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LOW-CARBON HEAT CONFERENCE

23 SEPTEMBER 2021 **GLASGOW**

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Heat in buildings – from strategy to reality

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Helen Melone

Senior Policy Manager

Scottish Renewables

#SRHEAT21 @ScotRenew

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Ministerial Address

Richard Lochhead MSP
Minister for Just Transition,
Employment and Fair Work

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Paul Steen

Regional Director for Scotland and North Vattenfall

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VATTENFALL





Heat in buildings – from strategy to reality

Vattenfall strategy for citywide decarbonisation of heat

Paul Steen
Regional Director Scotland and North of England

Scottish Renewables Heat Conference
23 September 2021

Vattenfall strategy for citywide decarbonisation of heat

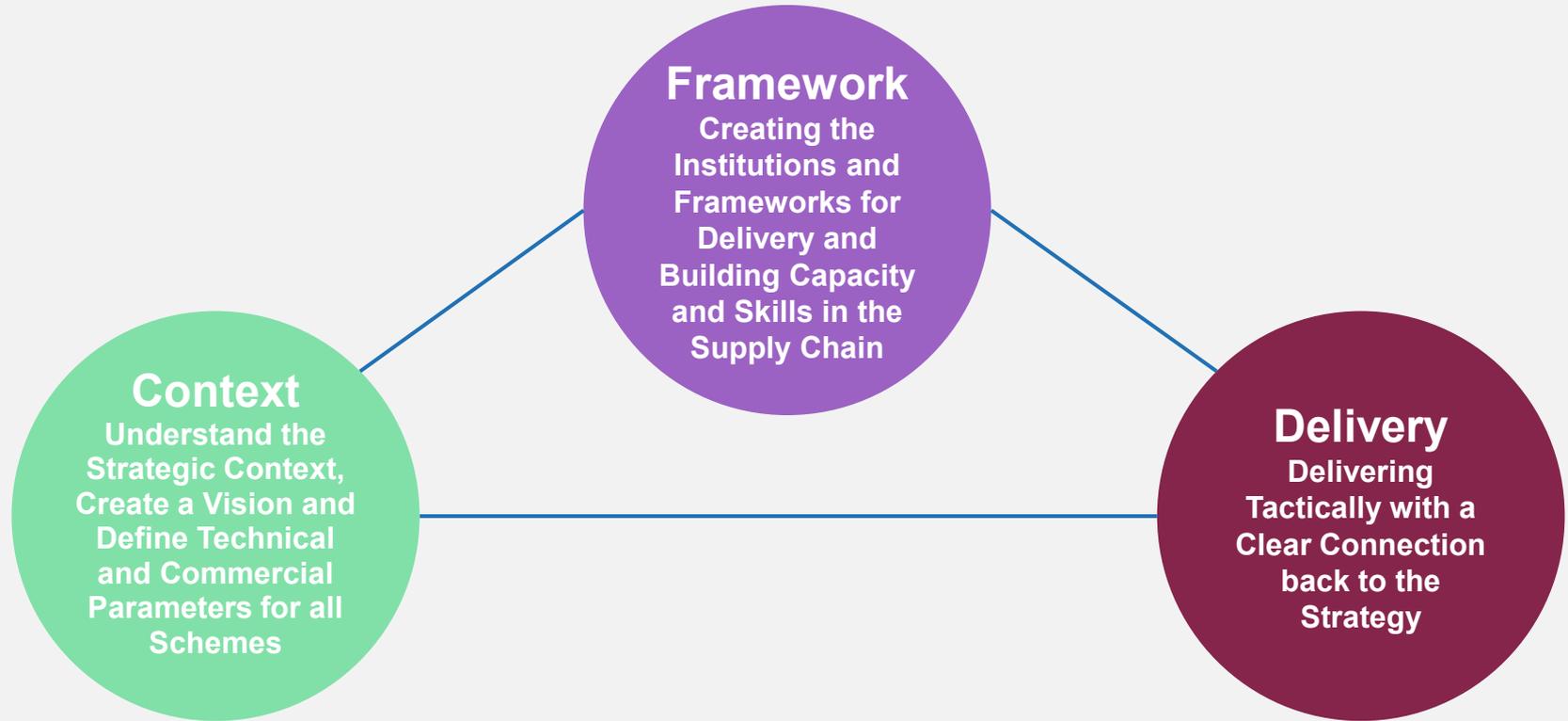
- Tactical approach to delivering the strategy
- The opportunities we see from an ambitious policy and regulatory framework
- Outcomes of delivering the vision





From experiences of energy system decarbonisation for international cities there are some basic steps that are common to the development of district Energy infrastructure

Tactical approach to delivering the strategy



“

Joseph Bazalgette created a sewer system which he originally sized for London's needs of the time - he then doubled it to anticipate the future beyond. These are the qualities that I admire.

Sir Norman Foster

”

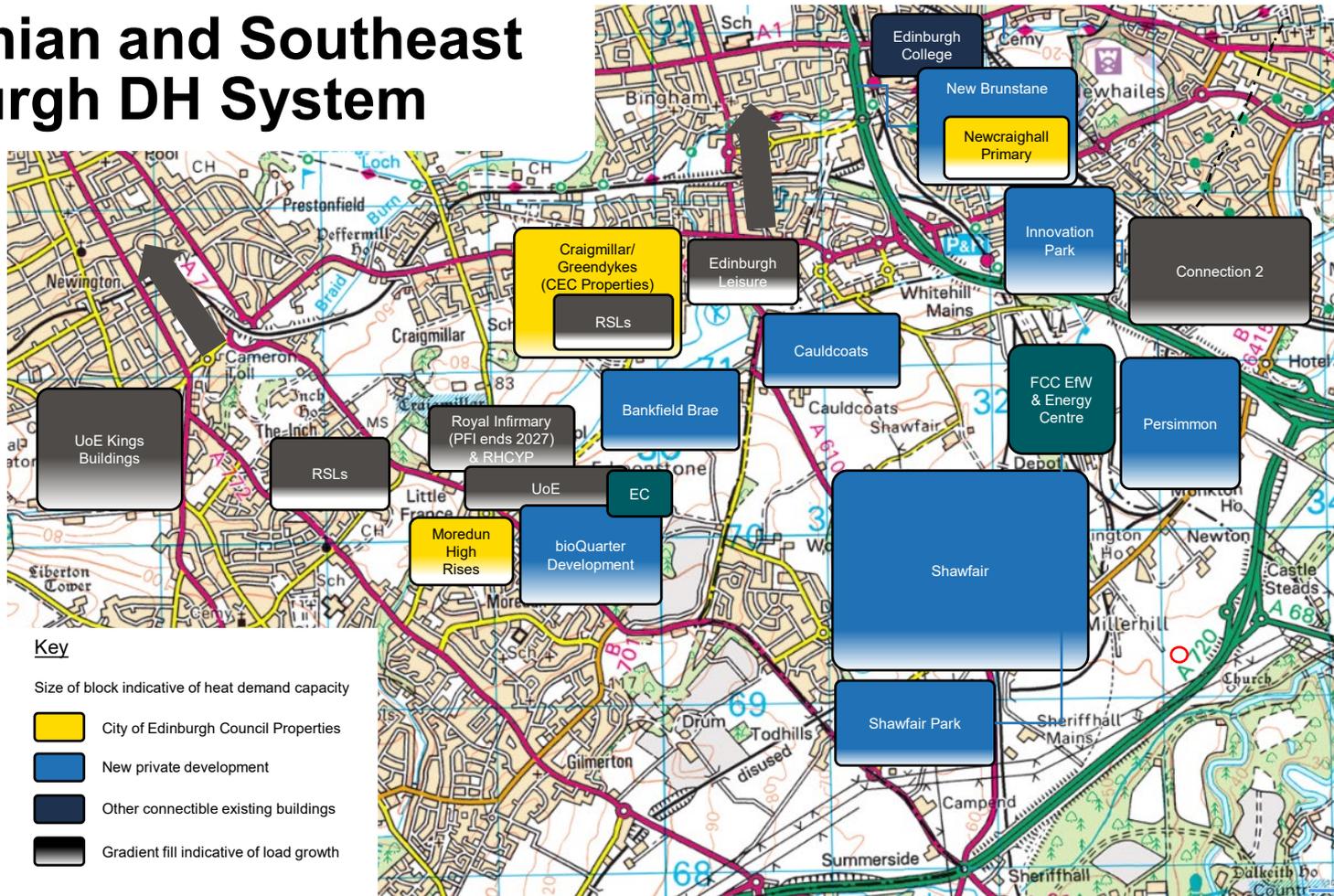
PROPOSED HEAT NETWORK

EDINBURGH



- 0 Greenspace opportunities**
1. Inverleith Park and Royal Botanic Gardens
 2. Jack Kane
 3. The Meadows
 4. Saughton Park
 5. Figgate Park
 6. Forthquarter park

Midlothian and Southeast Edinburgh DH System





**We support Scottish Government
setting an ambitious policy and
regulatory framework**

The critical role of policy and regulation

Priorities to get right in secondary legislation under the Heat Networks (Scotland) Act 2021 that drives uptake of district heating through mandates and incentives:

- Consumer protection (not devolved powers)
- Demand assurance including support to, and compulsion for, consumers to decarbonise
- Statutory undertaker rights and wayleaves for district heating
- Alignment with finance and funding
- Aligning with consultation on Scottish building regulations
- Standards and licensing that will fit alongside permits and concession zones.
- Aligning with policy and investment that supports skills and capacity needed in DH supply chains



Outcomes of delivering the vision

Decarbonise

getting to net-zero carbon emissions - meeting the targets set by governments to tackle the global climate emergency.

Decentralise

optimising energy generation and smart systems at scale for a whole community and that gives confidence to investors.

Democratise

strong engagement and participation with communities demonstrating the social, environmental and economic benefits of decarbonisation.

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Professor Janette Webb
Co-Director UK Energy
Research Centre
University of Edinburgh



Realising Local Heat and Energy Efficiency Strategies

Janette Webb

Heat in buildings – from strategy to reality

Scottish Renewables Low Carbon Heat Conference

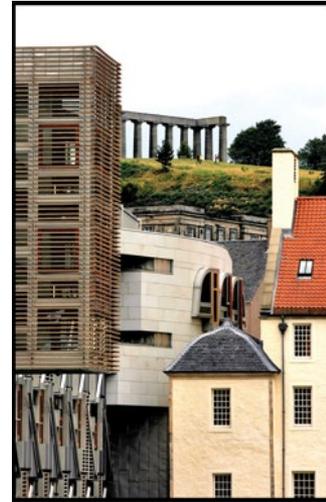
Glasgow

23 September 2021

Proposal – In each Local Authority LHEES will

- Set long-term plan for **decarbonising heat** and **improving energy efficiency** in *all* buildings

- Use a consistent, data-driven method to
 - Establish changes needed in each segment of building stock
 - to achieve **zero greenhouse gas emissions**,
 - and remove poor energy efficiency as a factor in **fuel poverty**
 - Identify **heat decarbonisation zones**
 - and primary measures for reducing emissions in each
 - zones as potential trigger for regulation
 - Prioritise **areas for delivery** against national and local objectives



Three Phases of LHEES Pilots 2017-21

- All LAs 2017-2021
- Tested tools & methods
- Identified data sources & gaps
- Area focus & sector focus
 - self-funding, SMEs, public, private rental, off-gas...
- Resources, capabilities, contractors
- Opportunities for co-working

12 First Round LHEES pilots
Sept 2017 – Mar 2019



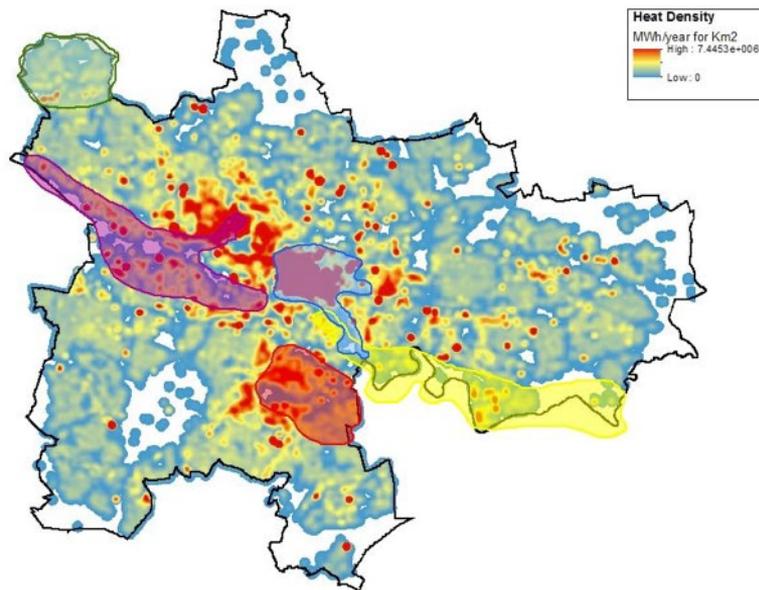
We cannot emphasise enough the costs and resourcing associated

LA Officer

SKILLS ‘Whoever’s... delivering an LHEES...needs to understand about energy efficiency measures, heat decarbonisation measures, district heating...different building types... and focus on the social” (consultant) AND project management, data analysis, GIS

Major learning from pilots and support for LHEES

Data sharing, availability and access



Lessons from LHEES Pilots

- Guidance for consistency & accountability across local and national governments & partners
- Single shared data repository
- Integrate LHEES with related local strategies & planning
- Place matters – urban, island, rural, mixed
- Shared support through central agencies
- Funding across financial years
- Invest in local skills
 - Including engaging exec & councillors
- Statutory LHEES
 - Development *and* implementation
 - Sufficient resources for useful strategy



Scottish Index of Multiple Deprivation
National Records of Scotland
Non-domestic EPCs
Corporate Address Gazetteer
Scotland Heat Map
Home Analytics
EPC Register
Site surveys Council tax register
Ordnance Survey
Council data
NOMIS
Exoserve gas postcode
Scottish Assessors Association
Scottish House Condition Survey
BEIS Sub-national gas consumption data
Private sector landlord registration



Full Reports

<https://www.gov.scot/publications/local-heat-energy-efficiency-strategies-phase-1-pilots-social-evaluation/>

<https://www.gov.scot/publications/local-heat-energy-efficiency-strategies-lhees-phase-2-pilots-evaluation/>

Thanks!

Jan.Webb@ed.ac.uk



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John Barclay
Associate Director
ITPEnergised

Scottish Renewables Low Carbon Heat Event

John Barclay
ITPEnergised





Scotland is serious about achieving net zero emissions

In order to meet our interim climate targets and ensure long-term delivery of our net zero objectives, **by 2030 around 50% of homes, or over a million households**, will need to convert to a zero or low emissions heating system. Reducing emissions from homes will mean converting the vast majority of the **167,000 off-gas homes** that currently use high emissions oil, LPG, and solid fuels, as well as **at least 1 million homes currently using mains gas**, to zero emissions heating. **By 2030, we will also need to convert an estimated 50,000 of Scotland's non-domestic properties to zero emissions sources of heat².**

£1.8 billion

to make homes and buildings greener and easier to heat.



£465 million

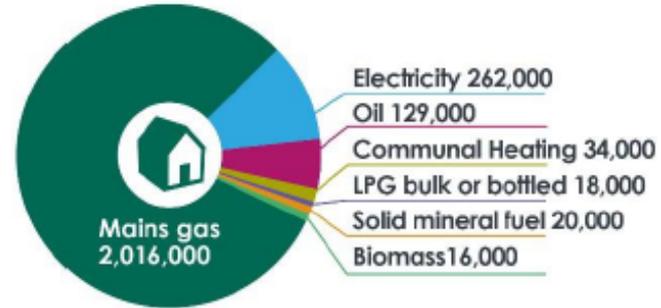
to support those least able to pay for home energy improvements,

£400 million

for heat and energy efficient projects.

110,000 energy efficient affordable homes by 2032

- at least **70%** will be in the social rented sector and **10%** in our remote, rural and island communities.



Breakdown of primary heating fuel vs number of homes (source Scottish House Condition Survey^{vii}, 2019)



What are the Biggest Barriers to Low Carbon Heat Uptake?

- I spent a lot of time over the last few years considering this very point
- This challenge is primarily about retrofit (80% of buildings here today will be here in 2045). And the majority of these buildings are served by natural gas boilers.
- **Is it technical?** No evidence to suggest this is the case aside from hydrogen
- **Is it due to high up front costs?** Partly
- **Is it due to higher energy costs than the counterfactual energy costs?** Partly but that doesn't explain why we haven't completely replaced systems with high counterfactual energy costs such as LPG, oil and storage heating (even when we had RHI). It is certainly a barrier to the counterfactual natural gas retrofit scenario.
- **Will low carbon heat lift people out of fuel poverty?** Depends on counterfactual energy source and how much savings can also be made by efficiency measures.
- **Have we won the hearts and minds of end users to convince them that low carbon heat HAS to happen and that the technology works?** Not to my eyes.

Energy Prices



- We often hear that the Scandinavian countries and the Netherlands do well with low carbon heat.
- Do we really delve deep to understand why? The cost of natural gas and the cost of electricity are large factors.
- The UK has some of the cheapest and least taxed gas in Europe at 5% (but we do tax energy efficiency and low carbon technologies at 20%!)
 - Denmark: taxes and levies correspond to 61.9 % of the final price of natural gas
 - Netherlands: 59% on the same basis
 - Sweden: VAT is 22% on natural gas
- There is a close correlation with countries who have high taxes on fuels and success of low carbon heat.
- Fuel poverty is not a problem that can be solved by low carbon heat. It is a problem that can only be solved by addressing the root causes of poverty.
- It is an unintended consequence that progress on renewable electricity has made the running costs of heat pumps more expensive (but greener)
- Policy and subsidy costs make up ~25% of the end of price of electricity

Energy Prices – Current State of Play



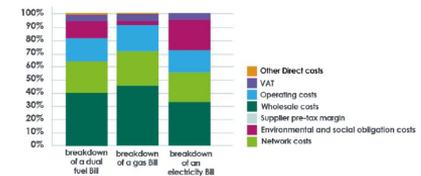
- This is recognised as an issue in the draft HiB strategy. But SG options are limited.
- Energy markets are in a state of flux
- Last natural gas domestic contract: 2.31 pence per kWh. Now 3.3 pence per kWh
- Good news for low carbon heat? Not quite.
- Last electricity domestic contract: 13.5 pence per kWh. Now 17.35 pence per kWh
- This means cost of generating heat will be more for a heat pump than a gas boiler. But...
- The heat pump install should always come with fabric first efficiency improvements
- It can also potentially access heat pump tariffs

Creating Favourable Market Conditions

As we undertake the necessary transformation of our homes and buildings, we also want to ensure that the **energy market** evolves to support decarbonisation and allows energy bills to remain affordable for households and businesses alike.

