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New approaches to Energy Efficiency



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# Scotland's Energy Efficiency Programme (SEEP)

Stephen Garland

Head of Housing and Sustainability Unit  
Scottish Government

 Greener  
Scotland  
Scottish  
Government

# Scotland Innovates

NEW APPROACHES FOR ENERGY EFFICIENCY

Glasgow Science Centre • 20 March 2018

## Scotland's Energy Efficiency Programme (SEEP)

*Stephen Garland, Head of Sustainable Housing Unit, Scottish Government*

- **Why take action? – policy drivers**
  - **Commitments to date**
  - **Key themes from consultation**
  - **How might the programme work? – the customer journey**
  - **Next steps -**
-

# Scotland's Energy Efficiency Programme (SEEP)

- Why take action on energy efficiency and heat?

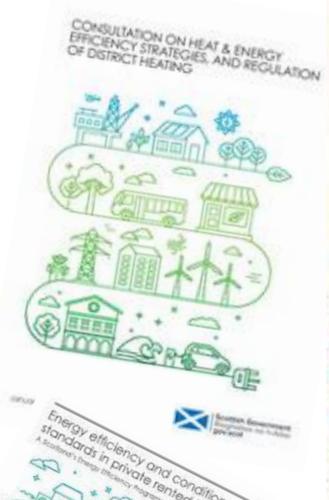


# Scotland's Energy Efficiency Programme (SEEP)-

ENERGY STRATEGY – SCOTLAND'S ENERGY EFFICIENCY PROGRAMME (SEEP)  
NATIONAL INFRASTRUCTURE PRIORITY FOR ENERGY EFFICIENCY



January 2017



15-20 year programme

Public and private investment

Homes and non domestic

Regulatory framework

Incentives and enabling

# Scotland's Climate Change Plan

- Requirement of the Climate Change (Scotland) Act 2009
- Policies and proposals for reducing emissions by **66% by 2032** across all sectors
- Allocates emission reductions across economy (TIMES)
- Articulates the on the ground changes that Scottish Government will take forward with its partners
- **Published 28 February 2018**



Increase proportion of heat supplied by low carbon technologies

-35% of domestic buildings' heat by 2032

-70% of non-domestic buildings' heat by 2032

Upgrades to fabric of buildings to reduce heat demand

-15% reduction by 2032 for domestic buildings

-20% reduction by 2032 for non-domestic buildings

# Scotland's Energy Efficiency Programme (SEEP)-

ENERGY STRATEGY – SCOTLAND'S ENERGY EFFICIENCY PROGRAMME (SEEP)  
NATIONAL INFRASTRUCTURE PRIORITY FOR ENERGY EFFICIENCY



January 2017



CONSULTATION ON HEAT & ENERGY EFFICIENCY STRATEGIES, AND REGULATION OF DISTRICT HEATING



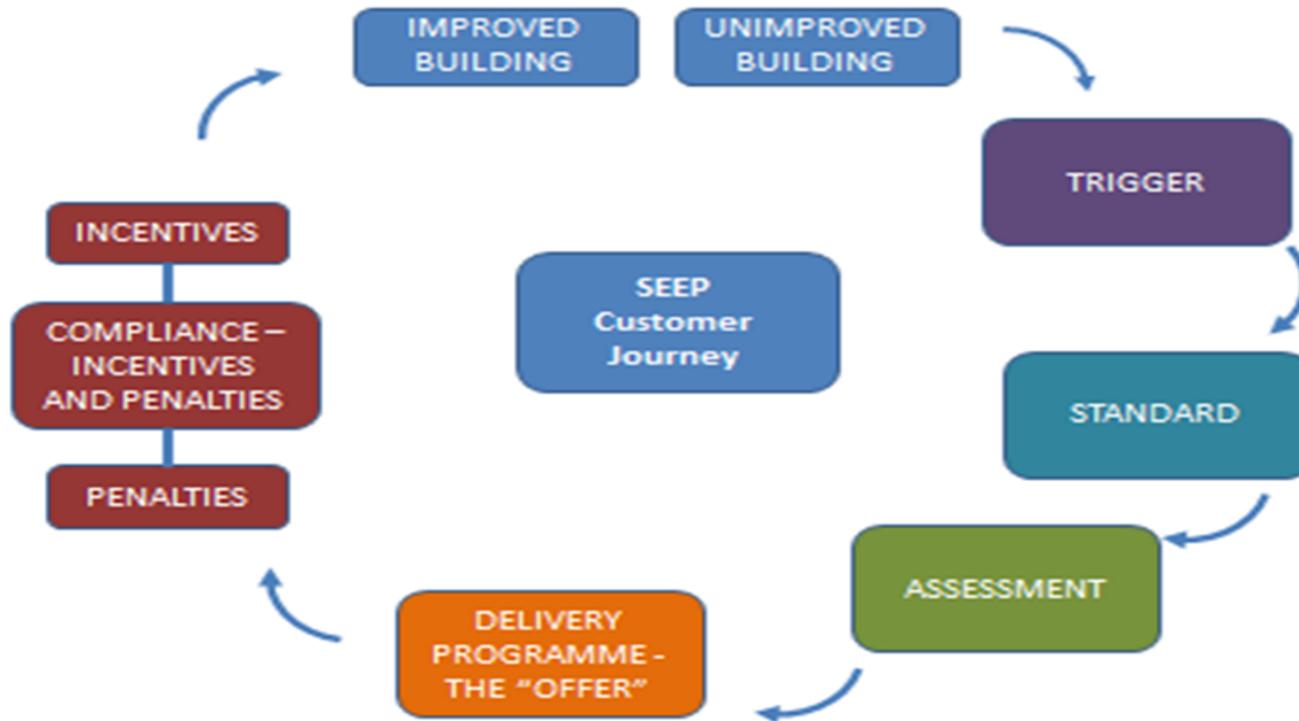
Energy efficiency and condition standards in private rented housing  
A Scotland's Energy Efficiency Programme Consultation



