



Plymouth waterfront energy plan

Deliverable 4

Plymouth waterfront Energy Plan Scoping and Feasibility project

August 2022

Introduction	3 - 7
Overview of the Plymouth waterfront and Plymouth City Council responsibilities	8 - 12
Plymouth waterfront energy plan – sector analysis	13 - 48
Electricity generation and storage	17 - 22
Heat and buildings - domestic	23 - 30
Industrial and commercial	31 - 36
Road transport	37 - 42
Maritime transport and shipping	43 - 48
Summary	49 - 50
Appendices	51 - 81



Introduction

Plymouth waterfront Energy Plan Scoping and Feasibility project

Regen is supporting Plymouth City Council (PCC) to develop a strategy for decarbonising the waterfront area in Plymouth. This is an area of Plymouth with unique features including marinas, ports, industrial areas, and historic features. The analysis aims to support PCC's ambition, set out in its Climate Emergency Declaration, for Plymouth to be net zero carbon by 2030.

Our approach uses concepts underpinning local area energy planning together with the scenario planning framework and data used in the Distribution Future Energy Scenarios (DFES) for Western Power Distribution (WPD).

The project is funded by the Community Renewal Fund.

We are delivering the work in two phases:

- **Phase 1** (work package 1, 2 and 3) - a high level analysis of the opportunities for decarbonisation in the Plymouth waterfront area. This takes into account the wider objectives of the National Marine Park, Plymouth and South Devon Freeport, marine e-charging Living Lab project in partnership with Plymouth University, and PCC climate emergency action plans.
- **Phase 2** (work package 4 and 5) - an in-depth analysis of two key opportunity areas.



PHASE 1

Work package 1 – Collating and analysing available work and data on Plymouth waterfront

Work package 2 – Baseline and decarbonisation options analysis

Deliverable 1 - Finalised methodology and initial findings

Deliverable 2 - Summary report from work packages 1 and 2

Work package 3 – Energy plan development

Deliverable 3 - stakeholder engagement workshop and brief feedback report

This report Deliverable 4 - Create a high-level energy plan for the Plymouth waterfront area

PHASE 2

Work package 4 – Further in-depth analysis of key opportunity areas identified from previous work

Deliverable 5 – Interviews held with various stakeholders and brief feedback report

Deliverable 6 - Summary report from work package 4

Work package 5 - Review of project outputs and updates

Deliverable 6 – Updated summary report from work package 4

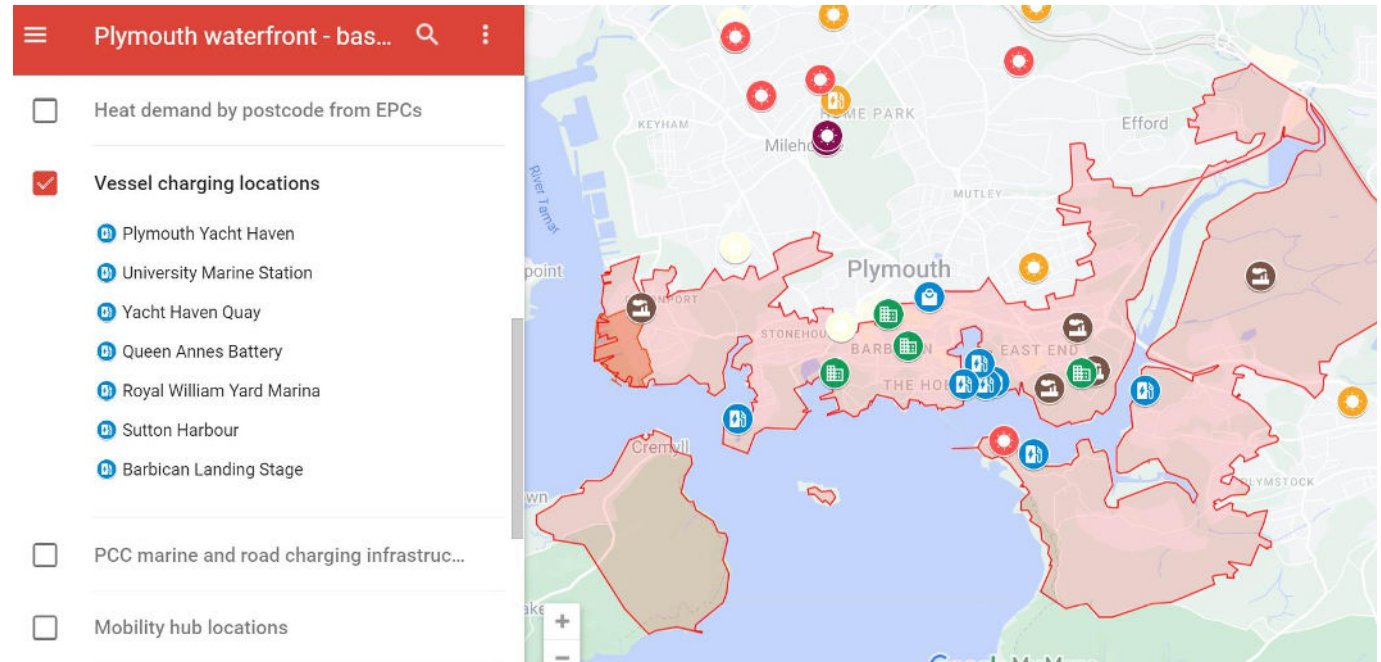
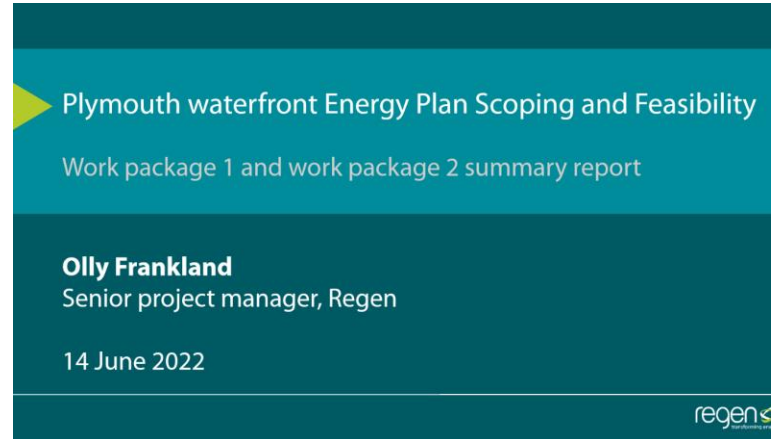
Project outputs to date

Introduction

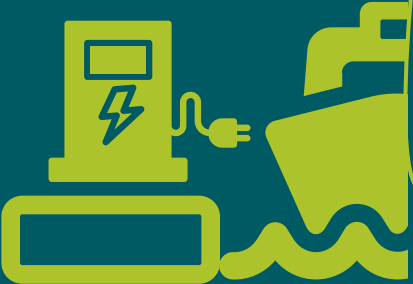
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This project has delivered the following outputs:

- **Work package 1 and work package 2 summary report** – a scoping report that
 - Summarised baseline energy use
 - Created net zero 2030 pathway projections
 - and reviewed and collated existing/planned decarbonisation projects affecting the waterfront.
- **Energy plan workshop and report** - a summary of a stakeholder workshop to review the energy plan focused on the marine sector, hosted on 20 July 2022.



Plymouth waterfront energy plan Deliverable 4



This report provides a high-level energy plan as part of Regen's work on the Plymouth waterfront Energy Plan Scoping and Feasibility project for Plymouth City Council.

The aims of this report are to:

- Deliver Plymouth City Council a better understanding of the Plymouth waterfront area and the energy characteristics using a high-level energy plan approach.
- Provide an overview of the baseline and projections for four main sectors and outline the investment opportunities.
- Bring together a set of actions for Plymouth City Council to deliver in the near term that are realistic and deliverable.

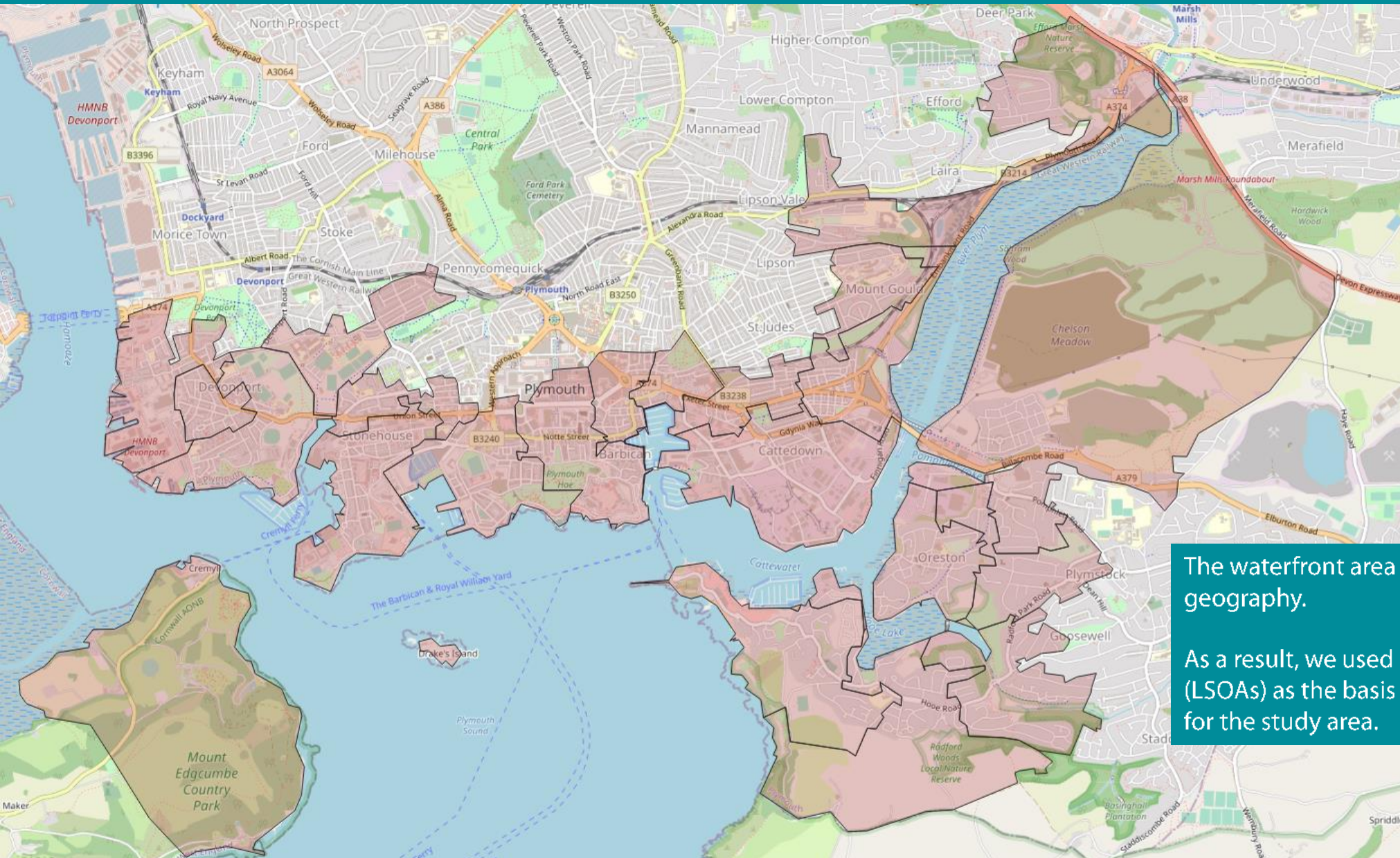


Overview of the Plymouth waterfront and Plymouth City Council responsibilities

Plymouth waterfront study area

PCC
responsibilities

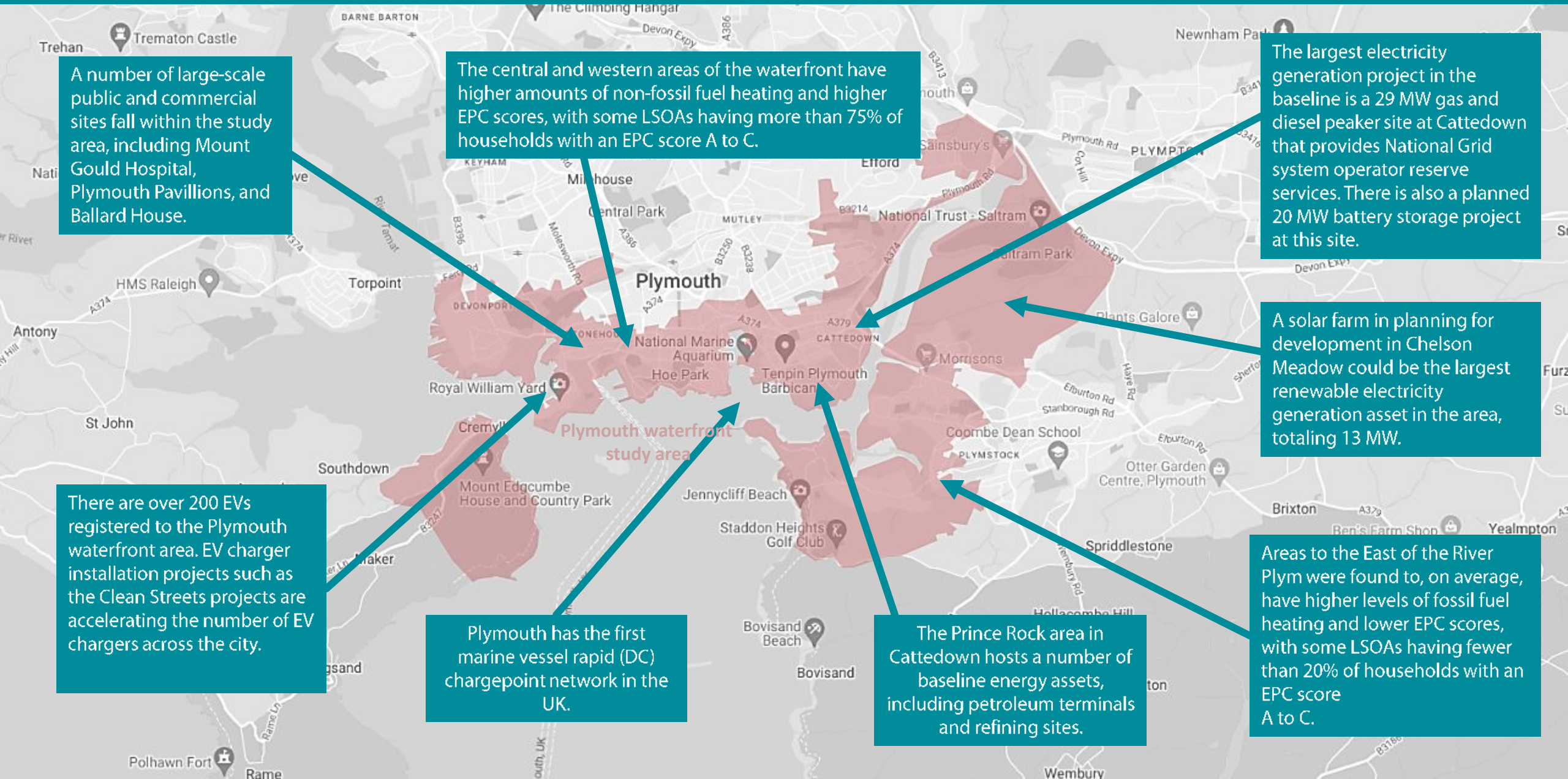
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The waterfront area is not an officially defined geography.

