Opportunities and challenges for heat networks in Edinburgh, 2022

John Maslen 25th July 2023

VITAL ENERGi

THE UNIVERSITY OF EDINBURGH

The University of Edinburgh Utilities Supply Company

City-wide district heating solution is not a new concept

District heating systems are present in Edinburgh and the citywide concept was investigated in 1980 and again in 2011.

sel being considered for ferrying plutonium nitrate from was under contract recently to P&O Ferries as a stand-in for en-Orkney-Shetland cargo run. She is pictured stern up to ro-ro berth in Aberdeen harbour.

Power station waste may heat Edinburgh homes

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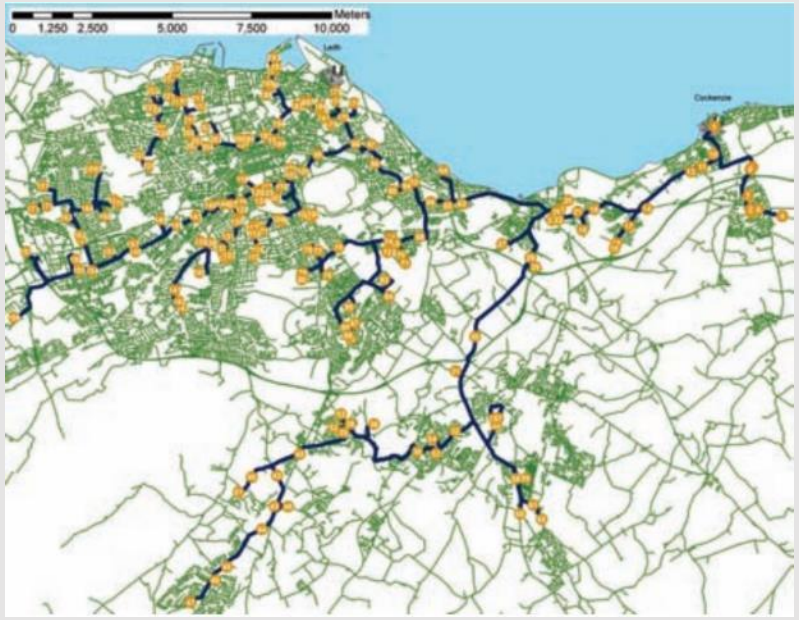
He added: "The public are clearly concerned about the Government's plans to expand the nuclear power programme and are seeking information on practical alternatives. Combined heat and power is widely-used in Europe and is available now to conserve energy and provide work for local industries on the decline."

