Chapter 7

Ocean Renewable Energy in the European Union: Understanding and Strengthening EU-Canada Relations in Law of the Sea and Ocean Governance

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7.1. Introduction

Ocean-based renewable energy sources, though in their infancy relative to other more widely employed technologies (particularly wind and solar), have an immense potential to positively impact two preeminent EU energy policy goals: greenhouse gas emission reduction and security of supply. Europe has made many progressive strides in terms of renewable energy governance, and other nations may therefore benefit greatly from a comparative assessment of the EU's ocean renewable energy policy. This contribution examines the legal framework governing the development of ocean renewable energy in the EU, in particular the Renewables Directive, and provides an overview of the various policy instruments employed by the Member States domestically, with special reference to those relevant for ocean renewable energy utilisation. Finally, the paper also includes a detailed case-study of the Scottish Strategic Environmental Assessment (SEA) as a singular example of a particularly comprehensive implementation scheme for commercially viable ocean energy projects.

7.1.1. Energy Governance in the EU – Starting Points

Apart from the Treaty establishing the European Atomic Energy Community (EURATOM)[1] and the former Treaty establishing the European Coal and Steel

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Community,[2] there is a notable lack of treaty provisions in the field of energy. Although the treaty establishing the European Community obliges the EU to take the "energy measures" necessary for the achievement of such Community targets as a common market, and an economic and monetary union, it does not hold any provisions regarding the Community's competence in energy matters. The lack of explicit Community competence in this respect is foremost due to the Member States' unwillingness to give up sovereignty in an area of such considerable economic importance as energy supply. As a consequence, decisions affecting the use of land and water areas, such as physical planning, and decisions that significantly impact the choice of energy sources and the energy supply mix must be taken in unison.

Notwithstanding the lack of expressed competence in energy matters, it is still possible for the EU to introduce energy policy instruments via the general competence since the Treaty does not include any special provisions regarding, for example, renewable energy. The EU may thus use its general competence regarding harmonisation and environmental protection to take measures with the intention to promote an increased use of renewable energy sources.

The opportunity to direct the energy policy in the Member States via legislative measures was first used in 2001 with the adoption of the Renewables Directive. Prior to this piece of legislation, renewable energy was primarily promoted via cooperation agreements, recommendations and research support and to some extent via other environmentally related legislation, such as the energy conservation requirement that follows from the Integrated Pollution Prevention Control Directive.[3] During 2000–2005, the EU established a system for emissions trading as a first step to achieving its commitments under the international climate regime. Under certain circumstances the emission trading system may promote an increased use of renewables, although the overall purpose with the system is to reduce the emissions of greenhouse gases, primarily carbon dioxide, and thus mitigate climate change. The trading system is built upon three legal regimes: the actual trading directive,[4] which establishes

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[1] *Treaty Establishing the European Atomic Energy Community* (Euratom), Rome, 25 March 1957.

[2] *Treaty Establishing the European Coal and Steel Community* (ECSC), Paris, 18 April 1951.

[3] Council Directive 96/91 of 24 September 1996 concerning integrated pollution prevention and control.

[4] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community, *Official Journal* 275/32 of 25 October 2003, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:275:0032:0046:EN:PDF> (retrieved 14 November 2008).

the cap-and-trade system; the "linking directive",[5] which links the EU trading system to the flexible mechanisms of the Kyoto Protocol; and the Registries Regulation.[6] The extent to which the trading system may promote the use of renewables will depend on, among other things, the size of the cap.

A couple of other legal regimes have been adopted with the intention to promote the use of renewable energy sources, although they are of minor importance for the utilisation of ocean renewable energy development.[7] Overall, there are (at least) four EU directives that have bearing on the development of ocean renewable energy and each is based on the Community's competence in matters regarding the environment (Article 175 (1)). The EU regulatory framework for offshore renewable development is examined below.

7.2. The European Regulatory Framework

In 2007, the Commission presented an energy policy for Europe (the "energy" package) with the intention to secure energy supply and promote sustainable development.[8] The primary drivers behind the proposal are the imminent threat of climate change, the increasing import dependency, and the rising energy prices. In view of this, the EU made several decisions, e.g., to reduce the emissions of greenhouse gases by 20 percent and that one fifth of gross

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[5] Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms, *Official Journal* L 338/18 of 13 November 2004, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:338:0018:0023:EN:PDF> (retrieved 14 November 2008).

[6] Commission Regulation (EC) No 2216/2004 of 21 December 2004 for a standardised and secured system of registries pursuant to Directive 2003/87/EC of the European Parliament and of the Council, *Official Journal* L 386/1 of 29 December 2004, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:386:0001:0077:EN:PDF> (retrieved 15 November 2008).

[7] Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport, [2003] *Official Journal* L 123/42 of 17 May 2003, available: <http://ec.europa.eu/energy/res/legislation/doc/biofuels/en_final.pdf> (retrieved 15 November 2008); Commission of the European Communities, *Biomass Action Plan*, Communication from the Commission, COM(2005) 628 final (Brussels, 7 December 2005).

[8] Commission of the European Communities, *An energy policy for Europe,* Communication from the Commission to the European Council and the European Parliament, COM(2007) 1 final (Brussels, 10 January 2007).

domestic consumption should stem from renewables by the year 2020.[9] As a means to implement the energy policy, the Renewable Energy Road Map speaks in favour of policies and measures to e.g., remove administrative barriers and improve the existing legal framework to promote an increased use of renewables.

Europe's renewable energy renaissance has many longstanding public policy concerns at its foundation. Following the first oil crisis in the 1970s, Europe became astutely aware of the prevailing issue of energy security and how external energy developments may have far-reaching negative effects on European economies. Although minor strides were made to consider the issue, real progress to combat this innate vulnerability in European strategic policy was hindered early on by two key factors: complexity and cost. In the early 1980s, energy again rose to the forefront of Europe's domestic and foreign policy interests. Yet, this time it was not purely in the context of security; rather environmental protection became an ever-strengthening competing interest. As the geo-political landscape of the 1970s cooled, the price of energy began to stabilise. However, with the signing of the Vienna Convention and the Montreal Protocol,[10] rising international anxiety over global greenhouse gas emission added a new dimension to the European security dynamic. In response, the European Community (EC) recognised the promotion of renewable energy sources as a new policy objective,[11] subsequently removing market barriers to their exploration and development.[12] The question of fossil fuel demands juxtaposing environmental protection culminated with the recognition of the problems posed by climate change and adoption of the United Nations Framework Convention on Climate Change (UNFCCC) signed at the Rio

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[9] Commission of the European Communities, *Renewable Energy Road Map. Renewable Energies in the 21st century: building a more sustainable future,* Commission Communication, COM(2006) 848 final (Brussels, 10 January 2007).

[10] *Vienna Convention for the Protection of the Ozone Layer*, 22 March 1985, 1513 *U.N.T.S.* no.26164, (entered into force 22 September 1988), available: <http://www.unep.org/Ozone/pdfs/viennaconvention2002.pdf> (retrieved 15 November 2008); *Montreal Protocol on Substances that Deplete the Ozone Layer*, 16 September 1987, 1522 *U.N.T.S.* no. 26369, (entered into force 1 January 1989) available: <http://www.unep.org/OZONE/pdfs/Montreal-Protocol2000.pdf> (retrieved 15 November 2008).

[11] Council Resolution of 16 September 1986 concerning new Community energy policy objectives for 1995 and convergence of the policies of the Member States, *Official Journal* C 241 of 25 September 1986, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31986Y0925(01):EN:HTML> (retrieved 15 November 2008), para. 1.f.

[12] Council Recommendation of 9 June 1988 on developing the exploitation of renewable energy sources in the Community(88/349/88), *Official Journal* L 160 of 28 June 1988, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31988H0349:EN:HTML> (retrieved 15 November 2008), p. 46.

Conference of 1992. At Rio, the international community established a global partnership for environmental protection and development aimed at preventing severe climatic interference.[13] It was now readily apparent that the issues of environmental preservation and energy usage were increasingly interconnected and could not be addressed independently.

Early on, European Member States were receptive to renewable energy sources as a means to foster a secure and sustainable energy supply. Shortly after Rio, the EC implemented the ALTENER programme as a financial support mechanism to promote innovation in renewable energy sources, coupled with a modest renewable energy target of 8 percent by 2005.[14] In 1995, in response to the mounting environmental, economic and technological developments, the EC put forward a reformed energy policy to adapt to the rapid progress internationally and that was aimed at increasing overall competitiveness, gaining security of supply, environmental protection,[15] and working towards a 12 percent renewable energy source mix by 2010.[16] Renewable energy sources were acknowledged as an avenue with immense potential, and one which should be more robustly promoted in the EU, as well as at the national level. Subsequently, the EC launched a second five-year promotion initiative – ALTENER II – with a bolstered budged and a broadened mandated,[17] and granted Member States the option to give priority to installations using renewable energy sources.[18] This approach allowed the EU to capitalise on the strategic gains made by the benchmark programme,

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[13] *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 *U.N.T.S.* no. 30822 (entered into force 21 March 1994), available: <http://unfccc.int/resource/docs/convkp/conveng.pdf> (retrieved 15 November 2008) [hereinafter UNFCCC].

[14] Council Decision of 13 September 1993 concerning the promotion of renewable energy sources in the Community (Altener programme) (93/500/EEC), *Official Journal* L 235 of 18 September 1993, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31993D0500:EN:HTML> (retrieved 15 November 2008), p. 41.

[15] Commission of the European Communities. *White Paper: An Energy policy for the European Union,* Com (95) 682 (Brussels, 13 December 1995), available: <http://aei.pitt.edu/1129/01/energy_white_paper_COM_95_682.pdf> (retrieved 15 November 2008).

[16] M. M. Roggenkamp, C. Redgwell, A. Rønne, and I. del Guayo, eds, *Energy Law in Europe*, 2nd edition(New York: Oxford University Press, 2007), p. 376.

[17] Common Position (EC) no 9/98 adopted by the Council on 19 January 1998 with a view to adopting a Council Decision concerning a multiannual programme for the promotion of renewable energy sources in the Community (Altener II), *Official Journal* C 62 of 26 February 1998, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:1998:062:0031:0037:EN:PDF> (retrieved 15 November 2008), p. 31.

[18] Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity, *Official Journal* L 27 of 30 January 1997, available: <http://www.seerecon.org/infrastructure/sectors/energy/documents/electricity_directive/dir96-92.pdf> (retrieved 15 November 2008), p. 25.

simultaneously empowering Member States with the requisite flexibility necessary to expand the percentage played by renewable energy sources in the national energy mix indefinitely.

