

Executive Summary

The geographical location of the Western Isles offers the potential to harness renewable energy to an extent that not only promises power and employment opportunities for the islands but also offers a significant contribution towards the Scottish Executive's aspirational national renewable energy targets for the coming years.

There are land-based wind power proposals currently under consideration for sites in Lewis and proposals are also being developed for a grid upgrade to the islands in order to facilitate export. Such developments offer the possibility of significant investment in the islands and grid connection offers further revenue potential. Viewed against a background of declining population and limited employment opportunities, there is a general perception that the concept of renewable energy is broadly welcomed by the islanders.

Significant improvements have been made to the transport infrastructure of the Western Isles over the last few decades, with established ferry and air links to the mainland being consolidated and improved. Improvements in inter-island transport links have done much to modernise the infrastructure of the islands and have thereby improved business, leisure and cultural opportunities for many. The spinal route through Lewis, Harris and the Uists has been incrementally improved and is a vital artery that complements the good mainland links.

The Sound of Harris represents the last and largest barrier to the formation of a continuous spinal road through Lewis, Harris and the Uists. The long-held aspiration to bring the communities of the Western Isles closer together through the formation of an uninterrupted spinal road has been confounded by the sea on a number of occasions, but gradually these obstacles have been overcome (by causeways, such as at Berneray, North and South Ford and Eriskay), now leaving the Sound of Harris as the only marine obstacle between the Butt of Lewis and Eriskay (Barra would remain linked by ferry south of Eriskay).

Vehicles and passengers can cross the 9km wide Sound of Harris in around an hour on the MV Loch Portain, which sails between Berneray and Leverburgh. The vehicle ferry service is viewed as a great success, but the length and nature of the crossing is such that the vessel operates to a restricted timetable and can only operate in daylight. The shallowness of the Sound also impinges on the free running of the ferry service, with cancellations in periods of particularly low water or rough weather. Although viewed as a tremendous asset for inter-island movement, the ferry inevitably restricts business and leisure travel through the islands; a situation that would be addressed if the ferry were replaced by a fixed link that would give queue-free, tide-free, timetable-free access across the Sound.

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Combining the twin aspirations of completing the Spinal Route and developing a renewable energy capability in the islands, it is clearly attractive to consider an integrated development that seeks to achieve both within a single project.

This report has reviewed the available technology and gauged its suitability against a resource review that has considered the wind, wave and tidal energy-exploitation capabilities of the Sound of Harris. This review has indicated that the shallowness of the Sound is an impediment to the widespread use of present tidal and wave technologies. Deeper channels within the Sound have been identified as more suitable for some of these emerging technologies, while others are not considered practicable even there. This, together with the need to maintain a degree of navigation through the Sound of Harris, has dictated an outline arrangement of supporting civil works that carries a road over the Sound and also gives access to the devices.

In considering the economics of such a scheme this report presents an outline discussion of capital and operational costs for both the civil engineering infrastructure and for the renewable energy devices. This has been done for various combinations of structures and devices and net present value calculations have been performed in order to present a ready comparison of the financial implications of the various options. The social and business implications of the introduction of a fixed link are also discussed, and compared with the status quo.

With 9km of sea to cross, the cost of the necessary civil engineering works can be readily anticipated to be considerable. Albeit the success of the current ferry service is testimony to a healthy demand for cross-Sound travel, this has nevertheless to be tempered by an acknowledgement that the volume of traffic using any fixed link will not be particularly significant and so the business case for its construction is challenging when viewed only in financial terms. In terms of social inclusion and the ongoing integration of isolated communities, the value of a fixed link is considerable. When this is augmented by the possibility of raising revenue through the generation of electricity, the case becomes more attractive. This is discussed in this initial study report.

Wind power is by far the most developed of the renewable energy technologies. Wave and tidal devices have very sparse pedigrees and many are only at a demonstrator stage of development, with little or no commercial precedents. The wave energy resource of the Western Isles is very good but this is seen to be in waters deeper than the Sound of Harris. The shallowness of the Sound and its approaches are not, for the present, well disposed to economic deployment of wave devices. The tidal resource in the Sound of Harris is not uniform, again being largely hampered by the general shallowness of the waters here. However, there are more fertile areas within the Sound that hold some promise with regard to deployment of tidal devices. These areas are concentrated in the limited number of deeper channels that run through the Sound. It is considered that a limited number of selected tidal devices could be deployed within these areas, although the need to maintain navigation would have an influence on the extent and positioning of these.

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Although a number of structural forms are possible for any fixed link (causeways, bridges of various forms, or even tunnelling), for the purposes of this initial study a preferred arrangement is one that:

- facilitates rapid vehicle transport across the Sound
- utilises physical topography to minimise the civil engineering works
- incorporates, as far as reasonably compatible with other aims, those areas that exhibit best marine energy resource
- offers the possibility of improving flow regimes to better suit the deployment of marine renewable devices whilst minimising any detrimental effect on coastal processes
- offers access to renewable devices
- maintains navigation through the Sound of Harris, commensurate with the range of vessels currently understood to require such

At this stage, this arrangement is envisaged to comprise:

- a causeway structure between Berneray and Killegray
- a limited number of openings through this causeway to facilitate a degree of water circulation while still targeting increased flow through the channel between Killegray and Ensay
- one of the openings through this causeway may be elevated to allow transit by local fishing vessels
- a number of offshore wind turbines installed adjacent to the causeway structure
- a bridge structure over the deepest portion of the Skaari channel between Killegray and Ensay, with causeway structures to the approaches either side
- tidal generators incorporated into this bridge structure, and a limited number of detached units also linked in
- a bridge structure between Ensay and Harris, by way of Saghay Beg and Saghay Mor
- this bridge to rise to a height above water that facilitates navigation through the Stanton (or, alternatively, Leverburgh) Channel
- tidal devices incorporated into this bridge, within the limited deeper channels but remote from dedicated navigation clearances

Such an arrangement is one of a number of options costed in outline within this report. In presenting these costings, an extended time period has been considered. This recognises that the significant capital expenditure involved in the construction of the link and the installation of generators cannot be quickly offset by the projected

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revenue stream from electricity generation. Such cost comparisons are a useful tool in developing strategies for further evaluation of options and funding possibilities at a more detailed stage of assessment.

The report also presents a discussion of the environmental sensitivity of the area and highlights those aspects that will require particular attention as the project investigation moves forward. There is little doubt that environmental issues, designations, consents and consultations will play a large part in the procurement of any works in the Sound of Harris and it is also clear that any project would have a considerable gestation period. There are a number of uncertainties in this regard.

While the concept of renewable energy has general support from the statutory consultees, formal endorsement of physical proposals is likely to be a challenging issue. The construction of a fixed link will have implications on the environment, particularly where causeway structures are adopted. Water flows and sediment movement regimes will be changed and the scale and nature of that change will need to be studied and understood if any proposals are to be fully accepted. Environment and safety issues would need to be closely addressed.

In comparison with the scale of other links constructed in the Western Isles, overcoming the Sound of Harris is very much more daunting. Despite the undoubted benefits that would accrue from linking the Uists to their larger neighbour, the case for doing so will always be handicapped by the imbalance between cost and the limited traffic usage that could be anticipated. That imbalance is partly addressed by the potential revenue stream that would come from power generation, but it is noted that there would be a considerable period of deficit before that revenue could be expected to begin to justify the cost of the civil works. The socio-economic benefits of a fixed link should be promoted as a legitimate early project driver, coupled with an enthusiastic demonstration of willingness to make a significant contribution to the Scottish Executive's ambitious renewable energy targets.