As a result, we used Lower Super Output Areas (LSOAs) as the basis for defining the boundary for the study area.

Key waterfront energy features



A number of large-scale public and commercial sites fall within the study area, including Mount Gould Hospital, Plymouth Pavillions, and Ballard House.

The central and western areas of the waterfront have higher amounts of non-fossil fuel heating and higher EPC scores, with some LSOAs having more than 75% of households with an EPC score A to C.

The largest electricity generation project in the baseline is a 29 MW gas and diesel peaker site at Cattedown that provides National Grid system operator reserve services. There is also a planned 20 MW battery storage project at this site.

A solar farm in planning for development in Chelson Meadow could be the largest renewable electricity generation asset in the area, totaling 13 MW.

There are over 200 EVs registered to the Plymouth waterfront area. EV charger installation projects such as the Clean Streets projects are accelerating the number of EV chargers across the city.

Plymouth has the first marine vessel rapid (DC) chargepoint network in the UK.

The Prince Rock area in Cattedown hosts a number of baseline energy assets, including petroleum terminals and refining sites.

Areas to the East of the River Plym were found to, on average, have higher levels of fossil fuel heating and lower EPC scores, with some LSOAs having fewer than 20% of households with an EPC score A to C.

Plymouth City Council decarbonisation roles and responsibilities

Local authorities have a critical role in terms of net zero delivery. The Committee on Climate Change stated in a recent report that, “**Local authorities are responsible for 2 – 5% of local emissions but potentially influence around a third of an area’s emissions...**”¹.

However, local authorities have a limited set of responsibilities and powers that can influence emissions in their area. They also face budgetary challenges post-pandemic and from the recent extreme inflationary pressures.

At the same time, government is asking local authorities to take on further roles. New responsibilities that are expected include:

- **Heat network zoning** – PCC is a pilot area and has been engaging key energy users alongside Buro Happold to develop further heat network projects.
- **Electric vehicle infrastructure planning** - the future of transport regulatory review stated the option of, “introducing a statutory duty to plan for EV infrastructure. We are also, in a separate question, seeking feedback on whether a statutory duty should be introduced to provide that infrastructure.”²

Responsibilities of unitary authorities*	Relevance to energy (Low to High)	Key PCC levers for change (not exhaustive)
Education	Low	School properties in Plymouth have been host to Plymouth Energy Community solar PV projects
Housing	High	Planning policy changes for new build Section 106 negotiations Heat network zones and connections Minimum Energy Efficiency Standards
Planning applications	High	Recent South West Devon and Plymouth Climate emergency guidance – implementation process.
Strategic planning	High	
Transport planning	High	Public transport licencing Mobility hub development Active transport infrastructure
Passenger transport	High	
Highways	High	
Leisure and recreation	Medium	Mobility hubs Active transport infrastructure
Waste collection	High	Contracts and procurement Policies regarding Energy from Waste plants
Waste disposal	High	
Environmental health	High	Air Quality Management Zones and Low Emission Zone options
Revenue collection	Medium	Business rates Council tax

*Fire, social services, and libraries removed from responsibilities list due to low relevance to energy.

¹ CCC, 2020 <https://www.theccc.org.uk/publication/local-authorities-and-the-sixth-carbon-budget/>

²DfT, 2021 <https://www.gov.uk/government/consultations/future-of-transport-regulatory-review-zero-emission-vehicles>

Plymouth's net zero leadership and ambition

PCC set out in its Climate Emergency Declaration the challenging ambition for Plymouth to be net zero carbon by 2030.

Despite the many challenges of an accelerated net zero target, PCC is a shining example of local leadership on delivering decarbonisation projects. The range, scale and ambition of the existing decarbonisation projects that are being developed by PCC was one of the main findings of the Work Packages 1 and 2.

The projects include a strong marine focus that has helped Plymouth become a leading city in terms of innovation, marine vessel charging infrastructure, and testing of new products.

Plymouth also has one of largest portfolios of locally owned and operated renewable energy generation in the country developed by Plymouth Energy Community (PEC Renewables), soon to total 19 MW, over a third of Plymouth's renewable energy capacity.

PCC projects	Opportunity areas for net zero project development
National Marine Park	Engagement opportunity to inform people about Plymouth decarbonisation projects and get people involved with transition to net zero from a marine sector perspective.
Smart Sound	Over 1000 km ² of ocean to test marine autonomous systems which have a lower carbon footprint compared to crewed vessels. Developed for use in ocean science and surveying, military and offshore energy sectors.
Plymouth and South Devon freeport (Oceansgate, Devonport South Yard)	Operational by 2023. Creation of new manufacturing and logistics hubs that could include more short-haul shipping. Electrification of marine transport included within Freeport application – opportunity to influence technology and policies. Inclusion of a 10 MW hydrogen electrolyser at Langage energy park.
Marine charging infrastructure (MeLL)	Implemented three marine charging points (All DC: 25 kW, 75 kW, 150 kW). Provides Plymouth an opportunity to develop a new technology area, influence policies, and communicate with DNOs.
Plymouth mobility hubs	Significant opportunity to reduce transport carbon emissions. 17 locations currently within waterfront study area – opportunity to coincide with National Marine Park. Need to engage communities to maximise use by population.
Heat networks (HNDU, PSDS)	PCC investigating 5 th generation heat network. Civic, Guildhall and Millbay/Pavilions within waterfront study area. Air source heat pumps being implemented as part of the Ballard House redevelopments. Borehole study into ground/water source heat pumps have been completed. PCC is piloting the heating zoning methodology with government.
Chelson meadow solar farm (13 MW)	Aim to start build in late summer 2022. The estimated energy generated is 14,284 MWh, saving 3,300t CO ₂ e per year, with inclusion of 25% biodiversity net gain commitment. Community-owned and virtual PPA with the council planned.
Plymouth Energy Community solar PV portfolio (5.9 MWp)	Plymouth Energy Community has an extensive portfolio of rooftop solar PV across schools and other buildings in Plymouth, as well as the 4.1 MW Ernsettle solar farm. With their largest solar farm, Chelson Meadow (13 MW) now on the horizon, Plymouth Energy Community will own over a third of Plymouth's renewable energy capacity.
Energy efficiency retrofit plans	Devonport and Stonehouse identified as key areas for retrofit and low carbon heat grant support via local authority Sustainable Warmth funding (Home Upgrade Grants and Green Homes Grant LAD 3). Particularly homes with EPC E, F and G in the waterfront area.



Plymouth waterfront energy plan – sector analysis



WP1: Background research (Apr- May 2022) ✓

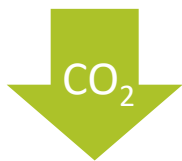
Desktop research and stakeholder engagement meetings on existing decarbonisation efforts in the area.



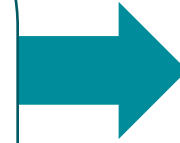
WP2: baseline and decarbonisation options analysis (Jun-Jul 2022) ✓

For each of the generation, storage and demand technologies in-scope, we:

1. Determined the historic, existing **baseline** (operational projects)
2. Assessed the **near-term pipeline** (connection offers/planning applications/Plymouth projects)
3. Developed medium and long-term projections accelerated in a **single Plymouth net zero 2030 pathway (see Slide 16).**



4. Geographically **distributed** these technologies/capacities within the study area (LSOA level)
5. Undertook a **high-level baseline carbon assessment** to identify key opportunity areas for decarbonisation compared to 2030 carbon snapshot.



WP3: High-level energy plan for Plymouth waterfront study area (Jul - Sept 2022)

- Stakeholder engagement workshop (20/07/22) used to inform thinking and potential actions.
- Several interviews with key Plymouth waterfront stakeholders were delivered to gain additional information.
- Review of baseline and projections analysis
- Further analysis of opportunities and actions, including research from other locations.



Sector analysis and decarbonisation action development

- Review of **baseline and projection** data per sector.
- **Opportunity assessment** using Plymouth net zero 2030 pathway projection data and available multipliers to develop CAPEX and job potential.
- Creation of a **realistic and near-term actions per sector** focused on those that Plymouth City Council can influence.
- Review actions against **carbon saving potential, estimated cost, and speed of impact** factors.



10
interviews

Plymouth waterfront
energy plan
Deliverable 4

The Plymouth net zero 2030 pathway has been developed by Regen and is a highly ambitious projection of how the energy system in the Plymouth waterfront area will develop, aligned with the aim for Plymouth to be net zero carbon by 2030. The 2030 pathway aims to demonstrate for each sector the scale of the decarbonisation challenge, showing what needs to be achieved if net zero is to be achieved.

The analysis used to create the pathway is based on an accelerated version of the WPD DFES Consumer Transformation scenario in many sectors. The DFES Consumer Transformation scenario achieves net zero by 2050 with high levels of local deployment of currently available technologies.

To achieve the acceleration of this DFES scenario from 2050 to 2030, the Plymouth net zero 2030 pathway requires very high levels of deployment of the available technologies to start in the immediate future.

Sector	Brief pathway methodology by sector
Energy generation	Uptake of renewable generation and storage based on an accelerated version of the WPD DFES 'Consumer Transformation' scenario. Uptake of low carbon generation and storage is based on the pipeline of accepted connections for larger-scale technologies, and scenario assumptions for smaller-scale technologies such as rooftop PV and domestic batteries.
Heat and buildings	The analysis of domestic heat technology uptake and decarbonisation is an accelerated form of the WPD DFES 'Consumer Transformation' scenario. This achieves net zero carbon from heat and buildings through electrification, using established, existing technologies such as heat pumps and district heating. The alternative net zero scenarios from the DFES framework utilise hydrogen for home heating, which is much less feasible when considering the 2030 timescale. Non-domestic heat technology uptake and decarbonisation would follow a similar trend to domestic decarbonisation, with fossil-fuelled heating predominantly replaced by electric heat pumps, district heating or smart storage heating. A higher proportion of non-domestic heating is already electrified, through direct electric heating, heat pumps or air conditioning units.
Transport	The analysis of road transport EV uptake and decarbonisation is an accelerated form of the WPD DFES 'Consumer Transformation' scenario, which covers EV uptake and related EV charger uptake. This scenario relies less on hydrogen vehicles or a societal shift to automated vehicles and vehicle sharing, making it the most suitable net zero scenario for a 2030 timescale. Rail electrification is reviewed for GWR Laira rail depot in the study area. Marine transport projections are based on replacing current fossil fuel demand with a combination of electricity (plus charging infrastructure), hydrogen, and ammonia.
Industry	High-level carbon baseline and decarbonisation action of industrial energy consumption. NAEI emissions data specific to the waterfront is the primary source, supplemented by BEIS energy consumption data that is interpolated to the waterfront, based on Addressbase distribution of industrial site counts.

Energy plan report approach

Sector Analysis

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The high-level energy plan is divided into five main sectors that provide the framework for discussion throughout this report.

We have included a baseline and Plymouth net zero 2030 pathway projection summary at the start of each sector to provide a quick overview of our previous detailed summary report and mapping work.

We then assess the opportunity that delivering the pathway projections would present - in terms of investment, jobs/GVA and carbon saving potential.

And finally, we provide a set of actions created from in-depth stakeholder engagement during the energy plan workshop, from several follow-up interviews, and informed by the projection data and wider Regen energy sector expertise. These recommended actions per sector are aimed at PCC to deliver and are focused on the near-term. The actions are evaluated against three factors that impact the ability of PCC to deliver them:

- **carbon saving potential** - in relation to the Plymouth waterfront area carbon budget
- **estimated cost** - cost to PCC, rather than total cost
- **speed of impact** – for delivery of the action by PCC.

Baseline and
projections

Opportunity

Recommended
actions



Electricity generation and storage



Source: South West Water

Energy generation and storage

Generation and
storage

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The Plymouth waterfront contains a mixture of built-up domestic, commercial and industrial areas, which limit the availability of renewable resources.

At present, renewable electricity generation is limited to rooftop solar PV, with some landfill gas generation from waste located at Chelson Meadow and Laira bridge.

There are plans to replace the fossil fuel peaking plant at Cattedown with battery storage. Alternatively, low-carbon hydrogen could be implemented at this site, depending on the development of this technology and its markets.

A new commercial solar farm at Chelson Meadow is currently at the planning stage and will be a key source of renewable energy for Plymouth.

