Ocean & Coastal Management 99 (2014) 72–81

Contents lists available at ScienceDirect

Ocean & Coastal Management

journal homepage: www.elsevier.com/locate/ocecoaman

Spatial planning for sustainable marine renewable energy developments in Scotland

Ian M. Davies*, Robert Watret, Matt Gubbins

Marine Scotland Science, Marine Laboratory, 375 Victoria Road, Aberdeen AB11 9DB, UK

ARTICLE INFO

Article history:
Available online 13 June 2014

ABSTRACT

Scottish Government targets for renewable energy developments are ambitious. The creation of new marine industries requires a structured approach that links marine spatial planning with Strategic Environmental Assessment and Sustainability Appraisal. Marine Scotland Science has worked with The Crown Estate spatial decision support tool MaRS to plan for wave, tidal and wind power in Scottish waters. This multi-factorial spatial modelling system has been used to visualise and balance the relative opportunities and constraints on development arising from a wide range of environmental, industrial and socio-economic factors. Areas of search for development sites have been identified, explored through Regional Locational Guidance and adopted in development plans.

1. Introduction

The Scottish Government has set a range of challenging targets for energy and climate change. These recognise the potential to take advantage of the extensive marine energy resources (wind, wave and tidal power) available in Scottish waters and include meeting at least 30% of total energy demand from renewable sources by 2020, incorporating:

- 100% of electricity demand from renewables (31% by 2011)
- 11% of heat demand from renewables
- 10% of transport fuel from renewables

In addition, the Climate Change (Scotland) Act 2009 sets statutory targets of at least 42% emissions cuts by 2020, and at least 80% by 2050.

To assist in meeting these targets, the Scottish Government has adopted an iterative approach to marine planning for the renewable energy sectors. For example, a Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters (Blue Seas - Green Energy) sets out the Government's vision for developing offshore wind energy up to 2020 and beyond and has identified short term development sites for offshore wind up to 2020, with a potential to deliver almost five Gigawatts (GW) of electricity generation capacity. A new Scoping Study extends the potential development area out to 200 nm.

The fundamental purpose of marine planning is to ensure efficient licensing of development projects. The planning process can be considered in four stages.

Stage 1

- Scoping study to identify areas of search for plan option areas
- Regional Locational Guidance provides more detailed information on each of the areas of search.
- A non-statutory consultation exercise introduces additional information to the planning process and results in the identification of Plan Option areas

Stage 2

- The Plan Options, are then subjected to Strategic Environmental Assessment SEA), as required by the EU SEA Directive (2001/42/EC).
- The SEA process is supported by a Sustainability Appraisal, including strategic Habitats Regulations Assessment and
- Socio-economic Assessment

Stage 3

- The resulting Draft Plan is put to Statutory Consultation
- The outputs of this are a Plan and Post Adoption Statement

* Corresponding author. Marine Scotland Science, Marine Laboratory, 375 Victoria Road, Aberdeen AB11 9DB, UK. Tel.: +44 (0)1224 295387, +44 (0)1224 876544; fax: +44 (0)1224 295511.

E-mail addresses: Ian.Davies@scotland.gsi.gov.uk (I.M. Davies), Robert.Watret@scotland.gsi.gov.uk (R. Watret), Matthew.Gubbins@scotland.gsi.gov.uk (M. Gubbins).

http://dx.doi.org/10.1016/j.ocecoaman.2014.05.013
0964-5691/

Stage 4

- Licensing can then be undertaken with greater confidence and efficiency supported by the planning process.

This paper will concentrate on the earliest stage of the planning process, namely the Scoping Study forming the basis for Regional Locational Guidance.

2. Scoping studies for marine renewables

Marine Scotland has undertaken Scoping Studies for marine renewable energy using The Crown Estate (TCE) Marine Resource System (MaRS) spatial modelling (GIS) system. They form part of a process of regular revisions and updates of sectoral plans for offshore energy. TCE MaRS is used to map zones of broad environmental sensitivity and technical opportunities and constraints relevant to marine renewables developments.

The MaRS system is a powerful tool for the handling and integration of a wide range of spatial data referring to environmental and technical factors that can influence the development of offshore energy, including tidal stream, wave and offshore wind energy (and other activities). The integrated data are presented as spatial models which map the opportunities and constraints applying in potential development areas.

In order to apply the MaRS tool, it is necessary for the user to make a number of decisions regarding the data to be included in the models and the way in which the data are to be handled. These decisions include factors such as:

- The factors that require consideration when locating marine renewable energy developments and the availability of spatial data that can be included in the models.
- Whether particular activities or uses should be considered as incompatible with particular forms of renewable energy developments, or whether activities or uses should be considered as presenting gradations of limitation to development potential.
- The relative importance (weighting and scoring) that should be applied to the different layers of data in the final integrated model.
- The relative quality and reliability of data layers.

