ENERGY IN SCOTLAND 2015
Energy in Scotland 2015 provides an overview of energy statistics for Scotland. All statistics presented in the report are from published sources, including publications by the UK Department of Energy & Climate Change (DECC) and the Scottish Government.

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CHAPTER 1

ENERGY IN SCOTLAND
OVERVIEW

‘Nearly 12% of Scotland’s total final energy consumption came from renewable sources in 2012’
Introduction

Energy is not just needed to keep Scotland’s businesses, hospitals and schools running; heat our homes; and transport goods and people - energy also plays a vital role in Scotland’s economy. Scotland accounts for around 10% of the UK’s total energy consumption, but is rich in energy resources.

World energy use has increased enormously over the last century, driven by a rising population, industrialisation and economic growth. Scotland plays, and will continue to play, a key role in the UK, European and World energy economy - aiming to become a global leader in developing solutions to the challenge of climate change. The way energy is used in Scotland is an important aspect of tackling climate change and creating a low carbon economy. The Scottish Government plans to move towards this as part of the Government’s overarching Economic Strategy.

The energy sector plays a key role in Scotland’s economy. Since the 1970s, the North Sea oil and gas industry has supported thousands of jobs, both directly and in the wider supply chain. At the same time, Scotland has long been a net exporter of electricity and in the past decade, has led the UK in renewable electricity generation through the rapid expansion of wind power, added to existing output from hydroelectric plants. Renewable electricity generation continues to grow, with onshore wind capacity expanding and substantial offshore wind, wave and tidal resources ready to be harnessed.

Renewable energy is a central element of the Scottish Government’s strategy for a successful Scotland. Scotland’s vast renewable energy resources create major job and investment opportunities and – as part of a wider, balanced energy mix - will deliver secure, low carbon and cost-effective energy supplies.

“Scotland plays, and will continue to play, a key role in the UK, European and World energy economy - aiming to become a global leader in developing solutions to the challenge of climate change”

What are renewables?
Renewables are energy forms which are essentially inexhaustible, unlike fossil fuel sources, which are finite. Renewable energy sources include wind (onshore and offshore), hydro, wave, tidal, biomass, solar, and geothermal. Renewable energy can be used for heating and transport as well as electricity generation.

Why renewables?
The earth’s fossil fuel supplies (oil, gas, coal) are limited and will be depleted over time. As this process continues, remaining reserves will become increasingly difficult to access. It is also widely held that the gases released when fossil fuels are burned to produce energy are contributing towards changes in our climate and rises in global temperatures. By using increasing amounts of renewable energy (as well as by conserving as much energy as possible), we are acting sustainably and helping to protect our environment. Renewable energy can also create opportunities for economic growth.
Scottish Renewable Energy Targets

The Scottish Government published an update to the 2020 Routemap for Renewable Energy in Scotland in December 2014. With the rapid pace of renewables development in Scotland, and because there is a potential resource capable of powering Scotland several times over, the updated Renewables Routemap remains committed to an overall renewable energy target of 30% by 2020. To achieve this overall energy target, individual targets were established for renewable electricity, heat and transport.

**Renewable Energy Target – 30% of total Scottish energy consumption from renewables by 2020**

As the data availability at a Scotland level has improved, more robust methodological options for measuring each of these targets have become available. A key development has been bringing together each of these methodologies to provide a consistent and transparent measure for monitoring the overall renewable energy target. This was one of Audit Scotland’s recommendations as part of their report on renewable energy published in September 2013.

Figure 1.1 shows that in 2012, **11.6%** of total Scottish energy consumption came from renewable sources, up from 10.6% in 2011.

**FIGURE 1.1: RENEWABLE ENERGY TARGETS - SUMMARY OF LATEST PROGRESS**

- **RENEWABLE ELECTRICITY - 100% BY 2020**
  - 44.4% (Actual 2012: 33.3%) (Goal: 100%)
  - 100% (Goal: 100%)

- **RENEWABLE HEAT - 11% BY 2020**
  - 3.0% (Actual 2012: 2.0%) (Goal: 11%)
  - 11% (Goal: 11%)

- **RENEWABLE TRANSPORT - 10% BY 2020**
  - 3.5% (Actual 2012: 3.0%) (Goal: 10%)
  - 10% (Goal: 10%)

- **ENERGY CONSUMPTION - REDUCE BY 12% BY 2020**
  - -11.8% (Actual 2012: -12.6%) (Goal: -12%)
  - -12% (Goal: -12%)

Please note that the most recent figures available for electricity and transport are for 2013. The latest data available to calculate progress on the overall renewable energy target is for 2012.

Sources: Department of Energy and Climate Change, Energy Savings Trust, Scottish Government
The EU seeks to have a 20% share of its gross final energy consumption from renewable sources by 2020; this target is distributed between the Member States with national action plans designed to plot a pathway for the development of renewable energy.

Figure 1.2 shows the latest data available for the share of renewable energy in gross final energy consumption across the EU\(^1\).

The EU average in 2012 was **14.1%** - 2.5 percentage points higher than Scotland and nearly 10 percentage points higher than the UK.

Among the EU Member States, the highest share of renewables in gross final energy consumption in 2012 was recorded in Sweden (51%), while Latvia, Finland and Austria each reported that more than 30% of their final energy consumption was derived from renewables.

The targets for the Netherlands (14%) and the United Kingdom (15%) require each of these Member States to increase their share of renewables in final energy consumption by around 10 percentage points. By contrast, Denmark, Sweden, Bulgaria and Estonia have already surpassed their targets for 2020.
Figure 1.3 shows the progress made by Scotland, the UK, and the EU as a whole since 2009, when the **EU Renewables Directive** was introduced.

It also shows what is required by 2020 in order to meet the respective targets.

![Figure 1.3: Share of renewable energy in gross final energy consumption across the EU, 2009 - 2012](image)

Although Scotland’s renewable energy share remains lower than the EU average, Scotland has made relatively better progress since 2009 - increasing the share by over 50% (7.7% - 11.6%).

The UK has increased its share by 40% since 2009 (3.0% - 4.2%), with the EU average going up by nearly 20% (11.9% - 14.1%).
The Scottish Government renewable electricity target\(^2\) is to generate the equivalent of 100% of Scotland’s own electricity demand from renewable resources by 2020, a target which will require the market to deliver an estimated 14-16 GW of installed renewable capacity. This does not mean that Scotland will be 100% dependent on renewables generation, but rather that renewables will form the key part of a wider, balanced electricity mix.

Figure 1.4 shows the continuation of the rising trend in renewable electricity generation in Scotland since 2004, with the exception of 2010. The lower level of renewable electricity generation experienced in 2010 was a result of a fall in hydro generation due to much lower rainfall that year.

Having already surpassed the 2011 interim target of 31%, the current interim target of 50% by 2015 was set to strengthen the commitment to renewables development in Scotland.

Data for 2014 so far shows that Scotland is on track for yet another record year of renewable electricity generation. Renewable generation over the first three quarters of 2014 is 21% higher than over the same period in 2013.

In 2013, the equivalent of 44.4% of gross electricity consumption was from renewable sources, up from 38.8% in 2012. This is explored in more detail in Chapter 3.

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In 2012, the equivalent of 3.0% of non-electrical heat demand was met from renewable sources. This is up from 2.7% in 2011. Over the year to 2012, renewable heat generation increased by 9.6%, while non-electrical heat demand decreased by 3.1%.

Renewable heat generation data for 2013 show a 17% increase compared with 2012.

Please see page 64 for more information regarding the measurement of heat demand in Scotland.

Figure 1.5 shows that steady progress has been made since 2009 with the level of renewable heat generation in Scotland. From a baseline 845 GWh in 2008/09, generation has more than trebled to 2,904 GWh in 2013.

90% of the renewable heat output in 2013 came from installations which used biomass primary combustion or biomass combined heat and power.

By considering potential scenarios of what the level of non-electrical heat demand may be in 2020, it is possible to estimate the range of renewable heat generation required to meet the 11% renewable heat target. This is currently estimated to be between around 7,000 and 9,000 GWh.

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Figure 1.5: Share of renewable heat in non-electrical heat demand, Scotland, 2008/09 - 2012

0% 2% 4% 6% 8% 10% 12%
3.0% 11.0%
Sources: Department of Energy and Climate Change, Energy Savings Trust, Scottish Government
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“Renewable heat generation increased by 17% between 2012 and 2013”
Biofuels had a 3.5% share of road fuels in the UK as a whole in 2013, up from 3.1% in 2012.

Data is not available separately for Scotland, so the UK proportion is assumed. Please see Chapter 5 for more information on transport energy use in Scotland.

**UK trends in liquid biofuel consumption for transport**

In 2013, 1,585 million litres of liquid biofuels were consumed in transport in the UK, a rise of 12% on the total in 2012. This is 13 times higher than that consumed in 2005.

Liquid Biofuels are broken down into two categories: Bioethanol (used with Petrol) and Biodiesel (used with Diesel):

- Bioethanol consumption increased by 6% to 819 million litres between 2012 and 2013 - accounting for 52% of all liquid biofuels.
- Biodiesel consumption rose by 21% to 766 million litres between 2012 and 2013 - accounting for 48% of all liquid biofuels.

Using latest data for the third quarter of 2014, bioethanol accounted for 4.6% of motor spirit, and Biodiesel 3.9% of diesel (DERV). The combined contribution was 4.2%, a rise of 0.3 percentage points on a year earlier.

“**Latest data for Q3 2014 shows that biofuels made up 4.2% of all road fuels in the UK**”
The Scottish Government published the “Conserve and Save: Energy Efficiency Action Plan” in October 2010. This action plan introduced a headline target to reduce Scottish final energy consumption by 12% by 2020 from a 2005 to 2007 baseline.

Consumption in 2012 was 3.1% lower than in 2011, and 11.8% lower than the 2005-2007 baseline against which the 12%

Recognising the importance of economic cycles and weather patterns to energy consumption levels, the energy efficiency target was defined to allow for fluctuations within the longer term trend. Figure 1.7 shows that the 11.8% fall from the baseline remains well within the 2012 annual maximum associated with the 2020 target.

Since the 2005-2007 baseline, each consuming sector has reduced their energy consumption, but to varying degrees. The domestic sector has experienced the largest decrease (-15%), with the non-domestic sector (-13%) and transport sector (-10%) just marginally lower.

Energy productivity in Scotland has increased by approximately 14% between 2005 and 2012, and this is expected to continue rising as the economy recovers.

Both gas and electricity consumption in Scotland declined between 2012 and 2013 (by 4% and 1% respectively) indicating that a reduction in total final energy consumption over this period may also be likely.

**DATA NOTE - ENERGY CONSUMPTION TARGET**

The total final energy consumption time series, published by DECC, is subject to revision as far back as 2005. More detail is available in the Data Revisions box on page 22.
Community and Locally Owned Renewables

Alongside the headline renewable energy ambition, the Scottish Government has also set a target to increase the capacity of community and locally-owned renewable energy.

The Scottish Government wishes to maximise the benefits for communities from renewable energy, and believe that a community can gain from renewables projects, over and above the energy generated and financial benefits. For example:

- increased community cohesion and confidence
- skills development
- support for local economic regeneration.

At the end of June 2013, an estimated minimum of 285 MW of community and locally owned renewable energy capacity was operational in Scotland. This was 40% higher than the estimate for a year previously. It should be noted that some of the increase in estimated capacity is likely to be due to an increase in the amount of data collected and being provided by the different owners of renewable installations.

These figures for 2013 represent a total of more than 8,000 individual renewable energy installations. The total capacity was split between 168 MW of electrical capacity and 114 MW of thermal (heat) capacity. Over a year, community and locally owned renewable installations are estimated to produce around 740 GWh of renewable energy, consisting of 390 GWh of electricity and 330 GWh of heat.

Development pipeline

As Figure 1.8 shows, a further 679 MW of community or locally owned renewable energy capacity is estimated to be in different stages of development (under construction, consented but not built, in planning, or in scoping).

Based on 285 MW of capacity in operation at the end of June 2013, and the further 679 MW identified as in development, it would appear that Scotland is on-track to meet its target of 500 MW of community and locally owned renewable energy by 2020. However this situation will need to be monitored with regard to the conversion rate of installations from developmental stages to operational capacity.
Categories of ownership

A breakdown of operational capacity by type of owner is shown in Figure 1.9. The largest proportion of operational capacity is on Scottish farms and estates (119 MW, or 42%). Community groups own 15% of total operational capacity (43 MW). The largest numbers of individual installations (over 7,000) are in local authority and housing association ownership, together accounting for over 86% of individual installations.

*Figure 1.9: Estimated capacity of operational community and locally owned renewable installations by type of owner, Scotland, June 2013*

- Farms and estates: 119 MW
- Community: 43 MW
- Local business: 35 MW
- Housing association: 34 MW
- Local authority: 31 MW
- Public sector + charity: 24 MW

Source: Energy Savings Trust

Installed technologies

The majority of capacity in operation at June 2013 was from wind turbines, at 155 MW of electricity, and from biomass primary combustion, at 69 MW of heat. These two technologies account for about 78% of operational capacity at June 2013. A breakdown by technology type is shown in Figure 8.

*Figure 1.10: Capacity of operational community and locally owned renewable installations by technology (MW), Scotland, June 2013*

- Wind: 155 MW
- Biomass: 69 MW
- Heat Pump: 34 MW
- Energy from waste: 9 MW
- Solar PV: 8 MW
- Solar Thermal: 6 MW
- Hydro: 4 MW
- Unknown

Source: Energy Savings Trust
Policy context

The Scottish Government wants Scotland to be at the forefront of energy policy, helping deliver reliable sources of energy and ensuring a more sustainable approach to energy use. This section gives a brief overview of some key Scottish Government energy policies, and the wider EU policy agenda.

**Electricity Generation Policy Statement (EGPS)**

The Scottish Government’s Electricity Generation Policy Statement (2013) sets out the Scottish Government’s objectives for an affordable, secure, low carbon electricity supply that generates new job opportunities through the ambitious targets for renewable electricity and decarbonisation through CCS.

This EGPS 2013 examines the way in which Scotland generates electricity, and considers the changes which will be necessary to meet the targets which the Scottish Government has established, and reflects both views from industry and other stakeholders and also developments in UK and EU electricity policy.

It looks at the sources from which that electricity is produced, the amount of electricity used to meet Scotland’s needs and the technological and infrastructural advances and requirements which Scotland will require over the coming decade and beyond.

**Routemap for Renewable Energy in Scotland**


After exceeding the interim target to meet 31% of electricity demand from renewables by 2011, a more ambitious interim target for 50% by 2015 was set. It is complemented by an equally important target for an increase in renewable heat generation, as well as an increase in community and local ownership of renewable energy schemes.

**Energy Efficiency Action Plan**

The Conserve and Save: Energy Efficiency Action Plan re-affirms the Scottish Government’s ambitious energy efficiency and microgeneration agenda for Scotland.

It sets out the wide-ranging programme of activity on behaviour change, household, business and public sector energy efficiency, infrastructure, skills, and finance.

It builds on the consultation paper and the responses to it, and is a key component of the Scottish Government’s broader approach to meeting Scotland’s climate change targets and securing the transition to a low carbon economy in Scotland.
Climate Change Report on Proposals & Policies

The EGPS supports the Climate Change Report on Proposals and Policies (RPP). The RPP is required under the Climate Change (Scotland) Act 2009 to set out proposals and policies for meeting annual emissions reductions targets from 2010 to 2022. A second RPP (RPP2) was published during 2013, which sets out further proposals and policies for the period 2022-2027 to meet the Scottish Government’s challenging decarbonisation targets across energy, heat, transport, buildings, business and industry and land use.

Heat Generation Policy Statement

The Scottish Government’s draft Heat Generation Policy Statement (HGPS) sets out how low carbon heat can reach more householders, business and communities and a clear framework for investment in the future of heat in Scotland.

It discusses how Scotland might reduce the amount of energy used for heat, diversify sources of heat, provide increased security of heat supply, greater local control and reduce the pressure on household energy bills.

EU Policy

In Spring 2007, European leaders reached a historic agreement for the first time to create a common European energy policy. The resulting Energy Policy for Europe set out the EU’s vision for Energy in the period to 2020. Recently, a new energy policy framework for 2030 has been adopted as well as a European Energy Security Strategy. In 2015 the EU will be working towards an overarching Energy Union strategy. The European energy policy is based on three fundamental ‘pillars’:

1) **SUSTAINABILITY** - to ensure that the EU addresses climate change by reducing its emissions to a level that would limit global temperature increases to 2°C above pre-industrial levels. In 2008 EU leaders agreed to do this by committing to a 20% reduction in greenhouse gas emissions; a 20% improvement in energy efficiency; and deployment of 20% of energy generation from renewable sources, all by 2020. These are known as the 20:20:20 targets. The 2020 targets will be succeeded by the recently adopted EU 2030 framework for climate and energy policies. The framework seeks to drive continued progress towards a low-carbon economy, build a competitive and secure energy system and creates new opportunities for growth and jobs. It includes the following targets:

- an emissions reduction target of at least 40% on 1990 levels by 2030, binding on Member States;
- reform and strengthening of the EU Emissions Trading System (ETS) with a cap declining by 2.2% annually from 2021 onwards (an increase on the 1.74% up to 2020);
ENGLISH IN SCOTLAND OVERVIEW

- a renewable energy target of at least 27% by 2030, binding at EU level;
- a non-binding energy efficiency target of 27% by 2030 (to be reviewed in 2020 with a view to an increase to 30%);
- a 15% target for energy interconnections between member states by 2030 (binding only at EU level), and;
- a reliable and transparent governance system will be developed to help ensure that the EU meets its energy policy goals.

Key to achieving the 2030 targets is energy technological innovation. EU leaders recognise that the EU will have to step up its efforts in research and innovation policy and a Strategic Energy Technology Plan has been put in place. The emphasis is on accelerating cost reductions and market uptake of low-carbon technologies, by focusing, among others, on scaling up investments in large scale demonstrators.

2) SECURITY OF SUPPLY - to minimise the EU's vulnerability concerning imports, shortfalls in supply, possible energy crises and uncertainty on future supply. To this effect, the EU have introduced measures which ensure solidarity between Member States, the diversification of supply sources and transportation routes, and improved security of oil stocks, gas supply and electricity generation.

Energy security is at the top of the EU agenda following the Russian-Ukrainian gas conflict in 2014. The conflict has underlined the overall importance of a stable and abundant supply of energy for the EU citizens and economy. While Eastern and Baltics Member States are most directly affected by the disruption in gas flows, many other countries face security of supply challenges, including the UK, Ireland, France, Germany and Belgium.

In response to the Ukraine crisis EU leaders agreed on a European Energy Security Strategy. The strategy includes measures at the short, medium and long-term and looks to accelerate the completion of the EU single market for energy by end of 2014, the construction of priority interconnectors and grids to ensure that no part of Europe is isolated from EU energy sources and the development of indigenous energy resources, including renewables, nuclear power and shale gas. The Strategy emphasises the need for coherence with the 2030 Climate and Energy Framework.

3) COMPETITIVENESS - to ensure the effective implementation of the internal energy market. The EU have introduced reforms to ensure clearer separation of gas and electricity transmission from production and supply, thereby creating a more competitive market and by harmonising the competencies of national energy market regulators and ensuring their collaboration.
Completion of the energy market is seen as key to the issues of affordability of EU energy and competitiveness. The ‘Third Package’ of gas and electricity reforms that was agreed by Member States in 2009 aimed to have a fully functioning market by 2014. There remain barriers and progress to make over the coming year.

Another aim of the Third package was to end by 2015, the ‘energy island’ status of those few Member States who are still unconnected with the rest of the EU for their energy supplies. Improved interconnections are to be achieved through infrastructure projects of common interests (PCIs). The current PCI list contains two PCIs that involve Scotland: the ISLES and NorthConnect projects.

Over time European energy policy has become increasingly complex and the three fundamental pillars have become more intertwined. Illustrative of this is the priority for 2015 to develop an EU Energy Union as an overarching strategy, which includes energy supply security; integration of national energy markets and improved interconnections between Member States; reduction in European energy demand; decarbonising the energy mix and promoting research and innovation in the energy field.

The European energy policy is of increasing importance to Scotland’s energy sector. To achieve the Scottish Energy and climate targets and ambitions it is vital that the EU provides a supportive context. However, Scotland also has an important role to play within the EU on international energy and climate change policy.

Given Scotland’s expertise in low carbon technologies and our vast renewable energy potential, Scotland has an immense amount to offer in this field - both in terms of capacity and cutting-edge thinking in the fight against climate change. The Low Carbon Economic Strategy and world leading Climate Change (Scotland) Act provide a comprehensive framework for Scotland’s actions to tackle climate change and develop the low carbon economy of the future.

The Scottish Government is undertaking a wide range of ground-breaking initiatives which will help to maintain Scotland’s position as a leader in low carbon technology (our expertise in ocean energy technology and Carbon Capture and Storage), a contributor to the European energy market (ISLES project as evidence base and framework for the development of an interconnected North Sea Offshore Grid) and security of supply (through our abundant energy resources).
Scottish Energy Industry

Scotland’s Energy (including renewables) sector was identified in the Government Economic Strategy as one of the growth sectors in which Scotland can build on existing comparative advantage and increase productivity and growth. Since the 1970s, the North Sea oil and gas industry has supported thousands of jobs, both directly and in the wider supply chain. At the same time, Scotland has long been a net exporter of electricity and in the past decade, has seen rapid expansion of wind power, added to existing output from hydroelectric plants.

