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Electrical consumption and renewable energy options.

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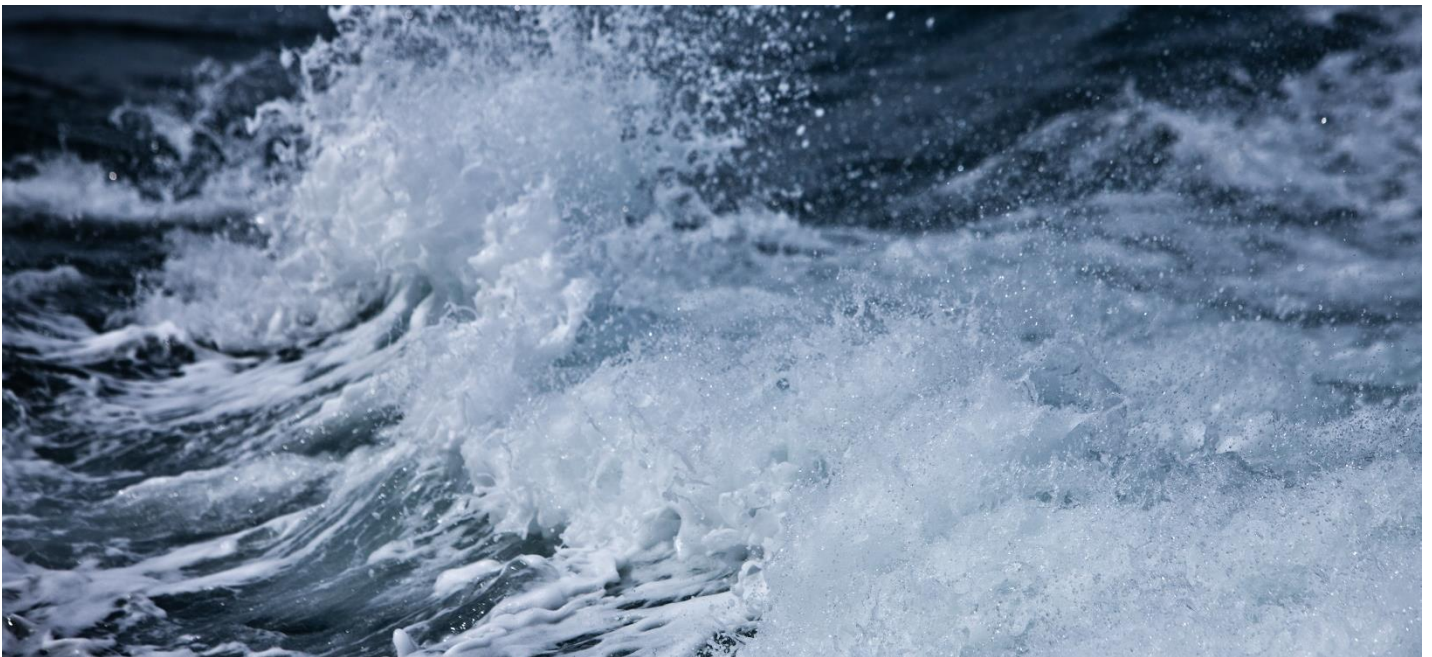
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ELECTRICAL CONSUMPTION AND RENEWABLE ENERGY OPTIONS

MARINE-I & MEVAGISSEY HARBOUR.

C1/C4 Business Assist Report



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1 Marine-I introduction

Part funded by the European Regional Development Fund, Marine Innovation 2: Coordinated support for Marine Technology RD&I (Mi2) is a £5.5m collaboration between the University of Exeter, Plymouth University, The Cornwall College Group, Cornwall Marine Network, Cornwall Development Company and the Offshore Renewable Energy Catapult.

This C1/C26 report is designed to support long-term co-operation between Business Research Fellows/Academics and business enterprises. This Co-operation C1/C26 report covers a short-term co-operation to enable the implementation of a feasibility study, providing a pre-cursor to support the potential establishment of a Marine Challenge Fund (MCF) application if applicable.