Although the strategies imposed by the EU were forward looking, on-the-ground progress of renewable energy sources was more modest. Member States developed renewable energy sources to differing degrees dependent upon their economic and geographic limitations, resulting in a great disparity in levels of renewable energy source consumption and types employed across the EU. Furthermore, a lack of "qualified objectives" made it difficult to calculate the progress of the ALTENER and associated programmes.[19] The signing of the Kyoto Protocol increased international pressure for a reformed policy on renewable energy sources by the EU as the emission reduction framework in place proved to be inadequate to fulfill the EU's international obligations.[20] Finally, because Member States developed renewable energy sources in a fragmented fashion, the EU lacked a clear-sighted common vision for the integration of renewable energy sources into the energy mix. Consequently, the European Parliament requested a concrete legal framework addressing, e.g., proposals for grid access for renewable energy sources,[21] continuation of current programmes, as well as setting clear binding targets for future developments.[22]

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[19] Special Report No 17/98, on support for renewable energy sources in the shared-cost actions of the Joule-Thermie Programme and the pilot actions of the Altener Programme together with the Commission's replies (Submitted pursuant to Article 188c(4)(2) of the EC Treaty), *Official Journal* C 356 of 20 November 1998, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31998Y1120(03):EN:HTML> (retrieved 15 November 2008), p. 39, para. 7.1.

[20] Commission of the European Communities, *Green Paper: Towards a European strategy for security of energy supply,* Communication from the Commission, COM (2000) 796 (Brussels, 29 November 2000), available: <http://aei.pitt.edu/1184/01/enegy_supply_security_gp_COM_2000_769.pdf> (retrieved 15 November 2008).

[21] Resolution A4-0199/98 incorporating Parliament's recommendation to the Commission for a proposal for a European Parliament and Council Directive on the feeding in of electricity from renewable sources of energy in the European Union, *Official Journal* C 210 of 17 June 1998, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:1998:210:0100:0165:EN:PDF> (retrieved 15 November 2008), p. 143.

[22] Resolution A5-0078/2000 of the European Parliament on Electricity from renewable energy sources and the internal electricity market (SEC(1999) 470 (C5-0342/1999 (2000/2002(COS)), *Official Journal* C 378 of 29 December 2000, available: <http://eur-lex.europa.eu/ LexUriServ/LexUriServ.do?uri=OJ:C:2000:378:0089:0095:EN:PDF> (retrieved 15 November 2008), p. 93, para. 6.

7.2.1. The Renewables Directive

With the submission of the Renewables Directive (the so-called RES-E directive),[23] the EU took a firm stance to enhance the role played by renewables in Europe and to establish a comprehensive framework to do so.[24] Although many previous strides were made to foster momentum behind the use of renewable energy sources, in practice their integration into the Community energy mix was a slow process. The Renewables Directive aims to streamline and enhance the integration of renewable energy sources into the market. However, rather than trying to amalgamate the previous programmes, Member States are provided with the flexibility to implement their own unique renewable energy strategies or to experiment with various sources.[25] Functionally, the Directive accomplishes four key goals: (i) outlining key definitions; (ii) designing a complex reporting mechanism; (iii) designating the administrative requirements of Member States; and (iv) setting a bolstered renewable energy consumption target for the Community. Each of these goals must be assessed in more detail to clearly define the new energy framework in place for the Community and to truly appreciate the energy vision of the EU.

7.2.1.1. Definitions

The Renewables Directive outlines four key definitions in Article 2. Of most relevance, "renewable energy sources" is given a broad and expansive definition, and valid sources are enumerated. Most notably, both wave and tidal energy systems are encompassed as eligible sources,[26] opening the door for future work on marine renewable energy development. Article 2 also defines "biomass" as biodegradable products, "consumption" as gross national energy usage, and "energy produced from renewable sources" as energy produced from purely renewable plants as well as hybrid plants (both renewable and non-renewable). While the first two definitions are straightforward, the definition of

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[23] Directive 2001/77/EC of the European Parliament and of the Council 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal market, *Official Journal* L 283/33 of 27 October 2001, available: <http://eur-lex.europa.eu/pri/en/oj/dat/2001/l_283/l_28320011027en00330040.pdf> (retrieved 15 November 2008) [hereinafter Renewables Directive].

[24] Roggenkamp, n. 16 above, p. 377.

[25] Id.

[26] Renewables Directive, n. 23 above, Article 2(a), eligible sources are defined as "renewable non-fossil energy sources (wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases)."

energy produced from renewables has a key point. It is possible to use a hybrid plant as a start-up to a full scale renewable plant. This provides a transitional strategy for energy producers and opens the door for smaller scale or more localised projects, and lowers the economic burden on producers at the onset of a project.

7.2.1.2. Reporting Mechanism

A very important contribution made by the Renewables Directive is the design and implementation of a complex reporting mechanism for both the EU and Member States which has numerous requirements. First, Member States are obliged adopt and publish a report outlining domestic consumption targets for renewable energy sources over the next decade. Member States are also to conduct a review and re-evaluation of these targets every five years, with the caveat that they must be consistent with the targets outlined in the Annex, as well as those agreed upon under the Kyoto Protocol.[27]

Second, Member States are to publish a report analysing the progress made towards meeting national targets, the reliability of the "guarantee of origin" system,[28] and whether or not this progress is in line with national commitments. Moreover, progress is to be re-evaluated and republished on two-year review cycles.[29] Third, the Commission must publish a report assessing the progress made in terms of both domestic as well as Community renewable energy consumption targets. The Commission report may be accompanied by policy proposals to the European Parliament or revised targets where necessary.[30]

Forth, the Commission shall evaluate the role played by support schemes, their cost-effectiveness, and their success in achieving national targets.[31] Fifth, Member States are obliged to publish a report assessing both the devices used to ensure and expand grid access,[32] as well as the existing legislative and regulatory mechanisms in place, with an aim to reducing barriers to increased renewable energy production, streamlining administrative procedures, and ensuring transparency and non-discriminatory behaviour towards renewable energy sources.[33] Finally, based on the previous reports submitted by Member

[27] Id., Article 3(2).
[28] Id., Article 5(5).
[29] Id., Article 3(3).
[30] Id., Article 3(4).
[31] Id., Article 4(2).
[32] Id., Article 7(7).
[33] Id., Article 6(2).

States, the Commission will publish a summary report every five years with the first being no later than 31 December 2005, on the implementation of the Directive. This report will also consider the success of the guarantee system,[34] the efficacy of current administrative procedures with a view to disseminating best practices,[35] the progress made towards achieving national and Community targets, the external costs of non-renewable energy sources, and, if necessary, it may make proposals to the European Parliament.[36] In the end, the Renewables Directive includes a total of ten reporting requirements.[37] The comprehensiveness of the reporting mechanism clearly demonstrates the importance of the renewable energy policy objective and the dedication to accomplishment embodied by the EU.

7.2.1.3. Administrative Requirements

Member States are required to take "appropriate steps" to foster greater use of renewables, and progress must be proportional to the committed targets found in the Annex.[38] Fundamentally, these steps come in the form of complementary initiatives, such as support schemes (Article 4), guarantees of origin (Article 5), administrative and planning procedures (Article 6), and grid system issues (Article 7). Each of these four steps is discussed individually.

1. Support Schemes

Even with the cost of renewable energy source electricity dropping, due to both technological and economic advances, the overall expenditure associated with renewable energy production is still very high and is expected to remain as such in the medium term. Support schemes are an indispensable tool to make renewable energy source electricity affordable for consumers. Functionally, they come in four broad forms (although there are hybrid models in use) and are used to differing degrees across the EU.

First, feed-in tariffs are used by most Member States and, generally speaking, are a tax paid by electricity companies and distributors to domestic renewable energy source electricity producers. This additional capital assists in

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[34] Id., Article 5(6).
[35] Id., Article 6(3).
[36] Id., Article 8.
[37] P. Bertoldi, R. Bowie, P. Hodson, J. Lorentzen, H.V. Malvik, and A. Toth (contributors) and L. Werring (editor), *EU Energy Law, Vol. III, EU Environmental Law: Energy Efficiency and Renewable Energy Sources* (Leuven, Belgium: Claeys & Casteels, 2006), p. 61.
[38] Renewables Directive, n. 23 above, Article 3(1).

offsetting the high cost of renewable energy sources, and ensures a moderate price for consumers. The primary advantages of such a programme are security of investment, flexibility in application, and support for medium- and long-term technological cost reduction. However, because each Member State has different internal economic factors to consider prior to implementation of a feed-in tariff, they inevitably are extremely complex to harmonise at the Community level.[39]

Second, the tradable green certificate system, admittedly not as widespread in terms of use,[40] has many positive attributes. As a more market-based initiative, green certificates' help to offset the added cost of renewable electricity production by requiring consumers (and some producers depending upon the country) to purchase a specified number of certificates ensuring both consumption and production of renewable electricity. Certificates are purchased on a secondary market between consumers and producers, which ensures the highest possible return for investment with non-compliance punished via fine. However, the volatility of such a programme poses a deterrent to potential investors and does little to drive-down either technological or service prices.[41]

Third, a pure-tendering procedure,[42] the use of which was originally limited and is currently on the decline, is one where the state procures tenders for the production of renewable electricity, which is then provided to consumers at the price outlined by the provider in the tender. The theoretical advantage to such a system is the optimal use of market forces to provide the lowest price to consumers. However, in practical terms the tendering procedure might hinder advancement rather than drive it. Since the increased production cost is shouldered by the end-use consumer, there is little market force to drive down overall costs of renewable energy technology, and projects may hence fail due to uncompetitive bidding.[43]

Finally, tax incentives are used to encourage more widespread use of renewables but are generally seen as an additional policy tool rather than a stand-alone strategy.[44] Realistically, Member States tend to use a complex combination of the above programmes based on the internal needs of both the market and their citizens.

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[39] Bertoldi et al., n. 37 above, p. 29.
[40] Id., currently used in Sweden, United Kingdom, Italy, Belgium and Poland.
[41] Id., p. 30.
[42] Id., currently used in only Ireland and France, with both jurisdictions having recently indicated a shift to a feed-in/green certificate hybrid model.
[43] Id.
[44] Id., currently in use only by Malta and Finland, with Cyprus, the United Kingdom and Czech Republic viewing them simply as a complementary policy tool.

