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Reality and Delivery

Achieving net zero in Scotland’s buildings





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**The authors are engineers who have spent a lifetime working in Scotland’s offshore industry**

**Executive Summary**

In Scotland, opinion polls indicate a dilemma in peoples’ minds:

There is strong agreement we must reduce our carbon emissions to mitigate against temperature rise and climate change which will, if not controlled, bring devastating impacts on people’s lives globally.

but

There is public resistance to paying the costs and suffering the disturbance of the individual measures imposed by government regulation, especially those affecting homes.

For the Scottish Government to meet its plan to hit net zero emissions by 2045, Ministers need to find a way to connect delivery to reality: so that net zero is delivered in a way that provides value for money for hard-pressed households across Scotland.

This paper argues that fast-tracking energy efficiency retrofit plans should be a priority for the new Scottish Government and the next UK Government.

This is a way both to reduce energy usage and to cut fuel poverty for families currently facing destitution to the high cost of living.

And we see a delivery model. We propose a **Delivery Plan managed by a Project Delivery Taskforce** under the umbrella of Great British Energy, the proposed national energy company that is to be set up in the event of a Labour victory in the coming general election..

This would be headquartered in Scotland but networked at national, regional and local level. This will offer citizens value for money and defuse much public dissatisfaction.

Scotland has had enough of unrealistic target-making: it is time for the focus to fall on delivery, to support both our ambition to hit net zero and to support the tens of thousands of Scottish families in fuel poverty.

**Introduction**

The gap between delivery and reality on net zero recently cost Scotland’s First Minister his job.

The scrapping of the 2030 target to cut emissions was the trigger for First Minister Humza Yousaf’s decision to end the partnership agreement between the SNP and the Greens. It serves as a reminder of the political risks attached to an agenda of such immense scale.

The root cause however is not the size of the task; it is that politicians have supported over-optimistic claims that we can reduce emissions and achieve Net Zero at little cost and inconvenience. They have set targets from which they are now retreating because of lack of public and private money and increasing public disquiet. The Climate Change Committee verdict was damning regarding the 2030 targets, noting the Scottish Government’s lack of any coherent delivery plan.

Chickens are coming home to roost as it becomes clear that achieving Net Zero in Scotland will be costly and intrusive - but essential to avoid greater pain in future. Targets were set with no foresight of the technical and organisational challenges or the dilemmas that citizens and governments face in a stagnant economy and a cost of living crisis. No wonder many citizens feel badly let down.

The recent policy and timing shifts by UK and Scottish Governments have not been the result of an orderly and rational rethink but a fragmented and chaotic flurry which has still not addressed the problems that the public are increasingly aware of. These include the lack of trained advisors and installers, the high cost of new heating systems, their limitations and high running costs because of high electricity prices. The public are confused by governments chopping and changing finance loans and grants schemes.

This paper starts by setting out the **challenges** we face. These challenges are not particularly ‘high-technology’ (although innovation is needed) but primarily about getting organised to deliver warmer homes and reduced CO2 emissions across around 2 million buildings in Scotland.

Difficult though the challenges are, there is a pragmatic way through which acknowledges the reality and focuses on providing value for money for the hard-pressed public. For example, schemes like Labour’s Warm Homes Initiative prioritise energy-efficiency insulation measures such as insulation and draught-proofing ahead of (or in tandem with) new heating systems. This is less expensive up-front and immediately effective for people living in fuel poverty. It achieves progress towards Net Zero whilst also allowing time for researchers and the supply chain to develop a new generation of better products and installation methods.

The public want to know if they can access impartial, expert advice and then rely on a skilled work force to carry out the work to proper standards. Regulation of the sector is required for public reassurance and as a condition of financing schemes.

The high price of domestic electricity (approximately four times that of gas), means that electrically driven domestic heat pumps are more expensive to run in winter temperatures than a gas boiler for the same heat output. This is contributing to the reduced demand for heat pump installation. This is a key challenge for the UK Government.

There is increasing support for prioritising energy-efficiency retrofit in buildings ahead of (or alongside) heat pump installation. Energy efficiency measures immediately help people in fuel poverty living in cold homes and, by reducing the energy demand they reduce the required output of the new heating system and reduce its capital and running costs.

Governments must stimulate innovation and cost reduction in energy-efficiency, in heating systems and heat networks combining University R&D, supply chain expertise and local expertise. What is available currently is not good enough to offer a comprehensive solution.

