Discussion Paper

Next Steps in Community Energy:

Mobilising the demand side: building stronger communities and a just transition to a low carbon energy system in the wake of the COVID-19 pandemic

Community Energy Scotland

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Community Energy Scotland

Empowering Communities

Introduction

In the context of the post-COVID-19 recovery, the ongoing Climate Emergency and slow progress in the decentralisation of the energy system, this paper highlights the need for community energy to be seen as an activity which is essential for the large-scale integration of renewable energy into the system. It starts with our 'vision' of what we are aiming for when we speak of 'community energy' and then works through what we see as key areas requiring action to achieve it.

But this is not a call to enable community groups to generate more energy *per se*, but to create a policy, regulatory and support environment that empowers them to drive the reduction and flexible management of energy demand at a local level, across Scotland. In other words, to help groups do what they do best: to inspire, support and motivate local people to act for our collective best interest.

In principle, many community groups, especially 'community anchor organisations'[1] present a ready-made route for investing in to speed up this process, not least as part of a green recovery from the Covid-19 pandemic. This is because of their ability to engage effectively with local people on a range of issues which are fundamental to social cohesion and wellbeing and because there is a foundation of sustainable energy practice to build on.

Such investment could not only build local resilience to future global shocks, it would also help to ensure a just transition to a low carbon economy – with communities at its heart.

There are a number of issues, ranging from regulatory barriers to community awareness and capacity, which will have to be systematically addressed if we are to meet the potential.

This report is in four parts: Part 1 reviews the impact of the COVID-19 pandemic and associated lockdown and how it has exposed our vulnerability to global level shocks and has caused us to consider the resilience of systems which underpin our economy and way of life. It then focuses on the implications for the energy system and community energy activity in particular.

Part 2 looks in detail at the current context and practice in key areas of interest; and Part 3 outlines a set of measures that we believe would help guide and unlock the considerable potential of community organisations to contribute to the energy transition. Part 4 concludes with a plea for urgency given our now clear vulnerability to global level shocks.

This is a discussion paper which we hope will stimulate discussion and debate on the future of community energy in Scotland and, perhaps, lead to the actions we have identified. At the very least it will inform our own strategy. We welcome all comments, views and corrections (we don't claim to have got everything right!) and will be pleased to discuss any aspect of the paper.

Where we want to be with Community Energy by 2025

Community-led action to inspire and support local people to reduce energy demand and adopt low carbon behaviour is widely seen as an essential part of the national effort to enable a more secure, more just, and more flexible low carbon energy system, powered by renewable energy. 'Community energy' is no longer a nice to have adjunct to an otherwise inaccessible energy system.

The supply and consumption of energy (power and heat) has been highly decentralised in a way which has enabled the development of local markets in energy supply. These are closely matched to local energy demand and integrated with the operation of the national grid and, where appropriate, gas grids.

Community organisations are seen as key partners in many aspects of this localised system, owing to their ability to engage and support local people, especially those who are harder to reach and less able to help themselves. They are supported by government and energy companies to work closely and in partnership with electricity and gas system operators, local authorities and energy developers and suppliers, with a common interest in the well-informed operation of the system in a way that takes account of local circumstances.

This growth in well-planned local energy partnerships has been enabled – and required – by the National Community Energy Plan, mandated by the Scottish Parliament. The plan sets out strategic priorities, partnership obligations and delivery mechanisms. A key tenet of the plan is to ensure decentralisation does not lead to inequality, by supporting and developing the capacity of local groups, especially in areas where there is no or little coverage, or are disadvantaged.

Initiating and leading the delivery of measures such as collective energy efficiency retrofits, bulk supply and installation of heat pumps, direct and on-site local renewable energy supplies, electric vehicle car clubs & charging points as well as disseminating information and advice, community anchors are enabling a highly localised national impact. They are able to take advantage of how the new decentralised system works and are rewarded for their contribution to its greater efficiency. They are also adept at working together at scale when there is an advantage in doing so – such as in the procurement of equipment and services. They play a key role in delivering solutions that enable everyone to benefit from smarter, flexible and more localised energy trading with low or no upfront costs – not just those who are able to pay.

The decentralised energy system has enabled the growth of a new tier of local energy suppliers who are contributing to a wider process of economic localisation, retaining more value in local communities and helping to underpin a renaissance of community life. Local production and supply of essential goods and services – the foundations for a good quality of life and resilience - is widespread, with safe and sustainable local transport options, powered by local energy.

The full integration of renewable energy into our energy system has been made possible through a combined national effort harnessing both the scope and expertise of large-scale renewable energy developers and community-led action on energy demand. We have achieved a robust and sustainable system, with high level of public participation, awareness and contribution to decision-making.

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The new context

The COVID-19 pandemic and lockdown has disrupted all aspects of Scottish life, creating a full economic recession and signs of a fundamental shift in perspective, from GDP growth to wellbeing as the primary indicator of a successful and sustainable society.

The pandemic has revealed the weaknesses of long global supply chains in a time of crisis, sharply exposed inequalities in our society and highlighted the importance of local infrastructure and community support networks. Governments across the world are implementing unprecedented economic interventions to stimulate recovery, within which resilience and decarbonisation should be central and urgent considerations. These factors require an urgent re-think of the role of community energy, and have re-set the context for action.

Community resilience and energy decentralisation

Strengthening resilience at the local level is part of the UK's national resilience strategy but, in practice, localisation has been in decline. Also, resilience is not just a question of being able to 'bounce back' from an adverse impact. Personal vulnerability, whether physical or mental, lack of capacity, lack of agency and control and lack of a supportive social environment are key issues which need to be addressed.

The crisis has revealed how local community organisations can play a vital role in connecting with and helping local people, especially those who are the most vulnerable. Decentralisation and a general transition from passive consumption dependent on long fragile supply chains to informed 'prosumption' – production and consumption at a local or household level are similarly key elements of resilience.

Planning for a new local layer of community-based energy action

The UK energy system was already undergoing a period of significant change, transitioning from a centralised fossil-fuel based system to a more decentralised, low carbon system. Lockdown had a huge financial impact on the global fossil-fuel business, and resulted in what has been described as a 'postcard from the future'; with much lower demand and resulting in a higher proportion of renewable energy, but also the need for urgent balancing measures by the National Grid.

An essential pillar of the green recovery will now be investing in building our future low carbon energy system. The role of community energy may be most important not in terms of community owned energy generation but in enabling the transformation of energy demand, enabling energy users to become active and empowered components forming a new 'local' layer in our energy system.

As yet this 'local' is a largely overlooked scale in analysis of the changes needed for decarbonisation. The DSO transition represents networks beginning to address this shortfall, but there is no 'DSO transition' equivalent for energy supply companies or many of the other elements of the energy system. Failure to engage at a local level is already becoming a substantive barrier to decarbonisation of heating, transport and the creation of electricity demand flexibility; all of which require locally attuned actions and significant behaviour change by energy users. Scotland lacks local level democratic institutions, leaving community anchor organisations (and especially Development Trusts), as the only viable organisations able to act effectively at this finely tuned scale.

Local level energy action does not supplant the need for coordinated action by national government, but should be carried out in new partnerships with local authorities and other public and private sector organisations, guided by a National Community Energy Plan.

Community energy and the demand side

Community-led energy action now needs to be seen as a key element for influencing the demand side in the energy system, not just a minor player in power generation. Community anchor

organisations, if supported to operate at scale, are key to this process, given their position and influence in the community. Key actions which are a basis for community-based action are identified: promoting energy demand reduction & 'prosumption', local supply, community transport and community capacity building.

Part 2 examines these actions in detail, setting them in the context of current policy and activity and the issues involved in driving change. The overarching issue of demand reduction is challenging. Although energy consumption in Scotland is falling, most energy consumption (over 80%) is still attributable to the burning of fossil fuels. The rate of installation of energy efficiency and low carbon heating measures needs to massively increase if Scottish targets are to be met.

Expanding the scope of Energy Efficient Scotland

The flagship Energy Efficient Scotland programme urgently needs expansion in a way which can reach hitherto untouched places. Levels of prosumption remain low and the 2020 renewable heat target is unlikely to be met, with just 15,224 accredited domestic Renewable Heat Incentive (RHI) installations at the end of March 2020, out of 2.46 million Scottish households. Effective solutions for tenement properties are not emerging quickly enough. Fuel poverty has been decreasing but still affects 25% of households, with those in homes below EPC level C far more likely to be affected.

Progress to date has been based on the easier measures, but the bulk of households in the 'able to pay' sector have not been addressed and there needs to be a different approach to encourage householders to act – and there is little incentive for private landlords to act either.

Citizen Advice Scotland argue that the current range of financial incentives should be increased as they are not sufficient to encourage people, especially owner occupiers, to upgrade their homes, especially fuel poor households. There should be a major new public information and awareness campaign via a 'one stop shop' system. In our view, there is plenty of behavioural evidence that demonstrates that local community-led initiatives are far more likely to be successful than centralised national campaigns or call centres in this process.

Harnessing the role of local groups

The embedded and trusted role of local community organisations should be harnessed for this - just as they have been in the COVID crisis. The challenge for local groups is to be able to convert this into action at scale within their communities and to overcome the argument that it is too expensive to deliver the required outcomes through multiple small players, rather than national contractors. We believe that the answer to this lies in striking a better balance between the two, with local organisations being empowered to do what they do best – work with and support local people in the uptake of measures. We highlight a number of approaches by which local groups could have greater impact through collective procurement approaches.

Wider factors affecting energy consumption

However, it is important to note that energy consumption in the home only accounts for around one quarter of total energy consumption by households – the rest arising through consumption of products and services. We highlight energy supply and transport as two key areas to address. Local renewable energy supply in the form of electricity and heat could play a very significant role in strengthening community resilience and energy security and community groups have a key role to play in this.

Speeding up the transition

The decentralisation of the energy system is underway but is proceeding very slowly and community engagement in the process is negligible. Legislative hurdles mean that local electricity supply is rarely a viable option and there are very few community-led heat networks. There have been important pilots that have demonstrated technical viability and there are routes to speed up progress, such as license exempt sale and 'split metering' for electricity supplies, but for both electricity and heat approaches are currently limited to small pilot projects. This might change rapidly if a right to a local supply is established in law, for which support is growing.

In the absence of a conducive regulatory environment, local supply projects typically are swimming against the current, marginal, and relegated to the 'off-grid' category. In fact, with the right metering, smart grid and local market arrangements they could play a useful role in a more efficient national grid. In some ways, low carbon heat has the opposite problem: consumer protection regulations are undeveloped & there remain significant technical challenges with low carbon heat networks. In both cases, however, local community organisations have the potential to play a significant role.

Unlocking community-level flexibility

The other key aspect of energy security – 'flexibility' – is not well developed at the community or domestic level, but needs to be. There is an unparalleled opportunity emerging for consumers to engage in and support the transition to a low carbon and flexible energy system which rewards demand reduction and enables local supply arrangements in ways that contribute to its integrated operation. Communities could be empowered through improved legislation and 'demand side response' mechanisms to provide a significant contribution to local and national balancing of the electricity system, harnessing significant unused and growing potential and enabling a greater emphasis on renewable supplies in the energy mix.

Electric vehicles, home battery systems, storage heaters and heat pumps all involve an element of energy storage and are often flexible in when they can be charged, which could be in response to market or grid operator signals. Aggregation of small scale energy storage and demand is key to this and it is possible to envisage a community-led aggregation service, which could complement the large-scale commercial aggregators currently in operation. Local direct matching of supply and demand is also technically viable and is particularly relevant in areas where the grid is constrained and surplus power cannot be exported.

Local energy: decarbonising local transport

The massive drop in travel and the likelihood of an even greater 'bounce-back' in car use owing to the COVID risk with public transport raises important questions relating to our hyper-mobility and the community, energy and carbon advantages of greater localisation of services and community transport and active travel options. There are important positive links to build on between community led energy measures and the development of better and more sustainable local transport options which also help to circulate funds in the community. Community led electric vehicle clubs, local supply to charging stations and bulk purchase and installation of domestic chargers, as well as collective procurement electricity supplies are all routes to get a step change in uptake. Whilst some of these measures have been piloted by some community organisations, progress so far has been disparate and piecemeal. The urgency of recovery from COVID-19 and the Climate Emergency demands a shift to a more comprehensive and planned programme which brings together all the key players in well planned local projects.

Strengthening community groups' capacity and coverage

Whilst there is a good foundation of experience in some community groups, coverage is patchy and can be skewed to more affluent areas. Also, community leaders need help to get up to speed on recent developments in the energy system and how they can engage in the sorts of measures outlined here. Whilst there are good sources of project advice and training courses for energy advisers, there is no capacity-building provision for community groups other than Community Energy Scotland's pilot 'Community Energy Futures' programme, which provides a structured approach to learning about community energy and the smart energy transition.

Measures required

Part 3 outlines a set of measures which we believe would be significant in helping community groups expand the scope and scale of their energy action. A strategy is now needed which rewards communities for their role in reducing energy demand, developing local supply, increasing flexibility, developing local sustainable transport options and strengthening community capacity to act. It needs to place more significance on their role in the energy transition. Pilot projects, general support measures, policy and regulatory measures, capacity-building and

geographically defined approaches all have a part to play in this strategy. Key measures (described in more detail in 3.2) include:

- **A new National Community Energy Plan**, which takes account of the new context for community energy
- **'Local energy zones'** in the Western Isles, Glasgow & Dumfries & Galloway, to take forward the full range of measures in an integrated way
- **A Community Energy Demand Reduction Incentive** that, if set correctly, could stimulate creative approaches to local energy demand reduction
- **A large-scale, community-led bulk procurement and energy efficiency retrofitting scheme**, to reinforce current Energy Efficient Scotland provision
- **Support the right to local electricity supply**, lobbying Westminster to enable local trading on electricity distribution networks
- **A 'Community Contracts for Difference' in Scotland** – Investigate potential for procurement of power from community generators by public sector bodies
- **Unlock PV on tenement buildings** and develop the scope for local generation and supply from vacant and derelict land
- **Fossil fuel substitution with renewable energy**, to drive local development in grid constrained areas
- **A more supportive regulatory framework**, to enable community level flexible demand response
- **Formal recognition of EV car clubs as an essential public service**, with area EV & e-bike hire targets
- **A national 'Community Energy Futures' programme** to build community group capacity to take forward local 'smart' energy demand reduction measures

Conclusion

Finally, in **Part 4**, we conclude that there is an urgency in acting to address the vulnerabilities and inequities exposed by COVID. If taken together, the measures will help lever the role of community organisations in the development of a more sustainable and resilient energy system, whilst reinforcing community resilience and a Just Transition.

Part 1. The New Context

The COVID-19 outbreak and likely consequences has starkly highlighted the vulnerability of our society and economy to adverse global-level events and the inequitable way in which impacts are felt. It has also shown how quickly governments and peoples can react when faced with a fast moving direct existential threat and the importance of the state in directing events rather than relying on market-led solutions – arguably unlike the response to the less immediate but hugely significant climate crisis.

Although the integrity of the UK energy system has not been threatened directly by the pandemic so far, plunging demand has generated a very significant economic crisis in the fossil fuel sector and has even given some rise for concern on the operation of the UK National Grid. Not only is forcing us to consider how resilient the energy system is in general, but also how it might contribute much more effectively to the strength and resilience of other essential requirements for wellbeing such as the food supply, manufacture of essential goods, provision of essential services and the strengthening of local economies vulnerable to gross loss of external income (e.g. through complete curtailment of tourism).

Broadly speaking, a more distributed, locally controlled & accountable, renewable-energy based energy system along with demand management measures is likely to be an important element of the way forward – i.e. part of a 'whole system' approach simultaneously tackling supply and demand along with appropriate regulatory, financial & behavioural measures and incentives.

To some extent, this is already beginning to happen, but needs to be accelerated and made more accessible for people to engage with and benefit from. Measures need to include a strong focus on energy demand reduction, substitution of fossil fuels with renewable energy, widespread provision of domestic & business energy demand flexibility, widespread 'prosumption' and, fundamentally, the sustainable retrofit of housing to minimize energy demand and maximise health and wellbeing. The current emphasis on the energy supplier-led model to deliver these requirements is insufficient to generate the scale & depth of the required response.

With an economic recovery dependent on large-scale government borrowing and intervention, there is a unique opportunity – and imperative - to hugely accelerate what, so far, have been small, pilot & unintegrated (i.e. not whole system) but nevertheless very useful distributed energy systems measures, so that they become mainstream.

Much has been made of the significance of community-led action to mitigate the impacts of the COVID crisis at a local level, reflecting the hitherto undervalued but key role and local reach of community anchor organisations - as well as testing their ability to 'deliver'. By the same token, these organisations could now be empowered to mobilise their communities in a more rapid and more just transition to a low carbon and resilient energy system.

1.1 The COVID-19 pandemic and the role of community organisations

"..it seems that we are experiencing an economic contraction that is faster and deeper than anything we have seen in the past century, or possibly several centuries."[2]

The economic impact of the lockdown has already been very significant. Covid-19 is causing a rapid and widespread fall in economic activity. Large parts of the economy have been deliberately shut down – a recession has been effectively engineered. Many observers believe there will be a significant long-term economic impact, perhaps even an ongoing depression. UK

Government borrowing requirement is expected to surge and, ultimately, this could mean higher taxes, restriction on public spending, or both. Unemployment is likely to surge, potentially reaching 10% this year.[3]

The social impact is likely to be equivalently significant, but unlike the economic impact (which, to some extent, follows the financial crisis of 2008) it is novel and unprecedented. It's now clear that, at a minimum, strict social distancing is likely to be required for the rest of this year in most places if and when lockdown is lifted, or even longer and that further lockdowns may be imposed without notice in the event of a resurgence of the virus.[4] It's difficult to forecast the impact of this, but it seems highly likely that it will dampen or even preclude a great deal of community, planning and development activity other than that which is essential to assist vulnerable people in the community. It is also likely to massively reduce the capacity of public transport.[5] Innovative solutions to these issues will be required.

