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Submarine cables: a challenge for ocean management☆

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Abstract

The international submarine cable industry is a major component of the global telecommunications system, providing important services and requiring increased levels of protection for the maintenance of global economic and maritime security, broadly defined. An overview is given of the submarine cable industry, including its technological developments, legal aspects, security considerations, and implications for integrated ocean planning and management. In the context of multiple ocean use, submarine cables can cause spatial conflicts with other ocean users, particularly the fishing industry. Issues to be examined include compensation for lost or damaged gear, legal liability for cable damage, and regulation and licensing of cables on the seabed of the continental shelf and the high seas. Recent industry-to-industry agreements and programs for compensation to fishers in the USA and Canada are significant advancements in the implementation of integrated approaches to ocean management and planning. The development of transparent and stable interdepartmental processes for the coordinated planning, management and regulation of submarine cables is required for national EEZs. The regulation of international cable industry practices must be harmonized with national management approaches.

Keywords: Submarine cables; Cable regulation; Ocean management; Ocean-use planning; Dispute resolution

1. Introduction

Marine communications is one of the fastest growing ocean technology industries worldwide [1]. The growth in submarine cable markets is being driven by demand generated by Internet and corporate data traffic and the investment of private capital into submarine cables. Current estimates are that 65% of all international telecommunications traffic, such as telephone, e-mail, e-commerce, and Internet service, is carried by these extensive networks of high-speed submarine cables, with a global value of about US$1 trillion per year [2]. Owing to their lower cost and longer lifespan, submarine fibre-optic cables have now largely taken over from satellites as the principal means of delivering international telecommunications traffic. Satellite technology will prove to be a complement, rather than a competitor, to the submarine cable industry.

The seabed of Canada's Atlantic continental shelf and exclusive economic zone (EEZ) is being used increasingly for the laying of submarine fibre-optic telecommunications cables to Europe and the USA. In order to continue to benefit from the important telecommunication services provided by the submarine cable industry, Canada will need to address conflicts that have arisen with other ocean users, particularly the fishing industry. This requires collaboration in planning and routing of cables, as well as cooperation in the maintenance and protection of cables in areas of multiple ocean use.

This article provides a snapshot of the international submarine cable industry, with a particular focus on the Canadian context. An overview of the industry and its development leads into the legal regime for cables, considerations of security issues, interactions with other ocean uses, and the implications for ocean-use planning, and ocean development and management.

2. The submarine cable industry

Although it is often considered a "high-tech" ocean sector, the submarine cable industry has existed for about

☆The views expressed in this paper do not necessarily reflect the policy of Fisheries and Oceans Canada.

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150 years. Undersea cable technology has evolved through several distinct phases: the submarine telegraph cable era of the mid-to-late-1800s; the transoceanic telephone cable in the mid-1950s; and the lightweight fibre-optic submarine cable of the 1980s to the present [3].

The use of terrestrial communications cables began with the invention of the telegraph by Samuel Morse in 1832. The era of submarine telegraph cables was inaugurated in 1850 with the laying of a cable between Dover and Calais in the English Channel. The growing pains began almost immediately, however, when a curious fisherman, thinking he had discovered a new species of seaweed, cut the cable a few days after it began to function! In 1858, Newfoundland and Ireland were connected by telegraph cable, although it was short-lived as well. In 1866, the converted passenger steamship *Great Eastern* (the largest ship ever constructed at that time) laid the first successful trans-Atlantic cable. Over the next 90 years, more than 833,400 km of telegraph cables were laid globally.

The first major submarine telephone cable was laid between Key West, Florida and Havana, Cuba in 1950, about 74 years after Alexander Graham Bell invented the telephone. In 1956, Britain, Canada and the USA collaborated on the first trans-Atlantic telephone cable (TAT-1), which consisted of 48 circuits and had repeaters every 69.5 km for signal attenuation. These cables were constructed of a copper coaxial design and were known as analogue cables. Refinements in coaxial analogue technology enabled the development of cables with capacities of 4000 circuits by 1983. Prior to the advent of fibre-optic cables in the late 1980s, 226,000 km of analogue submarine cable, with a capacity of 155,000 voice circuits, were installed worldwide [3].