Currently, primarily due to the relatively low cost of gas in comparison to electricity, in some situations zero emissions heating systems can be more expensive to run than fossil fuel systems like gas and oil. The impact that installing a zero emissions heating system will have on energy bills is dependent on a number of other factors, including the design and quality of system itself, user operation, the system it is replacing, and the energy efficiency of the property in which it is installed. Wider system costs, for example upgrading energy networks, will also likely have an impact on consumer bills and we will undertake further analysis on this issue.

Electricity prices are currently 4-5 times greater than gasⁱ, having risen by around 35% in real terms from December 2010 to December 2019, whereas gas prices remained virtually unchanged in real terms over this periodⁱⁱ. There are a number of reasons why electricity costs more than gas, including wholesale and generation costs as well as policy costs, such as social and renewable electricity obligations, which are recouped through charges and levies placed on consumer bills. Historically, the majority of these policy costs have been added to electricity bills, with comparatively little added to consumer gas bills. The figure below outlines the make-up of energy bills, and illustrates that around 23% of an electricity bill is made up of environmental and social obligation costs, compared to around 2% of a gas bill.ⁱⁱⁱ



Breakdown of GB gas and electricity energy bills. (Source^{iv}: Ofgem, 2021)

What can we do?



- Own the problem and recognise it
- See graphic opposite – broadly agree
- Stop linking low carbon heat with lifting people out of fuel poverty when it won't in many cases
- Progress fabric first and low carbon heat off gas grid
- Get on with fabric first for on gas grid homes
- Both are no regrets options
- Carry out independent analysis of the assertion that the cost of heat pumps and install will come down significantly – equipment, materials, labour
- 'Decisions will be required from the mid-2020s on the balance between electrification and hydrogen in decarbonising heating, and the implications for gas networks.' Source: CCC

Summary of action we will take:

65. In 2021-2022, we will commission independent analysis and modelling to better understand the expected costs of upgrading different property types to the proposed standards, to help guide investment decisions.
66. Establish a new Green Heat Finance Taskforce in early 2021 to provide advice and recommendations to Scottish Government on potential new financing models and routes to market.
67. Set out options for future financing and delivery in 2023, with a view to implementing these new mechanisms from 2025 where applicable and allowed within our legislative competence.
68. Work with the UK Government to design new market mechanisms that can secure and accelerate delivery.
69. We will undertake scoping work during 2021 to understand how the Heat as a Service model might support our decarbonisation goals, including commissioning market and consumer research.
70. We will consider how our local tax and charging powers, such as council tax and non-domestic rates, could be used to incentivise or encourage the retrofit of buildings, alongside our planned approach to regulation. We will commission further analysis to identify potential options, to be implemented from the middle of the decade where appropriate, subject to consultation and public engagement.
71. We will work with the UK Government as it progresses its call for evidence on affordability and fairness to ensure that any reforms do not disadvantage Scottish consumers and that they fit with and enable delivery of our more ambitious climate targets.
72. We will publish research on the impact of rebalancing consumer levies on electricity and gas bills.

The issue with Split Incentives – Not Unique to Low Carbon Heat



- ‘Achieving emissions reductions in buildings will require...an estimated 50,000 non-domestic buildings to convert to using zero or low emissions heating systems.’
- What are split incentives?
- Broadly speaking, where the landlord owns and operates the main energy consuming equipment but does not have a financial incentive to improve energy efficiency or move to LZC heating as they do not pay the energy bill or pass through the costs the tenants.
- Need a stick and perhaps carrots too – removing policy charges on electricity for heat pumps?
- Regulations mentioned opposite have to happen as soon as possible IMO

Existing Non-domestic buildings

Since 2016, regulations^{ksii} have required non-domestic buildings over 1000 m² on sale or rental to a new tenant to carry out an assessment to determine and implement modest energy efficiency improvements. Owners have the option of either implementing the measures identified or lodging a Display Energy Certificate reporting annual energy use.

As set out in the 2018 Energy Efficient Scotland Route Map, we will introduce regulations which will expand and tighten requirements so that they cover all non-domestic buildings. We will do this by placing requirements on owners to reduce demand for heat through energy efficiency improvements, and install a zero emissions heating supply, within the extent of our powers. Regulations will be introduced from 2023 to 2025, with backstops applying to all non-domestic buildings between 2035 and 2045.

In the Energy Efficient Scotland Route Map 2018, we proposed that regulations be phased in, starting with the largest buildings with the scope of the regulations increasing over time so that by 2045 all non-domestic buildings would be improved. A phased approach is likely to remain appropriate. We will consult on our proposed regulatory framework for non-domestic buildings, including trigger points, backstop dates, compliance and enforcement, during 2021-22.



How we work with you

Our approach – life cycle



We think win-win and full project life cycle to help our clients grow.

- We're passionate about Net Zero. We are a team of industry leading trusted technical advisors who aim to meet and exceed our clients' aspirations, targeting growth markets and clients.
- We identify relevant trends and innovation:
 - Emerging technologies and future best available techniques
 - Key regulations that drive investment opportunities and risks
 - Market size, growth and behaviour in short and medium term
 - Strategic actions of participants and our network
- We are then better placed to understand your wider goals
- We provide expert and commercially focused guidance and scientific analysis
- We join the dots with other ITPE services that may be of benefit
- We close gaps in expertise needed with our comprehensive network



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ITPEnergised Group offices in:

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“We believe passionately in the world’s transition to net zero. We are a team of trusted technical advisors who meet and exceed our clients’ aspirations.”



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Eddie McAvinchey
Executive Director –
Sustainable Investment
The Scottish National
Investment Bank



The
Scottish
National
Investment
Bank

The
investing in
Scotland's
future
Bank



Decarbonisation of Heat
Eddie McAvinchey, 23 September 2021

What are we?

The Scottish National Investment Bank is a new development investment bank for Scotland, established to deliver mission impact investment to Scottish businesses and projects on commercial terms.

Our Purpose:

To catalyse economic and societal change and stimulate innovation by investing in a fairer, sustainable and ambitious Scotland.

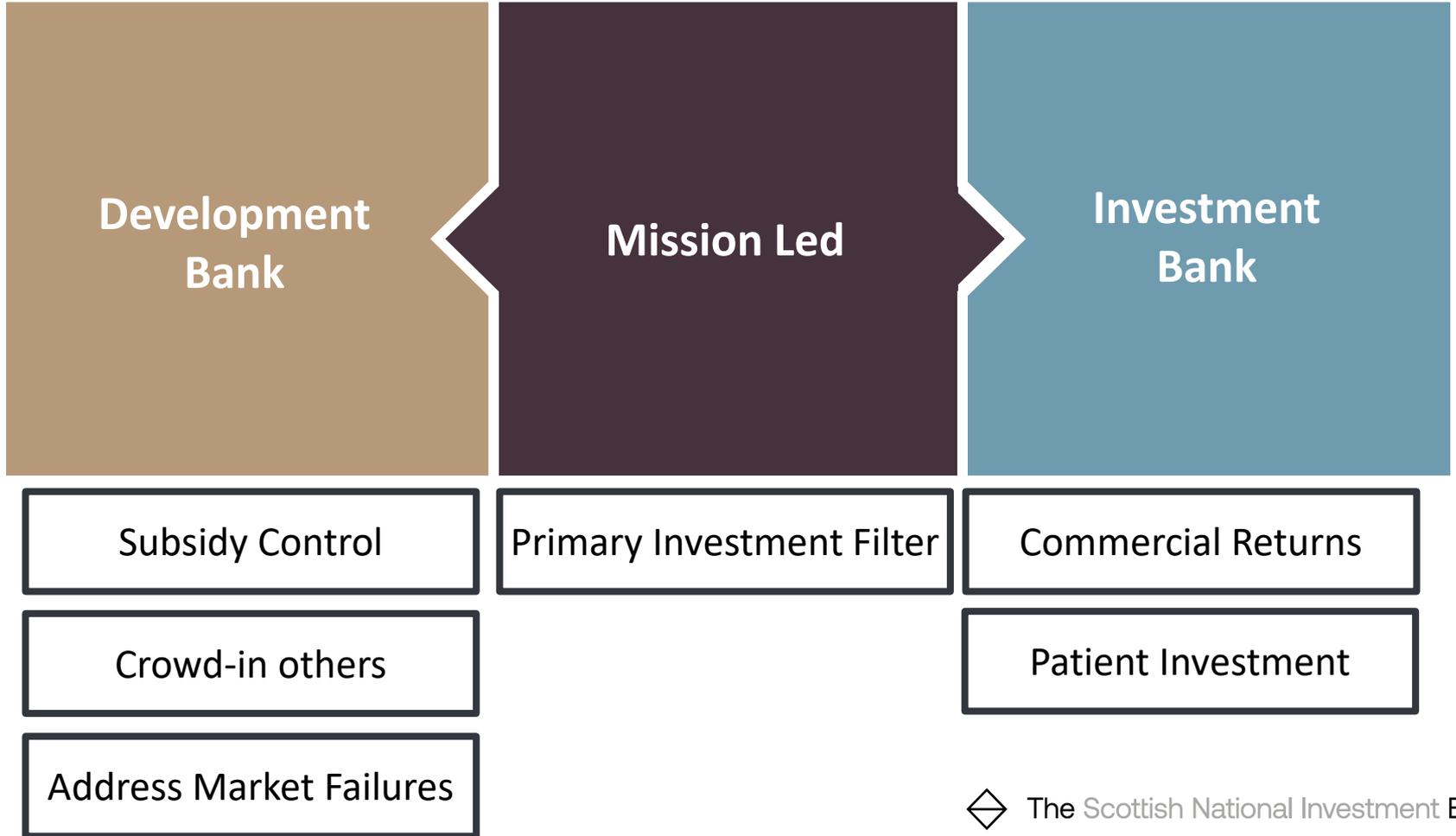
Operational Independence

- Bank established to be operationally independent from the Scottish Government (our sole shareholder), both Ministers and the Public Sector.
- Investment decisions and day to day operations are responsibility of the Bank, which is a PLC and governed by a board of directors.
- The independence of the Bank is critical to ensure its investment decisions are based on commerciality and addressing its missions and free from political influence and/or policy influence.
- Raising and managing third party funds is a core goal for the Bank, this will allow the Bank to invest additional capital alongside its own capital to increase the scale of its impacts and enhance delivery of its missions.

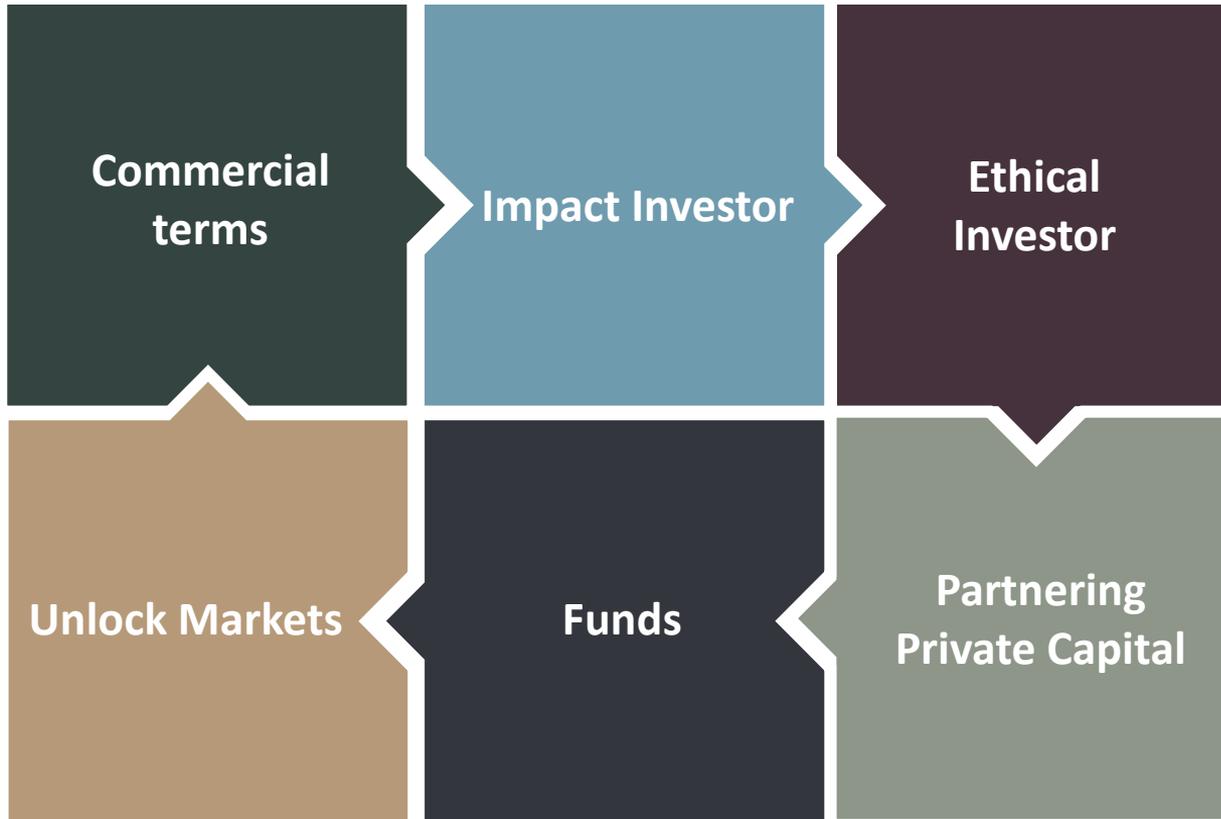
Our Missions



Our Priorities

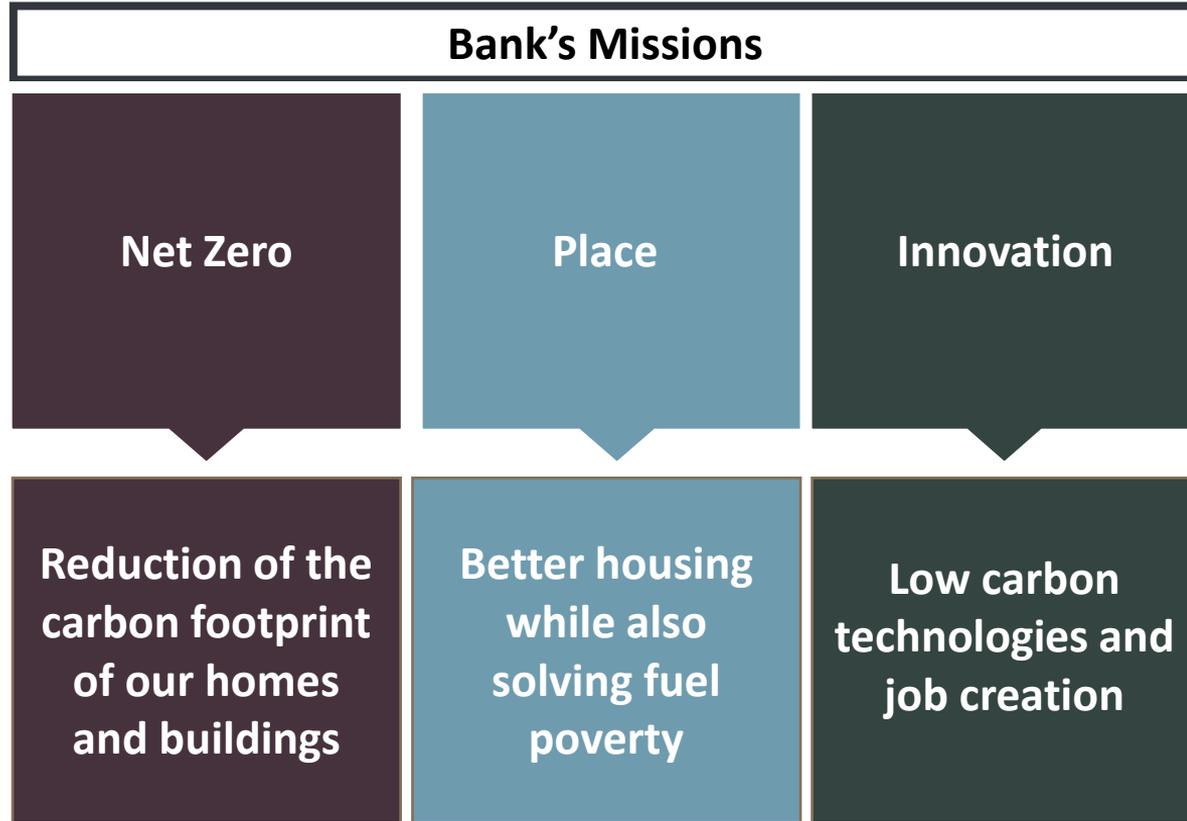


What do we do?