Aberdeen Press and Journal

Friday 07 March 1980

AEA, 2011. A study into the recovery of heat from power generation in Scotland

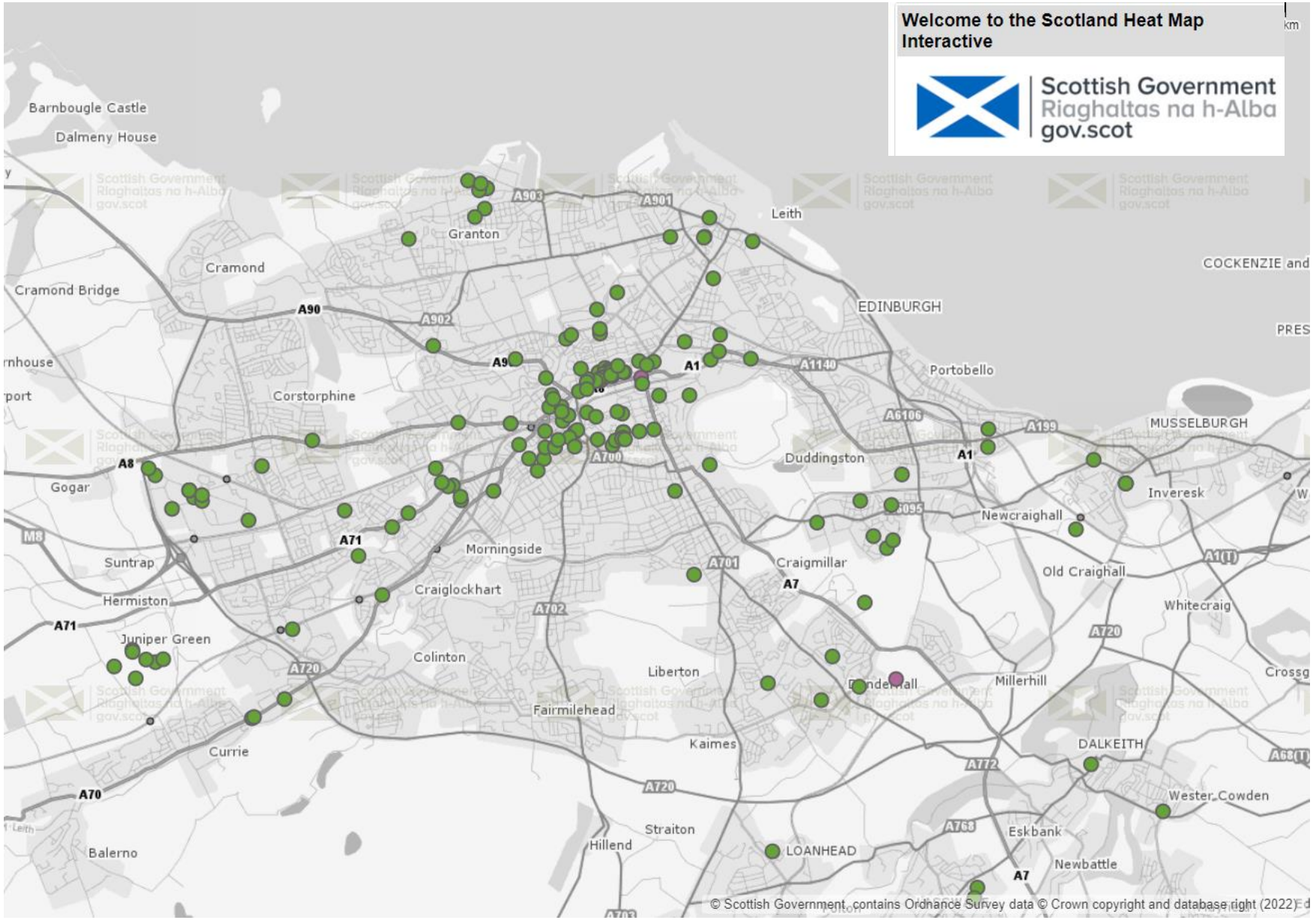


"The technical assessment shows that it is possible to develop extensive networks" and "The network for Cockenzie is much bigger, extending well into Edinburgh as this area is urban with many potential heat consumers."

Existing heat networks exist in Edinburgh

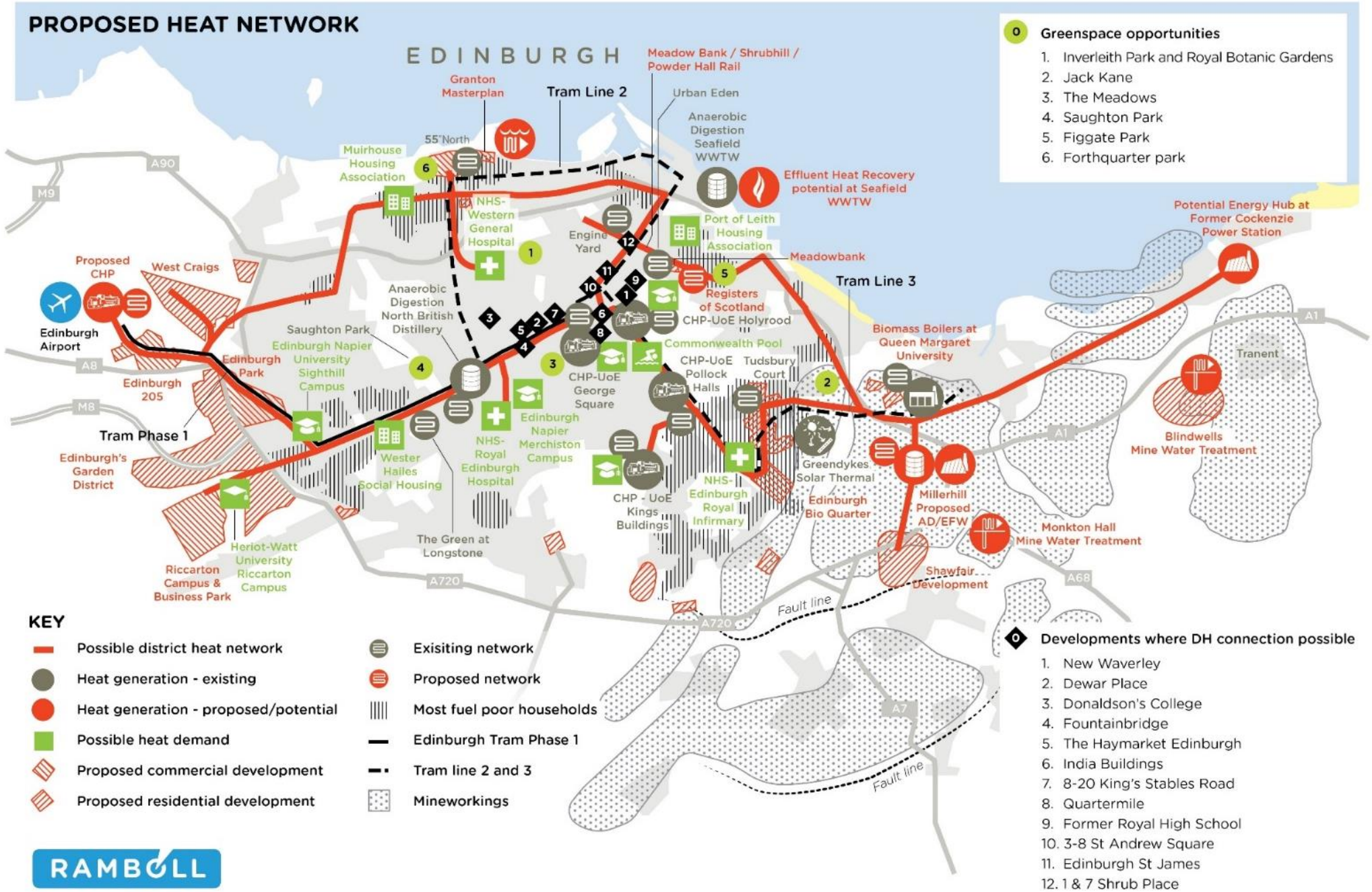
- University of Edinburgh operate large heat networks at George Square, Holyrood, Pollock Halls, and Kings Buildings
- City of Edinburgh Council operate communal heating systems for a number of residential blocks
- North British Distillery supplies heat to Tynecastle High School;
- Places for People have built new developments with heat networks
- Many of the above are gas fired CHP and boilers and to reach net zero can be replaced at the central energy centre with minimal disruption to the building occupiers.

