

# Energy Strategy for Expanding Scottish Towns

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# Introduction

- Sweco:

“Together with our clients, we plan and design the sustainable communities and cities of the future”



- Scottish Government:

“Scotland’s world-leading climate change legislation sets a target date for net-zero emissions of **all greenhouse gases by 2045**. Our contribution to climate change will end, definitively, within one generation.”



# Strategies for Low or Net-Zero Carbon Settlements

- Sweco is working on several projects for expanding and redeveloping new and existing towns and cities in Scotland
- Helping clients develop low or net-zero emissions settlements ahead of Scotland's 2045 deadline for net-zero
- Satellite, semi-rural developments on greenbelts or reclaimed land, such as former industrial sites
- Energy strategies are being developed, taking into consideration local constraints, local resources and future developments
- Keeping energy production and storage local: using local green spaces and undeveloped land. Linking to local waste energy sources when possible

# Advising on Energy Reduction Measures

- Working with house builders to improve building fabric
- Maximise insulation and air-tightness (near Passivhaus) –is full Passivhaus standard appropriate for the UK climate?
- Recover waste heat: WWHR, MVHR
- Indoor air quality must not be neglected
- 100% LED lighting and induction cookers

# No Gas or Oil by 2025 for New Homes

- New-build housing must avoid fossil-fuel heating, and cooking where possible
- Boiler replacements in existing homes will be allowed, but ideally a LZO alternative required
- Avoid new gas connections now, if possible, particularly when gas network requires extension
- LPG also not an option long-term, although bio-LPG might form part of the mix
- District Heating preferable for higher-density, urban housing
- District Heating an option where near to a waste heat source, such as Waste-to-Energy facility





# Heat Pumps Preferable to Hydrogen

- Electrification of heat: efficient, demand management, multi-sector (heat, light, power, EV charging, storage, solar PV)
- Heat pumps more efficient than hydrogen: Electricity straight to heat pump
- Electricity can be 100% renewable, and generated locally
- Hydrogen in mains gas network still in development, maybe never be appropriate or cost-effective
- Electricity and heat pumps available now, tried-and-tested
- Heat pumps are low temperature for a low temperature requirement.  
Hydrogen very high temperature for a low temperature requirement = waste of valuable energy



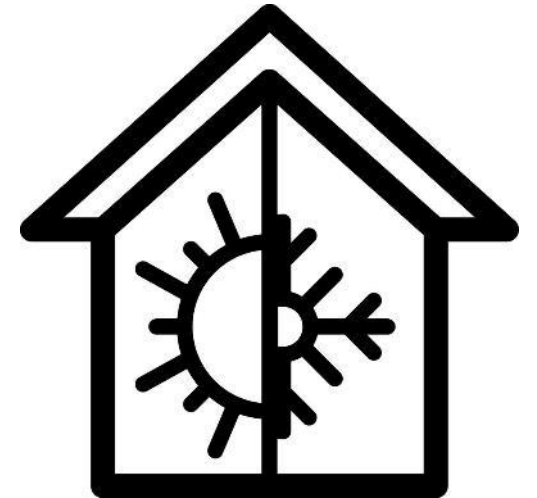
# Hydrogen for Heavy Industry, Shipping & Some Transport

- Hydrogen requires fossil fuel or renewable electricity to produce
- Conversion losses
- Hydrogen 18% effective use of offshore windpower compared to using heat pumps
- Hydrogen costs 3 or 4 times more per unit of heat than natural gas
- High energy, high temperature hydrogen better reserved for industry, possibly shipping and heavy transport
- 2,000°C flame to heat a room to 20°C and tap water to 50°C



