

## KEY INTERNATIONAL LEGAL ISSUES WITH REGARD TO OCEAN THERMAL ENERGY CONVERSION SYSTEMS\*

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*\* Editor's Note: Professor Reisman was commissioned by the United Nations Conference on New & Renewable Sources of Energy (UNERG) to prepare this report as a companion piece to Mr. Joseph's report. It is also being used as an integral working paper in preparation for the August 1981 UNERG conference. Professor Reisman's report is based on the best available legal information as of March, 1980, and, as is the case of any report prepared in advance, significant changes could occur by the time of the Conference. The JOURNAL publishes this report in substantially the form in which it was submitted to the United Nations.*

This report, prepared at the request of the United Nations, sets out in summary fashion key legal issues likely to arise from the development and deployment of Ocean Thermal Energy Conversion (OTEC) systems. A number of such studies have already been published and most legal issues appear to have been considered in one or more of them.<sup>1</sup> However, a number of issues which may be of importance appear to have thus far evaded mention or have received summary treatment. Other matters have been treated in nonsystematic fashion or severed from a context of other issues which may emphasize their significance. As for a number of others which have been treated, more might yet be said. Hence the approach which follows will be comprehensive, if summary. Reference is to international law, unless consideration of domestic legislation is pertinent to the former.

One of the major problems with a legal evaluation of the control and regulatory issues of OTEC is that much of the technology has yet to be developed; many extant uses are still unrefined. In other cases the question of feasibility still remains. For example, it

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1. Joseph, *Legal Issues Confronting the Exploitation of Renewable Sources of Energy From the Oceans*, 11 CALIF. W. INT'L L.J. 387 (1981) [hereinafter cited as Joseph]; see generally H.G. KNIGHT, J.D. NYHART & R.E. STEIN, *OCEAN THERMAL ENERGY CONVERSION: LEGAL POLITICAL AND INSTITUTIONAL ASPECTS* (1977) [hereinafter cited as *OCEAN THERMAL ENERGY CONVERSION*]. A 1978 comprehensive bibliography may be found in HOUSE COMM. ON SCIENCE AND TECHNOLOGY, *ENERGY FROM THE OCEAN*, H.R. REP. NO. 39, 95th Cong., 2d Sess. (1978).

is not yet clear whether OTEC enterprises can in fact be moored in a single place for long periods. Present experience indicates that mooring lasts only for a short period of time. Tort implications are great. Nor is there great experience with the transmission of large cables carrying high levels of electricity through or below the aquatic environment. While individual OTEC pilot projects have been tested in a limited fashion, there is as yet no experience about the impact of numerous OTEC operations on the ocean. In particular, little is understood about the impacts of thermal pollution in this medium. Nevertheless, the general promise of OTEC as a technique for the harvesting of thermal energy, the technological advances which have been made to date and the general foreshortening of lead-time in technological development, make even speculative consideration of the legal issues surrounding this technique of energy harvesting quite urgent.

#### I. THE CONSTITUTIVE DIMENSION: WHO WILL MAKE LAW ABOUT LAW-MAKING?

The first legal issue of major importance with regard to OTEC activities relates to the question of the constitution or the constitutive process — who will have the competence to make and apply law about future law-making for these activities?<sup>2</sup> Historically, the law of the sea has been made and applied largely as an unorganized arena, norms resulting from claims often made unilaterally and behaviorally which were either accepted or rejected.<sup>3</sup> The resultant patterns of behavior established and supported expectations about appropriate behavior or law. It is quite conceivable that OTEC law could be made in this fashion; those states having the necessary technology undertaking thermal energy harvesting in the common domain, either in their own waters or in those of third states, rejecting or accommodating protests, with the law crystallizing through this customary process.

Given the intensity with which both historical and new uses are being pursued in the maritime environment, there is widespread feeling that the traditional unorganized process is insufficient.

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2. McDougal, Lasswell & Reisman, *The World Constitutive Process of Authoritative Decision*, reprinted in C.E. BLACK & R.A. FALK, 1 THE FUTURE OF THE INTERNATIONAL LEGAL ORDER 73 (1969). See also M. McDougal, H. Lasswell & L. Chen, HUMAN RIGHTS AND WORLD PUBLIC ORDER: THE BASIC POLICIES OF AN INTERNATIONAL LAW OF HUMAN DIGNITY 161 (1980).

3. See generally M.S. McDougal & W.T. Burke, THE PUBLIC ORDER OF THE OCEANS (1962).

Hence, there is substantial interest in replacing the traditional unorganized arena with a more organized and institutionalized structure. This objective is pursued with greatest ardor by smaller states, which recognize the possibilities of enhancing their own power. Perhaps by inadvertence, the nascent "Seabed Authority" does not appear to have been endowed with constitutive competence with regard to OTEC. I believe Joseph<sup>4</sup> is correct in his reading of the Informal Composite Negotiating Text<sup>5</sup> with regard to the "Authority's" competence over thermal resources. It would not appear to fall within its jurisdiction under ICNT Articles 135, 136 and 157. This does not, however, mean that high seas OTEC operations will be subject only to the jurisdiction of the flag state. Many other entities may claim authority to prescribe and apply law for all or part of those activities.