Great strides have been made in the cable-laying industry since the first trans-Atlantic telegraph cable was laid 130 years ago. Aside from significant changes in vessel design, the aspects of cable-ship operations that have changed the most are navigation and cable-working equipment. Improvements have been made in the use of cable plows and remotely operated vehicles (ROVs) which have allowed inspection, burial, de-burial, cutting and recovery of cables at ever-increasing water depths.

The first trans-Atlantic fibre-optic cable, TAT-8, was completed in 1988 by a consortium of 29 North American and European owners. Between 1988 and 1991, 88 undersea fibre-optic cables, extending 73,000 km and with an investment cost of US$4.2 billion, were in place. This equaled the total investment in submarine cables during the previous 30 years. By the end of 1994, 60 countries had submarine fibre-optic connections, and in 1998, 129 countries were connected. By 1997, the total investment in undersea fibre-optic cable systems had risen to about US$20 billion. In November 1997, the world's longest submarine cable system, stretching 27,000 km from the UK to Japan, went into commercial service. The system, known as FLAG (Fibre-optic Link Around the Globe), is composed of eight sections running through the Atlantic Ocean, the Mediterranean and Red Seas, and the Indian and Pacific Oceans. It uses third-generation transoceanic fibre-optic cable technology capable of carrying up to 5.3 billion (10^9) bits of data per second per pair of optical fibres, compared to 0.56 billion bits/second for second-generation technology. Today, there are approximately 370,000 km of fibre-optic cable on the seabed, enough to encircle the Earth almost 10 times.

There are plans to launch a 169,000-km, US$10 billion global network called Project Oxygen. This 2.56 terabit (10^{12})/second system will connect every continent, except Antarctica, with 97 landing points in 76 countries/locations. Phase I of the project will involve major trans-Atlantic and trans-Pacific links to be completed in mid-2003.[1]

The tremendous growth in high-capacity submarine fibre-optic cables to meet the growth in demand during the last decade has boosted traffic capacity on international routes to an unprecedented level and has made the cost of carrying international traffic almost negligible. The transmission capacity of fibre-optic cables has increased by orders of millions and the newest trans-Atlantic cable can handle 2.4 million voice conversations at one time. With many more high-profile projects now underway, including Project Oxygen, Global Crossing, and FLAG, analysts predict that by 2003 more than US$56 billion will be invested in the fibre-optic undersea market, with about one million route kilometers in place (see Footnote 1: Pioneer Consulting LLC, 1999). Much of this projected revenue will be concentrated in the Asia–Pacific region, involving both long-haul, transoceanic repeatered routes, and an increasing number of short-haul, interregional systems utilizing high-capacity nested systems. The top five owners of international submarine fibre-optic cables are AT&T, MCI, Teleglobe Canada, British Telecom and Sprint.

It should be recognized that there are important issues related to the security of submarine cables. In essence, fibre-optic cable networks are a modern sea-line of communication with important implications for global economic and maritime security. When examining measures for protecting submarine cables, both the physical security of the cable infrastructures and the "virtual" security (i.e., information warfare) of the commerce and information flowing through cables must be considered.

[1] Project Oxygen website, http://www.projectoxygen.com; Pioneer Consulting LLC. 1999 Worldwide Submarine Fiber Optic Systems Report. http://www.pioneerconsulting.com; Oceans and the Law of the Sea: Report of the Secretary-General, 5 October 1998, A/53/456; Oceans and the Law of the Sea: Report of the Secretary-General, 30 September 1999, A/54/429. Accessed 15 March 2000.

Since the early 1990s, a number of commercial submarine cables have been re-commissioned as scientific cables. The need to obtain various forms of scientific data (e.g., oceanographic, geoscience) has meant that a number of redundant telecommunications cables have been put back into service under new owners who are not part of the telecommunications industry. These cables have been notified to hydrographic offices by their original owners as being out of service and been removed from navigation charts, and are designated on cable charts as being out of service. It is, therefore, becoming necessary to advise telecommunications cable owners of the status of these scientific cables to avoid damage during repairs or the installation of new cables. When planning new systems, repairing old cables or conducting cable clearance operations in the vicinity of scientific cables, information on the status of scientific cables must be obtained. It is also important that other ocean users (e.g., fisheries, shipping, and naval operations) are aware of the existence and positioning of scientific cables.