## Consultation themes –

- Long term certainty
- Build on existing success
- Delivery body

# Scotland's Energy Efficiency Programme (SEEP)-



# Scotland's Energy Efficiency Programme (SEEP)-

- What's next?
  - routemap setting out direction and milestones
    - Consultation on standards e.g 'ESSH 2' for social rented sector
    - Warm Homes Bill new statutory target on fuel poverty
    - Climate Change bill – meet new international agreements
    - 'SEEP Bill' if necessary

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# Technologies to support Scotland's Energy Efficiency Programme (SEEP)

Ciara O'Connor

Project and Information Manager

ClimateXChange

 Greener  
Scotland  
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Government

# Technologies to support Scotland's Energy Efficiency Programme

Ciara O'Connor

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# ClimateXChange

- The Scottish Government's independent expert on issues relating to climate change and the transition to a low carbon economy
- Provide timely and objective research evidence and expert advice

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# What do we do?

# What is knowledge exchange?

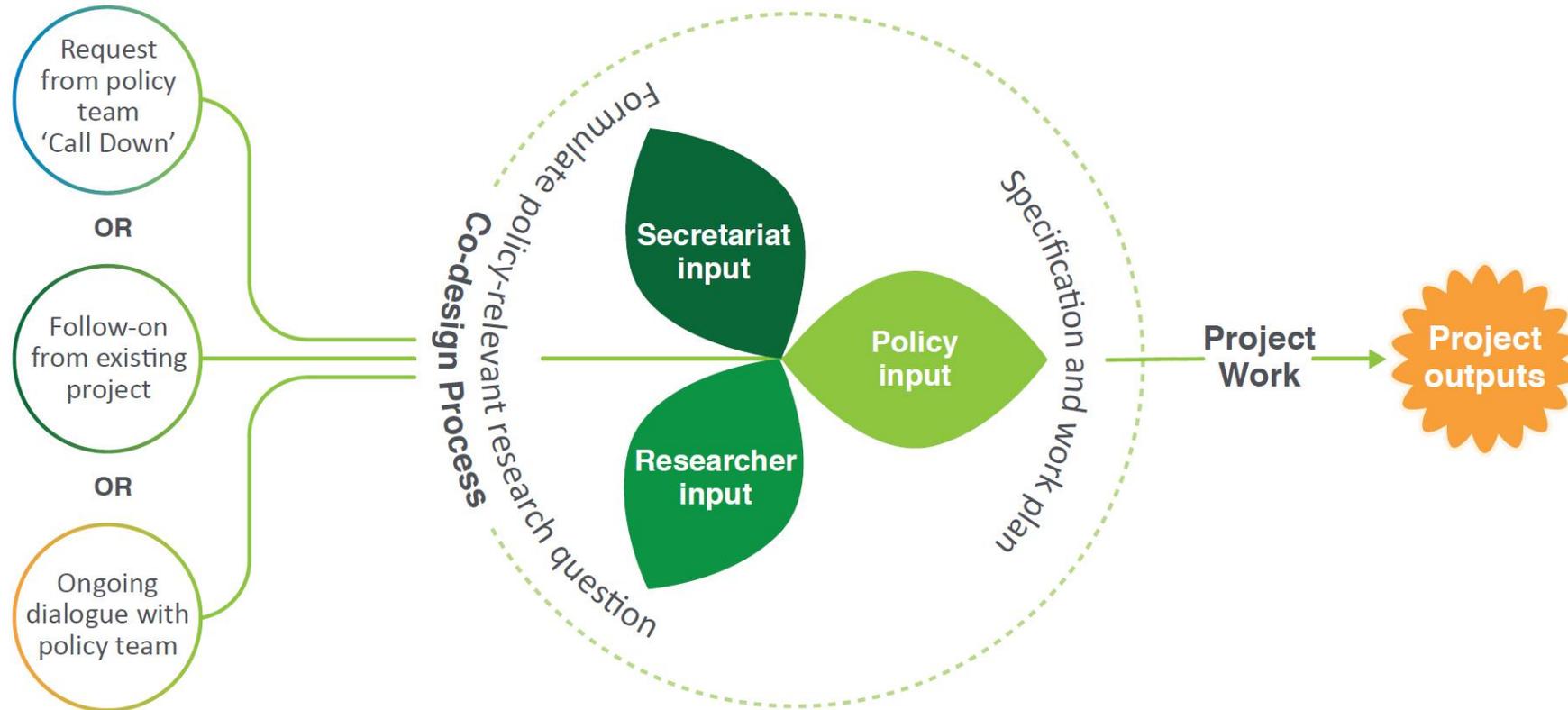
Knowledge exchange is a two-way process where scientists and individuals or organisations share learning, ideas and experiences.