Professor Knight notes the "philosophy of control" inherent in the common heritage idea and contemplates "[less developed countries (LDCs)] seeking to include energy and other resources in that area if it were politically feasible to do so."<sup>6</sup> Hollick observes that a strong Seabed Authority will certainly try to regulate high seas OTEC operations, and also notes that the formation of regional seas may lead to OTEC controls in former high seas areas.<sup>7</sup> But there are many other possibilities. It is possible to create a distinct Ocean Energy Authority, with specified competence to authorize the nascent Seabed Authority to prescribe for OTEC activities, to enable the Inter-governmental Maritime Consultative Organization (IMCO) to prescribe or to choose another agency. Each agency presents a different political constellation in its decision making, enhancing or weakening the power of particular groups. Leaving the matter as an unorganized arena essentially accords competence to those states endowed with the technological capacity to harvest ocean thermal energy. The point of emphasis here is the centrality of the "constitutive" issue and the urgency of its consideration.

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4. Joseph, *supra* note 1, at 406, nn.87 & 88 and accompanying text.

5. Informal Composite Negotiating Text, Revision 1, (ICNT), U.N. Doc. A/CONF. 62/WP.10/REV.1 (1979) [hereinafter cited as ICNT].

6. Knight, *International Jurisdictional Issues Involving OTEC Installations*, reprinted in OCEAN THERMAL ENERGY CONVERSION, *supra* note 1, at 45-50 [hereinafter cited as Knight].

7. Hollick, *International Policy Implications of Ocean Thermal Energy Conversion Systems*, reprinted in OCEAN THERMAL ENERGY CONVERSION, *supra* note 1, at 75-88 [hereinafter cited as Hollick].

## II. JURISDICTIONAL REGIMES

Because a temperature differential of at least 30° Fahrenheit is required for OTEC, not all of the oceans will contain the resource. Washom and Nilles have described a circumferential belt overlaying the tropics in varying configurations which can be viewed as a thermal energy resource.<sup>8</sup> If this resource is not declared a part of the common heritage or fails in some way to be subjected to a special regime—an alternative which presents some attractions but also many problems—we may assume that competence with regard to the resource will be allocated in accord with the general principles of maritime boundary delimitation. Those states that discover they have been indulged in this matter will be predictably complacent in attitude and therefore champion the doctrine that the fickleness of nature is not subject to regulation.

### A. OTEC as a Resource

A first point, whose resolution is prerequisite to the issue of national acquisition and title in ocean thermal energy, is the “resource” status of such energy sources. A number of writers have expressed some doubt as to the “resource” status of the energy harvested through an OTEC operation. Others, Professor Knight notably, have tried to characterize it analogically and teleologically.<sup>9</sup> To some extent, doubts on this problem, if they were ever warranted, have been allayed by the ICNT. But even in the absence of the text, it is important to understand that a resource is not a fixed and permanent thing. Rather, it is an artifact, a human creation which is shaped by the interaction of human imagination, need, technological capacity and environmental potential.

Thus, things which were not “resources” in the past become resources now and may cease to be resources in the future. Consider aluminum, a product of the neolin in clay. While we now consider it a major and indispensable resource for an industrial and science based civilization, it could hardly have been classified as such several decades ago. By the same token, it seems clear that any use of the ocean environment which yields substantial benefits to human beings and which may be purposefully exploited should be characterized as a resource. *The social and legal function of such*

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8. Washom & Nilles, Incentives for the Commercialization of Ocean Thermal Energy Conversion, Report to the National Science Foundation Research Applied to National Needs (1977).

9. Knight, *supra* note 6, at 60-67.

*a characterization is to make that activity and its benefits subject to community scrutiny with regard to exploitation, pricing, distribution and conservation, and, if necessary, legal prescription for any of these phases.*<sup>10</sup> Whether the resource is available for capture or requires an authorization raises different issues.

### B. A Renewable Resource?

Ocean thermal energy may be characterized as a renewable resource only in the context of certain controlled techniques of harvesting. It is not an infinite resource because the space required for an OTEC enterprise, and the limited areas of the globe in which the temperature differential or gradient is sufficiently wide, results in only a limited number of OTEC operations being capable of simultaneous operation. In this respect OTEC operations in high seas areas, if they should prove feasible, are similar to the allocation of space in the geostationary orbit. As the age of hydrocarbons ends and energy sources such as the oceans become more urgent and perform more economical, there may well be a scramble for OTEC positions. It would be wise for the United Nations to anticipate this matter and to try to develop certain general principles of allocation before the fact.