Generation and storage baseline

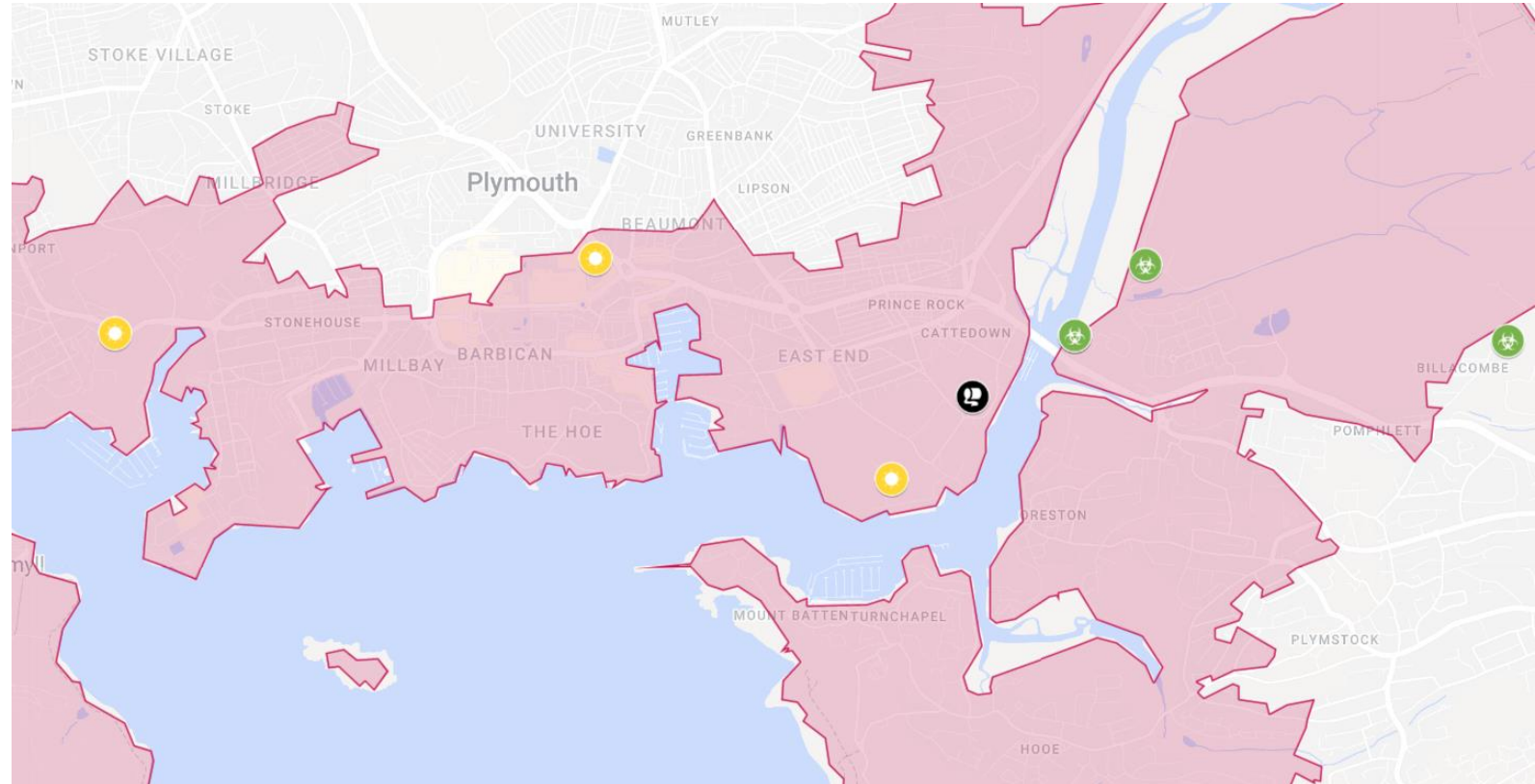
Solar

Biofuel - Landfill gas

Stored Energy

Fossil - Gas

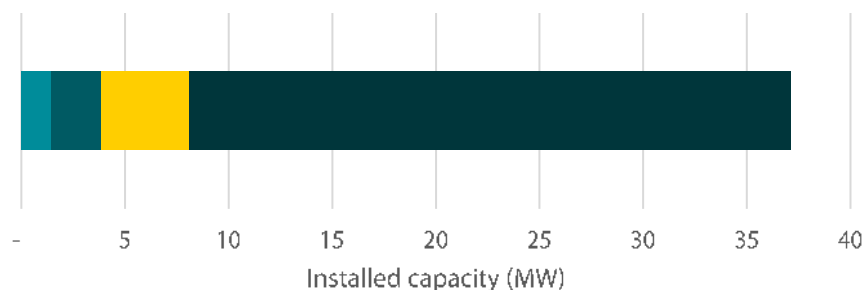
Fossil - Oil



Baseline (2021)

There are four key sources of electricity generation within Plymouth's waterfront area (as of 2021). Fossil fuels account for approximately 78% of the electricity generated within the waterfront in 2021, with commercial and rooftop solar accounting for approximately 6% and 4% respectively.

Plymouth waterfront electricity generation and storage baseline



Domestic rooftop solar (MW) Commercial rooftop solar (MW)
Landfill gas (MW) Fossil fuel generation (MW)

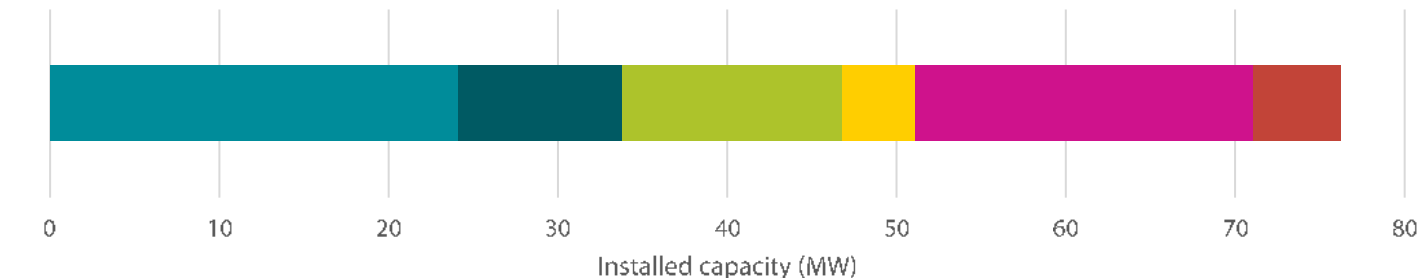
Source: WPD DFES 2021, Regen analysis

Plymouth net zero pathway projection (2030)

The main low carbon electricity generation resource in the Plymouth waterfront is rooftop solar PV. Under the Plymouth pathway projections, approximately one third of households could install rooftop solar PV, totalling 24 MW (31% of electricity generation), in addition to 10 MW of commercial rooftop solar PV. Together with the 13 MW of ground mounted solar projected by 2030 through Chelson Meadow solar farm – expected to be connected October 2022 – this could generate 32 GWh and save c.5 kt CO₂ emissions per year.

25.5 MW of battery storage is also projected in the area for 2030, providing system flexibility opportunities, as well as reducing the capacity requirement of other generation resources.

Plymouth waterfront electricity generation and storage projections



Domestic rooftop solar (MW) Commercial rooftop solar (MW) Ground-mounted solar
Landfill gas (MW) Grid connected battery storage Domestic and commercial domestic storage
Hydrogen fuelled generation

Source: WPD DFES 2021, Regen analysis

Renewable electricity generation provides a prime opportunity to decarbonise the Plymouth waterfront area, with rooftop solar PV and battery storage likely to be the key technologies.

The net zero scenario suggests around 47 MW of new solar capacity could be developed in Plymouth's waterfront by 2030, of which three quarters would be expected to be rooftop solar PV.

This solar capacity could provide 51 FTE jobs for local people, including installation and servicing.

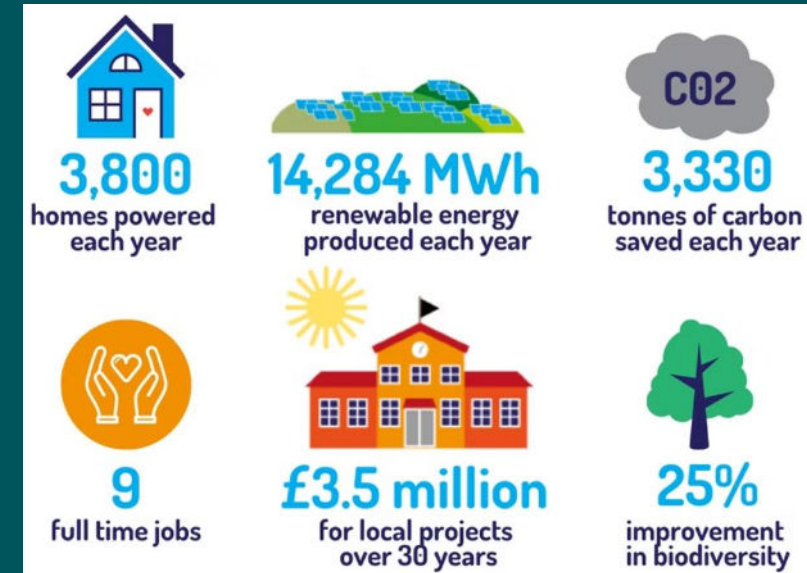
Low-carbon technologies such as solar PV can provide investment opportunities for local communities and will help with consumer energy cost-reduction during the ongoing energy price crisis. Some sites can also offer further value by co-locating with battery storage facilities.

Ground-mounted solar PV farms can also be used as an opportunity to improve biodiversity on a site, especially if biodiversity net gain is required through planning.

Technology and added installed capacity		Investment required (CAPEX)	GVA	Job years	Estimated lifetime emissions savings (CO ₂ e on today's grid carbon factor)
Solar (47 MW)	Domestic	£28. million	£29.2 million	26	101 kt CO ₂
	Commercial	£9.3 million	£30.9 million	25	96 kt CO ₂
Battery storage (25.5 MW)	Domestic and commercial (5.5 MW)	£4.7 million	£11 million	9.4	N/A (enabler for higher renewable energy system)
	Prince Rock (20 MW)	£17 million	£40 million	34	N/A (enabler for higher renewable energy system)

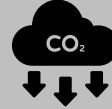
Case Study: Chelson Meadow Solar Farm

As a 13 MW ground mounted solar farm, feasibility studies by Plymouth Energy Community have estimated that Chelson Meadow could provide 9 full-time jobs, alongside a variety of system and environmental benefits.

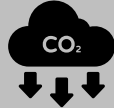


Recommended actions

Generation and storage

		Carbon saving potential 	Estimated cost 	Speed of impact 
Collective buying of solar PV and batteries	Provide an opportunity for a street-by-street collective buying project for technologies, such as solar PV and battery storage, integrated with Plymouth Energy Community projects.			
Local supply chain capability for solar PV	Review local supply chain capacity for rooftop solar PV and align any procurement opportunities and collective buying projects with local companies, maximising the local economic benefits.			
Review benefits of commercial solar PV with private landlords	Work with private building landlords to unlock commercial rooftop solar PV projects, alongside Plymouth Energy Community. Emphasise the improved business model from the energy price crisis and review options for lower business rates for those that install new solar PV.			
Review social landlord rooftop solar PV approach	Review social landlord policy for rooftop solar PV in retrofit and new build properties given the change in energy prices (15% of Plymouth Community Homes portfolio has solar PV).			
Optimise the planned battery storage project at Prince Rock	Engage with battery storage developer to discuss the planned site at Prince Rock that will replace the existing gas peaking site. And discuss optimisation of the site with the PCC Prince Rock depot and partnership with Plymouth Energy Community.			

Recommended actions (cont.)

		Carbon saving potential 	Estimated cost 	Speed of impact 
Resource assessment of PCC estate	Resource assessment of PCC estate in the waterfront area for further renewable energy generation opportunities.			
New houses in Millbay to be fitted with rooftop solar PV	Enforce new climate emergency planning guidance for rooftop solar PV (40% of roof space) for the planned new housing developments in the waterfront area (e.g. Millbay).			
Review options for Energy from Waste plant in Devonport to provide efficient electricity and heat	Even though it is outside of the Plymouth waterfront study area, continue review of Energy from Waste site in Devonport with MVV, MoD, and Babcock, as one of the largest single emitters in the city. Work to ensure that the electricity and heat is used in the most efficient way possible and to explore emissions abatement options.			



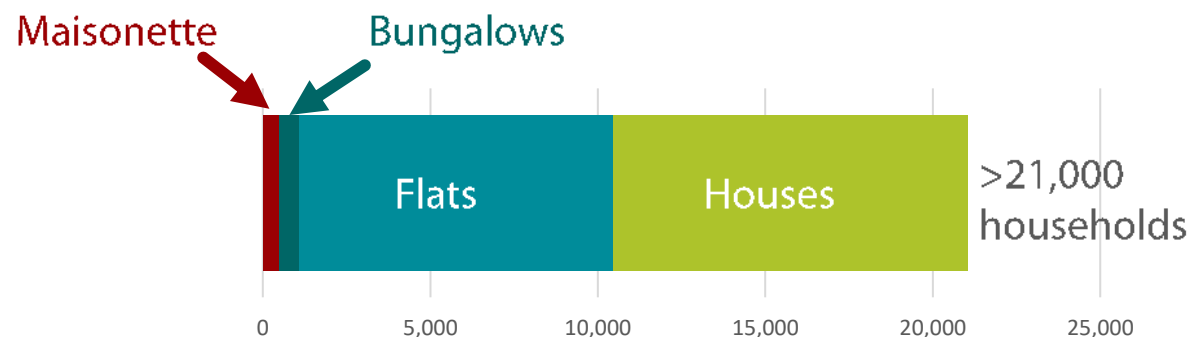
Heat and buildings - domestic

Plymouth waterfront area contains a range of domestic property archetypes. These range from Georgian properties across Stonehouse and Devonport – with low Standard Assessment Procedure (SAP) scores – to new build developments around Stonehouse and Millbay – built to higher SAP scores.

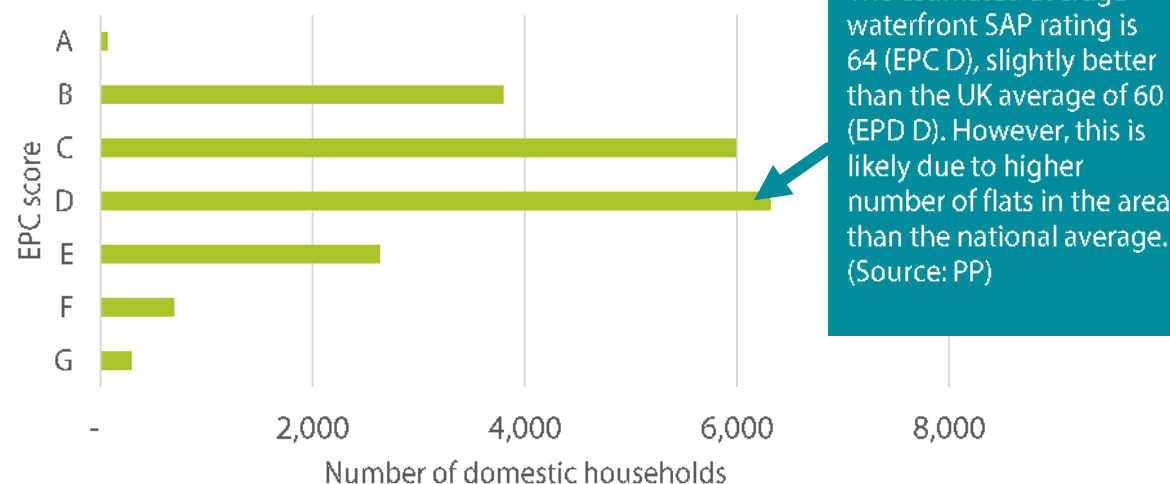
Overall, estimated SAP ratings in Plymouth waterfront are higher than the UK average, at 64 (EPC D) compared to 60 (EPC D), although a higher density of flats in the area compared to the national average may affect this conclusion as they have a higher EPC score on average.

Decarbonising domestic heat within the waterfront area will significantly depend on electrification technologies – primarily heat pumps. This will include a range of standalone heat pumps for domestic properties, standalone heat pumps within a shared loop system and district heat networks – including ground source and innovative marine source heat pumps.