Decarbonising heat in Scotland

Our Missions



Scale of the challenge

- There is significant scale to the challenge of decarbonising heat for our buildings.
- The estimates are that it will take up to £33bn.
- Heat is a significant challenge in Scotland's net zero ambitions. More than 80% of homes are heated by the gas network.
- However the Scottish government has already committed at least £1.8bn over the next five years to low carbon heat and energy efficiency,
 - **That is before any additional investment that may come from the Bank**

Scottish Government no and low regret programmes

Improve energy efficiency, retrofit existing buildings & improve the performance of new buildings

Install heat pumps in buildings currently not on the gas grid which are using high-carbon fuel

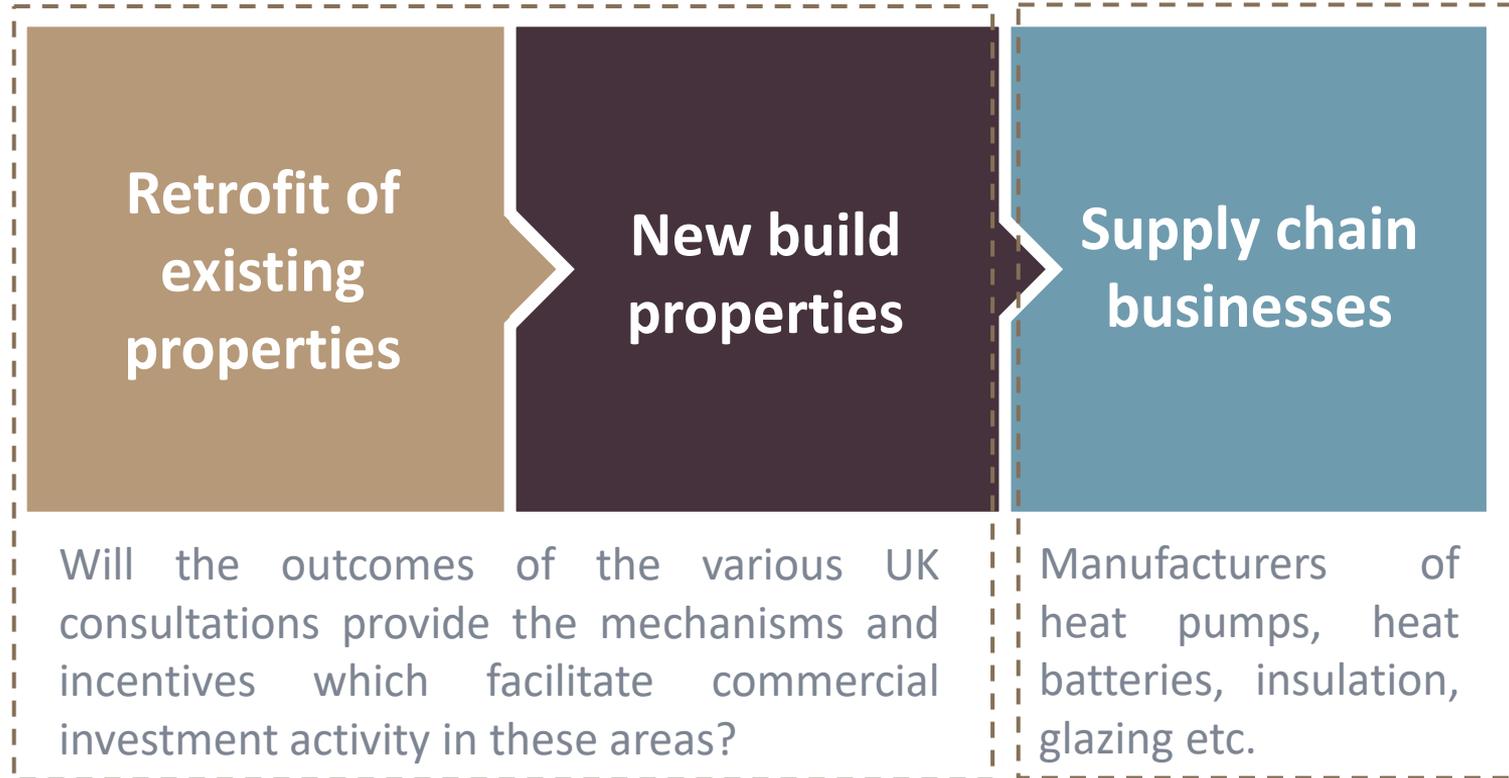
Deploy heat pumps to areas least likely to use hydrogen in the long term

Deploy heat networks in areas deemed suitable

- Scotland has a significant percentage of traditional buildings, over 650 conservation areas, 47,000 listed buildings and 10% of houses either listed or in conservation areas.
- Energy efficiency for the older and listed buildings will be a significant challenge

EPC Rating	Domestic	Non-Domestic
A	-	1%
B	4%	4%
C	41%	9%
D	41%	13%
E	10%	18%
F(FG for Domestic)	4%	14%
G	-	42%

Areas where Bank support may be relevant



Areas where Bank support may be feasible

- The Bank is open to funding a variety of business models in the sector.
- We are keen to work with commercial and social landlords on project finance for upgrades or funding new innovative business models.
- We will look to address the funding gaps which the market identifies as we move towards decarbonising heat in Scotland.
- We are always interested to look at new ideas and new delivery models.
- **As a provider of long-term patient capital we can potentially go where other investors cannot.**

Email: eddie.mcavinchey@thebank.scot

Our early Investments



Harnessing Innovation
M Squared



Building Communities
PfP Capital



Harnessing Innovation
R3 IoT



Net Zero
Nova Innovation



Net Zero
Forev



Net Zero
IndiNature



Net Zero
Gresham House Forestry Fund

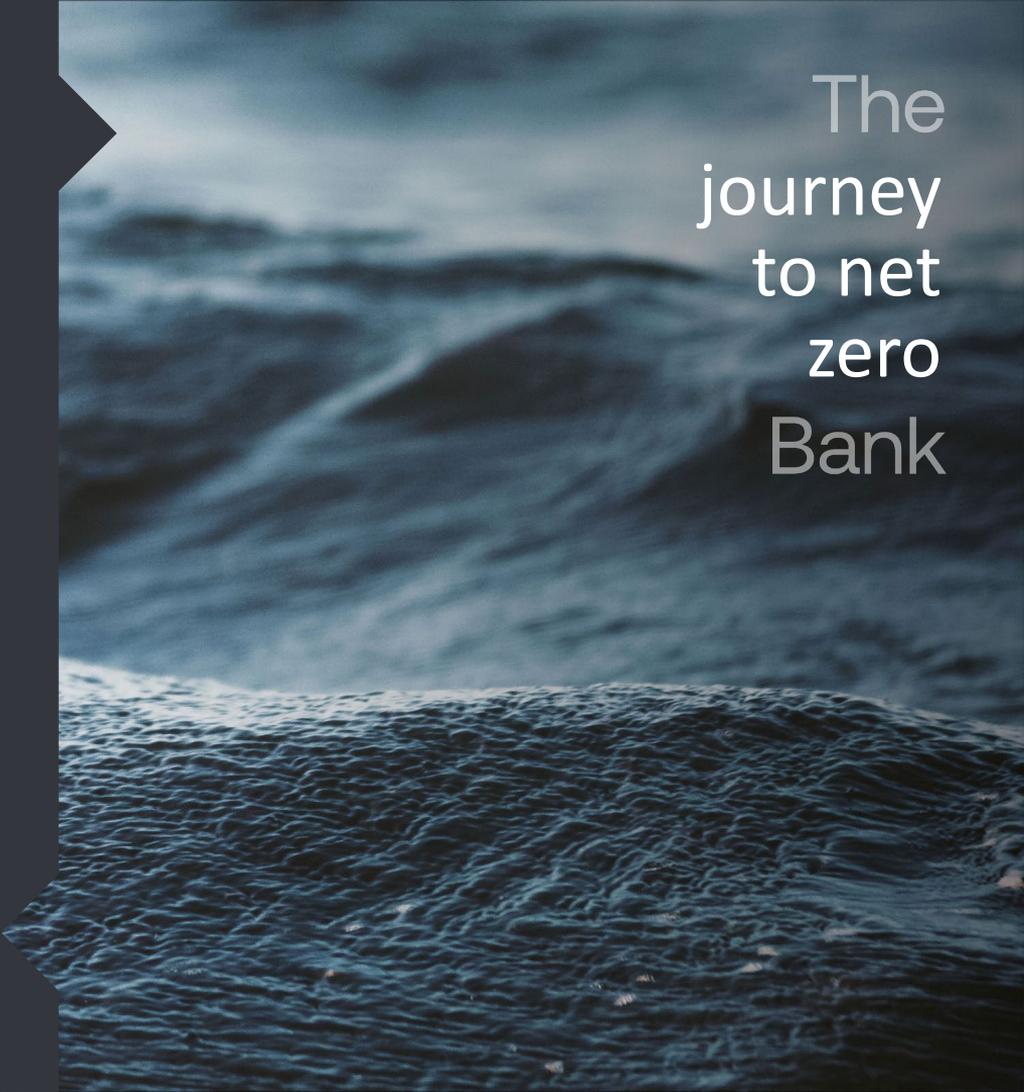
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Scottish
National
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Bank

The
journey
to net
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Turn up the dial on heat regulations

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Ben Carter

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Graham Wallace
Senior Associate
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Heat Networks (Scotland) Act 2021

Graham Wallace
Senior Associate
Pinsent Masons LLP

Pinsent Masons overview

Market leading in our five global sectors



Energy



Financial Services



Infrastructure



Real Estate



Technology,
Science &
Industry



Since 1769



£503.3m global
turnover (2021)



27 locations on
4 continents



3000+ people
in total



1800+ partners
and lawyers



Most Innovative Law Firm
in Europe



Law Firm of the Year



Law Firm of the Year

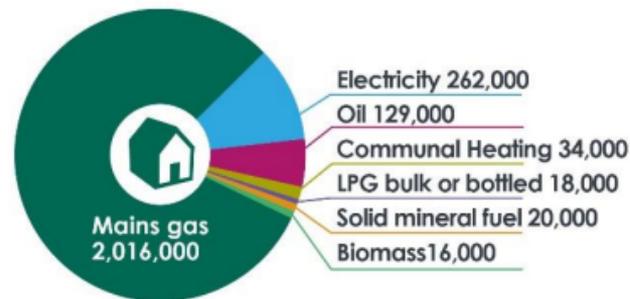
Heat Networks (Scotland) Act 2021

- Received Royal Assent on 30 March 2021
- Is a framework; much of the detail is to follow by secondary legislation
- Today I will cover:
 1. Statutory Targets and Delivery Plan
 2. Heat Networks Licences
 3. Heat Network Consents
 4. Heat Network Zones & Permits
 5. Powers of Licence Holders



Statutory Targets and Delivery Plan

- The Scottish Government is to ensure that the combined supply of thermal energy by heat networks in Scotland reaches:
 - 2.6 terawatt hours of output by 2027;
and
 - 6 terawatt hours of output by 2030.



Breakdown of primary heating fuel vs number of homes (source Scottish House Condition Surveyⁱⁱ, 2019)



- Heat Networks Delivery Plan to be laid before Parliament by 1 April 2022:
 - Intended approach to increase the use of heat networks in Scotland
 - How the Scottish Government intends to meet the targets above

Heat Networks Licences

- To obtain a licence, operators need to demonstrate:
 1. Knowledge, experience and expertise,
 2. Ability to operate a network in a manner that:
 - Minimises GHG emissions
 - Takes account of the “Just Transition Principles”
 - Contributes to fuel poverty targets
 3. Other matters as may be determined in regulation



Heat Network Consents

- Project-level consent
- Local authorities likely to determine
- Likely to require community engagement
- GHG emissions / fuel poverty
- Deemed planning consent available



Heat Network Zones & Permits



- LAs to consider whether an area is “likely to be particularly suitable” for a heat network
- No obligation to designate a zone
- Zones to be documented via Local Heat and Energy Efficiency Strategies (LHEES)
- Building assessment reports for public sector buildings (would-be anchor loads)
- Permits to be granted for zones to give exclusive right in that area following “robust initial competitive process”

Powers of Licence Holders

- Compulsory acquisition of land / rights
- Network wayleaves (which will run with the land)
- Right to carry out survey works on any land
- Power to enter land to replace or repair apparatus
- Ability to undertake road works



What's Missing / What's Next?

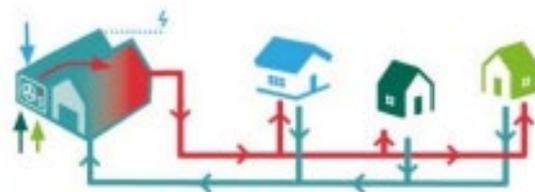


Missing

- Detail on many aspects
- A regulator
- Consumer protection
- Transitional arrangements

Next Steps

- Regime fully in force by the end of 2023
- Heat Network Delivery Plan by April 2022
- Opportunity to shape detail of regulation



Thank you



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SCOTTISH RENEWABLES

LOW-CARBON HEAT

Turn up the dial on heat
regulations

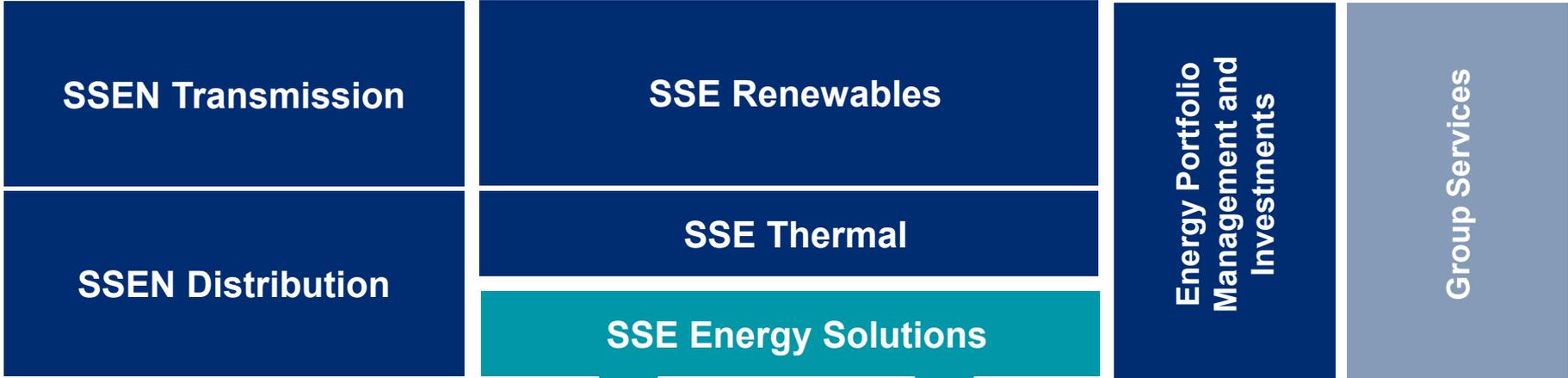
Charlie Drysdale

September 2021



OUR COMPANY

POWERING CHANGE ON THE ROAD TO NET ZERO



OUR VALUES

- 

SAFETY
If it not safe, we don't do it
- 

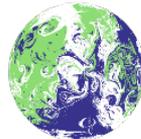
SERVICE
We are a company that customers can rely on
- 

EFFICIENCY
We focus on what matters

Distributed Energy



Business Energy



PRINCIPAL PARTNER
UN CLIMATE CHANGE CONFERENCE UK 2021
IN PARTNERSHIP WITH ITALY

OUR VALUES

- 

SUSTAINABILITY
We do things responsibly to add long-term value
- 

EXCELLENCE
We continually improve the way we do things
- 

TEAMWORK
We work together, respect each other and make a difference

|| WE HAVE SET OUR STRATEGY ACCORDINGLY

MISSION:

Invest, design, own, operate, maintain, and optimise local energy infrastructure in the UK and Ireland

Whole System Thinking: Smart Cities, Places and Buildings

SOLAR AND STORAGE

ELECTRIC VEHICLES

HEATING AND COOLING

ELECTRICITY NETWORKS

DIGITAL PLATFORMS



VISION:

Be the leading low-carbon localised smart energy infrastructure solution provider in the UK and Ireland

DECARBONISING HEAT

Low carbon heating and cooling networks to help achieve net zero goals

We deliver **resilient** and **reliable** heat networks in partnership with local authorities, housing associations, developers, universities, industrial and commercial customers.

Our **flexible commercial models** mean we offer **long term** asset ownership and **investment** for heat and cooling networks.

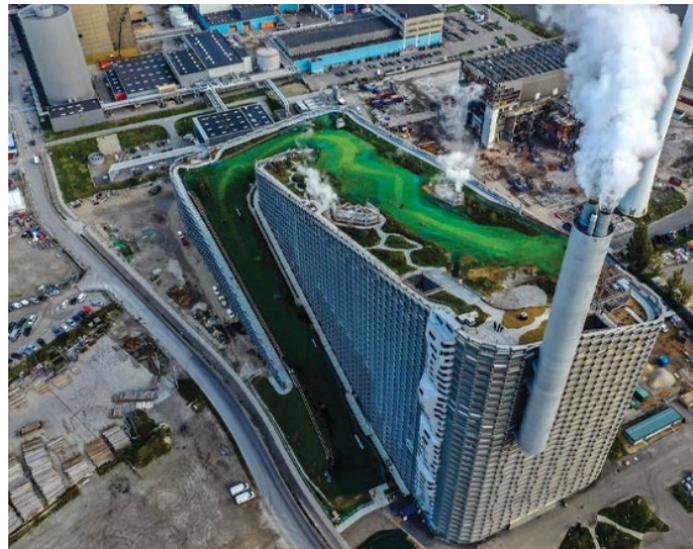
- **18** operational heat networks
- **10,500** residential customers now, 21,000 at full build
- **96,000m²** commercial space now, 500,000m² at full build
- **12MWe** of CHP generation capacity
- **25MW** of Chiller generation capacity
- **90MW** of Boiler generation capacity
- **5MW** of Heat Pump generation

Optimal design, delivery and commissioning supported by 24/7/365 industry leading customer care



II BACKGROUND AND FACTS

- **A third** of UK greenhouse gas emissions are heat related
 - **<5%** of energy used for heat is from **low carbon sources**
 - **80%** of household's energy costs are spent on heating and hot water
 - Gas boiler ban for new build properties 2024/5
 - **~90%** of existing building stock will still be in place in 2050
 - **20,000 homes/week** need conversion
 - CCC and BEIS project **18-20% of UK heat demand** can be met by HNs by 2050 and **half all non-domestic buildings**
 - Piping Hot Report estimated HNs could supply **10% of Scotland's heat by 2030**
- **Regulation is the key to unlocking this challenge**



Copenhagen's Copenhill waste-to-energy plant, designed by Bjarke Ingels Group

- 64% of households in Denmark were connected to a heat networks in 2019.
- “In the two largest municipalities, Copenhagen and Frederiksberg, 99% of all buildings are supplied with district heating, which improves the efficiency and is the most important instrument to be independent of fossil fuels.”