### III. JURISDICTIONAL ZONES — MARITIME DELIMITATION

Joseph distinguishes carefully between conventional *lex lata* and emerging law. Perhaps he is overly cautious. For better or worse, the *Fisheries Jurisdiction Case*<sup>11</sup> has endorsed some of the more radical prescriptive developments even when they failed to secure the majority necessary according to the rules of the formal arena. Some developments, whatever their wisdom, seem irrevocable: a territorial sea up to 12 miles, an exclusive economic zone of 200 miles including the seabed thereto even if it is not continental shelf in the geological acceptance, and of course, a shelf to the limits of its natural prolongation. Speculations on and planning for OTEC regimes must realistically take these developments, whatever the degree of their current authority, as matrices. Within them, I would suggest that the identification of key legal issues proceed with a different categorization than that taken by writers, such as Knight, Hollick and Joseph.

10. On this point see Arsanjani, *International Control over the Pricing of Resources: A Configurative Approach*, 3 YALE STUD. IN WORLD PUB. ORD. 251 (1977). *Emphasis added.*

11. *Fisheries Jurisdiction Case* [1974] I.C.J. 3.

In terms of the customary international legal distribution of spatial competences, OTEC operations may be envisaged in five distinct maritime zones. Where the depth increases rapidly from the coastline, it is conceivable that OTEC facilities may be located in a territorial waters belt, from three to twelve miles from the low water mark. Beyond that belt, it may be necessary to consider the possibility of claims for a contiguous zone. In addition, it would appear that OTEC operations may be located in a belt extending from the low water mark or other baseline to 200 miles. Where the continental shelf extends beyond 200 miles from coastal baselines, OTEC operations may take place in the high seas over these shelf areas; a space over which title is apt to become clouded. Finally, OTEC operations may be conducted beyond the 200 mile zone and hence be considered a use of the high seas. Each of these uses deserves special attention.

#### *A. Territorial Seas*

Territorial waters, whether considered under the 1958 Geneva Convention on the Territorial Sea and Contiguous Zone regime or under the consensus provisions in the ICNT, are assimilated into the territory of the coastal state. The single critical exception is that the coastal state may not impede the right of innocent passage ordinarily available to other users. Innocent passage was probably much broader under the 1958 Geneva Convention regime. As it emerges in the various versions of the Law of the Sea Conference, it would appear that the coastal state's competence to exploit its territorial waters even at the expense of the traditional right of innocent passage has increased greatly.<sup>12</sup> Under Article 21 of the ICNT the coastal state is authorized to make laws and regulations relating to innocent passage through the territorial sea in order to protect navigational aids and "other facilities or installations." This language would appear to be sufficiently spacious to include OTEC type installations. Moreover, Article 21 authorizes the coastal state to regulate innocent passage in order to protect "cables and pipelines." From a practical standpoint, it would appear that not only may the coastal state alone use its territorial waters for OTEC type operations, but it may establish such operations even at the expense of other innocent passage users.

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12. On this point *see generally* W.M. REISMAN, THE REGIME OF STRAITS AND NATIONAL SECURITY: AN APPRAISAL OF INTERNATIONAL LAW MAKING, 74 AM. J. INT'L L. 48 (1980).

A foreign OTEC plant ship making innocent passage would appear to be prohibited from continuing its conversion operations under the language of Article 19(2)(1) of the ICNT. This latter consideration might become extremely important with regard to archipelagic states which had exercised the privileges of straight baselines offered in Article 47 of the ICNT and which had hence enclosed substantial portions of what otherwise would have been high seas.<sup>13</sup> A critical question may be the costs of suspending conversion operations in a ship as a function of direct operating costs and return on capital. The requirement of constant movement through the oceans for such ships as a way of minimizing thermal pollution has been analyzed in the technical literature and need not be discussed here. The virtually plenary jurisdiction of the coastal state in its territorial waters would appear to preclude any moored or installation type OTEC facility without the coastal state's consent. As for criminal and civil jurisdiction "on board," that would be guaranteed an OTEC ship only if it were not harvesting and hence in innocent passage. Otherwise, under the 1958 Convention, jurisdiction would accrue to the coastal state, though the latter might choose not to exercise it.

If the economics of OTEC ships, as opposed to moored facilities, proves such as to preclude shutdowns during passage through the now substantially increased territorial water belts of the world, special bilateral arrangements or a multilateral treaty may be necessary.

### *B. Contiguous Zone*

The rapid acceptance of the 12 mile territorial sea limit and the exclusive economic zone (EEZ) in customary international law has probably rendered the contiguous zone of the Geneva Convention on the Territorial Sea and the Contiguous Zone obsolete, at least in the form in which it was envisaged in the treaty. Under Article 24 of that treaty, the contiguous zone could extend up to 12 miles from the baselines of the territorial sea. Within the contiguous zone, the coastal state acquires anticipatory jurisdiction to prevent infringement of customs, fiscal, immigration or sanitary regulations and punitive jurisdiction for violations of the above laws within its territory or territorial sea.

