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**SCOTTISH
RENEWABLE
ENERGY
FESTIVAL**

INTRODUCTION



The Climate Change (Scotland) Act 2009 was a pivotal point in Scotland's history, establishing our world-leading position on climate change action. Over the following decade, the renewable energy industry responded to this political leadership and today almost 75% of our electricity needs are met by renewable energy technologies.

In 2019, Scotland has once again cemented its world-leading position by declaring a climate emergency and committing to ending our contribution to climate change by 2045. Over the coming decades government and industry will need to work together to replicate the success of decarbonising electricity to do the same for our heat and transport sectors.

Scotland is without doubt in the middle of a renewable energy revolution, but this revolution is delivering much more than affordable, reliable, low-carbon energy.

In this document we look at the many other benefits – including world-leading innovation, high-quality jobs and stronger communities – that our ongoing renewable energy revolution has delivered and will continue to deliver as Scotland embraces a low-carbon future powered by renewable energy.

Morag Watson

Director of Policy, Scottish Renewables

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INNOVATION

It is nearly 25 years since Scotland's first commercial wind farm, at Hagshaw Hill in South Lanarkshire, opened in 1995. Over the intervening years the renewables industry has continued to embrace innovation to cut costs and increase efficiencies.

New onshore wind and solar PV projects are now the cheapest source of electricity of any type. Together they're currently generating more than half of Scotland's electricity needs. With Scotland's offshore wind sector picking up momentum and taking its place alongside hydro and other renewables, we will soon be meeting the equivalent of 100% of our electricity needs from renewable sources.

Offshore wind is now almost as cheap as onshore wind and solar PV, and around half the price of new nuclear power.

This price drop was driven by innovation, with Scotland playing a leading role in driving new ideas to boost efficiency and cut

costs. These innovations include the world-first deployment of suction-bucket jacket foundation at the European Offshore Wind Deployment Centre in Aberdeen Bay, and the Offshore Renewable Energy Catapult's unique Levenmouth Demonstration Turbine, the world's most advanced, open-access offshore wind turbine dedicated to research.

It's not just the wind industry where prices are falling due to innovation. Solar panels are now 70% cheaper than they were in 2010 and the cost of lithium-ion storage batteries – which will play a role in balancing energy supply and demand in a low-carbon future – has fallen 85% over the same period.

In addition to decreasing prices, innovation is also being used to solve local issues. With the abundance of renewable energy being generated in the archipelago, Orkney's electricity grid was routinely reaching capacity when generation was high, but demand was low. The innovative community project Surf

'n' Turf was developed in response, routing surplus electricity from tidal power devices to a 500kW electrolyser. This device uses renewable electricity to split water into its component parts (hydrogen and oxygen). The hydrogen acts as an energy carrier and stores the energy to be used at a later date. This hydrogen is then put through a fuel cell to be converted back into electricity which is used as auxiliary power for ferries which dock at Kirkwall Pier.

RENEWABLE ENERGY IS A SCOTTISH SUCCESS STORY AND, AS WE PURSUE OUR 2045 NET-ZERO TARGET, INDUSTRY WILL CONTINUE TO EMBRACE INNOVATION TO DELIVER THE LOW-CARBON, AFFORDABLE ENERGY WE WILL NEED TO DECARBONISE OUR ECONOMY.

Figures: UK Government / Green Business Watch



CASE STUDY

Orbital Marine Power: SR2000

The 3GWh of electricity generated by Orbital Marine Power's SR2000 turbine over the past 12 months is more power than that generated by the entire wave and tidal energy sector in Scotland in the twelve years prior to its launch.



Despite being an R&D project, the device's first year of testing has delivered a performance level approaching that of mature renewable technologies.

Orbital Marine Power has demonstrated that its solution to tidal generation – a highly-accessible, towable floating platform for low-cost installation and maintenance – can deliver a step-change reduction in cost and risk.

In 2017 – the latest figures available – the number of people employed in Scotland’s renewable energy industry had grown to 17,700, with the industry generating a turnover of £5.5 billion per year.

The Committee on Climate Change has calculated that we must quadruple the amount of electricity we produce to meet our net-zero target. As we deploy more renewables to meet this demand, the number of people employed in our industry will also increase.

A glance at the renewable energy job opportunities available in Scotland paints a rich picture of the range of opportunities: vacancies for engineers, technicians, research managers and many more. While the need for engineers and technicians are obvious sources of employment, there are many more ‘hidden’ jobs in the renewables industry. These hidden jobs cover a huge range of skills from legal and financial advisors to smart technology and data analysts.