To some extent, the socio-economic impacts will depend on whether the UK and Scottish governments take a 'new deal' – type stimulus path; or revert to an 'austerity' strategy designed to reduce public debt. There will be great pressure to enable a return to 'business as normal' as quickly as possible, bypassing any efforts to ensure a 'green new deal' approach – although there are calls for this new approach.[6]

A number of initial general conclusions can be drawn which bear on our current level of vulnerability through our exposure globalization:

1. The rapid escalation of the Covid-19 outbreak in China to a pandemic with severe global health, economic and social impacts has revealed the extreme vulnerability of the modern, globalized economy
2. A key element of this vulnerability is reliance on long, fragile, international supply chains which are overstretched and interdependent. "At the minimum, Western companies need to operate supply chains with more geographic sources. The trade-off will be between short term profit maximisation and longer-term risk reduction".[7] A better balance between local and international is required
3. Heightened concern over industrialisation of food supplies allied with unchecked exploitation of virgin ecosystems resulting in exposure to and rapid spread of pathogens previously limited to wild animal populations
4. Local economies dependent on tourism are expected to be disproportionately affected[8]
5. The impact of panic buying and delays in decisive action to prevent it, have revealed the vulnerability of the 'just in time' delivery system
6. The pandemic has revealed the limitations of the market and private corporations in effectively responding to an emergency and has demonstrated that the role of the state must go further than merely tweaking the regulations governing the operation of the market
7. It has shown that where there is an existential threat to health and society, governments can act very quickly with massive behavioural constraints & financial interventions
8. It has revealed the significance and vulnerability of 'key' but often low paid workers who keep basic systems running (healthcare, social care, food production, food retail, distribution
9. It may result in permanently higher reliance on the internet for home working & shopping
10. It has put into sharp focus the significance of and dependence on local social & voluntary networks and has revitalised community spirit in a way not seen for generations
11. That this becomes a defining moment for the local community sector and a major test of its ability to step up & deliver local services, in particular support to vulnerable people. Voluntary organisations themselves have been able to reach new audiences and previously unknown target group via online tools – whilst not ideal to work online versus face-to-face, some voluntary organisations have reported being able to reach more people with fewer resources

12. An increase in the number of people who are, or feel, traumatized by the sudden change in their way of life and even more anxious about the future and a heightened likelihood of post-traumatic stress disorders
13. The immediate drop in urban pollution levels and the link between these and vulnerability to COVID-19[9] drives recognition of the impact of air pollution on health and wellbeing & and may result in strong pressure to radically reduce it, with greater encouragement for cycling and walking; but, on the other hand…
14. The viability of public transport will be severely impacted & there could be a reversion to much higher levels of private car use.

Overall, COVID-19 has acted to starkly reveal underlying inequalities & associated issues in our society, most clearly revealed by the death rate in the most deprived areas being double that of the least deprived areas in Scotland.[10] This must mean that in any recovery measure there must be a razor-like focus on inclusion and the removal of disadvantage along with support for those best placed to ensure this happens.

As noted by the Advisory Group on Economic Recovery to the Scottish Government,[11] the activities and services provided by the Third Sector have been of critical importance in maintaining community resilience during the COVID crisis. It also suggests that there should be a renewed focus on place-based initiatives. Strengthening the role of Community Anchor Organisations in addressing energy demand is an important route for this, whilst simultaneously contributing to community resilience, local economic development and the drive to Net Zero.[12] This theme is well illustrated in Community Land Scotland's briefing note, showing how community landowners have played a key role in the crisis.[13]

1.2 Implications of the COVID-19 pandemic on our energy system

"Renewable electricity will be the only source resilient to the biggest global energy shock in 70 years triggered by the coronavirus pandemic, according to the world's energy watchdog".[14]

On the face of it, our energy system appears to have been largely unaffected by the crisis so far, with no interruptions to energy supplies or serious concerns about the operation of infrastructure. Electricity networks have implemented pandemic contingency plans to minimise the risks arising from large number of staff ill or self-isolating and are confident that "power will continue to flow throughout the coronavirus crisis".[15] Electricity network operators have been working hard with the UK and devolved governments and the system operator to mitigate low levels of demand never seen before on the GB supply mix – for example, curtailing generation and reversing interconnector flows.

Equally, network operators have had to prepare to meet the needs of new, critical, centres of demands such as field hospitals and mortuaries and ensured that local supply chains- e.g.- quarries for road resurfacing – remain open to allow essential works to continue.

However, although there has not been a **technical crisis** in the operation of the energy network with this pandemic, there are signs of an **economic crisis** emerging in the operation of the energy market due to reduced demand.

1.2.1 Energy Price

We were already only too well aware of the impact of the Chinese lockdown on energy prices, as the rapidly developing global gas glut was factored into PPA price options for the *Fishermen Three* windfarm[16] in Berwickshire, eliminating the prospect of any distributions for the foreseeable future.

Since then, the gas glut has been matched by an oil glut, arising largely from a huge global reduction in demand, resulting in oil in the US futures market trading in negative values for the first time in history.[17] Rather than 'peak oil' there is an argument that 'peak demand' has been brought forward by Covid-19 and that this will keep oil prices "low for years".[18] This could give rise to widely different scenarios:

- Ultra-low prices drive large parts of the oil & gas supply chain into a catastrophic slump from which it cannot bounce back, leading to widespread company failures owing to narrow or negative margins and then a massive spike in oil prices next year – enabling a rapid shift to a low carbon world driven by governments prioritizing green energy investment[19]
- Alternatively, ultra-low prices could drive a boom in oil demand & use, once the lockdown ends with a big bounce back in consumption, slowing or eliminating demand for renewable energy and electric vehicles and presenting an opportunity too good to miss for governments to enable the economic recovery.

Either way, the impact in Scotland could be very significant, especially in oil industry dependent areas such as the NE, with a widespread economic contraction.[20]

It is also the case that if wholesale electricity prices are set by the global gas price and low demand owing to a severe recession, these too will remain at a low level, with wholesale power prices potentially not recovering until 2025.[21] On the one hand this could be bad news for many community generators, and for renewables investment more generally. On the other, it could be good news for consumers, once / if wholesale prices track through to retail prices.

1.2.2 Energy Price & Flexibility

It is notable that wholesale electricity prices turned negative in Britain for the longest time on record owing to particularly windy & sunny weather over parts of the lockdown period.

Negative prices have been a feature of the German energy market in recent years and arise when there is high supply but low demand. Renewables are often blamed for this, but "inflexible conventional power stations are equally responsible".[22] Conventional power station operators either lose money or profit at such times and if negative pricing were to become a common event, their financial viability comes into question. A key risk with this is that the provision of grid balancing services is threatened or becomes very expensive. More flexibility on both the supply and demand sides is seen as the key to preventing more negative pricing.

One other factor may also be relevant to domestic energy prices – an increased risk of consumer bad debt as large number of people become unemployed. This risk, or more specifically the cost of bad debt, could factor into to energy price rises.

1.2.3 System operation and the need for flexibility

National Grid ESO has considered the impact of Covid-19 on grid management and considers that if demand for electricity remains low, it will create additional balancing challenges requiring additional sources of flexibility.[23]

Given the critical nature of the infrastructure, network operators and NGESO have well-established and regularly reviewed pandemic panning in place. In respect to Covid-19, there have been concerns around high levels of staff sickness and a shortage of critical staff, with one DNO UK Power Networks (SE England) contacting customers to advise them to be prepared for power cuts.[24]

Network Operators are also managing staff and contractors across the devolved nations where there are variants in C-19 return to work policies. This has required a huge amount of resource and collaboration with unions to ensure employees' rights are protected, health and safety is maintained – for staff and energy consumers – whilst the integrity of GB energy supplies are maintained.

OFGEM has made clear that electricity networks can de-prioritise certain operations outlined within their current business plans - without risk of regulatory penalty - so as to enable high priority works and services to continue. However, Ofgem are keen to push on with the transmission and distribution price control periods, so called 'RIIO-T2' and 'RIIO-ED2' despite the need for network operators to focus efforts and staff resource on ensuring the reliability of the network at this pivotal time.

This is particularly noteworthy given Ofgem's focus on an 'enhanced stakeholder engagement approach' for network operators as they plan for the future five years of Transmission and Distribution spending. Arguably, the middle of a pandemic may limit individuals and communities contributing to such plans whilst their attention is also focused on more critical activity. Low priority works can include reinforcement and connections works, which will mean further delays for projects dependent on such work and are also dependent on parts and supplies from international supply chains.[25]

Equally, 'low priority' maintenance activity can soon escalate if to high priority if repairs go untreated. Network companies and Ofgem will likely need to review how best to address delays to the planned works of the previous price control delivery periods and how best to ensure meaningful stakeholder – including community group – input in to upcoming plans at this pivotal time for network planning, C-19 recovery and looming Scottish and GB net zero targets.

In the meantime, the rapid change in working patterns and extensive home-working has meant that…

"Power usage on weekday mornings appears similar to that of a "normal" Sunday or holiday: the typical surge in demand as people start their day is less visible".[26]

Notably fossil fuel generators like coal and some gas power plants are needed less, and a greater proportion of the demand is being met with lower marginal cost, low-carbon generation like solar and wind. But this has further highlighted the need for greater flexibility in the system:

"*Lower electricity demand paired with continued growth of wind and solar PV has stepped up the share of variable renewables, calling for more flexibility to keep the lights on*.[27]

Most recently, the National Grid ESO secured emergency powers to switch off distributed generators without compensation[28] and plans to introduce a new market system for embedded generators, which would entail compensation[29] in the event of being switched off.

1.2.4 Summary: Key points relating to our energy system

Key points we can take from this brief review are:

- The Covid-19 pandemic has not, so far, threatened the physical integrity of the UK energy system, although there have been challenges. The shelving of planned outages and reinforcement work to ensure system integrity could create longer-term issues
- There are long-standing pandemic contingency plans for the electricity infrastructure assuming a worst case impact arising from widespread illness which hasn't yet been apparent, and there have not been power cuts (despite balancing challenges from low demand)
- The impact of ultra-low energy wholesale prices and large price fluctuation is unpredictable and problematic for the sector, impacting on investment plans
- The significant demand drop-off combined with high levels of renewables generation has highlighted the need for much greater flexibility in the system
- The economic impact on the oil industry in Scotland is likely to be significant, especially in the NE
- It is striking that, in an era where, given the right system architecture, the UK could meet a significant part of its energy requirements through renewable energy literally on our doorstep, we are still locked in to a global system (oil & gas) over which we have little control and to which we are acutely sensitive.

A much higher level of community energy activity, particularly focused on addressing energy demand, would be an important part of a strategy to reduce dependency on fossil fuels and increase flexibility in the system.

1.3 Community Resilience and Energy Security

1.3.1 Human Resilience

The lockdown period was one where normal life was 'on hold' and where confinement and illness presented real and direct personal challenges for many people. This was especially acute for those who are vulnerable and disadvantaged or who may have already been suffering with mental health challenges, or threats to physical or mental safety at home.

If social distancing measures have to persist after the lockdown for a longer period of time, or lockdowns have to be re-imposed, we may see a shift in the way people socially interact; with increased fear of strangers arising from an aversion to social contact, taboos around touching, and mask wearing in public. On the one hand, this could mean a rise in loneliness as people find it harder to seek out social contact, and an increasing prominence of mental health issues. Equally, it could also strengthen community and family bonds, as people place greater value on the known other and focuses attention on local areas.

Safeguarding, social care & mental health support, which depend on access & contact with support services, friends & carers, may be particularly threatened, especially where there are high levels of anxiety over health and what the future holds. Mental health services may see further increases in demand as the immediate threat of the pandemic subsides and individuals have the time to process and reflect on what has happened. Incomes are under pressure and many young people, whose educational processes have been abruptly curtailed and who were already anxious about the job market may now be facing an uncertain future.

'Resilience' literally means the ability to recover or bounce back. In the UK Government's Community Resilience Development Framework it is to 'respond and recover' from an emergency.[30] Community resilience is enabled when the public are empowered to harness local resources and expertise to help themselves and their communities to prepare, respond and

recover from disruptive challenges and plan and adapt to long term social and environmental changes to ensure their future prosperity and resilience.

But there is a strong argument that defining community resilience in literal terms as the ability to bounce back is misguided because the starting point is rarely an entirely good place. A more useful definition is "*The capacity of a community to deal with a major crisis by adapting and growing while minimizing causalities and preserving a fair quality of life for all its citizens and maintaining its core values and identity*". Accordingly, a resilient community is one that "*has the organizational flexibility and the resources with which they can grow and flourish with time*".[31] Measures that are needed to achieve this are seen as:

- Acceptance and expression of feelings in a safe, supportive environment
- Awareness of body reactions, as trauma is "essentially a somatic experience" that must be dislodged physically
- Normalising individuality of mental response to crisis given our unique human experiences - 'its ok not be ok' – and to respond to things in our own way: anxiety, depression, enjoying the peace of lockdown
- Enhancement of self-competence by "encouraging people to search for their own abilities and coping skills and to use them" often
- Promotion of hope and optimism by helping people to "make sense of their experience and to create a narrative that will be meaningful for them".

In other words, personal vulnerability, whether physical or mental, lack of capacity, lack of agency and control and lack of a supportive social environment are key issues to address in building resilient communities. It is likely that these fundamental factors will determine the way different communities or neighbourhoods respond to and recover from the current crisis.

Equally, it is also very evident that life would be very difficult indeed for many people if we were to be experiencing energy supply issues on top of the pandemic, given how closely energy links with ensuring our basic needs of water, food, warmth, hygiene, shelter needs are met.

1.3.2 Local Economic Resilience

In *Mapping Economic Resilience'*[32] the features of a resilient *economy* are seen as:

- producing goods and services at an appropriate scale to support a balanced and diverse local and regional economy
- adapting to climate change by reducing reliance on fossil fuels, reducing ecological impact through the environmental transformation of infrastructure (energy, transport and waste), and making more effective use of resources
- supporting investment in social as well as financial capital, which aims to address poverty and inequalities (of income, wealth, time, access and control over productive resources and carbon)
- supporting individuals and groups to experiment, develop and strengthen their adaptive capacities (i.e. self-organising, innovation and learning) and
- comprising structures (enterprises, public organisations and government) that support people to live the lives that bring them well-being.

The authors of this analysis saw **building the capacity of local financial institutions** (such as peer-to-peer lending, local currencies and mutual exchange mechanisms, community share issues, as well as credit institutions such as community development finance institutions (CDFIs) and credit unions); and **supporting specific sectors considered key to local economic resilience** as key measures. Sectors included: energy, food, land, housing, transport & social care.

From our experience, even at a local level these sectors can still be heavily 'siloed'. There could be real advantages in building collaboration to strengthen synergies and the resilience of the wider local 'system'. Examples include community transport with renewable-powered EVs; renewable energy provision for food production; and derelict & vacant land use for local behind-the-meter electricity supplies.

Notably, strengthening resilience at the local level is seen as an important element of the UK's national resilience strategy.[33] It also fits very well into the wider concept of the value of distributed systems in helping us to deal with economic shocks, resource scarcity & environmental change – where a whole system is built up from a set of smaller independent albeit interlinked units which, at least to some degree are self-sustaining. But, in practice, not much is being done to make this happen.

This localisation model is, in many ways, the opposite of the globalisation and centralisation trends evident in our economy, which makes us dependent on remote resources and undemocratic corporations, long fragile supply chains and a more-or-less regulated free market economy to supply us with what we need to live, over which we, as individuals or communities, have little influence. As has now been demonstrated, it also makes us highly vulnerable to adverse global-level events.

1.3.3 Decentralised systems

In 'Distributed Systems: a design model for sustainable and resilient infrastructure',[34] the authors argue for an urgent change in our approach to the design of infrastructure and services as a means of preparing for "unprecedented resource scarcity and environmental change". They link the need for this change along with access to information and communications technology as enabling a transformation of citizens from passive consumers *"relying on industrial production units hundreds or thousands of kilometres, or even continents, away"* to "prosumers – being involved (either individually or through community arrangements) in the production as well as the consumption of part of the resources, goods and services on which they depend".

They also note that *"innovative approaches…. are emerging…. not born from national-level planning and directives"* but from *"communities, businesses and local governments seeking-out ways to act that make sense in their immediate context. In most cases, this involves rethinking systems of provision of food, energy, water, transport services. It is leading to systems of production and consumption that are structurally very different from those we have been used to".*

1.3.4 Energy Security: Decentralisation, demand reduction and flexibility

The UK Government defines energy security as:

".. about ensuring secure, reliable, uninterrupted supplies to consumers, and having a system that can effectively and efficiently respond and adapt to changes and shocks. It is made up of three characteristics: flexibility, adequacy and resilience."[35]

The 2018 UK Energy Research Centre Report on energy security[36] examined six possible scenarios for how the security of the UK energy system could change in the future:

Energy Island	Insular UK, exit from EU, Scottish Independence, little further renewables investment, reversion to coal.
Slow Decarbonisation	UK exits from EU, economic growth primary concern, decarb falls down the agenda, delays in implementing carbon budget measures. Heat and transport continue to be dominated by fossil fuels.
Low Carbon	UK exits from EU but continues to meet low carbon budget and targets and seeks leadership role in climate change mitigation. Carbon Capture & Storage (CCS) tech implemented. Fossil fuel production declines. Biomass CCS significant role in electricity generation by 2030.
Low Carbon without CCS	UK continues to meet climate change targets but fails to commercialise CCS, fossil fuel use reduces, wind and biomass increase, nuclear power expands. Balancing achieved through interconnectors, biomass & hydrogen power plants.
Low Carbon without negative emissions	Climate targets followed & strong public support for low carbon action. Electricity supplied from diverse range of sources: gas with CCS, nuclear, wind, hydrogen. Decision-making shared between central, devolved & local authorities.
Technology Optimism	Most decentralised scenario, rapid decline in cost of renewables, decentralised decision-making, authorities more proactive in shaping markets and investment. Public interest high & emphasis on demand reduction & sustainable living.