Foreign OTEC activities in the contiguous zone would proba-

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13. On this interesting point see Knight, *supra* note 6, at 51-52.

bly not have come under the jurisdiction of the coastal state *stricto sensu*, for only in the most spacious sense could they be assimilated to matters covered by, for example, sanitary regulations. But subsequent to 1958, the notion of a type of "protective jurisdiction" extending beyond maritime areas lawfully under coastal state jurisdiction and exercised to protect interests within that area, came to be accepted. Instruments such as the Canadian Arctic protection legislation extended that notion broadly.<sup>14</sup>

The conception of the contiguous zone contained in Article 24 of the Convention on the Territorial Sea and Contiguous Zone may be viewed as little more than codification of a general principle of reasonable protective jurisdiction beyond one's territorial bounds. It is possible that a similar type of contiguous jurisdiction will be asserted by states *beyond the 200 mile EEZ*. Consider, for example, a foreign OTEC operation 5 miles beyond a coastal state's EEZ. Since many of its thermal consequences will be visited on the EEZ's waters, the coastal state will plainly make claims and assertions against that OTEC activity. The similarity between such claims and the Canadian Arctic Act are striking.

This is the sort of problem which can be analyzed in terms of Handl's abnormally dangerous activity or ADA (abnormally dangerous activities) paradigm.<sup>15</sup> Its implications for further encroachments on the shrinking area of the high seas and for international conflict are sufficiently grave to warrant further study and recommendations for legal clarification.

### C. *Exclusive Economic Zone*

For better or worse, the Exclusive Economic Zone may be considered a recent creation of customary international law. While the exact content of this new legal regime is as yet subject to negotiation and change, the fact that there will be an exclusive economic zone in which substantial privileges will be given to the coastal state at the expense of traditional and/or new users is clear. As it emerges from Part V of the ICNT, the Exclusive Economic Zone

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14. An Act to Prevent Pollution of Areas of the Arctic Waters Adjacent to the Mainland and Islands of the Canadian Arctic (1970).

15. Handl, *An International Legal Perspective on the Conduct of Abnormally Dangerous Activities in Frontier Areas: The Case of Nuclear Power Plant Siting* 7 *ECOLOGY L.Q.* 1 (1978); Handl, *The Principle of "Equitable Use" as Applied to Internationally Shared Natural Resources: its Role in Resolving Potential International Disputes over Transfrontier Pollution* *REVUE BELGE DE DROIT INTERNATIONAL* 40 (1978-79).

has increased the competence of the coastal state at the expense of other users. Article 58 of the ICNT provides:

1. In the exclusive economic zone, all States, whether coastal or land-locked, enjoy, subject to the relevant provisions of this Convention, the freedoms referred to in article 87 of the navigation and overflight and of the laying of submarine cables and pipelines, and other internationally lawful uses of the sea related to these freedoms such as those associated with the operation of ships, aircraft and submarine cables and pipelines, and compatible with the other provisions of this Convention.

2. Articles 88 to 115 and other pertinent rules of international law apply to the exclusive economic zone in so far as they are not incompatible with this Part.

3. In exercising their rights and performing their duties under this Convention in the exclusive economic zone, States shall have due regard to the rights and duties of the coastal State and shall comply with the laws and regulations established by the coastal State in accordance with the provisions of this Convention and other rules of international law in so far as they are not incompatible with this Part.

But Article 56 provides that:

1. In the exclusive economic zone, the coastal State has:

(a) sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the sea-bed and subsoil and the superjacent waters, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;

(b) jurisdiction as provided for in the relevant provisions of this Convention with regard to:

(i) the establishment and use of artificial islands, installations and structures;

(ii) marine scientific research;

(iii) the preservation of the marine environment;

(c) other rights and duties provided for in this Convention.

2. In exercising its rights and performing its duties under this Convention in the exclusive economic zone, the coastal State shall have due regard to the rights and duties of other States and shall act in a manner compatible with the provisions of this Convention.

3. The rights set out in this article with respect to the sea-bed and subsoil shall be exercised in accordance with Part VI.

Section 1(a) explicitly grants sovereign rights to the coastal

state for the exploring and exploiting of, *inter alia*, resources related to "the production of energy from the water, currents and winds." That formula would clearly appear to cover OTEC facilities. Section 1(b)(i) allocates to the coastal state jurisdiction with regard to "artificial islands, installations and structures." Article 60 of the ICNT grants the coastal state the exclusive right to do this. It would appear that the coastal state's competence in the envisaged exclusive economic zone is virtually as great as it is in the belt of territorial seas. This sweeping competence applies whether we envisage plant ships, structures or facilities. The plant ship, while it may perhaps traverse the exclusive economic zone in innocent passage, would appear to be required to suspend its conversion operations in the course of such passage lest it infringe the sovereign rights of the coastal state with regard to this particular resource. A structure of any sort be it moored, fixed or submerged and moored in a dynamic fashion, could not be emplaced without permission of the coastal state since it alone has the competence to create such structures.

Many commentators have noted the ambiguity introduced by the ICNT as to scientific research. Since OTEC operations in the EEZ are subject to coastal jurisdiction and consent, we need not consider the research problem here.