3. The legal regime for cables

In terms of global regulation of the cable industry, there is no international UN-mandated regulatory body for submarine cables on the seabed. However, the International Cable Protection Committee (ICPC)[2] promotes the safeguarding of submarine telecommunications cables against man-made and natural hazards. Plenaries of the ICPC have made recommendations regarding: (i) recovery of out-of-service cables; (ii) cable routing and reporting criteria; (iii) crossings between cables and pipelines/power cables; (iv) coordination procedures for repair operations; (v) standardization of cable awareness charts; and (vi) actions for effective cable protection. The ICPC calls for the development of national legislation to reduce the risk of cable damage by: (i) establishing a corridor in which other marine activities may be restricted; (ii) setting a legal framework that entitles the cable maintenance authorities to claim for compensation in the case of cable damage; and (iii) establishing fines or penalties for damage to cables arising from wilful misconduct and/or culpable negligence.

The first piece of international law to address submarine cables was the 1884 Convention for the Protection of Submarine Cables.[3] This Convention is still in force today and has provisions to ensure the safety of cable-ships and prevent interference with and from other ocean uses. Article 2 of the Convention states that "the breaking or injury of a submarine cable, done wilfully or through culpable negligence, and resulting in the total or partial interruption or embarrassment of telegraphic communication, shall be a punishable offence, but the punishment inflicted shall be no bar to a civil action for damages". However, the Convention is largely outdated, does not provide adequate protection measures for the cable industry, and fails to provide an effective regulatory framework for cables in today's context of multiple ocean use.

Customary international law as well as the 1982 United Nations Convention on the Law of the Sea[4] defines the right to lay cables on the seabed as one of the "freedoms of the high seas" (Article 87). As with most other activities, the Convention calls for the application of flag state laws and regulations for the protection of cables in the high seas. Reference to the high seas freedom to lay cables in the EEZ is made in Article 58, but this freedom is granted only in so far as it is compatible with other provisions of the Convention. However, in view of the growing intensification and diversification of ocean uses, these "freedoms" may need to be re-examined. Increasing risks of interference with other cables and pipelines and resource uses such as fishing, oil and gas exploration and exploitation, and ocean mining, call into question the "freedom to lay cables". Cable companies are aware of the risks and, before laying cables, they usually conduct comprehensive seabed bathymetric and sediment surveys to plan cable routing to avoid areas susceptible to disruption by earthquakes, munitions dumps, canyons, shipping routes, and bottom fishing gear. As activities on the seabed increase, additional sites may have to be avoided for environmental sensitivity reasons, or for conflict avoidance with resource-based activities. An important benefit of the increase in cable-laying activities has been the collection of new information about seabed characteristics resulting from the bathymetric, side-scan sonar and sub-bottom profiling surveys, usually covering a 1000-m-wide corridor along cable routes.

Article 112 of the 1982 Convention gives states the right to lay submarine cables "on the bed of the high seas beyond the continental shelf". However, "the bed of the high seas" falls partly under national jurisdiction (Article 79: Continental Shelf) and partly under the responsibility of the International Sea-Bed Authority (known as the

[2] The ICPC, with a secretariat in London, also serves as a forum for the exchange of technical and legal information pertaining to submarine cable protection methods and programs. Members co-operate with fishing, undersea mining, oil and gas, dredging, and other offshore industries utilising the seabed in an effort to reduce the number of incidents of damage to cables. The ICPC also funds projects and programs that are beneficial for the protection of submarine cables. The ICPC website, http://www.iscpc.org/, is a useful source of information about the submarine cable industry and cable protection efforts.

[3] Convention for the Protection of Submarine Cables, Paris, 14 March 1884.

[4] 1982 United Nations Convention on the Law of the Sea, opened for signature on 10 December 1982 in Montego Bay, Jamaica and entered into force on 16 November 1994. A/CONF.62/122.