2. Guarantee of Origin

One of the primary necessities of a renewable energy programme is the ability to differentiate unequivocally between renewable and non-renewable forms of electricity within the same market. Consumers have become increasingly interested in their ecological impact and are turning to renewables as one avenue to limit that impact even if they are more costly. However, if consumers are going to pay a premium for a green energy source, there must be administrative oversight to insure accuracy. Member States are granted full freedom to design their own domestic certification process barring that the procedure is accurate, transparent and non-discriminatory.[45]

Although the procedural elements are in the hands of the Member State and thus will differ marginally across the EU, the substantive criteria for a "guarantee of origin" are expected to be identical EU wide. A guarantee of origin should outline the type of energy source used, the date(s) and location(s) production occurred, and provide consumers with an assurance of authenticity.[46] Furthermore, guarantees of origin are expected to be mutually respected by other Member States, although refusal of recognition is acceptable as long as it is based on objective, transparent and non-discriminatory criteria.[47] In practical terms, a guarantee of origin is going to be recognised across the Community.[48] Finally, Member States are expected to designate to a competent body with oversight of the guarantee process to ensure accuracy, accountability, and reliability.[49]

3. Administrative and Planning Procedures

A major impediment to the wide scale development of renewable energy is the administrative barriers that must be satisfied by potential producers.[50] As such, Member States are to designate to a competent body with the power to evaluate the current legislative and regulatory framework. The goal is to remove unnecessary regulatory and non-regulatory barriers to renewable electricity production, streamline existing administrative measures, and ensure that rules are objective, transparent and non-discriminatory.[51] Although it seems wise to have common administrative criteria across the EU, in practice, flexibility is

[45] Renewables Directive, n. 23 above, Article 5(1).
[46] Id., Article 5(3).
[47] Id., Article 5(4).
[48] Bertoldi et al., n. 37 above, p. 49.
[49] Renewables Directive, n. 23 above, Article 5(5).
[50] Bertoldi et al., n. 37 above, p. 52.
[51] Renewables Directive, n. 23 above, Article 6(1).

necessary. Furthermore, Member States are expected to coordinate the varying administrative organs addressing renewable energy development domestically[52] because renewable energy projects typically fall under multiple and overlapping heads of power.

4. Grid System Issues

Producers of renewable electricity, often because of their small size and relative vulnerability, must be assured that the energy produced can be incorporated into the national grid effectively. Thus, Member States are expected to require domestic transmission system operators (TSO) and distribution system operators (DSO) to give priority grid access to installations producing electricity from renewable energy sources.[53] Member States must also require TSOs and DSOs to establish and publish objective rules on grid adaptation and connection costs (cost-bearing),[54] to provide new producers with a thorough estimate of the costs of grid connection,[55] and to create and publish a set of standard rules for cost sharing among beneficiaries in relation to system instillation and grid upgrades (cost-sharing).[56] The rationale for these points stems from the localised and often rural nature of renewable electricity production.

Generally speaking, electricity grids were created during the era of state-owned enterprises frequently left rural areas without the infrastructure necessary to transmit or connect to a national grid.[57] In many cases, these infrastructure modernisation costs are shared among the parties, however, in some cases, Member States may require TSOs and DSOs to shoulder the full cost of adaptation.[58] Regardless, grid system connection costs are required to only reflect the reasonable cost of the benefit of connection and must not be unduly prohibitive to the integration of renewable energy.[59] Undoubtedly this is, and will continue to be, an issue of importance as the production of renewable energy increases.

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[52] Id., Article 6(2).
[53] Id., Article 7(1).
[54] Id., Article 7(2).
[55] Id., Article 7(4)
[56] Id., Article 7(5).
[57] Bertoldi et al., n. 37 above, p. 37.
[58] Renewables Directive, n. 23 above, Article 7(3).
[59] Id., Article 7(6).

7.2.1.4. Renewable Electricity Consumption Targets

If the reporting element of the Renewables Directive is considered to be one of its most vital contributions, the bolstered renewable electricity consumption target is the most indispensable. Member States agreed upon individual *indicative* consumption targets which are, in many cases, quite progressive. However, they also vary greatly due to geographic and economic differences. For instance, Belgium has rather limited sources of renewable energies and thus its target is very low, 6 percent renewable electricity consumption by 2010.[60] Others, for instance Austria or Sweden, have a surplus and thus have considerably higher targets (78 and 60 percent respectively).[61] If the Member States meet their national targets, 21 percent of total electricity consumption in the EU will be produced by renewable energy sources by 2010.

Although some Member States are heading in the right direction, the majority of countries are behind schedule. In the present situation, the EU will only manage to produce 19 percent of its electricity from renewables in 2010. Hence, to accomplish its goals, additional efforts might be required.[62]

7.2.1.5. Discussion

In view of the fact that Member States are unlikely to achieve the sectoral targets for renewable electricity consumption proposed in the Renewables Directive, in many respects, the Directive can be considered a policy failure.[63] The shortcomings have varying explanations. First, although the cost of renewable energy technologies are on the decline, the inability to internalise the external costs of renewable energy sources into the market price of renewable electricity has negatively affected short-term funding options, in turn giving non-renewable sources a competitive edge in short-term affordability.[64] Bearing in mind the decentralised character of renewable energy applications, a second

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[60] Id., Annex.
[61] Id.
[62] Commission of the European Communities, *Renewable Energy Road Map: Renewable energies in the 21st century: building a more sustainable future,* Commission Communication, COM (2006) 848 final (Brussels, 10 January 2007), available: <http://ec.europa.eu/energy/energy_policy/doc/03_renewable_energy_roadmap_en.pdf> (retrieved 16 November 2008).
[63] Roggenkamp, n. 16 above, p. 382.
[64] Commission of the European Communities, *Green Paper: A European Strategy for Sustainable, Competitive and Secure Energy,* Communication from the Commission, COM (2006) 105 (Brussels, 8 March 2006), available: <http://ec.europa.eu/energy/green-paper-energy/doc/2006_03_08_gp_document_en.pdf> (retrieved 16 November 2008), p. 4.

practical consideration is the difficulty of streamlining various administrative processes. Proponents of renewable electricity projects have run up against opaque authorisation procedures, varying certification standards, and incompatible certification and testing regimes.[65] This reality prompted the European Council to request a "coherent framework" based on a new directive to increase the renewable energy capacity.[66]

In response, a second renewables directive was proposed for consideration in early 2008.[67] At its basis is a binding target of 20 percent renewable energy source electricity and a 10 percent binding target for biofuels in the transportation sector.[68] Moreover, the Renewables Directive II aims to address many of the practical considerations brought to the forefront through consultations with relevant stakeholders and the EU Strategic Energy Review. First, it requires all Member States to have a "National Action Plan" that sets out renewable energy policy targets in various sectors and outlines national policies aimed at fulfilling those requirements.[69] Second, it aims to standardise and expand the use of the guarantee of origin regime.[70] At current, guarantees of origin are used by Member States for differing reasons, be it disclosure, recommended practices or to qualify for a national support scheme.[71] A guarantee of origin will now, beyond specifying the source, date of and authenticity of production, require a host of new information, including the location, type, capacity, and operational date of the installation, the country of issue, and the amount and type of investment aid granted to the installation.[72] Furthermore, guarantees of origin are to be recognised across the Community,[73]

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[65] Id.

[66] Council Directive 96/91 of 24 September 1996 concerning integrated pollution prevention and control, *Presidential Conclusions, Council of the European Union*, 9 March 2007 doc. 7224/07, available: <http://register.consilium.europa.eu/pdf/en/07/st07/st07224.en07.pdf> (retrieved 16 November 2008), Annex 1, point 7.

[67] Proposal for a Directive for the European Parliament and of the Council on the promotion of the use of energy from renewable sources, COM (2008) 19 of 23 January 2008, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0019:FIN:EN:PDF> (retrieved 16 November 2008), [hereinafter Renewables Directive II], p. 2.

[68] Id.

[69] Id., Article 4(1)

[70] Commission of the European Communities, *Impact Assessment on Directive for the European Parliament and of the Council on the promotion of the use of energy from renewable sources,* Commission Staff Working Document, SEC(2008) (Brussels, 23 January 2008), available: <http://ec.europa.eu/energy/climate_actions/doc/2008_res_ia_en.pdf> (retrieved 16 November 2008), p. 12.

[71] Id.

[72] Renewables Directive II, n. 67 above, Article 4(2 a-e).

[73] Id., Article 4(3).

registered domestically with a competent body,[74] and fully transferable among Member States provided the transferor has achieved their immediate targets.[75]

Third, administrative procedures are to be clarified and streamlined by having licensing procedures clearly defined and certification criteria determined objectively, clear guidelines established for inter-administrative cooperation, and a fast-track procedure for smaller projects.[76] Furthermore, local and regional councils are to consider renewable energy development when planning, designing and refurbishing both industrial and residential areas.[77] Fourth, Member States are to provide to builders, planners, installers and architects information on support measures for renewable energy.[78] Member States are also required to ensure that the cost and energy efficiency of equipment is made available by suppliers and to develop a certification programme for installers of small-scale projects.[79] Finally, Member States are expected to develop infrastructure and to grant priority access for further expansion of renewable electricity production.[80]

A few important caveats must be noted at this juncture. Firstly, there are notable shortcomings in this directive. Most glaring, despite having binding targets for 2020, the proposed directive does not have binding targets in the interim, nor does it set out penalties for failure to reach these targets.[81] Furthermore, because it is a directive and not a regulation, it is subject to national implementation, thus leaving immense room for variations of policies particularly regarding priority grid access.[82] In this context, it is important to point to the EU's lack of competence in certain matters strongly related to the development of renewable energy, in particular regarding land use and planning, which are vital areas for the implementation of all kinds of renewable energy installations. The Member States' discretion is thus extensive and it is possible that, for example, planning regimes will function as barriers to the achievement of these targets.

Secondly, even if this proposed directive passes the complex approval process in the EU, this is clearly not the last of the directives aimed at

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[74] Id., Article 7.
[75] Id., Article 9(1-2)
[76] Id., Article 12(1).
[77] Id., Article 12(3).
[78] Id., Article 13(1).
[79] Id., Article 13(2-4).
[80] Id., Article 14 (1-2).
[81] D. Hendricks, "Directive sets the EU pathway," *Refocus* 9 (January–February 2008), available: <http://www.renewableenergyfocus.com/articles/general/features/EU%20pathway/EUpathway.html> (retrieved 10 November 2008), pp. 1–2.
[82] Id.

promoting renewable energy in the EU. The consolidation of the internal market is still a process under construction,[83] and this package should be viewed no differently. Realistically, it should be considered as a step in the right direction and a demonstration of Europe's clear intention to use renewable energy source as a principle policy tool to achieving both energy security and environmental protection.