*Economic and Social Research Council*

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# Our knowledge exchange model



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# Technologies to support Scotland's Energy Efficiency Programme

- ClimateXChange commissioned research to inform the Scottish Government on the status of certain technologies to support decisions on their suitability for inclusion within SEEP



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# Three landscaping studies

- Heat generation
- Energy efficiency (retrofit solutions to buildings)
- Smart energy

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# Identifying technologies

- Technologies identified through experience, desk based research, literature review, online databases, and market testing
- Focus on Technology Readiness Level (TRL) 8 and 9 to ensure technologies looked at are being tested and used in the real-world



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# Assessing technologies

- The technologies identified were scored against a list of assessment criteria  
*e.g. cost-effectiveness, carbon reduction, and economic benefit*
- Scored 1 – 5 against an agreed high / low scale



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## Smart meters - SMETS2

Provide a high level of data for network operators to use for better managing the network, as well as providing consumers with 'live' data on usage and opportunities for greater control

Technical	Scoring	Score	Comments
Technology readiness	TRL score 1-9	9	Dedicated smart meter network now live so SMETS2 meters (2nd generation smart meters with full functionality) can be installed
Efficiency (product / technology efficiency)	1 (low) to 5 (high) score	3	Depends on user interaction; moderate efficiency gains are possible but require user action.
Reliability	1 (low) to 5 (high) score	4	Subject to extensive specification and testing but limited experience to date of interactions with Smart Data Communications Company (DCC)
(level of) Compatibility with existing systems	1 (low/poor) to 5 (high/good) score	3	Requires replacement of dumb meters. Smart DCC now in place. Installation in some properties can be problematic, e.g. solid-walled tenements.
complexity of systems/ their integration	1 (complex) to 5 (simple) score	3	Simple interfaces but system behind them is highly complex. System is now live and SMETS2 meters can be installed, although very few have been
risk/severity of unintended consequences	1 (high) to 5 (low) score	4	SMETS2 meters should overcome many of the concerns associated with foundation meters, e.g. switchability, security but some concerns regarding consequences of those who choose not to switch.
<b>26</b>			

Environmental	Scoring	Score	Comments
(in-use) carbon saving potential	1 (low) to 5 (high) score	3	Moderate projected savings for consumers but network management benefits could be more significant and longer term potential may be higher
whole life environmental impact	1 (high) to 5 (low) score	4	Not addressed in DECC/BEIS Impact Assessment. Unsure of direct environmental impact of meters, no information on this. Must be some impacts from disposal of old meters, replacing with smart meters.
<b>7</b>			

Policy / Regulation	Scoring	Score	Comments
compatibility with Scottish policy	1 (low) to 5 (high) score	5	Currently being rolled out in Scotland
compatibility with current regulation	1 (low) to 5 (high) score	5	Directly compatible
compatibility with current assessment methodologies	1 (low) to 5 (high) score	2	Smart meters don't feature in RdSAP
<b>12</b>			