'Area'). In order to function effectively, national laws and the international regulatory regime must be compatible. Article 79 confirms the right of states to lay cables on the continental shelf but subjects this freedom to the right to take reasonable measures for the exploration of the continental shelf and the exploitation of its natural resources. Although the delineation of the route for laying submarine cables on the juridical continental shelf is not subject to the consent of the coastal state,[5] failure to seek agreement may lead to problems later [4]. While laying submarine cables, coastal states shall have due regard for cables already in position, and possibilities for repairing cables shall not be prejudiced. Disputes concerning cables in areas of national jurisdiction are subject to mandatory settlement under Article 297 (1)(a).

The International Sea-Bed Authority has a mandate to coordinate and harmonize activities in the Area beyond national jurisdiction with other uses of the seabed. In view of the potential conflicts in the Area between cables, ocean mineral extraction, and future methane hydrate exploitation, it is suggested that the Authority be mandated by the UN General Assembly to assume a regulatory function with regard to the routing of cables and their maintenance in the Area. This mandate could be promoted through the United Nations Informal Consultative Process on Ocean Affairs (UNICPO). The development of a Submarine Cable Industry Code by the Authority would assist in the harmonization between international cable industry practices and national approaches to cable regulation as guided by the 1982 Convention.

The degree of protection afforded to submarine cables would improve if parties to the 1982 Convention were to adopt domestic legislation to implement the cable protection provisions of the Convention [3]. The Convention provides direction for coastal states in dealing with conflicts between submarine cables and other ocean uses. For example, Article 113 of the Convention requires that all states adopt laws that make damage to submarine cables, done wilfully or through culpable negligence — including behavior likely to result in cable damage — a punishable offence. Similarly, Article 115 requires that all states adopt laws to ensure that vessel owners who prove they sacrificed an anchor or fishing gear in order to avoid damaging a submarine cable can recover their loss against the cable owner, provided that the vessel took reasonable precautionary measures beforehand.

Currently, regulatory deficiencies exist in cases of conflict between submarine cables and other ocean uses in EEZ areas. For example, shortcomings in US submarine cable law have frustrated cable owners in their cable protection and damage recovery efforts. In typical cases of cable damage by vessels, repairing cables and restoring telecommunications services can cost cable owners up to $2 million in both repair costs and lost revenue. However, the US federal statute for submarine cable protection imposes a maximum penalty of only $5000 for wilful injury to cables.[6] This insignificant maximum criminal penalty provides little incentive for enforcement authorities to assign full-time legal and investigative personnel to prosecute vessel owners caught damaging a submarine cable. The cable industry's only recourse is to litigate, since the penalties provided in US legislation "for the breaking or injury of a submarine cable shall not be a bar to a suit for damages on account of such breaking or injury" ([6], Section 28). There is increasing pressure being put on the US Government by the cable industry to strengthen legislation and cable protection measures.

4. The legal regime in Canada

Based on recent experience with proposed cables, Canada needs to address regulatory deficiencies such as those corrected in Articles 113–115 of the 1982 UN Convention on the Law of the Sea.[7] In Canadian waters, federal regulation of submarine cables can be divided into two timeframes, essentially *before* a cable is laid, and *after* it is in place.

A proponent for a domestic submarine cable in navigable waters must apply for an approval from the Canadian Coast Guard under the *Navigable Waters Protection Act* (NWPA).[8] An NWPA approval (as opposed to an exemption) triggers an environmental assessment under the *Canadian Environmental Assessment Act* (CEAA),[9] which allows for consideration of socio-economic impacts under "indirect effects" arising from a perceived change in the environment in relation to specific activities (e.g., fishing). An exemption under the NWPA can be granted if the work does not interfere with navigation. If exempted, there is no requirement for an environmental assessment. Domestic cables are not licensed by any government department and no additional regulations or fees apply to the cable after it has been laid.

A proponent for an international cable (i.e., landing points outside of Canada) through Canadian waters must apply for a permit from the federal department Industry Canada under the International Submarine

[5] In Article 79(3), pipelines on the continental shelf are subject to the consent of the coastal state, but cables, either intentionally or otherwise, are omitted from the clause.

[6] United States Code 47, Chapter 2, Section 21.

[7] Although a signatory, Canada has yet to ratify this convention.

[8] *Navigable Waters Protection Act*, R.S., c. N–19, s. 1.

