Initial Scoping Exercise

Presented to: Mevagissey Climate Action Group

Job reference: Initial scoping exercise

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Overview

Planet A has undertaken a desk based initial assessment of options that will reduce carbon dioxide (CO_2) emissions associated with the Mevagissey Parish. CO_2 is not the only greenhouse gas but is the main culprit and is largely associated with our energy uses. The options reviewed will fall into the following categories:

1. Power generation e.g., wind energy, solar PV etc -
   At individual, business and community scales.
2. Electrification of heat -
   At individual, business and community scales.
   With consideration of building fabric assessments and improvements.
3. Electrification of transport -
   With respect to private local, public, business and visitor needs.

This initial study is high-level and brief to match the budget available at this stage but will serve to inform any subsequent grant application or otherwise funded feasibility study.

In addition, Planet A will present this work as a 'Vision for Mevagissey' to an audience of your choosing to help with engagement; this is best as a real event if Covid measures allow but might be online. We would hope to garner support for the principle that Mevagissey Parish will benefit by becoming a recognised low carbon community.

1.0 Background

The following documents have been used as a reference point for this work and are referenced by their number:

(1) Carbon Audit of Energy Demand and Supply for Mevagissey Parish (2020) undertaken by Atlantic Energy as a reference

(2) MCA Charts

(3) Mevagissey Climate Action Group; relevant figures

(4) Mevagissey Parish Neighbourhood Plan

This work aims to promote actions to reduce $C0_2$ which contributes to the effect of global warming. It does not cover hard engineering or mitigation against particular effects, such as sea level rise, which must be dealt with separately.

According to the work completed by Atlantic Energy (1), oil was responsible for the majority of carbon emissions in 2018, and therefore should represent the primary target for reduction and replacement. Oil use represents 72% of the carbon emission figures for Mevagissey Parish, accounting for travelling, domestic space heating, freight and fishing.

The second largest contributor to energy consumption is electricity, at 24%. This is comprised of commercial business use and domestic space heating (38% - the second largest use of space heating after oil at 44%).

How net zero is met nationally, is largely expected to be via electricity – with a much higher contribution of renewable and nuclear power in the next 20-30 years. Other technologies are likely to play a part such as hydrogen (to replace gas – and as a storage mechanism for electricity), and carbon capture & storage (CCS). The pathway to using these technologies is yet to be determined and therefore does not offer clear incentives at this stage, particularly, these technologies are likely to be available at national level only, and not appropriate for community delivery.

Grid electricity has a carbon factor attributed to it because it is comprised from a variety of sources, largely; gas, renewable energy, and nuclear, but also imported electricity and coal. Grid electricity has reduced the carbon emissions equivalent by more than 50% since 2015 and must decarbonise completely by 2050 in line with national government targets to meet net zero by 2050.

Figure 1 shows a graph designed by Planet A to show the rate of decarbonisation required for the national grid by 2050. The reported figures for 2016 – 2021 show the graph is on track but requires a continued effort.

A move to an electric future has the benefit of integrating local generating renewable energy systems such as solar, wind and heat pumps which are well established. A combination of these technologies can be successful in decarbonisation strategies locally but are not always cheap to deploy, so

consideration must be given first to reducing consumption withing local areas – a contribution required by everyone. This contribution can be met by making buildings and lifestyle as energy efficient as possible.

This work will suggest the most practical and tangible ways to reduce energy consumption within Mevagissey Parish, and to replace fossil fuel as a primary energy source with electricity.

Domestic space heating in Mevagissey Parish is largely dependent on oil (1). Mevagissey is off the main gas grid, which means oil use is high, with the other viable mainstream alternatives for space heating being LPG gas and electricity. This gives opportunity for investment in renewables, a localised energy tariff, and supporting the route to decarbonisation using electricity.

The biggest risk with electricity is that the cost will increase, putting more people at risk of fuel poverty and rising bills. The first step to moving towards electric heating is to take practical steps which improve the fabric efficiency of buildings (domestic and commercial) and use energy in an efficient manner, using smart energy management and being aware of energy consumption patterns.

Monitoring and understanding energy consumption patterns is a big step towards energy reduction, educating people locally and working together to achieve results.