Household types in Plymouth Waterfront



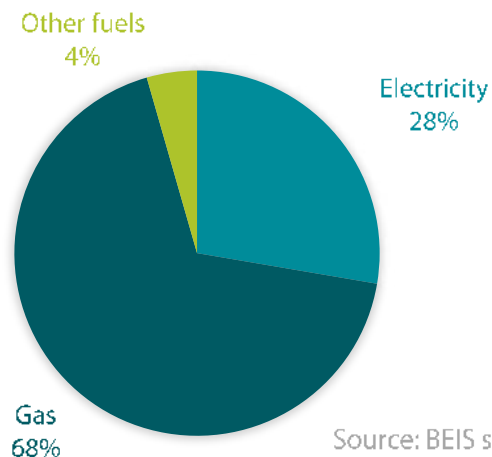
Plymouth waterfront domestic household
EPC scores



Baseline (2020)

In 2020, domestic houses in Plymouth's waterfront area were primarily fuelled by gas, with 28% fuelled by electricity and only 4% from other energy sources such as biomass. 81% of the energy consumption of a typical domestic household is from heating. Therefore, shifting away from gas use for heating is a priority for decarbonisation, alongside investment in insulation upgrades and associated measures.

Plymouth waterfront domestic energy consumption baseline



Source: BEIS sub-national energy consumption, 2020

Plymouth net zero pathway projection (2030)

If the net zero 2030 pathway is achieved, the majority of homes in the Plymouth waterfront area will be heated by heat pumps, with 17% of those houses connected to a district heating network. It is projected that no homes will be heated using fossil fuels.

Ensuring buildings are energy efficient will reduce the overall heat demand for the area. According to the 2011 census, around 50% of houses within Plymouth's waterfront are listed with an EPC rating of D or below. The Climate Change Committee estimate that all homes (including rented properties) should have an EPC rating C at point of sale by 2028 enforced by mortgage lenders.

Domestic heating



Number of homes heated by heat pumps in Plymouth waterfront

2021 <100

2030 22,399

Including
17%

of homes heated via district heating networks by 2030

Source: WPD DFES 2021, Regen analysis

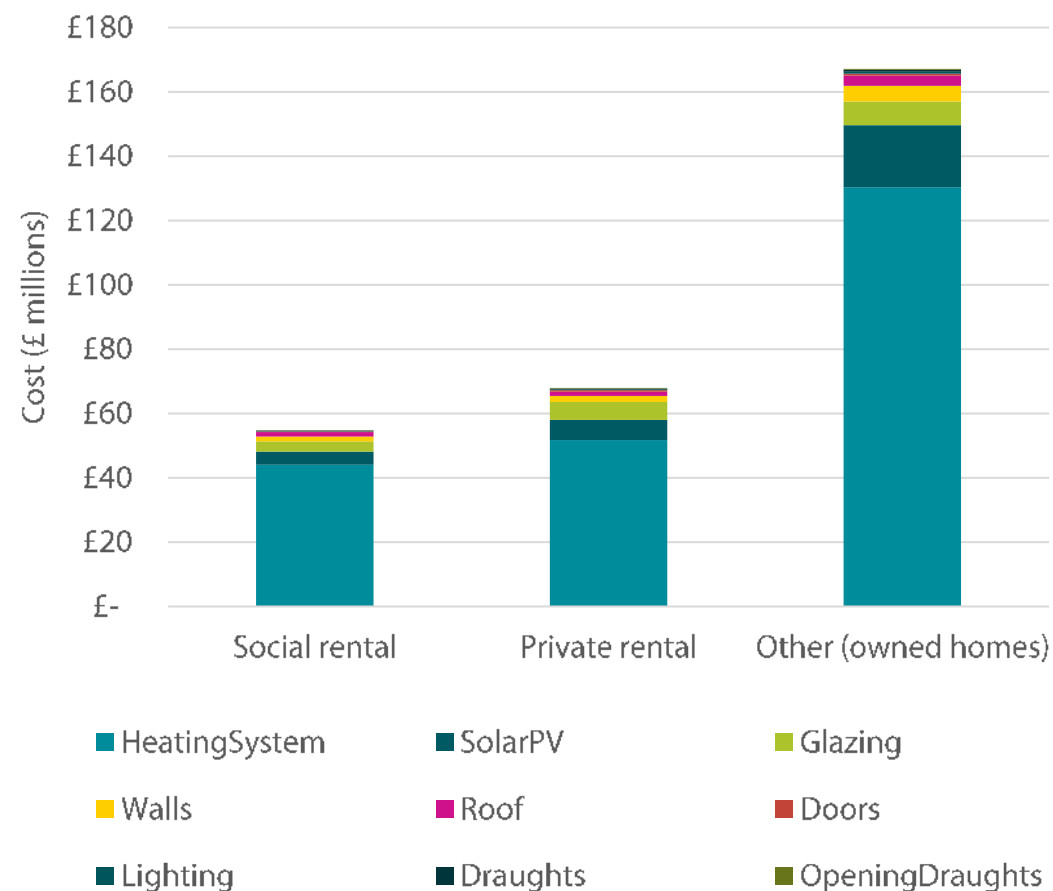
Retrofitting all houses in the Plymouth waterfront with the current list of impactful EPC recommendations would cost approximately £290 million, of which around £57 million would be required for social housing. To deliver the net zero pathway, it is assumed that Plymouth Community Homes, the biggest social house provider across the city, would be expected to adapt their own policies to provide these retrofits.

Around 1,393 jobs could be provided through the retrofit of all houses within the waterfront area. This only includes the initial installation of domestic efficiency measures and does not include jobs relating to repairs or maintenance.

Measure	Estimated cost (£ millions)	Total carbon saving (kt CO ₂)	Jobs/year
Doors	£1.4	0.01	Retrofitting houses can provide estimated 199 FTE jobs per year
Draughts	£0.9	0.4	
Glazing	£16.8	0.7	
Heating System	£226.0	40.8	
Lighting	£0.9	0.1	
Opening Draughts	£0.6	0.2	
Roof	£8.1	3.7	
Solar PV	£29.0	2.0	
Walls	£6.1	1.9	
Total	£290 million (£13,800 per property)	50 kt CO₂	

Source: Parity Projects

Estimated capital cost of implementing all EPC recommendations in different housing archetypes in Plymouth waterfront



Source: Parity Projects

Opportunity – domestic heat pumps

Heat and buildings -
domestic

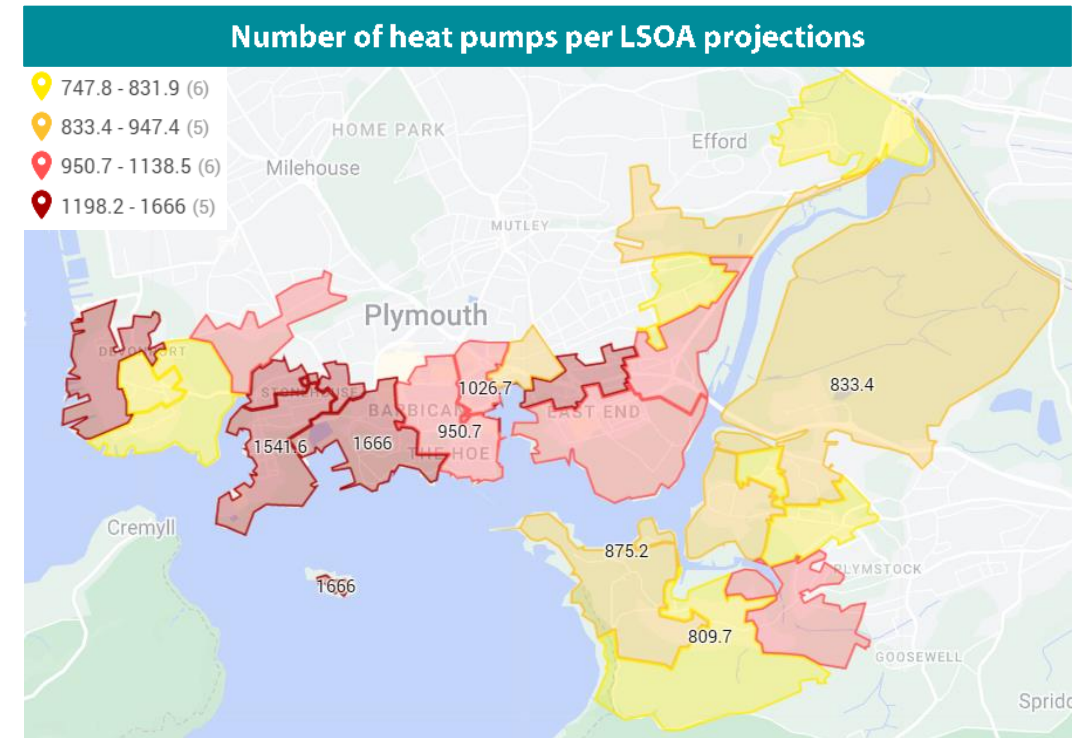
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Installing over 18,000 heat pumps in Plymouth's waterfront could create around 1,225 jobs initially, with long-term jobs also created to provide maintenance services – ranging from highly skilled engineering jobs to soft-skilled focussed roles. Both the installation and upkeep of heat pumps can offer the chance for local technicians to upskill.

Approximately £274 million will be required to install the projected domestic heat pumps. The UK government are offering grants through their Boiler Upgrade Scheme (2022 – 2025) to install low-carbon heating systems; however, significant CAPEX remains after the grant and convincing homeowners to install low-carbon heating systems, rather than upgrade existing gas boilers, may be challenging.

According to the 2011 census, around 25% of homes within the waterfront are social housing. The investment required to install heat pumps in these properties might be expected to be met by social housing providers in the area; however, at present their heating replacement policies and budgets do not support widespread installation of heat pumps.

At present, carbon savings of around 70% per household could be achieved if gas boilers were replaced with low-carbon heat pumps – these savings will increase further as electricity is decarbonised.



Source: WPD DFES 2021, Regen analysis

Technology and added installed capacity	Investment required (CAPEX)	Jobs	Total carbon saving (CO ₂ e on today's grid carbon factor)
Domestic air source heat pump - 8 kW ¹ (18,591 units ²)	£274 million ³	1,225	70% carbon savings

¹Assumes an average size of air source heat pump suitable for a poorly insulated 3 bed or well insulated 4 bed house.

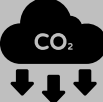
² This number of units is lower than the Plymouth net zero projection data on page 25 due to the use of EPC data from Parity Projects for this opportunity analysis.

³CAPEX estimates include the cost of the heat distribution system for air source heat pumps. Estimates do not include government grants.

Recommended actions

Heat and buildings - domestic

regen transforming energy

		Carbon saving potential 	Estimated cost 	Speed of impact 
Social housing	Energy efficiency in social housing			
	Policies to encourage switch to heat pumps			
	Coordinated heat pump benefits marketing campaign			
	Apply for Social Housing Decarbonisation Fund			
Planning	Climate Emergency Planning guidance acceleration			
	More ambitious net zero home policies			

¹PCC, 2022 <https://www.plymouth.gov.uk/sites/default/files/PlymouthandSouthWestDevonClimateEmergencyPlanningPolicyandGuidance.pdf>

²SW net zero hub, 2021 <https://www.swenergyhub.org.uk/wp-content/uploads/2021/12/WoE-net-zero-new-build-policy-evidence-1.3.pdf>

Recommended actions

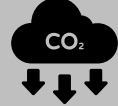
Heat and buildings - domestic

regen transforming energy

Energy Efficiency

Review plans with housing developers against new buildings standards

Work with housing developers to ensure they align with the uplift in building standards that occurred on 30 June 2022, ahead of the Future Homes Standard due in 2025, documented in Plymouth and South West Devon Climate emergency planning policy guidance¹.

Carbon saving potential


Estimated cost


Speed of impact




Retrofit works procured from local SMEs where possible

Build on approach already being piloted in Plymouth for heat networks, to create zones of energy efficiency work that can be procured locally from SMEs on a street-by-street basis.



Future funding for low-carbon housing measures

Work with government to secure further long-term funding packages that build on the Green Homes Grant Local Authority Delivery scheme and Social Housing Decarbonisation Fund.



Retrofit incentives using council tax and business rates

Support negotiations with government to gain powers in Devon Devolution Deal to use rebates on Council Tax and Business Rates to incentivise building retrofit.



Focus on private landlords and MEES enforcement in waterfront buildings

Resource the housing improvement team to more proactively enforce the Minimum Energy Efficiency Standard (MEES) on the 250 EPC F and G private rental properties in the Plymouth waterfront area and use any funds raised for further energy efficiency activity.



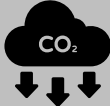
See next page

¹PCC, 2022 <https://www.plymouth.gov.uk/sites/default/files/PlymouthandSouthWestDevonClimateEmergencyPlanningPolicyandGuidance.pdf>

Recommended actions

Heat and buildings -
domestic

regen
transforming energy

Carbon saving potential	Estimated cost	Speed of impact
		
		
		

Build able to pay
market for retrofits

Stimulate the market for building and heating system retrofit to pay households through future home assessments (or via PAS 2035). See [Your Home Better](#) case study.

Locally targeted
future homes
communications
plan

Work with government and other local authorities to develop a future homes (energy efficiency and low carbon heat) communications plan with resources and funding that are locally targeted.

Energy Efficiency



Industrial and commercial



Heat networks

Plymouth has a Low Temperature Building Zone which covers the City Centre and Millbay, requiring new developments to connect to a heat network where possible.

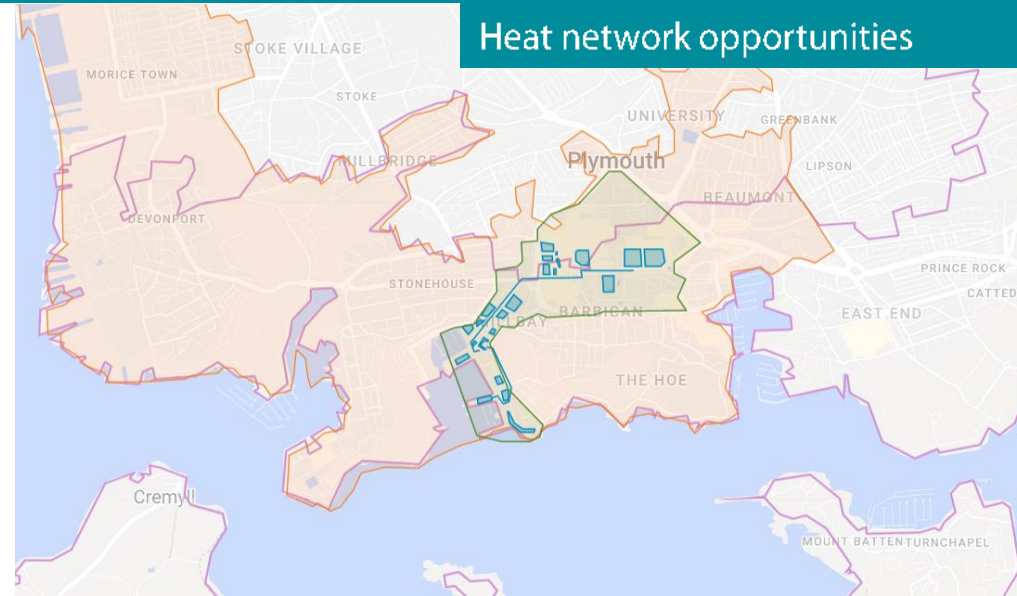
An existing heat network masterplan is being updated and is currently scoping out the implementation of a 5th generation heat network. The waterfront area contains significant areas of the district heat network plan, including extensions towards Millbay. Air source, ground source, and marine source heat pumps are being considered, with gas CHP used for top-up.