The authors tested these scenarios against a wide-raging set of indicators. The most secure scenarios with the fewest 'red indicators' were 'Energy Island' and 'Technology Optimism' – even though they are radically different, in that one involves a reversion to centralised fossil fuel system and the other has a highly decentralised renewables-based system and interventionist governments. But both have the lowest primary energy demand (total energy demand of the UK), with the Tech Optimism scenario having the lowest final energy demand (energy consumed by end users). Key findings are:

- Energy demand reduction and energy efficiency are key to security
- Risk to energy security will not automatically reduce as the system decarbonizes
- Significant risks to security can be mitigated by investing in system flexibility – particularly demand side response and gas storage (which would also reduce the cost of integrating a higher share of renewables). It goes on to say that significant growth in energy storage could also be expected and this would strengthen security further by adding to flexibility.

Overall, it concludes:

"As the energy system changes, it will be particularly important to prioritise actions that improve energy system resilience. This includes more emphasis on energy efficiency and measures to improve diversity and flexibility such as storage, demand side response and international interconnections."

The scenarios in this review are very recognizable and it's easy to see how elements of each reflect aspects of the developments since then. However, the decentralised 'Technology

Optimism' scenario clearly offers the most resilient route. This also aligns to some extent with OFGEM & the UK Government's 'Smart Systems and Flexibility Plan'[37], although, currently, we remain a long way from the level of decentralisation, demand reduction (other than in the lockdown) or flexibility envisaged in the scenario.

However, the key point is that decentralisation, demand reduction and flexibility are core to a more resilient system, depend (at least in part) on widespread community action – and at the same time are central to the development of more resilient communities.

1.4 Strengthening the role of community energy in the light of the COVID-19 pandemic

1.4.1 Playing to community strengths – the demand response

We summarise below what we see as the main areas for community led action below, taking account of the requirements outlined above. We see the 'community anchor' group[38] as the key local agent in delivering these actions.

To date, much of the impetus behind the development of community renewables in Scotland has been economic; community groups have seen renewable energy generation as an ethical, sustainable and lucrative means to ensure a long-term income stream for supporting their local charitable activities. This has had great benefits for local resilience in some communities and has had notable successes, as is clear from the progress towards the Scottish Government's 2020 target for community and locally-owned generation. It would be wrong to claim that carbon and climate have not been factors influencing the development of these generation projects, but it would also be naïve to assume this has been the principle motivation in all cases. And the benefits have been far from universal.

However, in the past few years, the context has substantially changed. The electricity distribution network has become increasingly constrained, and support mechanisms such as ROCs and FiTs have been withdrawn by the UK Government. These factors have led to a slowdown in the development and commissioning of new community-scale generation. The commercial sector has been able to continue development primarily by leveraging economies of scale onshore, and through the rapidly falling cost of offshore wind. Whilst valuable efforts have been made to secure a community stake in some of these larger developments through shared ownership schemes, only a handful of such sites have come to fruition (none of them offshore, where the bulk of future development is likely to take place).

In parallel, the consumer context has also changed. The climate emergency has been pushed to the forefront of many minds, and increasingly community groups now are seeing climate as a major challenge for them to confront, and the key driver for energy projects. The move to the Distribution System Operator[39] model, the urgent need for electrification of heating and transport, and the associated requirement for flexibility, have all become far more prominent in the past few years. In the past decade, communities and the private sector have delivered transformational change in electricity generation, but the emphasis now needs to shift and broaden to include more demand side action.

Community groups can play a number of key roles in the energy transition more effectively than the private or public sectors. They can act as trusted intermediaries, offering advice and support on energy efficiency; organise collective bulk-buying and retrofit schemes; coordinate peer-to-peer trading of electricity; and provide local aggregation platforms for flexibility; start up

community EV car clubs and e-bike rental schemes; and help to democratise the energy system. These are all essential areas to tackle as we transition to a low-carbon and decentralised energy model.

It will be important to continue decarbonising the electricity system, particularly with additional demand coming online from heating and EVs, and so where community generation can be achieved (at scale, with strong natural resources, and/or where it can be linked to local demand economically), this should continue to be supported. However, the primary focus for community energy now should shift to the demand side, as this is where there is greatest need for innovation and progress, and is also where communities are best placed to effect change.

Table: Key Actions in widening the scope and scale of community energy

Key action	Why	In practice...
Energy demand reduction: promote and facilitate sustainable retrofit[40] of domestic & community buildings in ways appropriate to locality and building type.	To improve health and wellbeing whilst reducing and controlling energy demand; reduce fuel poverty & dependency on fossil fuels; increase uptake of low carbon heat; contribute to grid balancing; improve the impact of the Energy Efficient Scotland[41] & contribute to delivery of local strategies (LHEES[42])	Strengthen local community anchor group capacity to act; organisation of collective neighbourhood / community bulk-buying retrofit schemes, in partnership with relevant other players where feasible; assisting people with purchase, installation & operation of smart appliances;
Domestic & local business 'prosumption'	Increase household resilience; increase local control on supply; reduce fuel poverty; reduce dependency on grid; replace fossil fuels; contribute to grid balancing with high renewables component;	Collective procurement & installation of locally suitable generation kit at scale; peer-to-peer trading; basis for aggregation of flexibility services.
Promote & develop local energy supplies and local energy markets, in partnership with like-minded developers where possible.	Increase supply diversity; stabilize local energy prices; increase local control and ownership of supply; increase resilience; contribute to grid balancing; strengthen decentralisation; replace fossil fuels; retain value in local economy; increase productive use of energy; support local businesses and suppliers; reduce energy demand from transmission & distribution losses.	Strategic identification of actual practical opportunities & linkage with constrained grids; lessons from off-grid and G100 (behind the meter) installations; review of business models and scope for financial viability; identification of requirements for regulatory change (e.g. move from single supplier model).
Aggregation and Flexibility, in partnerships (as above)	Improve system resilience; contribute to grid balancing and efficient use of grid; generate local income from grid services; reduce energy demand from transmission and distribution losses.	Community-scale roll-out of EVs, batteries, smart storage heaters & water heating; recruitment into demand aggregation schemes / platforms

Build positive links between local energy supply and local transport	Reduce dependence on car ownership and fossil fuels; strengthen local transport networks; contribute to energy storage; assist local grid balancing.	EV car clubs; community owned charging stations; 'behind the meter' / on site supply; bulk purchase of capital equipment & power supplies; e-bike hire & active travel measures; links with electricity networks
Strengthen the capacity of local groups to lead energy actions; awareness raising, familiarisation and assistance to current and future consumers, including vulnerable consumers.	Build up the base of well informed and active local groups engaged with energy consumers; help ensure an equitable transition; mobilise local skills and knowledge; ensure vulnerability is properly addressed; maximize job creation / industry benefits for Scotland	Roll out of Community Energy Futures'; Demonstration in community facilities; training and familiarization events; outreach to vulnerable consumers; development of collective measures (above). Link in with schools and colleges – ensure workforce/supply chain/economy/academia all ready and able to make change, support innovation and maintain new/existing projects

In **Part 2**, we assess current progress, issues and opportunities to progress each of these areas.

Part 2. Key actions: current status and issues

2.1 Community Energy Demand Reduction

2.1.1 General Context

Actual energy demand reduction is an important part of any strategy designed to increase energy system resilience and security as well as community resilience and fuel poverty.[43] Fundamentally, if we are dependent on less energy to maintain a good quality of life, we are less likely to experience serious problems if one or other supplies are interrupted.

However, a fundamental challenge is that demand reduction runs counter to a historical fact: the correlation between energy consumption and economic growth is historically strong[44] although the nature of the relationship is not always clear[45] (i.e. which one promotes the other). At the global level, "the impact of policies to reduce energy demand is both limited and contested".[46]

These make policy and practice on demand reduction challenging and typically results in a focus on increasing energy efficiency or 'energy productivity' i.e. the economic benefit from each unit of energy used. Both of these are difficult to measure (owing to the complexity of including all relevant variables) and neither will automatically reduce energy demand, not least owing to 'rebound' effects (where, for example, an energy cost saving prompts further energy demand through an additional purchase or trip). Also, it is arguable that the UK's reduction in energy consumption over recent years is at least partly due to offshoring our manufacturing industry:

"...while the UK's territorial GHG emissions fell by 27% between 1990 and 2008, it's 'consumption-based' emissions increased by 20% as a consequence of imported consumer goods displacing (more energy efficient) domestically produced goods."[47]

There is very little information available on energy-use trends at community level for a number of reasons. These include: there is no ready way of measuring it, other than by aggregating up from individual users; and any community draws in energy from a range of sources which can be difficult to trace & quantify.

At the same time, 'community level' demand reduction measures do not figure prominently in policy or practice – the focus is on individual households or 'consumers', or sectors (e.g. transport, industry etc.)

2.1.2 Energy Consumption in Scotland

Energy consumption in Scotland is falling. The Scottish Government's 2019 Annual Energy Statement shows that Scotland had achieved a 13.9% reduction in energy consumption by 2017 from the mid 2000 baseline, against a target of 12% by 2020. However, despite over 89% of Scottish electricity being generated by low-carbon technologies, more than 80% of total consumption is still attributable to the burning of fossil fuels, with renewables supplying 17.8%.[48]

2.1.3 Scottish Energy Strategy

"We know the rate of installation of energy efficiency measures and installation of renewable energy systems will need to ramp up significantly in the 'able to pay' sector (domestic and non-domestic)". [49]

The latest report on the Scottish Energy Strategy[50] provides an update on progress against Scotland strategic targets. In relation to energy consumption, the two key targets are:

- **12% reduction of energy consumed annually by 2020**, on a baseline of 162032 GWh in 2005-2006 (13.9% reduction in 2017)
- **30% increase in energy productivity by 2030** (0.3% increase between 2015-2017)

These are both significant targets which will be challenging to meet on a consistent basis. In 2015, the Scottish Government made improving the energy efficiency of buildings a national infrastructure priority along with a transition to low carbon heat.

2.1.4 Energy Efficient Scotland

Energy Efficient Scotland[51], the Scottish Government's flagship energy efficiency policy (previously the Scottish Energy Efficiency Programme, SEEP), comprises:

- The development of LHEES: Local Heat and Energy Efficiency Strategies – these are expected to "allow local authorities to prioritise and target work. That might be supporting owner occupiers and businesses to install energy efficiency measures or encouraging the development of district heating and other low-carbon heat solutions." 23 local authorities were supported to pilot LHEES across 2 project phases
- The introduction of a statutory duty on local authorities to prepare them
- Will support (advice, grants & loans) building owners to make changes to their buildings and heating systems to reach the required energy rating, with more support available depending on the extent to which home owners struggle to afford their heating

(a) Home Energy Efficiency Programme Scotland (HEEPS)

In addition to the LHEES initiative which is focused on planning for the delivery of heat and energy efficiency, the main route for delivery of actual measures is HEEPS. This is a cluster of programmes currently including:

- Area Based Schemes (ABS)
- Warmer Homes Scotland (delivered by Warmworks LLP, a partnership between EST, Changeworks and Everwarm)
- Home Energy Scotland Loan Scheme
- Equity Loan Pilot Scheme

Delivery of HEEPS is via EST/Home Energy Scotland, which operates through a central EST call centre and local offices. HES provides energy efficiency advice, information on low cost energy tariffs, and advice on income maximisation, as well as a wide range of energy efficiency measures.

Scottish Government funding for Area Based Schemes is delivered to local authorities via EST/HES. These schemes are designed and delivered by local authorities and specifically target fuel poor areas.

Therefore, in terms of planning and delivery, the main players are Scottish Government, Home Energy Scotland, Local Authorities and contractors.

(b) The long-term standard - Energy Performance Certificates

In the domestic sector, the most commonly used metric for assessing change is the number of households reaching an Energy Performance Certificate (EPC) 'C' level. This is now the basis for driving & monitoring progress in building energy efficiency in Scotland.

There has been considerable discussion on the inadequacies of the EPC system and this was the subject of a detailed review in 2019.[52] The bottom line is that, although you cannot use EPCs to compare the energy use of different properties, a move up the scale should result in less energy being used.

In 2019, the Scottish Government stated that of the 62% of homes in Scotland that are owner-occupied, only 38% had achieved an EPC 'C' level, although the situation was gradually improving.[53] The Scottish Government's target is that all owner-occupied properties should meet EPC 'C' by 2030. However, a 2019 Citizen's Advice Scotland survey[54] indicated that less than half (44%) of Scottish adults surveyed had heard of EPCs before taking the survey and a quarter of homeowners had not fitted any improvements. The number of households with an EPC below 'C' was decreasing by about 40,000 a year, although it is thought that this rate will slow down as 'easy wins' are completed and there remain very few properties in categories 'B' or 'A'.[55] There are an estimated 1.42m properties rated at EPC D or below.[56]

(c) Local Strategies: Evaluation of LHEES Phase 1 pilots

According to a 2018 ClimateXchange evaluation[57], phase 1 pilot projects delivered energy efficiency and low carbon heat measures in 1,456 domestic buildings and 47 non-domestic buildings, including mixed-use tenement blocks, owner-occupied hard-to-treat homes, community centres, schools and office blocks. The key findings of the evaluation were:

- Local authorities were very good at designing and implementing non-domestic retrofit projects within the council estate, but knowledge & skills to do so beyond public sector buildings was lacking
- Complex or large scale projects were avoided owing to funding timescales
- Small businesses selected to participate didn't proceed with retrofit owing to cost
- Organisations responsible for non-domestic, non-public building had particular challenges with consultation processes, especially with mixed use & multi-property buildings
- Less than half (9 out of 48) buildings had data suitable for analysis
- For domestic dwellings, the pilots worked well for ex council house stock where there was high quality data. The HEEPS:ABS experience meant that procedures were already in place
- The detail and accuracy of data sets for other (non ex council house) properties & non HEEPS:ABS areas needed improvement
- More time was needed in communities unfamiliar with HEEPS:ABS to build trust in the grant and loan funding offer
- Contractors needed a higher certainty about the number of measures to be delivered if they were to be able to offer lower cost installation to householders
- Uptake of measures by householders was influenced by the quality of home energy advice, whether contractors were endorsed by local authorities & the level of quality assurance after completion – i.e. the level of trust is vital
- Evidence of change in householder behaviour afterwards was limited – more systematic education at the point of change is desirable
- Successful data monitoring took place in 20 out of 419 households – some achieved energy savings, some increased energy use
- Areas of expertise lacking were:
  - Local authority staff resources & skills for more complex / innovative non-domestic measures
  - Ability to work with households who need to borrow or use savings to complete work
  - The extended cross-sector intermediary role necessary to tackle energy use in buildings is unprecedented and requires new types of organisation, networks and procedures
- Legal aspects of multi-ownership buildings are a challenge

From this evaluation, trust, systematic education, data gathering & evidence of change were clearly critical issues influencing uptake, along with the capacity & resources of local authorities to go beyond their own estate & existing HEEPS:ABS areas. What's less clear are factors relating to how the local strategies were prepared and who was involved; and how well contractors operated.

2.1.5 On-site renewables generation – 'prosumption'

To date, this has mostly taken the form of PV panel installations where power is used in a building and any surplus is exported to the grid, but can include production & use of biomass for heating. The purchase of biomass for heating is not strictly prosumption and neither is the use of batteries to store power – but both are covered here as they both are important aspects of domestic level energy resilience.

In relation to solar PV, a combination of falling panel prices and the Feed-in Tariff did result in a slightly more widespread deployment of solar PV in Scotland; 2019 figures suggest a total PV capacity of 369MW[58], and in 2016 (when 188MW was deployed), it was estimated that there were 45,000 homes with solar PV installed[59]. Even if domestic PV installations have doubled to 90,000 by now, this is still a very small proportion of Scottish homes, and with the FiT scheme closed to new applicants the case for new installations is weaker.

The 2009 renewable heat target for 2020 was a modest 11%, which is still likely to be missed by some margin (6.3% achieved by 2018)[60]. There were a total of just 15,224 accredited domestic Renewable Heat Incentive (RHI) installations at the end of March 2020[61], out of 2.46 million Scottish households[62]. It's clear that the RHI has not succeeded as a policy measure in Scotland, with very few installations in absolute terms.

Domestic batteries are not yet registering as a viable option for most householders in Scotland, with very few installations. However, if combined with PV and a 'smart' tariff – they could offer some energy cost saving.[63]

Although 'behind the meter' onsite supply forms the core business case for rooftop solar PV across Scotland, a significant proportion of urban households living in tenement buildings are excluded from this opportunity. This is due to a number of factors, including legal complications around shared roof ownership, and conservation status of many tenement buildings. However, the inability to self-supply 'behind the meter' to more than one household on a stairwell is probably the most important barrier, fatally weakening the business case for PV on Scotland's tenement blocks.

Solutions for tenement properties may be slowly emerging through policy changes already under consideration. The recommendation for mandatory owners associations by the Working Group on Maintenance of Tenant Scheme Property[64], for example, would go a significant way towards solving difficulties around shared roof ownership. Meanwhile, P379 code modifications for meter sharing may allow license exempt self-supply of solar energy to all houses in the stairwell. However, significant uncertainties remain, with these changes neither in place nor their use in this way proven.