However, whether it is progressive environmentalism or enlightened self-interest as its basis, the EU has clearly forged a new direction for the energy sector. Renewable energy sources have an immense potential to positively contribute to Europe's strategic as well as environmental concerns, provided that the market climate is welcoming to their arrival. Responding to a decade of fragmented progress in the renewable energy sector, the Renewables Directive has taken Europe in a new direction by attempting to craft the ideal market conditions for renewable energy development. Although much in this Directive may be commended, such as the monitoring, support and reporting initiatives, progress has not been made at the pace expected.

A revamped and more robust renewable energy policy has been submitted to the European Parliament for its consideration. This proposal sets out additional monitoring and reporting requirements, as well as an increased renewable electricity consumption targets. However, it is lacking in terms of consumption targets or penalties for failing to reach the prescribed targets. This is a notable shortcoming, and one that will surely need to be resolved if the pace of renewable energy development is to quicken.

7.3. Regulatory Frameworks in the Member States

To reiterate, the EU Member States have considerable room to design their own energy policy. In the absence of Community legislation and in the wake of energy crises and environmental concerns, many Member States have taken the matter into their own hands and introduced legal and economic instruments aiming to diversify energy supply and increase the use of renewable energy sources. Some of the most prominent countries in this respect are Denmark, Germany and Spain, who had in place specific renewable energy legislation early on. The initiatives have grown over time, but the overall picture is still

[83] Roggenkamp, n. 16 above, p. 391.

shattered; some countries have a complete institutional framework in place for the energy sector, whereas others are a bit behind in this respect.[84]

It is thus clear that the European Member States have, and will continue to play an indispensable role in transitioning the renewable energy policy from the EU blackboard to the boardroom. Although widespread goals are deliberated at the Community level, it is in the hands of the Member States that they gain their unique characteristics. And the Member States have indeed approached the renewable question with much diversity and employed varying strategies and initiatives dependent upon geographic, economic and social limitations. Of the renewable energy sources explored, ocean-based renewable energy systems are of particular importance to the question of ocean governance. This section focuses on initiatives taken by various Member States to expand the role played by ocean renewables in their respective jurisdictions. Eight states have been selected due to their advances in marine renewable energy sources, with each assessment focusing on the promotion of resources and regulatory framework for ocean-based renewable energy. Although each Member State confronts the subject matter differently, cumulatively many creative programmes have been implemented and much can be gained from a comparative analysis.

7.3.1. Belgium

Although little has transpired practically, in terms of extracting the potential of marine renewables in Belgium's North Sea, it is nevertheless an important policy objective. Belgium has a renewable electricity target of 6 percent by 2010[85] and a proposed target of 13 percent by 2020.[86] As of yet, only 2.2 percent of electricity consumption comes from renewable sources.[87]

Previous attention has been focussed predominantly on the use of hydro and biomass (biogas, biowaste and sold biomass) but ocean-based renewables, particularly wave energy, is an ever-growing area of focus. Belgium employs a programme using tradable green certificates (TGC), with a guaranteed

[84] An important aspect regarding legal instruments put in place by Member States is that they must not under any circumstance be contrary to Treaty rules. Particularly relevant in the context of policy instruments to support renewable energy production are the Community rules regarding state support (Art. 87) and the free movement of goods (Art. 28). See e.g., *Case C-379/98 – PreussenElectra* (2001).

[85] Renewables Directive, n. 23 above, Annex.

[86] Renewables Directive II, n. 67 above, Annex I.

[87] Id.

minimum price set for electricity produced from renewables, to promote ocean-based renewable energy sources.[88] However, the TGC market is rather small and generally allows only cost-effective technologies to thrive, which is a worry, although market conditions are considered acceptable for continued expansion.[89]

On 17 May 2004, Belgium passed a royal decree empowering the Minister of Energy with the ability to provide "domain concessions" for the creation and investigation of potential installations for offshore renewable energy such as wind and water. The decree is valid both for the territorial waters and the exclusive economic zone.[90] Belgium thus has a designated zone for the location of renewable energy installations, as well as a specific regime outlining criteria for eligibility and a procedure for the granting of concessions. Belgium also has in place an research and development initiative for ocean renewable energy sources called the Sustainable Economically Energy Efficient Wave Converter (SEEWEC) that aims to integrate the commercial manufacturing of wave technologies into the market.[91] Overall, Belgium may not have an abundance of ocean-based renewable resources, but they are taking focused strides to engage what resources they do have.

7.3.2. Denmark

Stemming from a change in the political character of the Danish government in early 2001, many of the progressive renewable energy initiatives undertaken in the 1990s were either abolished or allowed to run their course without renewal.[92] Though this political chill has seemingly subsided, the Danish wave energy development programme has nevertheless not been reinstated, and no formal development plan has been designed to replace it.[93] Denmark has

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[88] Commission of the European Communities, *The share of renewable energy in the EU: County Profiles, Overview of Renewable Energy Sources in the Enlarge European Union,* Commission Staff Working Document, SEC(2004) 547 (Brussels, 26 May 2004), available: <http://ec.europa.eu/energy/res/legislation/country_profiles/2004_0547_sec_country_profiles_en.pdf> (retrieved 10 November 2008), p. 14; see Bertoldi et al., n. 37 above, p. 31.

[89] Bertoldi et al., n. 37 above.

[90] International Energy Agency (IEA), *Implementing Agreement on Ocean Energy Systems Annual Report 2007* (IEA-OES Executive Committee, 2007), available: <http://www.iea-oceans.org/_fich/6/IEA-OES_Annual_Report_2007.pdf> (retrieved 10 November 2008) [hereinafter IEA], p. 34.

[91] Id.

[92] Commission of the European Communities, n. 88 above, p. 20.

[93] IEA, n. 90 above, p. 41.

a renewable electricity target of 29 percent by 2010[94] and a proposed target of by 30 percent 2020.[95] Currently, 17 percent of electricity consumption comes from renewable sources.[96] Regardless of the political climate, renewables still play a crucial role in the Danish energy mix.

Wind energy is the most widely used renewable energy source, accounting for 18.5 percent of the total 28.5 percent renewable electricity produced domestically.[97] Ocean-based renewables are still only in the developmental phase, with most of the work being done by private developers. Denmark uses primarily a feed-in tariff system, coupled with a tendering programme for offshore wind projects. However, the current feed-in tariffs are ineffectual at procuring investment, and broad policy reform has been slow coming.[98]

In 2007, Denmark reaffirmed its determination to double its production of renewable electricity production by 2020.[99] This was followed in 2008 by a policy statement put out by the Minister of Climate and Energy proposing a new "Renewable Energy Act."[100] While ocean-based renewable energy sources are not the primary focus of this legislation, which mainly concentrates on wind and biomass, marine renewables will most surely be incorporated once they have passed the development phase.

7.3.3. France

The French are uniquely situated geographically, with a favourable wave climate on their Atlantic coast near the Bay of Biscay, and an equally favourable tidal climate in the Mediterranean basin. France has a renewable electricity target of 21 percent by 2010[101] and a proposed target of 23 percent

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[94] Renewables Directive, n. 23 above, Annex.
[95] Renewables Directive II, n. 67 above, Annex I.
[96] Id.
[97] Roggenkamp, n. 16 above, p. 509.
[98] Commission of the European Communities, n. 88 above, p.20.
[99] Danish Energy Authority, *A visionary Danish energy policy 2025* (January 2007), available: <http://www.ens.dk/graphics/Publikationer/Energipolitik_UK/Engelsk_endelig_udgave_visionaer_energipolitikA4.pdf> (retrieved 16 November 2008).
[100] Danish Energy Authority, *Energy Policy Statement 2008: The report of the minister of climate and energy pursuant to the Danish Act on Energy Policy Measures* (November 2008), available: <http://www.ens.dk/graphics/Publikationer/Energipolitik_UK/Energipolitisk_redegorelse_2008_eng.pdf> (retrieved 16 November 2008), p. 8.
[101] Renewables Directive, n. 23 above, Annex.

by 2020.[102] Renewable electricity currently accounts for only 10.3 percent of the total French electricity consumption,[103] with hydro the primary contributor.[104]

Although the use of hydro electricity is disproportionately high, ocean-based renewables are quickly gaining recognition. France uses a pure feed-in tariff system for power plants with a capacity greater than 12 megawatts and a tendering procedure for smaller plants.[105] As of March 2007, France also has set a 15 c€/KWh feed-in tariff rate for electricity produced from waves. While administrative barriers still persist to the integration of renewable energy sources, investment in France has been constant and could be maximised if these roadblocks were addressed.[106]

France has also set up a test installation for wave energy production in the Pays de la Loire region on the Atlantic coast. With solidified funding secured in 2007, the facility is expected to be operational by 2010.[107] Although current wave and tidal projects are still in the research and development phase, the French government clearly has planned a role for ocean-based renewable energy sources to play in the country's energy mix.

7.3.4. Ireland

Based on its prime geographic location, Ireland has one of – if not the highest – proposed return from ocean-based renewable energy sources. Ireland has a renewable electricity target of 13.2 percent by 2010[108] and a proposed target of 16 percent by 2020.[109] Presently, however, only around 3.1 percent of consumed electricity is however generated from renewable energy sources.[110]

The development of Ireland's ocean energy potential has been identified as a top priority area. A long-term multiphase initiative was launched in 2006, with the goal of large-scale commercial electricity production in, or around,

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[102] Renewables Directive II, n. 67 above, Annex I.
[103] Id.
[104] Commission of the European Communities, n. 88 above, p. 33.
[105] Id.; Bertoldi et al., n. 37 above, p. 32.
[106] IEA, n. 90 above, p. 44.
[107] Id.
[108] Renewables Directive, n. 23 above, Annex.
[109] Renewables Directive II, n. 67 above, Annex I.
[110] Id.

2015.[111] Ireland previously used a tendering mechanism for the development of renewable energy sources but is set to replace this with a feed-in scheme in the near future.[112] These recent developments will surely assist in the expansion of marine renewable energy sources in Ireland in the future.

In March 2007, the Irish government reaffirmed its intentions to become a world leader in ocean-based renewables by proposing a target of 500 MW installed production capacity by 2020.[113] Furthermore, with a specific national agency in charge of research and development (Sustainable Energy Ireland), numerous institutional development programmes and a support programme for scholarly research into ocean energy utilisation put in place by the Minister for Communications, Marine & Natural Resources,[114] Ireland is keenly poised to capitalise on its wealth of ocean renewable energy.