This is why we see the creation of Great British Energy as a potential answer to our delivery problems. With its HQ in Scotland but networked at national, regional and local level, it could provide a model that allows the UK and Scottish Governments to work jointly on this vital task.

**The Challenge**

Scotland has approximately 2.5 million homes and 220,000 non-domestic buildings which are estimated (by Scottish Government) to emit around 13% and 7% respectively of Scotland’s greenhouse gases. So this sector is important to achieving our climate change objectives.

The Scottish Government estimates (in FOI responses) that around 1.25 million homes need retrofitting with energy efficiency measures to achieve EPC Level C at a rate rising to 100,000 homes each year.

Approximately 2 million homes are heated by gas, oil or coal and will need to have decarbonised heating systems installed to achieve Net Zero.

The timing in Scotland has been driven by Scottish Government’s self-imposed targets of achieving an interim reduction by 2030 of 75% in emissions (relative to 1990), a 90% reduction by 2040 and Net Zero by 2045. The Climate Change Committee (the independent body set up by Government to monitor and assess progress) has assessed the 2030 interim target as ‘not achievable’ and there being ‘no Delivery Plan’. The Scottish Government has accepted this reality and scrapped the 2030 target but has not set out plans or targets to bridge to 2045.

Fuel poverty is defined as a household which, after housing costs are deducted, must spend more than 10% of the household adjusted net income on energy. It has risen sharply with volatile gas, oil and electricity prices and it is estimated by Scottish Government that 35% or 860,000 Scottish households were in fuel poverty as from October 2022. Government modelling forecasts this as increasing to 39% or 980,000 households by April 2023 with the further rise in energy prices. Successive governments have failed to reduce fuel poverty and it is essential that the drive to Net Zero is prioritised to do so.

Cost estimates by Scottish Government Minister Patrick Harvie were £33bn to deliver the Heating in Buildings Strategy of 2021 covering both energy efficiency measures and installation of decarbonised heating systems. The funding would be split between Scottish Government and private investment. The Scottish Government has retreated by ditching its 2021 Heat in Buildings Strategy and is developing a new one. The Scottish Fiscal Commission (which officially advises Scottish Government on fiscal matters) has noted that the cost falling on Scottish Government to achieve its targets for Buildings rises from approximately £240 million/year for 2021-5 to around £620 million/year for 2026-40 then falls slightly to 2050. Altogether, the total government investment required in buildings is around £16 billion to be matched roughly by private investment. The SFC warns that this will seriously impact the Scottish Government’s budgeting and may require raising more revenue. What is needed is a forecasting model which shows ‘bang per buck’, i.e. what investment profiles bring about what greenhouse gas emissions reductions.

At household level the range of cost estimates is wide and dependent on the type of building and scope of work. Very approximately, the costs of raising a home to EPC Level C might ordinarily be of the order of £3-6000 for energy-efficiency measures such as 270mm of loft insulation, cavity wall insulation, draught-proofing, hot water cylinder 80mm insulation, suspended floor insulation and good heating controls. . This might reduce energy costs by around £400-600/year. This would offer a householder a viable return on the investment. However, if a new decarbonised heating system is fitted such as an Air Source Heat Pump the investment required would be higher, maybe an additional £10-15,000. Crucially, winter energy costs for the ASHP would not be lower than using a gas boiler for the same heat output. In short, there is little return on investment for fitting an ASHP except the satisfaction of reducing emissions.

Electricity pricing needs reform by the UK Government to rebalance the costs of gas and electricity to support electrification of heating buildings. This will be difficult since electricity prices will probably have to bear the capital costs of major additions and upgrading of the electricity transmission and distribution systems. At present electricity is 4x cost of equivalent gas. Even with heat pump energy leverage of around 3-5 times it remains the case that heat pumps are as expensive to run as gas boilers. The UK Government must intervene to reduce electricity prices compared to gas or few people will volunteer to install heat pumps.

The multiplicity of types and age of buildings will require a huge range of solutions for installing energy-efficiency measures and new heating systems. Whilst suburban homes may suit ASHPs tenement flats are more difficult and may require innovative solutions. A risk encountered in the Niddrie Street Project in Glasgow was that the tenement block was found to be in need of very expensive structural repair before the modifications could be installed. Each project is a practical upheaval and intrusion to the householders who may well require temporary rehousing. A database at address level of all properties is needed so that common problems can be addressed by researchers and progress can be assessed.

