



University of
Strathclyde
Business
School



The Economic Impact of Scotland's Renewable Energy Sector

Fraser of Allander Institute

Disclaimer

The analysis in this report has been conducted by the Fraser of Allander Institute (FAI) at the University of Strathclyde. The FAI is a leading academic research centre focused on the Scottish economy.

The report was commissioned by Scottish Renewables.

The analysis and writing-up of the results was undertaken independently by the FAI. The FAI is committed to informing and encouraging public debate through the provision of the highest quality analytical advice and analysis. We are therefore happy to respond to requests for factual advice and analysis. Any technical errors or omissions are those of the FAI.

Executive summary

- Central to any strategy in mitigating climate changes is the use of renewable energy sources. However, renewable energy is also being increasingly recognised as an opportunity for economic development.
- The opportunities in economic development are widespread, from new skills to new technologies to new geographical distributions of the energy economy. Despite this, we have little understanding of the relationship between renewables and the Scottish economy.
- This report quantifies the contribution of renewable activities to employment, output and gross value added in Scotland.
- There is no renewables sector in the national accounts and so we define this sector using an ONS survey of businesses undertaking renewable activities. We find that Scotland's renewables sector has a turnover of £2.8 billion and 6,440 full-time equivalent employment.
- The true impact of the renewable sector on the economy is far greater than its turnover and direct employment.
- Renewable technologies require goods and services to produce, and so support output and employment throughout its supply chain. And the employees supported directly and through the supply chain gain wages which they spend on firms across the Scottish economy, generating further output and employment.
- Including these spill-over effects, we find that Scotland's renewable activities support £5.2bn of output, £2.3bn of GVA and 22,660 full-time equivalent employment in the Scottish economy.
- This includes employment and activity in Scotland that are supported directly and through spill-over impacts by Scotland's renewable energy sector. This does not include employment and activities outside Scotland that are supported by Scotland's renewable energy sector.
- A significant amount of the FTE employment was supported by onshore wind (8,780), offshore wind (4,700), hydropower (3,290), bioenergy (2,630) and renewable heat (2,390).

Turnover and employment of Scotland's renewable sector

Before understanding the economic impact of renewables on the Scottish economy, we need to understand the renewables industry itself. There is no defined industry for renewables in national statistics, so we apportion the renewable activities in other industries to create a new renewables industry.

We make use of the ONS' Low Carbon and Renewable Energy Economy Survey which surveys companies around the UK on indicators such as their employment and turnover relating to 17 technologies.

Our analysis includes activities in Scotland relating to the following eight renewable technologies:

- Offshore wind
- Onshore wind
- Solar photovoltaic
- Hydropower
- Other renewable electricity (incl. geothermal, wave and tidal)
- Renewable heat
- Renewable combined heat & power
- Bioenergy

Excluded technologies are alternative fuels (e.g. hydrogen), energy efficient lighting, energy efficient products, energy monitoring or saving systems, low carbon consultancy, low emission vehicles, carbon capture and storage, nuclear power, and fuel cells & energy storage systems.

For the latest year, 2019, we calculate that Scotland's renewable sector had a turnover of £2.8 billion and approximately 6,440 full-time equivalent employment

An understanding of how firms which undertake renewable activities are spread across industries (as classified in national statistics) is important for modelling the full economic impact of the renewables industry on the Scottish economy.

We use data published in 2017 by the ONS on the spread of turnover by industry for each renewable technology to achieve this.

Table 1 shows the distribution of renewables turnover and full-time equivalent employment. This has been produced using the ONS survey. Around half of renewable turnover and 35% of FTE employment is generated by firms in the electricity & gas sector.

Table 1: Total direct turnover and FTE employment in Scotland's renewable sector, 2019*

Section	Description	Turnover (£m)	FTE Employment
A	Agriculture, forestry and fishing	61	220
B	Mining and quarrying	57	80
C	Manufacturing	284	1,190
D	Electricity & gas etc	1,453	2,240
E	Water supply, sewerage and waste	39	120
F	Construction	550	1,380
G	Wholesale and retail	115	180
L	Real estate	12	70
M	Professional, scientific & technical	208	710
N	Admin and support services	33	240
S	Other services	13	20
Total		2,811	6,440

* Rounded to the nearest £1m for turnover and 25 for FTE employment. Columns may not sum to totals due to rounding.

Economy wide impact of Scotland's renewable sector

Firms undertaking renewable activities do not work in isolation. They purchase components to build wind turbines, contract construction firms to build infrastructure, hire accountants to manage bookkeeping and far more. And these suppliers, in turn, have their own supply chains and employment.

The true economic impact of renewable industry is therefore not just the activity of the industry itself, but also includes the activity that it generates in its supply chains.

We examine three economic impacts:

- The **direct impact** relates to the output and employment of renewable activities.
- Firms undertaking renewable activities purchase goods and services from other firms in order to produce these activities. These suppliers, in turn, have their own suppliers and so on. The activity generated throughout the supply chain is called the **indirect impact**.
- The activity generated in the direct and indirect impacts supports employment in the Scottish economy. These employees earn wages and spend these on goods and services. This activity generated by wage spending is called the **induced impact**.