The issue of cables of a foreign state traversing another state's EEZ is in my view more complicated than the treatment given this subject by other commentators would suggest. Here, as in the high seas, we should distinguish between two types of cable: surface and sub-surface. Since the latter involves a physical and permanent intervention into and occupation of the soil of what is now authentically defined as shelf, it is difficult to see how a third state can claim such a use as of right. Cables *on* the shelf seem to be less of an intervention and would appear to be assured under Article 4 of the Continental Shelf Convention, though the Convention's bland assurance of coastal state cooperation with international users seem unfounded. The coastal state may be concerned about the as-yet unknown environmental consequences of high voltage transmission in the marine environment and it is improbable that permission to lay such lines would be given routinely. This is an issue which should be carefully examined by experts.

Hollick suggests that an exception for certain OTEC's may be carved in the rather comprehensive competence emerging for the

coastal state in its EEZ.<sup>16</sup> She argues that the exclusive economic zone regime envisaged in the ICNT reserves navigation freedoms and, by implication, military uses to all members of the international community. Hollick suggests that foreign military enterprises supported by OTEC's as their energy source might then freely use an economic resource of another state's EEZ as an exercise of their freedom of navigation. Accepting the hypothetical *arguendo*, an interpretation of the zone which overlooks the economic harvesting of a military activity in a non-belligerent situation would seem most unpersuasive.

There is a curious imbalance of distribution of surplus resources of the exclusive economic zone with regard to the harvesting of non-living resources of that area. While Article 70 of the ICNT grants contingent though preferential rights to "states with special geographical characteristics," with regard to the *living* resources of the exclusive economic zone, no comparable right is given to such states with regard to the *non-living* resources. This would appear to be an oversight and one would hope that before completion of the Convention an appropriate arrangement for the "special geographically characteristic" states will be made with regard to activities such as ocean thermal harvesting.

#### D. *High Seas Superjacent to the Continental Shelf*

Since 1958, there has been a strong conventional thrust to retain the high seas status of these waters. Nevertheless, they are an inviting area for unilateral coastal claims. Where the continental shelf extends beyond the EEZ, one may expect increasing coastal state claims over activities such as OTEC in the superjacent waters. Thus Hollick states: "history suggests that all available legal arguments will be employed to control OTEC activities over the margin beyond 200 mi (*sic*)."<sup>17</sup>

In contrast, Joseph suggests that textual analysis, apparently on the *exclusio* principle, of Article 4 of the 1958 Continental Shelf Convention would allow a foreign state to moor an OTEC facility on the shelf without the coastal state's consent. Actually, the regime of Article 4 is more complex than a "right-no-right" paradigm; for it subordinates the use of the space by cable and pipeline owners to the exploration and exploitation rights of the coastal state. But that aside, the question of whether to generalize cables

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16. Hollick, *supra* note 7, at 87.

17. *Id.*

and pipelines to anything that simply uses the spatial aspect of the shelf would appear much too important to be treated in such a mechanical fashion. The ICNT resolves the ambiguity in favor of the coastal state in Articles 79 and 80.

Arguments in legalist mode can be developed for both inclusive and exclusive competence in this unique zone. The basic policy for OTEC as for all other ocean resources — maximum shared access and optimum use — would not necessarily be fulfilled by reserving superjacent waters to continental shelves in excess of 200 miles from the coast for inclusive users. This is a legal problem which will have to be addressed.

### *E. High Seas*

The high seas are comprised of the water column beyond the 200 mile exclusive economic zone of coastal states and of the seabed in the same water column area beyond the continental shelves of the coastal states. Because, as mentioned, the continental shelf may extend to the end of the geological shelf of the coastal state and that geological formation may extend as far as 600 miles out to sea, the high seabed in certain areas will be considerably smaller than the superjacent high seas waters. This differential will have definite legal consequences for different types of OTEC facilities, especially for those which are moored.

Under contemporary law, OTEC plant ships would appear to be able to traverse the entire area of the high seas in search of appropriate thermal gradients, even if areas in which it is harvesting solar energy are actually over the continental shelf of the most proximate coastal state. Article 87 of ICNT provides a general freedom of the high seas to all states. Fixed OTEC installations in contrast will apparently be limited to the areas directly over high seas subsoil. They may not be emplaced on the continental shelf of a coastal state as of right, though they would be permitted under the ICNT to lay cables and pipelines over the shelf of another state, subject to the requirements of Article 79. But after the *Fisheries Jurisdiction Case*,<sup>18</sup> that sort of formulation must be taken as, in large part, an accommodation of the interests of the coastal state as opposed to the international user. Here as elsewhere, one must be wary of substituting text for reality. Different regimes and different

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18. [1974] I.C.J. 3.

areas will apply on the high seas to plant ships or fixed facilities as the case may be.

There may be special problems with regard to the lawfulness of a fixed facility above the seabed of the high seas. The Law of the Sea Conference may yet extend the notion of "common heritage of mankind" to include resources in the high seas beyond those on the seabed.