2.1.6 Issues with the current approach

Scottish Government statistics show a fairly stark picture on how much progress still needs to be made on domestic energy efficiency and renewable heating. Fuel poverty has been gradually decreasing, but still affects 25% of households, with those in homes below EPC level C far more likely to be affected.[65] Non-electrical domestic heat use dropped by 15.2% by 2017, compared to the 2005-7 baseline, but increased slightly in 2016 and 2017[66].

Domestic heating accounts for 13% of Scottish carbon emissions[67] but only 2.8% of Scottish households have low carbon heating installed. 79% have natural gas heating.[68]

Better progress has been made on domestic electricity consumption, with a 26.2% reduction to 2018 since 2005/7.[69] However, heating remains responsible for 75% of household energy demand[70] and so improvement in thermal efficiency and moves to renewable heating sources are particularly important for heat.

Overall, progress is not being made at a fast enough rate on improving domestic energy efficiency. In 2018, only 30% of lofts were insulated to a high standard (300mm or more), a proportion largely unchanged since 2015 (suggesting that the 'easy wins' have been won). 73% of cavity walls were insulated, but this has only improved by 7% since 2012. Only 19% of solid wall dwellings are insulated. Although 480,000 loft insulation measures have been undertaken in Scotland though government programmes since 2008[71] it is clear that progress has stalled, particularly on more expensive and invasive measures such as solid wall insulation.

There is still much to do to ensure that the vast majority of Scottish homes are insulated as far as possible, and are transitioned quickly away from oil and gas heating to electrically-based, district or self-standing biomass heating systems.

Progress to date has been based on the easier measures, rightly prioritizing fuel poor households where costs are covered and measures can be standardised. But the bulk of households in the 'able to pay' sector have not been addressed, either in terms of energy efficiency or low carbon heat - and these need a different approach to persuade homeowners to act. The main issues are:

- Many householders have found the referral and application processes offered through Home Energy Scotland to be confusing and time consuming. In some cases, simple frustration has caused householders to abandon efforts
- Confusion is caused by the plethora of (sometimes overlapping) support offered in different local authority areas, each with differing rules on intervention rates and efficiency measures supported. Although the aim has been for HES to act as a 'one-stop shop' to identify what measures an individual might be eligible for, this has not always been effective or clear enough to encourage householders to apply for funding
- The referral process is particularly problematic in more remote and rural areas. Examples abound of homeowners waiting for assessment visits from installers who never appear, or decline to quote because of the distance to travel or complexity of the work required for the building. Local installers and contractors whose core work is not in energy efficiency may not be accredited to participate, despite being better placed to do so, or may not have resources to bid in national tendering schemes (which are often awarded to larger firms that can deliver nationally, at scale)
- There is a real lack of guidance for contractors on best practice for energy efficiency retrofits, especially on older properties and those in conservation areas. Without the skills and experience in how to best tackle these properties, both local and national contractors are often unable to find practicable solutions which are acceptable to the homeowner (i.e. don't result in internal solid wall insulation significantly reducing room size, etc) and/or which can be funded by the particular grant schemes on offer in that particular area. Very often the costs of measures recommended (even after grants) will not pay back against energy savings for many decades
- There is little incentive at present for private landlords to invest in energy efficiency measures which will primarily benefit their tenants. Equally, tenants in inefficient homes have little power to install energy efficiency measures themselves, or to compel their landlords to do so
- Low oil and gas prices have meant that the potential savings would only be recognized over a long period, which acts as a disincentive for significant investment by homeowners. This problem will be exacerbated at present by low oil prices resulting from the pandemic. This is a particular issue in gas-grid areas where heating costs are lowest; less so where direct electric heating is used, as the most expensive fuel
- At present there is a major skills gap evident. Whilst the boom in PV installations in the FiT era resulted in a high number of specialist firms entering the market (as well as existing electricians and roofers training to diversify their work), the same effect has not occurred to nearly the same extent with renewable heating equipment. If targets for renewable heating and decarbonisation are to be met, then there needs to be a vast training programme initiated so that almost every plumber and boiler engineer in Scotland can be equipped to install heat pumps and solar thermal panels

- The existing Microgeneration Certification Scheme (MCS) accreditation system is also an issue. Many existing small contractors have complained at the cost and time of becoming accredited, with the result that the majority of electrical and plumbing firms in the UK do not hold these accreditations, and are effectively unable to install microgeneration equipment as a result, with MCS being a pre-requisite for most funding mechanisms. Equally, there are numerous examples of MCS-accredited firms and equipment resulting in poor and even dangerous installations, risking both safety and consumer confidence in the technology.

It should be noted that many of these barriers are not new, and indeed most were highlighted in a 2010 report by Changeworks commissioned by WWF Scotland[72]. It is vital that we don't pass a further decade of needless emissions and fuel poverty before the actions recommended in 2010 are taken.

2.1.7 Cost and Budget

According to Citizen's Advice Scotland:

"Despite energy efficiency being designated a national infrastructure priority in 2015, central funding has remained the same and existing support schemes haven't seen the uptake of energy efficiency measures at the pace and scale required to meet the target".

They argue that the current range of financial incentives is not sufficient to encourage people, especially owner occupiers, to upgrade their homes, who need more support to take action, especially fuel poor households. They suggest that the total investment required to bring Scotland's homes up to EPC 'C' will be £11.1bn compared to the government's £8bn estimate and that the SG's contribution to this cost should double, from an annual budget of £119m to £256m.

In addition, CAS' key asks include a new major public information and awareness campaign and a 'one stop shop' for advice, information and consumer redress.

CAS highlights the social and economic benefits of upgrading the energy efficiency of homes, including preventing ill health and premature death from cold homes leading to savings for health services and lower bills. In the wake of COVID, we could now add greater resilience to global shocks and a highly beneficial basis for job creation to this list of benefits.

Investment in energy efficiency measures is generally considered to create more jobs then new energy generation, because of the relatively high levels of labour intensity. Manufacture and installation of equipment and materials also has the potential to boost local labour markets but requires provision of training to local workforces owing to the relatively specialist skills involved.[73]

2.1.8 Behavioural factors affecting uptake of domestic energy measures

It has been convincingly argued that long term energy demand reduction requires changes in social behaviour in which local approaches are needed, on the basis that energy sector change is driven by bottom-up approaches.[74] The key factors which bear on behaviour in this context have been summarised as follows:[75]

- Broader values, attitudes, beliefs and social norms profoundly influence different types of economic and energy-related decisions
- Behaviour change 'demands changes in collective customs' and is about 'working with rather than against existing habits'[76]
- Behaviour is 'locked in' and constrained by the socio-economic systems that have developed, which are only broken down through disruptive innovation, crisis, deliberate policy (rare) or progressive failure in the system
- People focus on losses more than gains

- People tend to choose the default option or are reluctant to change
- People are more interested in relative rather than absolute performance, so neighbourhood comparisons are likely to have more impact
- People are heavily influenced by who communicates information – trusted individual are key
- People are more influenced by salient rather than accurate information, so visual cues and vivid descriptions should be employed

Could a systematic community-led approach help achieve a step change in uptake?

2.1.9 The community group role

Community Anchor Organisations have significant potential to drive the step change that is required in energy efficiency and local supply by harnessing local knowledge, trust, visibility and expertise to implement collective measures at community level. Over the last 20 years, there has been an unprecedented growth in such organisations, many of which have already led local energy initiatives amongst other things. There is already a foundation of 'energy practice' in place, although this is scattered and often hand to mouth, funded through short-term grants.

There are many examples of energy efficiency projects in Scotland led by community anchor organisations, often grant funded via the Climate Challenge Fund. Examples include:

- Greener Kirkcaldy: energy advice & handyman service, green exemplar hub with EV charging, PV, storage, active travel promotion, reuse and repair workshops, food and growing
- Huntly Development Trust: generation, car club, EV car club plans, e-bike hire, plans for active travel
- Moffat CAN
- Comrie DT: previous street-by-street insulation programme, PV generation, district heating, retrofit of old Nissan huts for affordable workspace rentals
- Galson Trust: generation, energy advice, recycling
- Neilston DT: generation legacy, cycling promotion and training, local growing
- Sustaining Dunbar: energy advice, community garden, repair café, car club, cycling promotion
- South Seeds: cycling promotion, energy advice and handyman, community growing
- Kyle of Sutherland Development Trust Energy Advice Service & Cosy Homes programme – both now ceased
- THAW Orkney (Tackling Household Affordable Warmth)

However, to fit within the wider Scottish Government energy efficiency framework, these have tended to involve provision of advice, surveys, and signposting to national/regional grant schemes via Home Energy Scotland (HES), with, at most, some limited 'handyman' services. For the 'able to pay' sector, it has ultimately been up to householders to coordinate and (at least partly) finance the works carried out.

In many cases, the additional support offered via the community project has not been enough to overcome hurdles in these wider funding schemes, and uptake has been low. Also, projects have mostly been grant-funded and cease once the grant expires. Long-term sustainability is therefore an issue.

Greener Kirkcaldy's 'Cosy Kingdom' programme is distinct in that it is funded on a rolling service level agreement by Fife Council to address fuel poverty across the council area. Whilst Greener Kirkcaldy provides advice & support to householders and a limited handyman service, all other requirements can only be addressed by referral to HES or Warm Works.

(a) Community group role in engaging householders & driving energy efficiency

A 2015 study[77] which examined the potential of community energy initiatives to act to reduce energy demand found that the local approach of community energy initiatives was a successful way to engage communities providing they recognise that everyone in the community is an individual in order to develop effective convenient solutions that are adapted locally. It also found that community groups could successfully generate income by acting as intermediaries between consumers and installers through charging commission.

A review of the London-based 'Smart Communities' project,[78] which focused on domestic energy demand reduction through behaviour change, began by acknowledging that community energy initiatives can be over-idealised as automatically meaning an inclusive and effective approach but this is not necessarily the case. The project entailed: community-based consumption feedback; weekly email communication; a web forum; community workshops; home visits; working with a primary school and library, and collaborating with local groups and experts. Its straplines were '*working together to save energy'* and '*don't forget to tell your neighbours'*. Around 400 households joined the project over two years. The review found that:

- The local and non-commercial aspects of the project were widely appreciated
- Project participants were particularly motivated by 'being part of something' – a group of people acting on the same issue
- Success depends on broad local buy-in and participation
- There can be divergent views & these have to be engaged with in a positive way
- Trust depended on the project being local and non-commercial.

(b) The key question: Operating at scale vs the need for a finely tuned, localised approach

This analysis suggests a core dilemma: that the centralised advice and delivery model has gone a good way to achieve the 'easy wins' but is not effectively addressing more complex requirements or the 'able to pay' sector; but a more localised, collective and finely- tuned approach, which is demonstrably more effective at changing behaviour, mobilising voluntary action and encouraging uptake of measures, is more complex to organise – and could be more expensive.

It would be a mistake, though, to take an 'either/or' approach as it also seems clear that the two approaches could complement each other more effectively than at present.

Investing in community led approaches could also help reinforce community resilience & the post-COVID recovery.

2.1.10 Achieving delivery at scale via a community-led approach: models

In principal, community anchor groups have a potentially very valuable role to play in driving full uptake of energy efficiency and low carbon heat measures owing to their influential position in the communities they serve. However, currently, there are few examples in Scotland of this happening at scale – i.e. community-based groups delivering significant numbers of retrofit measures and heating installations in local households, rather than purely advice. So the question is – is it feasible for such groups to facilitate more advanced and widespread uptake of measures?

There are at least three models that could apply, ranging from the simpler to the more complex:

- Community buying schemes
- Community partnerships with commercial energy service companies
- Community installation companies

(a) Community Buying Schemes

By clubbing together to purchase goods or services, quality can be improved and costs reduced. Community buying schemes also have the potential for reducing complexity when it comes to buying or installing equipment which residents may not be familiar with, such as solar panels.

Community buying schemes have been around for a while with details of some early examples in the UK Government's Guide for Community Buying Groups[79] which includes Transition Town Marlow's early example of a solar PV panel buying group. The approach has also been used by the Development Trusts Association Scotland to try to help alleviate rural fuel poverty through bulk oil buying for residents in rural areas.[80] For a more detailed assessment of how such schemes can work, see Citizen Advice Scotland's report 'Oil Buying Clubs – The Highland Experience'.

These schemes have in common a process which involves:

a) canvassing local people on whether they are interested in joining a group buying scheme
b) identifying potential suppliers who could be attracted by a readily-provided supply of work
c) inviting suppliers to bid to deliver work for a confirmed number of households and;
d) appointing the supplier who offers the best value for money. The contractual relationship is between the supplier and the householder, but the terms and cost of supplier are within pre-agreed limits.

Transition Linlithgow ran a buying-scheme project in 2011, coordinated with Climate Challenge Fund funding, to secure a bulk purchase deal for solar thermal panels. They estimate that this resulted in approximately a 30% discount, with around 200 systems installed as a result. A further project involved bulk procurement of solar PV systems, again installed in around 200 homes as a result of the initiative.

So far, we are not aware of community buying schemes for other low carbon installations such as heat pumps, although, in principle, such an approach could help decarbonize heating especially in off-gas grid rural areas.

(b) Community partnerships with commercial energy service companies

If the capital cost of installation of energy efficiency measures and low carbon heating is an obstacle, are there viable approaches which reduce or eliminate the capital cost to householders? Currently, the available measures are loans available via HES and the Equity Loan Pilot Scheme. The ELPS is available in a limited number of council areas and is similar to taking out a second mortgage – and is only paid back when a property is sold. There is no easily available information on uptake of either to date.

The Orkney ReFlex project is piloting an alternative approach to loans – leasing agreements for EVs, domestic batteries and electrical heating equipment. Private finance has been secured for the purchase of capital equipment by the ReFlex consortium and the revenue from leases and smart utilization of tariffs and aggregation services ('stacking' value) to the grid is expected to enable a financially viable delivery model at scale. This model, which depends on embedded community engagement to promote uptake, has scope for replication elsewhere.

(c) Community installation companies

In Manchester, Carbon Co-op has developed a very detailed framework for assessing the energy efficiency of existing homes. This is based on SAP, but goes into significantly more detail than traditional SAP assessments, and results in a 50-page document being provided for each property assessed, with recommendations for particular materials suitable for the construction of that property, along with projected costs for the materials, carbon savings, and running cost benefits.

From 2013-15 they also delivered a 'Community Green Deal', where they secured zero-interest government loans, procured a contractor and delivered high-quality, whole-house energy efficiency retrofits to 12 homes. This proved a successful way of designing and installing solid wall insulation in particular, with average carbon savings of around 50% and fuel savings of around £1000/year.[81] Since then, they have developed a 'People-Powered Retrofit Programme'. They found that many members were getting stuck after an initial assessment, and so Carbon Co-op provide assistance in finding good, experienced contractors and providing specific coordination services for the construction works.

It is possible to envisage well established groups setting up subsidiary installation companies, building up a local client and skills base then bulk purchasing & installing both energy efficiency and heating measures using local installers. Further work would be needed to assess whether there could be viable business models for this, perhaps linking with RHI payment in some way.

This approach would be quite different to the current approach to appointing national-level contractors which can exclude smaller local firms, leaving them behind in terms of skills and opportunities. Without the same local knowledge, accountability and presence for maintenance, there are examples where using national contractors has led to poor-quality installations which don't perform well in the long-term. Procurement rules may in some cases force public bodies into accepting bids for equipment which they know from experience to be more likely to fail than more expensive but reliable systems.

Many homeowners will not have the experience or confidence to translate a basic EPC report recommending something like solid wall insulation, into a specification for the overall works required (which might include redecorating, realignment of gutters and downpipes, replacing soffits and fascias, or adding a new external render); nor will most have the time or skills to project-manage or oversee these works effectively. These are roles which trusted community intermediary organisations such as Carbon Coop have been able to effectively fulfill.

If community groups across the country are supported in these roles by government, there is scope to substantially increase uptake of measures, and also to provide new training and employment opportunities for current and prospective contractors and installers, many of whom are facing uncertain futures due to the downturn from Coronavirus.

2.2 Wider factors in community energy demand: (a) energy supply

A shortcoming of focusing policy on the energy consumption characteristics of buildings is that household energy consumption "*only accounts for around one quarter of total energy consumption. In practice, most of the energy 'consumed' by households is 'embodied' in non-energy goods and services, with the energy being consumed directly by upstream producers and distributors at different stages of the global supply chains.*[82]

Measures which influence behaviour on energy use and wider lifestyles and consumption need to be aligned. Two particular areas in which community groups can have a significant role are **energy supply** and **transport**.

2.2.1 Energy supply as a key factor in demand reduction

The nature of the energy supplies to a building or community itself has an impact on net consumption. For example, electrical losses are an inevitable consequence of transferring electricity across the distribution network and they have a significant financial and environmental impact.

About 1.7% of the electricity transferred over the transmission network is lost. A further 5-8% of the electricity transferred over the [various regional] distribution networks is lost.[83] These losses contribute to approximately 1.5% of Great Britain's greenhouse gas emissions.[84] The Scottish Energy Strategy puts energy industry and distribution losses in Scotland at 6%.[85]

Utilising renewable resources to create local supplies of energy reduces energy losses from transmission if the power is used locally. This, combined with increasing energy efficiency within buildings resulted in Germany's 2014 energy consumption levels falling by 4% from 2013 levels.[86]

It is also the case that the decarbonisation of heating and transport will require significant reinforcement of the national grid and distribution networks, unless it becomes much more feasible to meet additional local demand through local supply on a flexible basis.

National Grid has noted that high levels of intermittent and inflexible generation will require high levels of new flexibility as well as new ways to maintain system balance.[87] The impact of the pandemic lockdown unexpectedly made this an urgent and much more expensive requirement.