2 Project Introduction

This report has been provided to Mevagissey Harbour as part of a 12 hr business assist through the Marine-i programme.

The intention is to provide some preliminary information to the Harbour on potential renewable energy generation opportunities that can support climate change mitigation policies and sustainability objectives.

3 Mevagissey Harbour – Current electricity consumption

Some initial data on electrical consumption has been provided by Mevagissey Harbour to help understand current patterns of electricity use across their sites. It should be noted that this initial data set is very crude and has simply taken consumption figures from the summer month of July and Winter month of January and then extrapolated these out over individual 6 month periods to gain a view of annual electrical consumption. We do however understand from the Harbour commissioners that electrical consumption across the site is relatively stable across seasons.

Though useful to gain a very general understanding of the opportunities that could be presented from on-site renewable electricity generation, if project ideas progress we would strongly suggest mapping electrical consumption on at least a monthly basis that can be derived from incoming monthly electrical bills or where feasible to access electrical consumption data half hourly that can then be specifically matched to a half hourly renewable electricity generation profile. This more detailed level of understanding will be critical to building a business case for the possible development of a renewable

energy scheme(s) and will also help in understanding how much of the generated power could be used directly on the site offsetting greenhouse gas emissions.

Table 1 Mevagissey Harbour two month actual and assumed annual electricity consumption

Meter Number	KWh consumption July	
E18UP00511	330	
E15UP07487 - Aquarium	1,079	
E15UP00826	6650	
E14UP00328	278	
E18UP00513	144	
E18UP00516	56	
E18UP00509	105	
211191350	20	
E18UP00517	344	
214056278	127	
E11D00433	0	6 months consumption based on July data (KWh)
Total July	9133	54798
	KWh consumption January	
E18UP00511	1218	
E15UP07487 - Aquarium	1231	
E15UP00826	5590	
E14UP00328	276	
E18UP00513	188	
E18UP00516	66	
E18UP00509		
211191350	60	
E18UP00517	461	
214056278	1072	
E11D00433	0	6 months consumption based on January data (KWh)
Total January	10162	60,972
		Total estimated annual electrical consumption (KWh)
		115,770

The total annual estimated electrical consumption of Mevagissey Harbour and its assets based on the provided data is 115,770 KWh/yr.

Based on Greenhouse gas conversion figures for 2021 produced by DEFRA¹ for UK grid tied electricity consumption (0.21233 kg CO₂e/KWh) this equates to annual CO₂e emissions related to electrical consumption on the Harbour assets of 24.58 tonnes/yr.

4 Renewable electricity generation options

For the purposes of this report we will focus on Solar Photovoltaic (PV) generation as the current most viable short term option for the Mevagissey Harbour sites.

To provide accurate and up to date building related Solar PV system options that can be taken forward for further consideration the ORE Catapult have engaged the local accredited Solar PV installation company ZLC Energy² to provide a provisional view on the existing site opportunities. Should any of the project ideas progress we would strongly recommend arranging site visits to the Harbour assets to further detail system options and costs as well as enabling the assessment of structural, access, connection, electricity export and other key installation considerations. We are aware of the grade 2 listed status of many of the harbour assets and this is reflected in the information provided on PV system options that consider in roof systems that may be more amenable in meeting heritage and conservation requirements. A link to guidance from Historic England on the integration of Solar PV in historic buildings is provided³ for reference. The agency is positive about renewable energy generation on historic assets but their design and integration into the structure is a critical consideration.



Figure 1 Solar PV for historic buildings - PV Magazine 2021

¹ <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021>

² <https://zlcenergy.co.uk/>

³ <https://historicengland.org.uk/images-books/publications/eehb-solar-electric/>

The following information provided by ZLC Energy gives provisional details of on-in roof solar PV options for the identified Mevagissey Harbour building assets. Information can be determined on provisional system sizes, PV types, generation potential, installation issues and indicative early costs. For further information and/or to arrange site visits please contact ZLC Energy⁴. Other accredited Solar PV installers are also available.