# Heat Pumps Can Be Preferable to District Heating

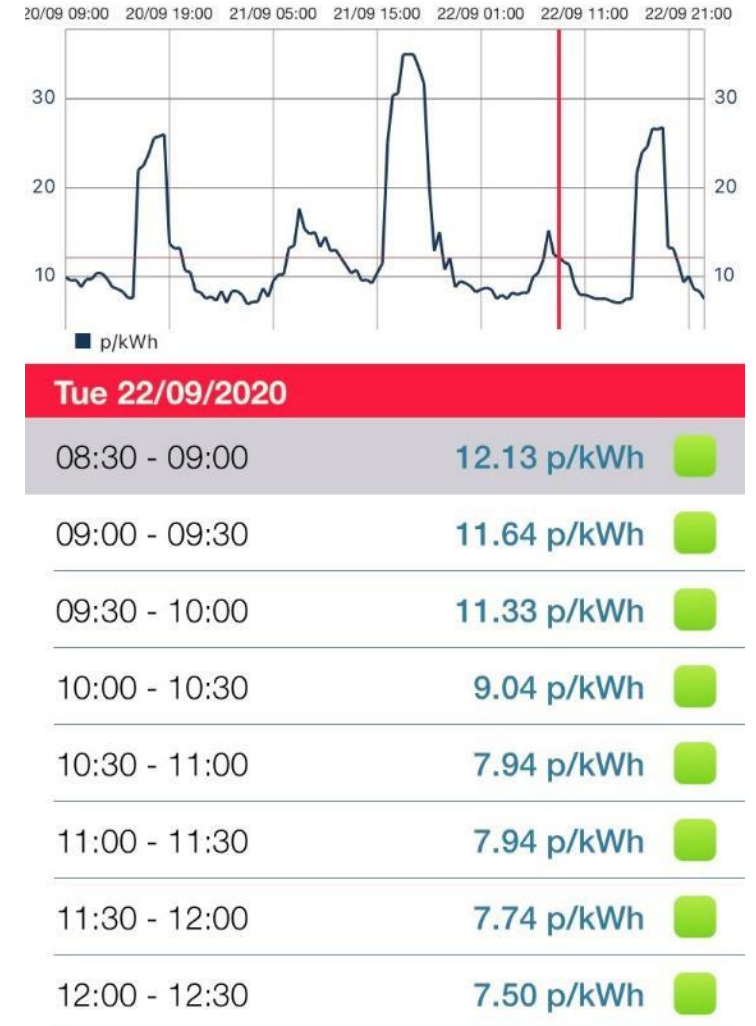
- District heating (3G & 4G) better suited to higher density housing and non-domestic buildings or if waste heat available.
- If DH available already, yes extend + large, central heat pumps can provide heat to network. Denmark has great examples; still small share of heat in UK
- District heating requires monopoly (at present, in UK) of heat supplier. Issues with pricing and reliability: improving, but people prefer choice
- Heat pumps: individual, own heat source or shared ambient loop
- Heat pumps: owners pay own electricity for running, ideally 100% renewable
- Housing developer can install shared ambient loop and benefit from development subsidies





# Smart Use of Power

- Battery storage, locally and nationally, and thermal storage
- Local power generation, where appropriate
- Green electricity tariffs, and 3-phase power (not normal in UK homes)
- Time-of-use domestic tariffs, e.g. Octopus Agile (see right)
- Smart energy consumption: (domestic) demand side response, time-of-use tariffs, smart appliances, EV charging, link homes and businesses.
- Make the complexity of smart energy management automatic and hassle-free



Screenshot of Octopus Agile prices from OctoWatchdog app. Tariffs include Standing Charges & VAT.

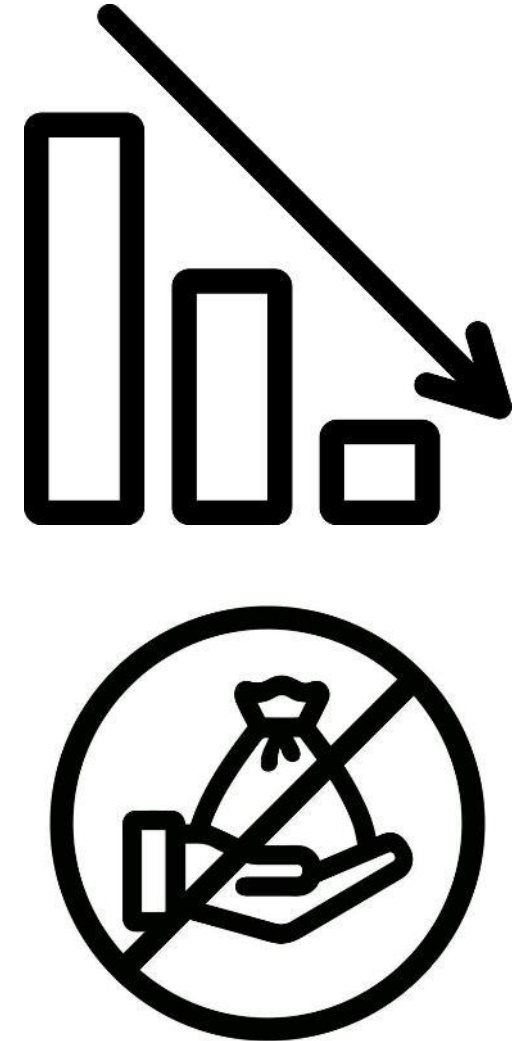
# Link it All Together

- Renewable electricity: Scotland's 100% renewable power
- Power storage and balancing
- Green and agile electricity tariffs for all
- Heating: heat pumps using shared ambient boreholes and water sources
- Avoid fossil fuels and hydrogen
- Smart energy consumption
- EV home charging – power management and vehicle-to-home or grid



# Who Pays for This?

- Government targets requires government support
- People don't have £1,000s spare for non-fossil fuel heating and driving
- Grants and 0% loans must be provided
- Trials to find effective models: Electrification of Heat
- Plenty of failures in the past: Green Deal, RHI, removing FiTs
- Reduce energy use before expensive energy production measures
- Learn from the past, adapt and find the best package of solutions





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