Innovation is needed from our universities and industrial research centres. Key problems are improving the performance of ASHPs and reducing their cost, new and better methods for installing insulation using robotics, new technologies to support district heating schemes, better methods of assessing buildings for their energy-efficiency.

Grants and loans to the public have been notably inconsistent in purpose and application. No sooner has a new ‘Green’ scheme been introduced than it is withdrawn. The whole supply chain identifies these inconsistencies as a real disincentive to medium-long term planning and investment.

The public needs assurance, through a regulatory system, that improving their home energy efficiency and decarbonising their home heating will yield a satisfactory outcome in terms of effectiveness, cost, longevity and operability. The Regulatory Review Group advises Scottish Government on regulatory needs. It has formally noted the urgent need to regulate this rapidly growing sector. A Regulator for Heating in Buildings would set up a framework to ensure that advice centres provide expert, unbiased advice, installation contractors are accredited, installers are trained and each household project is inspected and Certified.

An army of skilled advisers and installers will be needed but recent swithering on targets by government makes planning national and local training programmes difficult.

As yet there is no clear organisational structure for the efficient delivery of this huge Project in Scotland. This will require clear levels of devolved responsibilities, accountabilities and budgets from Government, through the proposed Great British Energy, and through City/Regions to Combined Authorities and Local Authorities. We advocate a dedicated Project Delivery Task Force as outlined below.

The most important challenge is to maintain public support for the changes needed to achieve Net Zero. Governments, both UK and Scottish, are failing to communicate honestly and effectively. Polling shows there is still strong public support for combatting Climate Change but the disappointing take up of heat pumps and EVs shows a reluctance to spend scarce cash.

**Structure for Delivery**

The key question for governments is how best to deliver Net Zero in Buildings. Is it a laissez-faire approach relying on building owners wanting to invest thereby creating a demand for better products and services from the supply side? Or is it to plan and deliver Net Zero as a properly managed national project? We advocate for a Project Delivery Taskforce, not least because it will provide confidence to owners and the supply chain that government has a coherent Plan.

A project is defined as:

*Any undertaking, carried out individually or collaboratively and possibly involving research or design, which is carefully planned to achieve a particular goal*

Net Zero for Buildings is clearly a project unprecedented in Scotland in that:

* the time scale stretches over 20 years through to Scotland’s ambitious end-date of 2045
* cost and benefit profiles are yet to be properly established. However, the total investment has been estimated at around £32bn by Scottish Government and SFC. The share of Scotland’s overall emissions at stake is around 20% so this project will be a key feature of our national strategy for over 20 years and requires proper management.
* there is no single site but around 2 million sites across the country, each one hugely important to its occupiers
* each site is unique in itself and in its particular local circumstances of climate and socio-economic environment
* the activity is spread country-wide so although action is local there is a need for central monitoring and support to ensure provision of trained people and access to expertise and advice together with logistics and supply chain resources linked by a local delivery hub.

**Because of the salience and difficulty of this project we recommend that Government recognises NZ for Buildings as a project and therefore needs to establish a Delivery Task Force.**

The Government needs firstly to determine the investment profile and accompanying emissions reduction profile to which it commits through to 2045. These targets must be realistic in order to secure sufficient public support.

When Government has established the targets, in conjunction with setting up the Task Force, we propose the following **5 point strategy shared by Government and Delivery Task Force**:

* Project delivery and completion in a local area absolutely need the agreement and support of the buildings’ owners and occupiers. Proposals and decisions must involve genuine consultation and be reasoned and honest to minimise public distrust and anger.
* Government finances are tight as are those of the building owners. A range of financial support packages is needed to assist owner-occupiers, social housing providers and private landlords. Priority must be given to schemes to reduce fuel poverty.
* Public opinion is in favour of combatting global warming but negative when actions and costs land on them locally or at individual level. Therefore the virtue of Net Zero Carbon as the only way to combat climate change must be emphasised with the message that the cost of prevention is actually much less than the physical and human and environmental cost of uncontrolled global warming
* Delivering the project should be scheduled to prioritise “easiest” actions and pick “low-hanging fruit” (e.g. insulation and housing schemes suitable for heat networks) so that delivery produces positive results and an improving public perception
* Revising the electricity market to make electrical energy cheaper than any of the carbon-based energies.