Edinburgh – Locations of Communal Heating Sites



- **CEC Net Zero 2020 target – 39% city's emissions derived natural gas**
- **155 communal and district heat network projects within CEC**
- **Approx. 10% Scotland's annual urban heat demand (5.5 TWh) (ranked 3rd)**
- **Heat sources: No major river, coastal sources from Forth, GSHP opportunities, sewage and water treatment works, extensive flooded mine workings in East Lothian and Midlothian**
- Strong heat network potential: ranked 2nd after Glasgow City Council
- Relatively low % of social housing (18%) – dependency on private building owners
- 20% households in fuel poverty, 10% in extreme fuel poverty
- 6% (17k) households off mains gas grid
- High % of pre-1949 property (48%)

Data derived from Scotland's Heat Map, EST Home Analytics and greenspace scotland GHiGs.

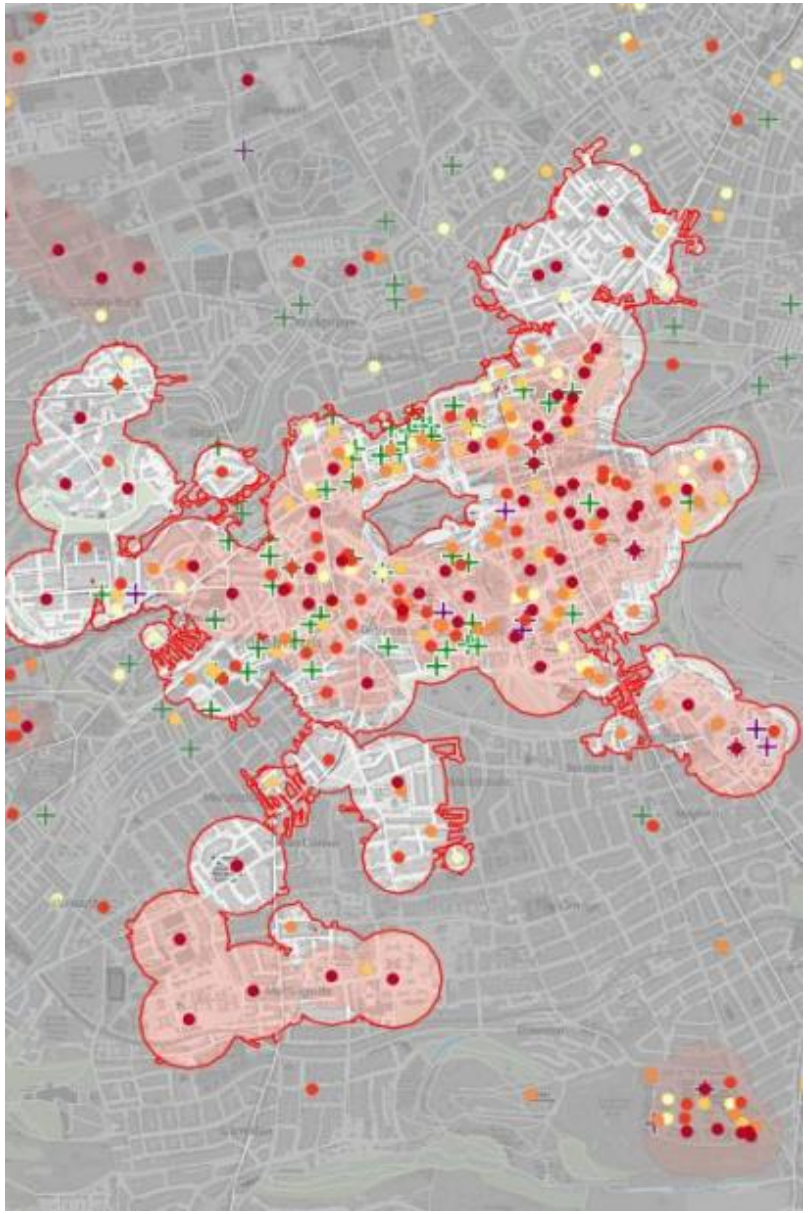

PROPOSED HEAT NETWORK
EDINBURGH
Granton Masterplan
Tram Line 2
Meadow Bank / Shrubhill / Powder Hall Rail
Urban Eden
Anaerobic Digestion Seafield WWTW
Effluent Heat Recovery potential at Seafield WWTW
55°North
Muirhouse Housing Association
NHS-Western General Hospital
Engine Yard
Port of Leith Housing Association
Meadowbank
Tram Line 3
Potential Energy Hub at Former Cockenzie Power Station
Proposed CHP
West Craigs
Edinburgh Airport
Anaerobic Digestion North British Distillery
Registers of Scotland
CHP-UoE Holyrood
Commonwealth Pool
Biomass Boilers at Queen Margaret University
Saughton Park
Edinburgh Napier University Sighthill Campus
Edinburgh Park
Edinburgh 205
CHP-UoE George Square
CHP-UoE Pollock Halls
Tudsbury Court
Tranent
Tram Phase 1
Edinburgh's Garden District
Wester Hailes Social Housing
NHS-Royal Edinburgh Hospital
Edinburgh Napier Merchiston Campus
Greendykes Solar Thermal
Edinburgh Bio Quarter
Millerhill Proposed AD/EFW
Blindwells Mine Water Treatment
CHP - UoE Kings Buildings
NHS-Edinburgh Royal Infirmary
Monkton Hall Mine Water Treatment
Shawfair Development
The Green at Longstone
Heriot-Watt University Riccarton Campus
Riccarton Campus & Business Park
Fault line
Fault line
A90
M9
A8
M8
A720
A1
A68
A7
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
KEY
Possible district heat network
Heat generation - existing
Heat generation - proposed/potential
Possible heat demand
Proposed commercial development
Proposed residential development
Exisiting network
Proposed network
Most fuel poor households
Edinburgh Tram Phase 1
Tram line 2 and 3
Mineworkings
0 Developments where DH connection possible
1. New Waverley
2. Dewar Place
3. Donaldson's College
4. Fountainbridge
5. The Haymarket Edinburgh
6. India Buildings
7. 8-20 King's Stables Road
8. Quartermile
9. Former Royal High School
10. 3-8 St Andrew Square
11. Edinburgh St James
12. 1 & 7 Shrub Place
RAMBOLL

Opportunities - generic

- Climate security = economic security: HNs are scalable, heat agnostic, long-term, Gov policy supported, newly regulated **low carbon heating solutions**
- Reduce cost of gas imports
- Lower **lifetime TCO** than alternative low carbon technology
- **Lower bills** + ability to limit fuel poverty for vulnerable customers
- Increase **local energy security** ('localise heat') and reduce costs of fossil fuel imports
- **Utilise financial** (£300M Heat Network Fund) **and resource support available** from SG (Heat Network Support Fund, HNSU, SFT, Zero Waste Scotland, HNDU England)