As explained in previous Energy in Scotland publications, official statistics on the employment and Gross Value Added (GVA) of the energy sector are based on the Standard Industrial Classification (SIC) system which does not lend itself to measuring non-traditional or new sectors that straddle a number of different industries – like the low carbon economy and renewable energy sector. This is explored in more detail in the date note in chapter 7.

The results in this chapter are based on the growth sector definition of the energy sector, but other information is available throughout the publication using alternative definitions (e.g. employment in the oil and gas sector in Scotland).

Employment

Employment in the Energy growth sector stood at 66,000 in 2013, representing an increase from 2012 (up 2,600 jobs). In Scotland, the sector accounts for 2.7% of employment, whilst across Great Britain as a whole, the Scottish sector accounts for 22.8% of GB employment in Energy, and for 60.6% of all GB employment in Extraction of crude petroleum and natural gas.

Employment in the Energy growth sector is highly concentrated, with 56.4% of employment being located in Aberdeen City and Aberdeenshire local authorities.

DATA NOTE - ENERGY GROWTH SECTOR DEFINITION

The Energy (including renewables) growth sector is defined by the Standard Industrialisation Classification (SIC) 2007 codes:
- SIC 05: Mining of coal and lignite
- SIC 06: Extraction of crude petroleum and natural gas
- SIC 09: Mining support service activities
- SIC 19: Manufacture of coke and refined petroleum products
- SIC 20.14: Manufacture of other organic based chemicals
- SIC 35: Electricity, gas, steam and air conditioning supply
- SIC 36: Water collection, treatment and supply
- SIC 38.22: Treatment and disposal of hazardous waste
- SIC 71.12/2: Engineering related scientific and technical consulting activities
- SIC 74.90/1: Environmental consulting activities

GDP

The latest GDP data shows that output in the Energy growth sector decreased by 1.9% in the most recent quarter, although in year on year terms output increased by 3.8%.

The quarter on quarter change for the Energy growth sector is in the opposite direction to that measured across the economy as a whole, where output increased by 0.6% in the last quarter. In year on year terms however, growth in the Energy Growth Sector is greater than that of the overall economy, which saw an increase of 3.0% year on year. Since 2009 output in the Energy growth sector has increased substantially (15.5%) between the first quarter of 2009 and the third quarter of 2014, whilst in the economy as a whole output increased by 6.3%.
Exports

Total exports from the Energy growth sector stood at £15.7 billion in 2013, accounting for 21.2% of Scotland’s total exports. Exports from the sector were 6.6% up in real terms from their 2012 level.

Exports to the Rest of the UK (RUK) stood at £11.1 billion in 2013 and accounted for 70.3% of total Energy exports. Exports to the Rest of the World (RoW) stood at £4.7 billion and accounted for 29.7% of total Energy exports.

Enterprises

In March 2014, there were 3,580 registered enterprises operating in the Energy growth sector, representing 2.1% of all registered businesses operating in Scotland. The Scottish Energy growth sector is characterised by small businesses. In 2014, 95.8% of registered enterprises in the Scottish Energy growth sector were small (0-49 employees), although these accounted for only 11.7% of employment in the sector. In contrast, large enterprises (250+ employees) which accounted for just 1.7% of registered enterprises, accounted for 80.1% of employment in the sector.

The majority of enterprises in the sector are Scottish owned (94.4%), but these accounted for 31.7% of employment in 2014. Although only 3.9% of businesses in the sector were foreign-owned, they accounted for 52.9% of employment in 2014.

Turnover/Gross Value Added (GVA)

In 2012, total turnover in the Energy growth sector was £55.3 billion, down 13.8% in nominal terms on 2011. A large share of this turnover was generated by Extraction of crude petroleum and natural gas (43.0%). Gross Value Added for the Energy growth sector totalled £23.1 billion, down 10.9% in nominal terms on 2011. This decrease was driven by a fall in Extraction of Crude Oil & Natural Gas activity value added (down £4.4 billion over the year), which was partly due to a drop in production. This drop in production was driven by a number of short-term impacts such as unplanned stoppages and maintenance downtime.

Exports

4% OF BUSINESSES WERE FOREIGN OWNED...

ENERGY GROWTH SECTOR 2013

ACCOUNTING FOR...

53% ...OF EMPLOYMENT

EXTRACTIONS IN 2013

£15.7 BILLION

TURNOVER IN 2012

£55.3 BILLION

14% SINCE 2011
ENERGY DATA UPDATES

There are frequent updates to the energy data for Scotland throughout the calendar year, primarily published by the Department of Energy and Climate Change (DECC). The figure below shows the key quarterly updates and how they impact on the Scottish Government target monitoring.

**MARCH**

- **Renewable Electricity**
  - Q4 (previous year) provisional
  - 1st annual generation estimate and progress toward 100% target (previous year)

**JUNE**

- **Renewable Electricity Data**
  - Q1 (current year) provisional
  - Q4 (previous year) final
  - 2nd annual generation estimate and progress toward 100% target (previous year)
  - **National Indicator Update (Renewable Electricity)**
  - 1st estimate (previous year) using proxy consumption data

**SEPTEMBER**

- **Renewable Electricity Data**
  - Q2 (current year) provisional
  - Final annual generation estimate and 3rd estimate of progress toward 100% target (previous year)

- **Sub-national Final Energy Consumption Data**
  - Progress towards 12% energy consumption reduction target (2 years previous)
  - Progress towards 11% renewable heat target (2 years previous)

**DECEMBER**

- **Renewable Electricity Data**
  - Q3 (current year) provisional
  - Confirmation of progress toward 100% target (previous year)

- **National Indicator Update (Renewable Electricity)**
  - 2nd estimate (previous year) using actual consumption data

- **Electricity Generation and Consumption**
  - Estimate of electricity generation (all technologies, previous year) and electricity consumption
ENERGY DATA REVISIONS

It is important to note that the energy data used to monitor the Scottish Government energy targets is subject to regular revision by DECC. Time series data can change from year to year as more accurate source data from suppliers becomes available to DECC, therefore the latest data must always be used when considering changes over time. The list below summarises how some of the energy targets can be affected:

Renewable Electricity Target

Provisional quarterly renewable generation is made available after 3 months, with final estimates available after 6 months.

Renewable generation time series data can be revised annually in September.

Electricity generation and consumption time series data can be revised annually in December.

National Indicator (Renewable Electricity)

This indicator is updated twice annually – June and December. Both these updates monitor the previous year’s renewable electricity generation, but June uses a proxy figure for electricity consumption, while in December the actual consumption figure is published.

This means that an indication of progress is available earlier in the year on the Scotland Performs website, but does mean that revisions to progress could take place between June and December each year.

Energy Consumption and Renewable Heat Targets

Sub-national final energy consumption data is published annually in September. This data is used to monitor both final energy consumption and non-electrical heat consumption in Scotland.

Data can be revised back annually in September as far back as 2005. This is primarily due to forecasted values being replaced with actual data, where actual figures were not available at the time of publication. In particular, annual revisions are made to the road transport, residuals and total final energy publications.

Further detail on the methodology and revisions policy of DECC regarding their sub-national consumption statistics are available here:

**What is an energy balance?**

An energy balance provides a global picture of energy in a given country in one common measurement unit and allows us to allow us to quantify and visualise the energy we produce, transform and consume. This publication uses Gross Calorific Values (GCVs) to convert fuel from their original units to tonnes of oil equivalent (toe). This is consistent with the UK aggregate balance and energy flow. The table in Annex A shows the energy balance for Scotland for 2012.

Figure 1.11 below shows a simplified energy flow chart which gives the proportions of fuel that goes into Scotland’s energy balance and the proportion of fuel that is consumed, taking into account exports, conversion and distribution losses.

**Figure 1.11: Simplified Energy Flow Chart, Scotland, 2012**

---

**What is an energy flow?**

An energy flow (or energy sankey diagram) is a simplification of the energy balance figures, illustrating the flow of primary fuels from the point at which they become available from home production or imports (on the left) to their eventual final consumption (on the right).

It demonstrates the volume of energy used in its original state, as well as the volume being converted into different kinds of energy by secondary fuel producers. The flows are measured in million tonnes of oil equivalent, with the widths of the bands approximately proportional to the size of the flow they represent (see page 26 for the full flow diagram).
What are the benefits?

Sankey diagrams put a visual emphasis on the major transfers or flows within a system. They are helpful in identifying interesting or significant aspects of an energy system such as: dominant fuels, energy lost in conversion, import and export trade and important end-use sectors. This allows priority areas to be identified and focus to be given to the most important areas within a particular energy system.

DATA DEVELOPMENT

This is the first time an energy balance has been included in the Energy in Scotland publication. It is a significant development and is an innovative way of gaining an overall summary of the key flows through the entire energy system in Scotland.

This development work has been carried out in response to a user consultation undertaken in 2014 in which a number of users expressed a demand for a clear way of quantifying the energy sector in Scotland.

Please note these are experimental statistics and are subject to change in the future as this work evolves through access to more comprehensive data sources and improvements to assumptions in the methodology.

If you have any feedback or queries please contact us at: energystatistics@scotland.gsi.gov.uk

In 2012, indigenous production and imports totalled 92,053 thousand tonnes of oil equivalent (ktoe). Approximately 73% of this was exported or used in marine bunkers, a further 11% was lost in transformation, distribution, energy industry use and conversion from primary energy to electricity and other energy products.

The final consumption accounted for the rest (17%), including non-energy use, which accounted for 6% of final consumption.

Figure 1.12: Indigenous production and imports by fuel, 2012

Indigenous production and imports totalled 92,053 ktoe in 2012 - with indigenous production accounting for 66,954 ktoe and imports accounting for 25,099 ktoe. Oil and gas makes the largest contribution with petroleum and natural gas combined accounting for 89.9% of total primary energy in 2012.
Final consumption, including non-energy use, was at 15,440 ktoe in 2012. The domestic sector consumed the largest proportion of energy - around 34% of energy consumption, followed by transport which consumed 24% and then industry which consumed 20%.

Figure 1.13 shows the end use split by fuel. Natural gas is the largest consumed fuel with around 41% of consumption, closely followed by petroleum at 35% and electricity at 18%.

Figure 1.14 shows the end use split by fuel. Natural gas is the largest consumed fuel with around 41% of consumption, closely followed by petroleum at 35% and electricity at 18%.

[Graph showing final energy consumption by consuming sector, 2012]

*Petroleum has been aggregated with 'Manufactured fuels and other' to avoid disclosure

Source: Scottish Government

Figure 1.14: Final energy consumption by fuel, 2012

[Graph showing final energy consumption by fuel, 2012]

*Petroleum has been aggregated with 'Manufactured fuels and other' to avoid disclosure

Source: Scottish Government

Please see Annex A for full aggregate energy balance and supplementary notes
Figure 1.15: Scotland Energy Flow Chart, 2012 (thousand tonnes of oil equivalent)
‘Scotland’s total energy consumption has decreased by 13% since 2005’
**ENERGY CONSUMPTION KEY FACTS**

Total final energy consumption:
- Heat: 55%
- Transport: 24%
- Electricity: 21%

**ENERGY CONSUMPTION IN SCOTLAND**

-11.8% TARGET ~12% BY 2020 SINCE BASELINE 2005-2007

**How does Scotland compare in energy consumption change between baseline (2005-2007) and 2012?**

- Scotland: -11.8%
- UK: -10.0%
- EU: -6.6%

**Energy efficiency improvements in the Scottish housing stock in 2013:**

92% have at least 100mm of loft insulation installed

**Equivalent to the energy required for approximately:**

24,000 flights around the world

**Average energy efficiency rating of the Scottish housing stock, 2010 - 2013:**

- Very energy efficient - lower running costs
  - (92+): A
  - (81-91): B
  - (69-80): C
  - (55-68): D
  - (39-54): E
  - (21-38): F
  - (1-20): G

Median EE Rating:
- 2010: 62
- 2011: 63
- 2012: 64
- 2013: 66

**Since the 2005-2007 baseline energy consumption has decreased...**

- Domestic: -15%
- Non-Domestic: -13%
- Transport: -10%

**Excluding transport...**

- 42% of energy consumed domestically
- 58% of energy consumed by industry/commerce
Total Energy Consumption in Scotland

We currently use energy to heat and light homes, to run businesses and public services, to power appliances and cooling systems, and to transport goods and people. In 2012, Scotland consumed ~145 TWh of energy.

*Figure 2.1: Scotland Energy Comparisons*

Scotland consumed **145 TWh** of energy in 2012, equivalent to...

The gas and electricity consumption of over...

3 times...

...the number of homes in Scotland

= 

Nearly...

1/5...

...of the energy consumption of Poland

= 

Approximately...

24,000...

...flights around the world

= 

Turning the Falkirk Wheel around...

100 BILLION...

...times

Figure 2.2 shows that the majority of final energy consumption in Scotland is used for heat (55%). Transport is the next largest consuming sector accounting for nearly a quarter of total energy, with electricity consumption responsible for just over 20%.

*Figure 2.2: Total final energy consumption by sector, Scotland, 2012*

Figure 2.3 shows the proportion that each fuel type makes up final energy consumption in Scotland in 2012. Petroleum Products and Gas dominate the final consumption, accounting for over 77% of all final energy consumption. Electricity is the other major consumption with a near 18% share of final consumption (see data note below). As it is final consumption this table does not take account of the fuel used to generate the electricity consumed.

*Figure 2.3: Final energy consumption by fuel type, Scotland, 2012*

**DATA NOTE**

Please note that the proportion of electricity differs in figures 2.2 and 2.3. Figure 2.2 includes an adjustment made for electricity to account for differences in the DECC dataset used to monitor the renewable electricity target.

Source: Department of Energy and Climate Change, Scottish Government

Source: Department of Energy and Climate Change
The share of final energy consumption in Scotland can be split into the three main consuming sectors:

- Domestic
- Non-domestic (Industrial and commercial use)
- Transport

Excluding the transport sector, approximately 42% of total energy consumption (electricity and heat) is consumed domestically and 58% in the non-domestic sector.

Figure 2.4 shows that over the year to 2012, final energy consumption decreased by 3.1%. Also, final energy consumption was 11.8% lower than the 2005-2007 baseline adopted for the Scottish Government’s 12% energy consumption reduction target.

Since the 2005-2007 baseline, each consuming sector has reduced their energy consumption, but to varying degrees. The domestic sector has experienced the largest decrease (-15%), with the non-domestic sector (-13%) and transport sector (-10%) just marginally lower.

So how does Scotland’s energy consumption compare with the other countries of the UK?

In 2012, Scotland accounted for 9.9% of the UK’s final energy consumption. This proportion has remained fairly stable, varying between 9.5% and 10.1% since 2005.

Figure 2.5: Average final energy consumption per household, Countries of UK, 2012

In terms of average final energy consumption per household, the comparison across the UK in 2012 is as follows:

- WALES.................................18.4 MWh
- SCOTLAND............................18.3 MWh
- ENGLAND..............................17.7 MWh
- NORTHERN IRELAND.............13.3 MWh
- UK........................................17.7 MWh

Since the 2005-2007 baseline energy consumption has decreased...

DOMESTIC -15%  NON-DOMESTIC -13%  TRANSPORT -10%
Figures 2.6, 2.7 and 2.8 present total final energy consumption in 2012 for each local authority in Scotland for domestic, non-domestic, and transport use. Please note these figures exclude bioenergy & wastes. Table 2.1 presents the largest 3 energy consuming local authorities in Scotland in 2012 (including bioenergy & wastes).

Table 2.1: Total final energy consumption, by local authority in Scotland, 2012

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Total Final Energy Consumption (GWh)</th>
<th>% of Scotland Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FALKIRK</td>
<td>19,043</td>
<td>13%</td>
</tr>
<tr>
<td>2. FIFE</td>
<td>13,180</td>
<td>9%</td>
</tr>
<tr>
<td>3. GLASGOW CITY</td>
<td>11,528</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: DECC

It is interesting to see how each area’s consumption varies dependent on sector. For example, Falkirk has a very large non-domestic consumption (16.5 TWh) - 27% of the total Scottish non-domestic consumption - largely due to the presence of the petro-chemical and refinery sites in Grangemouth. However, domestically, Falkirk accounts for 1.3 TWh of energy consumption, 3% of the total domestic consumption in Scotland.
Energy Consumption Target (12% reduction by 2020)

In 2012, final energy consumption was 11.8% lower than the 2005-2007 baseline adopted for the Scottish Government’s 12% energy efficiency reduction target. Over the year to 2012, final energy consumption decreased by 3.1%.

Consumption in 2012 was 11.8% lower than the 2005-2007 baseline against which the 12% Energy Efficiency Target is measured. Recognising the importance of economic cycles and weather patterns to energy consumption levels, the energy efficiency target was defined to allow for fluctuations within the longer term trend.

The 11.8% fall from the baseline remains well within the 2012 annual maximum associated with the 2020 target. However, it is important to recognise the effect that changes with the wider economic climate may have had in reducing energy consumption over the last few years. In order to get a better understanding of the impact of this relative to energy efficiency measures, figure 2.10 shows estimates of the factors affecting industrial & commercial energy consumption since 2005.

Between the baseline (2005-2007) and 2012, energy consumption in the industrial/commercial sector fell by 9,494 GWh, a reduction of 13.4%.

It has been estimated that if efficiency had remained at baseline (2005-2007) levels, an additional 907 GWh would have been needed to produce the same amount of output. Therefore, 1.3% of the 13.4% reduction in non-domestic consumption can be explained by the change in output, with the remainder (-12.1%) accounted for by energy intensity improvements.

DEFINITIONS

OUTPUT is a term used to describe the growth (or the decline) in the quantity of goods or services produced in a particular sector. For example, in the case of the industrial and services sectors, gross value added is used as a measure of output. As industrial output increases, then it is intuitive that energy consumption will also increase e.g. in manufacturing, the more goods that are produced then the more energy that is used.

INTENSITY is defined as the amount of energy consumed per unit of output. A fall in intensity in a particular sector could indicate an improvement in energy efficiency or a move to less energy consuming activities.
To complement the energy efficiency target, we also measure how productively energy is being used in the economy. Energy productivity expresses the gross value added achieved in the economy from the input of one unit of energy. Increasing energy productivity means ‘squeezing’ more out of every unit of energy consumed. This is measured as the level of GVA per GWh of final energy consumed in Scotland. Energy productivity in Scotland has increased by approximately 14% between 2005 and 2012, and this is expected to continue rising as the economy recovers.

Energy Efficiency

Energy use underpins activity across all sectors in Scotland - business, domestic and public. It is also responsible for the major share of Scotland’s greenhouse gas emissions, which contribute to climate change.

By maximising the output from Scotland’s energy inputs, energy efficiency and productivity offer a way to curb energy consumption without limiting growth and hence to reduce emissions whilst still growing the Scottish economy.

Improving Energy Efficiency

The energy efficiency levels in the Scottish housing stock are monitored using the Scottish House Conditions Survey (SHCS) using the Standard Assessment Procedure (SAP 2009 edition) and expressed as an Energy Efficiency Rating (EER). These ratings are based on the cost of space and water heating, ventilation and lighting per square metre of floor area. EERs are banded from A to G, where A is a very efficient dwelling with low running costs and G denotes high energy costs (and low energy efficiency).

Evidence from the SHCS shows continual improvement in the overall energy efficiency of the Scottish housing stock since 2003/4. Half of all Scottish dwellings are now rated 66 or higher. This compares to a rating of 62 in 2010 for the average Scottish dwelling.

Figure 2.11: Average energy efficiency levels of households, Scotland, 2010-2013

Source: Scottish Household Condition Survey
Scottish TIMES model - Modelling the energy system in Scotland

What is TIMES?

The development of the TIMES modelling framework is co-ordinated by the International Energy Agency (IEA). It is becoming a very popular tool for whole-systems energy modelling worldwide. In the following map, blue shaded countries indicate that the country is a formal member of the IEA modelling community; green shaded countries indicate that the modelling framework is in use.

For more information on this please see: http://iea-etsap.org

What will the Scottish model do?

The Scottish TIMES model will cover the entire energy system and contain many thousands of variables covering existing and future technologies and processes. The aim of the model is to capture the main characteristics which affect the deployment of technologies, their costs and GHG abatement for Scotland as a whole given a range of policy and other constraints.

The model will use existing evidence to allow the Scottish Government to consider the cost and benefits of all policy options in combatting climate change, across all policy areas, on a common basis. This includes:

- What is the least cost pathway to 2050?
- Targets: what is the effect of a more ambitious 2050 GHG target on costs and technology use?
- What impact does uncertainty about future costs have on the pathway choices?
- Energy balancing: how robust is a given pathway to troughs and peaks in energy supply and demand?

Next Steps

The Scottish TIMES model will be designed and built during 2015. If you would like any more information on this please contact: andrew.mortimer@scotland.gsi.gov.uk
Figure 2.12 shows an increase of more than 10 percentage points in the proportion of dwellings rated B or C and a similarly large decrease in D or E rated properties since 2010. The proportion rated F or G has also decreased, only more slowly. In 2013, 4% received a rating of F or G, 60% were in band D or E and around 37% received a B or C rating.

Social rented dwellings are among the most efficient in the Scottish stock; around half of Local Authority housing and almost two thirds of Housing Associations are rated B or C. This is likely the result of the characteristics of social sector dwellings – in particular a greater proportion of newer flats which tend to retain heat better than houses – and the improvements mandated under the Scottish Housing Quality Standard (SHQS).