Industrial and commercial sites

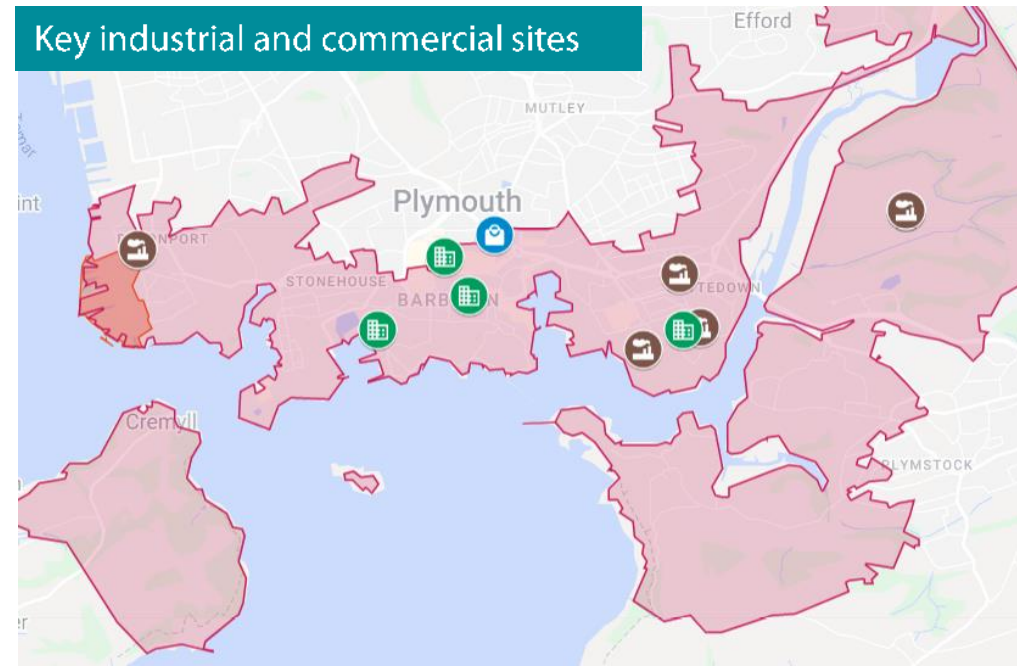
There are an estimated 2,900 commercial and industrial sites in the waterfront area, including over 500 shops, 350 offices and 220 industrial sites.

Industrial areas include Cattedown and Devonport, as well as an existing covered landfill site at Chelson Meadow. Cattedown includes a significant petroleum fuel terminal and port facilities as well as the Prince Rock depot for Plymouth City Council waste and recycling processing. Devonport includes the South Yard Freeport area, existing businesses and plans for further commercial developments in the next few years.

Heat network opportunities



Key industrial and commercial sites



Plymouth waterfront study area

Plymouth waterfront study area

Opportunity Areas

Waterfront Heat Opportunity Area

Heat Network Masterplan (current)

All items

Low Temperature Building Zone

Low Temperature Building Zone

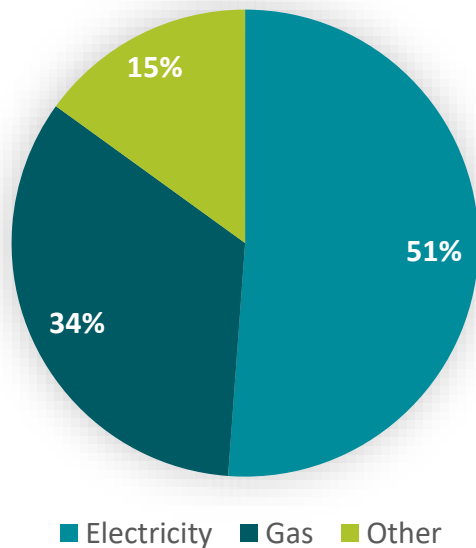
Points of interest

- Chelson Meadow Energy Ltd
- Chelson Meadow Energy Ltd
- Chelson Meadow Energy Ltd
- Devonport Royal Dockyard Ltd
- Esso Petroleum Co Ltd
- Shell UK Ltd
- Ballard House
- Midland House
- 1st Stop
- Prince Rock Depot
- Drake Circus
- South Yard

Baseline (2020)

Plymouth waterfront's commercial and industrial sectors are fueled by gas and electricity, emitting approximately 56 kT CO₂e in 2020 – c.25 kT CO₂e from commercial buildings and c. 29 kT CO₂e from industrial buildings.

Industrial and commercial energy consumption



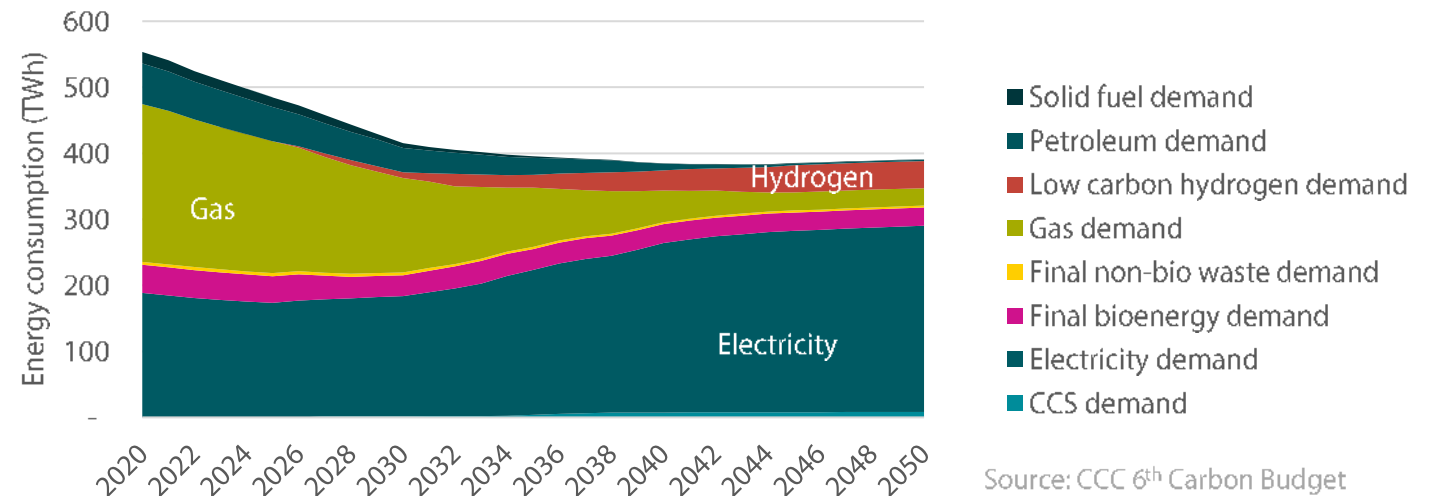
Source: BEIS – sub-national energy consumption

Plymouth net zero pathway projection (2030)

The 2030 net zero pathway projection assumes that the majority of gas consumed by the commercial and industrial sectors will be electrified, including the provision of heat networks. This will include the four council buildings located within the waterfront area, alongside major commercial hubs such as Drake Circus shopping centre.

The implementation of 4th and 5th generation district heat networks are already in the planning and feasibility stage across Plymouth, with the majority of the identified district heat network clusters and energy centres located within the waterfront study area, including water/marine source heat pumps in Millbay.

CCC 6th Carbon budget 'Manufacturing and Construction' and 'Non-Residential Buildings' energy decarbonisation trajectory - Widespread Engagement (electrification) scenario



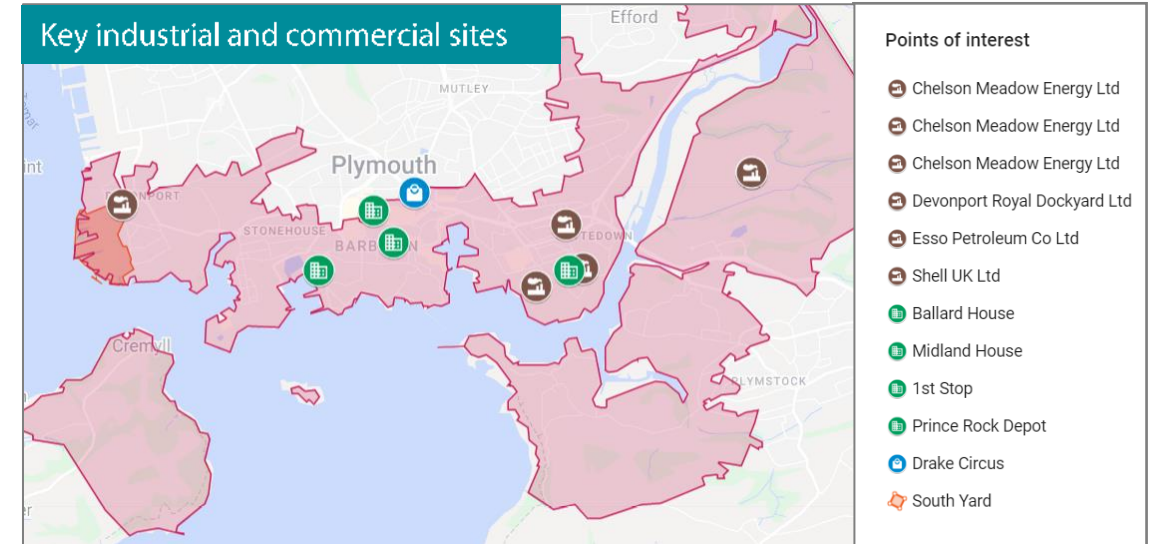
Source: CCC 6th Carbon Budget

Commercial and industrial buildings tend to lend themselves to integration within a district heat network, rather than having a heat pump per property. A heat network connection will provide whole system energy benefits - as supply and demand can be better managed.

Multi-stakeholder engagement with parties such as the National Marine Aquarium, Marine Biological Association and Associated British Ports will be critical and the Council will need to coordinate an approach with a wide number of heat users.

The expansion of heat networks across Plymouth's waterfront, irrespective of the low-carbon energy source, will contribute to the creation of c.150 jobs during the five-year peak construction period, with additional jobs created to maintain the network across its lifetime.

Switching from gas to a district heat network would provide a carbon saving around 30%, although this saving could range up to 90% depending on the decarbonisation of the electricity grid and improved efficiencies in the heat network.



Technology and added installed capacity	Investment required (CAPEX)	Jobs	Estimated emissions savings (CO ₂ e based on today's grid carbon factor)
Heat networks (heat pump focused)	£5-7 million/MW using latest heat network pipeline data*	In the order of 150** jobs created during construction	Carbon saving of 30%
Commercial solar PV	£9.3 million	34	96 kt CO ₂

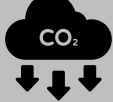
*CAPEX estimates based on current BEIS HNDU pipeline heat networks. Estimates include the cost of the heat distribution system networks, including pipe installation and any ground works necessary

**assuming 50% of Plymouth waterfront's commercial and industrial gas consumption switches to heat networks

Recommended actions

Industrial and
commercial

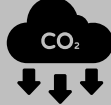
regen
transforming energy

		Carbon saving potential 	Estimated cost 	Speed of impact 
Heat networks	Widen low temperature building zones			
	Review marine source heat pump at South Devonport			
	Review tax benefits for heat network in Freeport			
	Develop role in heat network zoning pilot			
	Stakeholder engagement on low-carbon heat networks			
	Assess waste heat from sewers for heat networks			
	Widen the low temperature building zone in place to include other areas, such as the Plymouth and South Devon Freeport and Millbay port redevelopment plans, requiring heat network connections for any new developments.			
	Complete further feasibility work on South Devonport area to assess potential for marine source heat pumps and replacement of existing steam heat network.			
	Ask for HNDU or other to provide legal guidance on the potential use of Plymouth and South Devon Freeport tax benefits for the supply of heat using heat networks.			
	Continue to develop PCC zoning coordination role in heat network zoning pilot and aim to deliver wider projects in Plymouth waterfront.			
	Update the guidance and case for connecting to a low-carbon heat network against new counterfactuals and pricing, communicating this to key stakeholder groups (e.g. Plymouth net zero action group).			
	Work with South West Water to investigate use of the waste heat in the sewer system for heat network development.			

Recommended actions

Industrial and
commercial

regen
transforming energy

		Carbon saving potential 	Estimated cost 	Speed of impact 
Financial incentives for investment in low-carbon technology	Review business rates levels to provide financial incentive for business investment in energy efficiency and renewable energy generation technologies.			
Implications of Freeport status for local energy projects	Review the implications of the Freeport status and tax benefits in terms of new local energy project development.			
Wider campaign to bring in clean energy businesses to Freeport	Wider publicity campaign of the tax benefits of freeport designation in Devonport south yard and Oceansgate in order to bring additional clean energy and marine businesses into the waterfront.			
More ambitious policy enforcement on new developments in South Yard Devonport	Plymouth City Council to enforce more ambitious policies on new commercial and industrial developments in South Yard Devonport, excluding installation of new fossil fuel heating systems alongside offer of match-funding and enhanced capital allowances in Enterprise Zone and Freeport area.			