Monetary	Scoring	Score	Comments
capital costs	1 (high) to 5 (low) score	3	Total cost of the whole smart meter rollout including the new dedicated network and meter installations estimated at £11bn GB-wide but smart meters due to be freely available to all by 2020. Cost score - depends if we are talking about direct cost to consumer or overall costs of smart meter network? Consumers don't pay anything up front and in theory suppliers save by not having to pay for meter readers. However, the meters effectively cost around £200 each (£11B cost, 53M to be fitted; NB many households getting 2 meters, gas & electricity)
life cycle costs	1 (high) to 5 (low) score	4	Not addressed in DECC/BEIS Impact Assessments. Assume relatively low but that depends on level of future proofing and when they might need to be replaced.
carbon cost effectiveness (£ per tCO2 saved)	1 (low) to 5 (high) score	1	Total cost of rollout c£11bn, carbon saving (traded and non-) potential 30mtCO2e. Implies carbon cost effectiveness of £367/tCO2e. Carbon cost effectiveness at individual building level has not been calculated. (According to old Guardian, article, building new wind power capacity, which costs £50-£79 for each tonne of carbon saved; <a href="https://www.theguardian.com/environment/2008/feb/20/energyefficiency.smartmeters">https://www.theguardian.com/environment/2008/feb/20/energyefficiency.smartmeters</a> - but same article says smart meters are more cost effective than wind on carbon saving). Combined meter saving forecast to be £11 in 2020; combined meter costs would be over £400, giving savings of 2.5% of meter costs.
(potential for) economy of scale (to drive down costs)	1 (low) to 5 (high) score	2	Economies of scale already being achieved - GB-wide rollout. BUT the lack of area-based approach (supplier-led rather than, e.g. DNO-led) misses economy of scale opportunities.
<b>10</b>			

Capacity/ Supply Chain	Scoring	Score	Comments
applicability	1 (low) to 5 (high) score	4	Good applicability, although Scotland does have a higher proportion of problematic properties than the rest of GB
existing Scottish capacity/skills	1 (low) to 5 (high) score	5	Already being rolled out by the energy suppliers
Scottish content	1 (low) to 5 (high) score	2	Suspect that no smart meters are being manufactured in Scotland but supply chain for the rollout is extensive, which will benefit many Scottish companies
potential for cross-sector involvement/benefit	1 (low) to 5 (high) score	5	Potential for integration with demand-side (network management) and supply-side (greater consumer control)
Scottish economic impact potential	1 (low) to 5 (high) score	4	Implementation of rollout likely to generate significant impact, particularly for installers
<b>20</b>			

Consumer	Scoring	Score	Comments
user friendliness / practicality	1 (low) to 5 (high) score	4	Smart meters incorporate user-friendly in-home controls but research demonstrates that interaction with these is often short-lived
disruption	1 (high) to 5 (low) score	5	Little disruption in most cases. Simple meter replacements
customer acceptance	1 (low) to 5 (high) score	3	Benefit from significant promotional campaign but weighed against concerns around privacy of data
savings on bills	1 (low) to 5 (high) score	2	Projected to reduce the average household energy bill by £11 in 2020 and by £47 in 2030. (= Data from most recent Cost Benefit statement). The average dual-fuel non-domestic property is expected to realise bill savings of approximately £128 in 2020 and £147 in 2030
maintenance requirements	1 (high) to 5 (low) score	5	None
health/wellbeing/comfort	1 (high negative impact) to 5 (high positive impact) score	3	Allow more informed control of energy use but some concerns relating to vulnerable households. Long-term potential is high through greater interactivity
existing consumer protection? (adequacy?)	1 (low) to 5 (high) score	5	Being rolled out by the energy companies with extensive consumer protections in place, including code of practice for meter installation that all energy suppliers must comply with
<b>27</b>			

Opportunities / risks	Scoring	Score	Comments
Critical success factors/watch points	List/Describe		Level of future proofing and extension of applications to for example voltage limitation, time of use tariffs, real time information for distribution automation.
other relevant considerations/risks/opportunities	List/Describe		Some properties present technical challenges for installation. Smart DCC does not cover whole country
adaptability / future proofing	List / Describe		SMETS 2 meters have inbuilt functionality to talk to the DCC. Some concerns nonetheless that they won't be flexible enough for all potential uses.
<b>102</b>			

# Scorecards and databases

- Databases provide an ongoing resource on the technologies (heat generation, energy efficiency, smart energy) ready to make a contribution to energy savings
- Reports make a number of broad observations on where technologies might fit under SEEP



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# Some policy relevant findings