There have been improvements in efficiency more generally across the housing stock. As of 2013, at least 100 mm of loft insulation had been installed in 92% of lofts and around 30% of cavity walls dwellings had retrofit insulation added post-construction. As a result of higher standards for replacement boilers, the efficiency of central heating systems is also improving; 43% used condensing boilers for heating and/or hot water in 2013, compared with just 7% in 2007.
National Energy Efficiency Data Framework (NEED)

What is NEED?

The National Energy Efficiency Data-Framework (NEED) was set up by the Department of Energy and Climate Change (DECC) to provide a better understanding of energy use and energy efficiency in domestic and non-domestic buildings in Great Britain (currently only covers England and Wales). It combines data from multiple sources to provide insights into how energy is used and what the impact of energy efficiency measures is, for different types of property and household.

Why is NEED important?

NEED provides the largest source of data available for analysis of energy consumption; previous evidence has been derived from surveys and small technical monitoring trials. NEED forms an important element of DECC’s evidence base and already plays a key role in development and evaluation of DECC policies, including the Green Deal.

Data for Scotland

DECC published provisional results for Scotland for the first time in June 2014, in an Annex as part of their annual NEED publication. These figures remain provisional while DECC pursue access to more accurate Scottish property information available from the Scottish Assessors Association.

DATA DEVELOPMENT

National Energy Efficiency Data Framework for Scotland

Following the publication of provisional results for Scotland for this first time in 2014, the Scottish Government continue to work closely with colleagues at DECC to improve the range and accuracy of data published for Scotland as part of DECC’s wider NEED publication.

The Scottish Government will also be developing a Scottish NEED framework during 2015, following the significant development of gaining access to meter point level gas and electricity consumption data in 2014. This will allow greater flexibility and focus on bespoke analysis for Scotland, improving the evidence available for Scottish energy efficiency policy development.

The current Scotland NEED data are published here by DECC:

Data for Scotland (cont.)

In 2012, the average (median) gas consumption for properties in Scotland was 13,900 kWh with average (median) electricity consumption at 3,500 kWh. Typical consumption in Scotland is slightly higher than in England & Wales for both gas (7%) and electricity (6%). This is consistent with other previous estimates of energy consumption across GB.

This provisional analysis shows that the greatest typical saving is seen for Scottish households installing cavity wall insulation, with a typical saving of 9.9%, or 1,800 kWh. Properties installing loft insulation saw a typical saving of 2.9%, which represents a saving of 500 kWh.

DECC also carried out analysis showing the typical observed savings experienced by properties installing an energy efficiency measure in 2011 for Scotland compared with England and Wales. It shows that the typical saving for properties installing cavity wall insulation and loft insulation is very similar for properties in Scotland and England and Wales, with a difference of less than 0.1 percentage points. However, because the typical gas consumption is higher in Scotland compared to England and Wales, the saving in kWh is higher for Scotland. For cavity wall insulation, the typical saving for England and Wales is 1,500 kWh compared to 1,800 kWh in Scotland.

Non-domestic NEED

Whilst the NEED Framework was set up by DECC to provide a better understanding of energy use in both domestic and non-domestic buildings in Great Britain, work on the non-domestic framework is at an exploratory stage. It is more complicated than its domestic counterpart and therefore the coverage is poorer, and published results for England and Wales remain experimental at this stage.

The coverage of non-domestic NEED is approximately 30% of non-domestic electricity consumption. Work is currently being undertaken to improve the address matching and hence the coverage of the non-domestic data framework.

For more information regarding the issues and challenges with non-domestic NEED please see:

'Renewable sources delivered 44% of gross electricity consumption in 2013'
In Scotland, 21% of total energy consumption is accounted for by electricity demand.

Scotland is a net exporter of electricity to the rest of the UK, 28% of total generation in 2013.

2013 saw renewables generation match the output from fossil fuel generation for the first time.

In 2013, the two largest renewable technology generators were wind with 66% and hydro with 26%.
Electricity Balance for Scotland

The electricity flow chart below shows the flow of energy from fuel inputs through to consumption. This is a way of simplifying the figures that can be found in the aggregate energy balance in Annex A. It illustrates the flow of primary fuels from the point at which they become available for the production of electricity (on the left) to the eventual final use of the electricity produced (on the right) including exports, as well as the energy lost in conversion, transmission and distribution.

**Electricity Balance - Key Facts**

- In 2012, coal generated the largest amount of electricity from fossil fuels.
- Imports accounted for a small proportion of primary energy - 0.5%, whereas exports accounted for the equivalent of 16% of total primary energy.
- Around 38% of the total primary energy is lost in electricity conversion.
- 7% of total primary energy was used within industry or lost through distribution.
- 42% of end use electricity was consumed domestically, 29% was consumed by ‘other’ sectors, 28% was consumed by industry and 1% was consumed by transport.
- Of the 7,134 ktoe total primary energy, 40% was used within Scotland, 16% was exported and the rest was lost in conversion, distribution or consumed within the energy industry.

*Source: Scottish Government*
Overall electricity generation in Scotland increased by 2,635 GWh in 2012 to 53,071 GWh in 2013, where renewables and nuclear generated just over two thirds (66.9%) of Scotland’s electricity output. Scotland continued to be a net exporter of electricity, exporting 27.9% of total generation in 2013, up from 25.6% in 2012.

Renewable output was up 16.3% on 2012 (previous record year for renewables) and accounted for a record 32.0% of total Scottish generation – the same proportion as generation from fossil fuels. Figures 3.2 and 3.3, shows electricity generated in Scotland and UK, respectively, by fuel type (GWh) for 2000 to 2013. Since 2000 Scotland has seen the decline in coal and gas to generate electricity and the increase in renewables. The UK has seen electricity generated by gas decline and has seen renewables increase.

**Nuclear**

In 2013, nuclear output increased from 33.8% in 2012 to 34.9% of overall electricity generation.

**Coal**

Coal accounted for 20.6% of electricity generation in 2013, down from 23.7% in 2012. Scotland had two coal fired power stations in 2013, Longannet in Fife and Cockenzie in East Lothian. However, Cockenzie closed in March 2013 due to the Large Plant Combustion Directive (LPCD). The LPCD is an EU directive which requires countries to limit emissions from existing combustion plants with a thermal capacity of 50MW or more. From 2007, a plant could either opt to comply with the emissions limit or opt out and be limited to a maximum of 20,000 hours of further operation.

*Coal includes a small quantity of non-renewable wastes.*
Gas

The proportion of electricity generation from gas continued to fall from 11.2% in 2012 to 10.8% in 2013 (gas generation fell substantially between 2011 and 2012 from 16.2% in 2011). The main gas fired power station in Scotland is at Peterhead in Aberdeenshire.

This reduction in gas output reflects a broader change in the generation mix dispatched across Europe. Due to high gas prices and relatively low coal prices, combined with a low EU carbon price, coal generation has been more profitable than gas generation.

Fossil fuel generation as a whole has decreased from 36.1% in 2012 to 32.0%, while renewables have increased from 28.9% to 32.0%. This is partly due to the increase in renewable technologies and the Scottish Government’s commitment to achieving its 100% renewable electricity target (this is discussed in more detail in the renewable electricity section on page 55).

The UK generated 359,150 GWh in 2013, between 2012 and 2013 Scotland’s share of total UK generation increased from 13.9 per cent to 14.8 per cent, due to an increase in nuclear and renewable generation.

Figure 3.4 shows the proportion of electricity generated by fuel for Scotland and the UK for 2013, where renewable generation made up 14.9% of total generation in 2013. Scottish renewable generation made up approximately 31.6% of total UK renewable generation—down from 35.4% in 2012.

Figure 3.4 shows the proportion of electricity generated by fuel for Scotland and the UK for 2013, where renewable generation is defined as ‘Hydro Natural Flow’ and Other Renewables’ combined.

Electricity generation and impact on Gross Domestic Product (GDP)

A key user of electricity generation statistics is the Short-Term Economic Indicators Branch of the National Accounts Unit in the Scottish Government. This team is responsible for producing many of the headline figures for the Scottish economy, including quarterly estimates of real-terms growth in Gross Domestic Product (GDP) – the total measure of a country’s economic activity – and in Gross Value Added (GVA) at industry level.

Estimates of volume changes in electricity production are reported as part of the aggregate Electricity & Gas Supply index - which as a whole accounts for 2.7% of Scotland’s GDP and 13.9% of the Production industries (in 2011 weights).
Seasonal effects in electricity generation

The electricity component of Scottish GDP is based on quarterly reports from Scotland’s major power producers and supplemented by data from the Department for Energy and Climate Change (DECC). Coverage of the sector is complete, i.e. not estimated from a sub-sample. Figure 3.4 shows the profile of generation by source type from 1997 Q1.

The sub-annual frequency of the raw data means that such data would be difficult to interpret in a timely manner, as there are systematic variations associated with the time of the year - i.e. seasonal effects - which obscure or confound movements.

STATISTICS NOTE - TIME SERIES DATA

Time series can be thought of as a combination of three distinct features:

- **SEASONAL EFFECTS**: regular and predictable fluctuations which can be expected to recur with similar intensity in the same season every year, for instance the increase in energy consumption in the winter months;

- **IRREGULAR EFFECTS**: Comprise both random sampling or non-sampling variation and extreme values with identifiable causes such as uncharacteristic weather conditions and power stations outages. The latter, also referred to as outliers, are temporarily taken out in order to avoid distortions in the estimation of the seasonality, and are reinstated into the time series after seasonal adjustment is completed;

- **TREND**: Captures the long-term behaviour and direction of the time series and is affected by aspects such as installed generation capacity.

The process, which is aimed at removing seasonality from the time series, involves estimating these components and the relationship among them that provides the best fit to the data. As well as outliers, issues such as breaks in the seasonal pattern caused by structural changes in the electricity industry, also need to be accounted for.
As Figure 3.4 shows, electricity output is typically higher in the autumn/winter than in the spring/summer, with peaks in the first and fourth quarters and troughs in the second and third quarters.

The output growth series for the electricity sector, like for many other sectors, is therefore produced on a seasonally-adjusted basis; time-series analysis and modelling work thus represents an important part in the estimation process of these statistics.

**Improving the seasonal adjustment of quarterly electricity volume series**

Seasonal-adjustment models are routinely updated in order to fine-tune parameters in light of the most recent observations; meanwhile, a larger-scale review is conducted annually at which time more substantial improvements to the models setting/specification are incorporated.

As a result of the latest review for electricity generation, a new method has been adopted whereby seasonal adjustment is applied by type of power (conventional, hydro and wind) rather than to their combined total as under the previous approach.

*Figure 3.5 – Seasonal adjustment of total electricity generation: old and new methods, Scotland, 1997-2014*

![Seasonal adjustment of total electricity generation: old and new methods, Scotland, 1997-2014](image)

Source: Scottish Government, DECC

Figure 3.6 illustrates the extent of the long-run revisions to electricity estimates introduced by these methodological changes. For descriptive purposes, Figure 3.7 breaks down the new seasonally-adjusted series into its conventional, hydro and wind parts.
Different responsiveness among generation sources to demand/supply factors

One motivation for building separate seasonal-adjustment models concerns the different degrees to which seasonal effects and irregular effects characterise the conventional, hydro and wind data. Conventional sources (e.g. nuclear, fossil-fuel) tend to exhibit relatively strong seasonality, as they are primarily driven by demand-side variations and will adjust output accordingly, therefore they are summed together before being seasonally adjusted; this was found to deliver an appropriate level of statistical precision, with limited scope for additional gains from further disaggregation.

Renewable energy is highly correlated to weather conditions and thus largely determined by supply-related factors. Although the irregular component can be strong due to supply-side volatility, seasonal effects are present in both hydro and wind power, because output tends to be lower during summer when it is usually dryer and less windy.

Within renewables, hydro and wind are adjusted separately in order to better control for their respective features; for instance, wind is utilised whenever is available whereas hydro is relatively responsive to demand levels as it can start generation quickly as long as there is water in the reservoirs.

Structural changes in the electricity industry

Another reason for distinguishing between generation sources is concerned with different time trends. As evident from Figure 3.7, conventional power has been on a downward trend since 2007. In part, this is attributable to a number of UK thermal stations ‘opting out’ the European Union’s Large Combustion Plant Directive and having since been on reduced operation (scheduled to close completely before the end of 2015).

With regard to renewables, the trend in hydro has been fairly constant, reflecting an installed capacity which has remained stable at around 1.3 GW. Meanwhile, wind generation has been rising steadily in line with a marked increase in installed capacity which has almost doubled from 2.5 GW in 2011Q1 to 4.9 GW in 2014Q2.
Electricity in Scotland - Generated, Consumed and Transferred

Scotland typically generates around 50,000 GWh of electricity, as shown in Figure 3.8, while typically consuming around 40,000 GWh, although consumption has been declining since 2008. As a result, Scotland is a net exporter of electricity and has been for a number of years. In 2013, net exports to England and Northern Ireland accounted for 27.9% of total generation.

Figure 3.8 shows two measures of electricity consumption – both measures are illustrated in more detail in the box titles Monitoring the 100% electricity target on page 59.

- Total electricity consumption is calculated as total generation, minus generators’ own use, losses, and exports. Total electricity consumption in Scotland was 32,395 GWh in 2013.
- Gross electricity consumption measures total generation minus net exports. It is equivalent to total consumption plus generators’ own use plus losses. Gross electricity consumption in Scotland was 38,256 GWh in 2013. Scotland’s renewable electricity target uses this measure.

Figure 3.8: Electricity generated, consumed and exported, Scotland, 2000 - 2013

Total domestic consumption of electricity fell by 14% between 2005 and 2013, as shown in Figure 3.9. Over the same period, there was a 11.1% fall in non-domestic electricity consumption – with a particularly significant drop between 2008 and 2009, which in part may have been driven by wider economic factors in 2009.
Figure 3.9: Total Scotland electricity sales (GWh), 2005-2013

Since 2005 domestic consumption of electricity in Scotland has fallen by 14.0% and non-domestic electricity by 11.1%.

Figure 3.10: Average domestic electricity consumption per household (kWh), by GB Region, 2013

‘Since 2005 domestic consumption of electricity in Scotland has fallen by 14.0% and non-domestic electricity by 11.1%’

Figure 3.10 shows that domestic electricity consumption per household in Scotland in 2013 was estimated to be the second highest in Great Britain, at 4.4 MWh, the South West of England had a slightly larger average consumption at 4.5 MWh. The GB average was 4.1 MWh.*

* Note that the data presented for electricity consumption are calculated by dividing total domestic consumption by number of households. The alternative of consumption per meter is not used because some dwellings, such as those on an Economy 7 tariff (which provides cheaper off-peak electricity for seven hours each night), have more than one meter.
Figure 3.11 shows the 18.6% decrease in domestic electricity consumption per household from 2005 to 2013. Key drivers of this trend include increased prices and improved energy efficiency of appliances.

*Figure 3.11: Domestic electricity consumption in Scotland, per household, 2005–2013*

DATA DEVELOPMENT

Renewable Planning Statistics

Renewable energy is a key component of the Scottish Government’s strategic priority to move to a low carbon economy and meet our obligations under the Climate Change (Scotland) Act. Further development of planning and consenting data will help to monitor the deployment of renewable projects and enable the publication of more comprehensive analysis regarding the progress towards meeting Scotland’s renewable targets.

The Economy, Energy and Tourism Committee report published in November 2012 highlighted the importance of assessing progress at local levels towards the National renewable energy targets. The report said “it is critical that we can establish a baseline and trend data for the numbers of projects either operating, in development or at the planning stage in each of the 32 local authority areas.”

The Scottish Government worked with various bodies including DECC, Scottish Renewables, and Scottish Natural Heritage (SNH), to develop a consistent, reliable, and publically available renewable planning database for Scotland. 

...Continues on page 56
DOMESTIC ELECTRICITY CONSUMPTION - Average Consumption (kWh per meter)

SCOTLAND BY INTERMEDIATE GEOGRAPHY ZONE, 2013

Average Consumption (kWh)
- 0 - 3,200
- 3,200 - 3,700
- 3,700 - 4,350
- 4,350 - 5,200
- 5,200 - 7,000
DOMESTIC ELECTRICITY CONSUMPTION - Average Consumption (kWh per meter)

CENTRAL BELT OF SCOTLAND BY INTERMEDIATE GEOGRAPHY ZONE, 2013

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>Local Authority</th>
<th>Average Consumption (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Kippen and Fintry</td>
<td>Stirling</td>
<td>6,968</td>
</tr>
<tr>
<td>2nd Arbroath Landward</td>
<td>Angus</td>
<td>6,830</td>
</tr>
<tr>
<td>3rd East Mainland</td>
<td>Orkney Islands</td>
<td>6,620</td>
</tr>
<tr>
<td>4th Muthill, Greenloaning and Gleneagles</td>
<td>Perth &amp; Kinross</td>
<td>6,496</td>
</tr>
<tr>
<td>5th Whitecroags and Broom</td>
<td>East Renfrewshire</td>
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<tr>
<td>6th North Mainland</td>
<td>Shetland Islands</td>
<td>6,414</td>
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<tr>
<td>7th Powmill, Cleish and Scotlandwell</td>
<td>Perth &amp; Kinross</td>
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</tr>
<tr>
<td>8th Lerwick South</td>
<td>Shetland Islands</td>
<td>6,284</td>
</tr>
<tr>
<td>9th Benderloch Trail</td>
<td>Argyll &amp; Bute</td>
<td>6,253</td>
</tr>
<tr>
<td>10th Shetland South</td>
<td>Shetland Islands</td>
<td>6,214</td>
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<table>
<thead>
<tr>
<th>Zone Name</th>
<th>Local Authority</th>
<th>Average Consumption (kWh)</th>
</tr>
</thead>
<tbody>
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<td>2nd Govanhill West</td>
<td>Glasgow City</td>
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<tr>
<td>3rd Easter Road and Hawkhill Avenue</td>
<td>Edinburgh, City of</td>
<td>2,466</td>
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<tr>
<td>4th Gorbals and Hutchesontown</td>
<td>Glasgow City</td>
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<tr>
<td>5th Govan and Lighthouse</td>
<td>Glasgow City</td>
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<tr>
<td>6th Shettleston North</td>
<td>Glasgow City</td>
<td>2,509</td>
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<tr>
<td>7th Hillhead</td>
<td>Glasgow City</td>
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<tr>
<td>8th Seaton</td>
<td>Aberdeen City</td>
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<tr>
<td>9th Alexandra Parade</td>
<td>Glasgow City</td>
<td>2,569</td>
</tr>
<tr>
<td>10th Gorgie West</td>
<td>Edinburgh, City of</td>
<td>2,570</td>
</tr>
</tbody>
</table>

DATA NOTE - INTERMEDIATE GEOGRAPHY ZONES (IGZ)

The data zone is the key small area statistical geography in Scotland. The intermediate geography will be used to disseminate statistics that are not suitable for release at the data zone level.

There are 1,235 intermediate zones in Scotland, containing on average 4,000 household residents.

For more information:
http://www.scotland.gov.uk/Publications/2005/02/20732/53083

The tables above show both the ten highest and ten lowest domestic electricity consuming areas (average per meter) in Scotland. It is interesting to note that seven out of the ten lowest consuming areas were within the City of Glasgow local authority.

Please see Annex D for more information regarding the source of this information and points to be aware of when using this analysis.
NON-DOMESTIC ELECTRICITY CONSUMPTION - Average Consumption (kWh per meter)

SCOTLAND BY INTERMEDIATE GEOGRAPHY ZONE, 2013

Average Consumption (kWh)
- 0 - 19,500
- 19,500 - 28,500
- 28,500 - 41,500
- 41,500 - 72,000
- 72,000 - 250,000
DECC produce gas and electricity sub-national energy consumption analysis below local authority level. These data are used by a range of users for different purposes, including enabling local authorities to understand local energy use with the ability to monitor and target small areas for interventions as part of their local energy strategies. Data is available here:


The tables above show both the ten highest and ten lowest industrial and commercial electricity consuming areas in Scotland (average per non-domestic electricity meter).

It is interesting to note that all of the ten lowest consuming areas five were within the City of Edinburgh local authority.

Please see Annex D for more information regarding the source of this information and points to be aware of when using this analysis.
Fossil Fuel Generation

Fossil fuel generation in Scotland tends to vary over time and is influenced by a wide range of factors including fossil fuel prices (absolute and relative) and the prevalence of renewable and nuclear generation. Output from conventional fossil fuel generating stations has changed over time due to a number of dynamic, competing factors. These include the impact of fossil fuel prices (absolute and relative), carbon prices, environmental legislation (for example the Industrial Emissions Directive), technical constraints, use of system charges and wider commercial considerations.

In 2012, DUKES estimates that Scotland had just over 4.5 GW of installed fossil fuel generating capacity, with the coal fired Longannet and Cockenzie power stations making up the majority of this capacity. The gas fired power station at Peterhead accounts for much of the remaining fossil fuel capacity.

In early 2013, Cockenzie power station used up its remaining operating hours under the Large Plant Combustion Directive (LPCD) and was closed leaving Scotland with around 3.5 GW of installed fossil fuel capacity.

In 2013, fossil fuels accounted for 32.0% of Scotland’s electricity generation, down from 36.1% in 2012. Coal and gas provide the main fossil fuels used for electricity generation with oil used to a lesser extent. 2013 saw the lowest contributions to overall electricity generation from gas and oil since at least the year 2000 (see figure 3.12).

