

SCOTTISH WATER

WRITTEN SUBMISSION

Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027: The Draft Second Scottish Report on Proposals and Policies (RPP2)

Overview

Scottish Water has been actively monitoring and managing carbon since 2006-7. At 465,000 tonnes per annum our carbon footprint compares favourably with other water companies. It is on a declining trajectory despite the requirement for continued investment to deliver statutory quality enhancements, which drive more power usage. There is a clear link between enhanced treatment and energy demand. Scottish Water has both offset the increased demand and achieved a 10% reduction in carbon through programmes of energy efficiency, leakage management, and investment in renewables.

We anticipate that there will continue to be a demand for higher standards and we are currently seeking to understand the longer term trajectory for energy consumption and how we might continue to offset this.

Our water service has the lowest carbon intensity in the UK, benefiting from purer water and widespread use of gravity in distribution. Wastewater services have a higher carbon intensity as a consequence of the distributed population, more small treatment works with high treatment standards, and a need for more pumped sewers. It is similar to companies such as South West Water and Anglian.

We serve almost all households in Scotland and when our vital service is contrasted with other consumed services it is regarded as a low carbon – less than 200kg per household, two thirds of which is wastewater. This is less than running a normal household fridge freezer for a year. We have a water efficiency plan, which will support our sustainability agenda.

A key area of active work is in finding more sustainable ways of providing water and wastewater services to avoid future energy demand. This is evident in our work on sustainable land management and source control of pollutants – finding ways to avoid the need for treatment by preventing substances entering watercourses. We are also trialling more sustainable, passive treatment technologies.

We are investing in an ambitious renewables programme. Utilising our assets and land we have the potential to generate sufficient power to offset our energy consumption through a mix of hydro, wind and combined heat and power projects. The key challenge is finding economic schemes that support our objective of keeping prices low to customers. Coupled with a continued focus on leakage management and energy efficiency we will continue to actively manage carbon and energy in the coming years.

Appendix One

General Comments

Scottish Water supports Scottish Government goals on carbon and climate change and is taking a number of steps to deliver appropriate actions to both mitigate and adapt to climate change.

Our core purpose is to protect public health by providing high quality water and safe sanitation, to protect our environment by collecting, treating and safely returning waste waters, and to support the economy by ensuring these services are affordable. Over the past 10 years, our investment programme has substantially improved services to meet customer expectations and to deliver statutory quality enhancements.

Water and wastewater services are delivered through a large asset base with over 100,000km of water and wastewater networks and thousands of treatment works and pumping stations. Scottish Water currently consumes around 450 GWh/annum of electricity at a cost of over £40m per annum, which increases to circa 650GWh if PFI sites are included.

Since 2007 we have assessed our annual carbon footprint utilising a water industry methodology endorsed by the Carbon Trust. Our footprint finds that over 90% of carbon is associated with water and wastewater service provision, with minor amounts attributed to transport and offices.

Since 2008 we have reduced our carbon footprint by around 10%. However, it is important to note that this has been delivered against a backdrop of increased demand from service enhancement. Through programmes of energy efficiency, leakage management, renewable energy delivery and finding more sustainable ways to work, we will continue to drive the carbon reduction agenda within Scottish Water.

Fuel Prices and Fuel poverty

Affordable water and wastewater services are vital to a sustainable Scotland. Scottish Water has a strong focus on value for money for our customers and presently we offer the lowest average household charges in the UK for a service level that compares well with the rest of the UK water industry.

Future energy costs are expected to rise considerably. This places more emphasis on our continued focus on avoiding future demand for energy, energy efficiency where we currently have demand and, where appropriate, renewables.

A core element of our strategy is that investment in energy efficiency and renewables must be cost effective in order that we can achieve the best value for our customers. As such, there are a number of areas being developed for future investment:

Energy Demand and Emissions

Background

In the water sector there is a clear link between requirements to invest to meet statutory quality drivers and energy demand. For example, between 2004 and 2008 Scottish Water delivered a huge number of projects to meet drinking water and environmental obligations, requiring increased energy intensity (pumping and treatment). This saw a 10% increase in electricity usage in line with the investment delivery profile. This is shown in figure 1 below.