With a clear strategy agreed with Government, the Task Force should set about creating its **Mission for Delivery** which comprises 12 broad fundamentals:

1.  **Leadership.** This is the largest project ever in Scotland in terms of investment required and widespread impact on over 2 million households. It needs the proposed Great British Energy (headquartered in Scotland) to create a Project Delivery Task Force which works seamlessly through a devolved organisation at National, City/Regional, Combined Authority and Local Authority levels.

2. **Devolved delivery**: Focus locally as well as nationally. Set up locally-based Delivery Consortia with devolved budgets to pull together local organisations for expert advice, planning, skills development, innovation, and local communication. Include local Net Zero Innovation Forums in the Delivery Consortia to bring local experience and new ideas into action. Set up pilot projects and share the experience and learning nationally

3.  **Public approval and support**: Develop a Public Communications Plan and be honest and pragmatic at national and local levels. Scottish Government last published a Public Engagement strategy in 2021 and it needs revising to reflect the changes in Government targets and strategy.

At CA/LA level publish local plans and set up a properly accredited network of local advice centres which people can trust.

4.  **Finance:**   Set up finance schemes bringing together a range of public/private funding mechanisms.  Ensure that public funding priority goes to the many people subsisting in fuel poverty.

5. **Regulation**:     The public are greatly concerned about being ripped off so it will be necessary to create a Regulator for Net Zero in Buildings to oversee a quality-assured national project. This will cover training to national standards for advisers, installers and inspectors together with a Certification Scheme.

6. **Database**: this means an address level data-set of buildings’ status, ownership, energy-efficiency rating. This should record progress at address level as retrofit improvements are completed and signed off.

At local level, coordination with the Electricity Supply Operator is needed to ensure the increases in electricity usage are planned for and then fully supplied.

Collate all the data for local and national monitoring and modelling.

**7. Attack Fuel Poverty**: use the NZ Project to reverse the increasing fuel poverty which blights Scotland. This needs focussed and sustained financial support packages to individuals and housing associations. Also, prioritise public financing of energy-efficiency retrofits since these can quickly improve cold, damp homes as advocated by the Scottish Federation of Housing Associations which calls for a ‘fabric first’ strategy to prioritise investment and solutions that reduce heating demand and improve the condition of Scotland’s housing stock as a crucial first step in readying homes for zero-emissions heat and minimising fuel costs. Addressing fuel poverty as a priority will do much to boost public support for the overall project.

**8. Detailed Planning and Priorities**: Focus first on retrofit, energy efficiency projects. The early works need to be delivered well to raise public awareness and approval. Retrofitting energy-efficiency measures initially gains immediate benefits and quicker pay-back. They also pave the way for more economic installation of decarbonised heating systems and heat networks by reducing demand.

Of course, individuals or associations may wish to go further than energy-efficiency projects and install new de-carbonised heating systems and they should also be encouraged to access expert advice on performance, cost and running costs.

9. **Performance standards.** Reforming the Energy Performance Certificate (EPC) process is the declared (if belated) intent of Scottish Government but this will take years. Meanwhile a pragmatic approach might be to require that buildings are improved by retrofit or installing a list of appropriate energy-efficiency measures. This needs to be decided quickly.

10. **Training and Skills certification**: The skills portfolio needed will have to be very wide to deal effectively with both the expected and unexpected problems.

There are four broad skill sets needed:

* + Assessing a building’s current energy usage, energy users, and insulation status to provide information on options for more energy-efficiency measures and options for decarbonised heating system. This assessment activity should be by certificated advisers and reported into a central database as EPC’s are.
	+ Installing/upgrading is likely to be intrusive and needs skilled installers who can work with the building owner/occupier to decide the optimum way of executing the assessment report with the minimum upset and finishing with a “proof-of-success” report.

Removing the carbon-based energy using equipment and replacing with non-carbon energy equipment again to the standard required from the assessment report.

Updating the data base with ‘as-built’ information is crucial to monitoring progress.

* + The skills certification should be broken down to cover building types, local climate conditions, and local conditions such as access, transport, grid strength, etc. as there are millions of buildings and thousands, probably tens of, different types of building structures, age, condition, heating system and insulation and located in widely different climates in terms of rain/snow/wind and temperature each with widely differing summer/winter extremes.
	+ The required army of people need to be skilled to a regulated and certificated level by applying and developing existing systems of qualifications and accreditation. Manage these skills programmes at local level with devolved budgets but networked to share best practice. It is essential that work is carried out to a high standard and delivers high public recognition.