[9] *Canadian Environmental Assessment Act*, 1992, c. 37.

Cable Regulations of the *Telecommunications Act*[10] and for an exemption or approval under the NWPA. This process automatically triggers an environmental assessment under CEAA.[11] In both domestic and international cases, the location of the cable is communicated to shipping through Coast Guard Notices to Mariners and on navigation charts provided by the Canadian Hydrographic Service. Depending on how the cable is laid (buried or on bottom), an authorization under the *Fisheries Act*[12] for alteration of fish habitat may be required, and in cases of cable burial, the ocean dumping provisions of the *Canadian Environmental Protection Act*[13] can be triggered. The Responsible Authority under CEAA is required to consider socio-economic impacts (e.g., on the fishing industry and interaction between cables and other ocean uses). Under Section 2 of CEAA, "environmental effect" in respect of a project means "any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions". It should be noted that in most cases, the laying and operation of submarine cables is a relatively benign use of the seabed, and most environmental concerns can be addressed effectively. However, the socio-economic effects of cables are greater in areas where cables are unburied, effectively excluding fishers from fishing grounds by posing a risk to accessing fish habitat and causing a threat of legal liability for cable damage.

After the cable is in place, any conditions resulting from the environmental assessment that have been incorporated into the license or permit continue to apply to the holder of the license. However, subsequent interactions between cable operations and other ocean activities are not specifically addressed within the myriad of ocean-related legislation in Canada. For example, there are no legal requirements to remove inactive submarine cables from the seafloor. Although retired submarine cables can in certain cases be used by the scientific community for geoscience or acoustic research applications,[14] the removal or salvage of unburied portions of inactive cables by the cable industry would reduce the frequency of cable snags and eliminate the guesswork required to determine the status of snagged cables. With ever-increasing potential for conflict between cables and other ocean activities, such as fishing and shipping, the legal liability situation is not clear and has, to date, been based on civil liability with respect to private property (i.e., private law governing relations between private citizens). There are several on-going civil cases in Canada being dealt with in this manner: one involving an iron ore carrier that accidentally damaged a cable with its anchor in the approaches to Halifax, Nova Scotia, and two involving fishing trawlers that damaged cables with gear on the continental shelf off Nova Scotia. In order to seek compensation for cable repair costs through civil litigation under private property law, the cable owner as plaintiff has the onus to prove negligence on the part of the master of a fishing or cargo vessel snagging a cable. The due diligence principle is exercised by masters in defence of the act of snagging (and damaging) an operational cable in Canada.

5. Cables on Canada's Scotian Shelf

The Scotian Shelf, located off the province of Nova Scotia, Canada, is experiencing increasing competition for ocean space (Fig. 1). Multiple ocean uses include fishing, shipping, defense operations, oil and gas development, science and research, recreation and tourism, a potential marine minerals industry, and, of course, submarine telecommunications cables. There are currently six active submarine cables on the Scotian Shelf, as well as the planned billion dollar trans-Atlantic fibre-optic

[10] *Telecommunications Act*, Chapter 38, 1993. This applies to "terminating cable licences" and "through cable licences" which have fees of only CA$100 per annum. The latter refers to cables that extend across Canadian seabed but do not landfall in Canada. Fees for cable licenses vary considerably in different national jurisdictions. For example, license fees in the Republic of Ireland are either IR£2000 per annum or a one-time fee of IR£24,000 if deemed to be in the national interest. US fees for overseas cable construction are US$9125, and overseas cable landing licenses are US$1025 for common carriers and US$10,150 for non-common carriers. The US fee for domestic cable construction is US$610. The cable sector provides 14.5% of the gross revenue collected from seabed leases by the UK Crown Estate Commission, which manages 55% of the UK foreshore and most of the seabed out to the 12-nm territorial limit on behalf of the sovereign. For the year ended 31 March 1999, the cable industry paid over £3.3 million in cable-landing fees to the Crown Estate. These totals do not include other fees raised by autonomous English feudal owners of some of the remaining foreshore. Until the 1980s, relatively small payments were made for the rights to lay and maintain submarine cables in the UK. Recently, pressure has been mounting from the Crown Estate Commission to raise landing right fees due to the expansion of the telecommunications market, but also due to increased oil and gas activity and coastal development. As of December 31, 1999, the license fee for the right to lay a single cable was £105,000 per annum and £157,500 per annum for a looped system. Rates charged by the UK Crown Estate are up to 150 times the rate charged by other national administrations for cable-landing rights.