#### IV. JURISDICTION OVER ACTIVITIES ON THE HIGH SEAS

The jurisdictional discussions in various papers and published articles is disappointing. Nowhere has it been treated systematically and in many instances, discussion shifted quickly to metaphorical devices. This is an area of major importance and should be reconsidered systematically and thoroughly. The main issue is jurisdiction on the high seas, since territorialization of the other maritime zones means that coastal jurisdiction will generally apply.

Actually, the term "jurisdiction" is of limited use in juridical inquiry. In the United States, following the 2nd Restatement on Foreign Relations Law, it has been found more useful to inquire about the allocation of competence to make law (prescriptive competence) and to apply law (applicative competence). For any complex human operation, the inquirer usually discovers that there are a bundle of prescriptive and applicative competences, and rather than being concentrated in the hands of a particular entity, they are actually distributed between different entities. The so-called "proper law of contract," for example, is actually a group of different proper laws, some prescribing for the making of the agreement, others for different aspects of performance and others for termination. Thus, in a contract, jurisdiction—the competence to prescribe and apply law—may be divided among many different states.

If jurisdictional analysis for OTEC operations is undertaken by reference to prescriptive and applicative competences, then a larger heuristic model is required. It is the suggestion of this Author that future inquiry ask the following questions.

Competence to make law with regard to:

1. Establishment
  - a. organization of the OTEC entity, etc.
2. Conduct of Operations
  - a. access to pertinent ocean areas
  - b. determination of reasonableness with regard to competing uses

- c. conduct of operations
- d. internal order of operations and facilities
- e. safety vis-à-vis other maritime users
- f. conservation
- g. scientific research
3. Responsibility for Injuries
  - a. claim procedures
  - b. arenas
  - c. allocation of risk and measure of damages
  - d. enforcement
4. Termination

A number of items encompassed in the above outline deserve special, although brief, mention.

Cables over deep seabed space, which should ultimately be defined, would appear to be a lawful use requiring no special authorization. Cables *entrenched* in the seabed are more problematic and would appear likely to be subject to claims by the nascent Seabed Authority.

There may be no statutory or conventional basis for safety zones, but there is substantial practice and scholarly confirmation of the lawfulness of excluding third parties from licit uses of the ocean space when safety or efficiency requires the condition that it be done in a reasonable fashion. Some exclusions have been far-reaching.<sup>19</sup> Unquestionably, this, as many other areas, would benefit by statutory or conventional clarification, but pending such prescription, nothing should be done to undermine the customary and indeed common sense notion of reasonable safety zones. The 500 meter safety zone allowed in the EEZ, in accord with ICNT Article 60, recommends itself on the high seas as well.

A more complex issue turns on the retention of exclusive areas for OTEC, thereby barring other potential OTEC users or other types of users from their access to the ocean space. The Deep Sea Ventures claim to a comparable zone for the mining of manganese nodules appears to have been rather universally rejected. However that may have been occasioned by the bold challenge it presented to the emerging Seabed Authority. Plainly, decisions will have to be made on exclusive harvesting zones if OTEC is to be effective. Knight suggests the use of the traditional "reasonable use" theory or international ocean law.<sup>20</sup> But an issue of this complexity would

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19. McDougal & Schlei, *The Hydrogen Bomb Tests in Perspective: Lawful Measures for Security*, 64 YALE L.J. 648 (1955).

20. Knight, *supra* note 6, at 53-58.

appear to be most appropriately handled by formal international agreement rather than by informal claim and response.

If *ceteris paribus*, plantships may use the high seas, may more fixed facilities do so as well by mooring themselves to the seabed. Joseph suggests that there is room for debate on this matter and speaks of technical infringement in light of ICNT Article 137.<sup>21</sup> I find the suggestion quite implausible, comparable to characterizing a fishing trawler's anchoring itself on the ocean floor as a technical trespass on the Seabed Authority's domain and quite distinct from mooring in the EEZ and even on the shelf. The same reservation would apply to his discussion of fixed facilities at the edge of the shelf but reaching into the abyssal depths.

The possibility of dynamically moored subsurface OTECs in the high seas used as weapons sites has been bruited about. While military instruments of mass destruction may not be emplaced on the ocean floor, there would appear to be no textual prohibition for their dynamic emplacement in the water column as part of an OTEC complex. The lawfulness of such a high sea user must be determined by reference to international security needs and compatibility with other licit high sea uses.<sup>22</sup> But since such facilities would lack the comparative undetectability of mobile submarines, the likelihood of their emplacement in the foreseeable future seems slim.

## V. JURISDICTIONAL EVASIONS

The general principles of delimitation and allocation of competence considered thus far, as they pertain to OTEC, represent the international community's formal efforts to prescribe for the regulation of events in or with substantial impacts on common domains. A coordinate set of institutions has been developed to evade those jurisdictional principles. In this respect, the problem of flags of convenience in OTEC operations on the high seas, in the view of most commentators, should be addressed. One of the functions of flags of convenience has been to allow ship owners to evade the legislative reach of tax, labor, safety and environmental controls of certain governments, by substituting a more lenient government that

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21. Joseph, *supra* note 1, at 403, with particular reference to n.84 and accompanying text.