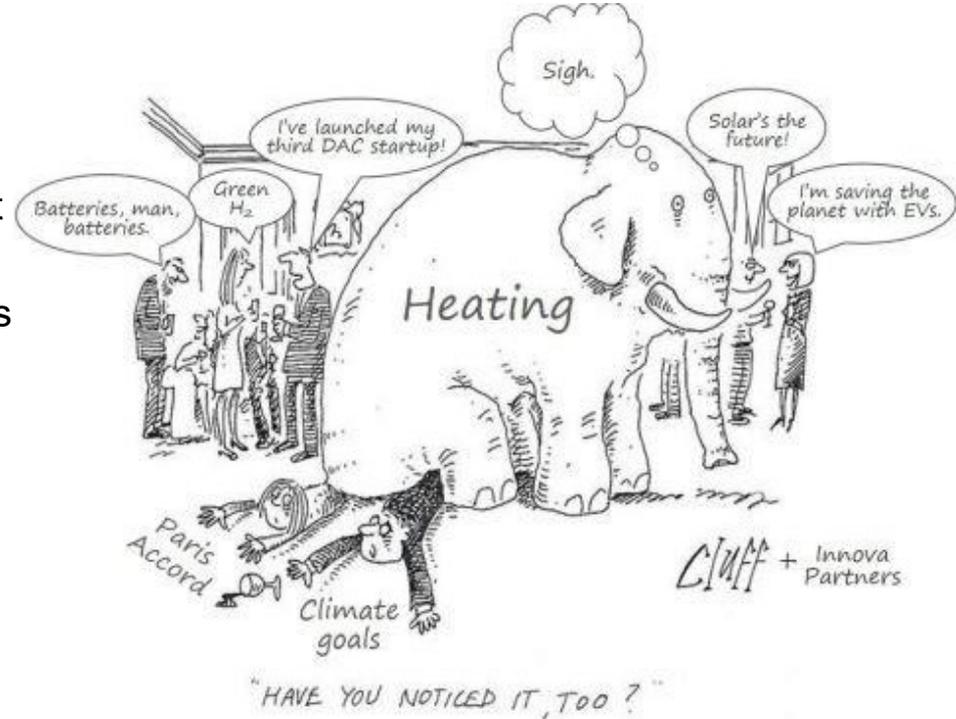
|| HEAT NETWORKS (SCOTLAND) BILL

- Hugely positive step
- Paul Wheelhouse Quotes:
 - 'Heat networks have huge potential ... by providing more efficient, environmentally-friendly solutions. The Scottish Government is determined to unlock the potential for that sector wherever possible and stimulate local jobs across Scotland in the process of delivering projects.'
 - 'The benefits of heat networks are not only environmental – they can save space, remove combustion risk within buildings, and have been shown to save householders and businesses up to 36% in fuel costs, with consequent benefits for tackling fuel poverty and reducing costs faced by businesses and public bodies.'



|| THE REGULATORY ELEPHANT(S) IN THE ROOM

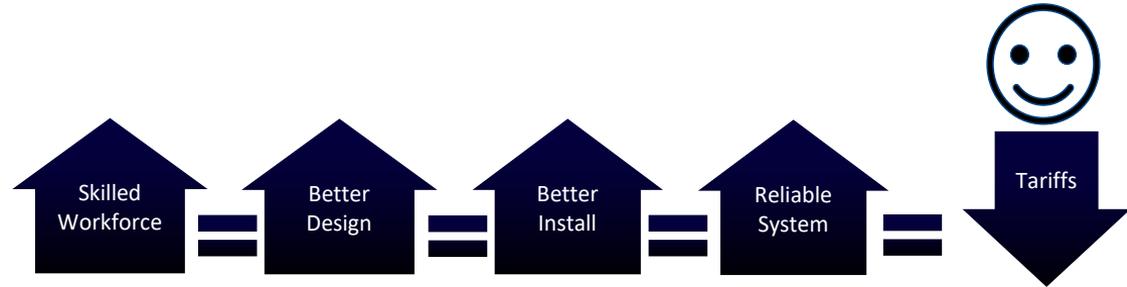
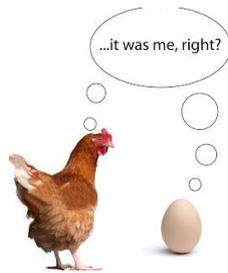
- Scotland's record in renewable heat
- Customer Protection and Pricing not devolved
- Retrofit requirements for heat pumps
- The counterfactual fuel
- The role H² will play
- *Independence*



HEAT NETWORKS (SCOTLAND) BILL

Road Map?

- Secondary legislation is critical – let's get going
- Transitional arrangements and existing sites - exemptions?
- Interface with other regulations
- What do the supply chain do for the next 1-3 years and how will this scale to meet the 'hockey-stick' growth required?
- Project pipeline visibility is what steers supply chain and reduces costs



HEAT NETWORKS (SCOTLAND) BILL

Zoning and LHEES

- Zoning is the key challenge
- LHEES are crucial to the success of Zones
- Resourcing LAs effectively:
 - ✓ To zone correctly and ensure value for heat customers
 - ✓ Provision of and obligation to engage with all stakeholders
- LHEES templates?
- All hinges on data
 - ✓ Building Assessment Reports
 - ✓ EPCs and EPC reform – primary portal to affect customer change
- Encourage/obligate to connect – de-risking demand to reduce cost

HEAT NETWORKS (SCOTLAND) BILL

Language and Clarity

- General Definition and Scope – what exactly will the Bill cover?
- Scope of Concessions and Licensing Authority
- Transparency and agility of the regulatory and licensing authority
- Getting clarity on permits and interaction with licensing
- Interface between Scotland and the rest of UK
 - Increased competitiveness reduces capex/opex
 - Avoid additional burden/cost
- SOLR?



|| FINAL THOUGHTS

- *More clarity needed soon on the direction of travel in the next 1 – 3 years*
- *Zoning and LHEES are pivotal*
- *Data is key*
- *‘Levelling up’ – how to fairly address the counterfactual to stimulate net-zero solutions*
- *The first steps are being taken but no, they are not enough - yet*





THANK YOU

For more information please contact:

Charlie Drysdale

Project Development Manager

SSE Energy Solutions

07818 946 322

charlie.drysdale@sse.com

'By 2045, emissions of greenhouse gases from heating our homes and buildings will have **all but disappeared**, with demand for energy reduced and space and water heating provided by zero emissions alternatives'

➤ **DOES THIS GET US THERE?**



PRINCIPAL PARTNER
**UN CLIMATE
CHANGE
CONFERENCE
UK 2021**

IN PARTNERSHIP WITH ITALY

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Gillian Campbell
Communications and
Public Affairs Lead
Existing Homes Alliance
Scotland

Low Carbon Heat - making it work for people

23 September 2021

Gillian Campbell
Communications and Public Affairs Lead

The **existing** homes **alliance** | scotland



Members



Supporters



The **existinghomesalliance** | scotland



Homes
account for
around 13% of
Scotland's
greenhouse
gas emissions



We need to
upgrade 1
million
homes by
2030



More than 80%
of existing homes
will still be in use
in 2050

IN THE YEAR **2040**, AS FAR AS REASONABLY POSSIBLE
NO HOUSEHOLD IN SCOTLAND IS IN FUEL POVERTY

No more than **15%** of households in Scotland are in fuel poverty

The median fuel poverty gap is no more than **£350**.

No more than **5%** of households in Scotland are in extreme fuel poverty

2030

No more than **10%** of households in Scotland are in fuel poverty

The median fuel poverty gap is no more than **£300**.

No more than **3%** of households in Scotland are in extreme fuel poverty

2035

No more than **5%** of households in Scotland are in fuel poverty

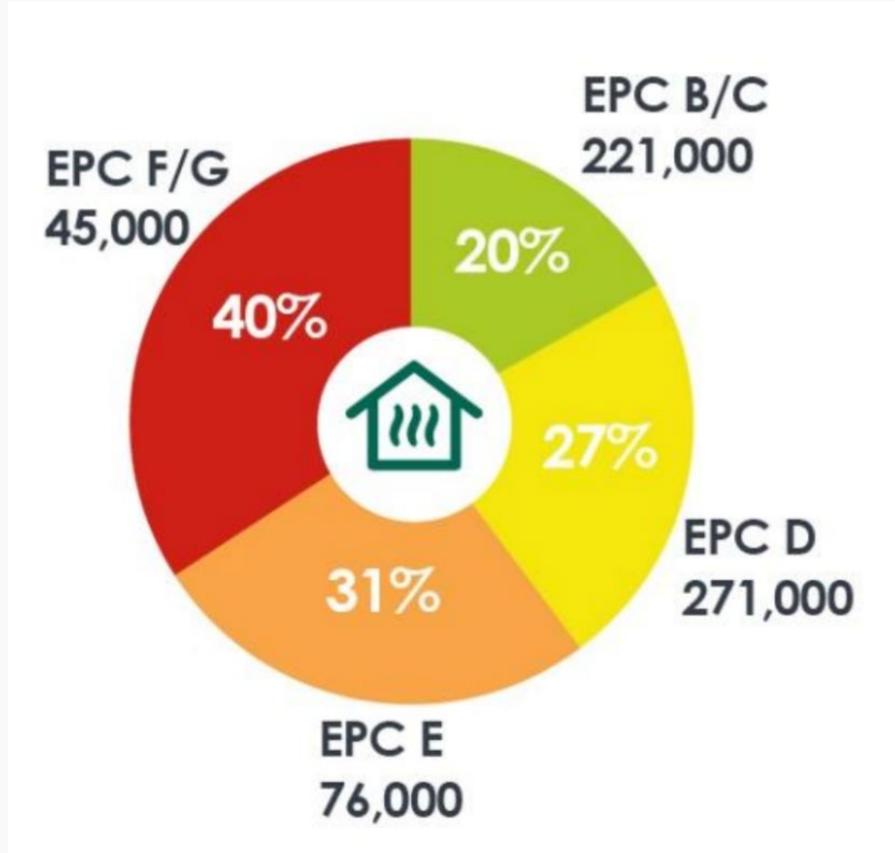
The median fuel poverty gap is no more than **£250**.

No more than **1%** of households in Scotland are in extreme fuel poverty

2040

“ We will only take forward actions where they are found to have no detrimental impact on fuel poverty, unless additional mitigating measures can also be put in place. ”

Squaring the circle



Drivers of fuel poverty?

- Energy efficiency of the home
- Energy prices
- Household income
- How energy is used

Scottish Government will “remove poor energy performance a driver of fuel poverty”

Fabric first

Kick-start investment in the transition

- Expand fuel poverty and energy efficiency programmes
 - Focus on whole house retrofits and zero emissions first
-
- A regulatory framework
 - EPC C at point of sale or major refurbishment from 2025
 - EPC C by 2033
 - Take forward recommendations of the tenement maintenance working group
-
- Engagement



Fabric first – the issues

Cost:

- £33 billion to upgrade 1 million homes by 2030
- Scottish Government investment of £1.8 billion
- Average cost to reach EPC C - £6,000 (but up to £11,000 for rural homes)
- £3-5,000 for low carbon heating



Awareness and attitudes

- 63% would like to make improvements but can't afford to
- 48% think it's difficult to access information
- 38% indicated it would be too difficult to organise
- 22% plan to make improvements to meet minimum energy efficiency standards.



The Energy Agency – Ayrshire and Dumfries & Galloway

- 97% felt external appearance of home had *'improved a lot'*
- 76% felt neighbourhood had *'improved a lot'*



Fig 2: Average EPC Values* (\pm SE)	Pre-install	Post-install	% Change
Primary Energy Indicator (kWh/m ² /year)	285 (\pm 10)	216 (\pm 8)	-24%
Energy Efficiency Rating (EER)	63 (\pm 1)	70 (\pm 1)	12%
% with EER below national average (61)	32%	8%	-
Environmental Impact Rating (EIR)	58 (\pm 1)	68 (\pm 1)	17%
% with EIR below national average (59)	52%	20%	-
Annual Fuel Costs (£)	£825 (\pm 35)	£640 (\pm 25)	-22%
Annual CO ₂ Emissions (tonnes)	3.8 (\pm 0.2)	2.9 (\pm 0.1)	-25%

*Excludes properties with additional energy-efficiency interventions between the assessment periods (n = 50)

Adding value through retrofit

James Nisbet Street - Roystonhill

- Upgraded thermal performance through enhanced insulation and installation of condensing boilers
- Radical facelift and internal renovation with overcladding to improve energy performance
- Creation of a wide mix of housing types
- Glazed-in 'sunspace' balconies, or retention of balconies, or extended living areas
- Ventilation improved by extracting from north facing kitchens and bathrooms to draw warm air from the south



*“You get up and it’s warm
even if the heating’s not on.
It’s never cold.*



It gives you peace of mind”.



The **existinghomesalliance** | scotland

existinghomesalliancescotland.co.uk



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Lori McElroy

Professor of Architecture

University of Strathclyde

LOW-CARBON HEAT CONFERENCE 2021

The role of Regulations and Building Standards
What will it take to get to net zero?

Lori McElroy – University of Strathclyde
23 September 2021

Scottish Government's 2045 Vision

Scotland's buildings are net-zero carbon by 2045 and this is achieved in a way that is socially and economically sustainable, through a Just Transition:

- new buildings where a building warrant is applied for from 2024 must use zero emissions heating and meet significantly higher energy efficiency standards, - explicit support for *passivhaus* and equivalent standards.
- by 2030 a large majority of buildings should achieve a good level of energy efficiency, at least equivalent to an EPC Band C;
- by 2032 - 94% of non-domestic buildings' and 80% of domestic buildings' heat will be supplied using low carbon heat technologies;
- all buildings achieve net zero by 2045.



ABN AMRO's Circl Pavilion in Amsterdam – by de Architekten Cie

Legislative and Regulatory Routemap to 2045

Delivering the 2021 Heat in Buildings Strategy

Supported by cross cutting working groups on:

Energy performance assessment (fitness for purpose)

Skills and Quality Assurance (readiness)

2024 New Build Heat Standard

Building Standards Consultation

(Closing date 29 October 2021)

- Review of the Energy Standards
- Addressing Building Standards Compliance
- Decarbonisation of Transport

and links to consultation versions of iSAP and iSBEM



Scotland's Housing Expo 2010:
Featuring Housing by Malcolm Fraser Architects

Building Standards (Regulations) Review 2021

Proposals under consultation:

Setting revised energy standards for new buildings.

Changes to energy standards applicable to all building work.

Consequential changes to ventilation standards for new homes.

Action to address overheating risk in new homes and new residential buildings.

Improving compliance with building regulations – energy performance.

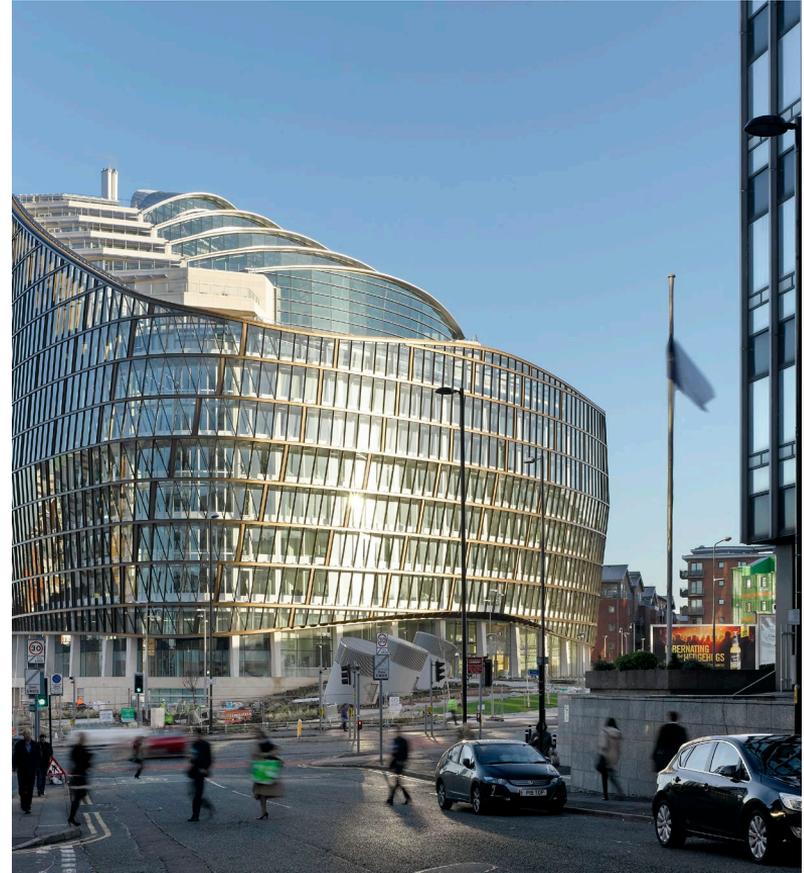
Proposals for Electric Vehicle Charge Point infrastructure in new and renovated buildings and at existing non-domestic buildings.



Housing, Greenock with Community Heating:
John Gilbert Architects

Building Standards (Regulations) Review 2021

- Two options for new buildings, 'improved' and 'advanced' - reducing emissions in new homes by around 32% or 57% and new non-domestic buildings by an aggregate of 16% or 25%.
- New energy target for new buildings and the form this should take.
- Amending the approach to the setting of standards where new buildings include on-site generation of power and where they are to be connected to a District Heating network.
- Focus on improved fabric insulation in new homes, to reduce overall space heating demand.



Co-operative Headquarters Manchester:
3D Reid Architects

Building Standards (Regulations) Review 2021

- Changes to ventilation standards to reflect the expectation that new homes will have reduced air leakage/infiltration.
- Mechanisms to assess summer overheating risk in new homes and residential buildings, reflecting projected increases in temperature due to Climate Change.
- Action to improve energy performance through improved compliance.

and

- *Proposals for EV charging points and infrastructure in new buildings and those subject to 'major renovation'.*



Glenalmond Street Housing with Community Heating (GSHP):
John Gilbert Architects for Tollcross HA



Not just about new buildings - we will still be occupying 80% of our existing building stock in 2050



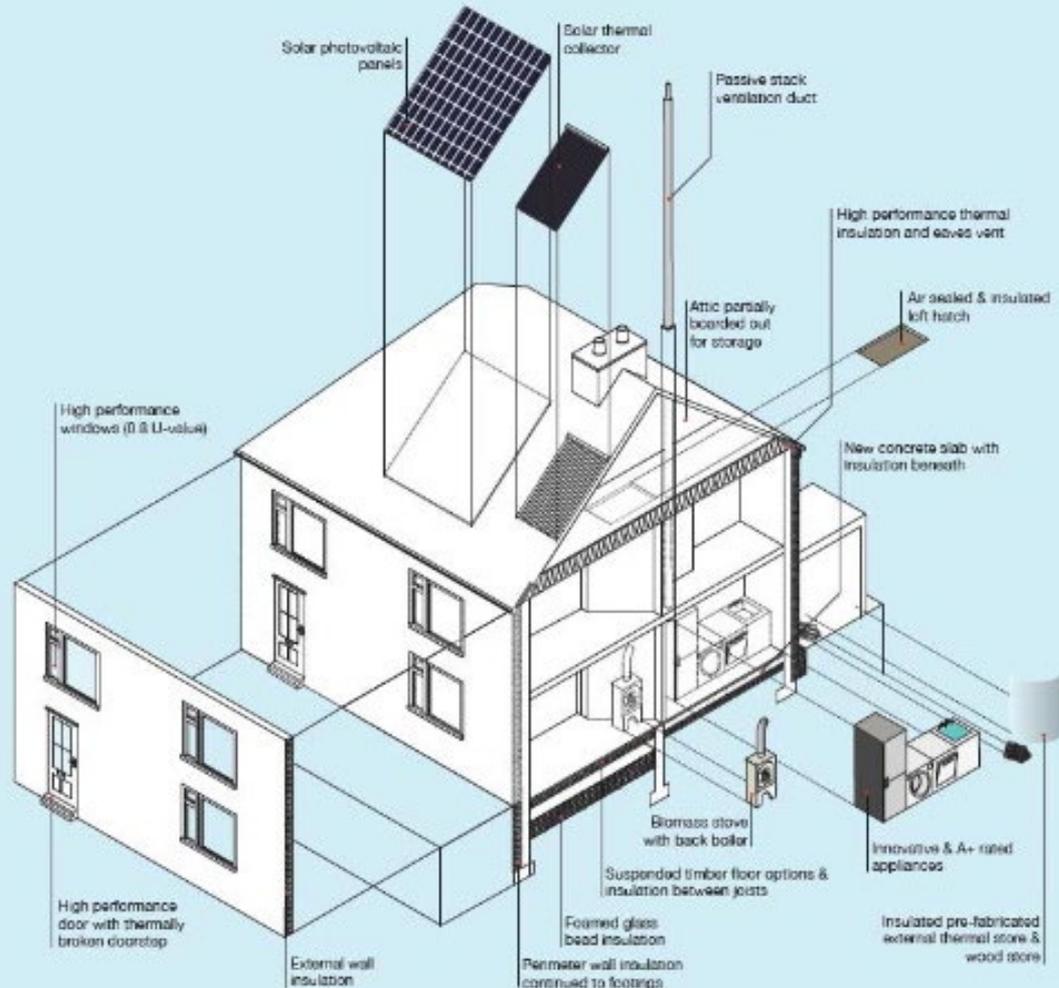


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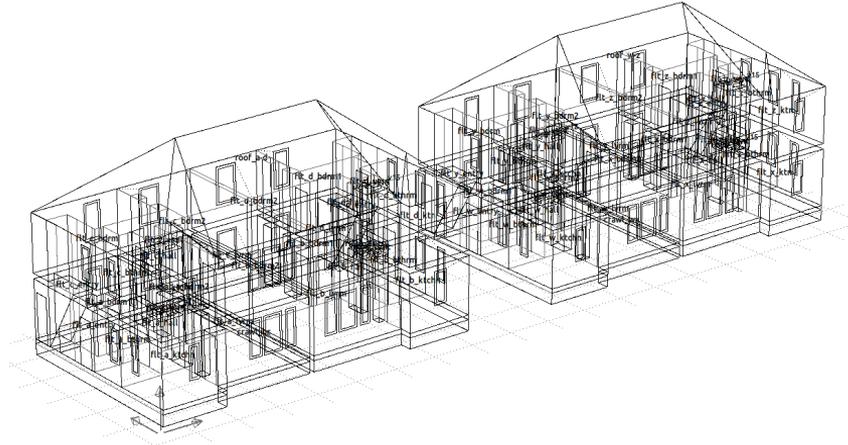