As an example, investment to meet statutory requirements of shellfish and bathing waters requires ultraviolet disinfection of wastewater, which in turn requires improved upstream treatment to be effective. This leads to significant increases in demand for electricity and hence emissions. Case studies from the water sector are reported in research undertaken by the Scottish and Northern Ireland Forum For Environmental Research¹. This makes a specific link between legislative drivers and energy demand (and hence emissions).

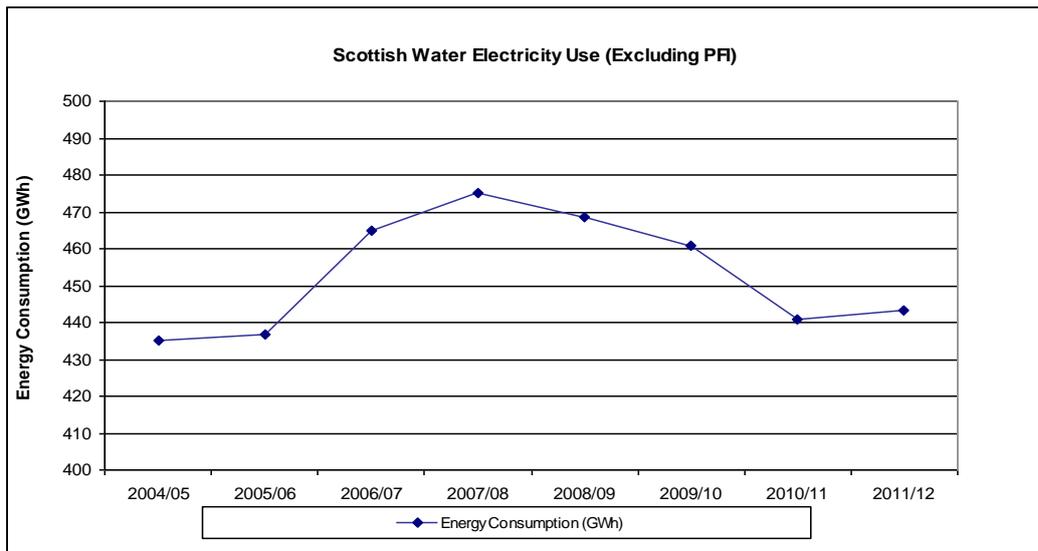
Recent Performance

Scottish Water has continued to invest in statutory quality enhancement *however this has not been matched by a similar increase in overall electricity demand* – in fact we have proactively stabilised and reduced demand.

It is difficult to quantify and attribute the reduced demand to specific measures owing to the wide number of variables that impact rising energy needs (weather, customer demand, new works, asset rationalisation etc). However, our reduced demand is a consequence of continued focus on energy efficiency (e.g. pump refurbishment programmes etc) and leakage management.

Figure 1 shows our electricity consumption over time.

¹ Minimising Greenhouse Gas Emissions Across Environmentally Regulated Industry in Scotland
http://www.sniffer.org.uk/files/2213/4183/7994/SNIFFER_UKPIR11_Final_Report_v_1_1_23.04.08_with_security.pdf



