

Performance Requirements in Ocean Mineral Development

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During the 1970s there was a wave of excitement over the potential exploitation of manganese nodules containing nickel, cobalt, and copper, that lie on the deep seabed. Economic constraints and political conflict have reduced interest in manganese nodules, but current attention has been drawn toward exploitation of the hard minerals that may occur within the 200 nautical mile exclusive economic zone (EEZ) of the United States.

Several policy studies of these minerals already have been initiated by government, research, and academic institutions, including the U.S. Office of Technology Assessment, the U.S. Bureau of Mines, the National Academy's Marine Board, the University of Hawaii, and the Marine Policy Center of the Woods Hole Oceanographic Institution. In these studies, significant effort has been devoted toward understanding factors that contribute to the timing and rate of exploration, development, and production of ocean hard minerals. An important related public policy issue concerns the degree to which the United States government, as a resource "owner" and manager, should be involved in encouraging the pace of exploitation. In order to achieve certain policy objectives, the Federal government may employ "performance requirements" as tools that hasten mineral development. This report considers the usefulness and potential costs of performance requirements and examines two examples of their use on outer Continental Shelf lands and on the deep seabed.

Public Minerals Disposal

The minerals at issue include all hardrock, solid, or aggregate materials, or any minerals other than crude oil, natural gas, sulfur, salt, helium, and uranium, thorium, or other "fissionable" materials. Figure 1 lists hard minerals known to occur within the U.S. EEZ and highlights those that have been examined recently as minerals with some development potential. These minerals are referred to here as "public minerals" in the sense that the Federal government has the authority to provide methods for their "disposal," usually in the form of commercial recovery by private developers.

The Federal disposal authority is found in section 8(k) of the Outer Continental Shelf Lands Act of 1953 (OCSLA), as amended in 1978. Compared to the main body of OCSLA, this section is a relatively short, nonspecific paragraph that gives the U.S. Secretary of Interior substantial discretion in prescribing disposal methods.

<i>Ocean Mineral</i>	<i>Prospective Commodity</i>
Hydrocarbons	Crude Oil* Natural Gas*
Sand and Gravel	Sand and Gravel* Industrial Sand
Shell	Calcium Carbonate*
Sulfur	Sulfur*
Salt	Salt*
Barite	Barite*
Phosphorite	Phosphate Rock
Heavy Mineral Placers	Tin Rutile Ilmenite Titanium Metal Zirconium Hafnium Yttrium Chromite Gold Silver Platinum Garnet
Nodules/Crusts	Platinum Cobalt Nickel Manganese Copper
Massive Sulfides	Zinc Copper Lead Gold Silver

* Commercially produced from either the U.S. territorial sea or the EEZ present. Barite was formerly produced off Alaska but is not currently in production.

Figure 1. Ocean Minerals and Commodities in the U.S. Exclusive Economic Zone.

OCSLA applies to the outer Continental Shelf (OCS) of the United States, which begins at the three nautical mile limit of the territorial sea and extends seaward, according to the 1958 Geneva Convention on the Continental Shelf, to the limit where shelf resources may be exploited. This seemingly unlimited OCS boundary conflicts with a more restrictive limit established by the 1982 Law of the Sea Convention, which the United States has not signed. In practice, the U.S. Department of the Interior has concentrated its