Scotland’s renewable energy expertise is in demand around the globe. A study by Scottish Renewables in May 2019 showed Scottish companies in our industry are working in 72 countries and employing staff in 22 of those.

RENEWABLES EMPLOYMENT IN SCOTLAND



TOTAL = 17,700 JOBS

- HYDRO
- ONSHORE WIND
- ENERGY FROM WASTE AND BIOMASS
- SOLAR PHOTOVOLTAICS
- LOW-CARBON HEAT
- OFFSHORE WIND

Scotland’s ambitious climate change targets mean we are decarbonising before much of the rest of the world. As global action on climate change accelerates, Scotland is perfectly placed to reap the economic benefits of exporting more of our expertise to more countries around the world. More than half of the companies which took part in the Scottish Renewables study say they’re currently moving into new overseas markets, with 29% considering doing so.

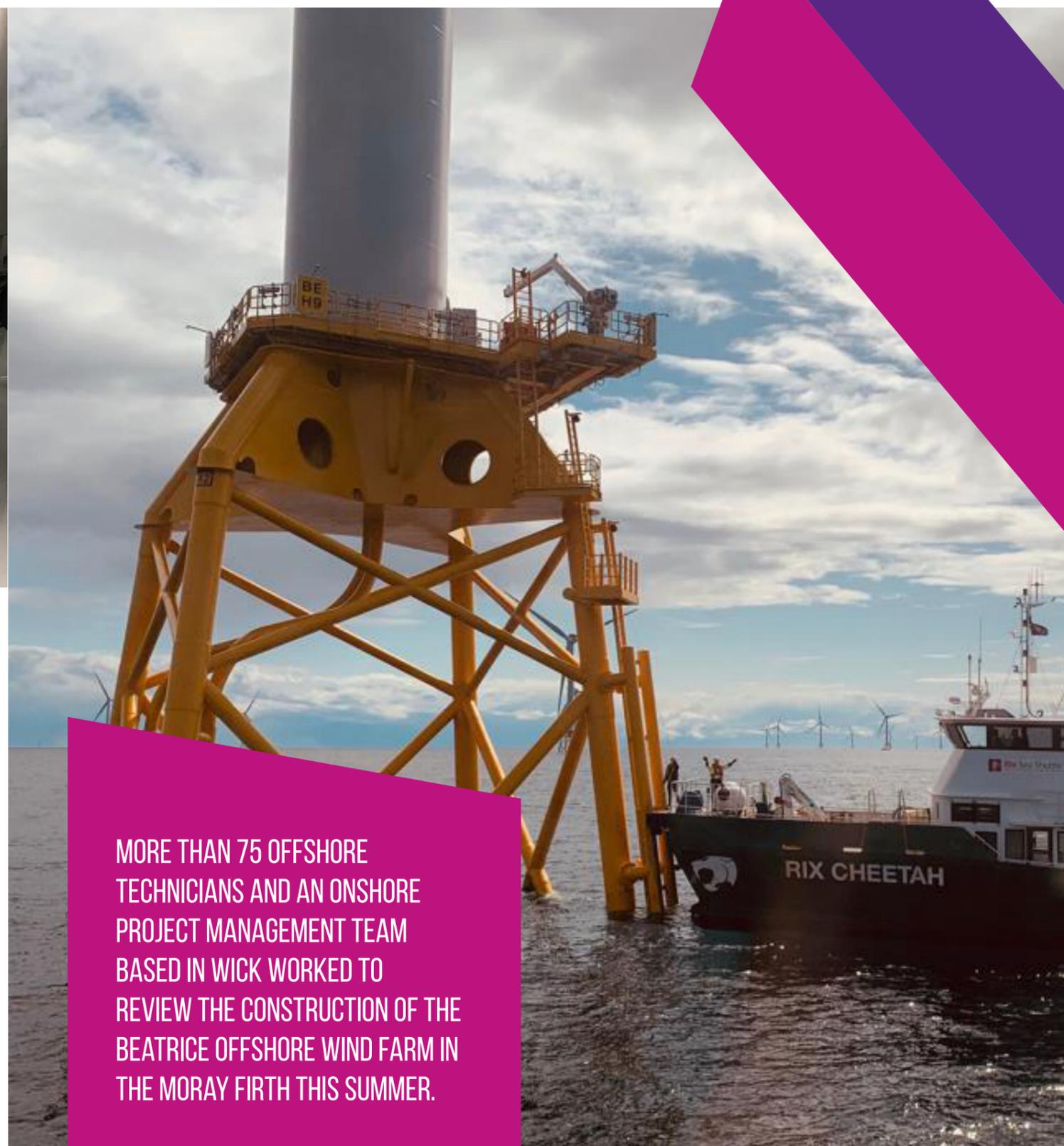
THE STORY OF A WIND FARM

The construction phase of a wind farm is only part of its story. Planning for each wind farm begins many years in advance. Construction itself, which can last around a year, typically employs hundreds of people. Its operations phase involves the detailed monitoring, optimisation and maintenance of turbines. Finally, at the end of a wind farm’s life its owner must decide how to proceed: extend the life of the turbines; apply to replace the turbines with more powerful models or, in some cases, remove the turbines and restore the land.

JOBS INVOLVED IN THE CONSTRUCTION AND OPERATION OF A WIND FARM

- Aggregate suppliers
- Archaeologists
- Aviation specialists
- Civil engineers
- Community and stakeholder engagement workers
- Construction engineers
- Control centre operators
- Crane operators
- Data managers
- Development managers
- Drone operators
- Ecologists
- Electrical engineers
- Environmental analysts
- Financial managers
- Foresters
- Ground workers
- GIS specialists
- Habitat management specialists
- HGV and heavy plant drivers and operators
- Insurance brokers
- Investment advisors
- Land agents
- Land and estates managers
- Landscape architects
- Maintenance crews
- Ornithologists
- Project managers
- Planning consultants
- Quarriers
- Road maintenance workers
- Solicitors
- Software developers
- Structural engineers
- Surveyors
- Turbine technicians
- Wind resource analysts





CASE STUDY

Global Energy Group

More than 75 offshore technicians and an onshore Project Management team based in Wick worked to review the construction of the Beatrice Offshore Wind Farm in the Moray Firth this summer.

Many of the workers transitioned from jobs in north east Scotland's oil and gas industry, and were taken through either retraining or upgrades to existing rope access certification before progressing to a new career in offshore wind.