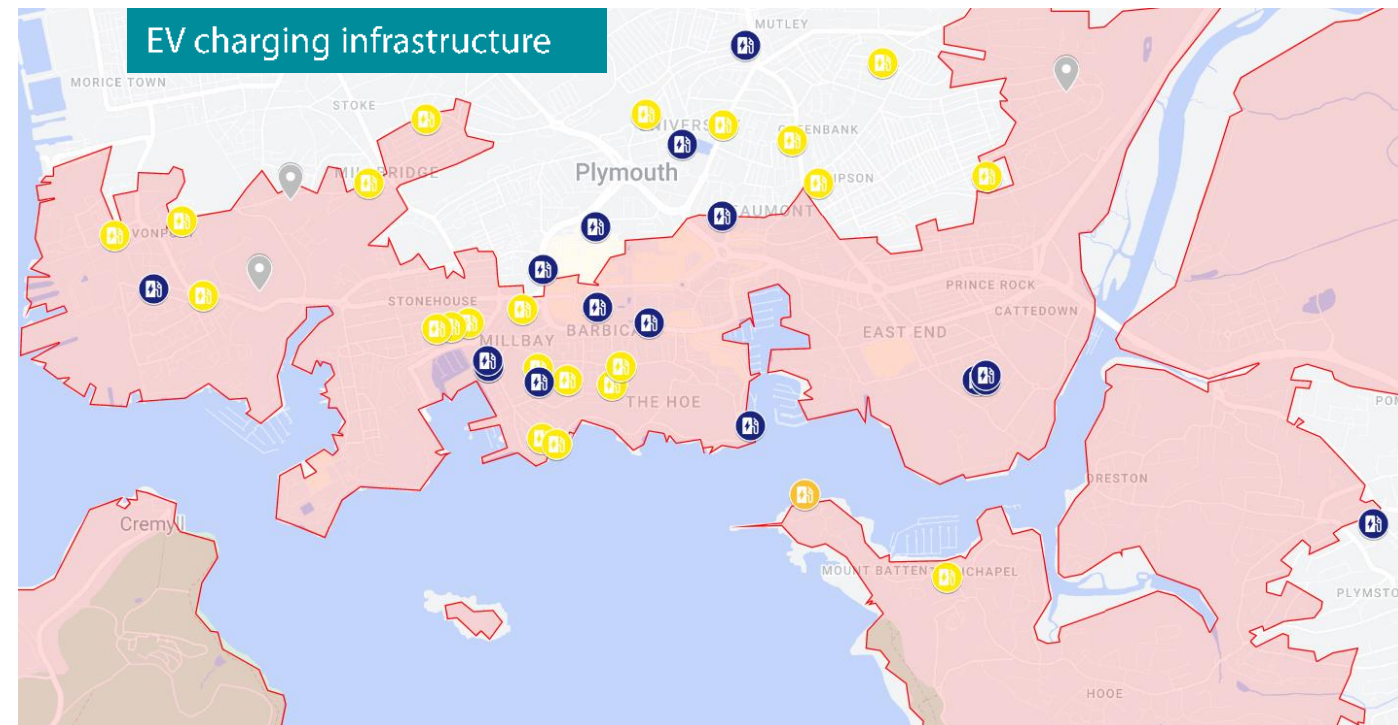
Road transport



Plymouth is developing its charging infrastructure for both terrestrial EV and marine electric charging. The Clean Streets innovation project (funding of £3 million) installed 27 new on-street pop-up chargers (54 sockets) across 10 locations in the Plymouth waterfront area.

Current EV charging infrastructure is a combination of public, on-street, and workplace, most of which offer around 7 kW. Prince rock is the PCC fleet hub for refuse collection and wider activities and has 26 charging sockets for fleet.

PCC is developing a pipeline of up to 50 mobility hubs as part of the Transforming Cities Fund investment. Each hub will be aligned with public transport routes and include electric vehicle charge points (Wenea), electric bicycles (Beryl Bikes) and shared electric car club vehicles (Co-Cars) -17 locations are in the Plymouth waterfront area.



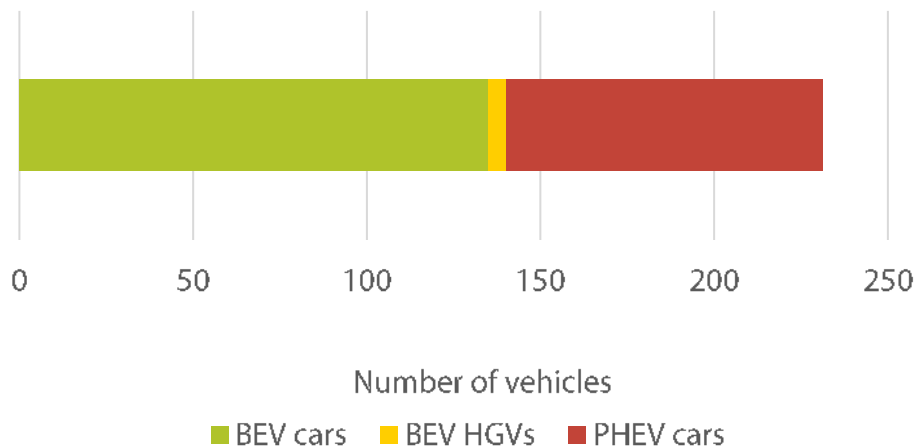
PCC road charging infrastructure

	7 (28)
	7.4 (27)
	150 (1)
	22 (1)
	Other / No value (5)

Baseline (2021)

The uptake of electric vehicles within Plymouth's waterfront is behind the national average. Currently only 0.7% of the estimated 19,500 registered vehicles in the area are pure electric, compared with 1.2% nationally.

Plymouth waterfront EV uptake baseline



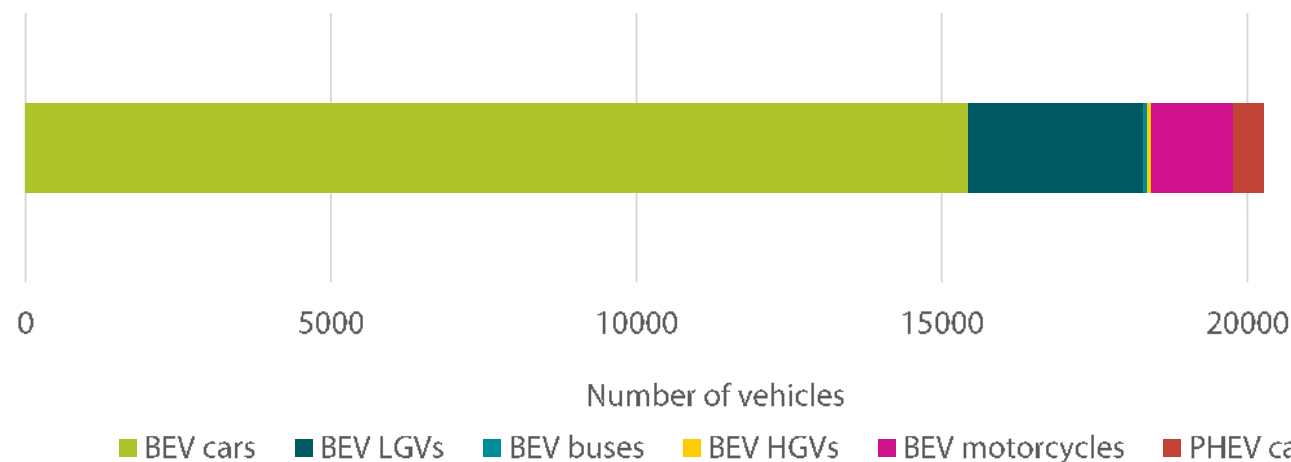
Source: WPD DFES 2021, Regen analysis

Plymouth net zero pathway projection (2030)

If the 2030 net zero pathway is delivered, over 20,000 electric vehicles could be registered within Plymouth's waterfront area – removing approximately 29.7 kt CO₂e – of which 76% are expected to be fully electric cars.

Based on the number of EVs required to deliver the net zero pathway, approximately 9,965 electric charging points would be installed across the waterfront area, including 1,565 public charge points and 500 workplace charge points. These estimates do not include schemes such as mobility hubs.

Plymouth waterfront EV uptake projections



Source: WPD DFES 2021, Regen analysis

The uptake of EVs will require sufficient charging infrastructure to cope with demand. The installation of c.10,500 EV chargers across the waterfront could provide between 300 – 860 jobs and, although GVA associated with Plymouth's transition to EVs is difficult to calculate, garages and mechanics are expected to upskill to accommodate EVs and business models of refuelling stations will need to shift from petroleum to electric.

Technology and total installed capacity		Investment required (CAPEX)	Jobs created (median)	Estimated lifetime emissions savings (CO ₂ e on today's grid carbon factor)
Charging infrastructure (10,492 units)	Domestic, off- and on-street (9,910 units)	£27.7 million	473	The emission savings attributed to the uptake of electric cars (29.7 kt CO ₂ e) and associated charging infrastructure.
	Workplace (239 units)	£1.2 million	21	
	Slow/Fast Public (268 units)	£1.3 million	23	
	Rapid Public (75 units)	£3.7 million	64	

Mobility Hubs

As part of the Transforming Cities Fund investment programme, 17 mobility hubs will be delivered within Plymouth's waterfront. Based on the scheme's overall cost of £11.57 million, it can be assumed that c.£2.6 million will be invested into the mobility hubs across the waterfront.

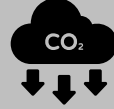
As well as offering sustainable transport connectivity across key commuter routes, the delivery of the scheme will also provide the opportunity to upskill existing employees and provide jobs associated with the installation and O&M of the hubs.



Recommended actions

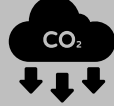
Road transport

regen
transforming energy

		Carbon saving potential 	Estimated cost 	Speed of impact 
Review need for further EV charging infrastructure	Review waterfront area for further EV charging needs. For example, identify clusters of houses without off-street parking.			
Grant funding scheme for EV infrastructure	Apply to the new Local EV Infrastructure (LEVI) Fund once fully launched and existing On-Street Residential Charging Scheme (ORCS) where applicable.			
Accelerate ULEV uptake in taxis via licencing	Review licensing conditions for taxis, looking to accelerate 2030 Ultra Low Emission Vehicle (ULEV) requirement for new applications and renewals.			
Review charging infrastructure needs for taxis	Assess the charging infrastructure requirements for taxis and partner with CPOs to develop where necessary.			
Review bus charging infrastructure needs	Discuss bus fleet decarbonisation plans with Plymouth CityBus and provide sufficient charging infrastructure ahead of the government ending the sale of non-zero emission buses from 2032 (at the latest).			
Review charging infrastructure at depot	Work with Stagecoach to review electrification of their Laira Bridge bus depot located in the Plymouth waterfront area.			

Recommended actions

Road transport

		Carbon saving potential 	Estimated cost 	Speed of impact 
Stakeholder engagement on low-carbon freight options	Review impact of HGV traffic to and from fuel terminals in Cattedown and investigate freight decarbonisation options with key stakeholders (e.g. Greenenergy).			
Green refuelling infrastructure in Freeport	Ensure green refueling infrastructure focused on electrification is included in all new Plymouth and South Devon Freeport developments for LGV and HGV traffic.			
Electrified vehicle mandate in Freeport zones	Review policy options to mandate electrified vehicle (cars, LGVs, HGVs, and plant machinery) use in Plymouth and South Devon Freeport areas (e.g. Low Emission Zone).			
Deliver actions in Freight strategy for South West	Work with Peninsula Transport to deliver the actions in the Freight strategy for the South West. Including increasing the marine freight capacity at Millbay and links with the Freeport.			
Support transport as key sector in Devon Devolution Deal	Support draft Devon Devolution Deal that includes transport as a key sector and potential for a new Local Transport Plan, multi-year transport settlement, and additional powers to introduce local bus franchising across Devon.			
More net zero demand responsive transport	Expand net zero compliant demand responsive transport options for those with additional needs.			



Maritime transport and shipping



Plymouth consists of four ports: Devonport; South Yard; Millbay and Cattewater. Together, these host a variety of maritime activities including naval operations, high speed pleasure crafts, freight landings and ferry berths. These ports are estimated to account for approximately 0.5% of the UK's shipping activity, based on analysis of BEIS port shipping activity data.

At present, large-scale vessels used in these maritime activities are unlikely to be fully electrified due to constraints in energy storage and charging requirements. However, opportunities for decarbonisation lie in battery electric hybrid and green hydrogen powered vessels. These developments could align with the development of the hydrogen plant at Langan - within the freeport area.

Vessels such as yachts, ferries and smaller pleasure crafts that are less than 12 metres in length are currently more suitable for full electrification. In light of the UK's first National Marine Park, Plymouth is already pioneering the electrification of such vessels and launched the UK's first sea-going e-ferry, the e-Voyager, back in 2020. Since then, the Mount Batten e-Link ferry has also electrified, and a bid has been won to design and build an all-electric 150-passenger ferry for Plymouth Boat Trips.

There is also the potential for the marine transport sector to play a bigger role in transport decarbonisation across the city, with closer links to active transport and public transport in the waterfront. The mobility hubs being developed and further investments in marine charging infrastructure could help enable that enhanced role.

Marine e-charging Living Lab

The Marine e-charging Living Lab (funded £570,000 by the Department for Transport) installed three electric vessel charging points within the Plymouth waterfront area, making Plymouth the first city in the UK to install a network of electric boat chargers.

Marine charging points are located at the Barbican landing stage, Queen Anne's Battery marina and Mount Batten marina, and range between 75 kW (DC) – 150 kW (DC).

Further charging locations were identified in this work but could not be taken forward in timeframe available. These locations could be progressed quickly if sufficient funding was available.

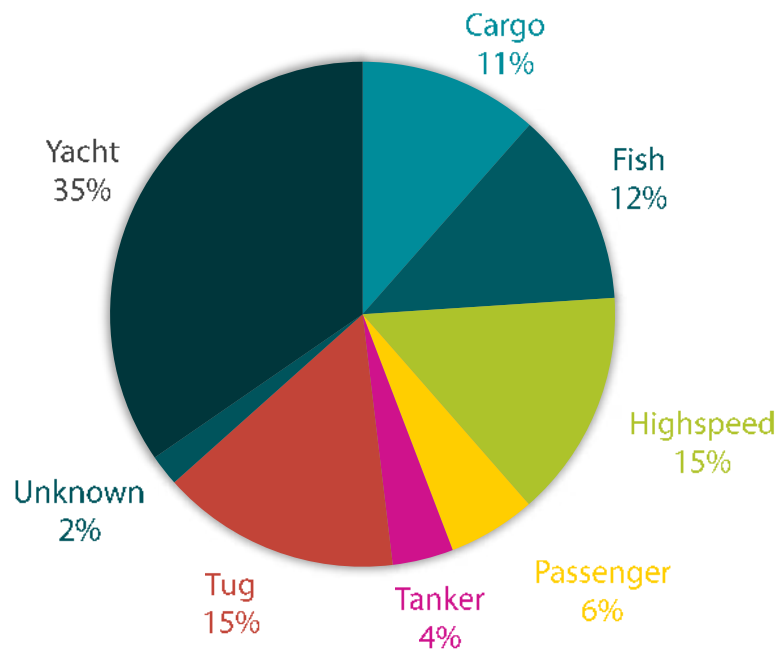


Source: University of Plymouth

Baseline (2020)

The refuelling of shipping activity based around the waterfront area (cargo, fishing, RoRo ferries) equated to around 48 kt CO₂e in 2020, approximately 0.4% of the UK's total greenhouse gas emissions for that year.

Plymouth port calls per vessel class
January – December 2019



Source: FleetMon

Plymouth net zero pathway projection (2030)

Plymouth is already capitalising on the electrification of vessels less than 12 metres in length – these are more suitable for full electrification and account for around 70% of marine traffic in the City's ports. It is projected that all four of the inter-city passenger ferries will electrify by 2030, as well as all pleasure craft <12m.

Charging infrastructure will need to be introduced to supply sufficient energy at peak times. Plymouth is leading the way as the first port in the UK to install marine-side rapid charging infrastructure, following on from the development of the UK's first electric passenger ferry. At present, six electric vessel charging points are located within the waterfront area though this represents just the first step of the marine sector's electrification. The provision of electric outboard engine charging infrastructure should also be considered.

A large proportion of Plymouth waterfront emissions will be attributed to when vessels are berthed. Brittany Ferries, one of the major ferries docking in Plymouth, is retrofitting their fleet for shore power, and has confirmed a 7 MW demand connection at Millbay with WPD. This shore power option could be upgraded to 10-12 MVA when Brittany Ferries receives hybrid vessels (LNG and battery) in 2024/25.