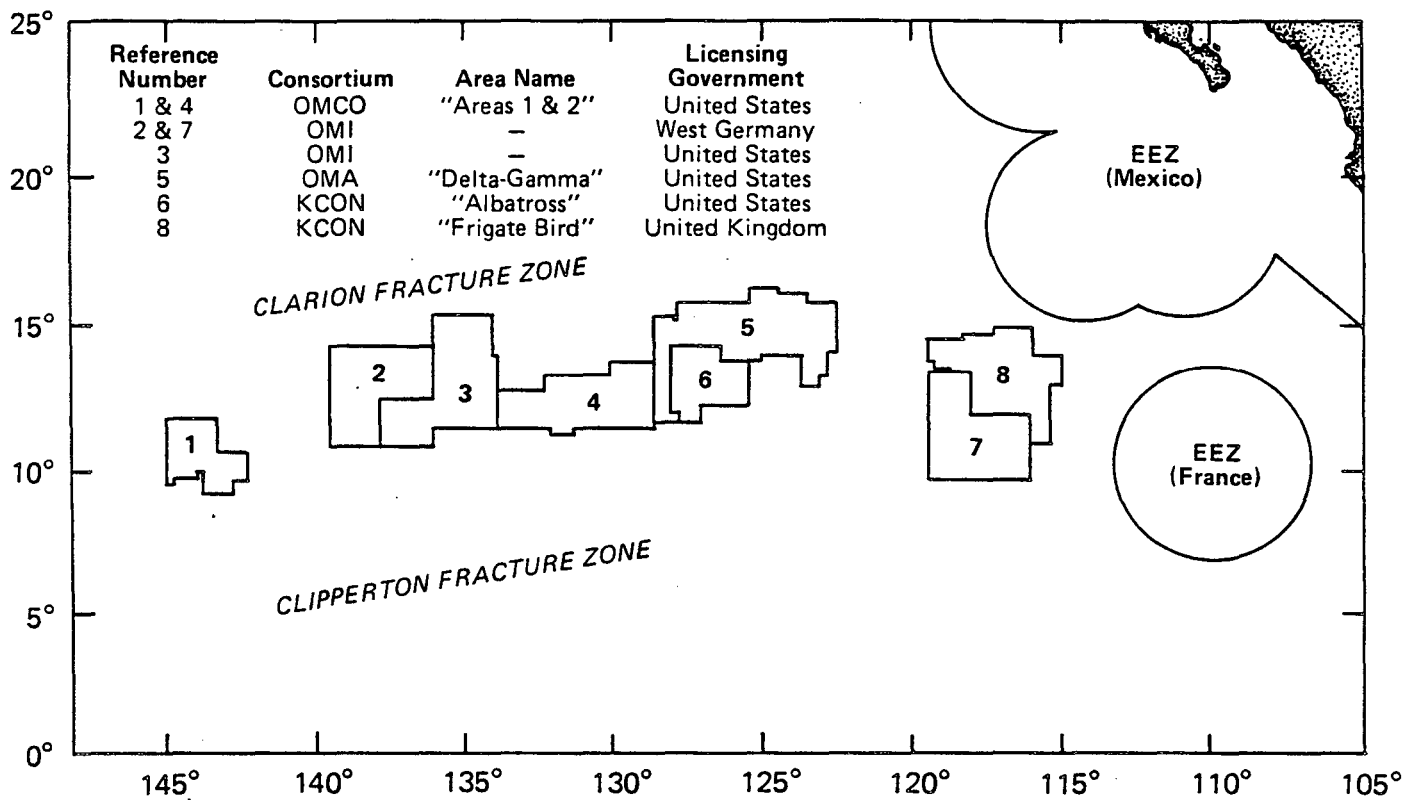


Figure 2. Deep Seabed Mining—Licensed Exploration Areas.

ocean mineral management within 200 nautical miles of the coastal baseline, which coincides with the American EEZ, established in March 1983 by presidential proclamation.

In the seabed beyond national jurisdiction, which is commonly referred to as the deep seabed or, in the Law of the Sea Convention, the "Area," the United States and several other states have issued licenses to private firms to conduct exploration, and potentially the commercial recovery of manganese nodules. Figure 2 depicts the location of those deep seabed exploration license areas that have been disclosed publicly.

In the United States, the National Oceanic and Atmospheric Administration (NOAA), an agency of the Department of Commerce, has authority under the Deep Seabed Hard Mineral Resources Act of 1980 to issue deep seabed exploration licenses and commercial recovery permits. This Act, therefore, is also a method for the disposal of public minerals, although the United States does not control the mineral resources of the deep seabed to the degree that it controls the mineral resources of the OCS. This is why licenses, not leases, are issued for deep seabed minerals. In a technical sense, a lease is an actual transfer of property rights, and Congress, through OCSLA, has authorized such a transfer for OCS minerals. Conversely, a license is only an authorization of business activity for individuals subject to the jurisdiction of the licensing body; it does not involve a property right transfer.