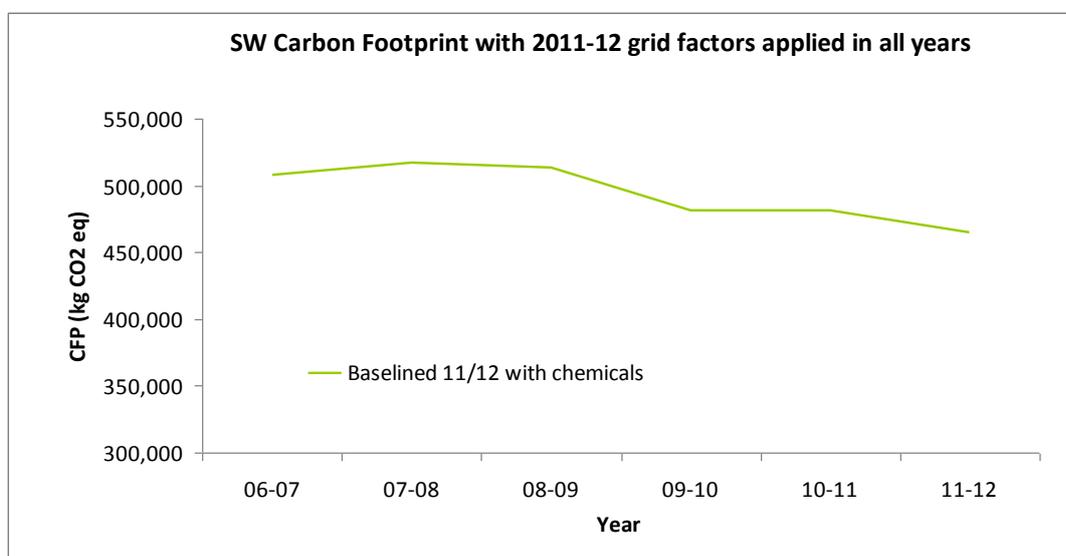
Key messages

- Scottish Water is required to continue to invest in statutory quality enhancement, however the increase in electricity demand has been offset by our focus on efficiency which, coupled with other initiatives such as leakage management, has enabled us to reduce overall demand.
- We anticipate that there will continue to be a demand for higher standards and we are currently seeking to understand the longer term trajectory for energy consumption and how we might continue to offset this.

Carbon Trends

Recognising the continuing investment in improving assets and meeting new requirements, it is positive to note that Scottish Water has reduced its Greenhouse Gas (GHG) emissions in recent years as shown in figure 2.

Figure 2- Carbon footprint



In terms of sources of carbon, emissions from the use of grid electricity represent over 60% of Scottish Water's footprint, with 13% attributed to process emissions (methane/nitrous oxide from biological treatment), 10% from gas use and 10% from chemical use. The remainder are associated with other fuels and waste emissions.

In terms of service, almost two thirds of our footprint is associated with wastewater and sludge, almost one third with water.

Our footprint compares favourably to water companies elsewhere in the UK. In terms of water supply, we have the lowest carbon intensive water service in the UK. We benefit from relatively purer water sources which require less treatment and more use of gravity fed rather than pumped catchments.

Our wastewater service carbon footprint is higher than most (though not the highest). With a larger land mass, distributed population and greater coastline we require more small treatment works, more pumped sewer mains and a need to meet high standards for bathing waters and shellfish waters. As such we are similar to South West Water and Anglian Water.

Carbon in context with other Services

At 465,000 tonnes per annum, Scottish Water's footprint can appear large. However it must be noted that this reflects the need for a vital service that requires a massive asset base and extensive treatment and pumping to ensure that water and wastewater services are available to all customers across Scotland.

Our footprint is similar to a large local authority. At a household level it equates to less than 200kg per annum. This is small when compared with the 10-12 tonnes per person per annum estimated to be Scotland's individual emissions level, and is equivalent to running a fridge for a year² or less than a pint of milk a day³.

Key Messages

- Scottish Water has a carbon footprint that compares favourably with the rest of the UK Water industry and reflects the nature of the service provided (treatment and pumping) and the geography of Scotland.

It is similar to a large local authority and small at a household level (equivalent to running a household fridge for a year) particularly when compared with other consumed services.

² energy Savings Trust information referenced in

<http://www.appliancesonline.co.uk/advice/fridge-freezers/buying-guide/how-much-is-my-fridge-freezer-going-to-cost-to-run.aspx?oo=0>

³ Mike Berners-Lee, 2010 [How Bad are Bananas?](#) 1 pint/day = 264kg CO₂e per year

Reducing or avoiding energy demand

Energy demand is driven by statutory or service requirements. We are undertaking work in a number of areas to find more sustainable ways to achieve quality and service outcomes. Particular examples are:

- **Sustainable land management** – to protect drinking water and the environment in a number of catchment across Scotland we are working with SEPA, landowners and farmers to promote better ways of working that prevent pollutants such as pesticides and nutrients getting into watercourses. This is expected to help avoid future more intensive water treatment.
- **Source control of wastewater pollutants** – working with SEPA we are seeking to promote a ‘prevention is better than cure’ approach to meeting quality standards required under the Water Framework Directive. This will mean a key focus on education and measures to prevent entry of pollutants into our systems and watercourses. The objective is to avoid more energy intense treatment.
- **Achieving environmental objectives more sustainably.** We are trialling more passive treatment systems and also working with SEPA to review environmental needs at a number of sites to ensure that the appropriate, minimum level of treatment is being applied to achieve environmental objectives.