22. See generally M.S. McDUGAL & F.P. FELICIANO, *LAW AND MINIMUM WORLD PUBLIC ORDER* (1961); W.M. REISMAN, *NULLITY AND REVISION: THE REVIEW AND ENFORCEMENT OF INTERNATIONAL JUDGMENTS AND AWARDS* 836 (1971).

is willing to lend its flag for a fee. International efforts to control abuse of flags of convenience in general maritime practice by insisting upon a genuine link have been largely unsuccessful and there are substantial policy reasons militating against a more vigorous pursuit of that effort. Of course, where an effective Authority regulates access to high seas OTEC operations; be it a Seabed Authority or a regional authority in regional ocean contexts; flags of convenience will not be successful in evading standards established by the Authority. But there are, as is well known, considerable misgivings in the industrialized world about an overly extensive and effective Seabed Authority. Be that as it may, the use of flags of convenience will continue to be a problem in OTEC as in other general maritime uses.

Closely related to the flag of convenience as a technique for jurisdictional evasion is the controversy over the character and status of an OTEC facility. Resolution of that problem is only important in terms of the effects it will precipitate. Certainly this has been one of the most dissatisfying discussions in the OTEC literature. Writers ask, is an OTEC a ship, and proceed to answer that question by using 18th and 19th century definitions of ship which were designed for entirely different policy purposes. If they are in favor of facilitating OTEC operations and believe that the status of a ship will conduce thereto, they then conclude that an OTEC facility is indeed a ship.

From a policy standpoint, these analogical approaches should be eschewed. The appropriate question is, what social and legal consequences are to be determined by the characterization of a facility as a ship or as something else. Upon examination of those consequences, there should then be an inquiry into the appropriate policies that should govern them. It is on the basis of these policies that status should be determined. An OTEC may be a ship for some purposes but for other purposes it should be viewed as a structure or indeed as an entirely new entity in ocean operations so that new policies can be shaped to it accordingly.

## VI. ENVIRONMENTAL AND RELATED TORT ISSUES

The external injuries which may be caused by an OTEC operation are quite diverse. In addition to breakdowns, foulings and collisions, thermal pollution is an obvious problem. The OTEC operation will unquestionably increase the surface temperature of the ocean gradient with potentially negative effects on complex ecologi-

cal systems. Since the reticulate network of interdependencies of ocean areas is only dimly understood, the extent of the injury from a single operation cannot now be gauged. Of course, ecological systems have a certain flexibility and are accustomed to adapting to changes. But a change in ecology necessarily means that certain human uses and exploitations theretofore based on the prior ecological constellation may be obsolesced. For example, certain types of fishing in areas where gradient temperatures have been changed may be impeded. It is also possible that species of coastal fish, which coastal fisheries with limited capacity for long distance fishing have exploited, will move away from the coasts thereby depriving local industries of an important resource. Other complex changes may take place in land areas.

Little inquiry has been made into the possible injuries which may ensue from the transmission of high voltage from the OTEC facility back to the land. It is generally known that high power transmission lines do create certain electrical disturbances which affect other electronic uses of the air space and may also have impact on living creatures. Here again the problem will be to find an appropriate balance between the ocean as a medium for solar energy harvesting and for all of its other traditional and anticipated uses. This problem will not arise in those circumstances in which the OTEC operation is conducted by a plant ship and the harvested energy is immediately exploited in that area either in mariculture, or the production of ammonia or hydrogen.

Change in an ecology is not *per se* undesirable or unlawful. The critical question will be who, if anyone, will bear responsibility for deprivations that appear to flow proximately from OTEC operations. Stein boldly proposes that there are fundamental principles of law governing this matter.<sup>23</sup>

The Stockholm Conference Declaration, building on already accepted principles of international law and practice, developed the basic rule of action that a nation is responsible for environmental harm that it causes, or that is caused by activities carried out under its jurisdiction, where that harm takes place outside its national jurisdiction. The accepted principles and practice are based on a number of precedents, including the Trail Smelter Arbitral decision which stated that no state can use its territory in such a way as to cause injury in the territory of another state

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23. Stein, *International Environmental Aspects*, reprinted in OCEAN THERMAL ENERGY CONVERSION, *supra* note 1, at 117, 120.

and the Corfu Channel case before the International Court of Justice which referred to each state's obligation not to allow its territory knowingly to be used for acts contrary to other states' rights. Moreover, the declaration also contained a principle that: States shall take all possible steps to prevent pollution of the Seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the Sea.