Regulation of OCS Hard Minerals

The Interior Department has been drafting regulations under OCSLA section 8(k) to govern the disposal of ocean hard minerals on the OCS. The hard minerals industry, however, has opposed the writing of any regulations because OCSLA limits Interior to competitive bonus bidding for leases that are issued to the highest bidder at an auction. The industry has always opposed competitive methods for the disposal of public minerals. Historically, public minerals onshore have been disposed of primarily through a location-patent system under the Mining Law of 1872 in which the rights to develop valuable mineral discoveries belong to the earliest, diligent person who stakes a claim.

Under a location-patent system, the resource owner, in this case the United States, does not receive the true "rent" or the difference over time between development costs (including the opportunity costs of investment) and revenues. The rent is captured instead by the developer and thus provides a significant incentive that encourages mining activity. The 1980 Deep Seabed Hard Minerals Resources Act license-permit system for manganese nodules on the deep seabed, which provided for a "first-come, first-serve" method of disposal, was designed by the hard minerals industry and is very much an offspring of the 1872 Mining Law.

In response to the Interior Department's efforts to formulate its own ocean hard minerals regulations, an unusual coalition of coastal states, environmentalists, and marine hard minerals interests has supported an alternative to the OCSLA leasing system. In 1986 a bill

(H.R. 5464) was introduced in Congress to establish a license-permit disposal method for the "national seabed," defined as the seabed within the EEZ.

The bill was intended to license EEZ hard mineral explorers on a first-come, first-serve basis. It would have assigned exclusive rights to a licensee for exploration activities, and, if hard minerals were found in commercial quantities, the licensee would have been entitled to a commercial recovery permit. The exclusive nature of the mineral entitlements provided by H.R. 5464 appeared to provide significant incentive for industrial interest at least in securing those entitlements.

Aside from the method of access, licensing instead of leasing, other important issues will have to be addressed by both the Interior regulations and new legislation. These issues involve antitrust problems and questions of environmental modification, tax structure, and the distribution of potential economic rents between the resource owner and the developer. In the case of H.R. 5464, the distribution of rents would also involve equity between the coastal states and the Federal Government.

Although hearings were held on H.R. 5464 in 1986, no action was taken by Congress, but a similar bill or an amended version may be reintroduced in the 1987 session of Congress.

Performance Requirements

A separate but fundamental consideration in the development of any disposal method for ocean hard minerals will be "performance requirements." Performance can be defined to include the set of legal requirements incorporated into a disposal method that require the dedication of capital and labor resources for the definition and development of a mineral deposit within a prespecified area and time period.

Performance requirements clearly are important for resource managers, especially for those who make policy in the public sector and attempt either to cull rents from the disposal of public minerals or achieve other policy goals. Moreover, performance requirements affect private firms by raising their operating costs and thus will influence their decision to begin exploration or development activity, or to continue that activity. Performance requirements also are important for oceanographers and engineers to the extent that their skills will be enlisted to determine the location, size, grade, engineering characteristics, and technology requirements of ocean mineral resources sooner than expected in the absence of such requirements.

Performance requirements have a long history in mineral law and policy. Indeed, the earliest written mining codes, dating back to the late medieval period, include performance requirements. Performance requirements are seen most clearly in the case of a resource "owner" or principal and an authorized resource "developer" or agent. Justification for performance requirements are usually made on the grounds that a resource owner, either public or private, requires a continuous return on the development of its

mineral asset. Non-performance, also known as "speculation," runs counter to a resource owner's prescribed development plan.

Types of Performance Requirements

For minerals owned or controlled by a government, performance requirements are essentially an allocation of economic resources directed under terms and conditions that are exogenous to private development decisions. Performance requirements for public minerals may appear in one or more of the following forms.