There are uncertainties associated with these measures, hence the need for more study and research, but it is critically important we seek all opportunities to avoid unnecessary power demand.

Leakage,

Our water service is low carbon compared with the rest of the industry, and the substantial investment in leakage management since 2006 has helped reduce this further.

We have made great strides on leakage management in recent years, cutting losses by over a third. We will continue to invest to ensure this does not deteriorate and we are currently working with regulators to plan future leakage objectives. We will include carbon appraisal in developing future leakage plans, which will include assessment of the embodied carbon associated with the digging and repairing of pipes to ensure there remains a net carbon benefit.

Water efficiency

As we have highlighted, domestic household emissions associated with water and wastewater services are below 200kg per annum. Of this, roughly two thirds is wastewater (which includes road and roof drainage). Consequently, the opportunity to save carbon through water efficiency is relatively low.

In the wider context of sustainable use of resources water efficiency is the right thing to do and we have lodged a Water Efficiency Plan with ministers outlining our actions. Key to this is the delivery of water efficient household fittings through revised building standards. This will take a number of years to deliver benefit, and

alongside this there are trials to understand the effectiveness of water consumption meters and customer education and awareness.

In the context of energy, it is important to understand that heating water in the home is over five times more carbon intense than the carbon associated with water supply⁴. Messages should focus on conserving heated water, and only heating that which is needed. In this respect we are keen to work collaboratively with the energy sector to deliver integrated messages to householders. The water industry's collaborative research organisation (UK Water Industry Research Ltd) has just completed a study to understand the benefits of joint messaging between the water and energy industry – they are the same customers. We will review the outputs and engage with energy companies to identify ways to engage customers more effectively.

Surface Water Drainage

It is often perceived that water companies waste energy by capturing and pumping rainwater. This is because we have a legacy infrastructure that combines surface water and foul drainage. However, combined systems were created to prevent flooding as our towns and cities developed, overtaking existing natural watercourses and drainage channels.

Separating and re-engineering such systems requires the creation of somewhere for the water to go. We have undertaken studies to understand the carbon benefit and disbenefit of surface water separation. Whilst it is location specific it indicates that the embodied carbon associated with creating alternative assets (detention ponds and associated infrastructure) may often be greater than the carbon benefit gained through reduced pumping. As a result, separate surface and foul drainage is the right approach for new developments, but may have limited carbon benefit for existing systems.

We will pursue more sustainable means to manage surface water through Surface Water Management Plans (SWMP) with SEPA and with Local Authorities. The primary driver is to alleviate flood risk and ensure we adapt sustainably to climate change. To this end a number of SWMP pilot schemes to reduce flows into sewers are expected in the next few years, particularly in Glasgow. There may be a secondary carbon benefit from this, but it would not be effective to do it just for carbon reasons.

Energy Efficiency

We are developing further energy efficiency opportunities to build upon existing programmes, setting out short, medium and long term actions. The aim is to ensure we are doing all we can to cost-effectively reduce power consumption. This will cover a range of areas such as pump efficiency, optimisation of treatment

⁴ <http://www.waterwise.org.uk/pages/hot-water-and-energy.html>

technologies and is principally targeted at assets with the largest consumption of power. Lessons learned will be rolled out more widely.

Key Messages

- We are undertaking extensive studies and work with stakeholders to avoid unnecessary demand for energy, for example in sustainable land management and in seeking ways to prevent pollutants entering our systems
- Leakage management has delivered substantial improvements over recent years and we will continue to reduce this further.
- Water efficiency is important in the wider sustainability context, but heating water in the home is far more carbon intense and we are keen to work with the energy sector to communicate messages effectively
- Taking surface water out of sewers will have role in the future primarily in flood management and climate change adaptation – the embodied carbon associated with this may be higher than the carbon saved from not pumping separated water.
- Energy efficiency programmes remain important and will continue, focussed on keeping energy costs down

Renewables

Scottish Water currently consumes around 450 GWh/annum of electricity at a cost of over £40m per annum.

Scottish Water currently generates over 5% of annual electricity demand through renewables, predominantly small scale hydro schemes. In the current regulatory investment programme we are delivering a further 25GWh of small scale hydro schemes. This equates to around 11,000 tonnes of carbon in grid electricity use, and we anticipate this to be in place by 2015-16.