Flat F2 Technologies applied:

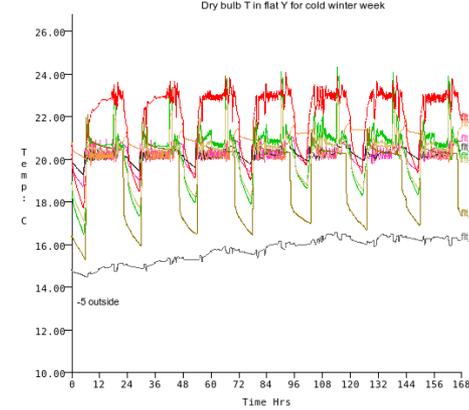


- Air Source Heat Pump with Radiators
- 2kW Solar PV Array and Solar Thermal panels
- Cavity Fill, Moisture Buffering Internal Insulation & Lining, Loft and loft-hatch insulation
- 6.04 q50 Air Tightness
- MVHR System
- Super Low Energy Windows & Door
- Feed in Tariff Income

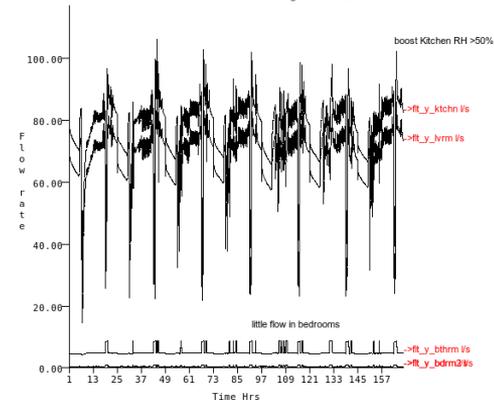
Dynamic Simulation Modelling



Lib: RC 4inaBlock trial enh ctf b.res; For RC 4inaBlock enh ctf ctf boost vent
 Period: Tue-09-Jan@00h03(2007) to Mon-15-Jan@23h57(2007) : sim@06m, output@06m
 Zones: fl_y_entry fl_y_bdrm fl_y_hall fl_y_bdrm2 fl_y_kchn fl_y_lvrn fl_y_bthrm fl_y_vent



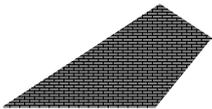
Lib: RC 4inaBlock trial enh ctf c.mfr; For RC 4inaBlock enh ctf
 Period: Tue-09-Jan@00h03(2007) to Mon-15-Jan@23h57(2007) : sm@06m, output@06m
 Fresh air entering rooms in flat Y





107-109 Blackstoun Oval
PA3 1LT
Archetype: REN 6025

Drawing No:	6025-EL-1	Date:	MAY 2018
Scale:	NTS	Drawn by:	MS
Renfrewshire Council			



Notes / Key:

R BRICK
SP = SOLI PFE ENTRY
SVH= SOL VENT PIPE
RWH=RAW WATER PIPE

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Renfrewshire Council

35-36 Blacktown Oval

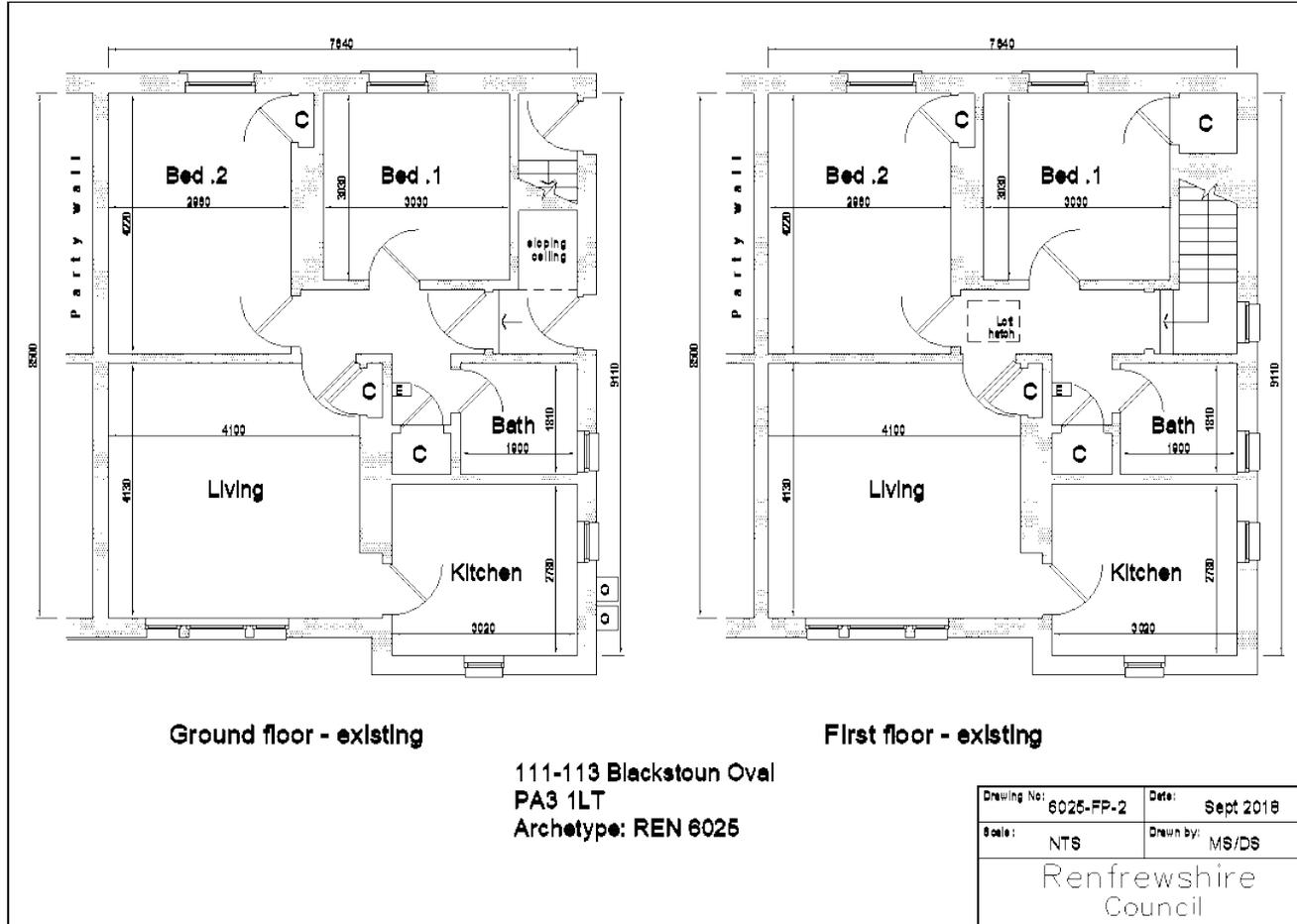
Elevations_Proposed

Warrant

03995 1:50

HT 28.11.18

Doc No: JPE/34 Rev:



107 Niddrie Road Glasgow

Tenement EnerPHit Passivhaus Retrofit

1. Top up insulation up to 450mm thick

2. Lower area of slates removed to check for timber decay and ensure insulation wraps over wall head to meet EWI

3. Two smaller windows knocked into one larger window for more light and heat gain into living areas

4. New high performance triple glazed windows and doors

5. External wall insulation to rear and gable walls, extended below floors, into window reveals, all downpipes replaced

6. Mechanical ventilation with heat recovery unit in bathroom ceiling removes almost all outgoing heat keeping flats warm with lots of fresh air

7. Wastewater heat recovery from baths and showers

8. Internal wall insulation to front elevation, walls stripped back to stone, wood fibre insulation and lime plaster added

9. Street side stone wall repaired with stone repair and repointed using lime

10. First floor joists removed from wall to avoid decay, allowing for continuous insulation and airtightness

11. Layout altered for better space planning

12. Ground floor insulated along with careful airtightness measures





113
111

112

114

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Dave Pearson

Group Sustainable Development Director

Star Refrigeration

0797 660 7746





**15:47 Glasgow Central Low Level to Clydebank
then 0.6 mile walk towards Clydebank College/Queens Quay.
Aim for the building in the photo.**

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LOW-CARBON HEAT CONFERENCE

23 SEPTEMBER 2021 **GLASGOW**

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All you can heat – a look at potential low-carbon heat technologies and sources

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Tweet @ScotRenew
#SRHEAT21

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Andrew Lyle

Chief Executive Officer

Locogen

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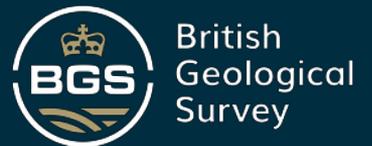
Dr Alison Monaghan
Principal Geologist
British Geological Survey



Heat from underground

Alison Monaghan

als@bgs.ac.uk

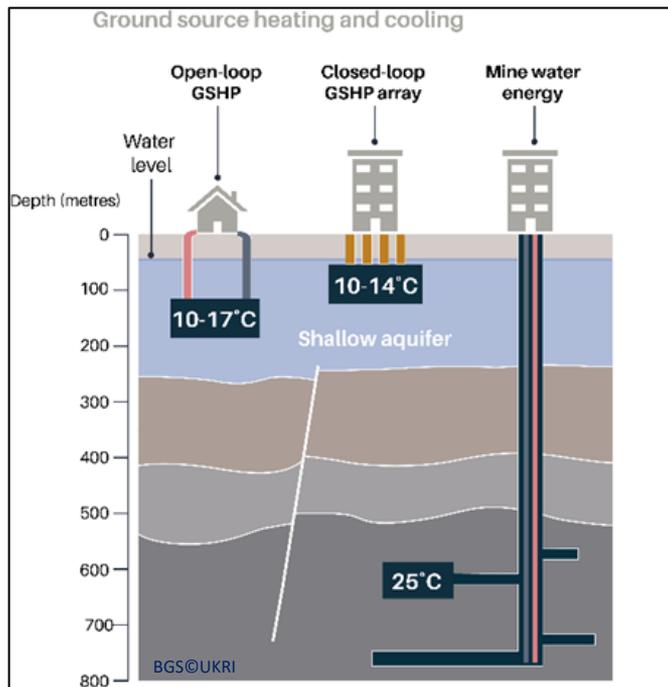
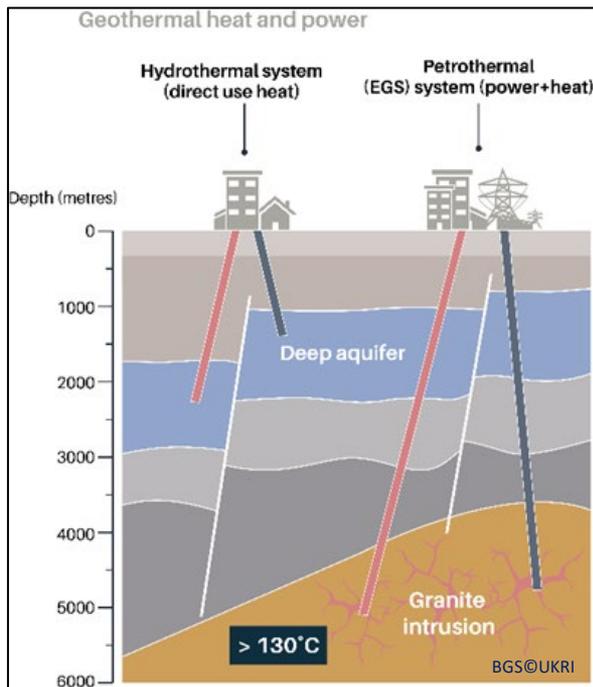


Scottish Renewables: Low Carbon Heat Conference

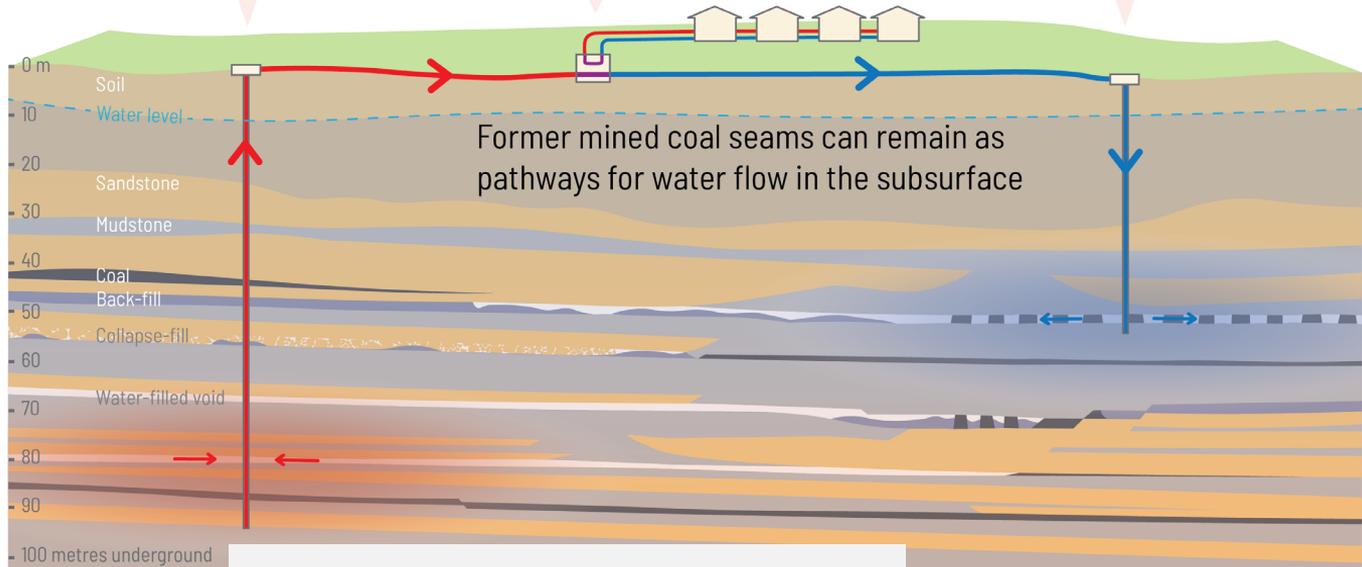
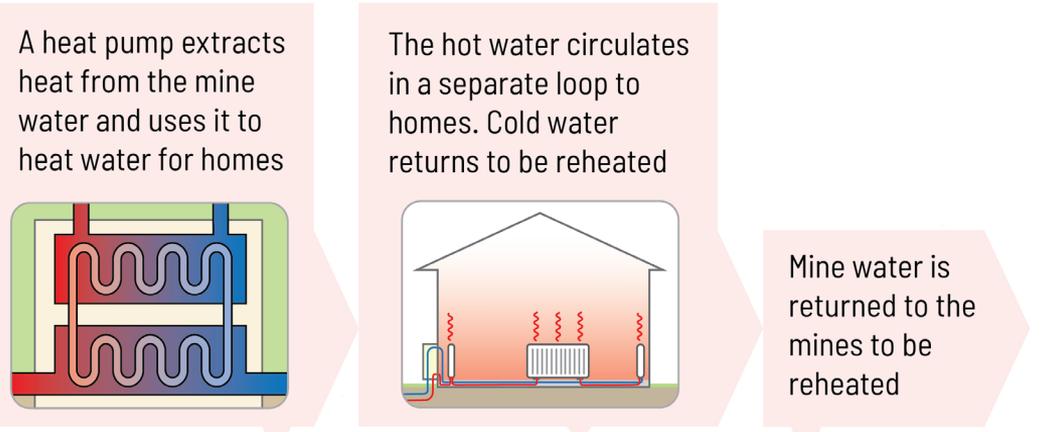
23rd September 2021

Geothermal energy and underground thermal storage

- Geothermal energy provides **low-carbon options for heating**
- Individual homes, businesses to heat networks
- Resource size is equivalent of **100 times UK annual heating demand** (Gluyas et al. 2018)
- Potential to make a **significant contribution** to decarbonising heating