- specific *due diligence* requirements, which are requirements for a continuous, steady effort to work a mineral deposit;
- performance *bonds*, which may require of the developer to guarantee diligent development and which may be forfeited if non-diligent;
- *rentals* (similar to *advance* or *minimum royalties* but with different tax implications), usually fixed in advance, that are paid to the government on an annual basis until production is initiated and which may then be credited against true royalty payments if those payments exceed the amount of the rental;
- *terms* or periods within which exploration, development, and production (sometimes referred to as "commercial recovery") must occur;
- *area restrictions* or a limited geographical tract, block, mining unit, or other mineral property within which mining activity may occur. Although technically not a true performance requirement, "area" is necessary to define spatially the locus of activities subject to such requirements;
- partial *relinquishment* of an exploration or development area in order to force exploration or development and to minimize large scale holdings;
- *expenditure* requirements, also known as "assessments," within a specified area and term that are used as a measure or indication of diligent activity;
- *operating* plans, usually for exploration and development, that outline specific activities and a timeframe for the conduct of those activities;
- periodic *reports* that describe in detail the operation and activities performed by a developer within the relevant period; and
- in the event of nondiligence, provisions that may affect a developer's *reputation*, such as its ability to obtain future development rights.

Figure 3 compares performance requirements across both existing and proposed mining codes.

Costs of Performance

Performance requirements appear to be worthwhile tools to assure the rational and equitable development of public minerals. But they are only useful if the public, through its resource manager (the govern-

	<i>OCSLA*</i>	<i>DSHMRA</i>	<i>H.R. 5464</i>
Due Diligence	Yes	No	Yes
Bond	\$50,000 per lease or \$300,000 per "area"	No	No
Rental	\$741/km ² /year	No	No
Term	5-10 years for exploration, production limited only by ability to produce in paying quantities (or drilling or well-reworking conducted)	10 years plus extensions for exploration, 20 years for commercial recovery or more if commercially feasible	10 years plus one extension for exploration, 20 years for commercial recovery or more if commercially feasible
Area	23 km ² or as determined by DOI	Variable but approx 150,000 km ²	Unlimited?
Relinquishment	(Proposed in 1974)	No	No
Expenditure	No	Exploration and Commercial Recovery	Exploration only
Plans	Exploration and Development/Production	Exploration and Commercial Recovery	Exploration and Commercial Recovery
Reports	Monthly operations	Annual	No
Reputation	Yes	No	No

* Performance requirements for OCS hydrocarbon minerals.

Figure 3. Performance Requirements in U.S. Ocean Hard Mineral Entitlements.

ment) wants offshore mineral development to occur. The American public might want ocean hard mineral development to occur for the following *hypothetical* reasons: (1) to diversify sources of supply for certain minerals considered "strategic" and necessary for national security; (2) to encourage the development of marine technology (in addition to encouragements already found in the U.S. patent system); (3) to support the growth of a nascent industry, such as marine mining, or a mature industry, such as the hard minerals mining industry generally.

At least one important caveat, however, should be mentioned here. Because performance requirements are a directed allocation of economic resources, there is a risk in allocating these resources too rapidly. Significant opportunity costs could be incurred if the investment of capital and labor resources in other, more productive endeavors, like onshore mining, were deferred or eliminated.

Private mineral developers will resist the costs of performance requirements, which represent a burden on their operation. As a result, the government may be saddled with higher enforcement costs as it attempts to ensure performance. Conversely, the government may have to establish some inducements to encourage a developer to begin operations earlier or to continue marginal operations. In most cases (some exceptions are tin, sand and gravel, and calcium carbonate), ocean mineral resources are more costly to develop than onshore minerals. An ocean minerals disposal system that reduces this comparative cost difference by providing inducements for offshore op-

erations can run the risk of diverting economic resources away from activities that would be less costly and less wasteful.