National Grid's original forecast for balancing costs for 2021-2022 was £1,478m; by the 15th May 2020, its forecast had increased to £2,000m.[88] Closely matching demand and supply at the local level can reduce the risk of imbalance in the grid and therefore reduce the costs incurred by National Grid to balance the system.[89]

(a) Community-level local electricity supply

The vast majority of community energy projects across Scotland produce electricity for export to the grid. With the end of FiT and ROC subsidies, revenue from selling electricity to a licensed supplier or broker via a Power Purchase Agreement (PPA) has become the sole income stream for most new projects.

However, the stability of this revenue has been increasingly put into question by volatility in energy prices, driven by an unstable global oil & gas market and significantly reduced demand due to the coronavirus lockdown. With the economic effects of lockdown only beginning to be felt, and global heating producing an increasingly unstable climate, we must expect such volatility to continue or intensify. As we go forward long term PPAs, able to insulate generators against energy market volatility, are likely to become increasingly critical in enabling new renewable energy projects.

Meanwhile, it is not by active choice that most projects adopt this export-based model; but due to the nature of UK energy market legislation, which makes local electricity use almost impossible. Recent years have seen increasing demands for the right to sell energy locally, so that output from community generators can be used to complement other community initiatives, rather than simply exporting the power as a commodity for cash, with no added value.

The case for local use is felt particularly strongly in many remote rural communities, where despite owning a significant amount of energy generation and being large net exporters of electricity, locals pay a premium price for the energy they use at home (due to their remote location) and experience more fuel poverty than anywhere else in Scotland.

Worse still, these same communities are very often now finding themselves unable to develop further community energy projects, due to a lack of export capacity in their local grids.

I. Current Policy: Enables local generation but not local supply

The rules governing the UK grid were developed following privatisation of the energy system in 1989. These were designed to break the state monopoly and introduce competition by separating the generation, network operation, and sale of electricity into separate activities, each performed by multiple competing organisations.

One effect of breaking the state monopoly was to enable the existence of small-scale community owned energy generation, and the growth of a community energy movement in Scotland. However, this movement has been strictly limited to the field of electricity *generation.* Community ownership of electricity networks and community-led *supply*, while existing to some extent in continental Europe, has not so far been possible in Britain.

This is because by law, energy flowing through the grid can only be sold to an end user by a licensed supply company. However, the licensing process was designed based on a nationalised and highly centralised energy system, and on the basis that there could only be one supplier of energy and associated services to a consumer – the 'supplier hub' model. It makes no provision for local energy supply by small scale or regional suppliers, or by multiple suppliers through one meter.

License conditions, designed to protect the customers of large supply companies, require such costly trading software and reporting processes that suppliers require a bare minimum of 10,000 customers to break even. As customers can be anywhere in Britain, and suppliers need to upscale as fast as possible, founding a local or regional supplier is simply not viable.

Energy supply legislation is reserved to Westminster, so Scottish Government will be unable to directly change supply license regulations to enable local supply. However, at the UK level, some movement in this direction is already visible, with local supply legislation featuring in Labour party proposals before the 2019 election[90], while the Power for People campaign for a Local Electricity bill[91] received support from over 100 MPs, including a majority from the conservative party. If enacted, this would establish a 'right to local supply'. This was successfully re-introduced to the UK Parliament on the 10th June 2020, which was an important step to build further cross-party support for the measure.

Meanwhile some smaller, more incremental changes to legislation may emerge through legislative changes required for smart metering and the DSO transition. [92] Although not fundamentally changing supply relationships, this might lay foundations for local supply or otherwise expand the benefits of local balancing.

II. Current opportunities & limitations

"At the moment, barriers to innovation – like access to data, complexity of industry codes and the entrenched role of traditional suppliers within the energy system – mean that it can be difficult for market participants to bring beneficial, and potentially disruptive, propositions to market."[93]

OFGEM believes that the current supplier hub model may not be fit for purpose for energy consumers over the longer term and has embarked on a process of fundamental reform, albeit one which will be "iterative, and approached in phases".

A number of exemptions do exist within current legislation, allowing for direct 'license exempt' sale of electricity by generators to energy users, where no energy flows through the grid. This enables self-use or sale 'behind the meter', at a single site where energy is both generated and consumed, as well as energy sale over privately owned cables.

Provisions also exist for license exempt sale of modest quantities of electricity over short stretches of public grid, but these include a vague requirement for a 'shipping' contract with a licensed supplier to facilitate the sale, which to our knowledge has blocked any such arrangements in practice. The different composition of English housing stock mean that this problem has largely been ignored, but a successful model for tenement buildings could significantly increase the potential for renewable energy in Scotland's cities. This should include supporting trials to enable license exempt supply to multiple properties in a single stairwell, and close consideration when enacting the recommendations of the Working Group on Maintenance of Tenant Scheme Property.

Electricity generators in the UK therefore do not normally sell directly to customers, but to a supply company or broker, through PPAs. The price paid for energy will fluctuate depending on wholesale market prices, but may be fixed for a few years at a time at a price agreed by both parties.

Finally, because our current energy system was designed around a centralised grid, the spread of decentralised renewable technologies has created significant problems. The majority of Scottish distribution networks are now classed as 'constrained', with further connection of renewable generators now severely limited because these peripheral cables have not been designed to handle the variable two-way power flows created when intermittent generation is installed at the edges of the network.

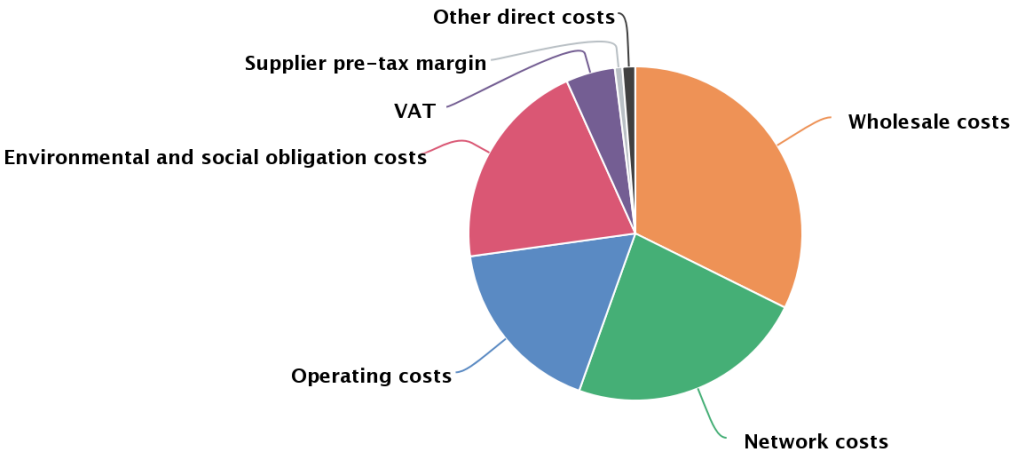
A consensus is emerging that a 'DSO' (Distribution System Operator) approach, based on localising and more actively managing power flows, will not only be the cheapest way to increase grid capacity, but could ultimately lead to a more efficient and resilient grid. This transition will require significant institutional and legislative change - with code revisions and pilot projects currently underway – but could create the context for local supply markets.

In a 2018 review,[94] Local Energy Markets (LEMs) were seen as a basis for coordinating the generation, supply, storage, transport and consumption of energy from decentralized energy resources – but much depends on how the DSO transition rolls out. The review emphasises the importance of LEMs being able to communicate effectively with grid operation systems; fully use smart metering & responsive tariffs; ensure cyber security and consumer protection; interact effectively with the balancing and settlement process; enable 'revenue stacking' by LEM participants; and ensure the market is fair and competitive.

Scottish Power Energy Networks (SPEN) have published their DSO Transition Strategy,[95] which sets out how they intend to deliver their role as a "neutral facilitator of an open and inclusive distributed energy market". This sets out 4 main drivers of change: Decarbonisation, Decentralisation, Democratisation and Digitalisation. SPEN sees the 'democratisation' driver arising from the active domestic consumer, empowered by smart meters, tech, storage and aggregation, reducing barriers for consumer participation in the energy system.

III. The potential value of local supply

The potential value of direct energy sale is significant. As visible from the breakdown of a domestic energy bill shown in the graph below, the price paid by consumers for electricity bought from the national grid is around three times the 'wholesale cost' of energy paid to generators.



Source: OFGEM 2020: https://www.ofgem.gov.uk/data-portal/breakdown-electricity-bill

The difference comes from the costs and profit margins of grid operators and energy supply companies, alongside that of social and environmental taxes applied via electricity bills.

This difference forms the basis of the business case for rooftop solar PV, where 'behind the meter' local supply allows many of the network and supplier costs to be removed, enabling both the generator and end user to receive better prices where high levels of local use can be achieved. This cost advantage does not simply come from a quirk of the market, but is based on a real value delivered by local supply in reducing the use of national grid transmission and balancing infrastructure by incentivising shorter and more balanced local power flows.

However, the value of local energy supply for community energy is not just about the chance of a better sale price. Direct local supply would boost economic resilience by insulating both generator and energy user from global price volatility; could form part of a powerful local identity about self-sufficiency and sustainable development; and the availability of cheap renewable power for local use could be a stepping stone for the development of local industry.

These benefits appear more important than ever from the perspective of a COVID-19 crisis which has exposed Scotland's vulnerability to global supply chains and triggered extreme energy price volatility, while alternative avenues for jobs and economic growth will be essential for our rural areas where travel restrictions have threatened the viability of a tourism-based economy.

Other than the regulatory barriers to local supply, there are also some issues around how local supply projects would contribute to wider network costs; and how the risk of inequitable benefits (i.e. only those benefiting being only those with a local supply project, sharing wider network costs) can be addressed. In its review of Local Energy[96] OFGEM saw improving consumer outcomes as the basis for the viability of local energy projects and suggested that this would best be served through all consumers being part of an integrated system which "*allows for diversity of size and scope*". A system of local trading and balancing based on price signals, or local market arrangements, was seen as an interesting solution, but this would depend on having the technical capability for local trading in place. As referred to above, it could also assist national grid balancing.

IV. Local and national supply at the same time?

With SMETS meters it is technically possible for a consumer to buy & sell electricity from/to multiple suppliers. Such 'meter splitting' opens the possibility of consumers accessing local

supplies directly when the price is suitable – or if they prefer to – and national supplies at other times.

At present, the Balancing & Settlement Code does not facilitate this, although a proposal to allow it is currently being assessed by Elexon.[97] The Proposer believes that the existing arrangements don't adequately facilitate the development of local energy markets and supply innovation, and effectively mean there is a monopoly of one Party, the 'default' or 'Primary' Supplier, over a consumer's energy volumes behind a Settlement Meter at any given time, restricting competition and innovation.

If approved, this would allow multiple suppliers to compete for the supply or export of electricity through a single Meter, without needing to establish an agreement between all of them – which is currently the case – and which is considered to be restricted.

A mechanism to sell energy locally would help encourage more people to install PV by improving the business case, and could also help local system balancing.

V. Local supply – experience to date

There have been a number pilot projects which have been trialing a range of alternative arrangements for more direct use of local energy outside of licensed supply relationships. They all fall into the 'proof of concept' or 'development' phase referred to in OFGEM's Local Energy paper (referred to above) and are not aligned with current market and regulatory arrangements.

Smart meters and local balancing zones

A number of projects across the UK have utilised emerging smart meter technology to push the boundaries of what is feasible through current supply license exemptions.

- Westminster City Homes, a London RSL, created the initial model for this approach by converting their legacy 'heat with rent' supply to tenants, based on a single meter at the base of the building, into a virtual metering point aggregating the readings of advanced meters in all properties. Since then a number of other London RSLs have adopted this metering arrangement, and Repowering have trialed sharing the benefits of 'behind the meter' supply of onsite solar PV across multiple tenants within a single virtual meter point
- Tower Power in Edinburgh and Energy Local in Bethesda, Wales, have explored widening such a virtual metering zone, to connect multiple buildings behind the same primary transformer, creating the infrastructure required for peer to peer energy trading and enabling local direct supply at times when local renewable energy generators are operational. Energy Local's model involves the establishment of Energy Local Clubs to invest in installations (e.g. PV panels) and then, via a licensed supplier, be charged at a lower rate for power from the installations when they are generating – creating the first local energy markets.

These projects show the potential of harnessing smart metering technology for local supply, and avenues for taking action forwards within existing regulations.

Successful models for supply to multiple premises within a single building could have far reaching benefits if applied, for example, to tenement buildings in Scotland. However, uncertainty over the fair division of use of network charges, and the stipulations within current legislation for 'shipping' by a licensed supply partner (who may have incentive to participate) have introduced significant complications which so far have prevented a replicable model emerging for wider local balancing zones.

VI. Incentivising local supply – Community Contracts for Difference?

Large-scale renewable generators can benefit from a Contract for Difference (CfD) with the Low Carbon Contracts Company (LCCC), a government agency. CFDs are designed to provide a minimum price guarantee to large-scale renewable energy developers, via an agreed 'strike price' and thereby enable financing. A generator with a CfD will still have a PPA, but if power prices fall below the strike price the LCC agrees to top up the difference. In return, when power prices are above the strike price the generator must pay the excess to the LCCC. CFDs are set via an auction in which generators bid the lowest strike price they are prepared to accept and CfDs are awarded to the lowest bidders, up to a pre-determined MW capacity of generators.

As subsidies are removed, PPA arrangements have become increasingly crucial for the development of new renewables projects. At the same time, various innovative PPA arrangements have emerged aiming for a more direct relationship between individual generators and loads:

- Sleeving contracts, facilitated by a licensed supplier, allow a generator and load to agree a bespoke price for energy generation that matches use in real time. Such a contract doesn't reduce energy costs (in fact, netting generation and energy use adds a small new overhead), so is mainly used by companies seeking marketing opportunities. Good Energy's Selectricity tool has automated the process, setting up a dating site offering to match prospective generators and loads
- Communities for Renewables CIC, in partnership with Devon Council and Devon Energy Network, are developing an innovative 'community CfD'. This is based on the synthetic PPAs already used by large energy users and some local authorities to insure against long term price volatility.[98] The innovation comes through the recognition by local government that such agreements are a valuable asset for the generation partner (and often a precondition to financial close). Therefore, preferentially contracting with community owned generation provides a route to market for that generator and can be a very cost-efficient way to leverage the multiplier effect of an asset locked community generator which will invest revenues back into the local community over the coming years.

While coronavirus demands a step change in government spending to stimulate economic recovery, such spending does not come free and must still be carefully directed to maximise the return. 'Preston Model' practices, leveraging local and national government procurement spending may be one of the most cost-effective ways to promote local industry, and the Community CfD provides an innovative option for applying this to community energy. Moreover, as a financial instrument rather than a purchase agreement, this approach avoids many state aid complications.

2.2.2 The community role in the local supply of heat

(a) Development of heat networks

In Scotland, heat makes up more than half of the total energy used and is the largest single source of our carbon emissions (47%). The Scottish Government acknowledges that heat networks using low carbon heat sources will play a significant role in decarbonising heat by 2045 and meeting future heat demand at an affordable cost.

There are currently 113 heat networks in Scotland which supply approximately 1% of Scotland's heat demand.[99] The situation across the UK is not much better with only 2% of heat demand being met by heat networks. The Committee on Climate Change recommendation is that up to

18% of heat demand be met by heat networks by 2050 and both the UK and Scottish governments have announced their commitment to support this growth.[100] Delivering heat more efficiently via networks is part of the SG's broader programme to decarbonise heat which also includes improving the energy efficiency of buildings.

The main challenges to wide spread adoption to date have been a lack of consumer confidence in what is still an emerging solution, and easing demand-risk concerns among potential investors. Public awareness is also very low with only 2 in 10 households having ever heard of heat networks.[101] This is symptomatic of a broader lack of awareness around low carbon heat technologies in general. While heat networks have flourished in Europe, particularly in northern European countries, it has been suggested that the UK's fragmented heat market, lack of regulation and low rates of return for building and operating heat networks are the reasons why the UK has not followed suit. An extensive national gas grid and low gas prices, has also provided little incentive for either developers or consumers to consider different heating options.[102]

(b) Economic & social benefits of heat networks

In principal there are a number of important benefits:

- Flexible heat - heat networks can be used with large scale thermal storage systems. The disconnection of heat production from heat use allows networks to offer balancing services to the grid.[103]
- Local economies can be strengthened - civil engineering (the digging of trenches and the laying of pipes) accounts for roughly 40% of a network's capital costs, often using skills that are sourced locally.[104]
- Consumer savings - heat network customers pay, on average, £100 less annually than gas customers, even before the cost of purchasing and maintaining a gas boiler is taken into account.[105]
- Long term price stability - heat network operators which use a mix of heat sources are less dependent on single fuel price variability
- Heat networks connecting more than one building can remove the need for individual plant rooms and can free up space in buildings which would traditionally be needed to house equipment – this can be utilised for other purposes, such as cycle storage or communal social spaces.

(c) Legal and incentive context

The Scottish Government's Heat Networks (Scotland) Bill aims to encourage greater deployment of heat networks in Scotland, de-risk investment and boost consumer confidence in this technology in order to help Scotland decarbonise its heat supply and contribute to climate change targets.

The key provisions are as follows:

- The Bill provides that all Heat Network operators must hold a Heat Network Licence issued by a Licensing Authority to be appointed under secondary legislation. This is designed to ensure that heat networks are developed according to a set standard. Licence holders will be given the same powers as other utility providers in relation to the acquisition of land, wayleaves and access to land
- A duty will be placed on local authorities to designate Heat Network Zones which they can opt to undertake themselves in the first instance, or can request that Scottish Ministers designate a Heat Network Zone on their behalf if they do not have the internal resource or capacity

- Heat Network Zone Permits will be issued following a competitive process which will effectively give the permit holder monopoly status within a given Heat Network Zone. These exclusive zones are hoped to provide assurances around demand and increase investor confidence (although it should be noted that potential customers within these zones will not be compelled to connect to the network).