Coal accounted for 20.6% of total generation, down from 23.7% in 2012 following the closure of Cockenzie. Although overall there is a decrease in the amount of fossil fuels used to generate electricity, coal attributes a higher proportion of the electricity generated by fossil fuels than gas. Proportionally increased coal generation reflects a broader change in the generation mix across Europe.
Figure 3.13 shows the gas and coal prices for large users in the UK, the left axis shows the price per kWh and the right axis shows the relative price of coal (where gas = 100).

Due to high gas prices and low coal prices, combined with a low EU carbon price, coal generation has been more profitable than gas generation.

Nuclear Generation

DUKES estimates that at end of May 2014 there was just over 2 GW of installed and operational nuclear capacity in Scotland, consisting of Torness (1185 MW) and Hunterston B (960 MW) nuclear generating stations.

In 2013, 34.9% of electricity generated in Scotland came from the two Nuclear power stations, up from 33.8% in 2012. Figure 3.14 below shows the output from nuclear generation since 2000, ranging from a high of 18,681 GWh in 2005 to a low of 12,344 GWh just two years later.

Figure 3.14: Nuclear electricity generation in Scotland (GWh), 2000-2013

While Hunterston B had been scheduled to close in 2016, in 2012 owner EDF successfully applied for a 7 year life extension meaning that the plant will continue to operate until 2023.

Torness is also currently due to be decommissioned in 2023 (although they may also apply for a plant extension if the appropriate health and safety requirements can be evidenced). There are no plans for more nuclear power stations in Scotland. Further detail on this can be found in the Scottish Government’s Electricity Generation Policy Statement.
Renewable Electricity

Installed renewable capacity has risen year on year since 2000 and as shown in Figure 3.15, there has been an increase from under 1,400 MW in 2000 to 6,590 MW in 2013. This increase can mainly be attributed to the large increase in operational wind projects. Despite the challenging economic conditions, 2013 saw an increase in renewable installed capacity of 809 MW, up approximately 14% from 2012.

‘Installed renewable capacity has risen year on year since 2000’

Common Electricity Calculations

Generating output is the actual generated electricity delivered by a generating plant over a period of time. Installed capacity is the maximum power output at which an electricity generating plant can operate. Capacity factor is the actual output as a proportion of the theoretical maximum output.

Generating output can be calculated by multiplying the installed capacity of the plant by the number of hours in a year, and then by the capacity factor for that technology.

A 5 MW onshore wind turbine located in Scotland has, on average, a 26.7% capacity factor;

$$5\text{MW} \times 365 \text{ days} \times 24 \text{ hours} \times 26.7\% = 11,695 \text{ MWh}$$

Which equates to, on average, 11,695 MWh per year generated by a 5MW onshore wind turbine located in Scotland.

The equivalent number of domestic households the 5MW onshore wind turbine could power over a year can be calculated by taking account of distribution and transmission losses and dividing by the average domestic household consumption in Scotland.

$$\frac{5\text{MW} \times 365 \text{ days} \times 24 \text{ hours} \times 26.7\% \times 95.5\% (\text{taking account of losses})}{4.435 \text{ MWh (the average household consumption in Scotland)}} = 2,518 \text{ households}$$

A 5MW onshore turbine could, on average, generate enough electricity to power the equivalent of approximately 2,518 domestic households in Scotland for a year.
DATA DEVELOPMENT

Renewable Planning Statistics (continued from page 48)

Using Scottish extracts from the Renewable Energy Planning Database (REPD), the Scottish Government have been publishing quarterly reports since March 2013 providing a breakdown of renewables capacity by stage of development (for example, in planning, consented, under construction, or operational) and local authority area in Scotland.

For the latest information (published in December 2014) please see:

The Scottish Government continues to engage with key partners regularly to enhance the depth and quality of this data, primarily to ensure that there is a comprehensive and robust database for all key stakeholders to access information at a national and local level. For example, exploring options for improving the presentation of renewable project data through mapping tools and linking with other relevant datasets to enhance the coverage and range of information we can provide quarterly.

As at September 2014, Scotland had 7.1 GW of installed renewable electricity generation capacity, with an additional 8.7 GW of capacity either under construction or consented, the majority of which is expected from wind generation, both onshore and offshore.

Figure 3.16: Renewable Capacity in Scotland by Planning Stage, September 2014

Taking into account pipeline projects in planning, this figure totals 19.8 GW, see Figure 3.16.

The Scottish Government recognises that there are a number of factors which mean that not all the projects consented will progress to commissioning, and the renewable electricity targets remains challenging.

Please note:
The data for those projects ‘in planning’, ‘consented – awaiting construction’, and ‘under construction’ are sourced from an extract the Renewable Energy Planning Database (September 2013). The ‘operational’ capacity figure is the provisional Q3 2013 figure sourced from DECC’s quarterly energy trends publication. The REPD ‘operational’ figure excludes projects not going through the formal planning system, Large scale hydro, and projects that are generating but not fully completed.
Figure 3.17 and Figure 3.18 show the capacity (GW) and number of projects split by planning status and technology (‘other’ includes biomass, Hydro, Bioenergy and wastes, Solar and Wave and tidal).

**Overall** (all pre-operational projects):

- 61% of the capacity is accounted for by onshore wind
- 33% is accounted for by offshore wind
- Biomass-co-firing, hydro, landfill gas, municipal and industrial waste and tidal and stream accounting for around 1% each.

**Projects in planning:**

- In planning projects account for 20% of the overall capacity in the planning system with 391 projects in total.
- Onshore wind projects account for 93% of the capacity and 91% of the number of projects.
- Biomass accounts for 4% of the capacity but only 1% of the amount of projects.

**Consented and awaiting construction:**

- Projects that are **consented and awaiting construction** accounts for 41% of the overall capacity in the planning system.
- Offshore wind projects account for 51% of capacity and onshore wind projects account for 43%.
- Although around half of the capacity which is awaiting construction is made up of offshore wind projects this amounts to only 9 large-scale projects—only 2% of the number of projects which are awaiting construction.

**Figure 3.17: Capacity of Pipeline Renewable Projects in Scotland, September 2014**

**Source:** DECC
Generation of renewable electricity from non-hydro sources has grown year on year since the start of the century from a starting point of almost zero as shown in Figure 3.19. Building upon a long established base of hydro generation, the growth in deployment thus far has been predominantly through onshore wind. However, Scotland has significant growth opportunities in offshore wind as well as wave and tidal technologies. As highlighted in the Renewables Routemap and draft Electricity Generation Policy Statement, with additional opportunities from the deployment of carbon capture and storage, Scotland will continue to move towards a balanced low carbon generation mix.

The Scottish Government has set a target to deliver the equivalent of 100% of gross consumption through renewable sources in 2020 as part of a wider, balanced electricity mix, with thermal generation playing an important roll.

The renewable electricity generation figures for Scotland show that generation during 2013 was 16,967 GWh – up 16.3% on 2012 (the previous record year for renewables), with the equivalent of 44.4% of gross consumption in Scotland met using renewable sources (see the Monitoring the 100% Electricity Target Box on the following page). The update to the Renewables Routemap in October 2012 published a new interim target of 50% by 2015—the latest renewables routemap can be found at the following link:


Provisional data from the published DECC regional quarterly generation statistics for the first three quarters of 2013 point towards another strong year for renewable generation. As an illustration of this, an additional 599 MW of capacity (7,112 MW total) was operational compared with the end of 2013. Provisional estimates show that renewable output in the first three quarters of 2013 (13,121 GWh) is 21% higher than the same three quarters of 2013 – the current record year for renewable output.
Figure 3.19 below shows renewable generation output by technology on the left axis and the percentage of gross consumption on the right axis. The graph highlights the year on year growth in wind output, such that from 2010 onwards wind has generated more electricity than hydro.

**DATA NOTE**

DECC’s quarterly regional data will provide an early indication of progress towards the output levels required to deliver the new interim target of 50% by 2015 in March 2016. However, it will not be possible to officially report against the new target until the Scottish consumption data is published in December 2016.
The difference in Scotland’s proportion of wind output and wind capacity is explained by the fact that the UK has a higher proportion of wind capacity from offshore sites. As offshore sites tend to experience higher load factors, the overall average generation is higher.

Scotland has by far the greatest electricity generation from renewables per unit of economic activity compared with UK regions as illustrated in Figure 3.21 (GVA is used as a proxy for economic activity).

Scotland is over 4.5 times larger than that of the UK as a whole, and double than that of the country/region in second place (East of England).

*The difference in Scotland’s proportion of wind output and wind capacity is explained by the fact that the UK has a higher proportion of wind capacity from offshore sites. As offshore sites tend to experience higher load factors, the overall average generation is higher.
Figure 3.22 shows renewables as a percentage of gross consumption for EU countries in 2012.

Austria ranks first with 65.5%. Scotland ranks fifth, with the equivalent of 38.8% of gross consumption generated from renewable sources, which was ahead of both the UK (ranked 24th with 10.8%) and the EU average of 23.5%.

Figure 3.22: Renewables as a percentage of gross consumption for EU countries, 2012

Source: Eurostat
‘Heat demand in Scotland has fallen by 15% since 2005’
HEAT

KEY FACTS

In 2012 Scotland generated...

3.0 %

...of heat demand from renewables sources

RHI

The Renewable Heat Incentive (RHI) is the UK’s financial support programme for renewable heat, and it pays those that generate and use renewable energy to heat their buildings.

Percentage of all GB accredited installations in Scotland:

DOMESTIC: 16%
NON-DOMESTIC: 18%

84%

...of all applications in Scotland are from off gas grid properties

HOW SCOTLAND COMPARES ACROSS EUROPE

Percentage of heat generated from renewable sources across Europe in 2012.

SCOTLAND........3.0%
UK.................2.4%
EU average........15.6%

In Scotland, 55% of total energy consumption is accounted for by heat demand (non-electrical)...approximately 42% is consumed domestically and 58% in the industrial and commercial sectors

In 2013, renewable heat generation in Scotland...

up 17%

...from 2012 to 2,900 GWh...now enough to heat 200,000 homes

Two thirds of all heat demand in Scotland lies within 1km of the coastline (Source: Scotland Heat Map)

Combined heat and power (CHP) schemes capture heat from the electricity generation process that would otherwise have been wasted. In 2013, 12% of the heat generated from CHP in the UK was in Scotland (5,713 GWh)...enough to heat 400,000 homes

RHI

Percentage of all GB accredited installations in Scotland:

DOMESTIC: 16%
NON-DOMESTIC: 18%

84%

...of all applications in Scotland are from off gas grid properties
Heat Demand in Scotland

Heat is estimated to account for over half of Scotland’s total energy use (see figure x). Switching from fossil fuel to renewable sources of heat has the potential to reduce greenhouse gas emissions, and make a significant contribution to Scotland’s overall renewable energy target.

In 2012, of the 55% of total energy consumption accounted for by non-electrical heat demand (see box on page 66 for more information on electrical heat use), approximately 42% was consumed domestically and 58% in the industrial and commercial sectors. Some of this industrial heat is required at very high temperatures, such as up to 1450°C in a cement kiln. Figures published by DECC on heat use in the UK suggest that the total commercial heat demand and total industrial heat demand in the UK were broadly similar in 2013.

Since 2005 there has been a significant reduction in the consumption of energy used for heating (and cooling) in Scotland—decreasing by 15% from 97,800 GWh to 82,700 GWh. This reduction is similar in both the domestic and industrial commercial sectors (see figure 4.2).

Heat demand varies over the day, at weekends and holidays and, in the case of space heating, heat demand is significantly higher in winter months. The pattern of heat use is highlighted in figure 4.3 using analysis showing annual gas and electricity consumption in the UK - demand for gas in the winter can be as much as five times the demand for electricity.
Gas Consumption

The most common heating fuel in Scotland is gas—and 58% of all gas consumed in Scotland is used domestically. 78% of Scottish households (around 1.9 million) use mains gas as their primary heating fuel. This is up from 76% in 2012 and 72% in 2007.

In 2013, domestic gas consumption per consumer in Scotland stood at 14.3 MWh, a 3.5% reduction from 14.8 MWh in 2012. This also represents a near 29% reduction since 2005. The 14.3 MWh average in Scotland remains the highest of any GB country or region - 4.4% higher than the GB average of 13.7 MWh.

As shown in figure 4.4, while gas accounts for the majority (78%) of Scottish households’ primary heating systems, electricity accounts for 13% and oil 6%. Communal heating and solid fuels cover the majority of the remainder.

Estimates for the UK in 2013 show that gas accounts for a similar proportion of heating in the domestic sector at 79%. However, electricity only accounts for 9% demonstrating that Scotland has higher dependency on electricity as a primary heating fuel.

DATA NOTE—OFF GAS GRID

The islands and remote parts of rural Scotland are off the gas grid. Therefore the gas consumption statistics tend to be presented per customer rather than per household, as the ‘per customer’ figure gives a better indication of the amount used by a typical gas user.

Data published by DECC estimates that 17% of households in Scotland are off gas grid. Excluding Orkney, Shetland and Eileen Siar (Western Isles), the local authorities with the highest proportions are Highland (62%), Argyll & Bute (49%) and Aberdeenshire (42%).

ELECTRICITY USED FOR HEAT IN SCOTLAND

At present, the measure of heat consumption in Scotland accounts for the non-electrical heat demand only.

It is estimated that around 13% of households in Scotland current use electricity as their primary heating fuel. This is an area where the Scottish Government are pursuing better data on the characteristics of those households which rely on electricity as their primary heating fuel, and in particular those who are off gas grid.

Estimates published by DECC for the UK indicate that electricity used for heat accounts for an even larger proportion of all heat demand in the industrial and commercial sectors, 25% and 19% respectively. Electricity accounts for 9% of all heat demand in the domestic sector for the UK as a whole.

For more information, please see the following UK article published by DECC:


Figure 4.5 below compares the average gas consumption per consumer in Scotland, Wales and the English regions in 2013.

*Figure 4.5: Average domestic gas consumption per consumer, regions and countries of GB, 2013*

As expected, other northern parts of the UK, such as the North East and Yorkshire and the Humber, tend to have higher domestic consumption per customer, in part due to the impact of weather differences on demand for heating fuel.
Figure 4.6 shows that domestic gas consumption per consumer has decreased steadily in Scotland between 2005 and 2012 (-29% overall). Rising gas prices and improved energy efficiency in homes and boilers were contributing factors to this trend. Please see sections on energy efficiency in chapter 2 and energy prices in chapter 7 for more information.

**Figure 4.6: Average domestic gas consumption per consumer, Scotland, 2005 - 2013**

Source: DECC

Non-domestic gas consumption

Industrial and commercial gas consumption makes up 42% of all gas consumed in Scotland (see data note below). Figure 4.7 compares how total non-domestic and domestic gas consumption has changed since 2005. Total domestic gas consumption has decreased by 21% between 2005 and 2013. Over the same period, non-domestic gas consumption has reduced by 20% - just marginally less. Hence maintaining a similar share of all gas consumption compared with 2005.

**DATA NOTE - NON-DOMESTIC GAS DATA**

A limitation of the gas consumption data is that it is not possible to accurately determine all of the non-domestic consumers accurately. DECC use the gas industry standard “Annual Quantity” cut-off point of 73,200 kWh and classifies all consumers using under that annual consumption as domestic consumers. Unfortunately, this classification incorrectly allocates many small businesses to the domestic sector and, conversely, a small number of larger domestic consumers to the non-domestic sector. This also implies that a small number of meters can change sector from year to year.

Also, gas used by power stations and some large industrial users, as well as a relatively small quantity of gas that is not supplied through the National Transmission System, are excluded from these statistics. Further information is available from the methodology document published by DECC to accompany these statistics.

HEAT

DATA NOTE - WEATHER CORRECTED GAS DATA

The gas data are weather corrected; that is, the consumption figure is revised downward in colder years and upwards in warmer years, to isolate changes in demand that are not due to year-on-year weather variation.

Please see the following document (published by DECC) for more information:

SCOTLAND BY INTERMEDIATE GEOGRAPHY ZONE, 2013

Average Consumption (kWh)

- 0 or N/A
- 1 - 12,100
- 12,100 - 15,300
- 15,300 - 19,400
- 19,400 - 32,500

Source: DECC

FIGURE 4.9: DOMESTIC GAS CONSUMPTION - Average Consumption (kWh per meter)
FIGURE 4.10: DOMESTIC GAS CONSUMPTION - Average Consumption (kWh per meter)

CENTRAL BELT OF SCOTLAND BY INTERMEDIATE GEOGRAPHY ZONE, 2013

The tables above show both the ten highest and ten lowest domestic gas consuming areas (average per household gas meter) in Scotland. It is interesting to note that all of the ten lowest consuming areas were within the City of Edinburgh and City of Glasgow local authorities.

Please see Annex D for more information regarding the source of this information and points to be aware of when using this analysis.

DATA NOTE - INTERMEDIATE GEOGRAPHY ZONES (IGZ)

The data zone is the key small area statistical geography in Scotland. The intermediate geography will be used to disseminate statistics that are not suitable for release at the data zone level.

There are 1235 intermediate zones in Scotland, containing on average 4000 household residents.

For more information:
http://www.scotland.gov.uk/Publications/2005/02/20732/53083
FIGURE 4.11: NON-DOMESTIC GAS CONSUMPTION - Average Consumption (kWh per meter)

SCOTLAND BY INTERMEDIATE GEOGRAPHY ZONE, 2013

Average Consumption (kWh)
- Less than 73,000
- 73,000 - 200,000
- 200,000 - 375,000
- 375,000 - 6,000,000
- Greater than 6,000,000

Source: DECC
### Central Belt of Scotland by Intermediate Geography Zone, 2013

Figure 4.12: Non-domestic gas consumption - Average consumption (kWh per meter)

#### Highest 10 Consuming Zones...

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>Local Authority</th>
<th>Average Consumption (kWh)</th>
</tr>
</thead>
<tbody>
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<td>1st Dalry West</td>
<td>North Ayrshire</td>
<td>93,766,871</td>
</tr>
<tr>
<td>2nd Cowdenbeath North</td>
<td>Fife</td>
<td>33,345,937</td>
</tr>
<tr>
<td>3rd Bo'ness - Douglas</td>
<td>Falkirk</td>
<td>21,308,885</td>
</tr>
<tr>
<td>4th South Speyside and the Cabrach</td>
<td>Moray</td>
<td>19,537,020</td>
</tr>
<tr>
<td>5th Windygates and Coaltown</td>
<td>Fife</td>
<td>18,910,576</td>
</tr>
<tr>
<td>6th Heldon West, Fogwatt to Inchberry</td>
<td>Moray</td>
<td>16,307,020</td>
</tr>
<tr>
<td>7th North Speyside</td>
<td>Moray</td>
<td>14,400,326</td>
</tr>
<tr>
<td>8th Springside and Rural</td>
<td>North Ayrshire</td>
<td>13,528,811</td>
</tr>
<tr>
<td>9th Invergordon</td>
<td>Highland</td>
<td>12,653,394</td>
</tr>
<tr>
<td>10th Alloa South and East</td>
<td>Clackmannshire</td>
<td>11,254,358</td>
</tr>
</tbody>
</table>

#### Lowest 10 Consuming Zones...

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>Local Authority</th>
<th>Average Consumption (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Chapelton, Glengavel and Sandford</td>
<td>South Lanarkshire</td>
<td>90,337</td>
</tr>
<tr>
<td>2nd Westerton West</td>
<td>East Dunbartonshire</td>
<td>100,874</td>
</tr>
<tr>
<td>3rd Fishcross, Devon Village and Coalsnaughton</td>
<td>Clackmannshire</td>
<td>100,874</td>
</tr>
<tr>
<td>4th Lenzie South</td>
<td>East Dunbartonshire</td>
<td>108,477</td>
</tr>
<tr>
<td>5th Whitecraigs and Broom</td>
<td>East Renfrewshire</td>
<td>110,147</td>
</tr>
<tr>
<td>6th Bonaly and The Pentlands</td>
<td>Edinburgh, City of</td>
<td>113,508</td>
</tr>
<tr>
<td>7th Barnton, Cammo and Cromond South</td>
<td>Edinburgh, City of</td>
<td>115,506</td>
</tr>
<tr>
<td>8th St Leonards North</td>
<td>South Lanarkshire</td>
<td>120,229</td>
</tr>
<tr>
<td>9th South Castlehill and Thorn</td>
<td>East Dunbartonshire</td>
<td>124,989</td>
</tr>
<tr>
<td>10th Pollokshields West</td>
<td>Glasgow City</td>
<td>125,136</td>
</tr>
</tbody>
</table>

DATA NOTE - LOCAL AREA CONSUMPTION

DECC produce gas and electricity sub-national energy consumption analysis below local authority level. These data are used by a range of users for different purposes, including enabling local authorities to better understand local energy use with the ability to monitor and target small areas for interventions as part of their local energy strategies. Data is available here: [https://www.gov.uk/government/collections/sub-national-gas-consumption-data#mlsoa-llsoa-data](https://www.gov.uk/government/collections/sub-national-gas-consumption-data#mlsoa-llsoa-data)

The tables above show both the ten highest and ten lowest industrial and commercial gas consuming areas in Scotland (average per non-domestic gas meter). Please note that this analysis excludes a considerable amount of consumption fed directly to power stations and some very large industrial consumers, as this would be disclosive. Please see Annex D for more information regarding the source of this information and notes on this analysis.
What is a heat map?
The Scotland Heat Map models heat demand on an individual building level. Every building in Scotland with a unique property reference number is assigned a heat demand value typical for a building of that type, age and use.

The Scotland Heat Map is a powerful tool to help Scotland meet its renewable heat, low carbon and fuel poverty targets.