11.  **Learning and Improvement**:    Stimulate innovation and improvement in all parts of the supply chain by linking Universities and Centres of Excellence with manufacturers, project managers of retrofit and heat network projects, and installation contractors. The common aim must be to improve the performance and installed costs of insulation methods, heat pumps, and heat networks. Encourage pilot schemes in public buildings as exemplars. Network the local Delivery Hubs and innovation hubs to spread success and avoid pitfalls.

There is also a need for a consistent and well-financed R&D programme to develop improvements in both the decarbonised heating systems, insulation systems and local heat networks and other community schemes. For instance, although government thinks the technology to achieve decarbonisation is proven and available in the form of Air Source heat pumps (ASHPs), in reality these only perform well in well-insulated buildings and even then, due to the higher cost of electricity relative to gas, an ASHP may cost more to run than a gas central heating boiler. Non-carbon energy options could be solar panels or possibly small wind turbines, and both combined with battery storage, might be developed into viable energy sources. Battery storage itself is still a fast evolving technology, high temperature ASHPs are appearing and community level projects using ground or water bodies for heat are also evolving technologies. All of these, and doubtless others, demand a Task-force overseen R&D programme.

12. **The challenging tail**: Address the issue of ‘hard-to-solve’ homes and buildings. Regulation, compliance and exceptions must be defined but pragmatically. Try pilot schemes like the difficult tenement block in Niddrie St or isolated old rural houses to learn from experience and apply more widely. There are no prizes for punishing householders with difficult-to-decarbonise dwellings.

**Conclusions**

Both the Scottish and UK Governments have panicked in the face of public scepticism and some hostility to Net Zero policies and hurriedly ditched or delayed key target dates. For Heating in Buildings, which is a devolved sector, the Scottish Government has been too preoccupied with setting headline-grabbing targets without addressing the difficult challenges.

The Scottish Government has consistently ignored cooperation with the Westminster Government, preferring to indulge in the rhetoric of ‘our targets are better than your targets’. The conclusion is that both Governments must attend to ‘means’ as well as ‘ends’ and must engage together with the public to stress that the costs of mitigation may be substantial but are much less than the costs of failing to control climate change. Time for some honesty – stop pretending it’s all opportunity and no cost. The scale, costs and benefits of the Scottish Heat in Buildings Strategy need to be established as soon as possible and debated in public consultation for the next edition of the Scottish Government’s Strategy. The scale and complexity of the tasks require a properly-organised Delivery Task Force, not a laissez-faire approach. The proposed Great British Energy should be the umbrella for a Mission-led task force. This must be networked and devolved at national, city/regional and CA/LA levels. Delivery must be at local level but coordinated at national level.

Priority must be given to alleviating fuel poverty through appropriate investment and financing packages. A range of finance schemes must be developed to encourage and assist public and private sector investment.

Cost-benefit analyses show the attraction of retrofit projects to improve the energy efficiency of buildings. Payback on investment is quick and home comfort improved significantly. In contrast, installing new decarbonised heating,, like Air Source Heat Pumps, has much less attractive payback in large part due to high electricity prices relative to gas.

The UK Government must reform the home energy markets for electricity and gas to rebalance in favour of using electricity.

Much innovation and improvement is needed to complete this Project at reasonable cost. Our Universities and R&D Centres together with the supply chain and the Delivery Task Force must work together to deliver the necessary innovation.

Most people want to help with Net Zero but they need a fair deal. The advice on scope and methods needs to be expert and objective, the equipment must be fit for purpose in performance and cost, the contractors must be trained and accredited and the work certified as meeting the standards. Politicians worry about overbearing regulation but the public also want and deserve protection and proper value for money.

In 30 years’ time people will be enjoying their warm homes and low energy bills. Industry will be producing a variety of new-technology heating systems benefitting from cheap electricity.  But this future will only happen if government adopts a purposeful and consistent strategy to be delivered by a Delivery Task Force.

Our Scottish Future stands for a stronger Scotland in a better United Kingdom. We set out practical policy ideas which show how better cooperation between the UK and Scottish Governments can improve outcomes on our key challenges.

