

The 18 innovative business chosen were:

1. Advanced infrastructure

We enable energy suppliers to personalise energy through our half-hourly energy attributes data service and programmable API. Source, location, carbon intensity, and distance are now all service differentiators and customer engagement stories upon which suppliers can deepen relationships with customers.

This data service can be used to form hyper local personalised energy billing, household level carbon accounting, demand side response automatic emissions reduction, lower-carbon trading strategies, and benchmarking against other energy suppliers.

2. Airex has developed a smart ventilation control to reduce heat loss from homes whilst also managing indoor air quality. Cold, draughty and poorly insulated homes contribute more than one third of the EU's total carbon emissions. While recent research demonstrated that up to 15% of energy waste can be caused by open air-bricks and residents that block these air vents permanently, can cause damp and condensation, with associated health risks.

Airex's "intelligent airbrick" has in-built sensors to monitor and analyse environmental conditions, with smart algorithms that responsively regulate the airflow.

3. BankEnergi is creating bankable energy assets in a unique end-to-end trading solution. The solution encompasses working with end users to provide energy and flexibility services along the value chain. This will bring socio-economic benefits as well as defer costly grid reinforcements. Our optimised energy trading provides end users with carbon and energy savings. They aim to develop the industry standard on energy and flexibility trading.

4. BlockDox has a patented technology that uses the Internet of Things, machine and deep learning data science to help make spaces smarter. Currently, most buildings are managed based on fixed assumptions rather than real time demand with implications for energy saving, operational efficiency, space utilisation and revenue generation.

BlockDox uses IoT sensors and data science to blend real time occupancy data with indoor air quality and other data sets (e.g. weather, event data) providing insights to building owners and managers about improving demand-side management.

With buildings responsible more than one third of carbon emissions, BlockDox has developed a Demand Control Ventilation model for Heating, Ventilation and Air Conditioning (HVAC) systems which currently shows an up to 10% improvement on energy saving. Implementing demand driven HVAC operations could save up to 56% of HVAC related energy consumption or 27% of total building energy consumption.

5. Carnego Systems work at the interface of buildings, data and people, specialising in large scale data collection systems, including interfacing to Building Management Systems, metering, environmental sensors and data management/processing.

Carnego collect, store and analyse real-time data from buildings to determine whether buildings work as designed. With specialist knowledge in human behaviour in buildings, they have developed the 'Shimmy' product now being installed in live deployments - combining real-time energy usage information, with transport, home information, community calendars and resident messaging. Carnego are looking to extend the functionality of Shimmy and

target large scale retrofit where there is a community dimension in addition to the technical retrofit of buildings.

6. City Science is an independent firm of software developers, data scientists and infrastructure experts, developing award-winning software solutions to serve the transport and energy markets. Working with the public and private sectors, they use specialisms in data management, data analysis, transport technology and energy innovation. City Science are developing energy products and services to reduce waste and improve efficiency, including: Smart Meter Thermal Efficiency Ratings, Energy Efficiency Dashboards, Data Gateways, Energy Network optimization, Energy Digital Twin and Electric Vehicle modelling,

7. Connected Response offer a range of control and metering technologies to deliver flexibility services that match renewal generation with electricity demand.

With systems for new build or to retrofit storage heaters, heat pump metering and monitoring control, aggregation services and real time metering for community energy projects, Connected Response has a range of products and systems to provide real time control with cloud connectivity.

8. Cumulus Energy Storage aims to be the leading manufacturer and developer of grid-level energy storage batteries with the lowest levelised cost of storage (LCOS) globally.

Increasing distributed renewables generation, especially the growth in solar PV on top of onshore and offshore wind, is causing pain points for grid infrastructure and incumbent generators; creating urgent global need for reliable low-cost, scalable grid-level energy storage.

Cumulus has combined a 200 year old battery technology with industrial scale mining and water treatment processes to create electricity super-storage - a low-cost grid-scale rechargeable Copper/Zinc battery.

9. De-CO2 is a new start-up that helps consumers reduce the energy use and carbon emissions from their homes, by leveraging machine learning to develop bespoke retrofit plans.

De-CO2 has designed an innovative approach to collecting existing property data, using an online portal and gamification techniques, to make the process of retrofitting a home simpler and more cost effective for consumers. The offering includes a Virtual Reality model that can illustrate the current energy performance, thermal model and embodied carbon of the property. It can also be used in real time, to illustrate the options for retrofit and renewable technologies.

Retrofit plans are produced that offer detailed schedules of works, enabling specific tenders and costs to be obtained, giving an accurate and granular forecast of capital and operational costs and savings - i.e. lifetime performance analysis. This will help justify the up-front capital costs and investment for the consumer.