Table 2 shows the results of our modelling for the three impact types.

In total, renewable activities support the Scottish economy to the tune of £5.2 billion output, £2.3bn gross value added and 22,660 full-time equivalent jobs.

Table 2: Direct, indirect and induced output, GVA and FTE employment supported by Scotland's renewable sector, 2019*

	Output (£m)	GVA (£m)	FTE Employment
Direct	2,825	1,100	6,440
Indirect	1,450	575	7,750
Induced	950	575	8,470
Total	5,225	2,250	22,660

* Figures rounded. Columns may not sum to totals due to rounding.

Table 3: FTE employment by sector supported by renewable technologies, 2019*

Industry	Total FTE employment (Direct + indirect + induced)
Agriculture, forestry & fishing	630
Mining and quarrying	200
Manufacturing	2,220
Electricity & gas	3,440
Water supply, sewerage & waste	240
Construction	2,970
Wholesale & Retail	3,080
Transport & storage	820
Accommodation & food services	1,300
Information & communications	340
Finance & insurance	570
Real estate	460
Professional, scientific & technical	1,660
Admin & support	1,770
Public admin & defence	200
Education	1,180
Health & social work	470
Arts, entertainment & recreation	540
Other services	540
Activities of households as employers	40
Total	22,660

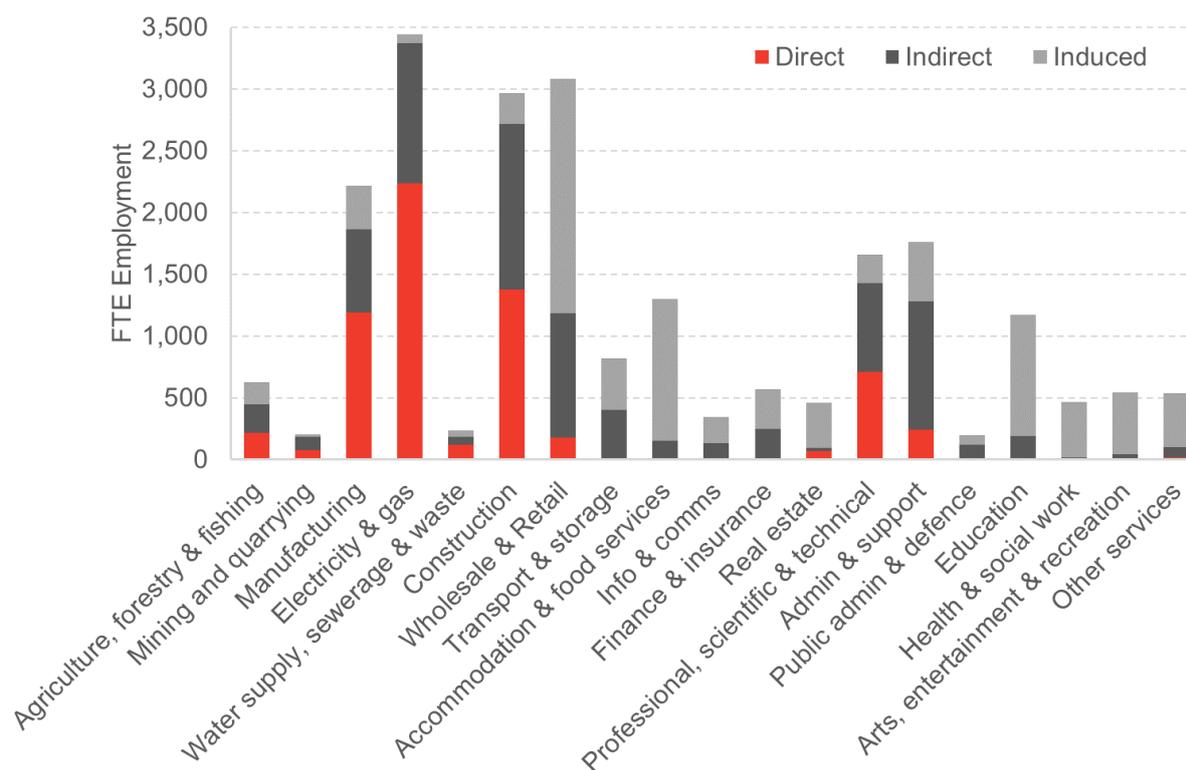
* Figures rounded. Columns may not sum to totals due to rounding.

Chart 1 shows the spread of the FTE employment supported by renewables across Scottish industries.

While the direct employment of renewable activities is mostly in the electricity & gas, construction and manufacturing industries, the spill-over impacts extend into many other sectors.

For instance, renewable activities support over 3,000 FTE employment in the wholesale & retail sector, 1,600 FTE employment in professional, scientific & technical services, and 1,800 FTE employment in the admin & support services sector.