A system of scoring and weighting of information held in MaRS is used to produce graduated maps of the least to greatest technical, and subsequently environmental, sensitivity. From these outputs, broad areas of technical opportunity and relatively low constraint on development can be identified and explored in more detail through Regional Locational Guidance.

3. MaRS modelling of resource and constraints

3.1. Identification of resource areas

The first step in the MaRS analysis is to identify broad availability of resource (wind, wave, tidal stream and technical constraints (e.g. distance from shore). Tidal stream resource that currently is considered to have potential for commercial scale exploitation is confined to a number of distinct areas around Scotland, often in sounds or around headlands, where mean spring tidal current speeds exceed 1.5 m/sec (Fig. 1). In addition to the very powerful resource in the Pentland Firth, other areas with strong tidal currents are found south west of Islay, off the Kintyre peninsular, sounds in Orkney Islands, etc. There are also a large number of other locations, for example at the mouths and sills of many sea lochs, where small areas of strong tidal resource can be found but are unlikely to be large enough to support large scale

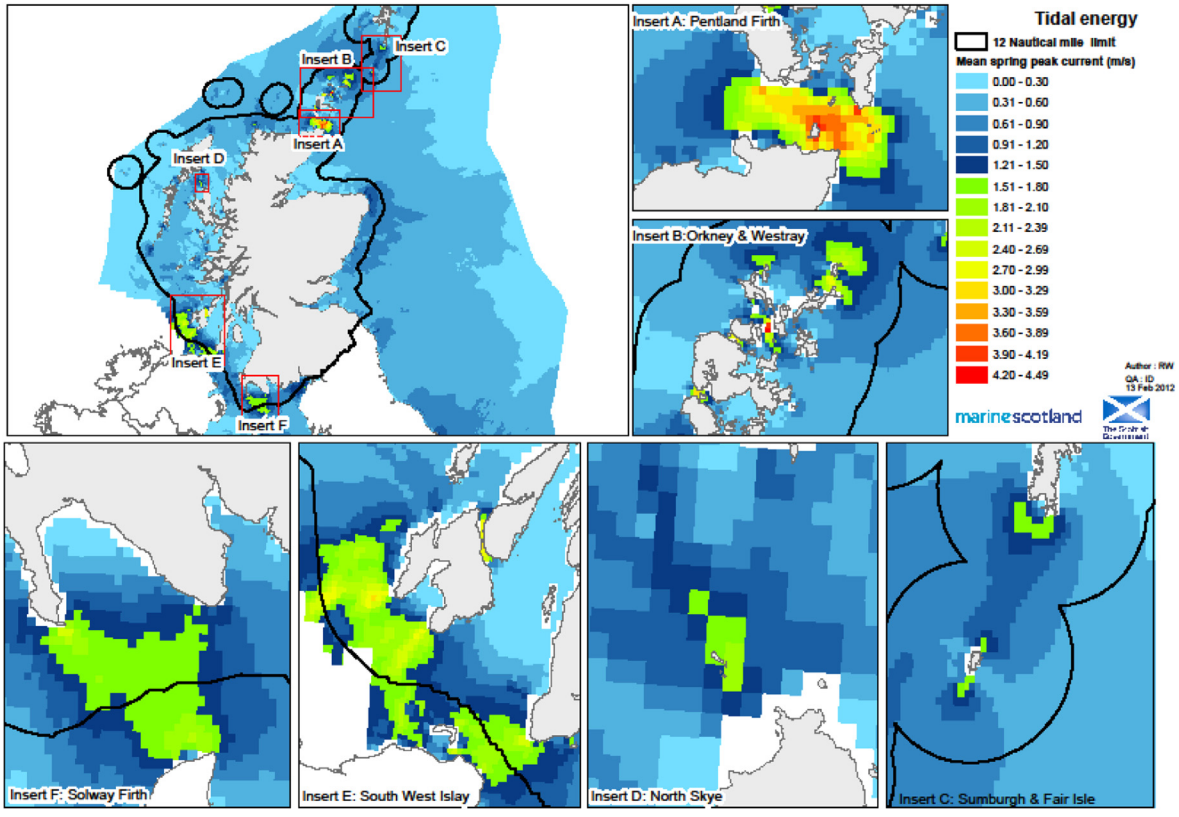

Fig. 1. Mean spring peak current (ms^{-1}) in tidal stream energy resource areas in Scottish waters.