Speculation

An often cited rationale for performance requirements is to prevent "speculation." The legislative history to the Deep Seabed Hard Mineral Resources Act, for example, reveals that government officials had perceived performance requirements as tools for discouraging speculation. In a joint letter to the House Merchant Marine and Fisheries Committee prior to the enactment of the Act, the Secretaries of Interior and Commerce explained that "even though deep seabed exploration and production are likely to be in an experimental mode for the near future, we believe that the developer should have a legal obligation to pursue exploration and development diligently. This would help prevent detrimental speculation."

This justification is probably misleading. Speculation, a term which over the years has become perjorative, is in reality only private "conservation" of mineral resources. Speculation represents an allocation of economic resources in response to market signals, rather than institutional directives. Because private firms succeed or fail on their abilities to respond to these signals, it is possible that private (as opposed to public) conservation is more likely to allocate economic resources so as to minimize waste.

Private conservation could be less effective than public conservation as a means of resource allocation if ocean mineral development were characterized by

imperfections in market structure, anticompetitive industrial behavior, external effects of environmental modification, or tax structure distortions. In modern public mineral disposal systems, however, the economic inefficiencies caused by many of these conditions usually have been handled through institutional mechanisms other than performance requirements.

Practice

Although performance requirements have an interesting and potentially instructive history in the management of public minerals onshore, there has been relatively limited practice in the case of ocean hard minerals. Two cases deserve mention here. On 15 December 1961, in the only case of OCS hard minerals leasing to date, sixteen phosphorite leases were offered off the coast of California on the federal OCS through OCSLA. Collier Carbon and Chemical Corporation, a subsidiary of Union Oil Company, obtained six of these leases by competitively bidding bonuses that totalled \$122,000 (figures in 1961 dollars). Collier's performance requirements included the posting of a \$100,000 performance bond, rentals of \$15,120 per year, limits on its exploration area and period, and the potential negative effect on its reputation in the event that it operated nondiligently.

Unfortunately the effect of the performance requirements on Collier's behavior cannot be demonstrated because during exploration the firm discovered unexploded naval ordnance on its leases. Collier

terminated its operations and succeeded in obtaining a reimbursement for the bonuses and rentals. It is noteworthy, however, that Collier was released from any requirements to perform, at the cost of losing its entitlements, because of another, incompatible use of the OCS.

The case of deep seabed mining also may provide some limited insight into the behavior of private firms in the face of performance requirements for ocean hard minerals. In August and October, 1984, NOAA issued four exploration licenses to four industrial seabed mining consortia. Performance requirements under these licenses include: ten year exploration periods, with the possibility of five year extensions; limited geographic areas; "periodic reasonable" expenditure requirements, as determined by the licensee and certified by NOAA; specified requirements to conduct operations diligently in the terms, conditions, and restrictions that attach to the licenses; annual reports; and exploration plans. Figure 4 summarizes these requirements for each consortium.

U.S. deep seabed licensees must conform "reasonably" to their exploration plans. NOAA's determination of reasonable conformance to these requirements occurs retrospectively, although NOAA maintains the right to place observers aboard exploration cruises. In making its determination, NOAA consider "legitimate periods of time when there is no or very low expenditure." Licensed explorers must submit an annual report to NOAA demonstrating reasonable conformance to their activity and expenditure schedule.

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	<i>Ocean Minerals Company (OMCO)</i>	<i>Ocean Mining Associates (OMA)</i>	<i>Ocean Management Incorporated (OMI)</i>	<i>Kennecott Consortium (KCON)</i>
Licenses	One (2 sites)	One	One	One
Term	1984-94	1984-94	1984-94	1984-94
Area	165,533 km ²	156,000 km ²	136,000 ²	65,000 km ²
Original Planned Expenditure	undisclosed	\$13 million	\$54 million	\$6.2 million
Modified Planned Expenditure	reduced	same	\$4.6-6.6 million	same
First Year Expenditure	undisclosed	\$1.2 million	\$0.2 million	\$0.1 million
Other Modifications (see text)	Yes	No	Yes	No

* OMI holds an additional exploration license from the West German government and KCON holds an additional exploration license of 118,000 km² under authorization of the British government. These two consortia are also subject to performance requirements under those licenses. (Expenditures expressed in 1981 U.S. dollars.)