Alas, Part XII of the ICNT and in particular Article 192 do not fulfill these expectations. In fact, the principles of international law on this matter are not pellucid. Cases such as the *Trial Smelter*<sup>24</sup> suggest that there is a type of nuisance responsibility in international law. But some argue that the principle of the *Trial Smelter Case* was based on the *compromis* and not on the award. More general statements to be found in the Stockholm Conferences' declarations are of ambiguous authority. The general principles of state responsibility may not apply in circumstances in which the activity causing an injury is not wrongful, as could be the case in an OTEC operation. The general principle of law of due care may not be appropriate since an OTEC enterpriser will probably be able to demonstrate that such care was taken. Injunctive relief for those who view themselves as likely to be injured by an impending OTEC operation is not a real alternative in contemporary international law, given the absence of compulsory jurisdiction. Even where such jurisdiction may be operative because of a prior and unqualified submission, it is not certain that an international tribunal will rule that activities which *may* cause injury can be enjoined. Some of the judges in the nuclear test ban case indicated in the interim measures phase that the only remedy that might lie to a party contemplating injury would be *ex post facto*.<sup>25</sup> The final phase of the case hardly clarified law in this area.

For all of these reasons, it may be desirable to clarify this particular matter prior to the extensive use of OTEC. A convention negotiated either in a special conference or through an organization such as IMCO might clarify the issue. It might be more economical, however, to have the General Assembly of the United Nations issue a declaration of a general principle of responsibility for innovative activities. The policy in such a legal innovation should balance the desire of the international community to encourage risk by

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24. 3 U.N. Rep. Int'l Arb. Awards 1911, 1965 (1941).

25. [1973] I.C.J. 99, 111, 115.

venturing capital and innovativeness with the desire to protect those who have made good faith investments on the expectation that existing social and political constellations will continue.

An appropriate analysis of polymorphous environmental injuries and the distribution of competence to deal with them should work with four factual situations.

1. Injuries in coastal (territorial, EEZ) waters by transiting foreign flag OTEC's and/or by foreign fixed facilities authorized to harvest thermal energy in those waters;
2. Injuries initiating in activities in the above coastal waters, but with impacts in the international area or other national areas and/or on international users of the high seas;
3. Injuries by users in the international area with impacts on coastal states;
4. Injuries by users in the international area with impacts on other international users.

Some injuries will fall in several categories, for example 1 and 2 may overlap as may 3 and 4. The categories are primarily for exploring the distribution of competence to prescribe and apply law to these events.

Category 1 is subject to national law, though it may be displaced by convention or by some general or peremptory international norm. Category 2, the most interesting of the four, imports a complex system of shared jurisdiction with the coastal state, other coastal states, the international community and the flag states of other users able to claim some competence in the matter. The point of emphasis here is that the mere fact that the event precipitating the injury initiated in coastal jurisdiction does not grant the coastal state exclusive jurisdiction. Consider the problem of location of OTEC's as a way of externalizing costs. Hollick suggests that states may move physically dangerous or environmentally destructive activities, supported by OTEC's, to the very edge of the EEZ.<sup>26</sup> The potentiality of OTEC installations for causing injury to the environment and to other legitimate users of the ocean means that the choice of location of OTEC sites will itself be subject to international legal standards. Joseph writes that subject to the innocent passage burden and navigation notice, a State has complete authority to authorize the location and operation of an OTEC facility or vessel in the territorial sea.<sup>27</sup> I would not concur in that view.

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26. Hollick, *supra* note 7, at 86.

27. Joseph, *supra* note 1, at 390-92 nn.20-25 & 40 and accompanying text.

Handl has written extensively on the problem of the location of ADA's in both international and national law.<sup>28</sup> The temptation in both systems of law to minimize the injuries visited on one's own territory, and to externalize in so far as possible the costs of certain activities, often impels enterprisers to locate an activity as close as possible to the boundary with an alien. Handl suggests that this operation may not be lawful and may indeed aggravate the liability of a tort-feasor. Investigation is required to determine to what extent similar policies should be applied to the location of OTEC installations.

In categories 3 and 4, the mere fact that the event causing injury initiated in the high seas, does not assure complete international jurisdiction. Indeed, the concept of the "contiguous zone" which was discussed above represents a persistent coastal state assertion of competence to prescribe and apply law to events that impact on its social and environmental processes.

A number of international conventions dealing with environmental responsibility will probably apply to OTEC, among them the 1973 IMCO Convention on the Prevention of Pollution from Ships, the 1972 Ocean Dumping Convention, and the 1973 Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft. Joseph reviews several other instruments.<sup>29</sup>

## VII. CONCLUSION

The importance of OTEC and the extent to which it may be made operational are now sufficiently important enough to warrant serious consideration of a comprehensive and systematic regime. A draft might be prepared by an international committee of experts and thereafter an international conference convened. The convention would deal with all aspects of OTEC operations and, by providing a common and effective regime, might accelerate its development. Even if such a draft fail to receive acceptance, it might, if effectively done, serve as a common standard. Given the technical complexity of the subject and the difficult policy choices to be made, it would be unwise to proceed to conference, whether special or part of UNCLOS, without a detailed draft on which to fall back.

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28. *See supra* note 16.

29. Joseph, *supra* note 1 and *see also* OCEAN THERMAL ENERGY CONVERSION, *supra* note 1.