7.3.5. Portugal

With almost half of the country bordered by the North Atlantic, Portugal is another Member State with immense ocean-based renewable potential of which they are moving quickly to capitalise upon. Portugal has a renewable electricity target of 39 percent by 2010[115] and a projected target of at least 31 percent by 2020.[116] Currently, 20.5 percent of all electricity consumed is from renewable energy sources,[117] with small-scale hydro being the primary contributor.[118]

Although in the past the tremendous success of hydro gave Portugal great optimism, with much of the current market still dominated by hydro, that

[111] Sustainable Energy Ireland, *Ocean Energy Strategy: Ocean Energy in Ireland* (Department of Communications, Marine and Natural Resources Ireland, 2005), available: <http://www.sei.ie/getFile.asp?FC_ID=1747&docID=1065> (retrieved 16 November 2008).
[112] Bertoldi et al., n. 37 above, p. 32.
[113] Government of Ireland, Department of Communications, Marine and Natural Resources Ireland, *White Paper: Delivering a Sustainable Energy Future for Ireland* (2007), available: <http://www.dcenr.gov.ie/NR/rdonlyres/54C78A1E-4E96-4E28-A77A-3226220DF2FC/27356/EnergyWhitePaper12March2007.pdf> (retrieved 16 November 2008), p. 36.
[114] Government of Ireland, Department of Communications, Marine and Natural Resources Ireland, "Minister Noel Dempsey Launches Charles Parsons Energy Research Awards: An Innovative New Research Funding Scheme," *Press Release* (28 September 2006), available: <http://www.dcenr.gov.ie/Press+Releases/Minister+Noel+Dempsey+Launches+Charles+Parsons+Energy+Research+Awards.htm> (retrieved 16 November 2008).
[115] Renewables Directive, n. 23 above, Annex.
[116] Renewables Directive II, n. 67 above, Annex I.
[117] Id.
[118] Commission of the European Communities, n. 88 above, p. 85.

optimism has been turned into pragmatism as Portugal aims to extract renewable resources more effectively. Portugal uses a feed-in tariff programme with a fluctuating rate of 76–191 €/MWh for wave energy dependent upon if it is pre-commercial or not.[119] This is coupled with specific investment incentives, for example the investment subsidy programme PRIME,[120] aimed at maximising the expansion of their renewable energy sector. The stability of the support programme for renewable energy sources in Portugal provides security for potential investors. However, complex licensing requirements have hampered the development of renewable energy.

Portugal has made the expansion of their renewable energy sector a prime policy goal with the passing of Resolution No. 169/2005.[121] The resolution outlines additional consumption targets, particularly for wind. The resolution also reinforces the target of 50 megawatts installed capacity by 2013 for renewable electricity produced from waves, originally set in place by Resolution No. 63/2003.[122] Furthermore, Decree-Law No. 90/2006 established a new framework for the allocation of costs between providers of conventional versus renewable energy sources.[123] More practically, Order-in-Council No 736-A/2006 provided for the installation of the world's first wave power plant (capacity 4MW) in public waters off the coast of Aguçadoura.[124] With the establishment of a pilot zone in 2008, and a high level of both public and private support for, and development of, ocean-based renewable energy programmes, Portugal is primed to capitalise on its immense geographic potential.[125]

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[119] Portugal's feed-in rate is variable dependent upon the size of the installation, its production capacity, and if it is for commercial sale. See Permanent Representative of Portugal to the European Union, *Third report on progress towards achieving the indicative targets for electricity production from renewable energy sources in Portugal* (TREN/2007/2895) (Brussels, 29 October 2007), available: <http://ec.europa.eu/energy/res/legislation/doc/electricity/member_states/2006/portugal_en.pdf> (retrieved 16 November 2008), p. 6.

[120] K.-D. Heer and O. Langniß, *Promoting Renewable Energy Sources in Portugal: Possible Implications for China* (Centre for Solar Energy and Hydrogen Research, June 2007), available: <http://www.resource-solutions.org/lib/librarypdfs/Heer.and.Lagniss.Portugal.Study.pdf> (retrieved 16 November 2008), p. 6.

[121] Government of Portugal, Energy Services Regulatory Authority, *Annual Report to the European Commission* (2007), available: <http://www.erse.pt/NR/rdonlyres/796098AC-54CF-4518-984D-4BF5D6B36A34/0/Relat%C3%B3rioCE_vers%C3%A3oinglesa.pdf> (retrieved 16 November 2008), p. 13.

[122] Heer and Langniß, n. 120 above, p. 5.

[123] Government of Portugal, n. 115 above, p. 16.

[124] Permanent Representative of Portugal to the European Union, n. 119 above, p. 5.

[125] Decree Law No. 5/2008, in force 8 January 2008, available: <http://www.dre.pt/pdf1sdip/2008/01/00500/0016800179.PDF> (in Portuguese) (retrieved 20 April 2009); English summary available at OECD/IEA Global Renewable Energy Policies and Measures Database:

7.3.6. Spain

Geographically speaking, Spain has a tremendous location to explore renewable energy sources, particularly ocean-based sources as over two thirds of the country borders water. Spain has a renewable electricity target of 29.4 percent by 2010[126] and a proposed consumption target of 20 percent by 2020.[127] At present, only 8.7 percent of the electricity consumed comes from renewable energy sources,[128] with hydro and wind the most dominant sources.[129]

With hydro reaching the cusp of its potential, the Spanish government has begun to expand the role of other renewables, including wave and tidal. Spain uses a feed-in tariff programme where producers may choose between the tariff rate, and placing a premium on top of the cost of conventional electricity for sale.[130] Coupled with other incentive programmes (soft loans, tax incentives, etc.), investors have a broad array of programmes to utilise. This diversity has provided a great atmosphere for investment, however, if feed-in tariffs are reduced, the growth in capacity could dissipate.

A comprehensive promotion programme for renewable energy sources was introduced in 1997 as a part of the *Electricity Sectoral Act* (ESA).[131] Under the ESA, a special regime for renewable energy production and remuneration was created. However, it took until 2004 for the practicalities of how this framework would operate to be worked out and implemented.[132] The system has been amended numerous times, most recently by Royal Decree 661/2007, which set in place a hybrid feed-in tariff system for ocean power. Specifically, it sets a general tariff of 6.86 c€/KWh for the first two decades, descending to 6.51 c€/KWh thereafter. However, producers also have the ability to negotiate a specific tariff rate for their installation.[133] The Spanish government has also installed a simplified authorisation procedure for marine installations.[134] Spain does not, as of yet, have binding consumption targets for ocean-based

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<http://www.iea.org/textbase/pm/?mode=re&id=4249&action=detail> (accessed 20 April 2009).

126 Renewables Directive, n. 23 above, Annex.

127 Renewables Directive II, n. 67 above, Annex I.

128 Id.

129 Commission of the European Communities, n. 88 above, p. 98.

130 Bertoldi et al., n. 37 above, p. 33.

131 World Future Council, *Legal analysis on Spain* (2007) available: <http://onlinepact.org/fileadmin/user_upload/PACT/Laws/spain_legal_analysis.pdf> (retrieved 16 November 2008).

132 Roggenkamp, n. 16 above, p. 1157; see Royal Decree No. 436 of 12 March 2004.

133 IEA, n. 90 above, p. 66.

134 Id.; See Royal Decree No. 1028/2007 of 20 July 2007.

renewable electricity, but the existing legislative framework still seems to provide a stable landscape for investment and development.

7.3.7. Sweden

Although Sweden has only a marginal potential for wide-scale employment of ocean-based renewable energy systems, based on the research initiatives currently underway, the Swedish government considers the exploration of all available renewable energy sources a priority. Sweden initially set a renewable electricity target of 60 percent by 2010[135] and a proposed revised target of 49 percent by 2020.[136] Renewable electricity consumption currently accounts for 39.8 percent of the national total; the highest percentage in the EU.[137] The renewable energy market in Sweden is dominated by hydropower, which accounts for almost half of electricity production, the other half coming from nuclear. Further development of large-scale hydropower is, however, to a significant extent prohibited by law, and other renewable energy sources, primarily wind power, are thus considered the only option. To promote renewable energy production, Sweden currently uses a TGC programme.[138]

In 2002, the Swedish government established a planning goal for an annual wind power production of 10 TWh by 2010.[139] Raising this goal to 16 TWh by 2016 has been discussed.[140] Beyond embracing the readily available hydro and wind resources, Sweden has implemented a progressive research programme into wave and tidal sources. The most telling project is a research facility for wave power, set to run from 2009–2014, aiming to extract energy from relatively small waves.[141] With the TGC programme paying immediate dividends, a clear vision for the future, and pragmatic research initiatives underway, Sweden will continue to lead the EU in renewable electricity consumption into the future.

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[135] Renewables Directive, n. 23 above, Annex.
[136] Renewables Directive II, n. 67 above, Annex I.
[137] Id.
[138] Commission of the European Communities, n. 88 above, p. 101.
[139] Permanent Representative of Sweden to the European Union, *Letter regarding Articles 3(2) and 3(3) of Directive 2001/77/EC* (31 October 2007), available: <http://ec.europa.eu/energy/res/legislation/doc/electricity/member_states/2006/sweden_en.pdf> (retrieved 16 November 2008), p. 3.
[140] Id.
[141] IEA, n. 90 above, p. 69.

7.3.8. United Kingdom

The United Kingdom is unquestionably blessed with one of the best environments for wave and tidal electricity generation. Exploration and development of this potential has been articulated to be a priority of the highest order.[142] UK has a renewable electricity target of 10 percent by 2010[143] and a proposed target of 15 percent by 2020.[144] Reaching the targets would imply a substantial increase from the 1.3 percent share currently held by renewable electricity.[145]

Despite strong support for renewable energy sources, the UK's electricity market is so liberalised that renewables have not truly found a stable foothold in the economy. However, with the passing of the original Renewable Obligation Order (RO),[146] which requires suppliers to purchase a designated amount of renewable energy, that trend has begun to shift.[147] The UK uses this obligatory programme in conjunction with tradable green certificates, tax exceptions for renewables, and a "buy-out" fine for non-compliance.[148] With the obligatory targets of renewable energy consumption determined until 2027,[149] investors may well find the UK a welcome market for expansion.

