



Aviva Opens One of the UK's Largest Solar and Energy Storage Initiatives at its Perth Site in Scotland

Aviva Plc is an international Savings, Retirement and Insurance business serving 33.4 million customers worldwide. Aviva exists to be with people through all phases of their lives and when it really matters. By looking out for each other and being part of something bigger, together we create the future we all want to live in. Aviva has been taking care of people for more than 320 years.

Aviva's Sustainability Commitment

Climate-related risks pose a systemic threat to the financial stability of insurance companies, such as Aviva and its investors over the coming decades, therefore mitigating action must be taken. At the end of last year Aviva committed to the UN Net Zero Asset Owners Alliance, with the aim of being a net zero carbon asset owner by 2050.

More widely, Aviva has committed to aligning our company goals to the Sustainable Development Goals and won the UN Foundation Leaders Award in 2018. Prior to aligning Aviva's investment business to a below 1.5°C long term temperature goal, ambitious energy and carbon reduction activities have always been applied to our own operations.

Whilst achieving great success through community and renewable energy projects, we recognise that there is always more that can be done in our own operations, which include owned and leased properties across the UK and Ireland, as well as properties in some of Aviva's investment funds.

In the UK, we have colleagues (c18,000) operating in several large commercial properties located centrally in cities such as London, Norwich, Bristol, York, Sheffield, Perth and Glasgow.

Annually we consume c41GWh of 100% RE100 green electricity matched to solar, wind and hydro sourced green electricity, along with c34GWh of natural gas and c151k cubic meters of water. We now have 2,250kWp solar generation directly on our buildings and are continually looking to expand further as well as our pioneering energy efficiency projects which include:

- Smart building optimisation within our operational buildings has achieved a 12% reduction in energy consumption or 2,600 tCO₂e, across the UK portfolio.
- 3yr 100% LED and controls upgrade saving 3,114 tCO₂e per year.
- Supporting the global Aviva Group to cut carbon emissions by 66% since 2010.

At Aviva, we know that in order to earn the trust of our customers we need to act responsibly and sustainably every day. Only then will we be able to meet our strategic priorities and live out our purpose to be: 'with you today, for a better tomorrow.' As a company we aim to do the right thing for the long term. We are deeply invested in our people, our customers, our communities and our planet. By caring more today, we can leave a legacy of which we can be proud.

This year also marks the end of our previous five-year Corporate Responsibility (CR) strategy. We are proud to have met or beaten a number of our ambitious targets over this period, including reducing our CO₂e emissions by 66% since 2010 (target: 50% reduction), supporting 4.8 million beneficiaries through our CR programmes (target: 2.5 million) and investing over £3.8 billion in low carbon infrastructure since 2015 (target: £2.5 billion). The following sections outline the key areas of progress we have made over the course of 2019.

Putting the customer at the centre of everything we do.

In order to deliver great customer outcomes, we are committed to helping our 33.4 million customers protect what is important to them and save for a bright future. In 2019, we paid out £33.2 billion in benefits and claims around the world.

Our more than 60 green or accessible products and services across the world enable our customers to be more environmentally responsible or give them easier access to the protection they need for themselves and their families. (More details can be found in our Corporate Responsibility Reporting Criteria 2019 on www.aviva.com/social-purpose).

Aviva Poland's anti-smog campaign continues to benefit customers. Over the last two years the campaign has seen

us fund the addition of 400 external air quality sensors to the national network, with over half of these sensors placed in areas voted for by the public. The sensors are accompanied by a downloadable app, to help people keep track of pollution in their city and adjust their actions accordingly for the good of their health.

Creating a better tomorrow for our planet.

To create a better tomorrow, we need to look after the planet we call home. Our plan to help tackle climate change is backed by our long history as a leader in sustainable practices. We continue to manage the impact of our business on the environment. Our Corporate Responsibility, Environment and Climate Change business standard focuses on the most material operational environmental impacts, which we have identified as greenhouse gas emissions. Our operational global greenhouse gas emissions data boundaries show the scope of the data we monitor and the emissions we offset. We report on greenhouse gas (GHG) emission sources on a carbon dioxide emissions equivalent basis (CO₂e) in respect of Aviva's Group-wide operations as required under The Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013. We also refer to the GHG Protocol Corporate Accounting and Reporting Standard, and emission factors from the UK Government's GHG Conversion Factors for Company Reporting 2019.

The Challenge

At Aviva, we are well regarded as an environmentally conscious insurer: we became carbon neutral in 2006 – the first international insurer to do so - and purchase 100% of electricity used within UK offices from renewable sources. It is our aspiration to try and generate as much of our operational energy from our own renewable energy installations. Following thorough investigations, we could find no better way to use our car parks for renewable generation.