In terms of financial incentives to support this regulatory framework, the situation is still unclear. The Scottish Government's draft budget for 2020/2021 announced a £120m "Heat Transition Deal", including a £50m "Heat Networks Early Adopter Challenge Fund" for local authorities, however this has been postponed due to the Covid-19 lockdown. This will no doubt be implemented at some point, perhaps as part of the SG's broader 'green' recovery strategy, but sustained financial support will be required in the longer term in the absence of taxes or limits on the use of fossil-fuel heating in existing buildings.

Currently, the following financial support mechanisms are in place to support Heat Network projects in Scotland:

- The District Heating Loan Fund, which provides low rate, unsecured loans of up to £1,000,000
- Although not designed to target heat network projects exclusively, the Energy Investment Fund could be accessed by heat network projects
- The recently announced Low Carbon Energy Project Development Funding (part of the Low Carbon Infrastructure Transition Programme) – again not exclusively targeting heat network projects
- The Scottish Low Carbon Heat Fund which provides financial support for 50% of total eligible costs of a capital project up to £10m, but is now closed to new applications.

At a UK level, subsidies for renewable heat has been delivered through the Renewable Heat Incentive (RHI) scheme, however this is due to close to new applications in March 2021 (for non-domestic RHI) and March 2022 (for Domestic RHI). The UK government's proposed replacement schemes i.e. the Green Gas Support Scheme and the Clean Heat Grant Scheme do not provide support for heat networks, however, a £320m capital fund for heat networks in England and Wales - the Heat Network Investment Program - is seeking to leverage over £1bn of investment over the next five years.

(d) Community role

There are very few community-owned and operated heat networks in Scotland. The £600,000 Balgair Castle Holiday Park biomass district heating scheme, developed and operated by the Fintry Development Trust, was completed in 2015 and supplies 26 residential homes.[106] The Comrie Development Trust have also installed a biomass district heating scheme to supply restored buildings (Nissan huts) at its Cultybraggan site. There is one other project, the Iona Heat Network – based on ground source heat pumps- at an advanced stage of planning on the Island of Iona.

There are a number of reasons why there are so few community heat network projects. These include the high capital costs involved and the difficulty securing investment due to the perceived 'demand risk'. It is challenging for community groups to sign up sufficient numbers of customers to a network to justify the installation – this is particularly true in more rural areas where heat demand density is lower and the business case can be less attractive. Urbans areas are no less challenging – the heat demand may be generally higher but investors will tend to prefer long-term supply agreements to ensure a return on their investment.

For these reasons, municipal-led heat networks drove much of the heat network development in countries like Denmark, Sweden and Germany where heat networks are much more common than the UK. This is because the public sector can provide the anchor-load demand and commit to long term supply agreements which are crucial to guarantee revenue streams. Local authorities will therefore play a key role if Scotland is to emulate this success.

However, as previously noted, public awareness of and confidence in heat networks is low and community groups are ideally placed to work alongside LAs to build trust in, and awareness of, both heat networks and low carbon heat technologies in general.

2.2.3 The community role in supply & use of hydrogen

The Scottish Government is currently assessing the potential to use hydrogen as an energy vector as part of its Energy Strategy[107], following the appointment of Arup in March 2020 to carry out the work. The intention was to issue a policy statement and action plan on hydrogen later in 2020, but this may be delayed by the pandemic.

As a result of the impact of the global recession arising from the pandemic, the Scottish Government has announced a £62m funding package to position the NE of Scotland as a 'Hydrogen Model Region', designed to support the production of hydrogen from natural gas and create an Aberdeen 'Hydrogen Hub', designed to use green hydrogen in the transport sector.

At first sight community-led hydrogen production seems unlikely but Community Energy Scotland, with its community partners in Orkney, has been at the forefront of piloting the generation and use of hydrogen using local renewable energy which would otherwise have been curtailed owing to grid constraints. CES' 'Surf 'n' Turf project and the interlinked BIG HIT project are pioneering the development of community-based hydrogen production to test a local supply business model faced with the need to decarbonise heating and transport and overcome curtailment limits on local renewable generation.

The Huntly and District Development Trust has just completed an initial feasibility study in to the generation of hydrogen at its Greenmyres wind turbine site. The study indicates that the most likely demand for green hydrogen would be from transport in the region – given that the area is on the gas grid - and this potential is set to be further explored.[108]

In the meantime, the SG is supporting a feasibility study into converting the islanded Stornoway gas grid to hydrogen based on the development of a new large-scale electrolyser, following on from experience with the award-winning Outer Hebrides Local Energy Hub project. This would entail a much larger and more complex community-based system, but, similar to the Orkney projects, provide a basis for both overcoming generation constraints on the local grid decarbonising heating and transport.

Currently, local hydrogen generation by community groups is not a viable business proposition and is technically challenging. Surf-n-Turf was only able proceed with the support of innovation funding.

Also, public knowledge on hydrogen is low and there are "*significant communications and education challenges to overcome*" according to a 2018 study commissioned by the Committee on Climate Change.[109] Hydrogen systems (along with heat pumps) were not seen by those surveyed to offer additional consumer benefits when compared with natural gas.

However, it seems likely that hydrogen generation and use will increase if its acceptability can be increased. So, community groups have the potential to play an important role in a transition to greater hydrogen use through:

- The supply of power to electrolysers in grid constrained areas
- Awareness raising on the use of hydrogen for transport, heating and cooking (through gas grids and tanked supply)
- Demonstration of hydrogen heating systems in community buildings off the gas grid.

2.3 Wider factor in community energy demand: (b) aggregation and flexibility

2.3.1 The need for, and opportunity from, flexibility in the system

(a) The need for flexibility

The significance of flexibility of supply and demand has been made even clearer by the impact of the COVID-19 lockdown. Although the National Grid has held up well during the pandemic due to swift action to safeguard control rooms and cancellation of planned work to maximise system integrity, the significant drop in electricity demand has caused issues for the National Grid Electricity System Operator (NGESO).

This has meant they have had to hurriedly introduce two new mechanisms; under the GC0143 'Last Resort mechanism', NGESO can instruct the regional Distribution System Operators (DSOs) to disconnect embedded generation (i.e. generation not connected directly to, or having a contractual relationship with the transmission system operator), without compensation or 'constraint payments' for those affected. NGESO has also been developing a new flexibility marketplace for small generators – the "Optional Downward Flexibility Management" (ODFM) product. This will be a voluntary service for small scale renewable generators to receive payments from the ESO, if National Grid ask them to turn down or turn off their generation of electricity

The high renewables component and low demand, has been described as "*a postcard from the future*",[110] where our energy system has a much higher proportion of distributed, intermittent renewables generation, requiring a much higher level of flexibility in demand and supply.

NGESO already has direct contractual relationships under the Balancing Mechanism with many large transmission-connected generators, and as the percentage of our electricity supply coming from renewables has increased, annual constraint payments have also increased, with many windfarm operators paid multiple millions of pounds each year to temporarily disconnect or reduce generation. This is a regular source of press criticism against the industry; although constraint payments are paid to fossil- and nuclear-powered stations as well, renewable generators can be switched off much more quickly and cheaply than thermal power plants, which have far longer ramp-up and ramp-down times.

Having consumers ultimately foot the bill by paying the lowest-carbon generators to turn off during times of peak supply (and therefore often minimal or even negative wholesale pricing), does not make good sense in cost or carbon terms. Flexible Demand Side Response (DSR) mechanisms could help substantially alleviate these constraint payments, resulting in reduced consumer costs; a direct local linkage between local renewable supply and demand; reduced need for reinforcement of transmission lines in some areas; increased renewable output and resulting carbon savings; and assurance of the integrity of the National Grid at times of high renewable generation and low demand. This could have benefits for energy security in future times of national crisis.

(b) The opportunity

Whilst there are significant measures in place for flexibility services at the large plant scale, there are very few measures at the small scale & domestic level. This means that consumers or communities are currently mostly unable to benefit from, or contribute to, flexibility services.

Decentralisation of the energy system along with the introduction of smart meters, appliances, EVs, domestic batteries and other tech is creating an unparalleled opportunity for consumers to engage in the transition to low carbon and flexible energy system. For the first time, consumers and communities could help establish a system which rewards demand reduction and enable local supply arrangements in ways that contribute to its integrated operation.

Communities could be empowered through improved legislation and DSR mechanisms to provide a significant contribution to local and national balancing of the electricity system. Peer-to-peer trading would allow individuals to sell surplus energy from their PV arrays to their neighbours; community-owned renewable generators could sell directly to homes and businesses nearby without the need for private wires; and community aggregation platforms could act as trusted local intermediaries to leverage cumulative flexible demand, providing services to the ESO or DSO and sharing the benefits with those owning the flexible assets. The technology already exists for these actions.

(c) Unused potential

Electrification of heating and transportation will create challenges for the electricity system, but also significant opportunities. Electric vehicles, home battery systems, storage heaters and heat pumps all involve an element of energy storage and are often flexible in when they can be charged, which could be in response to market or grid operator signals.

The scale of unused domestic flexibility is growing. For example, there are currently 200,000 Ultra-Low Emission Vehicles registered in the UK[111] (a mix of plug-in hybrids and full electric vehicles). 95% of vehicles are unused 95% of the time[112], meaning that out of this total fleet, a significant proportion could be incentivised to be plugged in at any one time, awaiting flexible charging.

Assuming a modest 30kWh as an average EV battery size, and 50% of the UK fleet of ULEVS being available to charge at any one point, with an average state of charge of 50%, that means that even conservatively there is already a typical energy storage capacity of 1.5GWh available most days in the UK at present. Most ULEVs have an on-board charger of 3.3 or 7kW capacity; assuming an average of 5kW, with 50% of the UK fleet deployed, this could within seconds bring on an additional demand of 500MW, allowing several large windfarms to remain connected instead of being constrained off by NGESO. National Grid has projected that the current figure of 200,000 could reach 2.7-10.6 million ULEVs by 2030, and 36 million by 2040[113].

2.3.2 Issues with community and domestic engagement in the balancing market

At the domestic level, there are limited options at present for householders, small businesses or communities to fully engage in the energy market. Those with solar PV installed will typically spill a high percentage of generation to the grid, and may not have any exports metered, leading to unrepresentative export payments. The payments they do receive for exports will typically only be around 1/3 of import prices, and there is no mechanism for micro-generators to sell their power directly and locally. This means they are disproportionately penalized for system charges, even though their use of the distribution system is very minimal.

NGESO has around 15 different mechanisms it uses to balance supply and demand on the UK National Grid at present. In the future, as Distribution Network Operators transition to Distribution System Operators, more of the balancing roles will be undertaken at a regional rather than national level. There are commercial opportunities for owners of flexible demand through existing mechanisms like the Capacity Market and Short Term Operating Reserve, but in many cases these still have a minimum requirement of several megawatts in order to participate. This is currently a barrier to entry for community groups, and certainly for domestic customers.

The Capacity Market in particular has also faced criticism over whether it is well aligned with decarbonisation ambitions,[114] and has also faced legal challenges over the short contracts offered to DSR providers compared to old existing thermal plants.

2.3.3 Aggregation

Given that most of the balancing mechanisms are designed to operate at scale, participation from smaller generators, domestic consumers, and businesses with small flexible loads can only be through aggregators, who must be able to control the loads or generation remotely and act as the party contracting with the DSO/ESO. The problem is that aggregating a large number of small sites is much more complex than for a small number of large sites.

Very few consumers currently participate in DSR (other than through the historical timed Economy 7 heating tariff), despite a very high proportion of heating coming from electric storage heaters, which could readily be fitted with smart controls. Likewise, there are relatively few home battery systems or vehicle-to-grid chargers installed at present, and not all home EV chargers are DSR-capable.

The pilot 'Flexible Power Community' project[115] envisaged a federated community aggregator service which would offer technical expertise, ICT and energy system knowledge to community groups who could contribute flexible generation or load into an aggregation platform, which would then interact with the grid. It considered some of the human aspects influencing the potential for aggregating domestic loads and developed a prototype digital aggregation platform.

One key finding was that a majority of participants considered lowering their carbon footprint as a priority, with a third considering that a 'flexibility' reward of £100 would be sufficient.

2.3.4 Local matching of demand and supply

(a) The Mull ACCESS Project

The ACCESS project on Mull and Iona demonstrated the potential for matching of demand and supply, or local balancing, by using smart controls on storage heaters and electric boilers to turn on these devices at times of high output from a local community hydro. This simulated a way of overcoming a local distribution constraint, but it could equally be applied to transmission constraints, or for national system balancing. In this funded trial, participants with smart heaters installed received a rebate from their energy supplier, one of the project partners, for any energy consumed during test periods.

(b) Obstacles to local matching

During the ACCESS project, ideally the community hydro would have sold energy to local consumers with smart heaters throughout Mull and Iona through the DNO's network. In this situation, the community hydro would have benefited from reduced grid curtailment, and

consumers would have benefited from enduring lower energy prices (potentially with dynamic pricing recorded by Smart Meters, allowing for much-reduced pricing at times of low demand and high hydro output, when the hydro would otherwise have been curtailed). However, due to the rules around supply licensing, this is not currently practicable. There is a general recognition that current regulation does not cater for the needs of community scale energy or local supply, which has led to a number of initiatives to introduce new policy measures to support this approach.

Peer-to-peer (P2P) trading is an extension of this idea. This would allow small businesses and households to become 'prosumers' and micro-suppliers themselves; a home with a PV array could sell surplus energy they generate to a neighbour down the road via the DNO network, instead of simply spilling or selling this power back to their supplier. Ideally, P2P trading would include a recognition of the benefits this would offer for local balancing by avoiding much of the Use of System charges that would normally be applied in this kind of situation; this would then result in mutually advantageous prices for those both selling and buying locally.

Greater support is also required to lower the barriers to entry for participation in aggregated flexibility markets. In the past, only very large (industrial) consumers and transmission-connected generators have been able to participate in the Capacity Market to bring generation or load on or off as required. Under the new ODFM proposals, generators as small as 1MW can be paid to participate, which is a welcome step, but still too large to apply to most community generators. Likewise, it is difficult for aggregators to participate at small scales, or for small businesses or households to provide any grid services directly.

2.4 Wider factors in community energy demand: transport

"..many people have also seen glimpses of healthier, greener, more peaceful and friendly streets, cities, towns and villages: how things can be if we reduce the dominance of the private car".[116]

2.4.1 Reset hyper-mobility?

Very significant changes have occurred to transport patterns worldwide during the Coronavirus pandemic, with direct impacts on CO_2 emissions and air quality. A recent study in the Nature journal found that daily global CO_2 emissions decreased by 17% by early April 2020 compared to the same period in 2019, of which just under half was as a result of changes in surface travel.[117]

Lockdown has largely curtailed our hyper-mobility and people have come to use and value local services like corner shops and local veg box deliveries and community transport far more than in the past few decades. Necessity has proven that many people can successfully work from home, and some will find that this suits them better, avoiding the stress and cost of a daily commute.

Meanwhile, community groups have taken on or expanded key roles in distributing community benefit funds to those in need; helping with shopping deliveries for the vulnerable; offering befriending and counselling services for those living alone; and many other key and area-specific roles which fall in between the gaps of local and national government provision.

The added sense of community and unexpected benefits of enforced localisation provide an opportunity to counter the mobility trend which has resulted in services being distant and dislocated from their users. Rather than settlements being designed around the needs of traffic, there is an opportunity now to drive greater localisation and a more sustainable approach to transport.

We could try to 'reset' our hyper-mobile lives by building on the renewed significance of local community life. There are important positive links to build on between community led energy measures and the development of better and more sustainable local transport options which also help to circulate funds in the community.

2.4.2 The likelihood of a bounce back

Despite the (literally) clear benefits in air quality visible in cities across the world, as well as the demonstrable reduction in carbon emissions, there is a significant risk that car ownership and use will increase relative to pre-pandemic conditions once lockdown is eased, due to fears over contracting the virus when in close quarters with other commuters on public transport.

One survey found that 56% of driving licence holders who currently don't own a vehicle are now considering getting one due to Coronavirus[118]. The UK Transport Secretary has advised that at present people should drive to work rather than use public transport, if walking or cycling is not an option.[119] This would have been a highly unlikely policy for any government to adopt just a few months ago. The problem may be compounded, at least in the short-term, by very low petrol and diesel prices resulting from the crash in global oil prices caused by the global lockdown.

Striving to have all services that people regularly require within a 20-minute radius of most homes will not only create much greater resilience in the event of future pandemics or national emergencies but could also help to counter this risk. It would reduce annual mileage (and associated financial and carbon costs) and make active travel a more realistic option when accessing these services.

2.4.3 Community energy & transport links

The main links are:

- The installation of community-owned EV charging stations
- Local supply to charging stations; 'behind the meter' arrangements, along with battery storage
- The development of EV car clubs available to all in a community (ideally charged via a community charge point)
- Community EV bus transport
- Bulk purchase of installation of domestic charge points
- e-bike bulk purchase & rental as part of an active travel plan

(a) EV charging stations

Public EV charging infrastructure in Scotland remains weak, despite much effort. The issues are most acute in rural areas, away from zones of high demand where commercial operators are likely to invest. Many rapid charging units have proven to be unreliable and the back-office IT and communication services provided by the operators of ChargePlace Scotland have been particularly poor. It is hoped that the retendering process underway for CPS at present will result in a more reliable service, but continued investment in new public charging infrastructure from both public and private funds remains vital, as this is a significant disincentive to prospective EV owners at present.