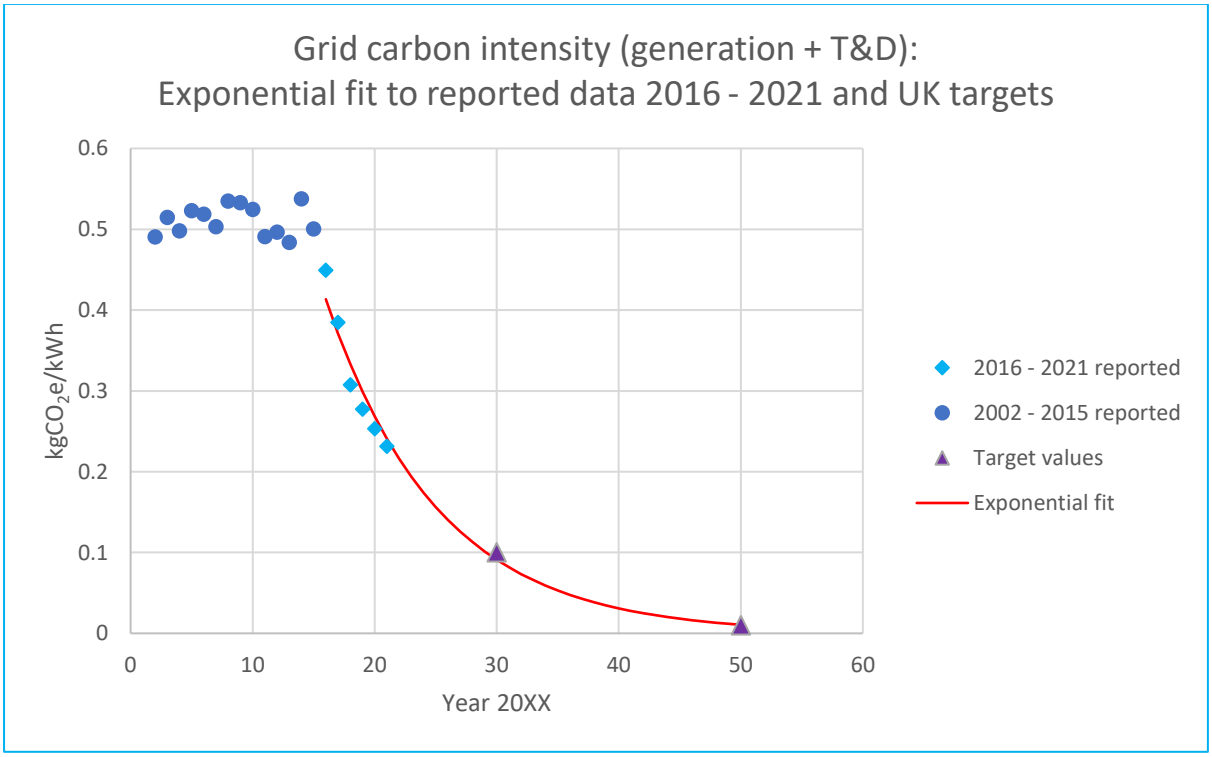

Figure 1: Planet A graph showing grid carbon intensity to 2050.

1.0 Power generation

wind energy, solar PV etc - at individual, business and community scales.

Business scale

As most business' use electricity in the daytime, it makes sense to prioritise covering all business roof tops with solar panels. The electricity generated will be used on site behind the meter - saving the business money on imported daytime electricity. The cost benefits of this are currently exemplified, when considered against the rising cost of electricity on the wholesale market.

An assessment should be undertaken at each premises to what the on site consumption is likely to be, and what the export value may be. It is generally considered good practice to install an export meter on systems over 30 kW whereby any excess electricity not consumed on site is exported to the national grid via a power purchase agreement (PPA). This means the installation requires an **export meter**. The current value of exported solar generation is around 8 pence per kWh.

Non-domestic electricity accounts for 3,790 MWh, or 3.8 million kWh annually within the Parish. Not all businesses will have suitable roofs for solar PV; an assessment can be done by an installer on the cumulative impact of business' in the area with suitable roof for solar. Most businesses with a high daytime electricity use will see a return on their investment within 6-10 years, and immediately benefit from reduced electricity bills.

Set goals to reduce the non-domestic electricity consumption of the Parish in 5 yearly increments. For example, a contribution of 10% of commercial demand may be met by achieving 370 kW of solar PV installed on business roofs, saving 72 tonnes of $C0_2^e$ each year.

