

Low Carbon Energy Solutions
Heat from Waste Water





Scottish Water Horizons
AN INTRODUCTION

About Scottish Water



Over 1.35 billion litres of water every day

Over 5 million customers

2.5 million households

156,000 business premises

£1.2 billion turnover


Around 4,000 employees

Over 60,000 miles of water pipes and sewers


More than 1800 waste water treatment works

245 water treatment works


Scottish Water Horizons



Generating PV power



Enabling innovation testing



Recycling food waste

Wholly owned subsidiary of SW

Non-regulated commercial activities

Conglomerate of diverse businesses

Key drivers include

- Climate Change (Scot) Act 2009
- Water Resources (Scot) Act 2013

Scottish Water Horizons are the commercial arm of Scottish Water, the core business are very busy making sure that our customers have clean, safe drinking water and that their waste water is treated and safely disposed of to the environment.

At Scottish Water Horizons we are responsible for identifying, developing and delivering innovative, profitable and sustainable opportunities for Scottish Water's assets

The image features a blue-toned photograph of a modern interior space. In the foreground, a white, cylindrical light fixture with a black top and a dial with numbers 1, 2, 3, and 4 is visible. In the background, there is a white, rectangular light fixture with a grid of vertical slats. The text "SHARC Energy Systems" is written in a bold, blue, sans-serif font, and "AN INTRODUCTION" is written in a smaller, blue, sans-serif font below it. The text is overlaid on a semi-transparent white rectangular background.

SHARC Energy Systems

AN INTRODUCTION



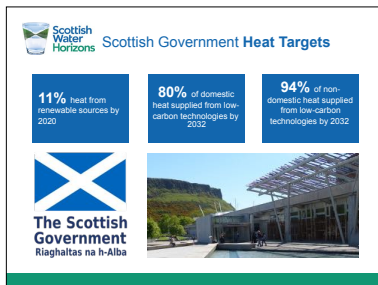
- Headquartered in Vancouver, Canada
- Founded in 2010 by a team of HVAC & Geo-Exchange engineering professionals
- SHARC Energy Systems - UK division of SHARC International & a wholly owned subsidiary
- SHARC International - currently listed on the Canadian Securities Exchange - (CSE:SHRC)



Canadian company that have been developing heat from waste water technology and implementing it at building level for a number of years, the application in Scotland where we harness public sewer networks is a new model for them and is now one that is being implemented around the world.

Talk about SHARC and PIRANHA





These are hugely challenging targets around renewable heat and they require a step change in technology to deliver. You cannot deliver these targets by doing what we have been doing just a bit more efficiently, these targets require a change in mindset as to how heat is delivered.

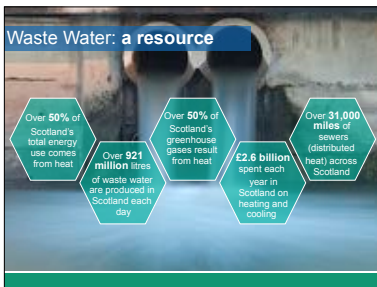


Scottish Government **Heat Targets**

“We expect Scotland's public bodies to lead by example in combatting climate change and make a valuable contribution towards achieving our emissions reduction targets. The public sector is critical to the successful delivery of the Climate Change Plan.”

Quote from Climate Change Plan - February 2018

As a public body, this is a clear statement from the Scottish Government that we are key to delivering their Climate Change Plan. This puts a responsibility on all public bodies to do whatever we can to ensure that the Climate Change Plan is a success. The key to delivering against these targets is going to be collaborative working between public and private sectors which has often been a challenge.



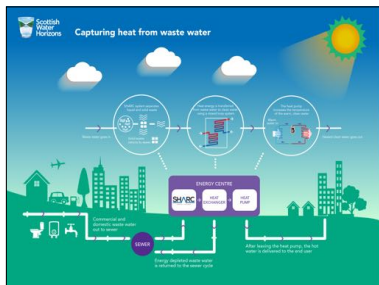
UK wide there are 11 billion litres of sewage produced each day – 368 Olympic swimming pools each day

Our sewer network can act as a heat network, minimising impact of new schemes on customers (reduced excavations, disruption, issues around access such as Network Rail or embargo roads)

Based on 921 million litres per day and removing 5 degrees of heat from this waste water, this would allow for the installation of around 223MW's of heat generation capacity which would be capable of delivering almost 2TWh's of heat per year.

The system can also be used for cooling where the heat is rejected into the sewer network. Using the sewer network for both heating and cooling allows for an almost limitless amount of energy to be harnessed and distributed for heating and cooling.