Following on from the success of the solar carport pilot scheme installed at our Norwich office, it was our ambitious intention to take another one of our largest offices off-grid. The "iconic" Grade A listed Pitheavlis building in Perth, Scotland, was chosen as it would have the biggest impact with one of the highest energy usage of any global Aviva office.



Aviva Norwich office

The Pitheavlis building also shares the same challenges as many buildings across the UK; therefore, it provided a suitable demonstrator project to aid future learning and a blueprint for replication. Such challenges include:

- Old infrastructure that requires a sensitive approach.
- Significant costly infrastructure upgrades are required to transition from gas heating towards a low carbon electric system.
- A desire to encourage staff and visitors to adopt low carbon transport by providing electric vehicle (EV) infrastructure.
- The site needed to remain fully operational during any infrastructure upgrades to minimise disruption to both staff and visitors.
- Protracted discussions with staff, the wider community and local authorities to secure support for the project.

The project secured funding from the Scottish Government's Low Carbon Infrastructure Transition Programme. The programme, supported by the European Regional Development Fund, is accelerating the development and delivery of low-carbon infrastructure projects across Scotland.

The Solution

A bespoke solar carport structure was designed to provide low-carbon energy generation, combined with battery storage and extensive EV charging infrastructure to form an onsite smart grid; a blueprint for smart-energy systems of the future.

Integrated with the site's existing building management system, we gained a highly detailed view of how and when energy is being consumed, giving greater control over our operational overheads and helping to inform behavioural and procedural changes that are more conducive to energy efficiency.



The ability to both generate and store significant amounts of energy on site reduces reliance upon volatile and inefficient grid infrastructure; as well as providing the resilience of supply necessary to not only support but encourage the widespread uptake of low emission vehicles amongst colleagues, further reducing our footprint.

The benefits of this investment are not confined to the site, we are now able to participate in a rapidly evolving energy marketplace, whereby diverse revenue streams can be earned for providing essential grid service that will serve to decarbonise the wider energy network. Together these technologies form a smart energy hub that is unique in its scale and provides a replicable blueprint for the decarbonisation of our energy networks. If a building of the architectural significance of Pitheavlis can become carbon zero, then it paves the way for other commercial buildings to follow suite.

Facts

It is one of the UK's largest combined application of solar carport, battery energy storage, and EV charging infrastructure.

- It covers 342 parking spaces.
- No loss of parking spaces.
- Provides a combined annual carbon saving of nearly 400 tonnes.
- The solar carport supplies 26% of the site's annual energy demand.
- The 1.8MWh energy storage system allows the site to operate off-grid for 4-5 hours a day during peak times when the national grid is at its busiest.
- 50 x EV chargers.

Benefits of the system

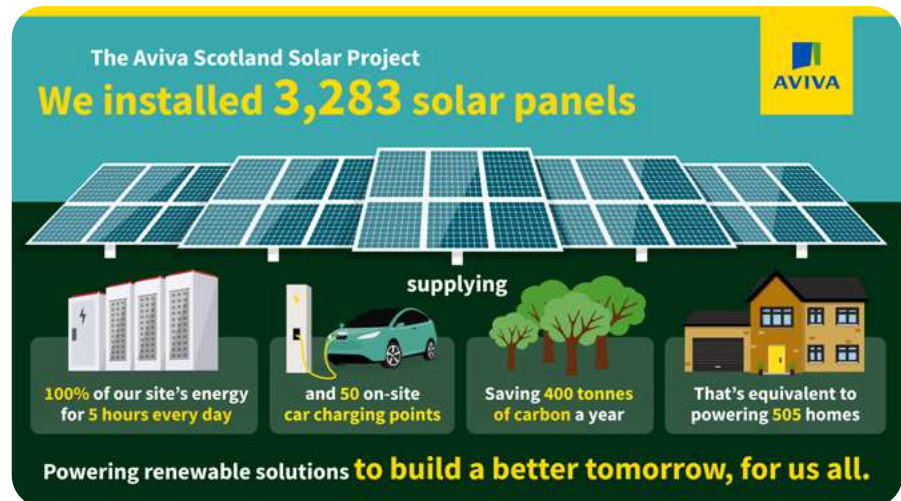
- Low-carbon technology retrofitted to a Grade A listed, architecturally significant commercial site, providing a blueprint for the UK's low carbon future.
- It offers an innovative exemplar demonstrator project to facilitate future learning of combining energy capture, storage and use.
- Innovative combination of technologies that is replicable at any scale, which provides a feasible solution for any business looking to secure a sustainable energy supply.
- The modular design ensures a quick and efficient build process which enabled the carpark and central bus route to remain fully operational throughout construction.
- The energy centre combined with the solar carport not only reduces our reliance upon volatile and inefficient grid infrastructure, but also relieves

pressures on the national grid, by taking the building off-grid during periods of peak demand.