$C0_2^e$ relates to carbon dioxide equivalent emissions – and includes all the greenhouse gases. The conversion factor of 0.21233 is applied for grid electricity from the current Government published conversion figures (2021). Note this figure will decrease over time based on grid decarbonisation (figure 1). Calculation is based on south facing roofs at a 25^o pitch, generating 338,700 kWh per year of $C0_2$ free electricity**.**

Domestic scale

Installing solar on domestic roofs is most viable when the occupiers are at home in the daytime, or able to make use of their generation through smart energy devices (programmable appliances, for example). Battery storage is not a financially viable solution in most situations, with the cost of the battery and a relatively low storage capacity outweighing the financial return, though this is beginning to change with the increased price of electricity. There are many options when considering smart storage and use of solar generation on a domestic premises:

DO

- Install or use an existing hot water store and immersion, which is triggered by otherwise exported solar generation (hot water / thermal storage)

- Use programmable smart appliances (even as simple as a timer on your washing machine) to benefit from solar in the middle of the day
- Use an electric car battery and a smart charger to store unused solar as fuel for the car

DO NOT

- Install an electric aga or any appliance which is going to be on for 24/7 without fully understanding the running cost.
- Rely heavily on a collaboration between solar PV and heating – solar does not contribute very much to winter loads

Installing solar on domestic roofs can have a positive impact when a local energy tariff is employed. That way, solar generated can be bought into a local project and a tariff given for those who are able to use that electricity at a given time, even if you can't. See section 1.1

Community Scale

Community owned renewables used to be a valuable commodity with a simple business case when the Feed In Tariff (FIT) was active to support and subsidise costs. Now, the business case must depend upon another mechanism for financing, something that many community interest companies are trying to re-model. The viability of a scheme depends upon several factors such as:

- The amount of electricity used at the time of generation
- The value of the Power Purchase Agreement (PPA) for excess electricity sold to the grid
- The ability to use the electricity generated locally, such as a sale arrangement for a specialist tariff which sells the electricity to a local business during the daytime, or to homeowners.

Community owned assets are best used when the electricity can be connected to a direct load which is well matched to the generation profile. Solar is the easiest asset and contributes well to the daytime electricity profiles in the summer. It does not offer an advantage in the winter (unless the array is oversized), or at night, which makes it poorly matched for contributions to heating.

Electricity generated by wind is much more valuable in terms of contribution to heating and night-time use. The contentious issue of wind power in Cornwall is one that plays heavily on the ability to decarbonise. Wind power provides cheap, reliable electricity most importantly, during the winter months when it may subsidise electric heating. In this context wind power is far more valuable (and more effective) at delivering power where it is needed throughout the year. As solar production diminishes severely throughout the winter months, wind power can pick up the demand and provide electricity during the evenings, and in the winter when demand is highest.

The Local Plan takes a strong position to discourage large scale wind and solar development. It does not mention the appetite to consider a single wind turbine which would provide a valuable resource to the community.

The inland area to the southwest may be suitable for some wind development in terms of technical viability, estimates suggest that wind speeds are in the region of 6.6 m/s at 25m above ground level 6.6 m/s, and 7.3 m/s at 45m above ground level, on the hill behind Mevagissey at SX002450. The

picture is similar for the hill above Portmellon. (This is only from a desktop analysis and other sites should be considered).

If we take the current total electricity generation estimate for the Parish of 12,000 MWh a year, this could be satisfied by 1 x 5 MW wind turbine, though a smaller one would be more viable given a) the cost and b) the AONB and planning regulations.

Looking towards 2050 where everything is electrified, the energy use in the Parish would increase to just under 60,000 MWh (1). **If we then consider growth and expansion at 10% between now and 2050, we see energy consumption rise to 66,000 MWh** (66,000,000 kWh).

For reference and visualisation purposes, this could be almost wholly supplied by 5 x 5 MW wind turbines. Understandably, this is not a viable option to deliver the road to net zero, but as a reference point, it is useful to understand that level of electricity which is needed.