[11] Industry Canada as Responsible Authority under CEAA engages federal departments through Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures.

[12] *Fisheries Act*, R.S., c. F–14, s. 1.

[13] Part IV and Ocean Dumping Regulations of the *Canadian Environmental Protection Act*, R.S., 1985, c. 16 (4th Supp.).

[14] In September 1998, a permanent deep ocean scientific research facility — the Hawaii-2 Observatory, or H_2O — was installed on a retired AT&T submarine telephone cable that runs between Oahu, Hawaii and California [5] (also see [6]). The proposed Project Neptune (http://www.neptunecanada.com/) will require the deployment of a submarine cable array on the Juan de Fuca plate, with a cable landing at Port Alberni, British Columbia.

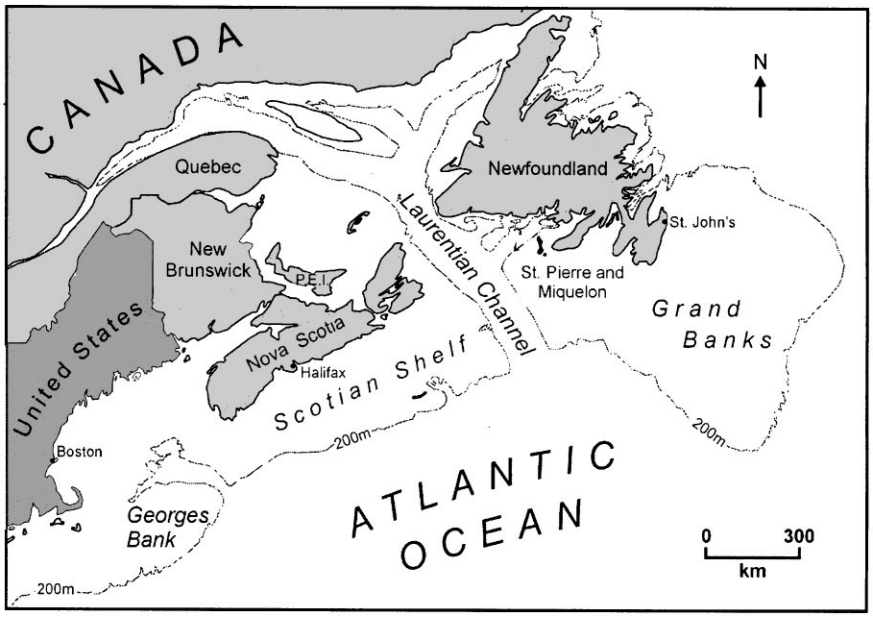

Fig. 1. Canada's Atlantic region.

cable — the Hibernia Project — linking Boston, Massachusetts with Halifax, Nova Scotia, Dublin, Ireland and Liverpool, England by spring 2001. There are also numerous inactive cables on the Shelf, some of which are more than 100 years old, and international cables, both commercial and scientific, cross Canada's Atlantic continental shelf linking northeast USA with Europe.

The local fishing industry has expressed concerns about the increase in submarine cables off the coast of Nova Scotia. Many questions have been raised concerning regulatory aspects of submarine cables, planning processes for routing and burial of cables, and interactions with other ocean users. The planned re-commissioning and physical re-positioning of the abandoned trans-Atlantic CANTAT-2 cable from Beaver Harbour, Nova Scotia to Sable Island and PanCanadian's Cohasset offshore oil production facility precipitated these concerns.[15] CANTAT-2 was a fully licensed but decommissioned international submarine cable that was re-commissioned as a *domestic* cable in 2000. Therefore, no license was required under the *Telecommunications Act,* but its owners, International Telecom Inc., applied for a permit under the *Navigable Waters Protection Act* from the Coast Guard. Because it was determined that it did not interfere with navigation, a Ministerial authorization was not required. The fishing industry is particularly concerned about the loss of fishing areas where *de facto* exclusion zones are claimed and the potential threat exists of legal liability for damage to cables. In an Atlantic Canadian fishing industry publication,[16] another company, Teleglobe Canada, advertises a 2-nm exclusion zone along cable routes for bottom fishing. Although there is no legal basis for this claim, there is a legal basis for liability from wilful and/or negligent damage to cables. Effective and satisfactory consultation between cable companies and the fishing industry is generally lacking.