Operational feasibility

The Perth office is a Grade A listed building that houses around 1,100 employees every day. Careful project planning and design was required to ensure these factors did not become challenges. Parking is at a premium on this busy campus, so it was important not to lose any spaces and construction was managed to minimise disruption. The build was phased, so only 70 parking spaces were ever out of use at any one time.

Additionally, the design and layout of the solar array was carefully considered to complement the site and respect the natural environment. Pre-existing conifers shield the solar carport from the road, and the terraced landscape of the site means the carport is not obtrusively visible from the office building.



The battery and other auxiliary equipment reside in a self-contained energy centre for security. We wanted this to be easily accessible for regular maintenance, and so the energy centre can easily be included in facilities tours, a testament to our satisfaction with the project. To avoid the large container compromising the natural sweep of the hillside, the landscape was excavated to create a more discrete location for the energy centre.

In order to maximise the effectiveness of the scheme, our energy supply contract has been altered to create a bespoke arrangement appropriate for sites with onsite generation and storage opportunities. This allows us to maintain a high level of budget certainty relating to non-energy charges, whilst time-banded charges remain as pass-through in order to allow us to benefit from managing electricity consumption at peak times. We also had to connect the solar generation, energy storage and EV chargers to our pre-existing high voltage switch gear. Originally, we were going to retain the 1980s HV switch but decided to change to new. This was a big decision, but fortunately with a proactive and resilient

team we had enough time to design, order and install the new switch gear.

Explanation of the results witnessed

The 1.8MWh energy storage system is underpinned by technology which manages power flows between the solar cells, office buildings, grid and electric vehicle charges, enabling the Perth site to operate off grid for 4-5 hours per day during peak times.

- The installation is powered by 3,283 solar photovoltaic panels and supports EV charging bays that can charge 50 EV at once.
- This green technology generates 812,000kwh. Aviva will use 77% of the generated energy, with the surplus entering the battery for later use or exported to the grid.
- All the manufacturing for the project was completed in the UK, with embedded carbon for the project kept to a minimum using 100% recycled steel from the North of England and over 60% of the project's construction and ongoing maintenance was completed and will be completed by Scottish workers.



The Perth renewables project helps Aviva on its way to meeting our ambitious environmental targets. Aviva aspires to purchase or generate 100% of its global electricity from renewables by 2025. The Perth renewables project is also in line with the Scottish Government's target to generate 100% of gross electricity consumption from renewables by 2020.

The array saves 250 tonnes of CO2 every year, with the reduction in internal combustion engine vehicles on site facilitated by the EV infrastructure expected to save a further 150 tonnes of CO2 per year. However, environmentalism was not the only motivator. The Perth site is one of the largest Aviva offices and consumes a high volume of energy. Generating more energy onsite allows us to reduce spend on grid power.

Whilst we already possessed rooftop solar PV at our Perth site, the solar carport is a more conspicuous display of our commitment to fighting climate change. We hope that the project will also inspire our colleagues to become more environmentally conscious, too. We think that EVs will become more popular among commuters now that they are able to charge onsite.

Tech specification

- PV Inverters - 44 inverters.
- Strings per Inverter – 3-6 depending

on inverter model.

- Support structure – Bespoke galvanised steel framework, manufactured from 100% recycled steel.
- EV Chargers – 47 No. 7kW Solo, 3 No. 22kW solo.
- Energy Storage System – 8 battery units (1,784 kWh total) + 522kVA Inverter (400V AC) (to the Energy Centre Pad).

Learnings from initial Norwich project and Perth

- Decided to leave panels with gaps with no guttering. This keeps the visual integrity of the panels.
- Panels provide shading for vehicles parked beneath them, keeping them cooler in summertime.
- Very important to clearly mark parking bays when carports are first used. Colleagues had a tendency not to park straight.
- Important to integrate LED lighting under the bays. Original carpark lighting not good enough.
- We had to include CCTV cameras under the carports. Important to protect our colleagues.
- New HV switch gear had to be installed within our plant room.
- Crash protection barrier had to be installed for energy storage centre.
- Grid export – very important to include District Network Operator in early scoping study.

Future plans

We have several environmental initiatives across our UK sites including the installation of a solar carport at the Norwich office, only using green electricity compliant with RE100 and onsite beehives. We are also working towards the installation of a 77m 900KW wind turbine at the Perth site which, integrated together with the solar carport and energy storage solution, could deliver 93% of the power required to run the Perth offices.

Author's profile:

Lee is an experienced and passionate environmentalist, with 17 years of industry experience working within large automotive and financial FTSE 100 corporations. At Aviva, Lee has so far driven a 66% global carbon emission reduction, versus a 70% target by 2030 through many energy efficiency projects. Lee is also a qualified lead ISO 14001, ESOS and ISO 50001 auditor.