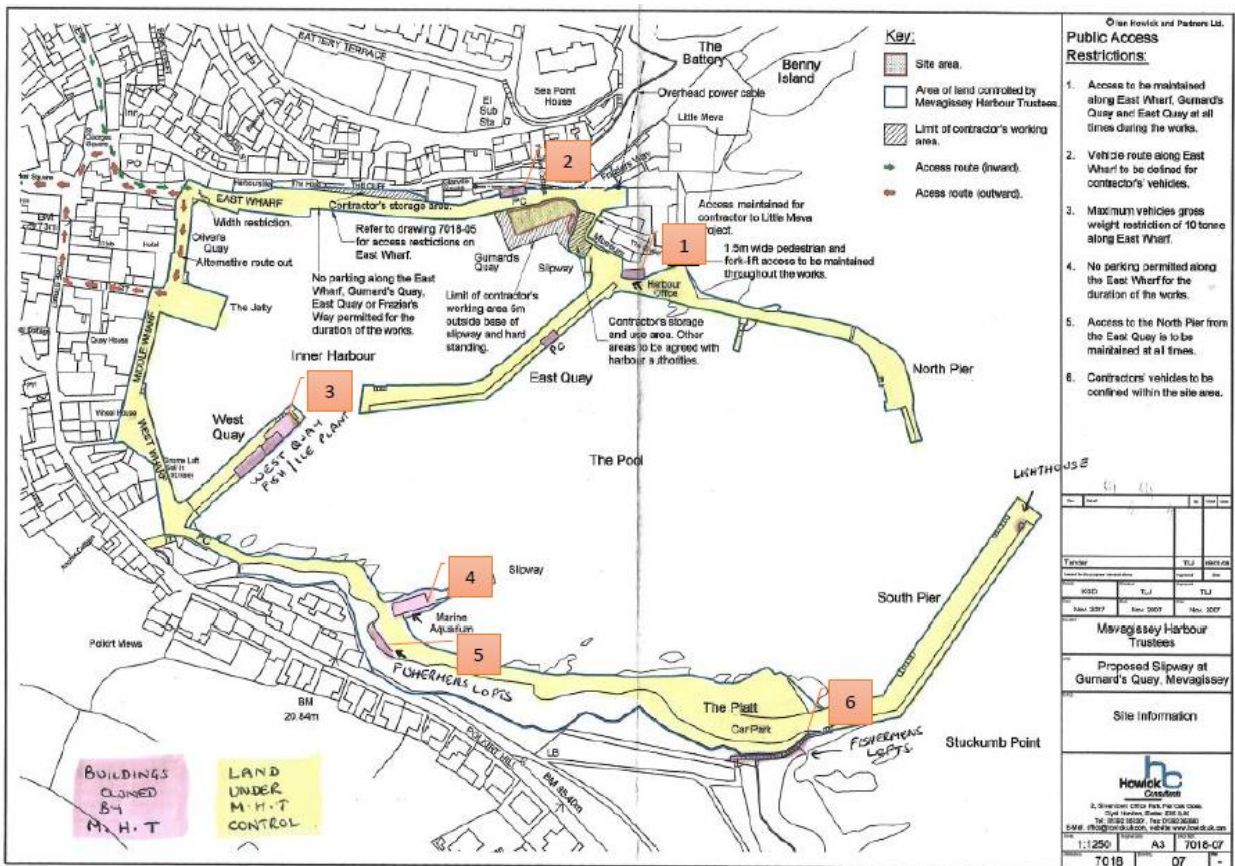


Figure 2 Mevagissey Harbour Assets and building related PV options 1-6

⁴ Mark Smith, Director. 07768 454840 / mark.smith@zlcenergy.co.uk

Table 2 Provisional Building Solar PV options - ZLC Energy

Site	Name	Roof Orientation	Viable	Pitch	Kk	Max no Panels	kWp	Annual Yield kWh	On Roof CAPEX (£/Wp)	In Roof CAPEX (£/Wp)	Notes
1	Harbour office	South	Yes	35	1050	14	5.32	5586	£1.30	£1.60	Difficult access for scaff
2	PCs	Flat	Yes	0	900	10	3.8	3420	£1.00	n/a	Difficult access for scaff
3	Fish Market \Store	South East	Yes	35	1000	36	13.68	13680	£1.40	£1.70	Very difficult - scaff in sea!
4	Aquarium	Flat - slight slope eastward	Yes	5	900	26	9.88	8892	£0.95	n/a	Easiest
5	Net Lofts 1	North or shaded	No	/	/	/	/	/	/	/	Unviable
6	Net Lofts 2	North or shaded	No	/	/	/	/	/	/	/	Unviable
7	Lighthouse	No roof	No	/	/	/	/	/	/	/	Unviable

A total of 32.68 kw of viable Solar PV building related installations have been identified. These sites could generate an estimated 31,578 kWh of on-site green electricity/yr. Based on electricity consumption data provided this could potentially meet 27% of Mevagissey Harbours annual electricity demand and save 6.7 t of CO₂e emissions/yr by displacing grid tied electricity generation.

Indicative cost related system information is also provided per site. These costs should be balanced against potential savings in electricity costs by using electricity generated on site rather than importing it from the grid and by determining an additional value from selling excess electricity back into the grid network. This can be better determined on an individual site basis when linked to more extensive and time specific building consumption data.

In many scenarios a project will have more value if the majority of the electricity generated is used on site rather than exported due to variations in the relative values per unit. Mevagissey currently pay 13.8 p/kWh⁵ for imported electricity which could be displaced by using electricity generated on site from a PV system. The value for exporting excess electricity on to the grid will be in the region of 5p /kWh.

Accredited Solar PV installers should be able to provide further support in determining a cost benefit model that could support Mevagissey Harbour in taking any of these plans forward. Accessible half hourly data for the sites or the installation of a meter that measures consumption half hourly would enable site specific and detailed projections and forecasts to be made. We have however provided a simplistic example cost benefit case below that could be relevant to the Harbour. Please be aware this does not account for inflation, expected increases to electricity prices per unit or system degradation over 20 years.