All Scottish local authorities have access to the Heat Map dataset for their area. Certain public sector organisations such as Scottish Enterprise and NHS Boards also have access to the Scotland Heat Map data.

“Having access to the Scotland Heat Map for the West Edinburgh Energy Masterplanning project gave us quick access to a compiled set of heat demand data and allowed us to focus our effort on creating a locally accurate heat map, saving us time and effort. “

Paul Steen, Ramboll Energy

What are the benefits?
The Scotland Heat Map is a good first place to look for new opportunities – where can demand be matched with supply? Where would benefit most from cheap, low carbon heating? It is also a valuable pre-feasibility tool, helping to answer questions such as - which areas should we focus resource on? What are the most promising sites for a new District Heating Scheme? Where should we target retrofit heat solutions?

The Scotland Heat Map is a powerful tool to inform strategic energy planning and policy development such as Local Development Plans and the Heat Generation Policy Statement.

It can also be used to inform and support local investment proposals and help manage pipeline energy infrastructure projects as it can be combined and presented with any other geospatial data.
What else is in the heat map?

The Heat Map contains many other useful datasets besides heat demand. It has data on Energy Supply points – both heat generation and electricity generation have been mapped on an individual site basis (where available).

The Scotland Heat Map contains the most up to date and comprehensive data available on existing and planned district heating networks.

Opportunities and constraints data has also been included so heat map data can be considered in context. Examples of these are some local development plans and conservation areas.

The data used to create the heat map was provided by many different organisations from both the public and private sector and all local authorities.

The full list of data layers is available in the heat map methodology documentation accessible through:

www.scotland.gov.uk/heatmap.

How can I access the heat map data?

Public sector organisation

Please contact heatmap@scotland.gsi.gov.uk. Please note – due to restrictions on some data sources, only certain organisations can have access to the full heat map database.

Company or organisation

Please contact your Local Authority. A table of heat map email contacts is available at www.scotland.gov.uk/heatmap on the ‘Who Has the Map?’ page.

Researcher or member of the public

Access the public version at www.scotland.gov.uk/heatmap. If you are interested in using the GIS data please contact heatmap@scotland.gsi.gov.uk
Feedback, Validation and General Enquiries

The Scotland Heat Map is still in development. User feedback is invaluable in helping us direct resources where they can produce most benefit to heat map users. We are keen to hear from you if you have feedback on any aspect of the heat map, whether it be specifics of the data through to its use as a funding tool.

In addition to feedback we appreciate any responses regarding data quality. Drawing together multiple datasets with millions of records means local knowledge is invaluable in highlighting areas we may need to improve.

To provide any feedback, data corrections or general enquiries please contact:

heatmap@scotland.gsi.gov.uk

“The Scotland Heat Map has provided us with a wealth of data allowing us to identify potential decentralised energy projects in Perth - saving us money by ensuring our consultants only have to assess the technical merits of proposals rather than spend time gathering data. It is a significant improvement on our pilot project Heat Map”

Graham Esson, Perth and Kinross Council
Renewable Heat Generation in Scotland

Low carbon and renewable heat technologies can support emissions reductions whilst also offering significant economic opportunities to reduce industry and householder costs. It can also enable new or emerging sectors to develop products and services for use around the world. Some of these technologies can also help to diversify Scotland’s sources of heat, to build up security of supply for the future.

In 2013, an estimated 0.662 GW of renewable heat capacity was operational in Scotland, producing an estimated 2,904 GWh of useful renewable heat. This represents an 18% increase in renewable heat capacity and a 17% increase in heat generated from renewable sources compared with 2012.

Figure 4.13 shows how the level of renewable heat generation Scotland has changed over the last few years. Since 2008/09, generation has more than trebled, from 845 GWH to 2,904 GWh in 2013.

The following are technologies which produce heat from renewable sources:

- biomass (wood) primary combustion
- biomass (wood) combined heat and power (CHP)
- solar thermal panels
- heat pumps: water source, air source and ground source
- fuel cell biomass
- deep geothermal
- energy from waste (EfW), including:
  - anaerobic digestion (AD)
  - landfill gas capture
  - biomass primary combustion of biodegradable material (other than wood)
  - advanced thermal treatment (ATT), using pyrolysis and/or gasification
Renewable heat installation size

As table 4.1 shows, the majority of renewable heat output in Scotland continues to come from large (1MW+) installations. In 2013, the number of large installations contributed 62% of the renewable heat capacity and 81% of the annual output. However, they represent only 0.4% of the total number of installations. The large installations tend to have longer running hours and (in some cases) higher efficiencies. In addition, the large installation category includes installations which are primarily using renewable heat to provide process heat, as a product of combined heat and power, or for waste disposal, which are year-round activities. Small to medium, and micro installations, are more likely to be used to provide space heating and/or hot water for buildings, whose demands are more seasonal.

Table 4.1: Renewable heat statistics by installation size, Scotland, 2013

<table>
<thead>
<tr>
<th></th>
<th>RENEWABLE HEAT CAPACITY (MW)</th>
<th>% RENEWABLE HEAT CAPACITY</th>
<th>ANNUAL OUTPUT (MWh)</th>
<th>% ANNUAL OUTPUT</th>
<th>NUMBER OF INSTALLATIONS</th>
<th>% OF INSTALLATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE (&gt;1 MWTH)</td>
<td>413</td>
<td>62%</td>
<td>2,360,995</td>
<td>81%</td>
<td>36</td>
<td>0.4%</td>
</tr>
<tr>
<td>SMALL TO MEDIUM</td>
<td>104</td>
<td>16%</td>
<td>249,917</td>
<td>9%</td>
<td>567</td>
<td>6.9%</td>
</tr>
<tr>
<td>(&gt;45kWth &amp; &lt;1MWth)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MICRO (&lt;45kWth)</td>
<td>145</td>
<td>22%</td>
<td>292,592</td>
<td>10%</td>
<td>7,504</td>
<td>90.7%</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>-</td>
<td>0%</td>
<td>574</td>
<td>0%</td>
<td>163</td>
<td>2.0%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>662</td>
<td>100%</td>
<td>2,904,078</td>
<td>100%</td>
<td>8,270</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: EST

Renewable heat technologies

Table 4.2 shows that the majority of both output and capacity in 2013 came from biomass primary combustion and biomass combined heat and power. 83% of renewable heat capacity, and 90% of renewable heat output came from installations which used biomass primary combustion or biomass combined heat and power.

Table 4.2: Renewable heat statistics by technology type, Scotland, 2013

<table>
<thead>
<tr>
<th></th>
<th>RENEWABLE HEAT CAPACITY (MW)</th>
<th>% RENEWABLE HEAT CAPACITY</th>
<th>ANNUAL OUTPUT (MWh)</th>
<th>% ANNUAL OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOMASS</td>
<td>290</td>
<td>44%</td>
<td>1,198,051</td>
<td>41%</td>
</tr>
<tr>
<td>BIOMASS CHP</td>
<td>261</td>
<td>39%</td>
<td>1,419,400</td>
<td>49%</td>
</tr>
<tr>
<td>ENERGY FROM WASTE</td>
<td>16</td>
<td>2%</td>
<td>120,811</td>
<td>4%</td>
</tr>
<tr>
<td>HEAT PUMPS</td>
<td>64</td>
<td>10%</td>
<td>151,162</td>
<td>5%</td>
</tr>
<tr>
<td>SOLAR THERMAL</td>
<td>30</td>
<td>5%</td>
<td>14,654</td>
<td>0.5%</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>0.25</td>
<td>0%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>662</td>
<td>100%</td>
<td>2,904,078</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: EST
Renewable Heat Target

The 2009 Renewable Heat Action Plan set a target of delivering 11% of Scotland’s projected 2020 heat demand from renewable sources. In 2012, renewable heat generation equated to 3.0% of Scotland’s non-electrical heat demand, up from 2.7% in 2011.

**Figure 4.14: Share of renewable heat in non-electrical heat demand, Scotland, 2008/09 - 2012**

Table 4.3 below shows that over the year to 2012, renewable heat generation increased by 9.6%, while non-electrical heat demand decreased by 3.1%.

<table>
<thead>
<tr>
<th>Year</th>
<th>Renewable Heat (GWh)</th>
<th>Heat Demand (non-electrical, GWh)</th>
<th>% Renewable Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/09</td>
<td>845</td>
<td>85,039</td>
<td>1.0%</td>
</tr>
<tr>
<td>2010</td>
<td>1,696</td>
<td>87,123</td>
<td>1.9%</td>
</tr>
<tr>
<td>2011</td>
<td>2,263</td>
<td>85,328,</td>
<td>2.7%</td>
</tr>
<tr>
<td>2012</td>
<td>2,481</td>
<td>-</td>
<td>3.0%</td>
</tr>
<tr>
<td>2013</td>
<td>2,904</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Sources: EST, DECC, Scottish Government

**International comparisons**

In 2012, renewable energy accounted for 15.6% of total energy use for heating and cooling in the EU. This is a significant increase from 9.9% in 2004. Increases in industrial sectors, services and residential use (building sector) contributed to this growth.

**Figure 4.15**: Share of renewable heat of all heating and cooling demand, countries of EU, 2012

Although good progress has been made in Scotland since 2009, the share of renewable heat remains well below the EU average, but higher than the UK.
DATA DEVELOPMENT

Heat Pathways Scenario Model

The Scottish Government’s Draft Heat Generation Policy Statement (HGPS) sets out how low carbon heat can reach more householders, businesses and communities in Scotland. The document outlines how Scotland might reduce the amount of energy used for heat, diversify sources of heat, provide increased security of heat supply and reduce the pressure on household energy bills.

To enhance the evidence base informing the HGPS, the Scottish Government commissioned a forward projection model to explore scenarios and pathways for decarbonising the heat system in Scotland up to 2050. The Heat Pathways Scenario Model brings together all heat use and generation within Scotland associated with the use and occupation of buildings, including space heating and cooling, hot water supply, cooking, and heat used in industrial processes.

The model explores different pathways of heat decarbonisation by altering two key drivers – the level and nature of ‘Government Intervention’ (GI), which encompasses action taken by Government to either mandate or incentivise the uptake of measures to reduce energy demand or to increase switching to low carbon supply technologies, – and the level and nature of Uptake (UT), which represents the level of willingness amongst individuals and businesses to adopt demand reduction measures and alternative low carbon supply installations.

Through altering levels of GI and UT the model can create a wide range of future heat decarbonisation scenarios. The graph below illustrates four illustrative pathways based on low and high levels of Government Intervention and Uptake, along with a reference scenario which is intended to reflect the continuation of existing government policies.

Scottish Heat Emissions, Scenario Comparison
Renewable Heat Incentive (RHI)

The RHI is a UK Government scheme set up to encourage uptake of renewable heat technologies amongst householders, communities and businesses through financial incentives. It is the first of its kind in the world, and the Scottish Government expects the RHI to contribute towards the 2020 ambition of 11% of heating coming from renewable sources. The RHI will help to sustain and build the supply-chains needed to deliver the Scottish Government’s aspirations for renewable heat in 2020 and beyond.

The RHI is designed to bridge the gap between the cost of fossil fuels heat sources and renewable heat alternatives. The scheme pays owners of participating installations based on the renewable heat supplied to their (or others) buildings. By increasing the generation of heat from renewable energy sources (instead of fossil fuels), the RHI helps the UK reduce greenhouse gas emissions and meet targets for reducing the effects of climate change. There are two parts to the RHI:

**Domestic RHI** – launched 9 April 2014 and open to homeowners, private landlords, social landlords and self-builders

**Non-domestic RHI** – launched in November 2011 to provide payments to industry, businesses and public sector organisations

DECC publish statistics on a monthly basis providing an update on the uptake of both the non-domestic and domestic Renewable Heat Incentive (RHI) schemes. The latest data is for uptake as at December 2014. See here:


**Domestic RHI**

There is considerable difference in the uptake rates across Great Britain, with Scotland maintaining a higher than population share.

- 15.6% of all GB applications (3,549 of 22,755)
- 15.5% of all GB accreditations (3,000 of 19,309)

In terms of the renewable heat technologies being accredited, figure 4.16 shows that biomass is the single most popular technology accounting for 42% of all domestic RHI accreditations in Scotland to date. Although, when considering both air source and ground source heat pumps together they account for nearly 42% of all accreditations.

![Figure 4.16: RHI accreditations by technology, Scotland, as at December 2014](source: DECC)
There is data available which shows the number of accreditations made from properties in Scotland and whether or not they are off gas grid. In Scotland, 84% of accreditations from properties off gas grid (see page 65 for more information on off gas grid), compared to 70% for GB as a whole. Disaggregating further, by technology type, shows the proportion of accreditations for each technology that are made from off gas grid properties:

- Biomass (88%)
- GSHP (88%)
- ASHP (86%)
- Solar thermal (68%)

The local authority area with the largest proportion of accredited domestic installations to date is Highland with 20%. Aberdeenshire is second with 9%, and Perth & Kinross in third place with 7%.

Non-Domestic RHI

Similar to domestic RHI, Scotland maintains a higher than population share of its non-domestic counterpart.

- 18.6% of all GB applications (2,133 of 11,487), with 21.0% of the capacity (396.4MW of 1,887.8MW)
- 17.6% of all GB accredited installations (1,274 of 7,258), with 18.5% of the capacity (225.2MW of 1,215.3MW)

The local authority area with the largest proportion of accredited non-domestic installations to date is Dumfries & Galloway with 19%. Highland is second with 15%, and Aberdeenshire in third place with 9%. Although Dumfries & Galloway accounts for the largest proportion of installations, Highland accounts for the largest proportion of overall capacity in Scotland with 21%.

“Non-domestic RHI is designed to bridge the gap between the cost of fossil fuel heat installations and renewable heat alternatives”

Department for Energy and Climate Change
Combined Heat and Power (CHP)

Combined heat and power (CHP) schemes capture heat from the electricity generation process that would otherwise have been wasted and uses the heat for productive purposes such as space heating. Table 4.4 sets out the current number of CHP schemes, their capacity and output, for Scotland and the UK.

Table 4.4: CHP statistics by installation size, Scotland, 2013

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of schemes</td>
<td>113</td>
<td>119</td>
<td>127</td>
</tr>
<tr>
<td>Electrical capacity</td>
<td>494</td>
<td>496</td>
<td>510</td>
</tr>
<tr>
<td>Electricity generated</td>
<td>2,653</td>
<td>2,274</td>
<td>2,338</td>
</tr>
<tr>
<td>Heat generated</td>
<td>6,649</td>
<td>6,000</td>
<td>5,713</td>
</tr>
<tr>
<td>UK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of schemes</td>
<td>1,791</td>
<td>1,955</td>
<td>2,014</td>
</tr>
<tr>
<td>Electrical capacity</td>
<td>5,969</td>
<td>6,175</td>
<td>6,170</td>
</tr>
<tr>
<td>Electricity generated</td>
<td>22,767</td>
<td>22,950</td>
<td>20,891</td>
</tr>
<tr>
<td>Heat Generated</td>
<td>48,184</td>
<td>48,244</td>
<td>46,701</td>
</tr>
</tbody>
</table>

In 2013, 12% of the heat generated from CHP in the UK was in Scotland (5,713 GWh). Enough to heat 400,000 homes.

There are 127 CHP schemes in Scotland, an increase of 12% since 2011. Over the same period the electrical capacity has increased by 3% and now stands at 510 MW.

However, the heat generated from CHP has decreased over this period, by 14%, totalling 5,713 GWh in 2013. This is enough to heat the equivalent of 400,000 homes in Scotland (using the estimate for the average domestic gas consumption per household in Scotland).

See pages 75 for renewables CHP heat output estimates from the Energy Savings Trust.

The full article “Combined Heat and Power in Scotland, Wales, Northern Ireland and the regions of England” is published annually by DECC and the latest report (for 2013) is available here:

Other unused or excess heat

Aside from capturing waste heat from the electricity generation process of a CHP plant, many industrial processes and commercial buildings generate heat as a by-product. The unused excess heat is often rejected as waste and can be costly to cool where this is required before expulsion into the environment. Unused excess heat may have an economic value when recovered for re-use or exported for secondary use by others. This heat can be used for many purposes, depending on its temperature and the wider circumstances.

Further data on the potential for unused or excess heat will be available over the coming year, primarily through work being carried out for the Scotland Heat Map (see page 73).

District Heating

District heating networks are a means of distributing heat to homes, businesses and public buildings, to allow us to make efficient use of a range of heat sources. Heat exchangers in individual buildings allow consumers to tap into the heat network for affordable controllable heat to meet their heat demand. In Scotland, individual boilers heating individual buildings are the main source of heat, but many other European countries have heat networks that supply towns or whole cities, resulting in lower carbon emissions, cheaper heating and long-term investment in infrastructure which can be adapted to meet changing energy markets.

There have already been some significant heat network developments in Scotland. The Scottish Government commissioned the Energy Saving Trust to carry out a study which created a database of 112 operational district heating networks supplying around 10,000 homes and a range of public, commercial and industrial buildings. The total estimated capacity of district heating schemes in operation in Scotland is nearly 100 MWth, about half of which is renewable, mainly biomass.

More data on district heating schemes will become available over the coming year through the Scotland Heat Map (see page 73) and through new Heat Metering Regulations.
'In 2013 renewable fuels had a 3.5% share of road fuels'
In 2013 biofuels had a ... 3.5% ...share of road fuels in the UK

Transport is estimated to account for about a quarter of Scotland’s total energy use. The split of energy used to transport people and goods on the roads is about 60:40 respectively.

“Latest data for Q3 2014 shows that biofuels made up 4.2% of all road fuels in the UK”

In 2012, the distance driven in Scotland on major roads was the equivalent of driving the length of Britain around 16 million times.

Total final energy consumption for road and rail transport, 2005—2012

The change in road and rail energy consumption between 2005-2012:

Road: 9%  
Rail: 12%  
Total: 8%

Out of 541 million public transport journeys made in 2012 in Scotland, these were made up of:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>78%</td>
</tr>
<tr>
<td>Rail</td>
<td>16%</td>
</tr>
<tr>
<td>Air</td>
<td>4%</td>
</tr>
<tr>
<td>Ferry</td>
<td>2%</td>
</tr>
</tbody>
</table>

In 1991:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>87%</td>
</tr>
<tr>
<td>Rail</td>
<td>10%</td>
</tr>
<tr>
<td>Air</td>
<td>2%</td>
</tr>
<tr>
<td>Ferry</td>
<td>1%</td>
</tr>
</tbody>
</table>
Final Energy Consumption in the Transport Sector

Transport is estimated to account for about a quarter of Scotland’s total energy use (see Figure 5.1). The split of energy used to transport people and goods on the roads is about 60:40 respectively.

As Figure 5.2 shows, road transport fuel consumption per capita in Scotland is similar to the overall UK level. With Petrol Cars accounting for 33% of fuel used per capita in Scotland and 36% in the UK, diesel cars accounting for 23% in Scotland 24% in the UK and HGV accounting for 23% in Scotland and 21% in the UK.

Figure 5.3 shows that from 2005 to 2012 total personal transport fuel consumption fell by 13%, while over the same period freight consumption increased by 3%. Across the UK total fuel consumption for personal reduced by 14%, while freight decreased by 1% over the same period.
The Scottish Government has a 2020 target of 10% of transport fuels to be from renewables. Thus far, Biofuels had a 3.5% share of road fuels in the UK as a whole in 2013, up from 3.1% in 2012 (data is not available separately for Scotland, so the UK proportion is assumed).

In 2013, 1,585 million litres of liquid biofuels were consumed in transport in the UK, a rise of 12% on the total in 2012. This is 13 times higher than that consumed in 2005.

Liquid Biofuels are broken down into two categories: Bioethanol (used with Petrol) and Biodiesel (used with Diesel).

Using latest data for the third quarter of 2014, bioethanol accounted for 4.6% of motor spirit, and Biodiesel 3.9% of diesel (DERV). The combined contribution was 4.2%, a rise of 0.3 percentage points on a year earlier.

Overall energy consumed by road and rail transport, combined, peaked in 2007 and has since been steadily decreasing - this trend has been driven mainly by road transport, as seen in Figure 5.5. The decrease in consumption of road and rail fuels between 2005 and 2012 was 8% for Scotland compared to 10% for the UK.

Energy consumed by rail transport increased by 12% in Scotland and 9% in the UK, between 2005 and 2012. Over the same period, energy consumed by road transport has decreased by 9% in Scotland and 10% in the UK.

In 2013 biofuels had a... 3.5%

...share of road fuels in the UK

“Latest data for Q3 2014 shows that biofuels made up 4.2% of all road fuels in the UK”
Transport Key Trends

Between 2007-08 and 2012-13, travel in Scotland has fallen as reported by the Scottish Household Survey travel and administrative data. There was a small fall in car traffic of 2%, whilst the distance cycled is estimated to have increased by 29%. There has been a fall in the number of bus, ferry and air passengers of 13%, 9% and 12% respectively, whereas rail passengers have increased by 12%.

There were 541 million public transport journeys made on bus, rail, air and ferry in 2012 (the latest year for which ORR rail data is available for cross border journeys, and including trips abroad by ferry or air).

Of these 78% were journeys by bus and 16% were journeys by rail, air accounts for 4% and ferries 2%. In the same year, 22.2 billion kilometres were traveled by car on major roads (M and A roads), the equivalent of driving the length of Britain around 16 million times.