Developing a more inclusive 'permitted wind' area within the Local Plan would be hugely beneficial to tackling climate change and decarbonisation between now and 2050, if some proportion of energy supply could be through wind generation. This could be linked to a Local Energy Tariff to allow residents to benefit from reduced rates of electricity. See Section 1.1

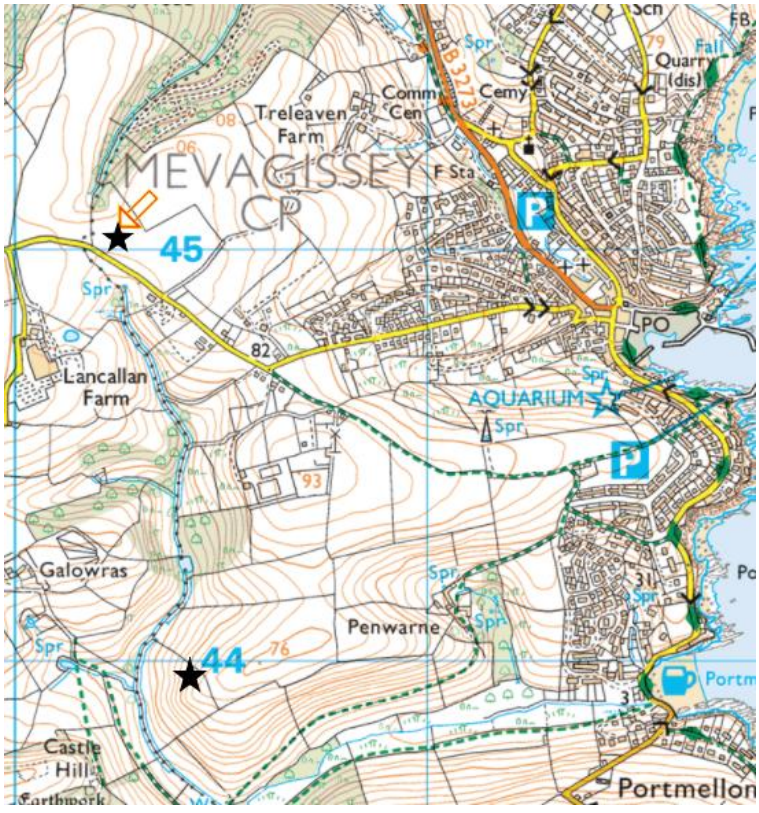

Figure 2, suitable wind power generation sites.

1.1 Business models to support local renewables

Cornwall has seen a fair amount of community owned renewables developed over the years, by community interest companies such as Community Power Cornwall (CPC) and Communities for Renewables. The Wadebridge Renewable Energy Network pioneered the Sunshine Tariff and other models exist elsewhere in the UK, such as Energy Local, which pioneered the development of renewables and a 'time of use' price for those able to use electricity as it is being generated, offering a cheaper price per kWh.

Energy Local

"Energy Local has designed a means for local people to benefit from local energy through Energy Local Clubs. This enables households to club together and show they are using local, clean power when it is generated. They agree upon a better price for local generators and reduce their bills. It reflects local renewables' true value and keeps more money local."

www.energylocal.org

Community for Renewables

CfR help develop business plans and new business models with a community focus. Raising investment using mechanisms such as community share and bond offers, long term finance from banks & social investment funds, and grant investment.

www.cfrcic.co.uk

Community Power Cornwall

"Community Power Cornwall evolved through community led demand for the ownership and integration of renewable energy technologies into everyday lives and settings".

CPC have not added any further projects to their portfolio since 2019, it is unclear whether they are currently taking on new projects.

1.2 Utilisation of existing renewables

Existing assets within the parish can be utilised onto a local energy tariff if engagement with the owner is successful; wind turbines and solar farms currently set up to export to the grid for a fixed fee, may be enticed away to provide electricity onto a dedicated local tariff (see 1.1) providing a better rate to the owner, and offering less cost per kWh to the consumer. This can be a win-win.

There are two small community owned wind turbines at Gorran which may be able to contribute to a local energy tariff with local benefit if the right discussions were had, and mechanisms put in place.

2.0 Electrification of Heat

To reduce the use of fossil fuels, the most viable alternative is all electric solutions for homes and businesses. This does not come without its challenges of a formidable cost increase and capital cost for new heating systems.

The first major step in working towards electrification is to **use less** and improve the **fabric efficiency** of buildings.

Energy reduction is by far the most economic method of saving carbon, with many practices being down to influencing behaviour change and raising awareness. This keeps capital expenditure (CAPEX) low, and motivational awareness high – perfect for a community group.

Setting targets to reduce energy consumption can be done relatively easily, asking each community member to record their meter readings on the same date each month, and review.

