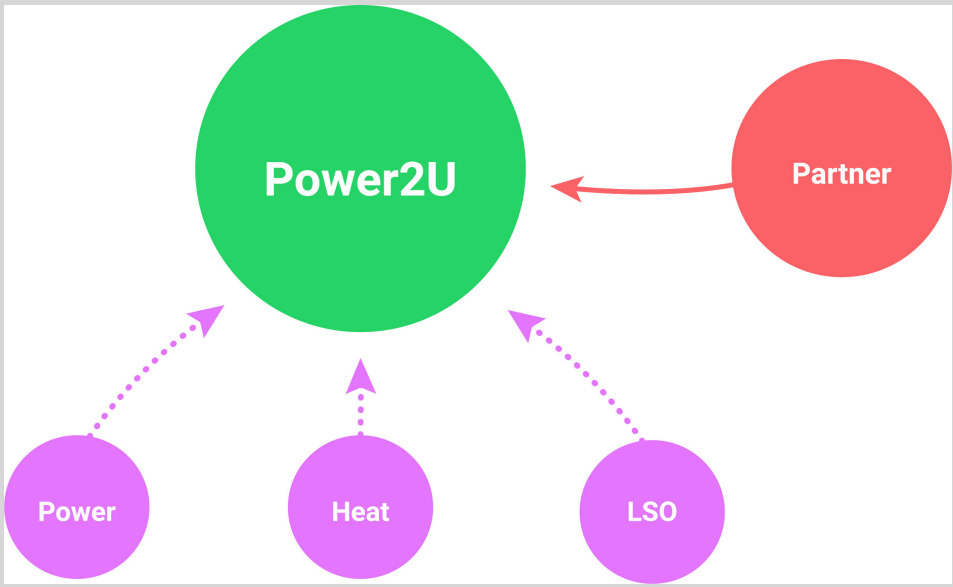
The climate threat makes it imperative that ways be found to make everyone part of the solution by sharing energy together and being flexible. There is a need to reduce energy costs and carbon footprint, increase efficiency and provide interfaces to energy markets for all types of buildings.

THE SOLUTION.

The Power2U solution is to offer customers a means to connect their properties and energy assets to each others, to the cloud and to the grid. Maximising their own energy production and contributing to a network unites and empowers people in a shared solution. By providing interfaces to energy markets, customers are able to trade energy and power flexibility.

VALUE PROPOSITION.

- Increased self-consumption of locally generated electricity.
- Local energy generation from renewable sources.
- Open for integration of wide range of hardware and software modules.
- Opportunity to become a participant in flexible energy markets.



CUSTOMER REFERENCES.

Stena Fastigheter, AB Uppsala kommuns Industrihus

MAIN MARKET. Residential Building

COMMERCIAL STAGE. Starting Sales

CONTACT

Torsgatan 39
113 62 Stockholm
Sweden

goran.ernstson@power2u.se
https://www.power2u.se/

Sensorfact B.V. · *Netherlands*

Product: Sensorfact

Smart energy savings for industries

CHALLENGE TO BE SOLVED.

Industries need to improve their energy efficiency because of environmental legislation and global competition. Eliminating energy waste in a smart and easy way is essential so that they can focus on production.

THE SOLUTION.

Sensorfact provides the technology, data, insights and advice to bring down industrial energy use. Industries are helped to reduce their footprint and energy bill, with value added by making the solution simple to use and easy to implement.

VALUE PROPOSITION.

- Plug and play hardware.
- Customised savings advice.
- Easy implementation of savings.

SENSORFACT

CUSTOMER REFERENCES.

Engie, Dr. Oetker, GEA Group, Tetra Pack, PET Power

MAIN MARKET. Industry

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Nicolaas Beetsstraat 216-222
3511 HG Utrecht
Netherlands

info@sensorfact.nl
www.sensorfact.eu

STEMY ENERGY · *Spain*

Product: SPLODER

Maximising consumers' energy efficiency while streamlining the energy flexibility of the grid

CHALLENGE TO BE SOLVED.

Renewable energy sources produce variable energy that depend on weather conditions. High renewable quotas are mandatory in EU policies. Flexibility in demand is essential to keep electricity systems in balance with high renewable shares.

THE SOLUTION.

SPLODER monitors distributed energy resources, weather conditions, building performance, energy markets and customers' load behaviour. Using several self-learning algorithms, it optimises the energy infrastructure of the end user to obtain the most from energy markets (wholesale, ancillary services markets and local markets). The platform then sends commands to the IoT devices or any other platform to apply the result of the optimisation.

VALUE PROPOSITION.

- Reduces customers' energy bill.
- Earns revenues from flexibility markets.
- Increases energy efficiency by 30% while reducing CO2 by 40%.

CUSTOMER REFERENCES.

Utilities in Spain, energy communities in the UK

MAIN MARKET. Power DSO

COMMERCIAL STAGE. Starting Sales

CONTACT

Calle Francisco Ricci 3
28015 Madrid
Spain

alvaro@stemyenergy.com
https://www.stemyenergy.com

Verv · *United Kingdom*

Product: Verv Connect

Unlocking energy data with AI to create unique smart home experiences

CHALLENGE TO BE SOLVED.