- SEEP can support issues around consumer acceptance of third party control
- Opportunities for supply chain stimulation, job creation and economic impact
- Increase the uptake of low carbon heating solutions



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# Conclusion

- Innovation and new technology will be key to improving energy efficiency and reducing heat demand through the delivery of Scotland's Energy Efficiency Programme (SEEP)

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# For more information:

Email: [Ciara.o'connor@ed.ac.uk](mailto:Ciara.o'connor@ed.ac.uk)

Reports and databases:

<https://www.climateexchange.org.uk/research/projects/technologies-to-support-scotlands-energy-efficiency-programme/>

Twitter: [@climateexchange\\_](https://twitter.com/climateexchange_)

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# Energy and Low Carbon Innovation

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# Energy and Low Carbon Innovation

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Sustainable Development Manager

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# Scottish Cities Alliance : Work Areas

- Energy:
  - Renewables
  - Energy retrofit
  - Hydrogen
  - District heating
- Low Carbon technologies:
  - Smart meters.
  - Street lighting

# Examples of Projects

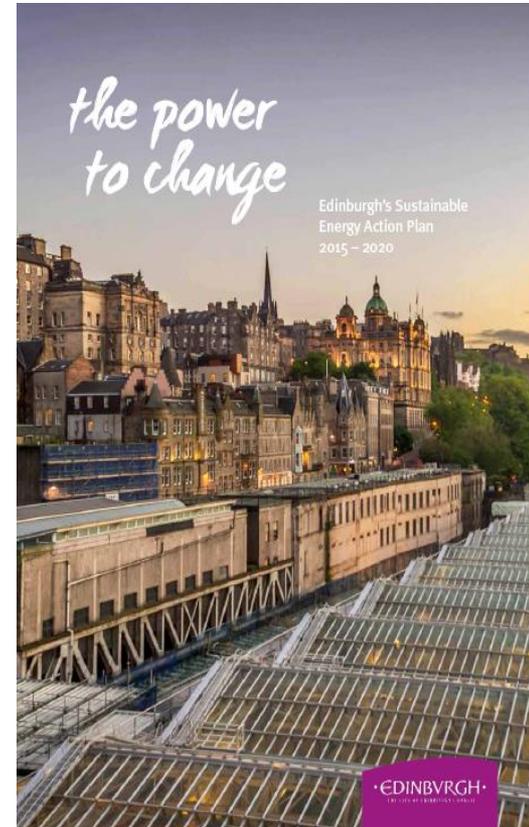
- LHEES (**Local Heat and Energy Efficiency Strategies**): cities involved in the piloting of LHEES enabling planning for energy demand reduction and heat decarbonisation of buildings.
- NDEE (**Non-domestic energy efficiency**): the Alliance undertook work to develop a pipeline of retrofit for non-domestic properties across cities.
- The Alliance progressed the development of planning assessments for **district heating**.
- **The Urban Innovative Action (UIA)** – cities developing submissions to test new solutions to address urban challenges across Europe.
- New working group set up to develop a **Smart Meter Implementation Programme**.
- Six of the cities are looking at opportunities related to the development of **urban wind systems**.
- **Intelligent/renewable street lighting** : reducing carbon through LED bulbs and sensors. Such lighting can also contain sensors for monitoring air quality and pollution
- The Alliance is looking at the development of **hydrogen refuelling station** infrastructure across the cities, and the production of green hydrogen.
- Looking at **SMART initiatives** to further enhance a commuter's experience whether purchasing a ticket, journey planning, etc.
- Aberdeen and Dundee are participating in the most ambitious **hydrogen deployment** to-date (EU Fuel Cells and Hydrogen Joint Undertaking Initiative, FCH-JU) with over 30 European cities.

# Edinburgh's Energy and Low Carbon Programme

Driven through the SEAP and 5 programmes:

- Energy efficiency
- Renewables
- District Heating
- Resource Efficiency
- Sustainable Transport

Aim to reduce carbon emissions by 42% by 2020 – achieved a 30% reduction to date.