Heat from mine water



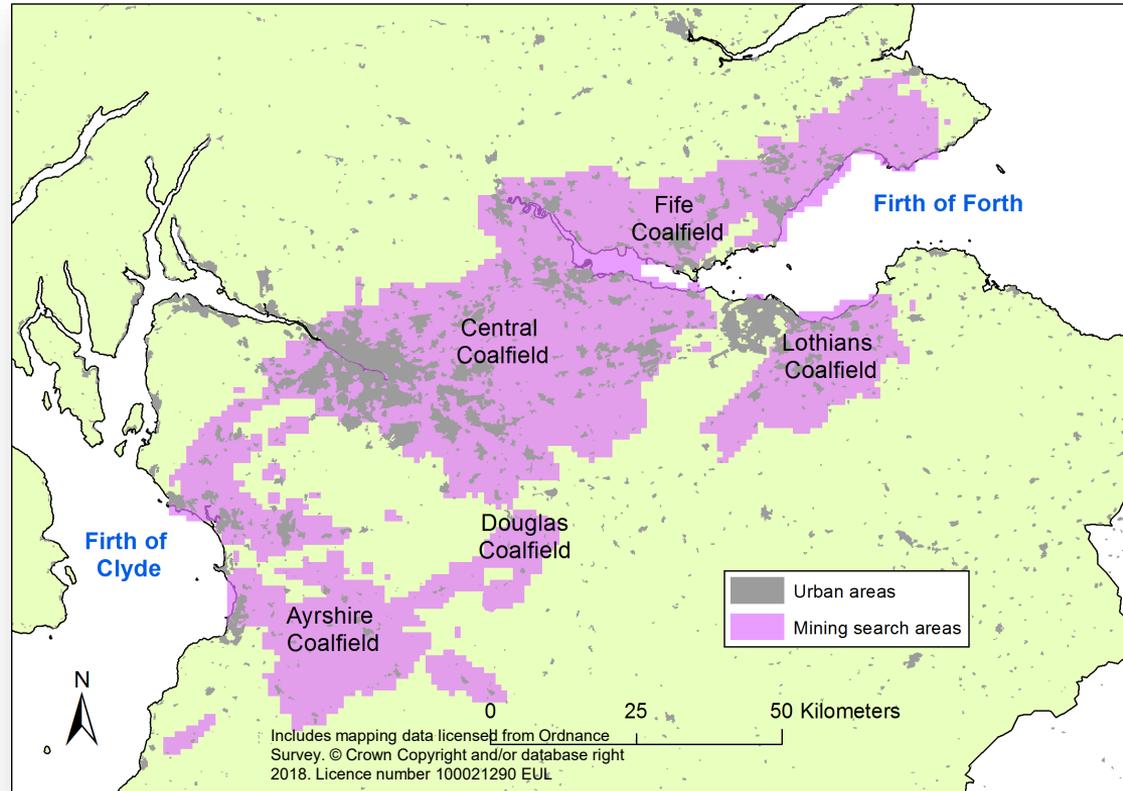
Mine water energy

- Low temperature geothermal, 'ground source heat'
- Heat pumps: COP~4 (get 4 times more energy out)
- Baseload for renewables intermittency & thermal storage potential

Mine water heat concept BGS©UKRI

Resource potential: coal mine workings across central Scotland

- Spatially extensive, co-incident with heat demand
- Quantification depends on sustainability (heating + inter-seasonal storage). Estimates *2004: 1.7GWh per year, **2013:12GW, *** 1/10th annual heating demand
- The Coal Authority manages the mine working legacy. Several mine water energy schemes in feasibility stages in Scotland
- Installed schemes in NE England c. 2-4 MWth , several larger schemes in development



*PB Power 2004 **Gillespie et al. 2013 ***Todd et al. 2019

Re-purposing flooded mine workings for heat in Scotland



John Gilbert Architects

Shettleston Glasgow

- open-loop system completed 1999 - serves 16 new-build houses
- 12 °C mine water circulated via a heat pump from a 100 m deep borehole, heating water to 55°C



John Gilbert Architects

Lumphinnans, Fife

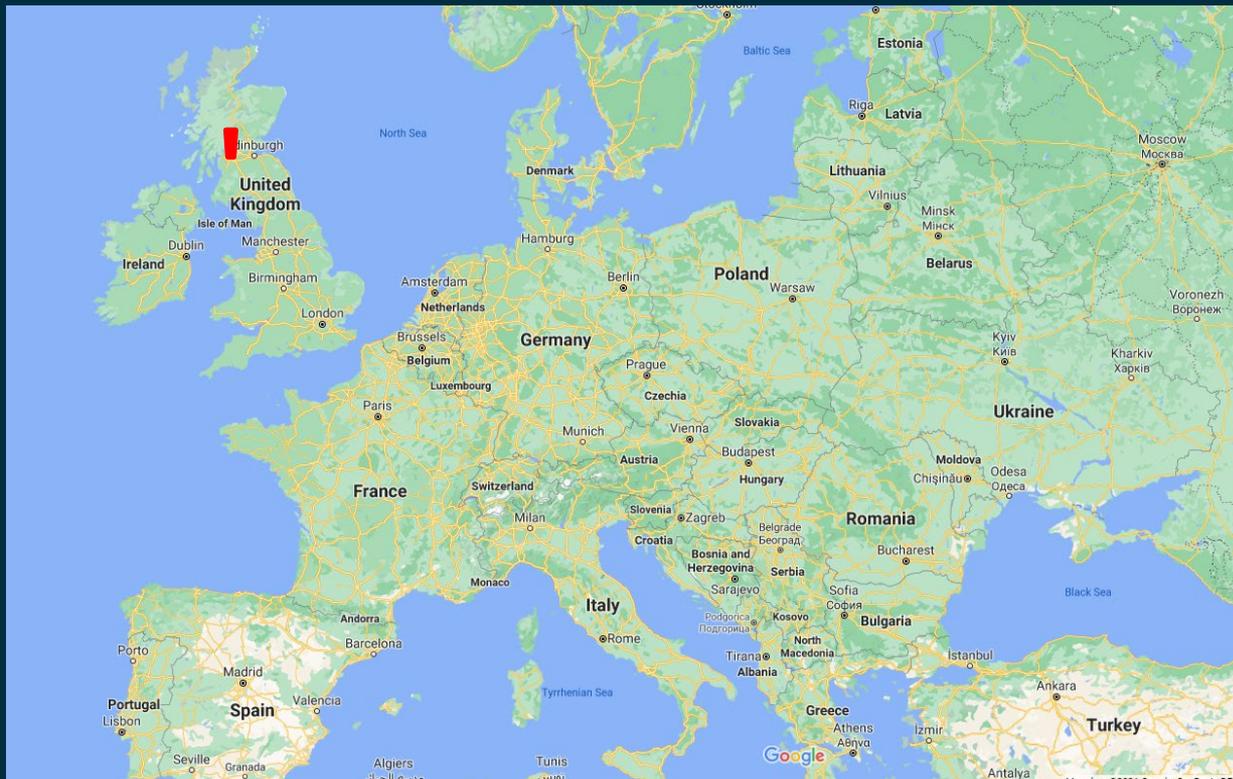
- open-loop system completed 2001 – retro-fitted
- 14.5 °C mine water circulated via a heat pump from a 172 m deep borehole, heating water to 55°C

Neither scheme currently operational

To scale up:

- Economics vs. gas
- Policy, regulation
- Social approval
- Supply chain
- **Technically: de-risking and cost-reduction**
 - Capital costs: accessing heat
 - Operational sustainability
 - Efficient heat transfer
 - Integrated systems and heat storage
 - Sensing, monitoring, optimising
 - Open data on environmental impact

UK Geoenergy Observatory Glasgow



From Google maps

Funded by UK Government (BEIS) through UK Research and Innovation

Borehole locations

Site 10 - seismic monitoring borehole

City centre

Site 5 environmental baseline boreholes

Site 2

Site 3

Site 1

Mine water & baseline boreholes

Cuningar Loop

River Clyde

Eastern Glasgow and Rutherglen are typical of many former coalfield communities

An industrial legacy and urban regeneration

Glasgow Observatory

12 boreholes
and 4
research
compounds

Open data

- Geological platform & models
- Data packs
- Continuous (time-series data)

Glasgow
Observatory

Sensors
Samples
Monitoring

Stakeholder
& public
engagement

Environmental
baseline

- Surface water
- Groundwater
- Soil chemistry
- Ground gas
- Seismic monitoring
- Ground motion



BGS@UKRI



Photo courtesy BAM Nuttall

Observatory	Data Type	Last
Glasgow	GGAD1 borehole information pack	New 14.05
Glasgow	GGAD2 borehole information pack	New 14.05
Glasgow	GGAD3r borehole information pack	New 14.05
Glasgow	GGAD4 borehole information pack	New 14.05
Glasgow	GGAD5 borehole information pack	New 14.05
Glasgow	GGAD6r borehole information pack	New 14.05
Glasgow	GGAD7 borehole information pack	New 14.05

ukgeos.ac.uk

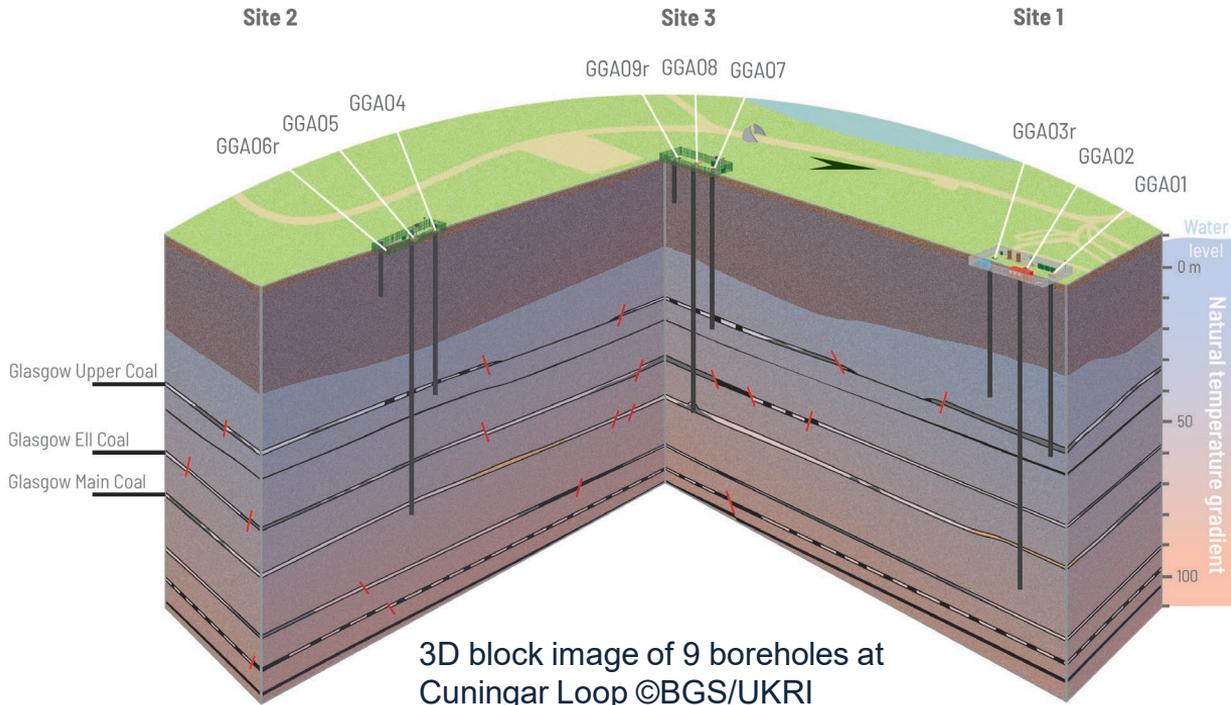


Surface water sampling BGS@UKRI



BGS@UKRI

Boreholes and research compounds



Flexible geothermal doublets/pipework/heat centre being added by Q1 2022 (no heat user)

Heat abstraction and thermal storage capability, at-scale, flexible

R&D themes

Subsurface resource

Environmental management

Sensors & technologies
Digital environment

Subsurface change. Operational sustainability

Training & engagement

Conclusions: mine water heat and heat storage

There are **significant opportunities** across former industrial areas of Scotland's central belt for mine water heat and heat storage to contribute to **decarbonisation of heat**

In Glasgow, we have unique, publicly-funded, flexible infrastructure to support the development of mine water technology and systems:

- resources
- environmental impacts
- technology development

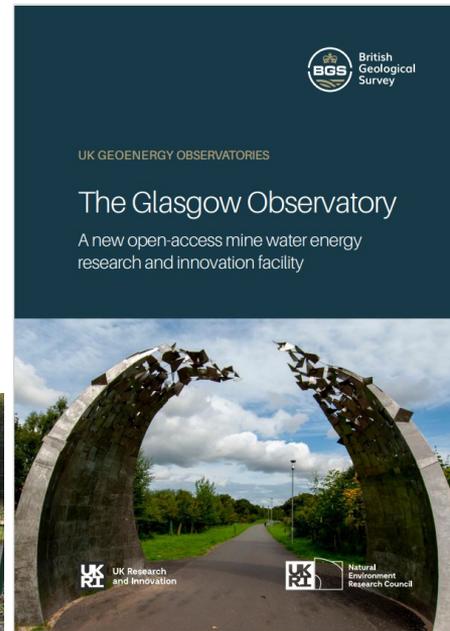
Open to industry and academia

Contact us: ukgeosenquiries@bgs.ac.uk

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Research at the Observatory BGS@UKRI



Brochure from ukgeos.ac.uk



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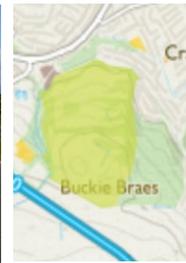


John Maslen
ParkPower Programme Manager
greenspace scotland

All you can heat – a look at potential low carbon heat technologies and sources

Utilising Scotland's urban open space and surface water resources for renewable heat

John Maslen, greenspace scotland





Former John Brown Shipyard, West Dunbartonshire - Image courtesy: Ross Goodman

CORE PARTNERS

- Clackmannanshire Council
- East Ayrshire Council
- East Lothian Council
- City of Edinburgh Council
- Falkirk Council
- Glasgow City Council
- Midlothian Council
- North Lanarkshire Council
- Perth and Kinross Council
- South Ayrshire Council
- South Lanarkshire Council
- Stirling Council
- West Lothian Council
- Green Action Trust (formerly
- Strathclyde University

Green Heat in Greenspaces

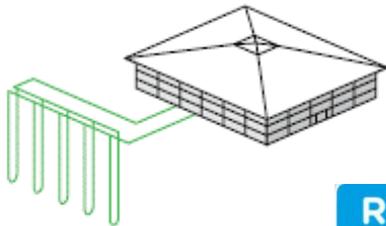
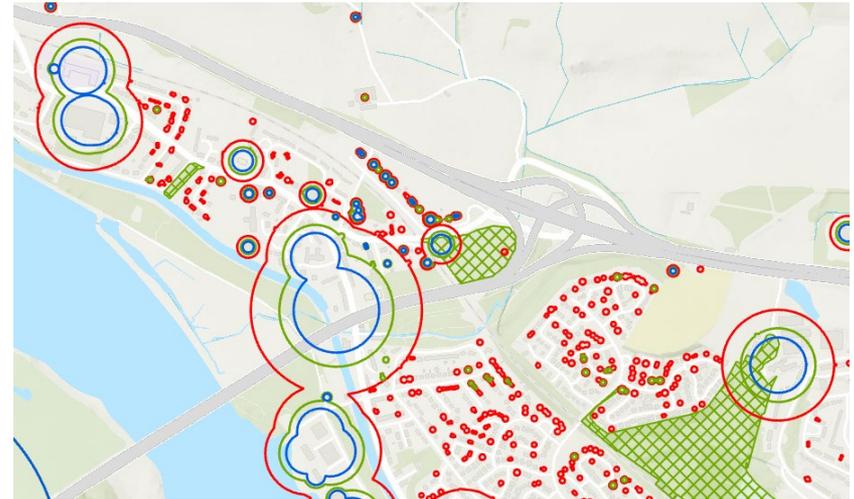
- Built on learning from ParkPower
- National scale opportunity analysis
- Results analysed by partner area and summarised by settlement (516) and local authority (32).
- National Findings Report available from <https://www.greenspacescotland.org.uk/introducing-ghigs>



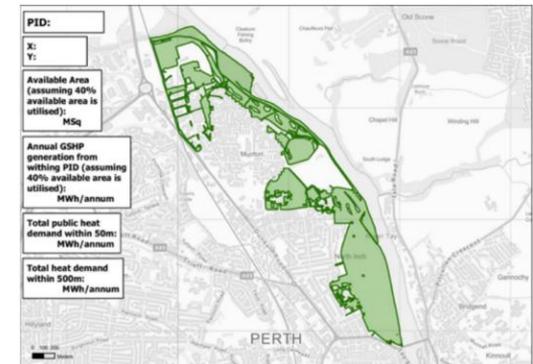
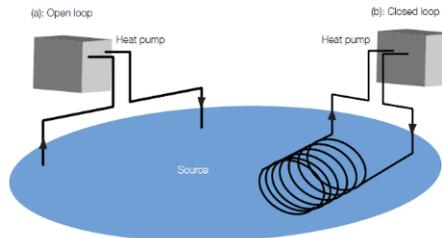
Strategic Opportunity Analysis

Aim:

- To identify specific renewable heat project opportunities linked to **green** and **blue** spaces for 14 local partners
- Create Scotland-wide datasets to highlight the opportunity for ground source heat from greenspaces and river source heat at a settlement scale



RAMBOLL

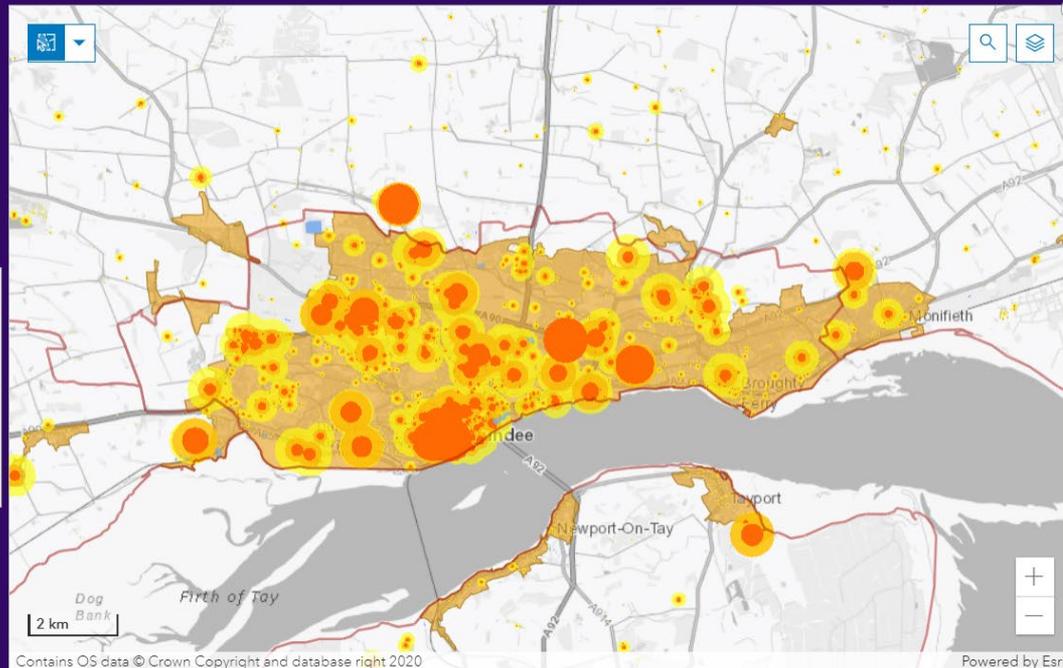


Map-based analysis: GHiGs Settlement Dashboard for settlement heat profiling

GHiGs Settlement Profile Dashboard

Search council area:

None



SETTLEMENT: Dundee

Ground Source Heat (GSH)

- (1) % of settlement area that is suitable greenspace to generate GSH: **7%** (LOW)
- (2) Potential GSH capacity from greenspaces: **457,865 MWh/year** (HIGH)
- (3) % of annual heat demand that could be met from GSH in greenspaces: **27%** (LOW)

Water Source Heat (WSH)

- (4) River source heat potential (H/M/L): **MEDIUM**
- (5) Static water body source heat potential (H/M/L): **LOW**
- (6) Marine (sea) source heat potential (H/M/L): **HIGH**

District Heat Networks (DHNs)

- (7) Suitability for DHNs (H/M/L): **HIGH**
- (8) Estimated number of higher demand (>50 MWh/yr) public buildings: **340**
- (9) Suitability for DHNs - public buildings only (H/M/L): **HIGH**
- (10) % of heat demand from higher demand public buildings (H/M/L): **HIGH**
- (11) Current number of DHNs: **39.00**
- (12) Heat density class (H/M/L): **HIGH**

Energy from Waste

- (13) Potential of Energy from Waste plants as heat source (H/M/L): **HIGH** (Count: 1.00)

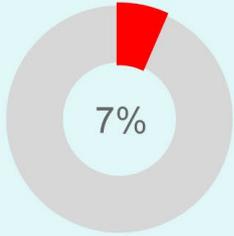
Heat General

- (14) Total heat demand: **1,683,646 MWh/year**
- (15) Total of heat demand addresses: **91,594**
- (16) Average heat demand per heat address: **18 MWh/year**
- (17) % homes off gas grid (H/M/L): **LOW**
- (18) % homes in fuel poverty (H/M/L): **MEDIUM**
- (19) % homes in extreme fuel poverty (H/M/L): **MEDIUM**
- (20) % of social housing (H/M/L): **MEDIUM**
- (21) % of pre-1949 residential properties (H/M/L): **HIGH**
- (22) % of residential properties SAP classes D-G (H/M/L): **LOW**
- (23) % of social housing (H/M/L): **HIGH**

Find out more about this dashboard in our [GHiGs Data Guide](#) and [Technology Guide](#). We would like to thank GHiGs Partners for supporting this project and key data suppliers (1) Scotland's Heat Map (2) EST Home Analytics and (3) Ordnance Survey.