The UK has also created the novel concept of the Renewable Energy Zone,[150] which allows the government to grant exploitation and construction licenses for offshore installations beyond the territorial sea.[151] Separately, the Scottish Government installed a Marine Supply Obligation as part of its RO, which provides an expansive support regime for both wave and tidal energy

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142 Government of the United Kingdom, *White Paper: Meeting the Energy Challenge* (2007), available: <http://www.berr.gov.uk/files/file39387.pdf> (retrieved 16 November 2008).

143 Renewables Directive, n. 23 above, Annex.

144 Renewables Directive II, n. 67 above, Annex I.

145 Id.

146 *The Renewables Obligation Order,* SI 2002/914 (2002), available: <http://www.opsi.gov.uk/si/si2002/20020914.htm> (retrieved 16 November 2008); Amended by SI 2004/924 and most recently by SI 2006/1004 although they function generally the same.

147 Government of the United Kingdom, Department for Business, Enterprise and Regulatory Reform, *Report by the United Kingdom on achievement of the indicative target for electricity generation from renewable sources by 2010* (2008), available: <http://ec.europa.eu/energy/res/legislation/doc/electricity/member_states/2006/uk_en.pdf> (retrieved 16 November 2008), p. 7.

148 Bertoldi et al., n. 37 above, p. 33.

149 *The Renewables Obligation Order 2006,* SI 2006/1004, available: <http://www.opsi.gov.uk/si/si2006/20061004.htm#sch1> (retrieved 16 November 2008), Schedule I.

150 *The Energy Act 2004* (2004), available: <http://www.bailii.org/uk/legis/num_act/2004/ukpga_20040020_en_1.html> (retrieved 16 November 2008), s. 84.

151 Roggenkamp, n. 16 above, p. 1257.

systems.[152] With numerous concentrated research initiatives for wave and tidal energy underway across the UK, commercialisation of these technologies has accelerated. Although the UK seems to be lagging behind some in terms of renewable energy consumption, the country is clearly ahead of most in terms of legislation pertaining to renewable energy broadly and ocean-based renewables particularly.

7.3.9. Concluding Analysis

The variety of programmes employed by Member States to promote renewable electricity consumption speaks to their ingenuity as well as their dedication. Although understandably in the preliminary stages of development, ocean-based renewable energy programmes are clearly on the policy agenda of many states across the EU. Although each jurisdiction has designed a promotion framework tailored to their particular domestic needs, best practices are observable. First, a market integration mechanism must be in place. Be it in the form of a feed-in tariff, TGC programme, or a consumption quota, a domestic support scheme to encourage investment into otherwise expensive technologies is a prerequisite to broader success. Second, a method of differentiating between conventional and non-conventional energy sources in the market is also necessary. Consumers must be informed of their broader energy options, and a certification system must be established for producers of renewable electricity to guaranty transparency and accountability. Third, domestic legislatures must work to quell negative investor sentiment and stabilise their domestic energy markets. A primary obstacle to mass dissemination of renewable energy technologies is their comparatively high cost. If a domestic energy market is steadied and specific entry points for renewables are created, investment will be fostered more readily, in turn driving down the costs. Finally, long-term renewable electricity consumption targets must be set in place, with a clear action plan for integration into the national energy mix. A long-term strategy, which effectively integrates renewables, helps guide industry as well as government in advancing an energy agenda while continually providing new avenues for investment. In the end, a balance must be struck between short-term energy needs and long-term renewable energy investment.

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[152] Government of the United Kingdom, n. 147 above, p. 10; IEA, n. 90 above, p. 71.

7.4. Scottish Strategic Environmental Assessment (SEA) – Case Study

In a report prepared by the Marine Energy Group (MEG), Scotland was identified as having the potential for up to a tenth of its electricity consumption needs to be satisfied by ocean-based renewable energy resources by 2020.[153] Considering the scale of a proposed commercial project and the potential for a significant environmental impact, the Scottish Government was obliged to commission a strategic environmental assessment (SEA).[154] The resulting report is a comprehensive overview of all probable environmental impacts and mitigation measures available, and is an ideal case study for future marine renewable projects. For clarity, the report will be discussed in four parts. First, the potential effects of these devices on the biological environment will be assessed. Second, the potential impacts of these devices on the human environment will be evaluated. Third, any additional considerations resulting from the placement of an ocean-based renewable energy project are discussed. Lastly, recommendations for future projects are outlined. On the whole, the Scottish SEA process provides a concrete framework for the assessment of environmental impacts and offers an approach that should be considered by other jurisdictions.

7.4.1. Impacts on the Biological Environment

Wave and tidal power devices differ greatly in terms of placement and design. However, generally speaking, their impact on biological ecology is relatively consistent. With devices anchored to the sea floor, having large submerged moving parts, and dispersed over a substantial area, the probability for ecological interference is high. When considering the potential biological impacts of a project, the SEA examined the effects on (i) marine birds, (ii) marine mammals, (iii) benthic ecology, and (iv) fish/shellfish. Each category is

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[153] Marine Energy Group (MEG), *Harnessing Scotland's Marine Energy Potential: Marine Energy Group (MEG) Report 2004,* Report produced for Scottish Executive (Edinburgh: Scottish Executive, 2004) available: <http://www.scotland.gov.uk/Resource/Doc/1086/0006191.pdf> (retrieved 16 November 2008), p. 1.

[154] Directive 2001/42/EC of the European Parliament and of the Council 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment, *Official Journal* L 197/30 of 21 July 2001, available: <http://ec.europa.eu/environment/eia/full-legal-text/0142_en.pdf> (retrieved 16 November 2008); *Environmental Assessment (Scotland) Act,* 2005 asp 15, available: <http://www.opsi.gov.uk/legislation/scotland/acts2005/pdf/asp_20050015_en.pdf> (retrieved 16 November 2008).

discussed individually, with a focus on the impact of the project on that particular group and potential mitigation measure available.

7.4.1.1. Marine Birds

Scotland's coasts are home to numerous bird species, some of which are among the world's most important bird populations. Of the 54 currently listed species present in the SEA area, 38 are protected species under the EC Birds Directive.[155] Furthermore, the potential impacts on these populations are numerous. In terms of the installation and operation of a project, the primary concerns are as follows: collision with the device, increased noise, habitat destruction, species displacement, increased sediment disturbance, and accidental water contamination from device failure.[156] To mitigate these negative effects, the report recommended that proponents attempt to avoid sensitive sites or seasons, design devices to minimise collision or leakage, and conduct in-depth project-specific studies to plan a suitable mitigation strategy for the particular species affected.[157]

7.4.1.2. Marine Mammals

The Scottish marine environment contains many different species of marine mammals, including seals, whales, dolphins, porpoises and otters. Marine mammals, particularly seals, are protected under the EC Habitats Directive,[158]

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155 Scottish Executive, *Scottish Marine Renewables Strategic Environmental Assessment: non-technical summary* (Scottish Executive, March 2007), available: <http://www.seaenergyscotland.net/public_docs/ER_NTS_FINAL_MAR07.pdf> (retrieved 16 November 2008), p. 9; Directive 79/409/EEC of the Council 2 April 1979 on the conservation of wild birds, *Official Journal* L 103 of 25 April 1979, available: <http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1979/L/01979L0409-20070101-en.pdf> (retrieved 16 November 2008).

156 *Scottish Marine Renewables Strategic Environmental Assessment*, FABER MAUNDELL and METOC PLC (March 2007), available: <http://www.seaenergyscotland.co.uk/> (retrieved 16 November 2008) [hereinafter Scottish Marine Renewables SEA], Chapter 8: "Marine Birds," pp. 9–19.

157 Id., Chapter 8, p. 20.

158 Directive 92/43/EEC of the Council 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, *Official Journal* L 206 of 22 July 1992, available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML> (retrieved 16 November 2008), Annex II and V.

the UK's *Wildlife and Countryside Act 1981*,[159] and the *Conservation of Seals Order (Scotland) 2004*.[160] Moreover, the potential impacts on marine mammals are noticeably similar to birds, in that collision with the device, increased noise, habitat destruction, species displacement, increased sediment disturbance, and accidental water contamination from device failure are all initial concerns. Further, underwater placement and operation of a device are of particular concern for marine mammals as noise increases sonar disruption and can potentially create a barrier to movement.[161] Again, avoidance of sensitive sites and seasons, as well as a project-specific study, was highly recommended. The report also suggested that proponents should consider "soft starting," a process which gradually increases operational production to allow mammals' time to deviate course, as well as the use of a marine mammal observer to monitor noise levels underwater.[162]

7.4.1.3. Benthic Ecology

The flora and fauna that occupy the seabed are referred to as benthic ecology. These fragile ecosystems are protected under the EC Habitats Directive[163] and the UK's *Wildlife and Countryside Act 1981*.[164] Potential impacts on this ecosystem stem primarily from the placement of the device on the seafloor, entrenchment of cables, contamination due to operational failure and change in tidal/wave flow. Attachment of a device to the seabed could smother benthic habitats, increase sediment suspension, and disrupt natural reefs. Operationally, the use of such technology could also alter wave and tidal patterns, having potential devastating and far-reaching effects. Avoidance of sensitive sites is again a prime recommendation,[165] as well as minimising seabed attachment when possible,[166] and conducting ongoing site-specific monitoring to minimise long-term alteration of coastal processes.[167]

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[159] *Wildlife and Countryside Act* (1981), available: <http://www.jncc.gov.uk/page-3614#download> (retrieved 16 November 2008), sections 9–12, and s. 28.
[160] *The Conservation of Seals (Scotland) Order*, 2004, available: <http://www.oqps.gov.uk/legislation/ssi/ssi2004/ssi_20040283_en_1> (retrieved 16 November 2008).
[161] Scottish Marine Renewables SEA, n. 156 above, Chapter 9: "Marine Mammals," pp. 20–28.
[162] Id., Chapter 9, pp. 33–34.
[163] Directive 92/43/EEC, n. 158 above, Annexes I and II.
[164] *Wildlife and Countryside Act,* n. 159 above.
[165] Scottish Marine Renewables SEA, n. 156 above, Chapter 2: "Geology, Seabed, Sediment and Sediment Transport," p. 15.
[166] Id., Chapter 6: "Benthic Ecology," p. 21.
[167] Id., Chapter 3: "Marine and Coastal Processes," p. 17.