Travelling by Road in Scotland

In 2013, there were 2.8 million vehicles licensed for use on the roads in Scotland of which 84% are cars. Over two thirds (68%) of the adult population (17+) hold a full driving licence. 70% of households have access to one or more cars or van for private use in 2013. A quarter (26%) of households have access to two or more cars/ vans.

Figure 5.6, shows vehicles licensed as at December 31st from 2002 – 2013 by method of propulsion. The number of taxed vehicles in Scotland has increased by 16% between 2002 and 2013. The largest number of taxed vehicles have consistently been powered using petrol, however this number of petrol vehicles is on a downward trend, decreasing by 10% between 2002 and 2013. The number of diesel vehicles, however, has increased by 86%. There were only 25 hybrid electric vehicles and 342 electric vehicles in 2002, these have increased rapidly and in 2013 there were 7645 and 3826 in Scotland respectively.
ELECTRIC VEHICLE USAGE

The Department for Transport has forecast the proportion of cars, LGV, and other vehicles kilometres using petrol, diesel or electricity up to 2030 for the UK as a whole.

See more in Table A1.3.9 which can be found here:


DATA NOTE—TRANSPORT STATISTICS SOURCES

Official Statistics covering transport topics in Scotland are published by Transport Scotland, an Agency of the Scottish Government. Further products and information about the work of transport Scotland can be found at: http://www.transportscotland.gov.uk/statistics

This report makes use of two main sources of transport data, the ‘Scottish Transport Statistics’ and ‘Transport and Travel in Scotland’ National Statistics publications.

Scottish Transport Statistics

This is an annual compendium National Statistics publication that brings together transport data for Scotland from a wide range of sources. The publications covers topics such as: road vehicles, traffic and the road network; bus and coach statistics; freight transport; water transportation; personal travel and international comparisons as well as others.

The latest edition (no. 32; 2013) was published in February 2014 and covers the latest data available at the time of release. The next edition will be published on the 25th February 2015.

Transport and Travel in Scotland

This National Statistics Transport Scotland publication brings together information from the Scottish Householder Survey relating to the transport behaviours of the Scottish population. The survey sample covers around 10,000 adults per year.

In the 2013 edition, publication in August 2014, Transport Scotland also included analysis of the travel diary for the first time. Previously these analyses were published separately at a later date but due to working with the survey contractors to improve data processing the two sets of analyses could be released together.

The next edition of Transport and Travel in Scotland is likely to be published in late summer 2015.

Figure 5.6: Vehicles licensed in Scotland as at December 31st from 2002 – 2013 by method of propulsion

Source: Transport Scotland

Steam/ Others
Gas Bi-Fuel/ Gas or petrol/gas
Hybrid Electric/ Electricity
Diesel
Petrol

0
500
1,000
1,500
2,000
2,500
3,000


000s of Vehicles

Source: Transport Scotland
Bus and Coach Travel

In the 2012-13 financial year there were 423 million passenger journeys on local bus services in Scotland, a decrease over the previous year of 3.6%, as shown in Figure 5.7.

**Figure 5.7: Passenger numbers: local bus, Scotland, 1975-2013**

Over the longer-term, there has also been a fall in bus passenger journeys. There were almost 1.7 billion passenger journeys on local bus services in 1960. The number had almost halved by 1975. Since then, it has roughly halved again, from 891 million in 1975 to 423 million in 2012-13. There was a steady fall in numbers between 1960 and 1999.

**Rail Services**

There were 86.3 million ScotRail passenger journeys recorded in 2013-14, 3 million (3.6%) more than in the previous year, and an increase of 35% since 2004/05, the period of the current rail franchise.

Over the longer-term, the number of rail passenger journeys originating in Scotland (including cross-border journeys) fell from a peak of 73 million in 1964 to a low of 50 million in 1982.

**Air Passengers**

There were around 23 million air terminal passengers at airports in Scotland in 2013, an increase of just over 1 million (4.7%) on 2012 but still 7.5% below the 2007 peak.

Figure 5.8 shows the rise since 1975. Over the longer-term, terminal passenger numbers grew from 1.2 million in 1960 to 25 million in 2007.

**Figure 5.8: Passenger numbers: rail, air and ferry, Scotland, 1975-2013**

Source: Transport Scotland
The future demand for energy for transport involves predicting how much travel will take place along with the type of energy used for that journey.

Forecasting the total demand for travel involves predicting both the demand for personal travel and the demand for goods. These can follow very different trends.

Forecasting Future Personal Travel Demand

The energy we use in making those trips depends on how far we travel in that time and what mode of travel we use.

Factors affecting how much energy each of us use to travel include our:

- Age.
- Sex.
- Household Income.
- Employment Type (National Statistics Socio-economic Classification – NS-SEC).
- Car Ownership.
- Licence holding.
- Household structure – different household structures affect distance travelled.
- Location – people living in rural areas travel further than those living in urban areas.

More information on forecasting transport for the UK is available on the Department for Transport website which can be found here:


Ferry Services

In 2013, 9.7 million passengers travelled by ferry, a similar number to the previous year. Of these, 7.8 million (81%) were carried on routes within Scotland, the remainder were carried on routes between Scotland and Northern Ireland and the EU.
In 2012, vehicle-km per head per year were 8,196 in Scotland which is **4% more than the GB average**. However, Scotland had 51 vehicles per 100 of the population whereas GB had 54 vehicles. Scotland had a higher number of air passenger journeys per year at 4.2 journeys where the GB average was 3.5.

Scotland had 21% fewer rail journeys (per head) than the GB average in 2011 (latest statistics available).

Also, Scotland had, on average, 83 bus journeys per head compared to the GB average of 83 journeys per head.

**Compared to the Great Britain average, Scotland has...**

- **4%** more road traffic per head
- **20%** more air travel per head
- **21%** fewer rail journeys per head
- **4%** fewer bus journeys per head
- **9%** fewer vehicles per head

**Travel to work and School**

Results from the Scottish Household Survey show that in 2013:

- Two-thirds of commuters travelled to work by car or van
- 13% walked
- 11% went by bus
- 4% took a train
- 3% cycled.

There has been little change in modal choice since 2002.

The Scottish Household Survey also revealed 52% of pupils walked to school in 2013, 20% went by bus, 24% by car, 1% cycled, and 0.6% travelled by rail.

While there have been year-to-year fluctuations in the results, there has been little change in modal choice since 1999.
'In 2013, oil and gas production is estimated to have been worth £17.7 billion to the Scottish economy.'
OIL AND GAS

KEY FACTS

OIL AND GAS PRODUCTION WORTH...

£17.7 BN
...TO THE SCOTTISH ECONOMY

12%
OF TOTAL SCOTTISH GDP

SCOTLAND IS LARGEST
OIL PRODUCER AND
SECOND LARGEST GAS
PRODUCER IN EU

225,000 JOBS

SUPPORTED BY THE OIL AND GAS
INDUSTRY IN SCOTLAND

UP TO
24
BILLION

...BARRELS OF OIL AND GAS STILL TO BE RECOVERED
FROM THE UK CONTINENTAL SHELF

TOTAL INTERNATIONAL SALES FROM THE SCOTTISH
OIL AND GAS SUPPLY CHAIN IN 2012...

£10 BILLION

N. AMERICA
£3.6bn

AFRICA
£2.3bn

£64,000

IS THE AVERAGE SALARY OF THOSE
WORKING IN THE OIL AND GAS INDUSTRY

2.5 TIMES
THE NATIONAL AVERAGE

SCOTTISH SHARE OF
UK OIL AND GAS
PRODUCTION...

WOMEN REPRESENT
25% OF THE OIL
AND GAS WORKFORCE

94%

51%
Oil and Gas in Scotland - Overview
This chapter presents a range of statistics on the oil and gas industry in Scotland. Although the primary focus is oil and gas, it also includes a section on other fossil fuel extraction. Much of the analysis in the chapter is based on the activity of the oil and gas sector in Scotland and its surrounding waters, rather than in the UK Continental Shelf (UKCS) as a whole. The method used to apportion an illustrative share of the activity on the UKCS between Scotland and the rest of the UK for this purpose is discussed later in the chapter. The North Sea is a mature basin that has made a substantial contribution to the Scottish and UK economies over the last 40 years. As outlined in chapter 6, following a period of stable oil prices over the last few years (between $110 and $120 per barrel), the oil price has fallen sharply in recent months.

The falling in oil price exacerbates many of the challenges that existed in the North Sea oil and gas industry and therefore is likely to have an effect on some of the metrics discussed in this chapter. However, this publication presents the latest available historical data on the oil and gas sector and therefore does not capture the impact outlined above. In January, the Scottish Government published a paper, ‘Oil and Gas Discussion Paper – Challenges, Opportunities, and Future Policy’ which provides further information on this issue.

Oil production in Scottish waters peaked in 1999, and gas production peaked in 2000. Although production has since gradually declined steadily for both fuels, significant resources remain to be extracted. According to both Oil & Gas UK and the Wood Review, up to 24 billion barrels of oil and gas could still be recovered from the UKCS.

Figure 6.1 shows the value of GDP associated with the offshore oil and gas production which is estimated to occur in the Scottish portion of the UKCS.

In 2013, oil and gas production is estimated to have been worth £17.7 billion to the Scottish economy. This is equivalent to 12% of total Scottish GDP in that year.

Whilst the volume of North Sea production followed a downward trend over the past decade, the value of this output rose. This reflected the rise in oil prices which occurred over this period. This is discussed further in Chapter 7.
Employment

The oil and gas industry is a major employer.

The industry body Oil and Gas UK publishes estimates of the employment supported both directly by the industry and indirectly in the wider economy.

The organisation’s 2014 economic report estimates that approximately 450,000 jobs are supported by the industry across the UK as a whole, with 200,000 of them in the supply chain.

In addition, Oil and Gas UK estimate that around half of the 450,000 jobs are based in Scotland.

In December 2014, Oil and Gas UK, OPITO and BIS, published a study on the UKCS upstream oil and gas workforce.

The analysis found that half the workforce is aged 25-45, and the proportion of workers over 55 in the industry is significantly lower than the national average. The average salary in the industry of £64,000 is two and a half times the national average.

In addition women represent a quarter of the workforce, compared to a national average of 47%.

Apportionment of Offshore Oil and Gas Activity

In the ONS Regional Accounts, the convention is for the UK Continental Shelf (UKCS) to be included as a (notional) separate region of the UK (the extra-regio territory) and not to allocate this to specific geographic regions within the UK mainland.

In order to apportion offshore oil and gas activity between Scotland and the rest of UK, a number of recent economic statistics produced by the Scottish Government have assigned offshore oil and gas fields in the UKCS to either Scotland or the rest of the UK, based on the median line principle.
This is consistent with the methodology used in 1999 (via the Scottish Adjacent Water Boundaries Order, 1999) for fisheries demarcation purposes. It also reflects the method of demarcation used in Government Expenditure and Revenue Scotland (GERS).

Alternative methods of demarcation are also possible but are unlikely to significantly affect the proportion of oil and gas production which are assumed to fall within ‘Scottish’ waters.

The demarcation of the UKCS between Scotland and the rest of the UK based on the median line principle is illustrated in the adjacent map.

Oil & Gas Energy Balance for Scotland

Following on from full energy balance on page 26, figure 6.2 below focusses in on the oil and gas flows in Scotland.

Oil and gas makes the largest contribution to overall primary energy in Scotland (indigenous production plus imports), with petroleum and natural gas combined accounting for 89.9% in 2012.

Scotland also exports the equivalent of 68% of all indigenous oil and gas production.

Figure 6.2: Oil and gas flow chart, Scotland, 2012

Source: Scottish Government

* denotes disclosive data
Oil and Gas Production

The Scottish Government produces experimental statistics providing quarterly estimates of Scottish oil and gas production, sales revenues and costs as part of the Scottish National Accounts Programme (SNAP). This provides a consistent time series of data covering the economic activity in the Scottish portion of the UKCS. Further information about the publication is available on the SNAP website:

http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/SNAP/expstats/oilandgas

In 2013, Scotland is estimated to have produced 41.6 million toe of oil and natural gas liquids (NGLs) - 94% of total UK production. Figure 6.3 shows that historically over 90% of UK oil and NGL production has occurred in Scottish waters and that this share has increased slightly over time.

Scotland produced 16.2 million toe of gas in 2013 - 51% of total UK gas production. Figure 6.3 shows that Scotland has historically accounted for a smaller share of UK gas production than oil production.

Table 6.1 provides estimates for the volume of oil and gas production in Scotland over the past ten years.

Table 6.1: Scotland Oil and Gas Production (Million Tonnes of Oil Equivalent), 2004-2013

<table>
<thead>
<tr>
<th>Million tonnes of oil equivalent</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIL/NGL PRODUCTION</td>
<td>96</td>
<td>86</td>
<td>78</td>
<td>80</td>
<td>75</td>
<td>71</td>
<td>66</td>
<td>54</td>
<td>46</td>
<td>42</td>
</tr>
<tr>
<td>SCOTLAND AS A % OF UK</td>
<td>92%</td>
<td>93%</td>
<td>93%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>96%</td>
<td>95%</td>
<td>94%</td>
<td>94%</td>
</tr>
<tr>
<td>GAS PRODUCTION</td>
<td>50</td>
<td>46</td>
<td>44</td>
<td>39</td>
<td>37</td>
<td>32</td>
<td>30</td>
<td>22</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>SCOTLAND AS A % OF UK</td>
<td>57%</td>
<td>57%</td>
<td>61%</td>
<td>60%</td>
<td>59%</td>
<td>61%</td>
<td>60%</td>
<td>56%</td>
<td>49%</td>
<td>51%</td>
</tr>
</tbody>
</table>

Source: SNAP, Scottish Government
The statistics show that production has been on a downward trend over this period. However, to put in context, Scotland is estimated to be the largest oil producer and second largest gas producer in the EU.

Following years of significant capital investment, new fields have been brought onstream which could be expected to make a material impact on production levels. For example, in December 2014 BP announced that the Kinnoull field, in the Central North Sea (CNS), has started production. In addition, a number of fields which have been operating below capacity due to unexpected shutdowns (i.e. Elgin-Franklin, Gryphon and the Penguins Cluster) have restarted production.

Remainining Reserves

Oil and Gas UK, the industry body, estimates that between 15 and 24 billion recoverable boe of oil and gas remain on the UK Continental Shelf (UKCS). This encompasses proven, probable, and possible reserves from existing fields and new developments, plus a contribution from additional resources arising from marginal or tertiary developments, using improved or enhanced oil recovery techniques as well as further exploration as detailed in Figure 6.4. To put this in perspective, UK production of oil and gas in 2013 was 0.5 billion boe.

A significant proportion of future production will occur in the area comprising Scotland’s illustrative geographical share of the UKCS.
Sales Revenue and Costs

Total onshore and offshore oil and gas sales in Scotland are estimated to have been worth £24.2 billion in 2013, 80% of the UK total. Sales revenue is estimated to have fallen between 2012 and 2013. However, as illustrated in Figure 6.5, sales revenue has broadly followed an upward trend since 1998, reflecting the increase in wholesale prices during this period.

Figure 6.5: Oil & Gas Sales Revenue, Operating Costs and Capital Costs, Scotland, 1998-2013

Source: SNAP, Scottish Government

Total capital expenditure in the Scottish portion of the UKCS has also followed an upward trend since 1999, with a particularly sharp increase between 2011 and 2013. In 2013 investment was estimated to be £3 billion. In the same year, investment by the oil and gas sector across the UK as a whole is estimated to have reached £16 billion. Investment in 2013 reached the highest levels on record.

The high levels of investment observed in the sector in 2013 were driven by a number of factors:

1. The effect of oil and gas field allowances has boosted investment – with the majority of new fields qualifying for an allowance.
2. There has been a significant amount of investment by the major operators in several very large UKCS fields.
3. Production efficiency has been declining on the UKCS. The time taken to drill a typical well has increased by 17 days over the past 5 years.
4. There have been higher levels of expenditure on maintenance and upgrades.
5. Unit costs in the UKCS have risen, as outlined in Figure 6.6.

This increase in capital intensity reflects the fact that companies are developing more technically challenging fields. This has been compounded by the fact that a global increase in demand for oil and gas services and infrastructure in 2013 also resulted in cost inflation in the industry running ahead of the economy as a whole. This has also contributed to the upward trend in operating costs observed since 1999, as illustrated in Figure 6.5.
Exploration

Exploration and appraisal (E&A) activity declined in 2013, with 15 exploration and 29 appraisal wells being drilled. As shown in Figure 6.7, E&A activity remains below trend, with exploration wells drilled at the lower bound. Despite a temporary rise in E&A activity in 2012, drilling levels have not recovered from 2011 levels which saw only 14 exploration and 28 appraisal wells drilled in the year. E&A activity peaked around 1990, and has been lower ever since. On the other hand, the rate of development drilling has been much higher throughout most of the period, increasing at a high pace after E&A activity peaked.

Figure 6.4 highlighted that a significant proportion of the remaining reserves on the UKCS are classified as ‘Yet-to-Find’ this demonstrates the importance of E&A activity in extending the lifetime of oil and gas production.

While exploration activity remains muted, there remains substantial interest in North Sea licence acreage. For example, on the 6th November the UK Government announced that 134 licences covering 252 blocks were offered in the 28th offshore licensing round, with a further group of applications to be decided after environmental assessments. This is reported as one of the biggest rounds ever in the five decades since the first licensing round in 1964. However, the recent fall in prices may impact on the development schedule for these license areas.
Exports and International Activity

The oil and gas sector is a major exporter. Scottish based oil and gas companies have also expanded their operations in recent years and many now operate in countries around the globe. This section summarises the latest analysis of the international activity of the oil and gas supply chain, and new figures produced by the Scottish Government on the value of oil and gas exports.

Internationalisation

Since 2000 Scottish Enterprise, Scottish Development International and the Scottish Council for Development and Industry have undertaken an annual survey of international activity in the Scottish oil and gas supply chain.

The results from the latest survey, published in May 2014, showed that international sales, defined as direct exports from Scotland and sales by overseas subsidiaries, were valued at £10 billion in 2012, an increase of 22% on the previous year.

Combined domestic and international sales by the Scottish oil and gas supply chain reached a record £19.9 billion in 2012, an increase of £2.7 billion compared to 2011.

The survey also monitors the destination of sales by broad geographical region. North America is the primary market, with sales of £3.6 billion in 2012, an increase of £1 billion on the previous year. Africa is also a significant source of international sales, which were valued at £2.3 billion in 2012.

Oil and Gas Exports

The Scottish Government is developing estimates of oil and gas imports and exports as part of the Scottish National Accounts Programme (SNAP). The latest experimental statistics show that exports of crude oil, natural gas liquids (NGLs), and natural gas from Scotland are estimated to have been worth £24.9 billion in 2013. These exports were dominated by sales of crude oil and NGLs worth £19.8 billion.

Table 6.3: Scottish oil and gas exports (£bn), 2013

<table>
<thead>
<tr>
<th>£bn</th>
<th>REST OF UK</th>
<th>REST OF WORLD</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRUDE OIL/NGL</td>
<td>5.3</td>
<td>14.5</td>
<td>19.8</td>
</tr>
<tr>
<td>NATURAL GAS</td>
<td>3.9</td>
<td>1.2</td>
<td>5.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>9.2</td>
<td>15.7</td>
<td>24.9</td>
</tr>
</tbody>
</table>

Source: SNAP, Scottish Government
Coal Production

2.8 million tonnes of coal - just over 20% of total UK production - was mined in Scotland in 2013, as shown in Figure 6.9. Scottish coal production has declined by 41% since 2012 and by 50% since 2008. The UK decline since 2008 has not been quite as high at 27%.

Figure 6.9: UK Coal Production, Scotland and Rest of UK, 1999 – 2013

Source: The Coal Authority
‘By 2020 the average household’s energy bill could be 7% (£92) lower than it otherwise would have been because of energy and climate change policies’
‘Energy bills are expected to continue to increase over the coming years as electricity generating assets reaching the end of their operational life require to be replaced’

FOR HOUSEHOLDS NEAR FUEL POVERTY THRESHOLD...

+ £100 IN FUEL COSTS
REQUIRES
+ £1,000 IN INCOME
TO MITIGATE

OF HOUSEHOLDS IN SCOTLAND WERE FUEL POOR IN 2013

940,000
HOUSholdS

39%
Domestic Energy Bills

Domestic energy prices increased substantially from 2004 to 2009 in real terms, before a slight dip in 2010. The average direct debit domestic gas bill in Scotland increased in real terms by approximately 117% over the period 2004 – 2014, as shown in Figure 7.1.

The average direct debit electricity bill rose by approximately 46% in real terms over the same period, as shown in Figure 7.2. See page 111 for a discussion on the drivers behind recent increases in domestic energy bills.

‘Energy bills are expected to continue to increase over the coming years as electricity generating assets reaching the end of their operational life require to be replaced’

Average domestic energy bills in 2014 (provisional) are shown in table 7.1. Note that unlike figures 7.1 and 7.2 these prices are not adjusted for inflation.
The average unit costs for domestic standard electricity in North Scotland for all three payment methods are substantially higher than that of South Scotland and UK average (see Table 7.2). Consumers in North Scotland pay on average 16.96 pence per kilowatt hour by using prepayment method, which is 6.5% higher than the average price in UK. North Scotland consumers also pay 6.9% and 6.7% higher unit prices for standard credit and direct debit payment methods respectively.

The average unit costs for domestic gas consumption for all three payment methods in North Scotland are lower than South Scotland and UK average (see Table 7.3). Domestic gas prices in North Scotland for standard credit and direct debit payment method are around 2% lower than the UK average, while prices for prepayment method are around 6% lower than the UK average. Domestic gas unit prices in South Scotland are higher than those in North Scotland but lower than the prices of UK average.