Figure 4. U.S. Deep Seabed Licensee Performance.*

The delivered cost of potential seabed nodule commodities, including nickel, cobalt, copper, and possibly manganese, if compared with their market prices, makes deep seabed mining an unprofitable venture at present. This situation may change over time as onshore sources are depleted and become more costly to produce. Thus it makes sense for nodule resources to be conserved at present. Those consortia that hold the development rights (licenses) to nodules are speculating on their own account that within their own planning horizons they will be able to market the minerals from nodules and compete successfully with other mineral sources.

The consortia face performance requirements that are sufficiently flexible to permit private conservation. Already two consortia have amended their U.S. exploration licenses to delay originally-planned exploration activity. Ocean Minerals Company (OMCO) has eliminated at-sea survey cruises that were to be conducted during the first five years of its license and postponed testing of new survey systems to the second half of the license period. OMCO still plans to file for a commercial recovery permit by 1994. Ocean Management Incorporated (OMI) has divided its exploration plan into two stages. The first stage will involve exploration of "prime" areas within its larger license area, and the exploration of other "nonprime" areas will be postponed. OMI reduced its planned expenditures from a previously-announced \$21 million to \$4.6-6.6 million, cut its planned ship time from 310 to a maximum of 180 days, and will not test new survey systems. Both consortia have explained that the resource information obtained through an industrial arbitration process, which resolved their overlapping seabed exploration area claims, has allowed this reallocation of exploration activity.

As the resource manager, NOAA has maintained a flexible stance with regard to performance requirements. NOAA has determined that the proposed expenditures of each consortium in its exploration plan meets the statutory and regulatory definition although there have been reductions in the level of expenditures. The consortia can make or modify these expenditures freely because there may be periods of no expenditure and because reasonable conformance with exploration plans is determined retrospectively. Moreover, NOAA has approved already the modifications in two exploration plans, and additional modifications in the form of five year exploration period extensions are possible.

It would seem inappropriate and costly for NOAA, an agency with many other ocean and coastal management responsibilities, to set the timing and pace of seabed mineral development according to notions of public conservation. Yet NOAA's flexible administration of seabed mining performance demonstrates that the agency has been concerned with conservation. In order to determine when potential nodule commodities will be conserved and when they will be developed, NOAA has relied upon private firms with highly specialized expertise in economic geology, mining engineering, oceanography, industrial research and

development, metallurgy, transportation, and marketing. In the event of a crisis situation, the 1980 Deep Seabed Hard Mineral Resources Act performance requirements could be made more stringent. If, for example, it appeared that significant economic and social dislocation would result from a cut in supplies of potential seabed nodule commodities, NOAA might consider strengthening performance requirements. Under present economic conditions, such a strengthening would have to be combined with additional inducements.

Conclusion

It is important to realize what performance requirements for mineral exploitation can accomplish. If ocean resource management objectives are to encourage research and development, industrial enterprise, national marine operational expertise, the diversification of supply sources for "strategic" minerals, or other public goals, then it may be important to provide inducements for the diversion of capital and labor resources into ocean mineral development. These measures could be supported with stringent performance requirements so that the policy goals are more likely to be achieved. It should be recognized, however, that such policies could impose costs that will be borne eventually by the public.

Conversely, the public's resource management objective might be to maximize the net present value of the resource over time; this is equivalent to true resource "conservation." With conservation as an overriding objective, careful consideration should then be given to making performance requirements as flexible as possible. Under competitive market conditions, there are good reasons to expect that private development decisions are more likely to achieve conservation than public development decisions. Flexible performance requirements would allow private developers the leeway to determine the most appropriate time at which mineral resources should be brought into production. Private developers would consider the comparative efficiencies and costs of mineral development without regard to the labels of "ocean" or "onshore." Whichever resources were the least costly to discover, prospect, explore, develop, and produce would be worked first, and economic resources would not be directed in a wasteful fashion at more costly minerals.

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