Opportunities – Edinburgh specific

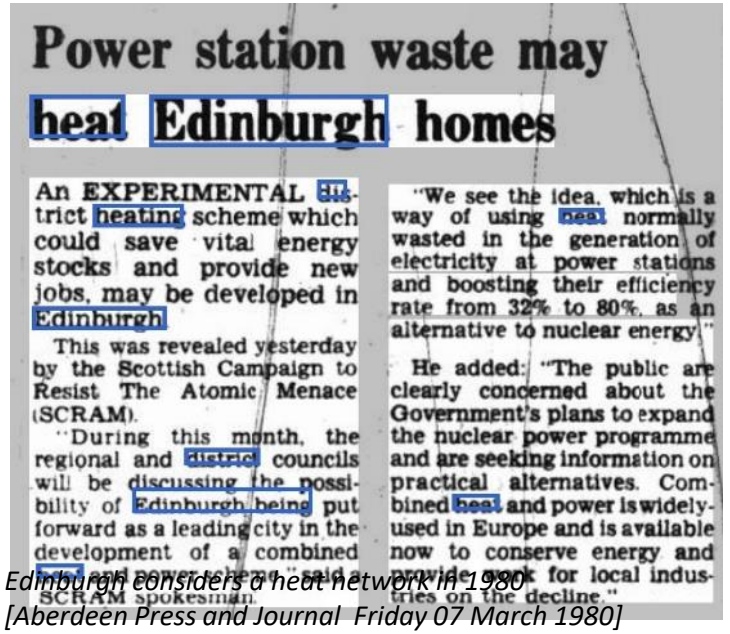
- Major city ranked 2nd in Scotland for density of HN opportunities – stimulate local investment in 'green growth', a key part of city's economic strategy
- Ability to decarbonise 20-80+% of CEC's heat demand + meet air quality targets
- Build on existing communal schemes + planned schemes (Shawfair, Granton)
- Meet needs of extensive areas of new development e.g. Edinburgh West
- Most likely optimal solution for heating tenements
- UK Centre of Excellence for low carbon skills – potential huge net job growth
- Collaborate with Edinburgh Climate Action Hub and CHEF



Indicative Heat Network Zone, Central Edinburgh 2021
Source: Scottish Government heat density mapping

Challenges - generic

- **Project**: typical large infrastructure project risks e.g. surprises (subsidence / archaeology / wayleaves), overruns, contract revisions, exchange rates, State Aid rules
- **Change**: Imposing a 'monopoly' heat solution on customers that have a 'free market' DIY heating culture, environmental change for climate adaptation
- **Perception**: HNs can under-perform, have higher OpEx costs, offer weak investment opportunities, do not help fuel poverty – limited UK exemplars
- **Financing**: Attracting public + private capital investment given scale and long-term RoI
- **Management**: Need for political leadership, long-term governance, and multi-stakeholder coordination (Edinburgh Partnership?) – reputational / political risks
- **Commercial**: Need for adequate, well-balanced heat demand with guarantees from offtakers committed to long-term HSAs at commercially acceptable prices
- **Strategic**: Need to secure political and community support given disruption – significant community engagement and comms overheads, need for **fairness**
- **Technical**: Dependencies on resilient power network, transport demands, 5G comms



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Edinburgh considers a heat network in 1980
[Aberdeen Press and Journal Friday 07 March 1980]

Challenges – Edinburgh specific

- City is growing - high proportion of historic buildings and conservation value (UNESCO)
- Political, business and citizen reluctance to large-scale street disruption after trams
- Question mark over appetite to progress a local utility supplier (ESCo)
- Limited in-house expertise/capacity in heat, risks of dependency on out-sourcing
- Track record of developing strategies but limited delivery – Granton model key
- Peripheral heat sources (inc. outside CEC), peripheral high density demand

Heat pipe ducts laid under A1, Shawfair Project
[Provided by Vattenfall 2023]

What needs to happen?

- Produce **comprehensive LHEES strategy + delivery plan** inc. whole energy systems + communication infrastructure (LAEPs) and progress to Feasibility studies -> Detailed Project Development
- Finalise **primary and secondary regulation** across Scotland + UK
- **Reduce investment risks**: (1) Obligate public building owners (esp NHS) to guarantee connection at market price (2) Introduce incentives for commercial building owners in HN Zones to connect
- Adopt **CIBSE Code of Practice CP1** for design, development and operation of HNs, awareness of Ofgem regulations e.g. pricing, standards (2025 ->)
- Review need for new **local partnership body** of all key city region stakeholders – agree vision and principles for long-term commitments
- Consider long-term **model of HN delivery** across city region to ensure effective delivery structures (control/risk/reward) with inter-operability
- Agree **local targets** for heat network adoption by 2030 and 2045 e.g. if CEC contributes 15% of national targets:
    - 0.9 TWh/yr by 2030 (15% of 2030 national target) – 7x rise in 8 years
- **Develop effective engagement strategy** and secure support with political representatives (recent CAB report)