# Examples of Edinburgh Projects

- LHEES (**Local Heat and Energy Efficiency Strategies**): project underway with Jacobs due in summer.
- NDEE (**Non-domestic energy efficiency**): The Council has progressed the energy retrofit of nine of the largest Council buildings through the RE:FIT framework.
- The Council is assessing major **district heating** opportunities at Bioquarter, Fountainbridge, Meadowbank and Granton.
- Housing is progressing a major **domestic energy efficiency** programme for existing homes through HEEPS:ABS.
- A new **SEEP2** programme is underway looking at both domestic and non domestic energy including commercial properties.
- A business case has been commissioned for the development of **electric vehicle** infrastructure across the city.
- **Street lighting** : The Council has awarded a contract to Amey for the replacement of the approx. 54,000 street lights with energy efficient lanterns over 2 years.
- The Council is assessing the development of **solar car ports** combined with storage for the park and ride sites.
- The redevelopment of **Saughton Park** includes the installation of large GSHP, solar PV and possible microhydro.
- The Council successfully applied for **CAN DO** funding for innovative EV solutions.
- In partnership with the BRE, the Council is involved in the MEMPHIS project looking at the opportunities for **waste heat** across the city.
- With the UofE the Council is evaluating the use of **sensors technology** to assess energy use in buildings.
- In partnership with Midlothian Council, both Councils looking at opportunities for the use of waste heat from **Millerhill**.
- In partnership with the Chamber of Commerce, Council carried out feasibility work for a **circular economy** approach in Edinburgh.

# Energy Efficiency

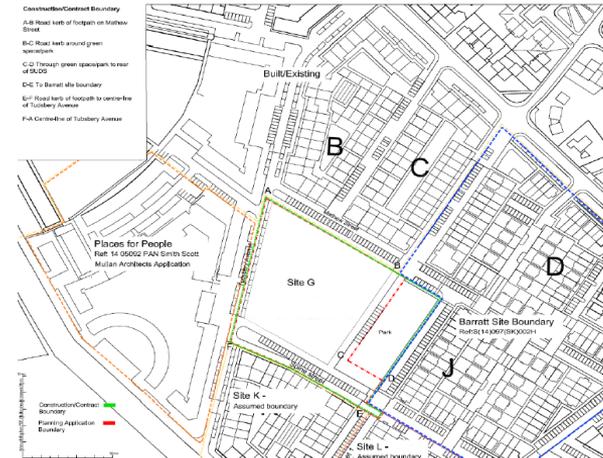
## Issues:

- Wide range of properties across city.
- Age/listed/historic environment/ UNESCO status.
- Hard to treat properties.
- The need for replicable solutions.
- Costs.
- Need for pilots/data/case studies.
- Engagement/persuasion



# Energy Efficiency : Domestic

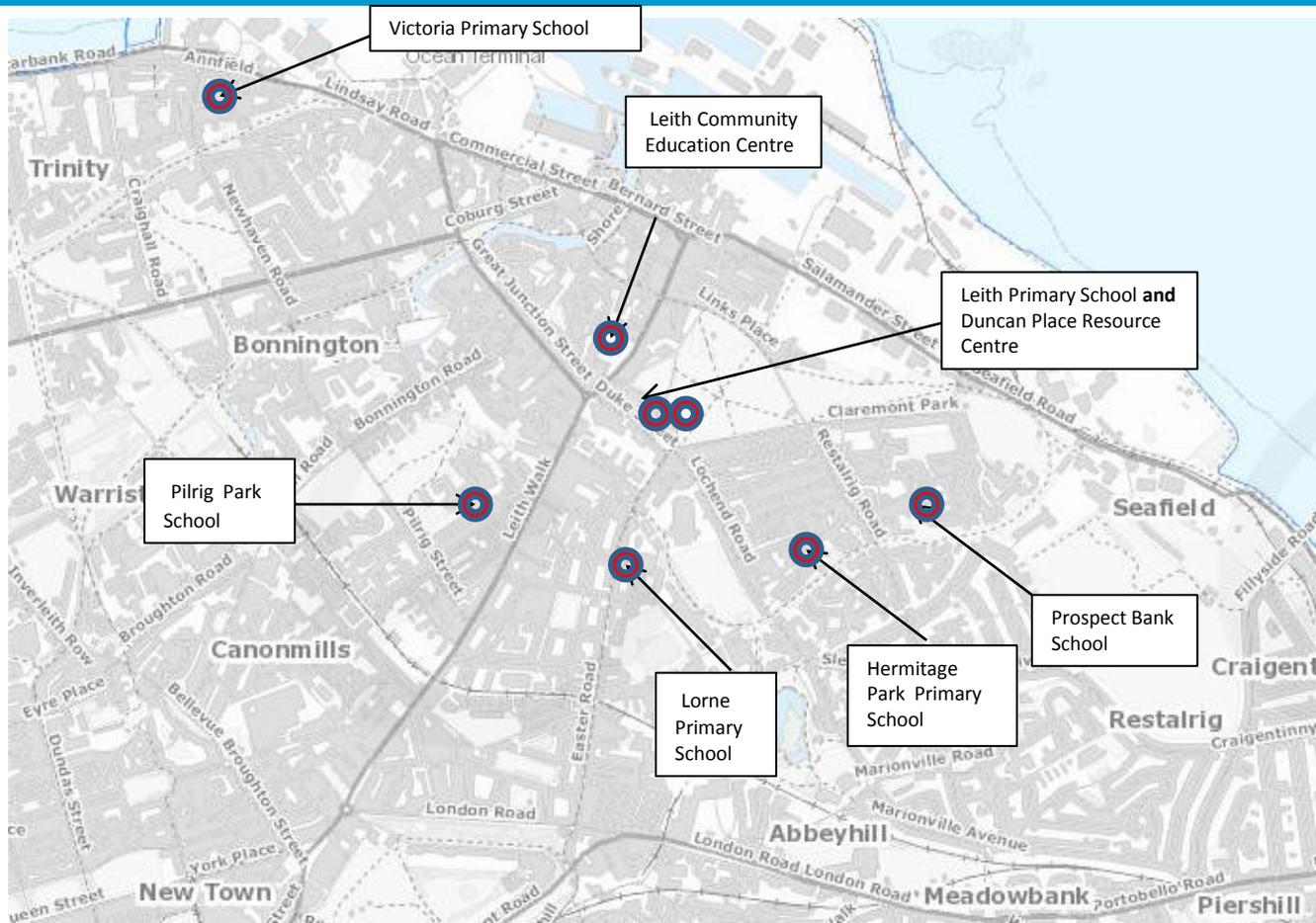
- Existing homes - aim to meet and where possible exceed EESSH. The HEEPS:ABS programme focuses on insulation in hard to treat homes in private and social households. As part of this programme, looking to pilot new technologies and solutions.
- New Build Homes – have 20,000 new homes to build over 10 years. Want to see innovation and pilot new technologies as part of this programme.