To date community groups have not played a major role in the development of the EV charging network in Scotland, with some notable exceptions. These include installations at community venues in the Uists at Claddach Kirkibost and Cothrom; [120] the pioneering Community Power

Orkney & Grid Smart Charging projects by the Rousay, Egilsay & Wyre Development Trust[121] (which demonstrated the viability of EVs in an island context); and the Isle of Hoy Development Trust (IoHDT), which is taking part in the Orkney ReFLEX project linking output from IoHDT's turbine to their EV charger. Huntly and District Development Trust is currently undertaking a feasibility assessment on an EV charging strategy for its area. In England and Wales, 30 community groups are planning low carbon transport projects, with a strong focus on EV infrastructure.[122]

(b) Local supply and energy storage at charging stations

Energy storage can play a number of useful roles at EV charging sites, particularly where rapid chargers are installed. Batteries can be used to 'trickle charge' on restricted connections to avoid grid upgrades, dumping higher rates of power into EVs when required. They can also charge up overnight on cheap tariffs to reduce import electricity costs, and can store electricity generated from on-site renewables until it is required for charging an EV. The Princes Street charging hub in Dundee is a great example, with second-life EV batteries now used in a static application to absorb energy from on-site solar canopies, and to discharge this into the fast and rapid chargers when required. Sites like this on key trunk routes could readily be scaled-up and co-sited with substantial community energy generation, sharing use of grid infrastructure and minimizing imports and exports. They could also provide grid services through large on-site batteries, further improving system resilience.

(c) EV Car Clubs

Car ownership has been increasing significantly in Scotland with at least 72% of households owning at least one car.[123] Car ownership is very ingrained in our culture, but 95% of vehicles are unused 95% of the time, which is a significant waste of resources, capital and parking space. One US study found that 50-60% of space in city centres is devoted to vehicles, and the proportion will be similarly substantial in Scotland. Meanwhile, at least 20% of households do not own a vehicle, a disproportionate number of these being in low income, ethnic minority and/or with long-term health or disability issues.

Car ownership and use is now an even more acute issue given the present need for social distancing, which can be problematic in cities with narrow pavements, as so much city space is devoted to cars[124].

Community car clubs can form part of the solution, offering multiple benefits in both urban and rural areas;

- Reduction in number of cars required, reducing parking congestion
- Reduction in number of families requiring a second car, saving on fixed running costs
- An opportunity for residents to experience the benefits of EVs without the high capital cost
- Higher utilisation rate for the vehicles; less capital and materials rusting away over time.

Community car clubs have already been operating successfully for some years in locations including Mallaig, South Ayrshire and Hawick, some of which use EVs. Encouraging the rollout of further EV car clubs will help further reduce car ownership, emissions and congestion. However, currently there is no targeted funding at present for community car clubs to set up local schemes or purchase vehicles.

(d) Community EV Bus Transport

There has been broad cross-party support at Westminster and Holyrood for policies to support the adoption of electric vehicles. This has resulted in a number of support measures from both Governments, in the form of loans and grants for vehicles and home/business charge points, and support for public charging facilities.

Policies to support (or indeed enforce) electrification of public transport have been less notable to date; electrification of rail networks has been stop/start and hindered by the significant infrastructure and rolling stock costs. As a result, most lines in Scotland are still served by diesel trains. Despite whole cities in China and Chile having switched to full-electric bus fleets, diesel is far and away the mainstay of Scottish bus routes, which have faced downward trends in usage, with a 10% fall in passengers in the past 5 years[125].

Despite long-term declines in bus usage, there will be insufficient buses in fleets to allow for social distancing whilst carrying pre-virus peak passenger loads (75-seaters will become ~20-seaters). There is also a real risk that declining passenger numbers may push local operators (who tend to service the more rural routes) out of business; this will further reduce local resilience and mobility, and will reduce opportunities for the unemployed in rural areas to find work outwith their immediate vicinity.

Diesel buses offer a very poor user experience at present; they are noisy, smelly and uncomfortable, with vibrations from the engine transmitted through the vehicle. E-buses by comparison are far quieter and smoother, offering a more relaxing and comfortable journey. However, regulations have mainly focused on ensuring bus fleets are upgraded to the Euro 6 emissions standards; a much more ambitious change is required to ensure operators move to zero-emission fleets, as quickly as possible.

Supporting and mandating the roll-out of electric buses (whether community-owned or through public or private operators) is going to be key. In terms of urban air quality, rural accessibility and impacts on areas of multiple deprivation, greening and strengthening bus services is vital, and likely more significant than electrification of rail services in terms of decarbonisation.

(e) Bulk purchase of charging infrastructure

In a similar manner to the community-buying options outlined for microgeneration and energy efficiency measures, community groups could play a role in organizing the installation of home charging infrastructure. This could take a number of forms:

i. *Community Buying Schemes*
In the simplest form, this could be a coordinated bulk 'deal' negotiated between a local installer and a community group for residents to benefit from. One limitation would be that the grants currently available for home charge point installations are only available to people who own or lease an EV, and they will need a charge point installed quickly after obtaining their vehicle; this means that unless there is also coordination over the local purchase of EVs over a short period of time, charge points probably wouldn't be installed in a large batch – instead more gradually as people acquire EVs. There would still be scope for cost savings though, and for the community group to offer independent technical advice on the best type of charge point to use, and where to install it.

ii. *Community partnerships with utilities and generators*
It would also be possible for community groups to offer a more complete, discounted package for home charge point installation, using units already equipped for DSR. This could involve collaboration with a national energy supplier to provide flexibility services,

with the homeowners benefiting from reduced tariffs in exchange for providing flexible charging services.

At a more local scale, the DSR-equipped units could be used to alleviate grid constraints for nearby generators, with the EV owners receiving a rebate from the community generator – an approach currently being trialed in Orkney as part of the SMILE project.

iii. Community installation companies and charging networks
It is possible to envisage well established groups setting up subsidiary installation companies, building up a local client and skills base then bulk purchasing & installing domestic charge points using local employees.

Community groups would also be well-placed to develop, install and operate local public charging networks, particularly for on-street charging to cater for those without off-street parking. Local authorities could work with community providers on this by providing access to street lighting circuits to minimise installation costs.

(f) e-bikes and Active Travel

Local community groups have an important role to play in the development of local active travel plans. Active travel measures to support cycling and walking have also been supported by the Scottish and UK governments, although usage is far lower than in most other European countries.[126]

Much of the focus on active travel has been in urban areas, where there is a greater prevalence of cycle lanes, and where journey distances are generally shorter, with workplaces, schools and facilities generally closer to homes, meaning walking or cycling is a more viable option.

Even pre-COVID, there was significant concern amongst transport planners on how road systems (especially in cities) would cope with public transport running at part-capacity and a mass transition to cars, contravening efforts in the past few decades to reduce car travel as much as possible. More broadly, even if 100% of new cars sold by 2035 are electric, it has been estimated that a total mileage reduction of 58% will be required in order for car CO_2 emissions to be in line with a 'well below 2°C' pathway[127] given the number of internal combustion vehicles that will still be on the road at that point.

There is therefore an urgent need not just for electrification of transport, but for a modal shift away from cars and towards walking, cycling, e-bikes and greener public transport.

Local authorities in Scotland are currently engaging in work to plan reassignment of road space for active travel, but it is likely that they will focus the vast majority of their attention on Scotland's cities and the very largest towns. Without town councils to design and implement changes, our medium-sized and smaller settlements face a real risk of being left behind.

In 2018, a survey found that 57% of Scottish adults didn't have a bike. Along with poor weather and limitations on load-carrying capacity, safety concerns are a major disincentive; 27% of respondents gave the lowest possible score on a scale for their perception of how safe it was for their children to cycle in their local area, with a majority expressing some concern. General safety fears, and specifically a lack of cycle lanes and traffic-free routes were amongst the most commonly cited concerns.

A recent study has identified that the most significant opportunities for e-bikes are in rural and suburban settings, as there are generally other existing low-carbon transport options within city centres.[128] This study recommends defining e-bikes as a strategically important mode of

transport within key policy initiatives. Growth in usage has already been substantial elsewhere; in the Netherlands, the majority of adult bikes sold are now e-bikes.[129] Active travel in rural areas has always been difficult to encourage given the greater distances involved, but e-bikes have the potential to significantly change mindsets, providing they are integrated with safer route measures.

Bearing in mind the areas where they are most likely to be used, the potential community linkage could be for community transport organisations to own and rent out a fleet of e-bikes to act as a 'last-mile' solution, helping to connect people to public transport hubs. This would need to be complemented by safety infrastructure measures, particularly in rural areas with faster roads, to ensure new users feel confident to use them.

Paths for All have highlighted a number of successful community-based projects[130] in both urban and rural areas, such as the Angus Cycle Hub and a guide to active travel in Glasgow published by South Seeds.

Community groups and local clubs are also well placed to deliver training to schools and workplaces on safe cycling and cycle repairs, as well as organising 'walking buses' or group cycles as an alternative to cars on the school run. Support for these kinds of initiative could help alleviate congestion at rush hour.

2.5 Strengthening capacity to act: awareness raising, familiarisation and assistance to vulnerable consumers

2.5.1 The need for active, informed consumers

The increasing penetration of distributed renewable energy in the UK energy system is driving the transition away from centralised energy generation and passive consumption toward a system which offers more choice over how people produce, consume and purchase the energy they need. Technological developments are rapid and are introducing a complexity into the energy system which is fundamentally changing consumer interactions now and in the future. Developments in power technology and home automation mean that the relationship between the customer and the way they manage their energy is now more fluid with choices around generating, storing and trading their own electricity as well as about energy management, efficiency, automation, monitoring and control.

In the simpler, supply-driven system of the past, there was little opportunity for consumers to take an active role, and a culture of passive consumption has meant that consumers are, on the most part, relatively disengaged from the energy sector and unaware of the ongoing changes. This lack of awareness and knowledge means that the majority of energy consumers are simply not equipped to take advantage of new opportunities such as flexibility services, energy co-operatives, peer-to-peer trading, aggregation, and virtual private wires. It also means that the potential for consumers to play a more active role in the development of a more decentralised and resilient system is not being met.

Raising awareness and educating people about emerging technological innovations and business models is even more important in a post-subsidy environment which has limited the range of revenue streams which are available. Community anchor organisation should be key players in this process.

2.5.2 The policy context for active engagement

The Scottish Government recently opened their local energy policy statement consultation (2019) which is part of a broader low-carbon transition strategy which prioritises an integrated system-wide approach that considers both the use and the supply of energy for heat, power and transport. The statement highlights the "consumer" as being central to local energy system development and emphasises a "*greater role for considering local solutions to meet local needs: ones which are more complex and operate using smarter technologies and new 'disruptive' business models*". There will also be a greater need to build strong partnerships and collaboration at a local level."[131]

The UK government also place the consumer at the heart of the energy transition as stated in Ofgem's "Upgrading Our Energy System - Smart Systems and Flexibility Plan" (2017) – "*we believe that consumers should be at the centre of the transition to a smart flexible energy system and, in line with this, consumer engagement and awareness-raising will be important. The Government recognises that vulnerable consumers may be less likely to benefit from smart appliances (whether because of lack of awareness, cost or inability to be flexible)*".[132]

Community groups will continue to play an important role in local energy development with early engagement considered key to the process, leading to well-informed, empowered, and active consumers. This shift in focus will be reflected by changes to the SG's CARES programme which will prioritise decarbonisation as the key driver of local energy development (as opposed to income generation) and the prioritisation of wider community engagement and raising awareness within this context.

2.5.3 Current Practice

There is a need for better access to clearer, more applicable information on the types of community-focused energy projects that can realistically be developed. This is particularly important given the knowledge gaps and financial constraints experienced in most communities. Local Energy Scotland delivers the Scottish Government's Community and Renewable Energy Scheme (CARES) which supports the development of locally-owned renewable energy projects by way of grant and loan funding and an online database of project development toolkits. Projects supported with public funds require all case studies to be published on both the Scottish Government and Local Energy Scotland websites in order to share learnings, build on successes and sharing the lessons from those that failed.

Research has shown that while government support (whether financial or in-kind) is important, the ability to exploit this support is highly variable and community groups who can call upon members with time, knowledge, expertise and connections are particularly well placed to take advantage and get projects of the ground.[133] This is backed up by the UK government's own research which found that lack of capacity, time, skills and knowledge are key barriers to community energy group development.[134]

While the CARES team do offer advice and support via a network of development officers across Scotland, this tends to be limited to technical support for already conceived renewable energy project ideas. However, there is little government effort or funding for the equally vital element of building collective community and consumer engagement in local smart energy systems projects (particularly for vulnerable consumers), and no government support to navigate through the complexities of the energy system changes and the drivers which are shaping the transition.

Organisations such as Energy Action Scotland and Green Skills Scotland offer some accredited, training courses focusing on domestic energy efficiency and energy advice, however these are

geared towards those currently employed as energy advisers or those looking to become energy advisers and don't explicitly address the opportunities and challenges of the smart energy transition.

A new CARES funding stream was launched in May 2019 – the Improving Consumer Outcomes Fund – to encourage innovative projects aiming to develop new approaches to help deliver fair and inclusive access for consumers in vulnerable situations. The fund cites approaches such as peer-to-peer energy 'gifting' as an example of such an approach and is a welcome financial support, particularly because vulnerable consumers stand to benefit most from a smart energy system but are least likely to because of the high cost of smart technologies or because they don't understand the opportunities. As with the wider CARES programme, however, this does not address the lack of capacity and knowledge around these types of solutions. If we are to encourage people to think innovatively about these issues, then a fundamental understanding of the context within which these approaches will operate is essential.

2.5.4 Examples of community action so far

If energy resilience is to be achieved, particularly in deprived communities, then there needs to be a fundamental shift away from imposing energy interventions on local people toward an approach which helps them to understand their relationship with energy and how they might benefit. Most community interventions in deprived areas focus on simple activities which prioritise material needs particularly around reducing energy bills, and while this is important, much of the activity ends here. This is often a resource issue, as most funding programmes do not accommodate community energy activities which prioritise embedded, long-term engagement.

Community Energy Scotland's Community Energy Futures pilot programme is the only structured programme of its kind which is currently supporting community groups across Scotland to understand the changes that are coming in the energy system and to identify the opportunities and challenges these might bring. This innovative capacity building programme supports groups to develop specific energy-related project ideas with their local community through a combination of workshop sessions and a tailored package of one-to-one support for each participating organisation. It also aims to facilitate the development of a peer group of community-led low carbon local energy systems projects which will deliver more coordinated community action on reducing carbon emissions at scale.

Due to a lack of core funding and a reliance on short-term grants, CEF participation has been limited to 16 community groups thus far, but a national rollout would significantly accelerate the shift toward more engaged, knowledgeable and confident community organisations with a solid understanding of how the energy system is changing, how these changes can be exploited for local benefit, and a clearer understanding of local energy-related priorities.

2.5.5 Potential role & how we make it happen

At present the focus is on investing in the technical side of enabling smart energy systems which, while important, does not address the equally vital element of behavioural change and engagement i.e. building community and consumer knowledge and enabling consumer engagement. There has been a sustained lack of action to inform consumers of what changes are happening, why they are happening or what the cost implications are, or could be, for them.

It has been noted that employee and knowledge capacity is particularly critical given the degree, and speed, of learning that is taking place about decentralised energy systems. This applies to

community anchor organisations on the ground but also highlights the need to ensure that local authorities have access to specialist staff and knowledge so that they are in a position to work alongside community groups and help drive and co-ordinate knowledge sharing locally.[135]

Partnering with local organisations and support from stakeholders such as local authorities have been identified as key factors in building the capacity and capability of community energy projects.[136]

Local energy planning is a key area which provides opportunities for local authorities and community anchor organisations to collaborate for mutual benefit. Building community resilience requires approaches that build on local knowledge to reflect the characteristics of local communities, their different risk environments, and local priorities.

The wider benefits of developing local area energy plans are:

- Greater collaboration between stakeholders which could act as a catalyst for future partnerships
- More local employment opportunities could become available whether temporary construction jobs or permanent roles for on-going management and maintenance works throughout the lifetime of the installation
- Greater participation of communities and individuals in the wider-energy system

To support and enable community organisations to develop and deliver community energy projects we need to:

- Raise awareness of the opportunities of community energy and increase the appetite to develop community energy projects
- Build capacity, skills and knowledge within communities to develop and deliver community energy projects
- Provide peer support and the sharing of knowledge, skills and expertise, for emerging projects through community energy experts and enthusiasts

2.5.6 Obstacles & Issues

- Energy planning is not an easy topic to engage the community in and getting community engagement right is a key, long-term commitment
- Building capacity within community anchor organisations to enable project development is challenging because resources are not always available due to P/T or voluntary working practices
- There are significant barriers to the replication of existing local energy projects and systems in Scotland related to knowledge sharing and finding more information on the lessons learnt from previous projects.
- Continual digitalisation of the energy system means that consumer engagement can often involve technical, complex issues which must be put across in an engaging and meaningful way

Part 3. Helping community-led energy action to expand its scope and scale

3.1 Strategy

Community-led energy action has the potential to play a much more significant role in the establishment of a more flexible, localised and low carbon energy system. Community-based groups are one of the best routes to help drive the large-scale changes in behaviour, consumption and lifestyles necessary, owing to their ability to work at a human scale, finely tuned to the local situation.

Supporting community-based groups in this work will also contribute towards building stronger, more equal and more resilient communities.

