14 Existing Submarine Cables, Electrical Grid, and Connectivity

14.1 Introduction

This chapter deals with the existing submarine infrastructure, both power and telecommunications, and with the connectivity into the power systems of Guernsey and Sark.

14.2 Baseline Environment

14.2.1 Location of Existing Infrastructure

The positions of all submarine power and telecommunications cables serving the islands are recorded on the Kingfisher Cable Awareness Chart for the English Channel[1]. Accurate grid coordinates for each cable are available from the cable operators listed on the Kingfisher Chart.

14.2.2 Existing Power System Connectivity

Guernsey

Guernsey has two principal sources of electrical power:

- A local power station using slow speed diesel engines and liquid fuelled gas-turbine generators with a total installed capacity of 115MW.
- An interconnector operating at 90kV, a.c., 50Hz with a continuous rating of 55MW connecting Guernsey to Jersey and providing access to the European Grid, via the two submarine cables connecting Jersey to France.

The maximum demand (12/1/2010) of the island is 84MW, the minimum demand 24MW, and the annual electricity requirement is approximately 400,000MWh.

The island's distribution system consists of 33kV bulk supply points, 11kV ring and radial circuits and a substantial underground low voltage network. Further information is available from Guernsey Electricity's website[2] . The network is described in the Statement of Opportunity (on the website under Public Information) and electricity supply statistics are found in the Annual Reports.

[1] www.kisca.org.uk

[2] www.electricity.gg

The geography of the on-island network is recorded digitally and records can be made available over the internet to registered users. Contact should be made with the Engineering Services Department of Guernsey Electricity for access to this service. Alternatively, cable records can be presented in traditional hard copy format.

Sark

Sark Electricity Company Ltd is a private company and the sole electricity supplier on the island of Sark.

Sark operates its own power station with four diesel generating sets with individual capacities of between 300 and 500 kW, giving a total capacity of over 1.5 MW, considerably over the maximum demand of around 500 KW. The base load is around 200 kW.

The power station generates at 415 volts, supplying nearby businesses and homes directly. The rest of the island is supplied though a 6.6 kV ring around the main island and a spur running across the Coupée to power Little Sark.

The Low Tension (LT) system is already almost completely underground, but the High Tension (HT) Ring still has some overhead lines. Work is underway to remove these, and the HT system is scheduled to be completely underground by 2011.

The system is a 24x7 operation, as Sark is a true "Island Grid", with no interconnections to other islands or grids.

14.3 Potential Effects

14.3.1 Interactions with Existing Cables

There is a risk that the deployment, operation and maintenance of renewable energy devices and associated cables will cause interference with or damage to existing subsea cable infrastructure. Similarly, as cables make landfall and are linked over land to existing infrastructure then there are further risks of clashes with existing services.

It is important that any marine installations are planned and situated to avoid interference with existing cables and to recognise the need for appropriate sea room to allow existing cables to be repaired using ship based repair methodologies. Crossing existing cables with new submarine cables should be avoided if at all possible, since crossing points present hazards to both existing and new cabling.

14.3.2 Expansion of Grid Connectivity

Guernsey

The suitability of the existing grid to accept new generation capacity depends upon the amplitude of the injection. The absolute injection limit would be the sum of the maximum transfer capability of the single existing submarine cable and the minimum island demand, currently circa 80MW.

There is a risk that, without proper investigation of the consequences of the connection of new generation equipment, the introduction of new electricity supplies could overwhealm existing grid infrastructure. This may be due to inappropriate selection of connection points, exceedance of the rated capacity of the existing equipment, or due to power-factor differences.

It is common for electricity demand to be variable. However, the introduction of renewable energy generation would introduce variability into the supply mix where, under the existing arrangements, generation is normally stable. When installed, this would require the grid operators, to take more corrective action in the management of other generators when renewable energy sources are available.

To properly understand the impact of specific generation proposals on the existing grid infrastructure, detailed power systems studies would be required. Without the benefit of such studies, any predictions made regarding the impact of additional generation capacity are speculative. Notwithstanding this, the location of a potential connection would have a great influence on its impact. It should be noted that the existing network is arranged to support the generation and import of electricity to the eastern side of the Island, and this is also the location of greatest usage. There is a general flow of electricity from the urbanised eastern side out towards the more rural areas of the west. Whereas the connection of new generating capacity to the existing generation facilities at St Sampsons may present few challenges, the connection of arrays in the wave energy resource off the northwest coast could be more problematic. If large scale wave energy production were to be developed, then this could lead to a requirement to reinforce the existing network in the west of Guernsey to allow a satisfactory connection to the centre of population in the east.

Sark

The small size and capacity of the existing Sark grid reflects the low demand. The base demand is lower than the generating capacity of most commercial-scale devices. Therefore, the connection of a full-scale device would cause overloading or instabilities in the existing system that would be difficult to balance with existing plant.

It is likely that, for Sark to make use of any marine renewable energy equipment deployed within its waters, it would require connection to Guernsey. However,

such a connection would present opportunities for export of electricity as well as the opportunity to import energy from Guernsey during times of non-production of renewable energy. It is anticipated that this would in turn bring greater energy security and lower electricity prices to Sark.

Any connection of renewable energy devices or a new interconnector to Guernsey would require significant upgrades to be made to the existing Sark grid.