- Currently have 9 of the largest buildings in the Council going through major energy retrofit programme. Whole building approach with eight buildings completed. Innovation element is use of EPC.
- ENHANCE project with UoE. Looking at sensor technology across four major Council buildings.
- Embarked on a major programme of controls work, commissioning new BMS system – looking at state of the art.



# SEEP1 Project Area: LEITH



Council applied for SEEP1 funding for both domestic and non domestic energy efficiency projects . Focus on the Leith area.

# SEEP1 Edinburgh Projects : Domestic Energy Efficiency

- Upgrading of ~320 hard to treat (HTT) properties.
- Wanted to take a whole house approach but in the end could only carry out insulation.
- Example shown of internal wall insulation in tenement in Prince Regent St.
- A major issue is engagement with tenants/householders – perception of disruption etc.
- Carrying out infra red assessments of properties.



# SEEP1 Edinburgh Projects : Non Domestic

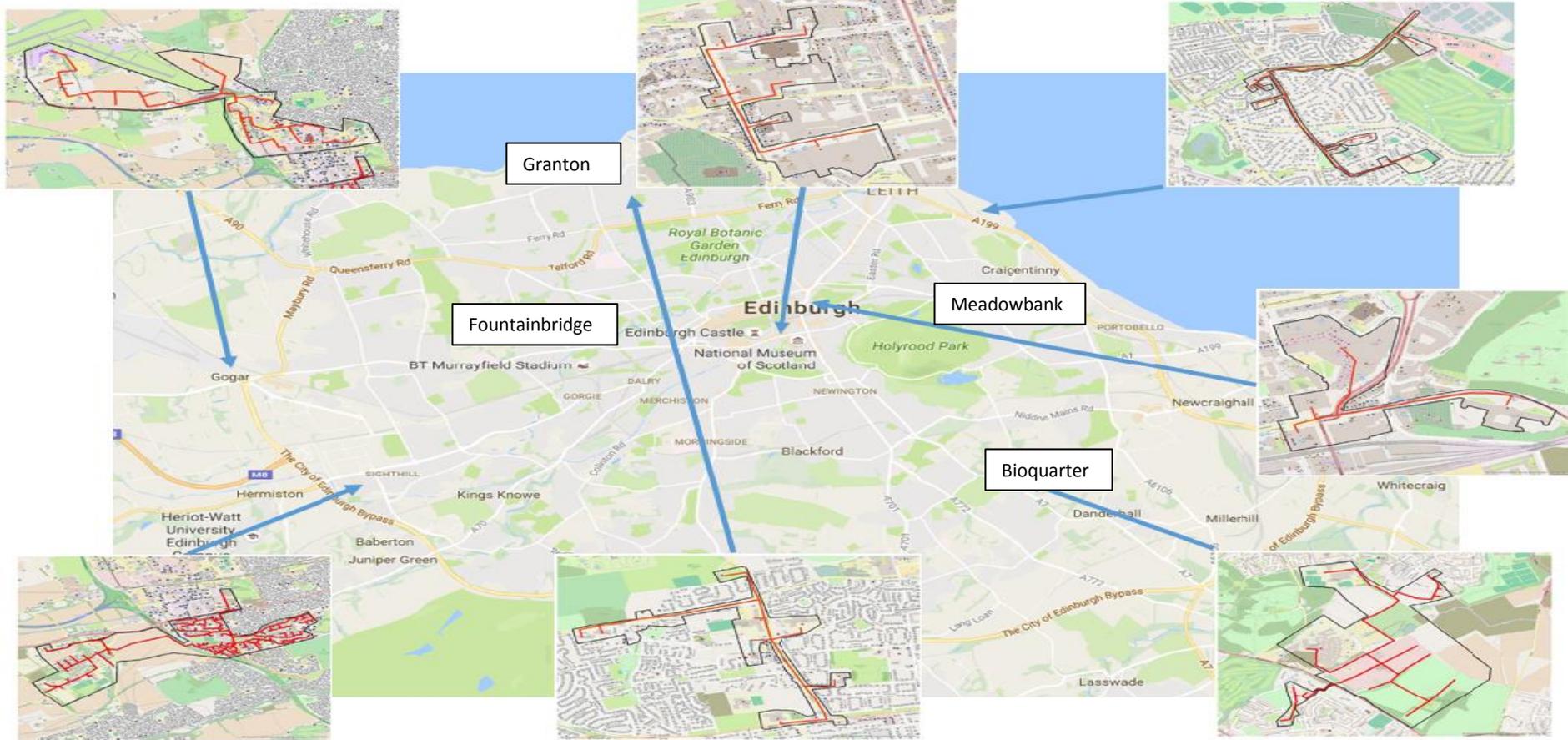
- Seven buildings (6 schools and 1 community centre). Upgrading the management controls and trialling innovative (for CEC) approaches e.g Synco Living Solutions.
- Focus on the Council HQ trialling software solutions to identify opportunities to reduce electrical demand and even out peak periods. Use of BEMS Analytics such as Coppertree.