Through innovative use of our existing assets we have the potential for our assets to be used to generate two to three times the electricity we consume. With large land holdings, potential energy in our water networks and organic sludges, there are opportunities across a suite of renewable technologies - wind, small scale hydro, and anaerobic digestion of organic waste.

In addition, there are further opportunities with respect to wind power on a large, medium and small scale. Scottish Water operates in partnership with others to manage such opportunities, and it is important to note the basis on which these opportunities are being pursued:

Large scale wind – ‘silent partner’

Whitelee wind farm is the largest in the UK and one of the largest in Europe, generating 733 GWh/annum of electricity. We facilitated this major investment as 60 of the 140 operational turbines are sited on Scottish Water land, established on a ‘silent landlord’ basis. In the past year we have also made

progress working in partnership with private sector developers to develop projects to exploit wind generation on other land. If they obtain planning approval, these are expected to be in construction from 2014/15 onwards and generating power from 2016/17.

Large Scale Wind Farms – Active Partner/Power Purchase Agreement.

We have been working with two experienced private sector wind farm developers to take forward opportunities for land leases and/or Power Purchase Agreements to facilitate the supply of discounted electricity at a known price over a 20-25 year period to Scottish Water, and potentially other parts of the public sector. We expect it will take 5 years to see these opportunities come to fruition with some sites going through Environmental Impact Assessment in 2013. .

Medium Scale Wind

We have completed an OJEU Procurement Process and awarded a number of frameworks with smaller developers to work with 25 sites on single turbine opportunities on our operational assets. We are in the process of allocating packages of sites which can then move on to the development phase. The electricity generated will largely be exported.

Small Scale Wind

Work is currently identifying sites suitable for hosting single turbines, where the electricity will largely be consumed on-site. Planning permission has been granted for our first sites at Stornoway Waste Water Treatment Works and Stronsay Water Treatment Works, which will be commissioned in April 2013. A number of other sites are going through planning.

Key Messages

- We have a number of opportunities using all forms of renewable technology and we will seek to deliver these ourselves or with partners in a way that is cost-effective and delivers value to customers through reduced energy costs or increased energy security

Energy Performance and Energy Efficiency of Existing non-domestic buildings

Whilst emissions from buildings constitutes a minor element of our carbon emissions, there are a number of activities we are pursuing to continually improve performance.

With respect to existing offices, consumption at main sites is metered to enable monitoring and management of power and those sites which are accessible to the public have had energy performance certification in place for some time. Various energy saving measures have been implemented including information and reminders for building users, installation of passive infrared sensors (PIRs) and voltage optimisation.

A key Change project is underway to promote Agile working within our organisation. Through the increased use of technology, employees will have flexibility to work from alternative locations resulting in reduced travel, space optimisation, and an overall reduction in our office building footprint

A new National Operations Centre will open later this year to house our Data Centre and Intelligent Control Centre along with office space for 600 workers. The building design is EPC A rated. Selection of the preferred design drew heavily on sustainability and carbon management, and we expect to see energy consumption reduce by over 40 % compared to the existing provision. Key features of the building include an emphasis on natural ventilation and daylight, removing the need for office air conditioning. This building will host a number of green features including a biomass boiler for space heating and water heating through solar panels.

Renewables Challenges

Interconnection and Grid Upgrades

Scottish Water has a great deal of potential across its estates, however much of this is in more remote areas where there may not be an obvious outlet for power. This means there are often additional costs to develop appropriate grid access which, in some cases, can render the schemes not financially viable. This can affect projects of all scales and at present there are a number of projects we are pursuing that require such connections to be developed.

For example, we are aware that the cost to develop a grid connection for a particular small scale hydro scheme may exceed £1m which, for the size of the scheme means it would not be economic to pursue. This is factored in to our assessment of future renewables projects, and the challenge is to promote schemes to make use of lower cost connections where they exist.

Whilst Scottish Water is not the primary developer, many projects are affected by grid constraints to a greater or lesser extent. This challenge is recognised by Government and the Industry and it will take continued joint working to resolve.

There are a number of administrative steps and prescribed periods within the process which are cumbersome, and increased engagement between developers and Distribution Network Operators may help to progress projects more quickly. Recognising that we see only one side of this issue, we would suggest that a forum to explore these issues may be useful.