7.4.1.4. Fish and Shellfish

Scottish waters are home to a myriad of fish and shellfish species. Some of these species – the native oyster, basking shark and common skate – are found on the UK Biodiversity Action Plan Priority Species list, while others – the native oyster, common skate, spurdog, cod and haddock – are on the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species.[168] The principle impacts on vulnerable fish and shellfish species are the smothering or destruction of habitats upon installation, increased operational noise effecting fish navigation, higher risk of collision, water contamination from device failure, and interference with migration and spawning patterns.[169] Similarly, avoidance of sensitive sites and seasons and a project-specific study are the primary mitigation measures available to proponents.[170]

7.4.2. Impacts on the Human Environment

While the biological concerns were generally centred on the method and location of installation, and subsequent operational effects, potential impacts on the human environment are centred more on aesthetic and commercial concerns. With devices submerged and often substantially offshore, the potential impact on the human environment seems relatively low. However, dependent upon the particular location of installation, marine renewable projects could have devastating effects on large industries. When considering the potential impacts of a marine renewable project on the human environment, the SEA assessed the effects on: (i) commercial fisheries, (ii) shipping and navigation, (iii) seascape, (iv) recreation and tourism, (v) marine and coastal historic sites, and (vi) onshore grid connection. Each category is discussed individually, with a focus on the impact of the project on that particular subject or industry and potential mitigation measure available to proponents.

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[168] Id., Chapter 7: "Fish and Shellfish," p. 5; International Union for Conservation of Nature and Natural Recourses, *2007 IUCN Red List of Threatened Species* (2007) available: <http://www.iucnredlist.org/> (retrieved 16 November 2008).
[169] Scottish Marine Renewables SEA, n. 156 above, Chapter 7: "Fish and Shellfish," pp. 5–11.
[170] Id., Chapter 7, pp. 19–20.

7.4.2.1. Commercial Fisheries

Commercial fishing is a vital industry in Scotland, as it is in many other nations. However, many of the methods of commercial fishing (trawling, dredging, long line, etc.) are particularly vulnerable to debris or protruding objects on the seafloor. Problematically, the bulk of commercial fish stocks also tend to be found in the exact areas with the highest potential for electricity generation.[171] The potential impacts on commercial fishing are direct disturbance with fishing grounds, temporary/long-term displacement of traditional fishing grounds or migration patterns, destruction of the seabed during installation, and potential water contamination from device failure or vessel collision.[172] Proponents have limited options to mitigate many of these concerns. However, if possible, it is recommended that proponents avoid project installation in prime fishing grounds, during prime seasons, and remove all seafloor debris post construction.[173] Regardless of careful site selection, in many cases there will be an inevitable effect on commercial fisheries.

7.4.2.2. Shipping and Navigation

Scottish waters have immense shipping traffic. Recognised sea lanes that are essential to international navigation are protected under domestic law, and the Scottish Government is to refuse the licensing of any offshore energy installation that will substantially interfere with these vital sea lanes.[174] Important potential impacts on international shipping and navigation are increased travel time, displacement of shipping density, and risk of collision with installations or other vessels.[175] The potential is high to mitigate many of the concerns of the shipping community. Through consultation with the shipping industry, sites may be selected which do not directly affect shipping lanes, devices may be designed which provide clearance for ships to pass over them, or safety lighting systems could be developed.[176] However, some negative effects such as increases in shipping density, or travel times must be expected.

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171 Id., Chapter 10: "Commercial Fishing and Marine culture," pp. 4–8.
172 Id., Chapter 10, pp. 17–20.
173 Id., Chapter 10, p. 30.
174 *The Energy Act 2004,* n. 150 above, s. 99.
175 Scottish Marine Renewables SEA, n. 156 above, Chapter 15: "Shipping and Navigation," pp. 9–12.
176 Id., Chapter 15, pp. 21, 23–25.

7.4.2.3. Seascape

The seascape, broadly speaking, is the coastal landscape, adjacent waterways, and scenic views. Infringement on the visual character of a region could be viewed by residents and visitors alike as disastrous. Potential effects resulting from the installation of ocean-based renewable projects are entirely dependent upon the design of the device used and its proximity to the coastline.[177] Generally speaking however, the principle impact of ocean-based renewable projects is the interference with the peaceful enjoyment of the coastal environment. Proponents are encouraged to be selective in their location of projects aiming to maximise the potential distance of devices from the shoreline and to minimise the height and intrusiveness of devices possibly with the use of colour.[178] On the whole, however, some infringement upon the seascape must be acceptable.

7.4.2.4. Recreation and Tourism

Scotland's coastal area has been a destination for outdoors enthusiasts and tourists alike for generations. However, there is a growing concern that the construction of offshore renewable energy projects may hamper recreational as well as tourist activity to some extent. Potential impacts on recreational and tourist activity include installation noise, disturbance of natural habitats effecting wildlife watching, increased risk to recreational sailors of collision with the installation, and restrictions on access to particular areas.[179] The SEA Report recommended that proponents complete installation in the tourist off-season, avoid popular sailing or sport routes, and look to use devices which have little negative visual impact on the surrounding landscape.[180] However, it was noted that it is difficult to calculate the public response to projects of this nature, as the installations may become a tourist attraction themselves. Moreover, because of the localised nature of recreational activities and the diverse areas available, it is not expected that marine renewable projects will deter people from engaging in those activities.[181]

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[177] Id., Chapter 19: "Seascape Assessment," p. 5.
[178] Id., Chapter 19, p. 21.
[179] Id., Chapter 16: "Recreation and Tourism," pp. 12–15.
[180] Id., Chapter 16, pp. 19–20.
[181] Id., Chapter 16, p. 22.

7.4.2.5. Marine and Coastal Historic Environment

Scottish waters are peppered with countless important historical sites, including archaeological remains and wreck sites. Numerous international conventions address the subject of historic remains, including the UNESCO Convention on the Protection of Underwater Cultural Heritage 2001.[182] However, the most notable is the 1982 United Nations Convention on the Law of the Sea (LOS Convention), which requires states to protect objects of historical significance.[183] Furthermore, UK domestic law requires that wrecks be registered[184] and also creates a safe-zone around submerged wrecks to regulate activity.[185] The principle impact on these sites is the potential for direct disturbance/destruction of important historical remains during the installation of the project and entrenchment of cables.[186] An initial site survey of the seabed, done in conjunction with experts, is a principle mitigation practice which should be followed. Moreover, proponents are also encouraged to follow the Code of Practice for Seabed Development,[187] designed by the Joint Nautical Archaeology Policy Committee, when installing projects.[188]

7.4.2.6. Onshore Grid Connection

A prerequisite to power generation or transmission to consumers is the connection of the installation to the national grid. Any offshore wave or tidal

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182 *UNESCO Convention on the Protection of Underwater Cultural Heritage,* 2 November 2001, 41 *I.L.M.* 37, available: <http://unesdoc.unesco.org/images/0012/001260/126065e.pdf> (retrieved 16 November 2008).

183 Scottish Marine Renewables SEA, n. 156 above, Chapter 11: "Marine and Coastal Historic Environment," p. 2; *United Nations Convention on Law of the Sea*, 10 December 1982, 1833 *U.N.T.S.* 3 (entered into force 16 November 1994), available: <http://www.un.org/Depts/los/ convention_agreements/texts/unclos/unclos_e.pdf> (retrieved 16 November 2008) [hereinafter LOS Convention].

184 Scottish Marine Renewables SEA, n. 156 above, Chapter 11: "Marine and Coastal Historic Environment," p. 6; *Merchant Shipping Act 1995* (c. 21), available: <http://www.opsi.gov.uk/ ACTS/acts1995/ukpga_19950021_en_1> (retrieved 16 November 2008), s. 236.

185 *Protection of Wrecks Act 1973* (c. 33), available: <http://www.opsi.gov.uk/RevisedStatutes/ Acts/ukpga/1973/cukpga_19730033_en_1> (retrieved 16 November 2008), s. 1.

186 Scottish Marine Renewables SEA, n. 156 above, Chapter 11: "Marine and Coastal Historic Environment," pp. 12–13.

187 Joint Nautical Archeology Policy Committee (JNAPC), *Code of Practice for Seabed Development* (2007), available: <http://www.thecrownestate.co.uk/ jnapc_code_of_ practice.pdf> (retrieved 17 November 2008).

188 Scottish Marine Renewables SEA, n. 156 above, Chapter 11: "Marine and Coastal Historic Environment," p. 17.

station is going to need additional infrastructure, including entrenched cables, an onshore power substation, land cables and overhead transmission lines; all of which could have harmful impacts on the surrounding environment. The key potential effects resulting from the development of the required onshore infrastructure are permanent alteration to the character of the landscape, disturbance/destruction of habitats during installation, disturbance/destruction of archaeological remains, and infringement on traditional land uses.[189] The most practical mitigation measure available to proponents is to conduct a detailed routing assessment at the onset of the project with the aim of finding the most direct and least intrusive route for transmission line placement.[190] Furthermore, the SEA Report recommended that this assessment be done in accordance with industry best practices for routing of overhead transmission lines.[191] A pre-project routing assessment will allow the proponent to find an efficient transmission strategy, while avoiding sensitive sites, farms or habitats.

7.4.3. Additional Environmental Impacts

Not all potential impacts addressed under the SEA are conveniently compartmentalised as effecting either the biological or human environment. A potential impact may bridge the gap between these two distinct ecosystems or may be entirely unique to that industry. Regardless, the SEA assessed the effects of a marine renewable project on (i) military exercise areas, (ii) water quality, (iii) electric and magnetic fields (EMF), and (iv) decommissioning of offshore installations. Each subject area is discussed below, potential project impacts are outlined, and available mitigation measures are summarised. Although, classified as "additional," these subject areas, particularly decommissioning, are important to minimising negative environmental impacts of renewable energy resource development.

[189] Scottish Marine Renewables SEA, n. 156 above, Chapter 20: "Onshore Grid Connection," pp. 3–6.
[190] Id., Chapter 20, p. 10.
[191] Id., Chapter 20, p. 11. In the UK see "Holford Rules" as industry standard best practices for the installation of overhead transmission lines.