Utilities are struggling to acquire, engage and retain customers, while customers struggle to reduce their energy bills. Carbon emissions and energy bills are increasing and the removal of the UK's feed in tariff (FiT) scheme means longer ROI on domestic renewables.

THE SOLUTION.

Verv unlocks granular energy data providing unique real time insights at an appliance level to users, providing utilities with a competitive advantage and the ability to personalise their services. This solution offers blockchain-based renewable energy trading, a budgeting function, high-frequency appliance disaggregation in real time, individual appliance usage cost and usage activity and safety notifications if key heated appliances are left on.

VALUE PROPOSITION.

- Ability to acquire, engage and retain customers - utilities.
- Improved access to low carbon energy.
- Reduced energy bills - users.
- ROI for domestic renewable owners.

CUSTOMER REFERENCES.

Not available.

MAIN MARKET. Residential Building

COMMERCIAL STAGE. Starting Sales

CONTACT

3 Lower Thames Street St Magnus House
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United Kingdom

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www.verv.energy

VoltStorage GmbH · *Germany*

Product: VoltStorage SMART

The cost-efficient redox-flow power storage system for private homes

CHALLENGE TO BE SOLVED.

A photovoltaic system generates solar power – but only when the sun is shining. For an optimal utilisation of solar energy, it is therefore beneficial to temporarily store the self-produced surplus solar power.

THE SOLUTION.

Compared to conventional storage solutions made of lithium and lead-sulphuric acid, VoltStorage's solar power battery system is not only cheaper and more durable, but also offers greater safety in domestic use and an ecologically sustainable production: the recyclable vanadium electrolyte used for the battery consists mainly of pure water and is therefore not flammable or explosive, even under extreme conditions or malfunctions.

VALUE PROPOSITION.

- A safe, ecological and durable alternative.
- Back up power.
- Over the air updates.
- Remote maintenance.
- Not flammable.
- Long lasting.
- 100% capacity guarantee.

VOLTSTORAGE

CUSTOMER REFERENCES.

Mainly business to consumer (B2C).

MAIN MARKET. Residential Building

COMMERCIAL STAGE. Consolidated Sales

CONTACT

Gmunder Str. 37
81379 München
Bavaria
Germany

jakob.bitner@voltstorage.com
https://voltstorage.com/

Watty · *Sweden*

Product: Watty

Take control of your energy consumption

CHALLENGE TO BE SOLVED.

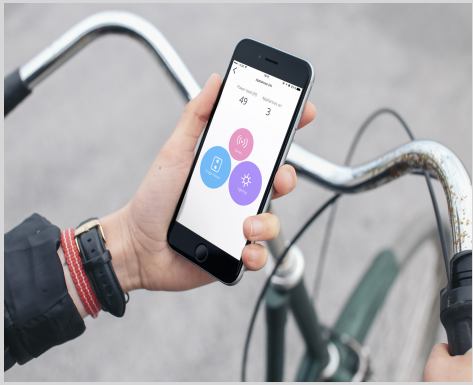
Households are increasingly aware that reducing energy usage can mitigate climate change. Smart solutions that do not compromise home comforts are urgently needed.

THE SOLUTION.

The Watty box is a compact device that can be easily installed in the household's fusebox. Once connected to WiFi, Watty's algorithms can detect and identify most appliances at home, providing households with high-quality data via an intuitive interface, enabling users to see and take control of their energy consumption. It can also detect anomalies.

VALUE PROPOSITION.

- Affordable.
- Allows households to keep track of what is happening at home in real-time.
- Easy to obtain and install.
- No need to retrofit or change appliances.
- Smart: Watty's artificial intelligence solution can detect and identify households' appliances.



CUSTOMER REFERENCES.

1000 units sold to Solarix in Chile. About 500 units pre-ordered directly from homepage by private households

MAIN MARKET. Residential Building

COMMERCIAL STAGE.

CONTACT

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118 46 Stockholm
Sweden

info@watty.io
https://watty.io/

Woon Duurzaam · *Netherlands*

Product: Woon Duurzaam

Live independently from fossil fuel sources, take an easy step towards an energy-neutral home

CHALLENGE TO BE SOLVED.

Homeowners experience rising energy bills and wish to take more control by improving the sustainability of their homes. The process, however, seems complicated and many are reluctant to take action.

THE SOLUTION.

Woon Duurzaam offers a unique, integrated sustainability plan for every household with a single customer-friendly point of contact. All assistance and execution of measures are done by one company, including help finding subsidies and the right financing. A service subscription is also offered.

VALUE PROPOSITION.

- A good economic solution for homeowners.
- A positive contribution to the environment.
- Complete unburdening of the process involved.
- More comfort and a safer home.

CUSTOMER REFERENCES.

For details see: https://www.klantenvertellen.nl/reviews/1029660/woon-duurzaam

MAIN MARKET. Residential Building

COMMERCIAL STAGE. Consolidated Sales

CONTACT

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Annex 4. Companies identified through the snowball method and contacts given by other grid operators and companies that operate in the field of energy services and process energy data

1. Use cases provided by re.alto energy: Voltaware, wesmart, bcheck, Ilumen and Ubirch.
2. Contacts of clients provided by Energinet: Entolabs, IC meter, Watts app and Barry app.
3. Company contacts provided by Estfeed Client Instagib: Span, sense and Neur.