4.1 Site 4 – Aquarium – Simplistic financial case

PV system size: 9.88 kWp

Estimated System cost in roof: £16,796

⁵ Total Gas and Power cost per unit 2021 – Harbour electricity bills

Assuming 100% of the electricity generated is used on or near the site (8892 kWh/yr) the annual saving would be £1,227. Over the 20 yr warranted lifetime of the PV system this would generate savings of £24,541 (based on the Harbour's current electricity unit cost 2021). *Please note the system would need to be connected to a number of consumption points given the known difference in estimated annual energy use from the Aquarium meter readings and the systems expected annual generation.*

Assuming 70% of the electricity generated is used on site the annual saving would be £858 with an annual income for exported electricity of £133 (at 5 p/kWh for export) giving an annual total of £991. Over the 20 yr warranted lifetime of the PV system this would generate a total value of £19,820.

Annual CO₂e savings 1.9 t/yr. CO₂e savings over warranted 20 yr system lifetime 37.8 t.

A similar method can be used to assess other provisional site options but accurately understanding site consumption is important.

5 Alternative options – Green energy tariffs

An alternative option to ensure significant emissions reductions in relation to the Harbours electrical consumption could be to consider a green energy tariff that guarantees your electricity supply comes from a renewable energy source. The majority of UK electricity suppliers now provide a green tariff option if it is not already integrated into their main supply tariffs and these tariffs have become increasingly competitive in recent years even outstripping standard tariff prices in some cases. The current Harbour electricity supplier Total Gas and Power do purchase green energy but it is unclear from the utility bills provided how much of this may be attributed to the current contract.

If the Harbour is not tied into a long-term contract with Total Gas and Power we would recommend investigating alternative green tariff options with providers that could remove electricity related emissions for the harbour and potentially also reduce its costs. A number of sites and brokers are available that can provide alternative electricity supply contracts options and green tariffs. U switch for business⁶ is an option that may be worth investigating with no early commitment needed to obtain initial quotes and offers.

⁶ <https://smart-comparison.uswitchforbusiness.com/v4?r=ushybelink>

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