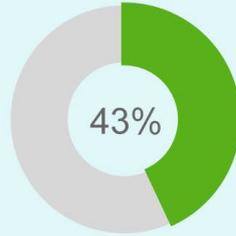


Currently



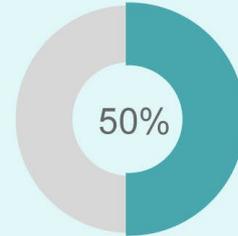
of heat demand in Scotland is met by renewable heat sources

Urban Green Space could supply the equivalent of



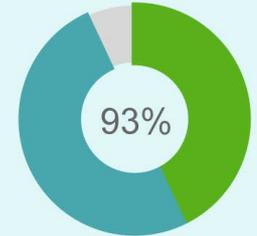
of Scotland's urban heat demand through ground source heat

Urban Blue Space could supply the equivalent of

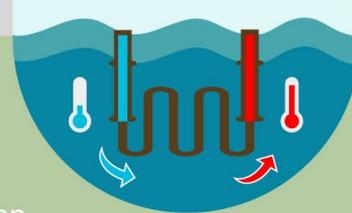
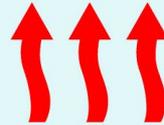
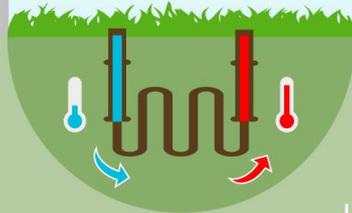
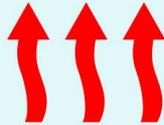


of Scotland's urban heat demand through water source heat from rivers

Together could supply the equivalent of



of Scotland's urban heat demand

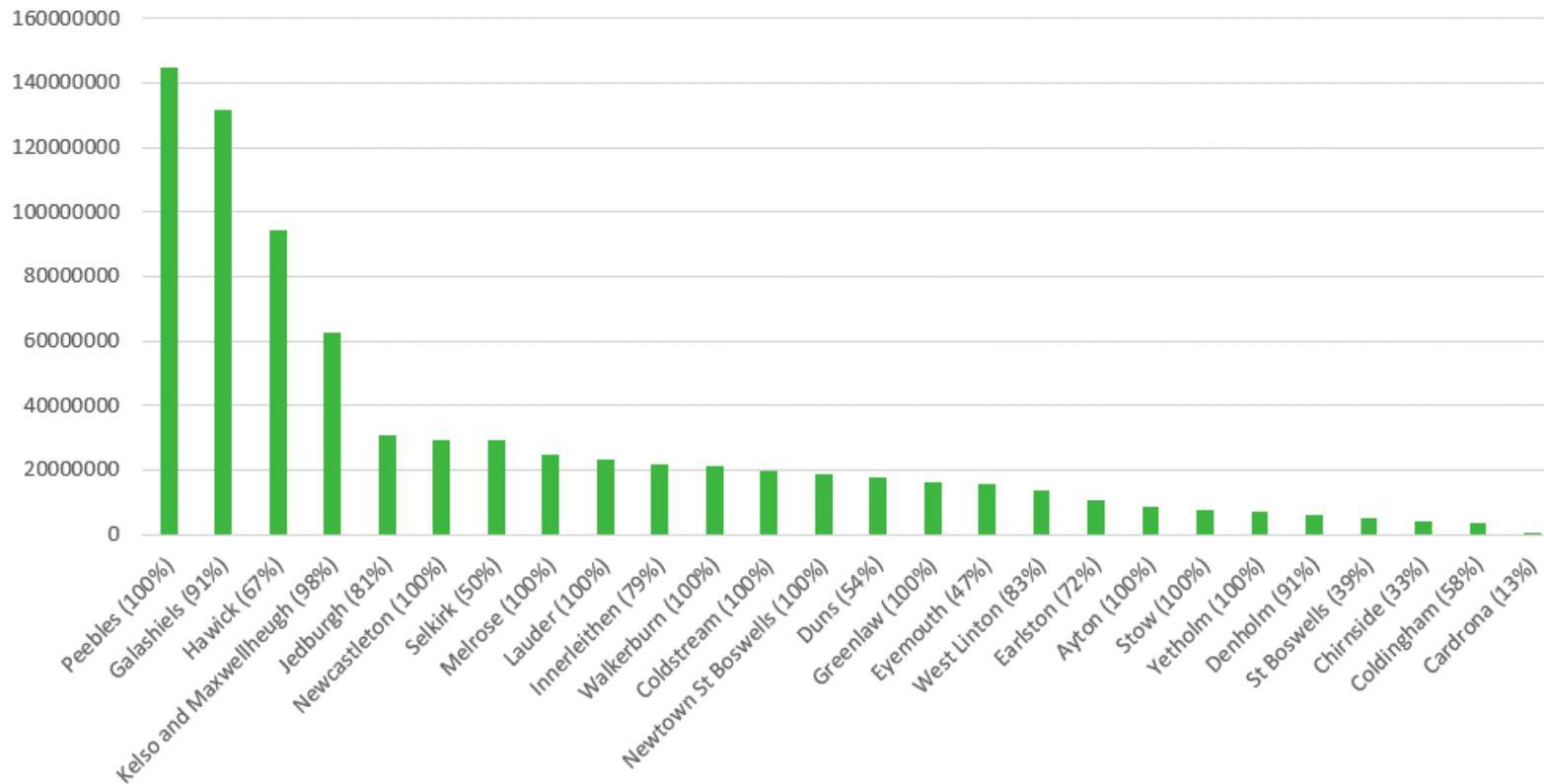


Low Carbon Renewable Heat Sources



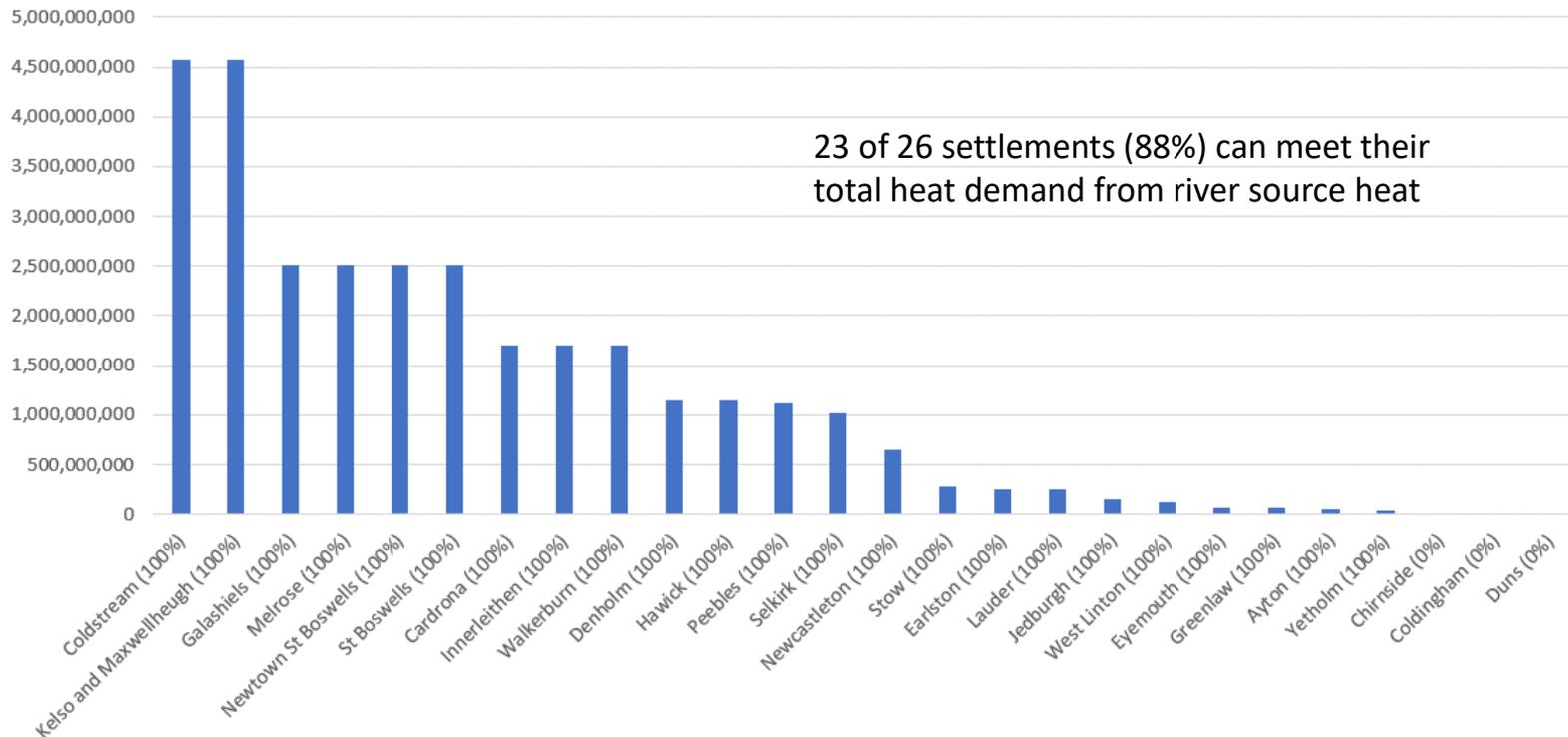
Ground Source Heat

Scottish Borders Council Settlements: Greenspace heat potential (kWh)



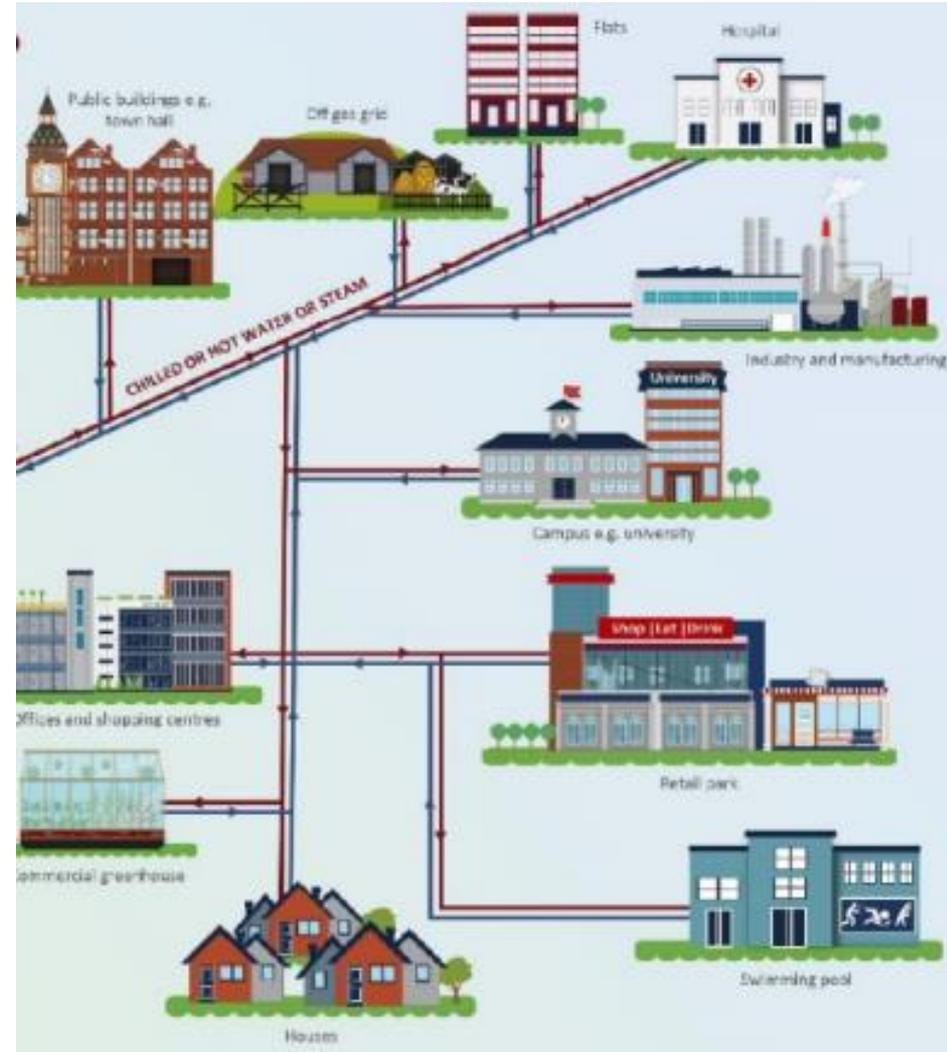
Water Source Heat

Scottish Borders Council Settlements: Water Source Heat potential (kWh)



Heat Networks

- **167 settlements** (32%) with a combined heat demand of **46.2 TWh** (90% of all settlement heat demand) are considered as highly suitable for district heat networks.
- **One third of the 167 settlements** have a high potential for water source heat from local rivers.
- **59%** (45,249) of greenspaces are located in areas considered 'potentially suitable' for district heat networks with a heat supply capacity equivalent to **28.7 TWh / year**.



Regional analysis of low carbon heat supply and demand: Clyde Valley



Datasets:

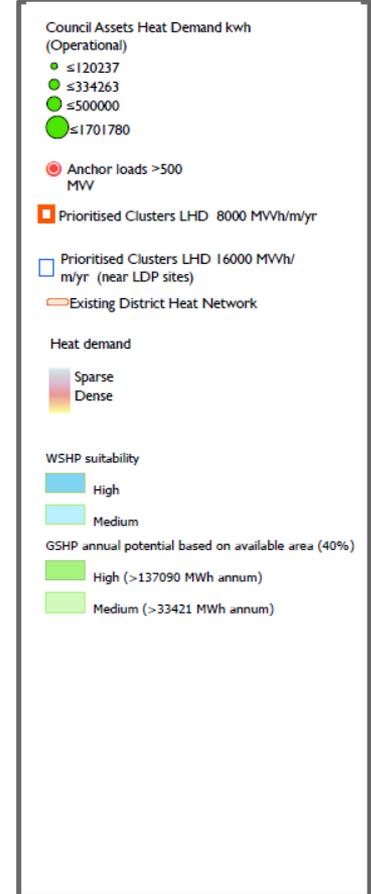
- Heat density zones
- OS Open Rivers

Council Assets - Heat map & anchor loads (>500 MW)

Local analysis of opportunities

Perth centre:
public assets,
anchor loads
and GHIGs data
for heat
network
planning

Low regret off-
gas settlements



Credits: GHIGs Greenspaces: boundaries derived from OS Mastermap Greenspace. Attributes derived from Scotland's Heat Map v.2 with additional attributes from GHIGs. See OS Terms and Conditions <https://www.ordnancesurvey.co.uk/business-government/licensing-agreements/public-sector-licences-contractors-end-users>. © Crown copyright and database right 2021. Ordnance Survey (OS Licence number 100024655). Incorporates data from PAFs, the copyright in which is owned by Royal Mail Group Plc. Contains OS data. © Crown copyright and database right 2021. All rights reserved. Scottish Government 2021. Ordnance Survey (OS Licence number 100024655). Crown copyright [and database rights] 2021 OS 100016971. You are permitted to use this data solely to enable you to respond to, or interact with the organisation that provided you with the data. You are not permitted to copy, sub-licence, distribute or sell any of this data to third parties in any form.