This infographic was developed to give an overview of how the system operates.

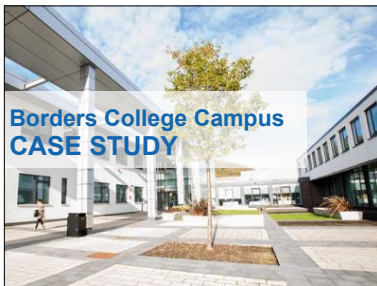
The sewer network collects the waste water from homes and businesses (and in the majority of cases some rainwater as well) and transfers this to our network of treatment works.

We intercept this flow of waste water close to the customer (the system can be sited anywhere on the network where there is sufficient flow, it does not need to be at or near a treatment works)

The waste water is separated by SHARC's patented technology which allows the warm water to pass through a heat exchanger.

Once the waste water has passed through the heat exchanger it picks up the separated solids and returns them to the sewer network.

The water on the other side of the heat exchanger is then passed through heat pumps to lift the temperature to, typically, around 60C. It is then used to provide space heating and hot water.



Background to the Borders campus job and the benefits it has brought to them

Target of 25% carbon reduction, had achieved 20% through PV, LED lights etc

Initial plan to have Biomass but site constraints meant this was challenging so keen to explore other options

Introduction through Scottish Enterprise



Borders College



The campus benefits from:

- ✓ 1.8 GWh of annual heat
- ✓ GHG emissions saving of in excess of **150 tonnes** per year
- ✓ **20 year** stable heat supply price
- ✓ Ongoing system O&M
- ✓ System SPF **4.2**



There is a lot of information on this slide but some key points are:

The System SPF of 4.2 (averaging 420% efficiency over the course of a year)

The Carbon saving of 150 t is based on figures developed at the design stage of the project, as the grid has decarbonised over the intervening years the same calculation based on 2017 figures would result in a Carbon saving of closer to 230t

Customer benefits - SHARC Energy will provide:

- 1.8 GWh of annual heat
- GHG emissions saving of in excess of 150 tones per year
- 20 year stable heat supply price
- Ongoing system O&M
- System SPF 4.2

Onsite construction of:

- Energy Centre
- Sewer Interface and pumping station install

Success at Borders College



“During our evaluation period we wrestled with the ongoing question, ‘Where’s the catch?’ Surely this could not be as presented, new heating system, price certainly, no capital outlay, significant carbon savings and no ongoing space or delivery issues to worry about.

Yes, there were teething problems as you would expect with a new system but these were overcome. Our suspicions were unfounded and we have now been operating successfully for 18 months.”

Rob Hewitt – Facilities Manager at Borders College





**Bandwidth project**

Two projects under one funding agreement:

- Leisure Centre in Argyll & Bute
- Art Gallery in Glasgow

Combined CAPEX value circa £2.5m



Aqualibrium contracts signed and starting on site within the next month or so, Kelvingrove to go after that.

9 months of planning to get approval for Kelvingrove

- Demonstrates retrofit capabilities of the technology in different buildings across different geographical areas
- Demonstrates our business model & SPV structure for public sector adoption



- Demonstrates our ability to provide energy to new networks and influence positive building design
- Wholesale heat sold to an ESCO to then be distributed to individual building occupiers.



Stirling District Heating



Installation of a CHP and SHARC system on Stirling Waste Water Treatment Works

Biogas from site AD plant to be used along with mains gas

Electricity from the CHP used in the SHARC system as well as helping to power the Works

Heat sold to District Heating Network owned and operated by Stirling Council





POTENTIAL LOCAL PROJECTS



Hawick potential



Teviotdale Leisure Centre:

- Solar PV on the roof
- Heat from Wastewater system

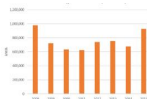
Bid submitted to LCITP for funding for what would be a first of its kind installation



Peebles Cluster:

- Live Borders
- Eildon Housing Association
- NHS Borders

Bid submitted to LCITP for funding





While heat from waste water is not a 'magic bullet' to fix our low carbon heat needs, it is a very effective solution that can be delivered in areas where some other solutions cannot.

3 Key takeaway points

- waste water is a resource, this is a change in mindset as it has historically been seen as an obligation or a problem to be dealt with
- We can harness this resource and, through innovative use of tried and tested technologies, use it to deliver low carbon heat to customers
- We can de-risk the project for customers by funding the installation work with the costs being recouped through a 20 year heat supply agreement and RHI incentive payments (heat as a service is another change in mindset for customers)

Questions