Improving the thermal performance of buildings is the next most important contribution. The local plan displays a strong tendency within the community to support better fabric efficiency of new build houses which is very important, but the quality of existing building stock must also be identified. This can be challenging as retrofitting houses can be extremely costly and needs expert advice when considering the integration of modern materials to old construction.

Start with insulating the roof, current building regulations require 270mm of mineral wool covering the joists. This can be exceeded, and 300mm will increase the benefit. Lofts should not be boarded out.

Replace and / or draft proof doors and windows, and board up unused chimneys and fireplaces. Heat is lost by the second law of thermodynamics, which draws warm air to areas of cool air.

Wall insulation on the interior or exterior of the house can be expensive and time consuming, but the results when using electricity for home heating will be clearly seen through a reduction of bills.

The U-Value of a material is the rate of thermal transmittance and improving the U value of a building fabric (reducing it) will retain heat for longer.

<u>Heat pumps and associated resources</u>

Installing a heat pump to supply electric heating for a building increases the benefit of electricity to heat by a ratio of up to 1:4.

Direct electric heating gives a ratio of 1:1, therefore 1 kWh of electricity provides 1 kWh of heat. Using a heat pump will give a much better co-efficient of performance of at least 1:2.5 over the season. This is called the seasonal co-efficient of performance (SCOP) and it balances out the more effective ratio of 1:4 which is often marketed by suppliers, against a poorer performance in poor weather conditions, to account for an expected seasonal variation.

Heat pumps can be sourced through water, ground, or air. If the community had an appetite to progress with an ambitious project, the harbour provides a water resource for a large-scale community heat network. This may be possible both at Mevagissey and Portmellon.

This may be attractive for some grant funding, in particular the Rural Community Energy Scheme (RCEF) accepts applications for grant funding of feasibility studies of up to £40,000, and up to £100,000 as a loan to assist with planning and development work for a focus project (note they do not favour scoping studies).

On a smaller scale, houses which already use electricity should consider the availability of government grants and schemes to install a heat pump. For replacement of a direct electric system, an air-to-air unit may be easiest. This requires an outdoor heat pump unit to provide warmth (and cooling if required) by warm air blown units inside. One outdoor unit can provide up to 5 heated zones within the building with different zoned control.

If a wet system is preferred, via radiators or underfloor heating, the installation cost is likely to be higher. However, if a wet system is already in place and the heating can be replaced using the existing infrastructure, costs may become more favourable. This is likely to be the case for those currently using oil as a primary heating fuel. An assessment should be undertaken individually (per property) to assess the capability of the existing heat delivery system to sustain a comfortable thermal temperature in a house, with a lower distribution temperature of the water.

3.0 Electrification of Transport

With respect to private local, public, business and visitor needs.

Moving away from fossil fuels, electric vehicles (EVs) provide a low or zero emissions free way to travel. Planet A believe that although battery power is not the ultimate transport solution, it is a step up from burning fossil fuels, and ultimately, we must stop burning things to decarbonise. As we move forward with technology, systems and processes involved with manufacture need to decarbonise their own businesses, and this will happen incrementally as the industry grows. Car manufacturers are developing their own sustainability agenda with integrated decarbonisation plans. For example, BMW announced in a press release in September 2021:

"The main focus of the company's pioneering strategy is, on the one hand, to drastically reduce CO2 per vehicle by 2030. On the other, with the introduction of the "Neue Klasse", the BMW Group will be massively promoting the use of secondary material and the forward-looking principles of the circular economy. The BMW Group is committing to a more sustainable pathway, with the goal of limiting global warming to 1.5 degrees C."

Similar policies can be seen in most major car manufacturers, and most are published online.

Incentivising the move towards electric vehicles can happen at individual, commercial and community scale, taking the following bullet points as a guide:

- Businesses leasing company cars can offset 50% of their VAT for cars, and 100% of their VAT through electric vans. There are other tax savings associated with the use of electric cars through businesses, accountants should be able to advise on more specific savings.
- Providing hire and lease options for locals and tourists.
- Connecting EV charging facilities to incentivise emissions free travel and a local business opportunity.