14.4 Sensitivity of receptors

14.4.1 Interactions with Existing Cables

Telecommunications

Guernsey possesses a sophisticated telecommunications infrastructure with fibre optic connectivity operated by two operators. In general terms damage to a single cable is unlikely to lead to a loss of service since operators have constructed dual redundant systems. Any such damage would, however, activate a cable repair agreement and involve significant costs to those responsible for the damage.

Electricity

There is a single power cable linking Guernsey to Jersey. Damage to this cable is likely to cause a power failure to the island until power is restored using local generation, normally in about an hour. Damage would cause the activation of a repair agreement, but depending on the time of year and weather, repair may not be achieved for up to six months. Reliance on local generation during this period will cause significant cost increases. Repair costs could be up to £3 million at current prices.

If unmitigated, the potential effects of uncontrolled laying of cables and deployment of equipment on the seabed in proximity to existing cables could be damaging. However, there are well-established procedures for recording and identifying the location of existing plant, and developers would be required to make use of these in the design of proposed cable routes and deployment sites. Therefore, the magnitude of impact on existing cables is considered to be Medium.

14.4.2 Expansion of Grid Connectivity

Although, if unmitigated, the potential effects of uncontrolled connection of renewable energy capacity to the Islands could be damaging, this is not likely to be allowed. It is considered that there is no technical limit to the amount of power that can be imported, used and exported, so long as there is sufficient demand. Clearly, significant upgrades may be required to be made to the existing grid to achieve this, but this should not be considered to be a constraint to development. Therefore, the magnitude of impact should be regarded as Medium.

14.5 Potential Significance of Effects

The valuation of the receptors, which are the existing cable infrastructure and electrical distribution grids, is difficult to assess in the same manner as the ecological receptors covered in the other chapters of this REA. However, using the procedures for assessment established in the REA Scoping Document, we can identify the value of the receptors as Local and the Significance of the potential impacts prior to mitigation as Minor.

14.6 Likelihood of Occurrence

Outline the probability of the receptors being affected by the potential effects based on currently available information.

Table 14.6.1: Table outlining the probability of effect on receptors

Receptor	Effect	Likelihood of Occurrence
Existing Cables	Damage to cables	Low
Existing grid infrastructure	Overload or instability within systems	Low

14.7 Mitigation Measures

14.7.1 Interactions with Existing Cables

Geographic Areas for Development

The cable awareness chart (See 14.2.1) illustrates that only relatively small areas of seabed are unavailable for development by reason of potential interference with existing infrastructure. In all cases the most sensible risk mitigation strategy is to avoid positioning new installations and cabling in close proximity to existing equipment. This constraint should be considered during the zoning of potential deployment areas. Where there is an apparent need to do otherwise then in all cases the operators of the existing infrastructure should be approached for advice at an early stage of the planning process.

Potential Cabling Routes

Power cables to be laid to connect marine renewables are anticipated to be of significant cross-section and weight and potentially to require burial to reduce the risks to such cables from fishing and shipping activity.

In all cases the rocky nature of potential cable landing sites will require appropriate survey activity and operational planning. Potential cable landing sites are available on all Guernsey coasts, but are severely restricted on the south coast. Cable routes across the entrance to St Peter Port or St Sampson's harbours are to be avoided since any cable-laying and repair operations which may be necessary risk interference with harbour operations.

Landing sites in Sark are very restricted and the island's cliffs present a significant difficulty in onward connection. Potential landing sites exist, however, on the island's south and west coasts.

14.7.2 Expansion of Grid Connectivity

Full power system studies would be necessary to demonstrate satisfactory connection and performance of any renewable energy scheme. These would be project and location specific and would recommend any grid infrastructure improvements that are considered to be necessary to support a project.

The Statement of Opportunity (see 2.2.1) provides guidance on the geographical position of existing major grid assets, but in broad terms the grid is strong on the developed eastern coast of the island and weaker towards the west coast. Guernsey has significant legislation governing excavation in public roadways and most roadways are both narrow and heavily trafficked. Requirements for excavation are set out in a code of practice available from the States of Guernsey Public Services Department. Attention is specifically drawn to the existence of three year "no dig" embargoes on roadways which have recently been resurfaced.

Developers are strongly recommended to make early contact with Guernsey Electricity Ltd for advice on grid connectivity.

14.7.3 Additional Information

Submarine cables and the oceans: connecting the world, a collaborative best practice guide, United Nations Environment Programme, www.unep-wcmc.org, and International Cable Protection Committee www.iscpc.org.

Various policies, guidelines and documents, United Kingdom Cable Protection Committee www.ukcpc.org.uk

Requirement and Specification for the Opening and Reinstatement of Works in the Public Highway, 2009 - Public Services Department, the States of Guernsey, www.gov.gg.

Contacts

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14.8 Confidence and Knowledge Gaps

Subject to the development of site-specific proposals, the confidence in the existing information relating to existing infrastructure and likely impacts is High.

14.9 Residual Effects

The analysis provided in this chapter assumes that all risks to existing infrastructure will be properly understood and mitigated through design and the provision of infrastructure upgrades to support any new connections. Therefore, the Residual Significance is reduced to None.

14.10 Recommendations for Survey and Monitoring

Developers will be required to undertake Electrical Systems studies in association with the existing operating authorities to demonstrate the suitability of any proposed connections.

References

Cable Awareness Chart Website - www.kisca.org.uk

Guernsey Electricity Website - www.electricity.gg