In the case of the planned Hibernia cable, however, interaction between the cable proponent Worldwide Fiber Inc.[17] and an offshore fishing industry lobby group (i.e., Seafood Producers' Association of Nova Scotia — SPANS) has been more proactive. Based on lessons learned from recent agreements between the fishing industry and several cable companies in Oregon, California and Alaska to lessen the impacts of fishing and cable interactions, the two sides have worked together in planning and adjusting cable routes, and are negotiating a Commercial Fishers' Compensation Program to cover lost and damaged gear, waivers for legal liability for damage to cables, and consultation/dispute resolution procedures.[18] Despite the fact that portions of the cable will be unburied, no exclusion zone around the cable will

[15] The Sable Island to Cohasset platform cable link has since been abandoned.

[16] The Sou'wester: The Voice of Atlantic Canada's Fishing and Marine Industry. ISSN: 0049-1705. Yarmouth, Nova Scotia.

[17] Worldwide Fiber Inc. is now operating as 360 networks Inc.

[18] A precedent exists for compensation programs among ocean sectors operating on the Scotian Shelf. The Sable Offshore Energy Inc. Commercial Fisheries Compensation Program provides fishers an alternative to making a claim through the Canada–Nova Scotia Offshore Petroleum Board or the courts. The Program covers losses as a result of damage to fishing gear or vessels and includes lost wages.

exist and fishers are not liable for accidental damage to the cable.[19]

The CEAA environmental assessment process considered socio-economic impacts of the Hibernia cable on the fishing industry and resulted in a recommendation by the Department of Fisheries and Oceans that a compensation policy be developed as a condition pursuant to the cable license. However, Industry Canada as the Responsible Authority determined that the condition of license was beyond their legislative mandate. The condition of license was also considered unnecessary given the cable proponent's continuing commitment to negotiate an industry-to-industry compensation program with SPANS, covering lost and damaged fishing gear and fuel costs for fishers to return to port for replacement gear. The Compensation Program would assist in developing a long-term working relationship between these ocean stakeholders to more effectively resolve conflicts over ocean space.[20] However, this offshore fishing industry lobby group does not represent the interests of nearshore gillnet and longline fishers, and hence the proponent may have to enter into agreements with other individual fishers' associations. The development of an industry-to-industry civil agreement between a cable company and a fisheries lobby group raises questions regarding the legality of an industry lobby group signing away the collective rights of a fishing gear sector over the individual rights of fishers.

Nonetheless, the development of agreements between cable companies and the fishing industry represents a significant shift in relations between these industries and a useful step toward ocean-use planning. As noted earlier, useful lessons may be drawn from the experience of cable companies and fishing industry associations on the US west coast where several agreements have been reached to facilitate cooperation.[21] A notable example is the 1998 agreement to create and establish the Oregon Fishermen's Undersea Cable Committee (OFUCC) between WCI Cable Inc. and some Oregon commercial fishing interests.[22] This precedent-setting initiative includes a compensation fund for lost fishing gear as a result of cable interaction, indemnification from liability for cable damage,[23] and a cooperative planning process for future submarine cables, including the possible establishment of a corridor for cables.