However, it's important not to over-romanticise the current capability of community anchor groups, which often depend heavily on voluntary commitment which can change or become 'burned out' and can be dependent on short-term finding arrangements. Some groups are well established and financially secure (notably those with significant land, building or renewable energy assets) whereas some are not. Some areas have strong coverage, others do not.

In Scotland, the motivation behind community energy to date has very largely been driven by a desire to strengthen the things that make a community work, such as the quality & viability of community centres; and generating funds to allow investment in local development activities, local jobs and services – all the things that build community cohesion. There has also been a strong and increasing desire to decarbonise. Whilst very few projects have been driven by personal financial gain, the difficultly in developing a financially viable generation project in the absence of capital grants, FiTs or ROCs means few community groups consider that the effort required to take a project forward is worthwhile.

A strategy is now needed which rewards communities for their role in reducing energy demand, increasing flexibility and developing local supply options. It needs to place more significance on their role in the energy transition. It needs measures that are attuned to their needs and characteristics and takes account of their support requirements and gaps in coverage. Pilot projects, general support measures, policy and regulatory measures, capacity-building and geographically defined approaches all have a part to play in this strategy.

It's also important to recognize, cherish and support the scale of voluntary commitment which is often involved - and help ensure that people feel it has been worthwhile and not taken for granted.

The Scottish Government has previously consulted on a Local Energy Policy Statement, which was a commitment in its previously published Energy Strategy. We believe that a new, broader-ranging National Community Energy Plan is now required.

We summarise below the measures that should be considered and which we believe are likely to have the greatest positive impact in unlocking the potential of the sector to play a decisive role in the energy transition.

3.2 Recommendations: supporting community-led energy action on energy demand

3.2.1 Local Energy Innovation Zones

Many of the recommendations in this paper could be developed and tested within designated areas of high renewable resource and severe grid constraint (for example the Western Isles and Dumfries). Local Energy Innovation Zones could also be used to trial new regulatory arrangements in an Ofgem 'sandbox'. In this way, Scottish Government could provide local economic stimulus at the same time as building momentum for wider regulatory change via positive examples.

3.2.2. Energy Demand Reduction

Communities and the private sector have delivered transformational change in electricity generation but the emphasis now needs to shift toward reducing energy demand. We must continue to build upon the successes within the social rented sector and mirror this success by scaling up and rolling out energy efficiency improvements in 'able to pay' households i.e. owner occupier/private rentals as well as businesses. This could be achieved through the following:

- **A Community Energy Demand Reduction Incentive** that, if set correctly, could stimulate creative approaches to demand reduction. A pilot programme, targeting community anchor organisations across several different geographical areas could be developed by working groups of interested parties and linked specialists, and could consider the method & amount of payment, the basis for assessing demand reduction and the time period over which it would apply.
- **Implementation of a large-scale, community-led bulk procurement and energy efficiency retrofitting scheme** employing trained, local contractors and utilising trusted community anchor organisations to engage, lead and focus on recruitment of vulnerable and 'able to pay' households. A portfolio of area projects, aiming to test a range of approaches and bringing together community organisations able to undertake such measures could result in a step-change in impact.
- **A Scottish Government review of existing Energy Efficient Scotland provision** for homes and businesses offered via HES and others in order to improve clarity and strengthen integration with local community hubs; open up eligibility as far as possible; have consistent offerings across the country whilst still recognising that particular measures may be required in certain regions; remove barriers to entry for small, experienced local contractors; and ensure that community groups are empowered to assist residents in their areas with the application, assessment and installation processes as well as bulk procurement schemes.
- **Private landlords should be required to bring tenanted properties up to a certain energy efficiency standard** to protect tenants from cold, expensive-to-heat homes. This could involve requiring that homes are brought up to at least EPC level C when they become vacant before they are let again. Some legislation does already exist with similar targets, but these are not ambitious enough, only requiring EPC level D by 2025.[176]

3.2.2. Local Supply

Unlike community generation, local supply is currently not feasible because UK legislation does not recognise a 'local' level and powers to change this are not devolved to Scotland. This prevents action towards enabling flexibility, de-constraining distribution networks, and adds costs

and delays to decarbonisation. Local load matching on distribution networks behind grid connection points and behind the meter supply have already been demonstrated to be feasible. The following measures should be considered to address these issues:

- **Support the case for a right to local supply:** the costs and complexity of developing local supply arrangements needs to be directly addressed through legislation, and the growing 'Power for People' campaign, which seeks to achieve this, needs the support of all interested parties. The Scottish Government should lobby for UK level legislative changes but can also take action now to support emerging solutions, particularly through procurement policy and local supply trials.
- **Split Metering** would enable the development of a local supply market which could be integrated with the national supply market
- **Review of the scope for a 'Community CfD' in Scotland:** we need to find ways to effectively incentivize local supply and leveraging of procurement spending has significant potential in many aspects of a green recovery. A community CfD promises significant multiplier bonuses from relatively modest action, and falls well within the devolved powers of Scottish Parliament. It will be crucial to engage and learn from work already done in Devon, and to develop template contracts deliverable by existing brokers alongside the Energy Framework Agreement
- **Develop solutions to unlock PV on tenement buildings:** the different composition of English housing stock mean that this problem has largely been ignored, but a successful model for tenement buildings could significantly increase the potential for renewable energy in Scotland's cities. This should include supporting trials to enable license exempt supply to multiple properties in a single stairwell, and close consideration when enacting the recommendations of the Working Group on Maintenance of Tenant Scheme Property.
- **Load development in constrained grid areas through fossil fuel substitution**: pilot projects in Orkney have shown that it is technically feasible to direct curtailed local renewable energy generation into heating appliances. This an important way of both addressing carbon reduction, fuel poverty and the retention of value from generation in the local economy. This now needs to be expanded to other areas such as the Western Isles.
- **Vacant and derelict land scope for local supply:** a strategic assessment of the scope for renewables development on vacant and derelict land close to communities would be particularly useful to input to consideration of local supply to EV charge points and perhaps wider opportunities for local supply. This should be undertaken in a way which is aligned with the Scottish Land Commission's derelict and vacant land work.[177]
- **Develop a more supportive regulatory framework for community Demand Side Response and local sale provision:**
  - The Capacity Market and other balancing mechanisms such as ODFM should be reviewed to lower the barriers to entry for community-scale generation and load; 100kW could be a more appropriate minimum capacity to enable more local and widespread participation.
  - DSR contracts offered under the Capacity Market and other flexibility mechanisms should be long-term (10-15 years) to match those offered for generation, and to allow DSR providers the certainty required to finance their investments.
  - DSR, storage and dispatchable renewable generation should be selected in preference to fossil-fuel plants when offering contracts under the Capacity Market or similar, in view of the climate emergency and the need for urgent decarbonisation.
  - A simple peer-to-peer (P2P) trading system should be introduced, allowing neighbours to sell surplus energy from microgeneration or home storage to one another, recorded via Smart Meters, without the need for complex

accreditation or intermediary organisations. Consumer savings will arise if the P2Pregulations recognise the benefit of this local balancing and exempt this very short-distance trading from distribution system charges.

- A simple local sale system for small distributed generators should be introduced, without the need to become a full licensed supplier or to act as the primary supplier for their customers. Consumer savings will arise if the local sale regulations recognise the benefit of this local balancing and exempt or substantially reduce this short-distance trading from distribution system charges. This will also enable additional renewable generation if DSR measures are incorporated to bring on flexible loads when the generation would otherwise be curtailed.
- To enable the local and P2P sale mechanisms, regulations should allow for customers having two electricity suppliers per meter point (allowing for example one national supplier, and a local supplier or neighbour).

3.2.3. Flexibility

Currently only large, industrial and commercial energy users are able to engage in demand flexibility services, however, if we are to achieve a decarbonised grid we will also need to enable domestic flexibility. This can be enabled by the smart grid roll out and DSO transition but only if energy consumers can be engaged and induced to act. Community groups have the potential to play a key role in enabling demand flexibility, by engaging in both awareness raising measures and peer to peer trading and local aggregation.

- **Legislate to ensure that all new heating systems are flexibility service ready:** by 2022, all new electric heating systems installed in properties, including those installed as part of Scottish Government supported energy efficiency retrofitting work, should be capable of delivering flexibility services.
- Where not replacing heating systems, **energy efficiency surveys should consider the potential to retrofit improved control systems to older electric heaters**, which enable both delivery of better heating, and provide flexibility readiness. The Scottish Government should engage with social housing providers to ensure the same standards apply for RSL-led heating system upgrades.
- **A strategic assessment of the scope for retrofitting smart switching devices into electric heating,** to assess the 'latent' scope for domestic level flexibility and how practical it would be to harness this through retrofit of smart switching devices, would help inform the approach to retrofitting.
- **All flexible ready systems must be compatible with open protocols** preventing 'capture' of flexibility customers by technology providers, and laying the foundations for community-led engagement on delivery of flexibility services.
- **Early rollout of flexibility upgrades should be targeted in consultation with DNOs in areas identified for early transition towards DSO** thus enabling flexibility provision trials to begin as soon as possible and provide learnings to inform future work.

3.2.4. Transport

The Covid-19 lockdown necessitated a radical shift towards local living and active travel, and has significantly increased the importance of community cohesion and local infrastructure. However, there is also the possibility of a shift away from the use of public transport and increased future car use in the event of continued restrictions and future outbreaks. Community groups have an important role to play working with local authorities to plan the infrastructure and behavioural

changes required to embed active travel at local level and move towards the creation of viable 20 minute neighborhoods across Scotland.

- **Collective procurement of community EV charge points and electricity supply:** it is likely that the procurement of equipment and installation services at scale would have a significant impact on cost and could be further enhanced by collective procurement of electricity supply. This would probably require a novel special purpose vehicle owned by participating community organisations.
- **Enhanced support for community-led transport:** while it is important to continue to offer financial support via charge point grant schemes and vehicle loans to encourage people to move away from combustion vehicles to private electric vehicles, the electrification of transport and the subsequent increased loads on the grid means there is a pressing need to reduce car numbers and mileage on our roads.
- **Electric Car Clubs** are an essential form of public transport and should be defined as an essential public service. They are also a flexibility resource, as well as a tool for promoting the shift to electric vehicles and creating a larger second hand EV market. Measures could include targets for EV & e-bike hire across all local authority areas and standard grants and zero-interest loans to community groups for EVs and charge points, and LAs should be encouraged to provide dedicated parking/charging spaces for car club vehicles.
- **Support for community-based electric bike hire schemes** to allow for connections to local bus routes and other key local services. Councils should also be encouraged to offer land and potentially grid connections from existing street lighting circuits for e-bike charging/docking stations.
- **Targeted support for small and community-based transport operators** would ensure the continuation of local and particularly rural bus routes, in order to safeguard jobs and improve local resilience/mobility. Demand-responsive transport services should be supported as well as timetabled operators. Support could also be offered for electrification of fleets where feasible.
- **Identification of rural 'C' and below roads as 30mph or 40mph 'shared use' routes** as a pragmatic basis for a step change in the level of cycling & e-bike use.
- **Strategic assessment of the scope for community-owned EV charge points in all communities as part of the national network:** it makes sense to consider this at a strategic level to ensure full coverage and to minimize unnecessary duplication or competition.

3.2.5. Strengthening Communities

A decarbonized, smart energy system increasingly requires informed, active energy users, but centralised provision of support services to consumers has largely failed to have sufficient impact. There is substantial evidence that educating and empowering energy consumers requires direct and locally specific interventions, led by local anchor organisations, alongside existing centralized provision of expertise and funding. As community anchor groups are not formally incorporated into the Scottish state they lack reliable long term funding, and the coverage and quality of groups is very uneven. Mechanisms providing longer term financial stability, and increased early stage support to 'level up' groups where required are essential in creating a reliable and robust community network.

- **Investment in community capacity building:** Community Energy Scotland has implemented a pilot capacity-building programme, 'Community Energy Futures', designed to help community group leaders familiarise themselves with the latest developments in

the energy system and highlight the scope for groups to engage in it. This has been a successful programme which has led to projects which are currently in development.
    - The introduction of a new, dedicated capacity building fund to support development programmes such as CES' Community Energy Futures, is essential to give community groups the skills, knowledge and confidence to develop and implement 'smart' local energy projects, encourage community peer networking and take forward installation projects at scale.
    - Community anchor organisations and local authorities, in particular, are vital players in the development of local energy systems and therefore stand to benefit most from being prepared for the impact of ongoing energy system changes.
- **Create a new National Community Energy Plan for Scotland,** led by the Scottish Government, and developed inclusively and in relation to the new circumstances we face moving forward. This would build on the forthcoming Local Energy Policy Statement, acknowledging the new context for community energy. Recognition of the Climate Emergency and its impacts and the need to decarbonise the energy sector by 2045 also requires a review of the CARES programme to ensure the programme remains fit for purpose.
- **Involve community partners in local energy strategies and planning activities:** we believe LHEES activities and local energy/active travel planning are a key way for local authorities and community anchor organisations to collaborate for mutual benefit and the ability of these partners to work together should be strengthened; they are currently being carried out in a fragmented piecemeal way. Community groups have been heavily involved in local energy and travel planning but this has been developed on a separate track to LHEES and there has been little integration with the LHEES process. Community-led LEPs detailing localised, finely tuned planning should be integrated within the broader, strategic LHEES process with community groups playing a vital role in helping to develop district heating schemes by raising awareness and encouraging households to sign up.
- **Strengthen the supply of local installation services:** a government-supported training framework is required to ensure that the workforce has sufficient skills to perform high-quality installations of renewable heating systems, particularly ASHPs.
    - Financial support should be targeted at very small and sole traders to ensure they are not excluded, and to widen the network of locally available and accountable installers across the country, without imposing high-cost barriers to entry. This could be linked to post COVID-19 job creation initiatives to reduce unemployment and strengthen the Scottish manufacturing and installation base for domestic renewables and energy efficiency rollout.
    - The Scottish Government should work with BEIS and MCS to ensure that the accreditation scheme for equipment and installers protects consumers, but that support is offered to ensure that far greater numbers of installers can cost-effectively gain accreditation.
- **Establish a baseline of community anchor group coverage & current energy action:** it would be very useful to establish a baseline of the coverage of community anchor groups and the degree to which they are currently involved in local energy and transport activities. The Development Trusts Association Scotland have full information on coverage but less information on the level of energy-related action. Support for the development of area networks of local groups as exist in the Western Isles (Community Power Outer Hebrides) and Orkney (Community Power Orkney) would help build momentum and a basis for sharing experience.
- **Understand the effectiveness of energy initiatives with vulnerable groups:** a review of the viability of interventions which address the issues faced by vulnerable groups both in

terms of financial barriers and participatory exclusions would be particularly helpful in the design of new community-led programmes and in building local capacity to act.

- **Review of low carbon heating installation skills base:** a better understanding of the extent of capability and the level of need to widen the network of locally available and accountable installers across the country would be helpful, along with an assessment of the appetite in local trades for skills training on renewables installations.
- **Strengthen the demand-side aspects of the Community and Renewable Energy Scheme (CARES):** Scotland's Community and Renewable Energy Scheme should focus on helping to develop and deliver community demand side measures, local supply arrangements and capacity-building. Developing and widening the scope of the new Improving Consumer Outcomes Fund could provide a mechanism to demonstrate the viability of new approaches and interventions and address the issues faced by vulnerable groups both in terms of financial barriers and participatory exclusions.

Part 4. Conclusion

"The tragedy is real, immediate, epic and unfolding before our eyes. But it isn't new. It is the wreckage of a train that has been careening down the track for years.

Historically, pandemics have forced humans to break with the past and imagine their world anew. This one is no different. It is a portal, a gateway between one world and the next.

We can choose to walk through it, dragging the carcasses of our prejudices and hatred, our avarice, our data banks and dead ideas, our dead rivers and smoky skies behind us. Or we can walk though it lightly, with little luggage, ready to imagine another world. And ready to fight for it."[137]

The COVID-19 pandemic and associated lockdown has exposed our vulnerability to global level shocks and has caused us to consider the resilience of systems which underpin our economy and way of life. It is widely assumed that unless the world adopts a radically different approach to development, shocks like this will happen again and could be even more serious in impact. It is therefore essential to consider and put in place measures which will help us to cope better with such events.

The UK energy system had entered a period of significant change before the pandemic, transitioning from a centralised, fossil-fuel based system to a more decentralised, low carbon system. But this process needs to be speeded up. The effect of the pandemic and lockdown has been described as a 'postcard from the future' in relation to our energy system and, in particular, the impact of much higher levels of renewable energy generation coinciding with a significant drop in demand, which required urgent balancing measures by the National Grid. It has also had a huge financial impact on the global fossil-fuel business. We also need to be better prepared for the likelihood of further global shocks.

Energy security in the transition to a low carbon energy system depends not only on higher levels of distributed generation but also much higher levels of flexibility – where supply is closely matched to demand. A general reduction in demand, particularly for fossil fuels, will help with this along with measures to enable distributed generation to supply local consumers directly whilst being part of the national energy system.

'Community energy' now needs to be seen as a key element for influencing the demand side in the energy system. Community anchor organisations, if supported to operate at scale, have the potential to play an important role in this process, given their position and influence in the community. This also chimes with broader whole system reform and regulatory planning in the electricity networks with industry discussions around the move towards the Distribution System Operator or 'DSO' model, Distribution Future Energy Scenarios (or 'DFES') and the next electricity distribution planning period currently in active consultation by all GB Distribution Network Operators (DNOs) ahead of delivery beginning 2023-2028.

This report has reviewed the main areas for action: energy demand reduction, local supply, flexibility, transport and capacity building and sets out measures which could form key elements in a new community energy strategy for Scotland. All of these need further development, but, have the potential to lever the role of community organisations in the development of a more sustainable and resilient energy system, whilst reinforcing local community capability and a Just Transition.

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