The recent increases in fuel prices from 2004 onwards follow a period of declining prices, as the data in Figure 7.3 illustrates. It also demonstrates the variability in fuel prices in the domestic sector. All fuel types reached their highest prices in 2014, with the exception of Liquid fuels and Motor fuel & oil. Liquid fuels and Motor fuel & oil prices fell 11.3% and 5.0% respectively in 2014.

### Table 7.1: Average annual domestic energy bills for GB countries for 2014 (£ cash terms)

<table>
<thead>
<tr>
<th></th>
<th>£</th>
<th>Standard Credit</th>
<th>Direct Debit</th>
<th>Prepayment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eng &amp; Wal</td>
<td>Scotland</td>
<td>Eng &amp; Wal</td>
<td>Scotland</td>
</tr>
<tr>
<td>Gas</td>
<td>797</td>
<td>789</td>
<td>722</td>
<td>716</td>
</tr>
<tr>
<td>Standard Electricity</td>
<td>616</td>
<td>623</td>
<td>568</td>
<td>572</td>
</tr>
<tr>
<td>Economy 7 Electricity</td>
<td>834</td>
<td>889</td>
<td>759</td>
<td>826</td>
</tr>
</tbody>
</table>

*Source: DECC*

### Table 7.2: Average unit cost for domestic standard electricity, Scotland & UK, 2014

<table>
<thead>
<tr>
<th>Average unit cost (£/kWh)</th>
<th>Standard Credit</th>
<th>Direct Debit</th>
<th>Prepayment</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Scotland</td>
<td>16.90</td>
<td>15.65</td>
<td>16.96</td>
</tr>
<tr>
<td>South Scotland</td>
<td>15.97</td>
<td>14.58</td>
<td>15.76</td>
</tr>
<tr>
<td>UK</td>
<td>15.83</td>
<td>14.65</td>
<td>15.93</td>
</tr>
</tbody>
</table>

*Source: DECC*

### Table 7.3: Average unit cost for domestic standard gas, Scotland & UK, 2014

<table>
<thead>
<tr>
<th>Average unit cost (£/kWh)</th>
<th>Standard Credit</th>
<th>Direct Debit</th>
<th>Prepayment</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Scotland</td>
<td>5.02</td>
<td>4.58</td>
<td>4.75</td>
</tr>
<tr>
<td>South Scotland</td>
<td>5.07</td>
<td>4.61</td>
<td>5.01</td>
</tr>
<tr>
<td>UK</td>
<td>5.11</td>
<td>4.68</td>
<td>5.06</td>
</tr>
</tbody>
</table>

*Source: DECC*

**Figure 7.3: UK Fuel price indices in the domestic sector (real terms, 2010=100), 1996-2014**

Source: DECC
What makes up a domestic gas and electricity bill?

Ofgem analysis demonstrates that wholesale costs accounted for 48% of the average domestic dual fuel energy bill in 2014, network costs accounted for 22%, supplier costs for 13% and environmental and social costs accounted for 7%. VAT set around 5%, while the estimated pre-tax margin to suppliers accounts for 6% of a bill.

![Figure 7.4: Breakdown of a duel fuel bill, UK, 2013 - 2014](source: Ofgem)

The proportion of wholesale costs has fallen since 2013, from 49% in 2013 to 48% in 2014. The proportion of environmental and social obligation costs has also fallen over the same period, from 8% to 7%. Network costs have increased slightly as a proportion of the overall bill, up around 1 percentage point to 22%. Supplier profit margins have also increased as a proportion of the bill, from 4% in 2013 to 6% in 2014.

Payment Method for Household Energy Bills

As shown in Figure 7.5, the split between payment methods for domestic energy is similar between Scotland and GB as a whole. The costs that consumers face varies depending on the method used to make payment. Direct Debit is generally the cheapest payment method, as shown in Figures 7.1 and 7.2.

![Figure 7.5: Percentage of customers by bill type (Scotland and GB), as at Sep 2014](source: DECC)
This is of particular interest for Scotland, as both South Scotland (22%) and North Scotland (18%) have a higher proportion of consumers using prepayment method for standard electricity than the overall UK level (17%). South Scotland (55%) has a slightly lower proportion of consumers using direct debit payment method than the UK average (56%), whereas North Scotland is slightly higher (57%). Both regions in Scotland have a lower number of consumers choosing the standard credit payment method than the UK level (see Table 7.4).

The distribution of consumers payment methods for domestic gas consumption in Scotland differs from that of the electricity market. A higher proportion of consumers from North Scotland use the direct debit payment method (62%) (see Table 7.5). However, the proportion of consumers who use prepayment in South Scotland (18%) is higher than the GB level (15%).

Stickiness to Home Suppliers

Electricity consumers in Scotland are still more likely to choose their home supplier than the GB average (home suppliers are the original supplier in any given area). In particular, consumers in the North of Scotland are more likely to be with their home supplier irrespective of payment type. There are 70% of pre-payment customers in North Scotland with their home suppliers, compared to only 38% for the GB average (see Table 7.6).

Domestic gas consumers in North Scotland appear to be the least sticky to home suppliers compared to South Scotland and GB level (see Table 7.7). The proportion of home suppliers for domestic gas by all three payment methods in North Scotland are lower than the GB level. However, there are slightly more consumers in South Scotland, paying by standard credit and direct debit, who stay with their home suppliers than the GB average.

| Table 7.4: Proportion of consumers by payment method for standard electricity, June 2014 |
| % | Standard Credit | Direct Debit | Prepayment |
| North Scotland | 24 | 57 | 18 |
| South Scotland | 23 | 55 | 22 |
| UK | 27 | 56 | 17 |

Source: DECC

| Table 7.5: Proportion of consumers by payment method for standard gas, June 2014 |
| % | Standard Credit | Direct Debit | Prepayment |
| North Scotland | 23 | 62 | 15 |
| South Scotland | 26 | 56 | 18 |
| GB | 28 | 57 | 15 |

Source: DECC

| Table 7.6: Proportion of home suppliers for standard electricity by payment type, 2013 |
| % | Standard Credit | Direct Debit | Prepayment | All Types |
| North Scotland | 73 | 61 | 70 | 66 |
| South Scotland | 42 | 37 | 54 | 42 |
| GB | 44 | 33 | 38 | 37 |

Source: DECC

| Table 7.7: Proportion of home suppliers for domestic gas by payment type, 2013 |
| % | Standard Credit | Direct Debit | Prepayment | All Types |
| North Scotland | 42 | 22 | 28 | 28 |
| South Scotland | 59 | 36 | 38 | 42 |
| GB | 6 | 32 | 44 | 40 |

Source: DECC
How have domestic bills changed?

Average annual domestic gas and electricity bills in Scotland between 1998 and 2014 have increased by 113% and 30% respectively. The costs that consumers face varies depending on the method used to make payment. On average across Scotland, consumers of electricity using standard credit face 9% higher bills than those using direct debit payments (10% for gas bills). Consumers of electricity using prepayment face 8% higher bills than those using direct debit payments (9% for gas bills).

![Figure 7.6: Average annual domestic gas and electricity bills (direct debit), Scotland, 1998 - 2014](image)

These figures rely on standardised consumption data to allow for comparison between regions, payment types and over time. There are however substantial differences in energy unit prices between Scotland and the rest of the UK, and within Scotland (see Tables 7.2 and 7.3). In addition, the chart below uses final energy consumption data for electricity to highlight the regional variation across Scotland. A number of factors will influence this variation, including differences in temperature and the penetration of electrical heating as a primary heating fuel. It is also possible that these data capture some proportion of consumption from small non-domestic enterprises, nevertheless they provide an indication of the variation in consumption by geographical area.

![Figure 7.7: Average annual household consumption of electricity, Scotland, 2012](image)

Source: DECC
It is clear that there is a variation in average annual household consumption of electricity across Scotland’s Local Authorities. Both regional price differences for electricity and variation in domestic electricity consumption have impacts on the energy bills within Scotland. This is a particular issue in the North of Scotland, where the variation in domestic electricity consumption is larger than South Scotland. In addition, customers in North Scotland pay higher average unit electricity prices across all payment methods. Therefore, the average household electricity bill would be higher than the GB average. The aggregated average annual household consumption of electricity in North Scotland in 2012 was around 4,577 kWh, which is 8.2% higher than the GB average.

Why are energy bills rising?

A report by the independent Committee on Climate Change demonstrates that the annual energy bill increased by almost £500 between 2004 and 2013, 80% of this increase was associated with the rising costs of wholesale energy & system costs and therefore unrelated to low-carbon policy. In contrast, support for low-carbon investment added £40 over the same period, accounting for approximately 8% of the overall increase. Support for energy efficiency schemes accounted for another 10% (£50) of the increase.

Energy bills are expected to continue to increase over the coming years as electricity generating assets reaching the end of their operational life require to be replaced. The Scottish Government’s policy is that those assets should be replaced by a diverse mix of low carbon generating technologies. It is hoped this policy will aid consumers by avoiding an over reliance on fossil fuels. The aim is also to ensure that the costs associated with delivering the policy are as low as possible and affordable to consumers. DECC has produced estimates of the impact of energy and climate change policies on average household energy bills in 2020. This analysis shows that by 2020 the average household’s energy bill would be 7% (£92) lower than it otherwise would have been because of the net effect of the energy and climate change policies that have been established.
Energy Prices for Industrial Consumers

Prices for industrial consumers have followed a similar pattern to domestic prices, as they are subject to the same underlying influences. Figure 7.9 uses UK fuel price indices for the industrial sector showing an increase across all fuel types in recent years. The price of gas increased by 8.9% between 2012 and 2013. Also, while both electricity and coal prices increased by around 3.6% between 2012 and 2013, the price of heavy fuel oils reduced by around 4.8% over the same period.

![Figure 7.9: UK Fuel price indices in the industrial sector (real terms, 2010=100), 1983-2013](source: DECC)

Oil Prices

Perhaps the most important development in the global oil and gas markets is the decrease in oil price that has been taking place since June 2014. Figure 7.10 plots historical monthly oil prices from December 2000 to December 2014. Oil prices increased very significantly from 2004 to 2008, peaking at about $130 per barrel. During the financial crisis in 2008 oil prices decline to a low of $40 before rebounding in 2009. From 2011 to June 2014, prices averaged around $110 dollars per barrel. Due to demand and supply imbalances in the market, prices have since declined, averaging $63 per barrel in December 2014. Brent crude averaged $99 over the course of 2014.

![Figure 7.10: Crude Oil Price (not adjusted for inflation), Dec 2003 - Dec 2014](source: Index Mundi)
Competition and Markets Authority – Energy Market Investigation

In 2014, the energy regulator Ofgem referred the energy market to the Competition and Markets Authority (CMA). This Investigation will look at features of wholesale and retail energy markets to determine whether any feature or combination of features of the market prevents, restricts or distorts competition in connection with the supply or acquisition of energy in the UK.

The Scottish Government has published its submission to the CMA investigation in which it highlighted a number of features of the Scottish retail energy market which may mean Scottish consumers are not benefitting from a fully competitive energy market. For example, the retail market is more concentrated in Scotland than in Great Britain as a whole and data show that electricity consumers in Scotland are still more likely to choose their home supplier than the UK average (home suppliers are the original supplier in any given area).

As Table 7.6 shows, consumers in the North of Scotland are more likely to be with their home supplier irrespective of payment type.

*Figure 7.11: Proportion of direct debit electricity consumers to use home suppliers, Scotland & Great Britain, Q1 2001–Q4*

This suggests that electricity customers in Scotland have a lower responsiveness to the price changes of electricity than the GB average. For example, Figure 7.11 shows that as domestic electricity prices have increased in real terms, the proportion of home suppliers for standard electricity paid by direct debit has a clear downward trend.

Customers in GB as a whole appear to be more responsive to these price changes than consumers across Scotland, albeit there are a number of factors which will affect the decision to change supplier.
Fuel Poverty

Fuel poverty is the inability to heat a home to an acceptable standard at a reasonable cost. A household is in fuel poverty if, in order to maintain a satisfactory heating regime, it would be required to spend more than 10% of its income on all household fuel use.

Extreme fuel poverty indicates that a household would have to spend more than 20% of its income to maintain a satisfactory heating regime.

A satisfactory heating regime is defined as follows:

- For "vulnerable" households, 23°C in the living room (zone 1) and 18°C in other rooms (zone 2), for 16 hours in every 24.
- For other households, this is 21°C in the living room (zone 1) and 18°C in other rooms (zone 2) for 9 hours a day during the week and 16 during the weekend.

Between 2012 and 2013 fuel poverty in Scotland increased by around 4 percentage points from 35.2% to 39.1%. This represents an increase of about 100,000 households from the previous year, reaching 940,000 in 2013. Around 252,000 (10.5%) of these households were in extreme fuel poverty.

The lowest rate of fuel poverty over the period 2010-13 was recorded for mid-2011 at 33.2%, representing around 787,000 households.

Following a fuel price increase in the autumn of 2011 this rose to 38.8%. After a modest drop during 2012, fuel poverty levels returned in 2013 to the previous high level reaching 39.1%, equivalent to around 940,000 households.

USA:

<IF THE PROPORTION OF INCOME A HOUSEHOLD NEEDS TO SPEND ON HEATING IS...>

> 10% = FUEL POVERTY

> 20% = EXTREME FUEL POVERTY

DATA NOTE - FUEL POVERTY

Notes and Definitions

- Vulnerable households are those where an occupant is aged 60 or over or self-identifies as long-term sick or disabled.
- The cost of the satisfactory heating regime is determined using a BRE Domestic Energy Model (BREDEM) calculation which takes into account a range of energy uses in the home, mid-year energy prices and information about the occupancy and location of the dwelling. When this cost exceeds 10% of the net income of the household occupying the dwelling, the household is considered to be in fuel poverty. No information on the actual energy use or energy bills of the household is taken into account when deriving the fuel poverty indicator.
- Fuel poverty levels in the Scottish housing stock are monitored using the Scottish House Conditions Survey (SHCS).
Levels of fuel poverty are broadly the outcome of three drivers:

- household income
- fuel prices
- the energy efficiency of the housing stock.

However the impact of these three drivers is not equal. For example, for households near the 10% threshold for fuel poverty, a £100 increase in fuel costs would require a £1000 increase in income to mitigate. Fuel poverty levels are sensitive to changes in consumer prices in spite of the improvements in energy efficiency.

As Figure 7.13 illustrates, fuel prices have risen much faster than income, so that by 2012/13 fuel prices were more than two-and-a-half times their level in 2002/03, while median equivalised household income had risen by less than a half. The upward trend in fuel prices has continued since then, with the fuel price index in Q2 2014 nearly three times as high as it was at the beginning of 2002.

Source: SHCS
As shown in Figure 7.14, the energy required to meet the fuel poverty heating regime for the average Scottish household has fallen almost 8% since 2010 as a result of improved energy efficiency of the housing stock.

However the cost of that energy has risen by over 20%. This effect (along with any distributional changes in income) has meant fuel poverty rose by almost 13%, or 4.5 percentage points, over the same period.

Figure 7.14: Proportional changes in fuel poverty, energy requirement and cost, 2010-2013

Figure 7.15 shows that fuel poverty is higher for properties with poor EPC band rating: in 2013 fuel poverty was 27% in dwellings rated A-C, 38% for D-rated dwellings, 58% for E-rated dwellings and 87% for those rated F or G. The increase from 2012 resulted in nearly 14 percentage point increase for households in F and G rated dwellings, but around 8 points for A-C rated.

Figure 7.15: Fuel poverty rates by EER bands, 2010-2013
‘Greenhouse gas emissions in Scotland have fallen by 30% since 1990’
CLIMATE CHANGE KEY FACTS

CLIMATE CHANGE TARGETS
FROM 1990 BASELINE...

-42% BY 2020

-80% BY 2050

96% CHANGE IN EMISSIONS SINCE 1990

SCOTLAND EMITTED 52.9 Mt CO2e IN 2012. THIS IS EQUIVALENT TO THE EMISSIONS FROM...

18 MILLION GAS BOILERS Based on Scotland’s average domestic gas consumption per meter

IN 2012, GRID EMISSIONS IN SCOTLAND WERE...

271 gCO2e/kWh

DOWN 17% SINCE 2004

CURRENT EU CARBON PRICE...

€7.14 PER TONNE CO2e

CHANGE IN EMISSIONS SINCE 19901...

SCOTLAND UK EU

29.9% 23.7% 18.5%

EMISSIONS PER CAPITA1...

SCOTLAND UK EU

9.95 TONNES CO2e 9.42 TONNES CO2e 8.93 TONNES CO2e

11.9 MILLION TONNES OF CARBON DIOXIDE...

...WERE DISPLACED BY RENEWABLE ELECTRICITY IN THE UK IN 2013

IN 2012, GRID EMISSIONS IN SCOTLAND WERE...

...OF ENERGY SUPPLY EMISSIONS FROM PARTICIPANTS OF EU ETS

17% OF ENERGY SUPPLY EMISSIONS FROM PARTICIPANTS OF EU ETS
Greenhouse Gas Emissions in Scotland

Energy supply is a major source of greenhouse gas emissions. These are estimated in the Scottish Greenhouse Gas Inventory, which is the key tool for understanding the origins and magnitudes of the emissions and the assessment of policies designed to control or reduce emissions. The inventory is compiled in line with international guidance from the Intergovernmental Panel on Climate Change (IPCC). The inventory is also used to report data against targets as required under the Climate Change (Scotland) Act 2009.

Scottish Greenhouse Gas Emissions are allocated into sectors for the purposes of reporting and are classified according to the source where they have taken place. These source sectors include net sources of emissions, such as Energy Supply, Business and Industrial Processes and Residential in addition to sequestration of emissions from areas such as from Forestry.

Emissions from the Energy Supply sector are classified as those generated from fuel combustion for electricity and other energy production sources, and emissions from fuels (such as from mining or oil and gas exploration activities). In 2012, the Energy Supply sector was the largest source of greenhouse gas emissions in Scotland.

Table 8.1 provides the headline statistics on net source greenhouse gas emissions for the energy supply sector. Scotland has reduced its greenhouse gas emissions (-29.9%) by a higher proportion than both the UK (-23.7%) and the EU overall (-18.5%), between 1990 and 2012.
In 2012, Scotland’s greenhouse gas emissions per capita were slightly higher than for the UK, which were in turn higher than for the EU-28 as a whole. This is, in part, due to a greater amount of emissions being required for space heating of residential and other buildings, which could be associated with cooler temperatures. There were also higher per capita emissions from agriculture and waste in Scotland in 2012, although these have been offset by a much larger amount of carbon sequestration, particularly from forestry but also from grasslands.

The Energy supply sector has remained the largest source of Scotland’s greenhouse gas emissions since 1990.

The emissions from this sector have decreased at a lower rate than for Scottish greenhouse gas emissions overall. The chart demonstrates the volatility from year to year in emissions from this sector, which is linked to the ambient temperature, particularly during the winter months; and fuel used for electricity production, which in turn is largely driven by the price of fossil fuels.

Electricity production emissions from power stations comprised 66% of all energy supply emissions from 1990; this relative share increased to 74% in 2012. Emissions from other energy supply sources have fallen since 1990 and these have been driven by falls in emissions from coal mining, upstream oil and gas production, coke manufacture and oil refining. For more detail on electricity generation in Scotland, please see chapter 3.

Carbon Price and the EU Emissions Trading System (EU ETS)

Since 2008, EU emissions have been lower than anticipated due in part to the economic downturn. This has resulted in a fall in demand for EUAs (EU Allowance Units), and a growing surplus of allowances in the system. Both elements have contributed to a reduction in the price of carbon in the EAU market.

DECC have updated their short-term traded carbon values for 2014 (see figure 8.2) and the overall impact of the changes highlighted above is to decrease the values of the central scenario when compared to the 2012 short-term traded carbon values, but increase the values in the high scenario. The differences between the 2014 values and 2013 values are most significant under the high scenario. The changes to the high series as compared with 2013 are primarily driven by: changes in the underlying BAU (Business As Usual) emissions projections; and longer horizon and revised foresight window in the DCPM (DECC Carbon Price Model). After 2030, it is assumed a global carbon market exists, applicable to both the traded and non-traded sectors. The long-term carbon values reflect the costs required to achieve the internationally agreed UNFCCC long term goal of limiting global temperature increases to not greater than 2 degrees centigrade above pre-industrial levels.
The vast majority (96%) of emissions which were produced in the energy supply sector in 2012 occurred from installations which participate in the EU Emissions Trading System (EU ETS). Just over three quarters (76%) of all of Scotland’s EU ETS emissions in 2012 occurred within the energy supply sector.

Scotland’s Climate Change Targets
Scotland has a number of targets for reducing greenhouse gas emissions contained in legislation, within the Climate Change (Scotland) Act 2009. These targets can be summarised as follows:

“The Act creates a statutory framework for greenhouse gas emissions reductions in Scotland by setting an interim target of at least a 42% reduction for 2020, and at least an 80% reduction target for 2050. These reductions are based on a 1990 baseline (1995 for the F-Gases). The Act also requires that Scottish Ministers set fixed annual targets for emissions at least 12 years in advance.”

The EU Emissions Trading System (EU ETS)

What is the EU Emissions Trading System (EU ETS)?
Launched in 2005, the EU ETS is an EU policy aimed at mitigating climate change by limiting greenhouse gas emissions from industry sectors and aviation. Participants include more than 11,000 heavy energy-using installations in power generation, the manufacturing industry and airlines across 31 countries in the European Economic Area (EEA).