Their work, high above the North Sea, involved completing detailed visual inspections of all Beatrice's 84 turbine 'jackets', or platforms, during which 126,000 defects, mainly to paintwork, were identified.

A comprehensive summer repair campaign was then instigated, not only to remedy minor coating damages but also to look forward at future project management resource requirements including availability of staff accommodation in Wick and the offshore weather conditions which can prevent access to offshore turbines for routine maintenance.

MORE THAN 75 OFFSHORE TECHNICIANS AND AN ONSHORE PROJECT MANAGEMENT TEAM BASED IN WICK WORKED TO REVIEW THE CONSTRUCTION OF THE BEATRICE OFFSHORE WIND FARM IN THE MORAY FIRTH THIS SUMMER.

COMMUNITIES

While the voluntary contributions made by renewable energy projects to neighbouring communities are well documented – currently totalling more than £16 million every year – renewable energy has far more to offer than that.

Since 2007 Community Energy Scotland - a nationwide charity working with local people to help them make the most of their renewable energy resources - has supported 294 community renewable energy projects.

In addition, the Community and Renewable Energy Scheme (CARES) funded by Scottish Government and run by Local Energy Scotland has given advice and funding to communities, businesses and other organisations to support 80 renewable energy innovation projects.

Together these are enabling communities, businesses and other organisations to install a wide range of renewable technologies, from solar panels on roofs to small-scale wind turbines and hydropower schemes. These projects are often at the forefront of technology or business model innovation; reducing energy bills and generating income for community development or business diversification.

But some island communities have gone much further and embraced renewable energy as a way to transform their communities.

After decades of relying on expensive diesel generators, in 2008 the Isle of Eigg became home to its own off-grid electric system, providing islanders with 24-hour electricity for the first time. Eigg Electric is a community-owned company which provides electricity for all island residents – 95% of which is produced renewably, from wind, water and solar.

In 2018, Fair Isle (located halfway between Orkney and Shetland), became the latest island community to establish its own off-grid system. At three miles long by one and a half miles wide, and home to just 60 people, the island has never had a 24-hour electricity supply, needing to rely on expensive diesel generators for its power. Using a combination of three wind turbines, a ground-mounted solar PV system and battery storage, the Fair Isle Electricity Company now meets the community's electricity needs around the clock.