Plymouth is leading the way in decarbonising the maritime sector. As a winner of the Clean Maritime Demonstration Competition Round 2, and having been allocated Freeport status, Plymouth can spearhead the decarbonisation of the maritime sector. There is the opportunity for PCC to influence the development of the revised Clean Maritime Plan expected in 2023, which is likely to include both clean propulsion innovation and shore power.

The number of jobs created by clean maritime transport is difficult to determine due to the early stage of the sector's development. Electric vessel charging points, until now, have been modelled on terrestrial EV chargers and so it is likely that the number of installation and maintenance jobs will be somewhat comparable – further upskilling could be required due to the added difficulty of installing chargers in a marine environment. GVA and costs associated with installing marine charging infrastructure are also difficult to estimate. Comparisons could be made with the cost to install terrestrial EV chargers, although it is likely to be significantly more expensive to install marine charging points due to distance from the grid and the intricacy of laying cables around marinas.

There is a substantial ambition from industry to implement shore power for larger-scale vessels, such as military fleets and international passenger ferries. A 7 MW new demand connection has been reserved for Millbay with an estimated CAPEX of £3.5 million. Funded by ABP and potentially grant funding from round 3 of Clean Maritime Demonstration Competition (CMDc) (when details are confirmed). Jobs and GVA associated with shore power investments for larger-scale vessels across Plymouth are difficult to determine due to only two such examples in the UK so far.

Plymouth and South Devon Freeport

The Plymouth and South Devon Freeport provides an opportunity to drive clean maritime innovation across the UK, creating an estimated £400 million of economic benefits over 15 years including 3,500 direct jobs.

The South Yard development hosts several industries which are paving the way for clean maritime innovation. A mobility hub and a new innovation centre will be installed at Oceansgate (funded with c.£28 million), integrating net zero transport with clean maritime advancement. Also home to the Maritime Business Technology Centre, Oceansgate has secured more than £735,000 to support cutting-edge marine businesses including innovative marine autonomy and clean propulsion systems.

Several businesses located within the Freeport are already engaging in low-carbon opportunities. Princess Yachts are investing £22 million in a new factory to help support their transition to hybrid vessels. Babcock are also investing £6.5 million to upgrade infrastructure and have already applied for a Low Carbon skills fund grant to do feasibility work to review low carbon heat options.

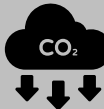


Recommended actions

		Carbon saving potential 	Estimated cost 	Speed of impact 
Future marine charging points with grant funding	Develop further marine charging infrastructure sites identified from MeLL project using available grant funding (e.g. CMDC round 3).			
Discuss wider charging needs for leisure vessels	Review wider marine charging infrastructure requirements for leisure vessels in marinas and dry stacks, working with landlords and operators to find potential solutions.			
Electric outboard charging for smaller vessels	Develop electric outboard charging infrastructure for smaller leisure vessels to use with marinas and other partners.			
Smart pontoon development a Mount Batten	Work to develop smart solutions for the development of Mount Batten pontoon that include renewable energy generation options.			
Millbay shore power requirements and funding options	Shore power Engage with ABP to review delivery of shore power requirements associated with wider port facilities expansion in Millbay and review grant funding options with government (CMDC round 3).			
Support removal of taxes on electricity as a marine fuel				
Green marine technology growth in Millbay				

¹ABP, 2020 https://www.britishports.org.uk/content/uploads/2021/10/BPA_Shore_Power_Paper_May_2020.pdf

Recommended actions

		Carbon saving potential 	Estimated cost 	Speed of impact 
Future funding for renewable growth in Millbay	Review further funding bids with ABP for additional renewable generation projects and port vehicle fleet electrification in Millbay.			
Coastal charging network expansion with other LAs	Plymouth City Council to share best practice on marine charging infrastructure provision with other local authorities to build a network of coastal chargers. And review with MoD and Babcock.			
Future agreements in clean propulsion for tug fleets and supply vessels	Review future contracts and agreements on clean propulsion in the fleet of tugs and supply vessels active in the port with MoD and Serco. Including this specific vessel fleet type in future CMDC funding bids.			
Plymouth waterfront as pioneer for green marine technology	Continue to champion Plymouth waterfront, Freeport and the Smart Sound area as world-leading test bed for new marine products and technologies, offering PCC assets as potential test sites.			
Supply of hydrogen to ports	Review the supply of hydrogen to the port facilities and future vessels from Langage hydrogen plant due to be operational by the end of 2024.			
Potential for hydrogen refuelling for marine vessels				

Hydrogen



Summary



This report has brought together an analysis of the decarbonisation pathway to achieve net zero across the five key energy sectors. It also sets out a comprehensive list of recommended actions for PCC to deliver in the near term – focussing on what PCC can do to directly deliver decarbonation, as well as to encourage, facilitate and coordinate action from other public and private sector organisations.

The 2030 timeframe for achieving net zero is incredibly ambitious, and the analysis undertaken through this project has further emphasised the sheer scale of challenge. The Plymouth waterfront study area only covers a proportion of the total Plymouth area and yet we have identified the need for a high-level estimate of at least **£657 million** of investment, with the potential to create over **2200 jobs** and save **277 kt CO₂e**.

The Plymouth waterfront study area contains decarbonisation projects that would require:



£657 million

and deliver an estimated



2200 jobs



277 kt CO₂e

If net zero is to become a reality – whether this is in 2030 or 2050 - there is an urgent need for investment and delivery at scale – both locally and nationally.

This can only occur with coordinated partnerships between government, local authorities, community energy organisations and the private sector. Plymouth City Council has been successful in coordinating these partnerships already and has received grant funding from various sources. The Levelling up funding, Local EV Infrastructure fund, and CMDC round 3 are initial grant funding options emphasised in the recommended actions from this report. There is also the need to integrate net zero into the investment plan required as part of the Plymouth Shared Prosperity Fund allocation (£3.1 million over 2022-25).

The delivery of decarbonisation projects has to be resourced and funded more effectively by central government. As referenced in our recent [local delivery of clean heat paper](#),

“we call on the government to introduce significant, non-competitive long-term investment in retrofit, heat decarbonisation infrastructure and public transport and give flexibility to local authorities to blend budgets to deliver multiple co-benefits”.

PCC should continue to work with its partners across Devon to influence government to better resource local decarbonisation ambitions, including through the Devon Devolution Deal. As currently PCC does not have sufficient powers or enough government funding to deliver on the climate emergency target.

Appendix 1 – Energy plan workshop report



Plymouth Waterfront Energy Plan Scoping and Feasibility

Energy Plan workshop report

Olly Frankland

Senior project manager, Regen

20 July 2022

An independent centre of **net zero energy expertise and strategy**, focused on analysing and addressing the **systemic** challenges of the energy transition.

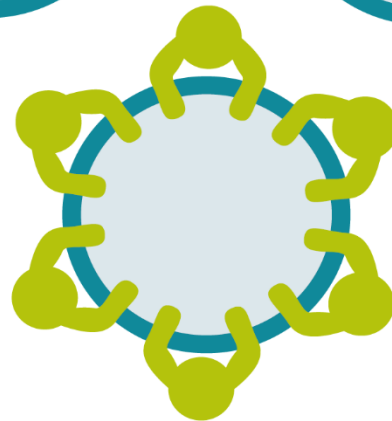
Experts

We approach the energy transition from a position of knowledge and evidence. By understanding the technical, financial, political and societal enablers needed to make sustainable energy work, we can tackle the barriers preventing progress.



Pioneers

We choose to work in areas that are innovative or new. We take on challenges; we get cutting edge projects off the ground and share the learning to inspire and enable others to follow.



Convenors

We bring the right people and organisations together to create ideas and solutions to achieve change. We work across the energy industry and its wide range of stakeholders.



Regen hosted a workshop from 10.00-11.30am on 20 July 2022 for a small group of Plymouth stakeholders in order to disseminate the project to a wider audience and gain input to the energy plan actions.

Given the attendees in the room, we focused the discussion on the marine transport sector, allowing stakeholders to provide a brief overview of their current projects and actions. This helped to maximise the interest given the time available.

We also provided two poll questions via Mentimeter.

The highlights from the discussion and polls questions are provided in this workshop report.





Marine transport and shipping

Summary of attendees

App.1: Energy
Plan Workshop

regen
transforming energy

- Attendees = 12 (see logos below)
- Registered participants = 15





ASSOCIATED BRITISH PORTS

Associated British Ports

Opportunities

- Follow up discussion with ABP on future energy and infrastructure needs for shore power.

- Engaging with Western Power Distribution (WPD) and need 7 MVA additional demand capacity to supply the shore power requirements for Brittany Ferries. Have applied and are scoping out work to bring new cable in from the city. All local substations will need upgrading and new substation needed. Project underway and are looking at delivery within 12-18 months.
- Brittany Ferries are looking to retrofit entire fleet for shore power connectivity and have a tender out at the moment for that work.
- Brittany Ferries future vessels are likely to be hybrid LNG and battery power, battery in port, emissions free. This would increase shore power requirements to 10-12 MVA. Also looking at containerised battery pack solutions that can be charged at the dock and swapped out when moored.
- Still trying to understand shore power demands for hybrid LNG and battery ships. LNG preferred over green ethanol as it more mature technology option in the short to mid term.
- ABP are assessing electrification of plant machinery and vessels such as tugs and forklifts at Millbay port.
- Brittany ferries is the main company working on this in Plymouth.
- ABP have plans to berth more cruise ships at Millbay and will include this in any shore power infrastructure plans. Goal is to have any ship with shore power to be able to dock at Millbay.



Babcock

Opportunities:

- Follow up discussion on heat network feasibility plans and grant funding outcome (due w/c 25 July). A separate HNDU feasibility grant funding bid with PCC could be the next step.
- Link with wider PCC PSDS grant applications.

- Babcock have a 2040 net zero target for scope 1 and 2 emissions. Already done baseline assessment, have a good understanding of emissions. Currently working to do more granular road map to net zero, with actions and timeframes, and costings. Until roughly December.
- Devonport south yard area - heat network system fueled by gas fired boilers (3 x Hill 60) which is a significant emissions source. Looking at possibility of replacing that. Applied for Low Carbon skills fund grant for feasibility and may use Public Sector Decarbonisation Scheme (PSDS) for delivery. This is a centralised system and depending on the outcome could move to a decentralised system (e.g. heat pumps per building). Any collaboration on water/marine source heat pumps and a heat network could be very valuable. First thing to do is insulate buildings due to their age there would be a fabric first approach.
- Main manufacturing facility Combined Weapons & Electrical Workshop (CWEW) onsite which is leased from MoD at Devonport Dockyard in Plymouth and is the main source of emissions. Babcock are going to do a more detailed study on solutions if they get the funding.



University of Plymouth

Opportunities:

- Partnering on CMDC funding bids for round 3 and 4.
- Delivering further charging locations following on from MeLL project that wanted to go ahead but couldn't meet the grant timeframes.
- Influencing Connected Places Catapult Maritime accelerator to include Plymouth as a site for activities.

- University of Plymouth has made two applications to the Clean Maritime Demonstration Competition (CMDC) round 2 fund which closed mid July 2022. CMDC round 3 is due to be confirmed in Autumn 2022. Two or three project ideas are being prepared for round 3. Local renewable energy production, shore power, and clean propulsion technologies are all included as topic areas in these bids.
- At least two sites involved in MeLL project were keen to move forward but couldn't meet the timeframes of the CMDC round 1 funding. This would need relatively small amount of extra capital spent in order to deploy further marine charging infrastructure.
- University of Plymouth – outboard charging projects have been talking to mount batten marina in particular to look at solutions.
- The University is just about to publish a report on smart pontoons (generation, charging, monitoring...) for PCC and happy to share once that has happened.
- Connected Places Catapult are just about to launch a maritime accelerator programme and are looking for sites to test and pilot projects in specific areas. Launch due in September 2022. Levelling up agenda is useful for Plymouth as a test site. ORE Catapult could also be bought in to future projects.
- UK SHORE – University is working closely with them and have met with the new CEO several times.
- University of Plymouth [Marine Station](#) and [marine fleet](#) could be considered separately as assets to shift over to clean and net zero options.



Plymouth City Council

Opportunities:

- Integrating Smart Sound project in to thinking and data collection.
- Reference Plymouth as a test bed for new innovative products and services (e.g. [Drift Energy](#)).

- Smart Sound connect - a 5G testbed for new marine products and services. Emission detection in a real time. Investigating marine fleet management and effects on emissions.
- Researching the value of autonomy of marine vessels and how that impacts efficiencies and emissions.
- PCC are working with a company who is developing autonomous foiling sailing catamarans with hydrogen electrolysis – [Drift Energy](#). The company is testing a prototype this month at Plymouth Sail GP.



Plymouth City Council

Opportunities:

- Meeting with National Marine Park design team to align thinking on net zero and future plans.

- Part of the PCC National Marine Park delivery team.
- Keen to see plans for a smart pontoon and air source/marine source heat pumps in Mount Batten delivered.
- Key National Marine Park gateways are Mount Batten, Tinside lido, National Marine Aquarium, Mount Edgcumbe. Design team have been procured and the lead consultant is [Service Design Solutions](#) and the architects are [LHC group](#). They are working on future plans and developments for those sites and areas.
- Ernsettle Creek and Firestone Bay are key National Marine Park access points for consumers that the design team are working on. Firestone Bay is in the Plymouth waterfronts study area so future plans here should be considered.



Ocean Conservation Trust (National Marine Aquarium)

Opportunities:

- Make sure to align actions with energy plan.

- In the process of tendering for a report on energy and emissions baseline. This will identify future options for decarbonisation.
- Keen to collaborate on future funding opportunities for delivery.