10. eCloudS has developed a low-cost, easy to implement and scalable platform that uses data and optimisation controls to reduce costs and carbon emissions of major energy users. Currently deployed in trial studies in the field, the eCloudS technology sits at the intersection of advanced Energy Management and Building Management Systems to determine the best

solution – including a dashboard that provides a visualisation of energy fluctuations and carbon emissions in real time. Drawing on wholesale electricity pricing, self-generated energy production and demand data, eCloudS has developed proprietary cost modelling software and Data-as-a-Service products that give customers increased control of their resources, automating import and export energy flows between the power systems and grid to optimise financial returns.

The technology can integrate into a new build development or be retrofitted, and is interoperable with Building Management Systems to allow supply and demand to work together dynamically, shifting load demand, increasing return on investment, and help companies reach their sustainability goals quickly.

11. EcoSync aim to reduce carbon emissions, energy cost and waste with a simple solution - stop heating empty rooms. With more than one third of energy consumption and carbon emission are from buildings – and this is expected to reach 50% by 2030. Larger organisations spend millions of pounds on their energy bills while 70% of their heated rooms are empty and 40% of the energy is wasted.

EcoSync is a cloud-based platform synchronising room booking systems and heating control. Ensuring heating is provided only in occupied areas, while saving energy in rooms permanently or temporarily vacated. EcoSync uses Internet of Things devices, machine learning algorithms and an innovative, patent-pending hardware-free occupancy detection technology to find empty rooms and create responsive heated zones within buildings. It is also a retrofitted technology that has been successfully implemented in both modern and 15th century buildings, and is suitable for hotels, hospitals and offices across the UK and Europe.

12. GridDuck is a low-cost energy management system utilising wireless hardware, an online dashboard and an API. They offer consumption monitoring and analysis, remote control and automation.

Utilising Internet of Things (IoT) technology, they offer real-time and historical per-second consumption data and remote control of appliances using a cloud-based alternative to a traditional Building Energy Management System (BEMS). GridDuck are certified for cybersecurity and the system enables data sharing with different organisations.

13. Gridedge offer AI powered efficiency and flexibility technologies to harness a buildings data to deliver cost savings and reduce emissions.

The Edge2X technology drives down energy consumption, maximises comfort and performance, and identifies and automates carbon savings.

The Flex2X technology goes beyond efficiency with our next-generation and harness predictive data to flexibly manage your energy demand against the volatility of the grid. The innovation shifts demand to pre-empt peak prices, utilises day-ahead data and manages electric vehicles, distributed assets and building management systems in harmony.

14. Q-Bot supply contractors with a range of intelligent tools that: identify the needs of each property; automate repetitive tasks; track the work done; and, seamlessly share information in order to make the retrofit of buildings cheaper, easier and higher quality.

The company was founded in 2012 with the objective of using robotics and AI to survey and insulate suspended floors. This is a huge problem, in the UK there are 8m homes with uninsulated suspended floors and 20m in Northern Europe. Q-Bot's solution uses a robot to

apply insulation remotely, which is quicker, cheaper, performs better and is hassle free compared to alternatives.

Q-Bot's range of services has recently been expanded, using the technology to survey, design, procure, manage and measure the quality of a wide range of retrofit measures.

15. Rotaheat has developed a patented heating technology that converts motive power into clean thermal energy in the form of heated fluids. Capable of delivering clean heat with 97%+ energy efficiency, Rotaheaters are suitable for space heating in buildings or to provide hot fluid for cleaning, industrial processing or energy storage.

Simple to install and requiring minimal support infrastructure, Rotaheaters are designed to heat fluid for closed or open loop systems at temperatures up to 110°C (but can exceed over 300°C) and work alongside existing heating systems or an additional pump.

16. SEaB Energy offer on-site energy from waste technology. Their patented Flexibuster™ and Muckbuster® units are compact and easy-to-install, turnkey Anaerobic Digestion (AD) systems housed in shipping containers. Designed to be a modular and scalable technology, they are ideally suited to small and medium scale sites that produce between 500kg and 3000kg of organic waste per day. The units are being installed globally, directly and through distribution and licensing agreements.

17. Surple offer Energy Management Software that connects to electricity, gas, water and generation data — allowing the monitoring and management all your energy data in one place. Surple understands how buildings interact with energy, to improve efficiency with analytical tools enable investigation of energy consumption across any combination of assets and period of time.

18. Tepeo is developing a new heating technology to help deliver zero carbon domestic heating while supporting the transition to a decarbonised electricity grid. Their Zero Emission Boiler, called a ZEB™, combines electric resistive heating, dry core thermal storage and patent-pending technology to deliver the same performance as a fossil fuel boiler at a similar operating cost, but without the associated carbon emissions.

The first ZEB™ model launching in early 2021 stores 40kWh of usable heat, is the size of a washing machine and delivers the same heating performance as a 15-20kW regular or system gas boiler. ZEB™ can be installed as a direct boiler replacement without requiring changes to the existing heating system or building fabric.

Tepeo's IoT infrastructure uses a range of data to optimised operation, including grid carbon intensity, energy cost and weather, in addition to supporting grid balancing, frequency response and self-consumption of solar PV. This optimisation enables a ZEB to run at or below the cost of a gas or oil boiler.