Across the country renewable energy technology is strengthening communities and providing services and opportunities that were previously unavailable or unaffordable.

CASE STUDY

Isle of Gigha

The Isle of Gigha, off the Kintyre Peninsula, is host to the first community-owned grid-connected wind farm in Scotland. The three second-hand Vestas V27 turbines are known as the 'Dancing Ladies' and named after the Gaelic words for Faith, Hope and Charity.

In 2001 the island was the subject of a community buyout by the Isle of Gigha Heritage Trust: a group of local people who felt the future could be brighter for this beautiful Inner Hebridean idyll.

Erected in 2003, at the very start of the UK's community energy journey, Gigha's



three turbines have a combined capacity of 675kW and produce electricity worth around £100,000 each year – money which is used to support the Isle of Gigha Heritage Trust in its efforts to improve life on the island. In 2011 the community decided to add another turbine to the windfarm, bringing its total to four.

Willie McSporry, the first Chairman of the Trust, said: "When Gigha's community bought the island we realised we needed to develop in a sustainable way, and that is what our 'Dancing Ladies' are helping us to do. Our wind turbines generate electricity and an income for the community and help to protect one of the island's greatest assets – the environment".

OUR WIND TURBINES GENERATE ELECTRICITY AND AN INCOME FOR THE COMMUNITY AND HELP TO PROTECT ONE OF THE ISLAND'S GREATEST ASSETS – THE ENVIRONMENT.

CLIMATE

With Scotland committing to achieving net-zero climate change emissions by 2045, the country continues to be a world leader on climate action. As a nation we have long acknowledged that embracing renewable energy is key to delivering on our climate change commitments. Nearly 75% of the electricity consumed in Scotland now comes from renewable sources like wind, hydro, tidal, solar and more. The first quarter of 2019 saw generation reach record levels, with renewables producing enough electricity to power around 88% of Scottish households for a year.

But electricity only accounts for around a quarter of the energy we use. Heat makes up around half of Scotland's energy use, with only 5.9% of that currently being produced by renewable sources. The Scottish Government's target to have 50% of our energy demand met by renewable sources by 2030, means heat is where the challenge lies, and that the decarbonisation of our heat system will be critical to meeting our climate change targets.

Transport makes up the final quarter of Scotland's energy use. We are already seeing electric vehicles and charging points becoming more common as local regions, cities and

towns step up to the plate on transport. Aberdeen has pioneered the use of hydrogen buses; the central belt railways have been electrified and there is a national-level vision to make the vital A9 an electric highway.

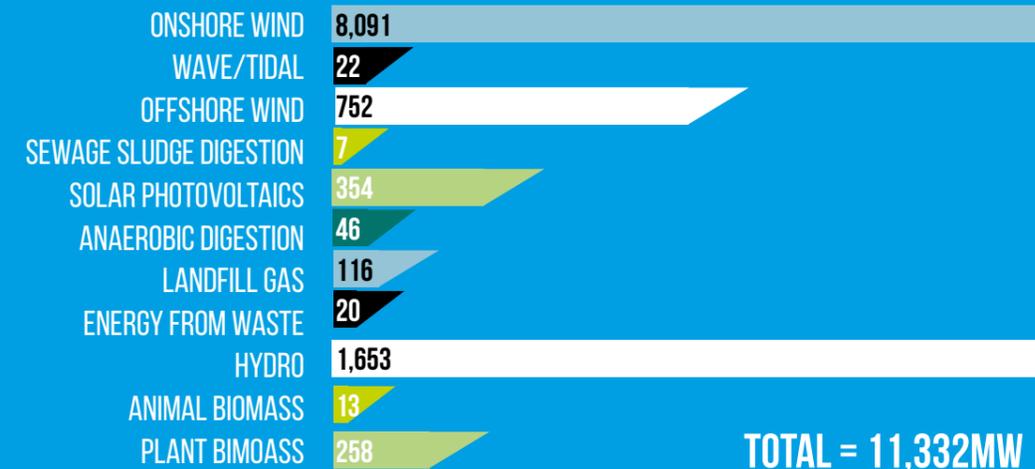
The Committee on Climate Change has calculated that we must quadruple the amount of electricity we produce to enable the decarbonisation of heat and transport. If we are serious about tackling climate change, renewable energy must play a pivotal role in providing that power and, with the support of government, industry stands ready to deliver the low-carbon, affordable energy we will need to meet our net-zero target.