Plymouth Energy Community

Opportunities:

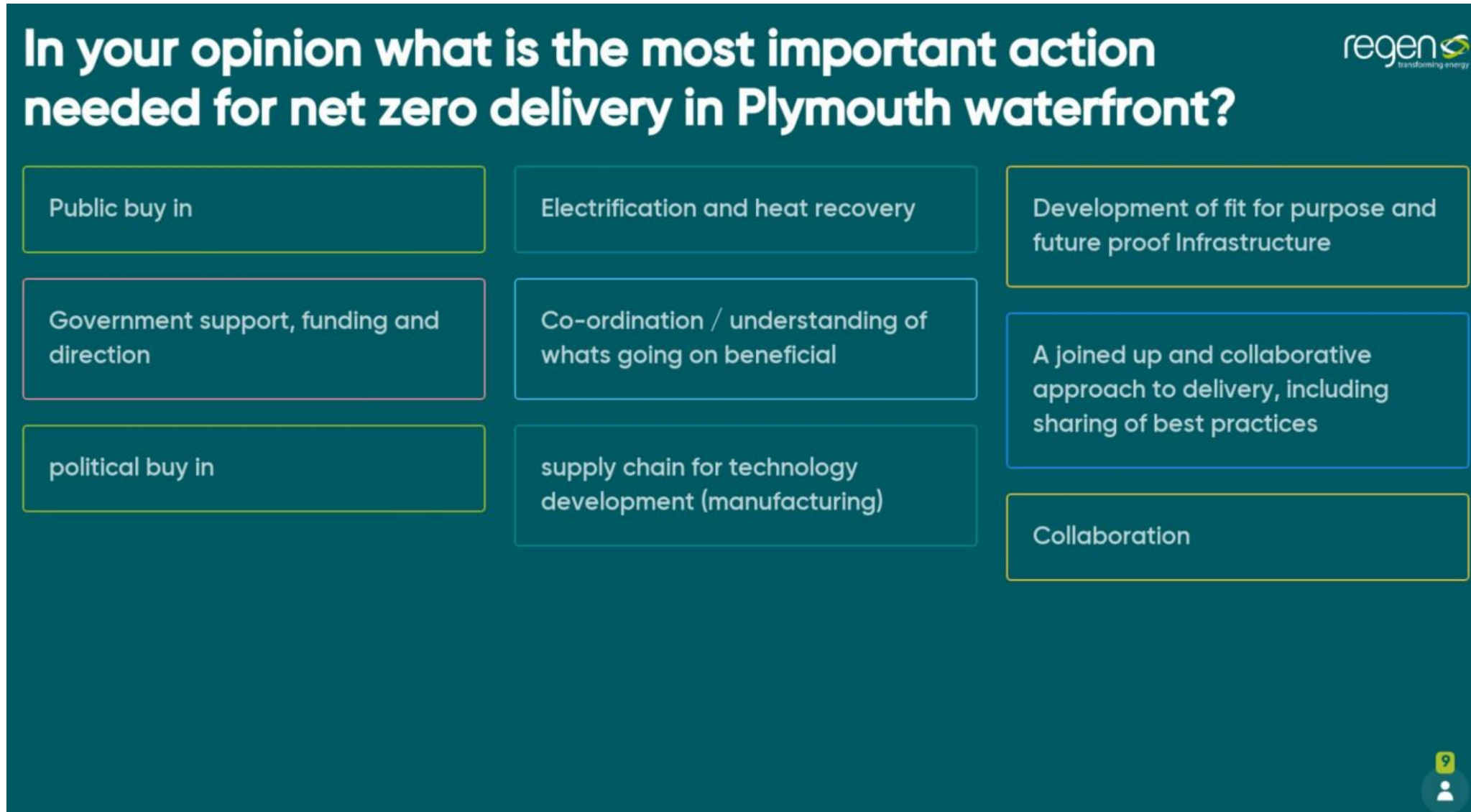
- Refer on commercial solar PV opportunities.

- Chelson Meadow solar farm has received planning permission.
- Looking for more commercial solar PV opportunities.
- Delivering £4 million of energy efficiency work in collaboration with PCC. Some focused in Devonport and Stonehouse.

What are the main barriers to action on net zero in the Plymouth waterfront?



Answers - Page 1 of 2



Answers - Page 2 of 2

In your opinion what is the most important action needed for net zero delivery in Plymouth waterfront?

regen
transforming energy

Heat in buildings

Policy appetite

Policy banning fossil fuel
technology uptake

Utilise Freeport - FREN

business ambassadors

9



ABP

More work needs to be done on understanding the future of shore power requirements in the Plymouth Waterfront area as Brittany Ferries moves to hybrid powertrains (LNG and battery) and more cruise ships dock in Millbay. A follow-up discussion with ABP has been planned.

Babcock

A wider discussion on the opportunity for new heat network solutions in the Oceansgate area is needed. Babcock are keen to collaborate with others on solutions and now is a good time to engage due to their decarbonisation road mapping work for the site. A follow-up discussion with Babcock has been planned.

University of Plymouth

Several grant applications to the CMDC rounds have been completed, some of which include marine charging infrastructure. Smart pontoons project outputs and a general comparison of methodology/data analytics for future marine charging requirements were mentioned. A

follow-up discussion with University of Plymouth has been planned.

Plymouth City Council

Make sure to showcase Plymouth as a test bed for new innovative products and services (such as Drift Energy). Review project with design team for new developments in National Marine Park gateways.

Ocean Conservation Trust (National Marine Aquarium)

At an early stage of developing their net zero plans and are just looking at potential feasibility work.

Plymouth Energy Community

Refer options for commercial solar PV and integrate energy efficiency project plans.

List of attendees

App.1: Energy
Plan Workshop

regen 
transforming energy

Organisation
Plymouth City Council
Ocean Conservation Trust / National Marine Aquarium
University of Plymouth
Plymouth City Council
Plymouth City Council
Plymouth City Council
Plymouth Energy Community
Babcock
ABP
Regen
Regen
Regen





Next steps

- Continue to engage with PCC and wider stakeholders in one-to-one interviews and discuss relevant actions that PCC could deliver in the energy plan.
- Finish draft of energy plan using information from this workshop.
- Develop further analysis of two sectors:
 - Marine heat pumps and heat networks
 - Marine transport charging infrastructure (incl. shore power)

Presented to Plymouth net zero action group - 21 July

Appendix 2 - Stakeholder engagement sessions

Attendees

Associated British Ports

Opportunities:

- PCC to work with ABP on [Trinity Pier sub site](#) in wider Millbay masterplan focusing on green marine technology.
- Look at further funding bids with ABP to support additional generation projects and port fleet electrification

Port fleet electrification

- ABP are looking at solutions for electrifying the fleet of tractors and forklifts at the port. Implementation is expected over the next 18-36 months (subject to availability).

Shore power

- A new 7 MVA demand connection has been confirmed with Western Power Distribution. £3.5 million CAPEX to be potentially match-funded with 50% grant funding from round 3 of Clean Maritime Demonstration Competition. Still waiting on suppliers and Brittany Ferries to confirm solution in September 2022. Estimated completion in 2024.
- This shore power option could be upgraded to 10-12 MVA when Brittany Ferries receives hybrid vessels (LNG and battery) in 2024/25.

Port facility upgrades

- ABP are interested at maximising any renewable energy generation opportunities on site. They are doing feasibility for solar PV on rooftops, including designing the new border post so that solar PV can be fitted. And feasibility work is ongoing looking at battery storage options for the port.
- There is also work looking at providing electric vehicle chargers at the ferry terminal taking advantage of the dwell time once you are through security.
- Wider port facility improvements have been included in a Levelling Up fund bid with PCC. This includes replacing the terminal building, better traffic flow systems, and upgrading the quayside to allow for more freight traffic.

Attendees

Babcock

Opportunities:

- Plymouth City Council to share best practice on marine charging infrastructure provision with MoD and Babcock.
- Review future contracts and agreements on clean propulsion in the fleet of tugs and supply vessels active in the port with MoD and Serco. Including this specific vessel fleet type in future CMDC funding bids.
- Review future of Energy from Waste site in Devonport with MVV, MoD, and Babcock. As one of the largest single emitters in the city ensuring that the electricity and heat is used in the most efficient way possible and that emission abatement is developed over time.
- Plymouth City Council to organise joint carbon offsetting options for stakeholders (e.g. Babcock)

Heat network

- Applied to Low Carbon Skills fund to review replacement Hill 60 steam heat network. Assessing a decentralised vs centralised options. Decision on grant funding expected by the end of August. Using Public Sector Decarbonisation Scheme (PSDS) to help fund capital works. Commercially very challenging to include additional customers that aren't Babcock/MoD but they are still keen to collaborate on solutions where possible.

Devonport net zero routemap

- Working with Energy Systems Catapult to do site audits (mainly desktop) on whole of Devonport. Providing a pathway to net zero (Scope 1 and 2) emission by 2040.
- Aligning with wider redevelopment of the Devonport site that will impact approx. 50% of the site.
- Babcock are looking at setting some minimum standards (e.g. exclusion of fossil fuel heating) from next year as more detailed plans are developed.

Rooftop solar PV

- Lots of roofs but have very cheap power from the Energy from Waste plant as the counterfactual making it hard to make a business case.

Attendees

South West Water

Opportunities:

- Interested in sleeved or direct PPA options from Chelson Meadow solar farm or other sites for Plymouth Central.
- Sludge is not digested and is limed and mixed to go on land. Future plan is to ship sludge away to large new biomethane digester (TBC - 2027) at Heathfield industrial estate. But they are open to other opportunities for sludge use locally. Perhaps another PCC site?
- SWW happy to use of general sewage lines with 16°C ambient temperature as a heat source for heat pumps (e.g. [Thames Water case study](#)). Header and concentration of sewers is just upstream of Plymouth central sewage treatment works.

SWW also have a 2030 net zero declaration

Early plans to build new biomethane digester for Plymouth and Exeter sludge processing (tanker transport) near Heathfield industrial estate in 2027 (TBC).

Plymouth Central SWW site

Energy demand = 11.5 GWh per year

Mains electricity connection (2.6 MW peak) and gave up gas connection

No CHP on site.

Separate sludge but do not digest. It is shipped and applied to land locally (no energy benefit from sludge).

Assessed a digester at Plymouth central site but it is too small.

Reviewed a private wire opportunity to Chelson Meadow – the estuary would be cost prohibitive. SWW were not aware of Chelson meadow solar farm development but were interested in PPA options.

Attendees

Plymouth Energy Community

Introductions

Babcock

Plymouth Citybus – Go South West

Princess Yachts

Agreed to speak at the next action group meeting on 21 July.

Plymouth net zero action group

Three main projects:

Funding – Public Sector Decarbonisation scheme and collaborative funding bids.

Greenhouse gas accounting – standardising the approach and gathering data across partnership. PEC have created a Excel tool to capture data using standard government factors. Mainly focuses on scope 1 and 2 and easy scope 3 options. Due to be returned by group members in next few months.

Offsetting

Reviewing local collective options and organising a working group. Recent speakers - Doug Eltham, DCC on woodland carbon units and a representative from Woodland Carbon code.

Attendees

Plymouth Community Homes

Data

Provided some housing stock data and some assessment of income per household.

PCH net zero carbon review by Savills

Advised to carry on with cycle of gas boiler replacement for at least the next 5 years rather than heat pumps due to: overload of network; financial cost; potential for an increase in operating costs for consumers; high disruption; and need for consumer education.
(NB. assessment was pre-Ukraine energy price crunch)

Social Housing Decarbonisation Fund

- Currently delivering wave 1 (£10k grant funding for EPC D, £12k for EPC E). PAS 2035 - fabric first approach (no heat pumps).
- Currently assessing housing stock and preparing bid for the much larger fund in phase 2 expected in September 2022 (3 year programme).
- Advised not to include heat pump costs
- Cost of heat network connection could be included in phase 2
- ECO 4 could support low carbon heating for private homes (but no other grant support for social housing)

District heating (with PCC)

- Devonport and Stonehouse project is ongoing. PCH find it very difficult to get buy-in for heat networks at a senior level.
- Need to get MoD involved in the project too. Nigel from PCH has recently moved to MoD.
- There is not an appetite at a senior level to commit to a share of heat network feasibility costs at this stage. PCC need to pay for this.

Attendees

University of Plymouth
Plymouth City Council

Princess Yachts

Interested in electrification particularly for tenders and hybrid options for hotel load (and perhaps some propulsion).

Local renewable energy supply options

Solar canopy on boats and local rooftop
Floating solar?
Mobile charging options?

- 12 sites initially. Aqua Superpower looked at grid connections and did site surveys on each.
- Timeframe of funding was tight which constrained site finding.
- Looked for simple land ownership (e.g. Plymouth CC)
- Network connection costs were highly variable (£5k to £300k)
- Size of charger based on demand at site. Main DC options are:
 - 25kW DC
 - 75kW DC - fits majority of MDL needed
 - 150kW DC Mount Batten – a world first - largest they make
- AC charging still valid and part of the solution. But has less clear business model and was not available from Aqua Superpower.
- Outboard – electric options are very simple and reliable but roughly double the cost (10 kWh max.).
- Commercial sector with short planned trips (e.g. ferries) will lead electrification. As will high-end leisure and outboards. More coming to market all the time.
- Dry stack mooring charging an easy win too.

Attendees

Plymouth City Council

Area based scheme for energy efficient work in Plymouth:

- Batch houses (10, 15, 20) and then present to installers. Avoiding going to Tier 1 contractor via procurement and then subcontracting with associated loss of value and local skills.
- The work goes direct to local SME installers
- PCC and PEC have spent a lot of time building a good local supply chain.

Sustainable Warmth – Home Upgrade Grant (HUG) and Green Homes Grant LAD 3 (total £4 million grant, no match)

- 300 homes in total (Off gas and on gas homes)
- 115 - HUG off-gas homes (£15k grant per house, fabric first - EWI and IWI, some heat pumps, low carbon night storage heaters).
- 185 LAD 3 homes (£10k grant per house, fabric first)
- Yet to identify homes but Devonport, Stonehouse - identified as key areas (particularly homes with EPC E, F and G)

Social Housing Decarbonisation Fund

- Live West (59 homes Barn Barton) and Plymouth Community Homes (flats Alcester close – outside study area)
- £1 million grant matched by LiveWest and PCH
- Plymouth CC giving money to residential housing provider and reporting
- Wave 2 of SHDF due at end of Summer 2022 with much more funding available and could help support heat network connections.

Parity projects data has been bought by PCC and PEC – discussing access for use in this project.

Attendees

Carlton Power

Industrial customer identification

Interested in identifying large industrial energy users as off-takers and shared an initial MoU document discussing how a supply contract for a large industrial user would work.

- 10 MW electrolyser
- Alongside the 900 MW CCGT and 5 MW solar farm that is there already
- Planning – due to submit end of April 2022
- New grid connection confirmed - 12 MVA demand connection
- Private wire from existing 5 MW solar farm planned
- Mainly importing from grid using sleeved PPA arrangement
- Targeting being operational Q3 2024 (depending on Hydrogen consultation responses from govt.)
- Hydrogen would be delivered by tube trailer up to 40 miles from the Langage site.

Attendees:

WSP (carbon assessment)

Buchman associates

- Final business plan – 22 April
- Carbon assessment by WSP. Embodied + operational. Offsets will be needed. What type? Where will they be located?
 - Timeframes – late April/May
- Hadn't discussed heat networks or electricity network connections in detail.
- Keen to stay in contact and share data.

Attendees:

Plymouth City Council

- Lots of feasibility work and conversations – needs to be brought together in list of key projects of interest.
- Plymouth is a pilot for heat zoning with Heat Networks Delivery Unit.
- Key areas where feasibility work has been carried out within study area: Mount Edgecombe, Oceansgate, and Millbay.
- Marine source heat pumps are a key area of focus at Millbay and Oceansgate.
- The £500 per tonne of carbon saved limit to Salix PSDS funding has limited the fabric measures that could be done alongside the heat pump and solar PV technologies.

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