Key messages

- Created Scotland wide data sources to support strategic energy masterplanning and LHEES development.
- Major potential of river source heat with heat networks for 50% of Scotland's settlements
- Significant potential of ground source heat from greenspaces in 44% of settlements especially in remoter areas with few other supply sources
- We need to be considering viability of low carbon heat sources for all 516 settlements



WSHP meeting needs of Drammen Norway (pop 66k) – approx. size of Ayr or Dunfermline

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Grant Feasey
Senior Design Engineer
AES Solar

The Potential of Solar Heat

Helping to Meet Net Zero Targets

Grant Feasey CEng FRGS
Senior Design Engineer

Who we are



- Established 1979
- Manufacture Solar Thermal
- Solar PV, Electrical Energy Storage, Heat Storage, Off-grid, EV Chargers
- Manufacture, Design, Install, Maintain, Consult
- Installation capability UK wide
- Award Winning
- Multiple R&D Projects



HEAT-COOL
An advanced decision-making tool integrating different technologies for heating and cooling at building and district level
www.heat-cool.eu

KEY GOALS

- 1 Pay back period of below 10 years
- 2 Reduction of energy consumption by 30% in residential buildings
- 3 An advanced decision-making tool and an easy to install energy efficient solution for retrofitting buildings
- 4 High potential of application across Europe contributing to large scale market development before 2025

DEMO SITES
Trade and residential buildings, district heating stations

6 TECHNOLOGIES

- Heat pump (air/water)
- Heat pump (water/water)
- Solar PV (Roof-mounted)
- Solar Thermal collectors
- TES (Thermal Energy Storage)
- TES (Thermal energy storage from storage tanks)

PROJECT PARTNERS
www.heat-cool.eu

- POLITECNICO MILANO IRIE
- FAHRENHEIT
- THERMOWATT
- HYPERTECH energy labs
- tecnalia
- Sunamp Heat Batteries
- AES Solar
- Building Energy
- Solintel
- Symelec
- Shell Energy Storage
- ehpa

Cooperation partner:
HOCHSCHULE LUZERN

The Project has received funding from the European Union's Horizon 2020 programme for energy efficiency and innovation action under agreement No. 733923

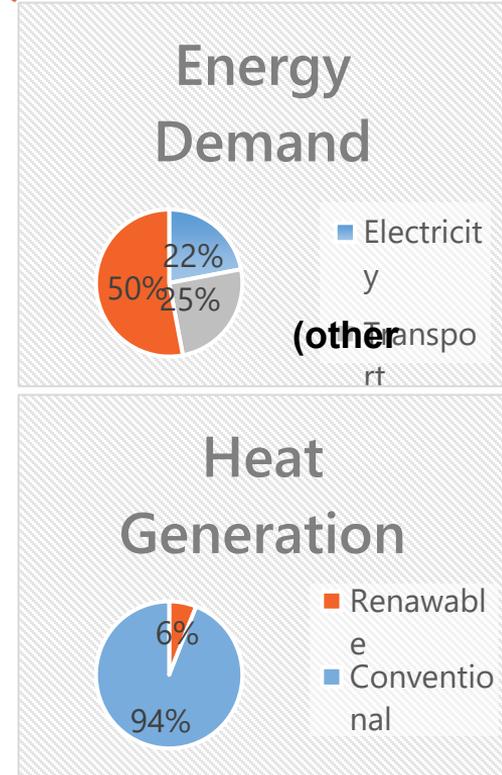
The yellow square



- **80,077GWh heat generated in Scotland in 2019 (Scot Gov)**
- **Roughly equivalent to 225km² of Solar Thermal collector**
- **501GWth of solar in operation globally at end of 2020 – IEA-SHC**

The opportunity

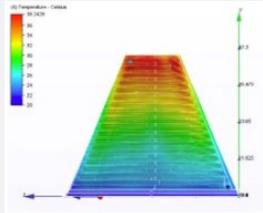
- Zero carbon energy source
- Zero cost energy source
- Protection against price volatility
- ‘Buy-in-advance’ principle
- Reduced operating hours of other plant
 - Less maintenance
 - Longer life
 - Reduced costs and imbedded carbon



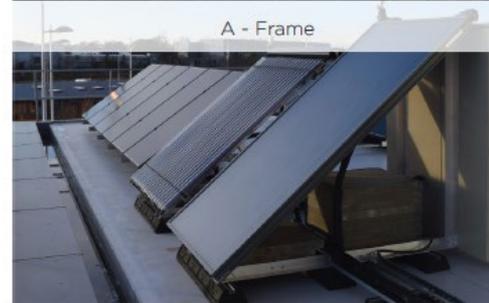
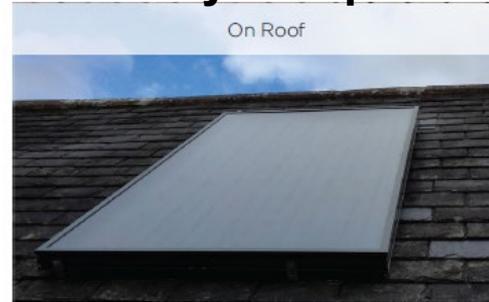
The how



SolarisKit – low cost flat packable solar



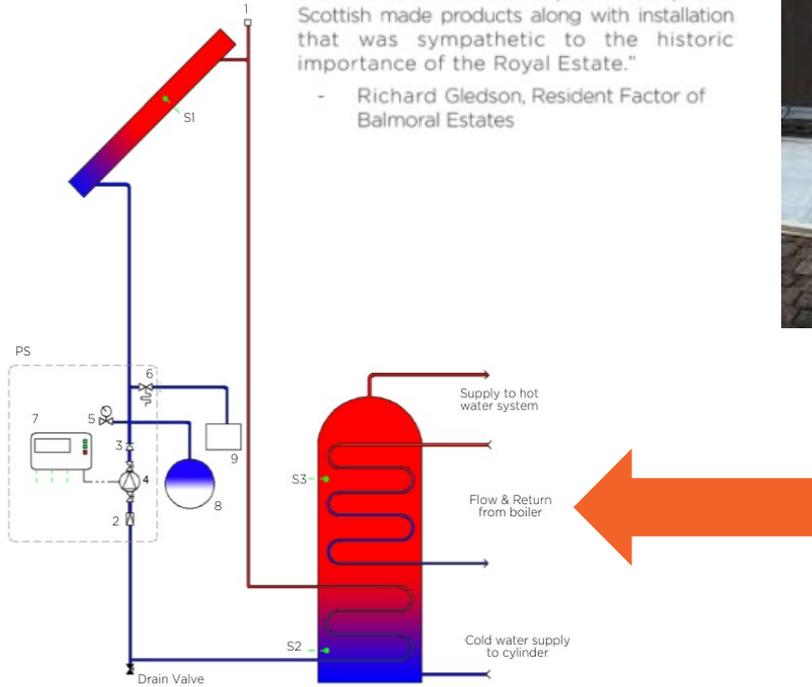
AES Solar– world leading efficiency & experience



Domestic Hot Water

"We look to be as self-sufficient as we can and AES Solar were able to provide exceptional Scottish made products along with installation that was sympathetic to the historic importance of the Royal Estate."

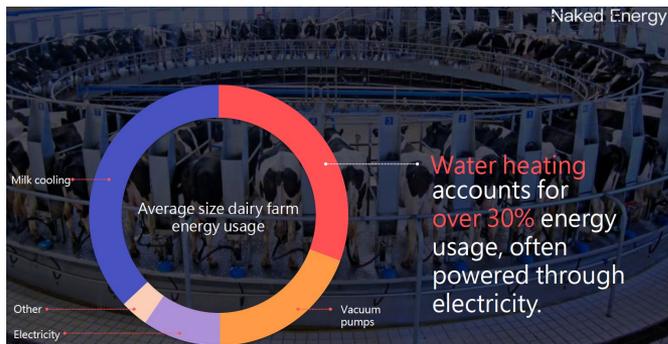
- Richard Gledson, Resident Factor of Balmoral Estates



Supports ANY other heat source

- Heat pump
- Gas/oil
- Solid fuel
- Heat network
- Electric immersion

Commercial & Industrial



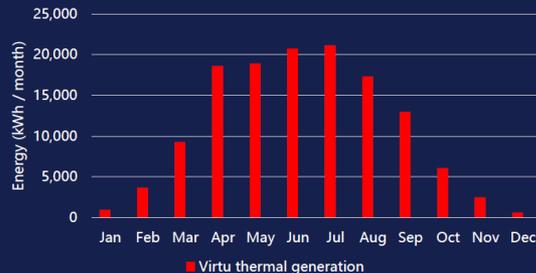
Swimming Pools



Investment and Return

CAPEX cost ²	£199,000
First year bills savings (Gas + Electricity)	£15,700
Payback period	11.2 years
Internal Rate of Return	7.0%
First year carbon savings	25.3 TN

² Provisional sum subject to site visit, detailed design and quotation



Generation and Savings

Thermal generation	133,000 kWh/year
Cumulative Carbon Savings	317 TN

95% efficient boiler

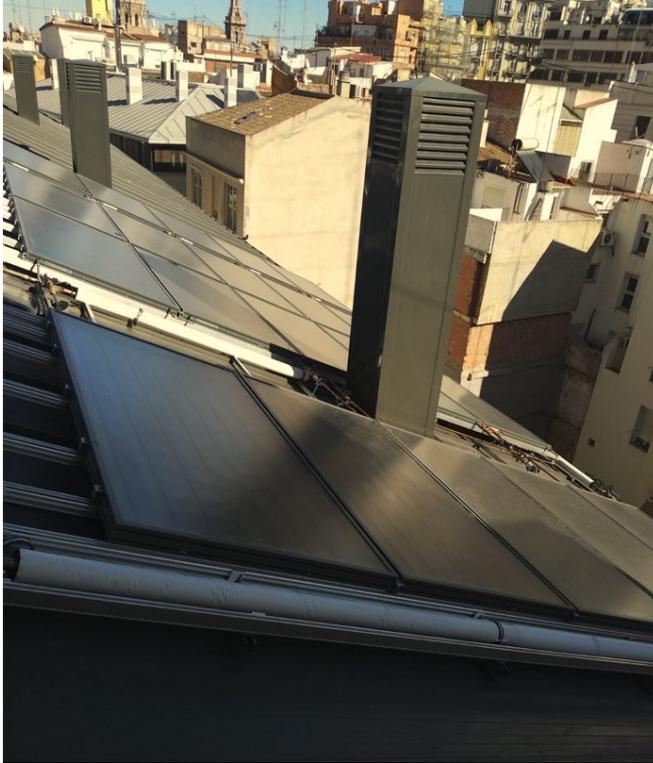
Assumptions

cost of electricity	(£ / kWh)	0.13
existing boiler efficiency		95%
heating fuel emissions	(kgCO ₂ / kWh)	BEIS projection

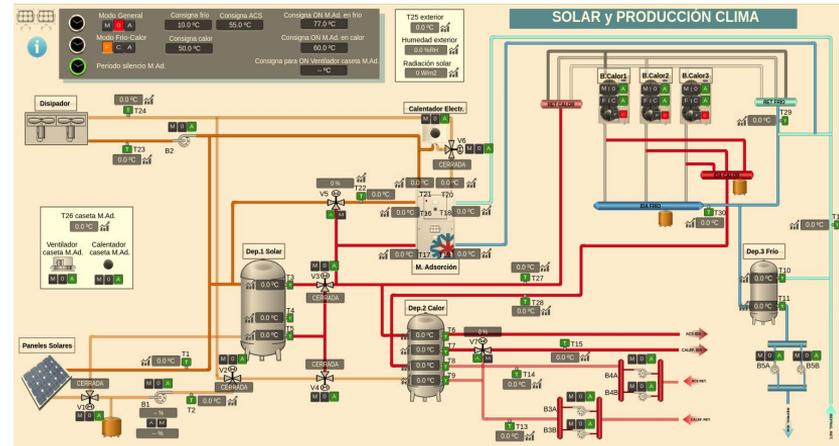
Technical Overview

Client	Forres Swimming Pool
Total Collector Area	79.2 m ²
Performance	24, 831 kWh /yr
CO ₂ Savings	6, 207 kg / yr

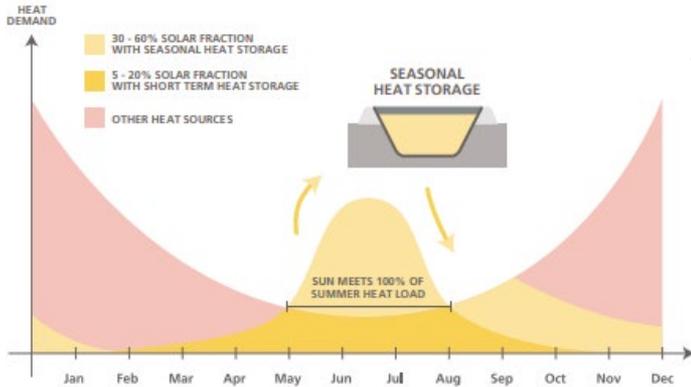
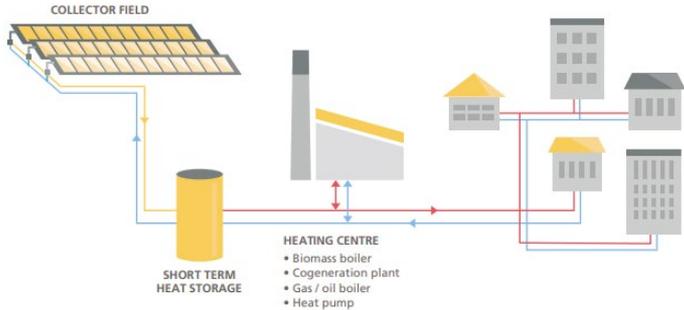
Cooling



- Solar heat input to adsorption chiller
- Targets $>70-90^{\circ}\text{C}$ input
- <10 year financial payback
- Heat network scale prototype in Toledo



Heat Networks



Source: IEA-SHC Task 55 – Solar Heat for Cities

- **Silkeborg – World’s largest Solar Heat network (2016)**
- **157,000m² / 39 Acres / 110MW**
- **20% of City’s heat demand = 21,000 homes**
- **District Heat Network achieved 46% CO2 reduction**
- **SHN cost’s falling – 2-6p/kWh**



The Potential of Solar Heat

Grant Feasey CEng FRGS
Senior Design Engineer

Q and A

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Ian Smith

Head of Consultancy

Changeworks



CHANGeworks

Delivering positive low carbon living

How is the public responding to the low carbon agenda?

Teresa Bray
Chief Executive

Interest in low carbon heat growing



- Climate emergency focusing interest
- Home Energy Scotland seeing increasing interest – not just in off gas areas
- Home Energy Scotland loans
- Manufactures
 - Pre-Covid increase 25% per annum
 - Demand re-established a projections of faster growth

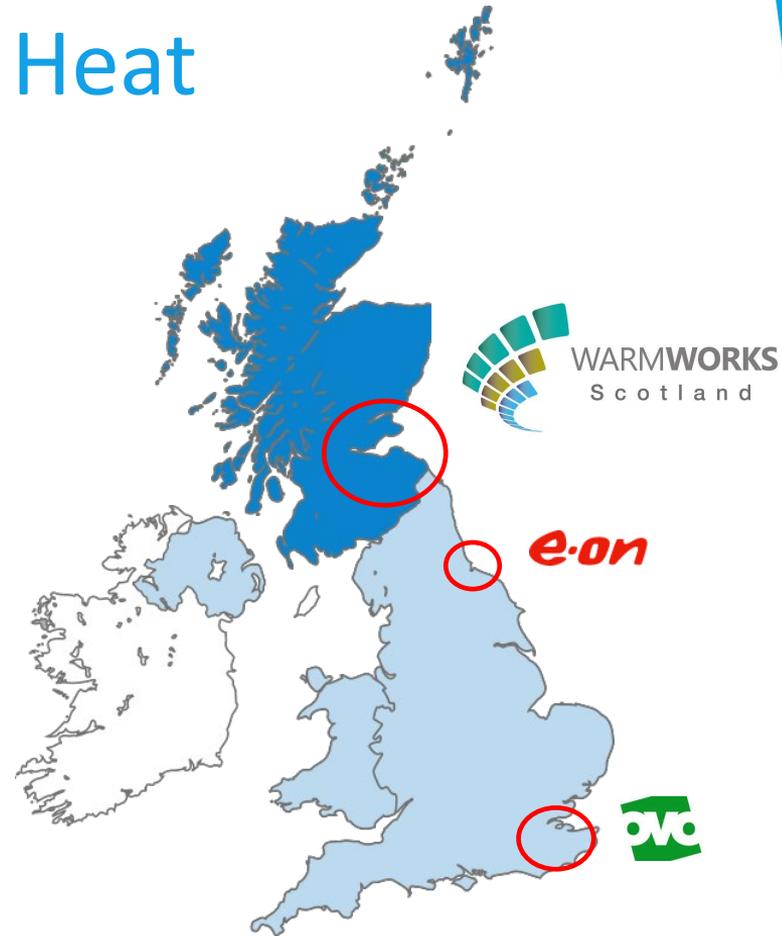
Government programmes and Social housing leading the way

- Warmer Homes Scotland
- Energy Efficient Scotland: Area Based Schemes
- Other Government Programmes
- Argyll Community Housing Association



BEIS Electrification of Heat

- 750 heat pumps, free of charge, mostly (85%) converting on-gas properties to heat pumps
- Project covers three separate areas of the UK
- Warmworks appointed as Delivery Contractor in SE Scotland
- Defined mixture of tenures, property types, socio-demographic groups for participation
- ASHP (high and low temperature), hybrid and GSHP systems in scope
- Detailed system performance monitoring in place for two years post-installation
- High level of monitoring of customer perception during sales, installation and post installation experience



Outcomes and insights to date

- 1,954 initial applications received
- High levels of cancellations due to property suitability (insulation inadequate) or due to participants withdrawing due to perceived level of upheaval
- Customer feedback for Warmworks and its installers so far has generally been very good although hybrid heat pumps have been challenging
- Heat pumps performing well, even at -18C
- Challenges clearly exist in DNO readiness for mass deployment – checks and upgrades have taken months
- Risks remain regarding bill increases when switching from gas – regulation can level this
- Detailed bespoke design work required, the right design is key to getting maximum efficiency
- Monitoring and after-care vital



Supporting the self-funded market



Develop and refine a route map to mainstreaming low carbon heat amongst the self-funding market



Demonstrate how solutions could become business as usual



Assist Scotland to reach heat decarb targets by increasing uptake of renewable heat



Develop understanding of effective messaging around low carbon heat



Increase level of understanding of public/householders in low carbon heat and associated behaviours



Engage with the supply chain as part of pilot and route map development



Explore the potential for potential for bulk buying/community led schemes or paid for service for self-funding market

West Linton Delivery



- 1,000 homes, off-gas, 52% suitable for ASHP with no insulation
- Active low carbon community
- Provide handholding support options for those wishing to upgrade their current heating system and adopt modern technology
- Contractor framework
- Support the successful installation of renewable technologies
- 5% community referred to scheme, 21% of whom installing

The Essential Ingredients



ACTIVE
COMMUNITY
GROUP(S) WITH
AN APPETITE FOR
CHANGE



A LARGER
NUMBER OF
PEOPLE WILLING
TO TAKE
DECISIONS AND
GET INVOLVED



THE RIGHT HAND-
HOLDING ADVICE



THE RIGHT
TECHNICAL
SUPPORT



THE RIGHT
BEHAVIOUR
CHANGE SUPPORT



THE RIGHT
FINANCE
PACKAGE



WELL-DEVELOPED
CONTRACTOR
NETWORKS



PROJECT
FUNDING /
SUSTAINABLE
PAID FOR SERVICE

Reducing the barriers

- Disruption to the home
- Size of the kit
- Lead in time to install
- Confidence in the installers
- Value engineering



Additional action required

- Stronger signals on phasing out of gas boilers
- Regulation
- Development of the supply chain including customer service
- Development of demand generation, support services and quality assurance
- After care support to optimise performance, overcome issues
- Heat pump tariffs
- Smart energy systems

Keep in touch



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Visit changeworks.org.uk

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Q & A



The Scottish Green Energy Awards 2021
Finalists announced: w/c 04 October

Offshore Wind Conference 2022
25-26 January, Glasgow

scottishrenewables.com/events

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LOW-CARBON HEAT CONFERENCE

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