Although it has been the "fishing versus cable" issue that has received most attention in Canada, there are broader ocean management issues involved. Canada's *Oceans Act* mandates the federal Minister of Fisheries and Oceans to develop and implement plans for the integrated management of all activities and measures affecting coastal and marine ecosystems.[24] The principles and approaches of the Act are the *integrated management* and *sustainable development* of Canada's oceans and their resources, the application of both an *ecosystem* and *precautionary approach* to the conservation, management and use of marine resources, and the use of inclusive, *collaborative approaches* for planning and decision-making. Based on the five principles of the *Oceans Act*, ocean and coastal management is designed to achieve an effective, sustainable balance among environmental, social and economic objectives in Canada's coastal and ocean areas. As part of this mandate, the *Eastern Scotian Shelf Integrated Management Project* was initiated in late 1998 to develop a collaborative ocean management plan for the offshore area between Halifax, Nova Scotia and the Laurentian Channel entering the Gulf of St. Lawrence. The interaction of cable and fishing operations is an example of user conflict that needs to be addressed through the development of integrated management plans for coastal and ocean areas. After all, ocean management is about balanced decision-making regarding the use of ocean space. Under an ocean management plan for the eastern Scotian Shelf, both the fishing industry and the submarine cable industry would be partners in the on-going planning process, along with all other users and interests. The eastern Scotian Shelf is an ideal test case for the implementation of provisions of the *Oceans Act*, with cables and fishing interactions being one of many ocean management issues in the region.

Ocean-use planning concepts and tools such as area-based management and zonation could be used to address this particular issue, and multiple ocean use generally. For example, the concept of a corridor for all future submarine cables across the Scotian Shelf, originally proposed by the fishing industry, could be considered. However, cable companies are generally opposed to corridors and instead demand an industry-standard minimum separation between cables of 500 m or greater to avoid

[19] Revised Environmental Screening Assessment Report, 22 December 1999. Prepared by Jacques Whitford Environment Ltd. for Worldwide Fibre Inc. Section 6.0: Conclusion and Recommendations, pp. 66–67.

[20] Concerns have been expressed regarding the Hibernia cable licensing process by the fishing industry, the aboriginal community, and residents near the cable landing sites. At the time of writing, negotiations on a draft compensation agreement have stalled due to legal interpretations of potential negative impacts on the fishing industry.

[21] Walcott addresses the increase in submarine cables landing at Morro Bay, California and the efforts by the commercial fishermen's association to deal with widespread off-limit fishing areas for cable protection [7].

[22] Agreement to Create and Establish the Oregon Fishermen's Undersea Cable Committee, 9 July 1998. On: http://www.ofcc.com/agreements.htm. The agreement, signed between fishing industry representatives and WCI Cable Inc., created the OFUCC. The committee has since changed its name to the Oregon Fishermen's Cable Committee. Accessed 6 July 2000.

[23] This excludes clam and scallop dredges and other sub-benthic gear types.

[24] *Oceans Act*, Chapter 31, 1996. The Minister "shall lead and facilitate the development and implementation of plans for the integrated management of all activities or measures in or affecting estuaries, coastal waters and marine waters" (Part II, Section 31).

inadvertent snags during cable repairs. In view of the growing proliferation of cables globally and their impacts on accessing fishing grounds, this policy should be reconsidered. Whatever mechanism is used to resolve and avoid user conflict, it must be achieved collaboratively, with consideration for all interests involved. Intuitively, the development of a transparent and stable interdepartmental process for the coordinated planning, management and regulation of submarine cables, inclusive of all interested and involved parties, would be a positive step forward in the development of integrated management processes in coastal and marine areas.

6. Conclusion

The rapidly developing submarine fibre-optic cable industry has a large impact on global marine commerce. Risks to cables exist from anthropogenic and natural causes, making it imperative that the economic security of global cable networks be maintained through adequate protection measures. Disruptions to the integrity of submarine cable systems potentially cost cable companies millions of dollars in cable repairs and lost revenues from e-commerce and telecommunications. Cooperation from the fishing industry and other ocean users will help minimize the risks of interference and will protect the interests of all involved.

There are important issues relating to submarine cables in the context of multiple ocean use, including conflict between cables and other ocean uses, the legality of exclusion zones around cables, compensation for lost or damaged fishing gear due to cable interactions, legal liability for damaging cables, and unclear jurisdiction and interdepartmental coordination in the cable licensing and regulatory processes. These interactions and potential conflicts provide further rationale for the integrated planning and management of activities in ocean and coastal areas. The recent compensation agreements and programs between cable companies and fishers' associations in Canada and the USA provide optimism for implementation of integrated approaches to ocean management and planning. The development of a Submarine Cable Industry Code by the International Sea-Bed Authority would help to harmonize international cable industry practices in the Area with coordinated national approaches to cable regulation.

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