# District Heating Strategy For Edinburgh



# DH : Identifying Opportunities in Edinburgh



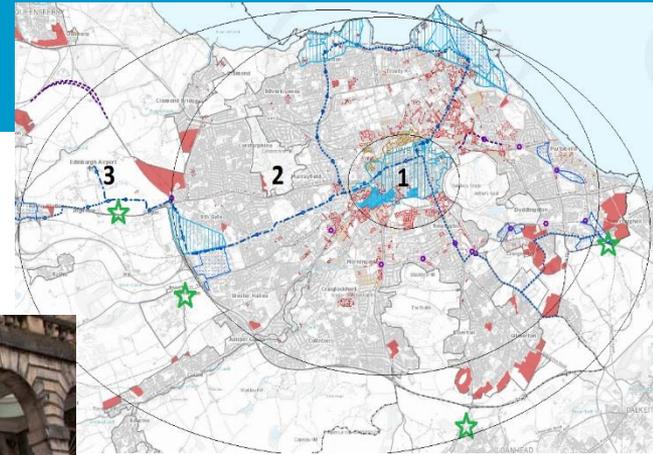
# Resource Efficiency: Circular Economy

- Circular Economy Investment Fund A consortium bid for £0.4m was submitted to ZWS led by the Edinburgh Chamber of Commerce in partnership with the Council.
- This project will highlight the most significant, tangible Circular Economy opportunities in Edinburgh, which can be adopted by SME's.
- A first phase of this project led by the Council is nearing completion.



# Electric Vehicles Programme

- Council approved its first EV Action Plan in December 2017 taking an innovative “whole city” approach.
- A Business Case has been commissioned which will assess the growth in the market, best locations, type of chargers and the level of investment needed.



# Electric Vehicles Innovation

- The Council secured £80k through Innovate UK's CAN DO challenge to support a number of SME's to undertake innovative R&D linked to the development of an integrated and scalable low carbon EV charging solution.
- The solutions require renewable on-site generation, battery storage, bi-directional smart meters, and an innovative software system.



# Issues for CEC

- Huge amount of work underway in the energy and low carbon areas.
- There isn't always the expertise within Councils.
- Complex area.
- Need for pilots – how do we know what works?
- Innovation not always about technology.