7.4.3.1. Military Exercise Areas

The Scottish military uses designated offshore locations for a variety of military purposes, including test firing, military manoeuvres and ammunition dumps. Offshore energy installation construction could disrupt military exercises either temporarily or, potentially, permanently.[192] Construction of the installation would require a full cessation of activities in that area. The entrenchment of cables could result in the disruption of unexploded ordinances. The only mitigation measure available to proponents is to liaise with the Ministry of Defence to identify and avoid dangerous sites and to coordinate installation.[193]

7.4.3.2. Water Quality

One of the most vital concerns of an ocean-based renewable energy project is ensuring that water quality in the surrounding area will not be diminished during installation or operation. Protection and monitoring of water quality and aquatic environments is a key policy goal for the EU,[194] as well as the Scottish government.[195] Construction of an ocean-based renewable project could have potentially disruptive effects on water quality in the area, and proponents must be aware of this risk at the onset. Key environmental concerns pertaining to water are disturbing sediment, accidental release of a contaminant during construction or operation, disturbance of contaminated or sanative materials on the seabed, and a permanent change in sediment dynamics.[196] Proponents are encouraged to use installation methods that minimise sediment disruption, use non-toxic materials during construction and operation, and to do a hydrodynamic study prior to commencement of the project.[197]

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192 Scottish Marine Renewables SEA, n. 156 above, Chapter 13: "Military Exercise Areas," p. 2.

193 Id., Chapter 13, p. 4.

194 Directive 2000/60/EC of the European Parliament and Council of 23 October 2000 establishing a framework for Community action in the field of water policy, *Official Journal* L 327 of 22 December 2000, available: <http://eur-lex.europa.eu/LexUriServ/ LexUriServ.do ?uri=CELEX:32000L0060:EN:HTML> (retrieved 17 November 2008).

195 *The Water, Environment and Water Services (Scotland) Act,* 2003 (ASP 3), available online: <http://www.opsi.gov.uk/legislation/scotland/acts2003/asp_20030003_en_1> (retrieved 17 November 2008).

196 Scottish Marine Renewables SEA, n. 156 above, Chapter 4: "Contamination and Water Quality," pp. 9–11.

197 Id., Chapter 4, p. 14.

7.4.3.3. Electric and Magnetic Fields

Cables used for the transmission of electricity from offshore installations will produce electric and magnetic fields. The severity of environmental effects is entirely dependent upon the type, composition, and location of the cables.[198] Usually, an electric and magnetic field is contained within the cables outer sheath. However, some interaction with the surrounding environment is to be expected. The key potential impact is an interference with marine species detection and location capabilities.[199] A major practical limitation for proponents is minimising the negative effects on surrounding species. The SEA Report recommended that area-specific and species-specific surveys be done to calculate possible cumulative effects and to design species-specific mitigation measures when available.[200]

7.4.3.4. Decommissioning of Offshore Installations

The effective removal of an offshore installation is of equal, if not greater, importance than any installation or operational environmental concern. Internationally, decommissioning was introduced as a legal obligation in the LOS Convention[201] and domestically by the *Energy Act 2004.*[202] Except in specific circumstances, generally where the installation can serve a new use or where removal would be extremely costly, once decommissioned, all offshore installations must be removed.[203] The standard of removal should draw upon internationally recognised guidelines[204] and be determined on a case-by-case evaluation.[205] Paradoxically, the decommissioning of an installation has many of the same effects and concerns as installation. Thus, many of the mitigation

[198] Id., Chapter 18: "Electric and Magnetic Fields," p. 2.
[199] Id., Chapter 18, pp. 4–8.
[200] Id., Chapter 18, p. 15.
[201] LOS Convention, n. 183 above.
[202] *The Energy Act 2004,* n. 150 above, ss. 105–113.
[203] Scottish Marine Renewables SEA, n. 156 above, Chapter 21: "Decommissioning," p. 2.
[204] International Maritime Organization, *Resolution A.672(16) Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and Exclusive Economic Zone, adopted 19 October 1989*, available: <http://www.imo.org/Newsroom/contents.asp?doc_id=628&topic_id=227> (retrieved 17 November 2008).
[205] Government of the United Kingdom, Department of Trade and Industry, *Decommissioning Offshore Renewable Energy Installations: Consultation on guidance relating to the statutory decommissioning scheme for offshore renewable energy installations in the Energy Act 2004* (9 June 2006), available: <http://www.berr.gov.uk/files/file29979.pdf> (retrieved 17 November 2008), p. 15.

strategies employed during the construction phase may be useful during the deconstruction phase as well.[206] However, proponents can alleviate many decommissioning concerns by either using a device design that is easily removed or one that can serve an alternative purpose – as an artificial reef perhaps.

7.4.4. Recommendations for Future Projects

Cumulatively, four key recommendations may be offered for future ocean-based renewable projects. First, prior to the installation of an offshore renewable energy source facility, it is essential for proponents do a site specific SEA. As the environmental conditions will be unique to any given location, a site specific SEA will inform the relevant parties of the particular environmental conditions that must be measured at the planning stages of installation.[207] Furthermore, considering environmental concerns (be they biological, commercial, or human) at the early stages will also allow for the selection of a site which will minimise environmental impact, while maximising potential electricity return. Second, proponents must be open to selecting the appropriate device for the particular environment conditions. Not all wave and tidal devices are designed the same, have identical production capacities, or affect the surrounding environment in a similar fashion. Thus, proponents must be informed by a site specific SEA, and choose devices which aim to mitigate enumerated concerns. Furthermore, pressure must be put on the developers of ocean renewable technology, be it by industry or the legislature, to develop devices that have a minimal environmental impact.

Third, proponents must devise a monitoring procedure to observe environmental conditions in and around the offshore installation continually. Many environmental concerns outlined in the SEA may take time to become evident. If a robust monitoring programme could be designed and implemented – possibly through consultation between industry and governmental experts – it may allow for otherwise devastating environmental impacts to be identified and addressed early on. This in turn allows proponents to minimise both negative environmental impacts and expenses. Lastly, proponents and developers alike must think of a practical decommission strategy prior to installation of any devices. Although counterintuitive at the planning stage, designing offshore

[206] Id., p. 10.
[207] Scottish Marine Renewables SEA, n. 156 above, Informing the Future Development of Marine Renewable Energy, p. 7.

projects with decommissioning in mind will naturally lead to minimal impact of installations. Recognisably, the cost of such an approach may be initially higher – as a greater amount of research and expertise will be needed – but, in the long term, it will allow for more effective mitigation of environmental concerns. Furthermore, such an approach will naturally facilitate technologies which are minimally impacting and easily removed. On the whole, given the interconnected nature of ocean-based renewable energy projects and environmental integrity, it would be wise of proponents to lead the development of the industry's legal framework, rather than simply reacting to it.

7.5. Concluding Remarks

The EU has shown progress in developing a comprehensive legislative framework to promote and govern renewable energy production broadly and ocean-based renewables specifically. Recognisably, this evolution has been in response to mounting geo-political pressure to curb climate change. But it also has strategic benefits for Europe, namely increased competitiveness, environmental protection and energy security. Renewable energy sources play a vital role in accomplishing these goals. By allowing Member States to craft localised energy consumption strategies which maximises the role played by renewable energy sources, the EU has begun the slow renovation of its oil dependent economy.

However, the desired direction was not always clear. Early on, various renewable energy sources were developed at different rates across the EU, resulting in divergent growth and varying practices. The Renewables Directive addresses this uneven usage of renewables in Member States by adopting a comprehensive promotion programme for renewable electricity generation, which sets clear consumption targets for renewable electricity. The Directive also outlines administrative barriers to entry into the market and designs a functional support scheme to encourage renewable energy investments. The EU has thus taken hold of the global environmental standard and hoisted it high. Unfortunately, the practical outcome of the ambitious targets have been less than stellar, with Member States cumulatively missing consumption targets by half. A renewed directive, addressing some of the shortcomings of the initial promotion programme, has been submitted for consideration and should be adopted by the summer of 2009.[208]

Individual jurisdictions have also made impressive strides in developing a welcoming market for renewable energy sources. By combating domestic market conditions through feed-in tariffs, TGCs and consumption quotas, Member States are forging a healthy climate for investment in renewable technologies. Although much of the current focus commercially has been on wind, biomass and biofuels, ocean-based renewable energy sources are beginning to take hold in particular locations. However, governance of marine renewable programmes is a complex and ever-growing process, with a regulatory framework being a prerequisite to commercial projects. To this end, Member States have worked to answer primarily two key questions. First, how are acceptable locations for ocean-based renewable projects determined? Although particular methods vary, legislatures must have a mechanism in place to designate an area – possibly in the exclusive economic zone – for renewable energy production similar to the Belgian domain concession programme or the UK's renewable energy zone, and a method to license and monitor operations within that area. Second, how is the electricity produced at these installations going to be delivered to consumers? In some instances a strong variable feed-in tariff would be sufficient, as is the case in Portugal, while other markets are so liberalised that renewable energy sources cannot compete without a mandated quota, as is the case in the UK. With the particular market conditions unique to each jurisdiction, the countermeasures employed must be market specific.

Only Scotland has gone on to comprehensively address the environmental effects of a proposed commercial marine renewable installation. With its SEA of marine renewables, Scotland has set the standard for calculating the potential impact of an ocean-based renewable project on marine ecosystems. By assessing the potential effects of a project on the biological, human and commercial environments, and evaluating possible mitigation measures available, broad recommendations may be made for future projects. Most imperative is the need for a project-specific site survey, continued monitoring of environmental standards in the area, and decommission-friendly project design.

On the whole, ocean governance is an indispensable element of marine renewable expansion and jurisdictions must take certain steps to promote and

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[208] Directive of the European Parliament and of the Council 26 March 2009 on the promotion of electricity produced from renewable energy sources amending and subsequently repealing Directive 2001/77/EC and 2003/30/EC, (PE-CONS 3736/08), available: <http://register.consilium.europa.eu/pdf/en/08/st03/st03736.en08.pdf> (retrieved 12 November 2008).

administrate ocean-based renewables if they are to be positively integrated into the national energy mix. First, states must identify clear goals for renewable energy consumption in the short, medium and long term. Second, they need to determine the particular market factors negatively affecting the natural integration of renewables into the economy and design a domestic support scheme that aims to counteract those factors. Third, states must evaluate and mitigate the potential environmental impacts of marine renewable projects. Finally, periodic monitoring and evaluation of the programme must be conducted to maximise market efficiency.

In the end, a comparative analysis of Europe's marine renewable sector provides interested parties with a holistic approach to expand the presence of renewable energy sources in their domestic markets, a host of best practices and an ever-growing legal and regulatory framework. Early on, Europe was deftly aware of the geo-political realities affecting their economy. Their subsequent reaction, a rapid expansion of their renewable energy sector, has uniquely poised them to provide positive contributions to other developed economies. Competitiveness and environmental protection are not incompatible goals; they are both possible. What is needed is a restoration of the current energy dynamic to incorporate renewable energy sources more effectively, and in this respect, Europe is leading the way.