How does it work?
The EU ETS is a 'cap and trade' system. A limit (cap) is placed on the overall volume of emissions from participants in the system. Within the cap, organisations receive or buy emissions allowances which they can trade (1 emissions allowance equals 1 tCO2e). Each year, an organisation must surrender enough allowances to cover its emissions. The cap is reduced each year so that by 2020, the volume of emissions permitted within the system will be 21% lower than in 2005. The reducing cap alongside the financial considerations of trading emissions allowances, incentivises organisations within the system to find the most cost effective way of reducing their emissions.

The Carbon Price Floor (CPF) came into effect on 1 April 2013.
It is made up of the price of CO2 from the EU Emissions Trading System (EU ETS) and the Carbon Price Support rate per tCO2 which is the UK-only additional tCO2 emitted in the power sector.
In October 2010 the Scottish Parliament passed legislation setting the first batch of annual targets, for the years up to 2022.

Targets for 2023-2027 were set in October 2011, and will continue to be set at 5-year intervals.

The 2012 target is 53.226 MtCO2e.

Scotland’s Climate Change targets are presented in terms of emissions which are adjusted to take into account of trading in the EU Emissions Trading System (EU ETS). Adjusting for trading in the EU ETS has a smoothing effect on the greenhouse gas emissions; in 2012, the adjustment increased reported emissions from 52.895 Mt CO2e to 55.665 Mt CO2e.

‘In 2012, the EU ETS adjustment increased reported emissions from 52.9 Mt CO2e to 55.7 Mt CO2e’

DATA NOTE

The Official Statistics publication Scottish Greenhouse Gas Emissions 2012 contains further details on the process by which source emissions are adjusted to take into account of trading in the EU ETS:

http://www.scotland.gov.uk/Publications/2014/06/5527/0

More information on the Climate Change Targets can be found here:

http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact
Figure 8.3 contains data from the latest (1990-2012) inventory, adjusted for trading in the EU Emissions Trading System as well as progress against the 42% and 80% reduction targets. These percentage targets are based on a percentage reduction from the Baseline in the latest inventory.

**Figure 8.3: Percentage Reductions Targets - Based on Adjusted Emissions, Scotland, 1990 - 2050**

Using the 1990-2012 inventory:
- Baseline was 75.589 Mt CO\(_2\)e
- 2012 was 55.655 Mt CO\(_2\)e
- A 26.4% reduction

- 42% reduction by 2020 (43.842 Mt CO\(_2\)e)
- 80% reduction by 2050 (15.118 Mt CO\(_2\)e)

Source: Scottish Greenhouse Gas Inventory

**National Performance Framework - Sustainability Purpose Targets**

In addition to the statutory Climate Change Targets, the greenhouse gas statistics are used to monitor progress against the Scottish Government’s Sustainability Purpose Targets.

There are two targets: The long term target (2050) now equates to the target in the Climate Change (Scotland) Act 2009. The Scottish Government also set a short term target to reduce emissions by 2011 compared with a 2006 baseline, which has been achieved.

Information on progress towards these targets can be found on the Scottish Government Scotland Performs website:

[http://www.scotland.gov.uk/About/Performance/scotPerforms/purpose/sustainability](http://www.scotland.gov.uk/About/Performance/scotPerforms/purpose/sustainability)

Figure 8.4 contains data from the latest (1990-2012) inventory, adjusted for trading in the EU Emissions Trading System.

The fixed annual targets are also presented on this chart. The fixed annual targets were set at the time of the 1990-2008 inventory. Emissions adjusted for trading in the EU ETS using the 1990-2008 are shown for context.
The Second Report on Proposals and Policies (RPP2)

The Climate Change (Scotland) Act 2009 set two statutory emissions reduction targets:

1. Reduce greenhouse gas emissions by 42% compared to 1990 by 2020.
2. Reduce greenhouse gas emissions by 80% compared to 1990 by 2050.

“Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027: The Second Report on Proposals and Policies” was published in June 2013 and sets out a clear framework for hitting Scotland’s annual emissions reduction targets from 2013 to 2027. It also sets the strategic direction towards further reductions in emissions of 80% in 2050. The document is often referred to as RPP2.

RPP2 is structured around the key sectors of energy supply, homes and communities, business and the public sector, transport, waste and rural land use. For each of these sectors, Scottish, UK and European policies and proposals have been identified that can reduce greenhouse gas emissions and contribute towards achieving the annual targets.

The latest data shows that in 2012, Scottish emissions are estimated to have been 52.9 million tonnes of carbon dioxide equivalent (MtCO2e), a 30% reduction in emissions from 1990.

Grid Emissions

Under the terms of the Climate Change (Scotland) Act 2009 the amount of Scottish gross electricity consumption and the average greenhouse gas emissions per kilowatt hour of electricity generated in Scotland are required to be reported on an annual basis. The latest report was published in October 2014, covering emissions in 2012.
In 2012, total Scottish electricity generation was 49,498 GWh and gross electricity consumption was 36,602 GWh. There are various ways of estimating the average greenhouse gas emissions per megawatt hour of electricity generated in Scotland and possible methodologies were outlined in Annex A of the Scottish Greenhouse Gas Emissions Target Report. Using the preferred approach, which accounts for both productive and non-productive emissions, the average greenhouse gas emissions per megawatt hour of electricity generated in Scotland was estimated to be 271 gCO2e/kWh in 2012. (CO2 accounted for 99.4% of these greenhouse gas emissions).

This represents an increase from 256 gCO2e/kWh in 2011, however the carbon intensity of electricity generated in Scotland has reduced by approximately 17% since 2004.

Overall electricity generation in Scotland increased by 2,635 GWh to 53,071 GWh in 2013, and Scotland continued to be a net exporter of electricity, exporting 27.9% of total generation in 2013, up from 25.6% in 2012.

Therefore, while grid intensity of Scottish generation represents a key measure of emission in the sector, it is important to also consider emissions from electricity generation in the wider context of the GB grid.

It is not necessarily the case that Scottish renewables will displace the equivalent amount of thermal output in Scotland, rather renewable output in Scotland may displace emissions from elsewhere in the GB system.

Data published by DECC shows that an estimated 11.9 million tonnes of carbon dioxide were displaced by Scotland’s renewable electricity generation in 2013, an increase of over 14% on the 10.4 million tonnes of CO2 displaced in Scotland by the sector in 2012.

Carbon emissions displaced by renewable electricity generation have been calculated as renewable electricity generation multiplied by the average emissions factor for electricity supplied by fossil fuel stations in 2013.

http://www.publications.parliament.uk/pa/cm201314/cmhansrd/cm130911/text/130911w0002.htm#130911w0002.htm_spnew14
CHAPTER 9

LOW CARBON ECONOMY

‘Since 1998, carbon productivity has increased by 66% in Scotland’
Low Carbon Economy in Scotland

The Low Carbon Economic Strategy was published in November 2010 and set out the Government’s aspiration for a shift to a low carbon economy. The importance of this aspiration was given further weight when the transition to a low carbon economy was incorporated into the Government Economic Strategy refresh in September 2011 as a new Strategic Priority.

The Low Carbon Economic Strategy set out a number of indicators to demonstrate the impact of the move to a low carbon economy, and this chapter provides an update on progress against those indicators.

“The Transition to a Low Carbon Economy will be central to maximising Scotland’s sustainable economic growth rate – particularly in the long-term”

Government Economic Strategy, September 2011

In making the transition to a low carbon economy, figure 9.1 shows how GVA is changing in relation to the level of emissions in Scotland.

Figure 9.1: Estimated GVA and Greenhouse Gas Emissions, Scotland, 1998-2020

Sources: ONS, Scottish Government
Carbon Productivity

Carbon productivity is measured as the level of GVA per tonne of CO\textsubscript{2}e, as shown in Figure 9.2. Between 1998 and 2012, carbon productivity has increased by 66%. Successful delivery of the emissions reductions target would see this figure improve further, depending on the growth rate of the economy.

A further indicator of success of the transition to a low carbon economy will be the numbers employed in low carbon sectors. Please see the data development box below for more information on the measurement issues regarding low carbon employment.

**Figure 9.2: Estimated Carbon Productivity, Scotland, 1998-2020**

A further indicator of success of the transition to a low carbon economy will be the numbers employed in low carbon sectors. Please see the data development box below for more information on the measurement issues regarding low carbon employment.

**DATA DEVELOPMENT**

**Employment in Energy and Low Carbon sectors**

As explained in previous Energy in Scotland publications, official statistics on the employment and Gross Value Added (GVA) of the energy sector are based on the Standard Industrial Classification (SIC) system which does not lend itself to measuring non-traditional or new sectors that straddle a number of different industries – like the low carbon economy and renewable energy sector.

The energy sector (including renewables), as defined using SIC codes for the Scottish Government growth sector, accounted for **66,000 jobs** in 2013. However, it is likely that a significant proportion of renewable jobs will fall under other SIC classifications such as construction or manufacturing. It is also particularly difficult to attribute renewable or low carbon employment where organisations cover a wider range of business activities (e.g. Scottish Power and Scottish and Southern Energy have employees dealing with onshore wind, hydro and marine renewables, as well as with coal and gas generation, grid, customer services etc).
Energy Productivity

We can also measure how productively energy is being used in the economy.

Energy productivity expresses the gross value added achieved in the economy from the input of one unit of energy. Increasing energy productivity means ‘squeezing’ more out of every unit of energy consumed. This is measured as the level of GVA per GWh of final energy consumed in Scotland (as shown in Figure 9.3).

Energy productivity in Scotland has increased by approximately 17% between 2005 and 2012, and this is expected to continue rising as the economy recovers.
Figure 9.3: Estimated Energy Productivity, Scotland, 2005-2020

Sources: ONS, DECC
# Aggregate Energy Balance for Scotland, 2012

## Gross calorific values

<table>
<thead>
<tr>
<th>Thousand tonnes of oil equivalent</th>
<th>Coal</th>
<th>Primary oils</th>
<th>Petroleum products: Natural gas</th>
<th>Bioenergy &amp; waste</th>
<th>Primary electricity</th>
<th>Electricity</th>
<th>Manufactured fuels</th>
<th>Other</th>
<th>Total</th>
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<tr>
<td><strong>Supply</strong></td>
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<td>Indigenous production</td>
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<td>590</td>
<td>2593</td>
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<td>Imports</td>
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<td>5431</td>
<td>5998</td>
<td>10564</td>
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<td>-</td>
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<td>3729</td>
<td>8362</td>
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<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Rest of UK</td>
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<td>2269</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-8374</td>
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<td>Marine bunkers</td>
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<td>-</td>
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<tr>
<td>Stock change</td>
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<td>-</td>
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<tr>
<td><strong>Primary supply</strong></td>
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<td>11707</td>
<td>724</td>
<td>2593</td>
<td>-1110</td>
<td>-</td>
<td>25071</td>
</tr>
<tr>
<td><strong>Statistical difference</strong></td>
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* Denotes disclosing data

(1) Includes manufactured solid fuels, benzole, tar, coke oven gas and blast furnace gas.

(2) Other contains heat generation and blast furnaces. We do not currently have any estimate of end use for Scotland. Manufactured fuel can be split with 58 ktoe used by industry and 24 ktoe used domestically.

(3) Stock fall (−), stock rise (+).

(4) Primary supply minus primary demand.

(5) Rest of EU net export (including rest of UK)

(6) With the data available at present it is difficult to quantify the amount of imported petroleum that is consumed in Scotland or exported.

The current flows are a best estimate in a simplified representation of what is a complex sector.
ANNEX B - Energy conversion units/factors

Calorific values – The amount of heat produced by the complete combustion, under specified conditions, of a fuel or material.

Joules – A joule is a generic unit of energy, work or amount of heat from the conventional International System of Units. It is the equivalent to the energy dissipated by an electrical current of 1 ampere driven by 1 volt for 1 second; it is also equal to twice the energy of motion in a mass of 1 kilogram moving at 1 metre per second.

Tonne of oil equivalent (toe) – A common unit of measurement which enables different fuels to be compared and aggregated.

Conversion factors for petroleum

Crude Oil

1 m³ of crude oil = 6.2898 barrels of crude oil
1 tonne of crude oil = 1.090 tonnes of oil equivalent (toe) of crude oil
1 barrel of crude oil = 1.090 barrels of oil equivalent (boe) of crude oil
1 tonne of crude oil = 7.5 barrels of crude oil
1 tonne of oil equivalent (toe) of crude oil = 7.5 barrels of oil equivalent (boe) of crude oil

Natural Gas

1 m³ of natural gas = 35.315 standard cubic feet (scf) of gas
1 m³ of natural gas = 0.0066 boe
1 m³ of natural gas = 0.0009 toe
1 m³ of natural gas = 0.00074 tonnes of LNG
1 million standard cubic feet (mmscf) of natural gas = 26.629 toe
1 million standard cubic feet (mmscf) of natural gas = 21 tonnes of NGL
1 million standard cubic feet (mmscf) of natural gas = 172.41 thousands of boe

Natural Liquid Gas

NGLs from Crude Oil: 1 tonne of natural gas liquids (NGLs) = 1.160 toe of NGLs.
NGLs from Associated Gas: 1 million standard cubic feet (mmscf) of gas = 172.41 thousands of boe

Prefixes

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Value</th>
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<td>mega (M)</td>
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<td>$10^9$</td>
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Standard Energy Conversion Factors

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<td></td>
<td>= 41.868 GJ</td>
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<td></td>
<td>= 11,630 kWh</td>
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<tr>
<td>100,000 British thermal units (Btu)</td>
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ANNEX C - Terminology and definitions

Capacity Factor (or Load Factor) - Actual output as a proportion of the theoretical maximum output

Capacity margin – The ‘capacity margin’ is the difference between the electricity generating capacity needed to meet peak demand and what is actually available. This capacity margin is needed to ensure that in extreme situations - i.e. power station failures, sustained periods of high demand – there is sufficient reserve capacity to meet demand.

Carbon Intensity of Electricity Generation (or Grid Intensity) – The Climate Change (Scotland) Act 2009 requires Scottish Ministers to estimate the carbon intensity of electricity generation. This calculation estimates the aggregate emissions from electricity generation, as defined under the EU Emissions Trading Scheme, divided by the aggregate electricity generation in a given year. There are numerous ways of estimating this figure with some options discussed in the official report to the Scottish Parliament. The approach adopted in the 2012 report uses the Scottish Pollutant Release Inventory which calculates emissions based on fuel inputs. As such, the figure reported to the Scottish Parliament are based on emissions from regular operations and abnormal events, including start-up and shut-down and emergency situations over the reporting period.

CO₂ – Carbon dioxide

Co-firing – Usually refers to the burning of biomass products in fossil fuel power stations.

Conventional thermal power stations – Power stations which burn fossil fuels to produce heat to convert water into steam, which then powers steam turbines, which in turn generates electricity.

DECC – Department of Energy and Climate Change

DEFRA – Department for Environment, Food and Rural Affairs.

De-rated capacity margin – The de-rated capacity margin is an indicator of security of supply. It is defined as the expected excess of available generation capacity over demand. Available generation capacity is the part of the installed capacity that is expected to be accessible in reasonable operational timelines, i.e. it is not decommissioned or offline due to maintenance or forced outage. The available generation capacity will also take into account any expected intermittency of the generation fleet.

EU-ETS – European Union Emissions Trading Scheme. It was launched on 1st January 2005 to combat climate change and involves the trading of emissions allowances as a means of reducing emissions by a fixed amount.

Exports – Refers to goods exiting the UK or, in more specific cases, Scotland.

Feed-In Tariffs – The Feed-In Tariffs (FITs) scheme was introduced on 1st April 2010 to encourage deployment of small-scale, low-carbon electricity generation. This scheme replaced the UK government grants as the main financial incentive to encourage uptake of renewable electricity-generating technologies.

Final energy consumption – Total energy consumed by a final user. It is the energy which reaches the final consumer’s door and excludes energy which is used by the energy sector itself, including for deliveries and transformation.

Fossil fuels – Contain a high percentage of carbon and are typically formed over millions of years. Coal, natural gas and fuels derived from crude oil are classed as fossil fuels.


A household is in fuel poverty if, in order to maintain a satisfactory heating regime, it would be required to spend more than 10% of its income (including Housing Benefit or Income Support for Mortgage Interest) on all household fuel use’

GDP – Gross Domestic Product

Generation output - This is the actual output of electricity delivered by a generating plant. It is normally expressed in megawatt hours (MWh) or gigawatt hours (GWh).

Green deal – A scheme by which energy-saving improvements can be made to a home or business without having to pay all the costs up front. These include: loft or cavity wall insulation, heating, draught-proofing, double glazing and renewable energy technologies.
Heat pumps – A device that takes heat from the ground or air and converts it into heating. Ground source heat pumps use pipes which are buried into the ground to extract heat. Air source heat pumps absorb heat from the air outside.

Imports – Refers to goods entering the UK or, in more specific cases, Scotland.

Indigenous production – The production of primary energy.

Installed Capacity - This is the maximum power output at which an electricity generating plant can operate. Manufacturers generally measure the maximum, or rated, capacity of generating plant to produce electric power in megawatts (MW).

Levelised costs – Electricity generation costs are a fundamental consideration of energy market analysis but, different types of generation exhibit different cost profiles which can lead to difficulties in making direct comparisons. For example, renewable technologies are characterised by high capital costs and low running costs, whereas a CCGT gas power plants are characterised by relatively low capital costs but high operating costs (e.g. fuel costs). Levelised costs estimate data broken down into component costs, from planning through construction to eventual decommissioning, which are combined to estimate the lifetime cost of generation of a plant. These are combined with estimates of energy output from the plant to derive an average cost per unit of energy generation. These average costs are described as levelised costs.

Non-energy use – Non-energy uses include chemical feedstock, solvents, lubricants and road making material.

OFGEM – The regulatory office for gas and electricity markets

ONS – Office for National Statistics

Primary electricity – Electricity generated from sources other than fossil fuels, these include nuclear and non-thermal renewables. Imports of electricity are also included.

Primary fuels – Fuels which are directly obtained from a natural source, these include coal, oil and natural gas.

Renewable energy sources – Renewable energy sources includes wind, wave and tidal, solar power and hydroelectricity. Renewable energy includes solar power, wind, wave and tidal, and hydroelectricity. Solid renewable energy sources consist of wood, straw, short rotation coppice, other biomass and the biodegradable fraction of wastes. Gaseous renewables consist of landfill gas and sewage gas.

RESTATS – The Renewable Energy Statistics database for the UK.

RO – Renewables Obligation. An obligation on all electricity suppliers to supply a specific proportion of electricity to customers from renewable resources.

Secondary fuels – Fuels which are derived from primary sources of energy, which includes electricity generated from burning coal, gas or oil.

Thermal efficiency – The thermal efficiency of a power station is the ratio between the useful output of a device (electrical energy) and the input (heat energy contained in fuel).
ANNEX D - Notes and References

NOTES/REFERENCES

1. Please note that comparisons for some metrics with the relevant UK and EU figures may not be strictly comparable and should be used as a broad indication only. This is primarily due to lack of comparable sub-national data being available and different assumptions and methodologies have to be used to generate the relevant Scottish proxy comparators. For example, the DECC produce different metrics to measure the share of renewable electricity generation - one of which is used to report to the EU for the Renewable Energy Directive. Please see page 51 of DCC’s latest energy trends publication for more information:


2. Within the definition of the energy growth sector, the estimate of the GVA for the extraction of crude petroleum and natural gas (SIC 06) relates to the GVA generated by companies registered at an address in Scotland. It does not reflect the full value of GVA generated from oil and gas production in the North Sea. For a further discussion of the GVA and GDP associated with offshore oil and gas production, please refer to Chapter 6.

ELECTRICITY MAPS

1. The source data for these maps is DECC published sub-national consumption statistics. The data can be viewed or downloaded from: https://www.gov.uk/government/collections/mlsoa-and-lsdoa-electricity-and-gas-estimates


3. For disclosure control purposes some consumption data was not allocated to a specific intermediate zone. The total unallocated consumption accounts for less than 1% of all consumption.

4. Non-domestic half hourly meter data is available only at the local authority level and has not been mapped here.

5. Consumption recorded on half hourly meters represents 68.3% of total non-domestic consumption. Half hourly meters account for 4.9% of the total number of non-domestic meters.

6. The colour schemes for the maps were assigned by applying the Jenks natural breaks classification method with 5 classes. The class partitions were then rounded to create readable legends.

7. The data was mapped using the most recent 2011 Intermediate Geography boundaries.

GAS MAPS

1. The source data for these maps is DECC published sub-national consumption statistics. The data can be viewed or downloaded from: https://www.gov.uk/government/collections/mlsoa-and-lsdoa-electricity-and-gas-estimates


3. For disclosure control purposes some consumption data was not allocated to a specific intermediate zone. Total unallocated consumption accounts for less than 5% of all consumption.

4. The colour scheme for the domestic map was assigned by applying the Jenks natural breaks classification method with 5 classes. The class partitions were then rounded to create a readable legend.

5. The colour scheme for the non-domestic map was assigned manually to incorporate the gas industry standard “Annual Quantity” cut-off point of 73,200 kWh which DECC uses to classify all consumers under that annual consumption as domestic consumers. Classes thereafter were roughly assigned to a geometric interval classification and then adjusted and rounded to create a readable legend.

6. The data was mapped using the most recent 2011 Intermediate Geography boundaries.