THE COMMITTEE ON CLIMATE CHANGE HAS CALCULATED THAT WE MUST QUADRUPLE THE AMOUNT OF ELECTRICITY WE PRODUCE TO ENABLE THE DECARBONISATION OF HEAT AND TRANSPORT.

INCREASE IN RENEWABLES

Scotland's installed capacity of renewable electricity has increased from 1.4GW in 2000 to 11.3GW in 2019, with a further 12.6GW of capacity either under construction, awaiting construction or in planning.

INSTALLED CAPACITY BY TECHNOLOGY (MW)



OUR TARGETS (AND PROGRESS TOWARDS THEM)

NET-ZERO EMISSIONS BY 2045 AT THE LATEST

In 2016 renewable electricity generation displaced approximately 9,400,000 tonnes of CO₂, equal to around 21% of Scotland's carbon emissions in 2015, the most recent year for which statistics are available

EQUIVALENT OF 100% of Scotland's electricity demand to be generated from renewable sources by 2020. Renewables provided the equivalent of 74.6% of Scotland's electricity demand in 2018 – a new record.

11% OF NON-ELECTRICAL HEAT DEMAND TO COME FROM RENEWABLE SOURCES BY 2020
Scotland produced 5.9% of its non-electrical heat demand from renewable sources in 2017

50% OF SCOTLAND'S OVERALL ENERGY CONSUMPTION COMING FROM RENEWABLE SOURCES BY 2030

(across electricity, heat and transport) This figure was 20% in 2017 - an increase from 16.0% in 2016.

Figures: Scottish Government Annual Energy Statement; UK Government Energy Trends

RURAL ECONOMY

While Scotland's ongoing renewable energy revolution has delivered benefits across the country, it is in the rural economy where the benefits are most noticeable.

Onshore wind developments have an enormous positive socio-economic effect on the rural communities where they are situated. A study by BVG Associates in 2017 found just eight onshore wind farms in south west Scotland commissioned between 2016 and 2017 will add £297 million to the local economy, provide 7,768 years of employment and deliver £59 million of community benefit over their 25 year lifespan.

Renewable energy is also transforming rural businesses. In Berwickshire, Woodend Farming Partnership is a family farm business that specialises in arable crops and free-range eggs. The farm has established three renewable energy units - biomass, wind and solar PV - which have dramatically reduced its reliance on fossil fuels, slashed energy costs and mean the business can now harvest and dry its crops quickly and efficiently. Fossil fuel used to cost the farm

£128,000 per year. Including Renewable Heat Incentive and Feed-in Tariff payments, energy costs are now a net positive for the business.

Renewable energy is also having a positive impact on a very local scale. On Scotland's west coast the Ardtornish Estate has installed three hydro schemes to generate renewable energy. The electricity they produce is sold to the national grid, providing Ardtornish with the income it needs to help sustainably maintain the estate. Ardtornish Estate was among the first private developers to commit to a community benefit scheme, making payments to the Morvern Community Trust to support community development projects including local schools, the local tourism association and highland games, as well as nearby arts organisations.

Marine energy is also playing its part. The European Marine Energy Centre is a world-leading test and research centre focusing on wave and tidal power development, based in the Orkney Islands. The centre provides developers with the opportunity to test full-scale

grid-connected prototype tidal and wave devices in unrivalled conditions. In EMEC's first 10 years of operation, direct jobs in the marine energy sector in Orkney grew to 250.

All of these renewable energy developments provide skilled roles in some of our most remote communities – jobs which not only bring people to remote areas but provide chances for local people who otherwise may have had to move away to forge a career near home.

**EIGHT ONSHORE WIND FARMS
IN SOUTH WEST SCOTLAND
COMMISSIONED BETWEEN 2016 AND
2017 WILL ADD £297 MILLION TO
THE LOCAL ECONOMY**



CASE STUDY

Glensaugh

Glensaugh, in the foothills of the Grampians, was originally established as an experimental farm in 1943. Its primary use is hill farming, with 900 sheep, 50 cows and 90 breeding deer producing meat, milk and fleece.

In 2011 the farm commissioned a 70kW biomass boiler which burns metre-long pieces of wood to heat Glensaugh Lodge and adjoining buildings as part of a mini low-carbon district heating scheme, where multiple buildings are connected by underground pipes and warmed by one heat source..

The project budget was £46,000, 50% of which was met by the Scottish Rural Development Programme.

Glensaugh's renewable energy technology successfully displaces the burning of about 6,000 litres of LPG every year and generates an income to support the business.



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