Chart 1: FTE employment supported by renewables in each industry, 2019*



Economy wide impact of individual Scotland's renewable sector

Using the same methodology we can examine the impact of each of the eight renewable technologies on the Scottish economy.

It is important to note that the ONS survey data on the activities of these individual technologies in Scotland has low sample sizes and therefore comes with wide confidence intervals (the 'true' size of these activities lies somewhere within a wide range).

In particular, we have found that the survey may be underestimating the direct jobs within technologies such as tidal and wave (contained within 'Other renewable electricity').

Therefore we caution that these results should only be used to provide a sense of magnitude. These figures should not be used to track performance of these technologies over the short term as the margin of error on the underlying data is likely to exceed any short-term changes.

Table 4: Output supported by renewable technologies in Scotland, £ million, 2019

	Direct	Indirect	Induced	Total
Offshore wind	474	185	230	889
Onshore wind	1298	746	395	2,439
Solar photovoltaic	65	28	28	120
Hydropower	476	292	147	915
Other renewable electricity	3	1	2	6
Renewable heat	185	87	86	358
Renewable combined heat & power	25	13	11	49
Bioenergy	299	151	114	564

* Figures rounded. Sum of the individual technologies does not equal the total due to rounding and the structural implications of removing one sector individually rather than closing down several at once.

Table 5: Gross value added supported by renewable technologies in Scotland, £ million, 2019

	Direct	Indirect	Induced	Total
Offshore wind	219	89	139	447
Onshore wind	474	285	239	998
Solar photovoltaic	32	13	17	62
Hydropower	172	110	89	371
Other renewable electricity	2	0**	1	4
Renewable heat	78	41	52	171
Renewable combined heat & power	11	6	6	23
Bioenergy	132	63	69	264

* Figures rounded. Sum of the individual technologies does not equal the total due to rounding and the structural implications of removing one sector individually rather than closing down several at once.

** Rounded to zero but figures are non-zero.

Table 6: Full-time equivalent employment supported by renewable technologies in Scotland, 2019

	Direct	Indirect	Induced	Total
Offshore wind	1,400	1,540	2,020	4,700
Onshore wind	1,900	3,380	3,490	8,780
Solar photovoltaic	600	230	240	1,070
Hydropower	700	1,300	1,290	3,290
Other renewable electricity	90	10	20	120
Renewable heat	900	730	760	2,390
Renewable combined heat & power	50	80	90	230
Bioenergy	800	820	1,000	2,630

* Figures rounded. Sum of the individual technologies does not equal the total due to rounding and the structural implications of removing one sector individually rather than closing down several at once.

Modelling methodology

Our modelling methodology combines a survey of businesses by the ONS with our model of the Scottish economy. This model separates the Scottish economy into 98 industries and examines how these industries interact with each other, as well as households, government and investment.

A model of the Scottish economy has advantages over the use of a UK wide model, as it better reflects the inter-industry relationships that occur with Scotland.

One issue with the survey is that, for particular technologies, there can be issues of disclosure in the data and these figures are therefore suppressed.

For the year 2019, this occurred in the totals for solar photovoltaic turnover in Scotland and we used the turnover of previous years to estimate the latest year. This is a small component of the total and so will not impact the results.

In addition, direct employment figures for other renewable electricity and renewable combined heat and power were not disclosed as these were below 100 in 2019, but found to number 100 in 2018. Discussion with the industry suggested that these were not zero. Due to our discussions, other renewable electricity was set as having 90 direct FTE employment while renewable combined heat and power was set to have 50.

Several cells were not disclosed when looking at turnover of a particular technology within Scotland and across industries. Turnover for each technology by industry was constrained to the total turnover for that technology.

The difference between the sum of the disclosed values by industry and the known total for the technology was spread among suppressed values for industries. The choice of the spread was mostly based on known past values and UK wide patterns, although in a couple of cases a judgement on the spread was made.

It should be noted that, particularly when looking at individual technologies in Scotland, the confidence intervals around estimates can be very large. This is not uncommon when segmenting a survey by two variables as you are viewing a smaller sample.

Due to the confidence intervals and requirements for estimates to be made around the spread across some sectors, we strongly caution users on the quality of the results by technology. These provide a sense of scale, but they are not appropriate for tracking short term progress.

Finally, an issue with the LCREE survey is that it may accidentally capture firms involved within the supply chain. We have discussed this with the ONS and there is an ongoing ambition to investigate how best to define the direct activity.

Fraser of Allander Institute

University of Strathclyde
199 Cathedral Street
Glasgow G4 0QU
Scotland, UK

Telephone: 0141 548 3958

Email: fraser@strath.ac.uk

Website: fraserofallander.org

Follow us on Twitter via @Strath_FAJ

Follow us on LinkedIn: FAJ LinkedIn

the place of useful learning

www.strath.ac.uk

University of Strathclyde Glasgow

The University of Strathclyde is a charitable body,
registered in Scotland, with registration number SC015263