Planet A organises and hosts the Decarbonisation Roadshow twice yearly, offering advice and hands on experience on decarbonisation – including electric vehicle test drives in collaboration with local dealerships. The next Roadshow is on Tuesday the 5th April at The Alverton Hotel in Truro. It is free to attend. For more information and details follow us:

- on Instagram @planet_a_solutions
- on Linked In **Amanda Forman and David Parish**
- on Facebook Planet A Solutions CIC

What the accountants say

Pure electric vehicles are exempt from company car tax from April 2020 onwards, with Benefit in Kind rates increasing to 1% from April 2021 and 2% from April 2022. This is compared to a maximum of 37% charged on the least CO2 efficient vehicles. Meanwhile, plug-in hybrids and other electric vehicles that emit 1-50g of CO2/km fall under five new tax bands from 2020/21.

As with the Benefit in Kind tax, employers' Class 1A National Insurance contributions are linked to a car's CO2 emissions and P11D (purchase cost) value. As a result, employers offering staff brand new electric cars at a reduced rate can, in turn, benefit from reduced NI contributions.

Additionally, business owners can claim capital allowances on cars bought and used within their company, meaning they can deduct part of the value from their profits before paying tax. Until 1 April 2021 a brand new low or zero emission car can qualify for a 100% first-year allowance (FYA) if its CO2 emissions are no higher than 50g/km.

https://tblaccountants.co.uk/news/tax-benefits-electric-cars-business

Replacing diesel with HVO

Hydro treated vegetable oil (HVO) offers carbon savings when compared to conventional fossil diesel. The original source of the HVO should be traced to ensure it is coming from a reputable supplier. In Cornwall, Mitchell and Webb have recently started selling HVO. It can be bought in bulk and burnt as a diesel substitute without any filter changes or build up of additional waste in an engine typically associated with biodiesel and Fatty Acid Methyl Esters (FAME).

Interestingly, HVO can also be used as a heating fuel. Boats may also replace diesel with HVO and might potentially substitute ammonia for petrol in the future.

HVO claims up to 90% carbon emissions reduction compared to regular diesel and has been approved at Original Equipment Manufacturers level (OEM) by multiple mainstream car dealers such as Volvo and Mercedes Benz, and all red diesel vehicles.

4.0 Table of Interventions

The following table is designed to deliver some achievable considerations for the Parish.

Solution	Description	Aimed at…
	Manageable, Local Interventions	
Use less	Set targets and use monitoring and meter energy readings to measure progress.	Everyone
Subsidise electricity use with onsite renewables	Solar PV on businesses and homes where a suitable roof space is available. This reduces reliance on grid imported electricity and there are 0 emissions from renewable generated electricity.	Businesses and residential
Prioritise the reduction and replacement of oil	Oil is responsible for the highest proportion of CO_2. Replace oil fired heating with electricity, preferably heat pumps. Reduce reliance on oil-based transport.	Everyone
Insulate and drought proof	Improve insulation levels in lofts, and walls where possible. Drought proof windows, doors and chimneys	Residential
Improve fabric efficiency	Upgrade single glazing to double or more. External or internal wall insulation. This helps retain heat and use less energy.	Residential
Heat pump incentive: electric properties move onto a heat pump	This gives an improved co-efficient of performance compared to direct electric heating systems. Seasonal co-efficient of performance 2.5.	Residential and businesses
Integrate wind power to the local plan	Designate an area in the local plan which will accommodate wind power development	Community
	Long term, Interventions	
Engage with a community energy tariff	This is a longer-term goal and needs leadership from a community group. See section 1.1 for inspiration. People who sign up benefit from cheaper tariffs when they are using electricity generated locally from renewables. Best benefit comes from communities owning renewable energy assets on a large scale.	Community
Heat pump harbour project	Consider further feasibility work on the technical viability of using the harbour water as a heat source for a district heating scheme. Similar schemes have been successful with Star Energy, turning cold 4^{o}C water into 90^{o}C water through a high temperature heat pump.	Community

	Transport Interventions	
HVO introduction for diesel replacement	HVO represents a direct switch from diesel fuel to HVO without any engine modifications. HVO claims up to 90% reductions in $C0_2$ emissions and has just been approved by Volvo for use in its engines.	Everyone – diesel users
EV uptake	Encourage EV uptake amongst businesses and residents.	Community and business
EV charging	Investing in locally owned EV chargers encourages the uptake of EVs and reduces anxiety around charging. Community owned chargers can offer a local business model and bring revenue.	Community

It cannot be left up to Government alone to meet the challenge of climate change. Communities, individuals, and businesses must come together.