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Considerations relating to the regulations for prospecting and exploration for hydrothermal polymetallic sulphides and cobalt-rich ferromanganese crusts in the Area

Prepared by the Secretariat

I. Introduction

1. In August 1998, during the resumed fourth session of the Authority, the delegation of the Russian Federation reminded the Assembly that, in addition to polymetallic nodules, other mineral resources existed in the Area, including hydrothermal polymetallic sulphides and cobalt-rich ferromanganese crusts (cobalt crusts), and requested the Authority to adopt rules, regulations and procedures for exploration for such resources.¹ Pursuant to article 162, paragraph 2 (o) (ii), of the 1982 United Nations Convention on the Law of the Sea, and paragraphs 15 and 16 of section 1 of the annex to Part XI Implementation Agreement, such rules, regulations and procedures are to be adopted within three years of the date of such a request. The rules, regulations and procedures shall be based on the principles contained in sections 2, 5, 6, 7 and 8 of the annex to the Agreement.

2. From 1997 to 2000, the main focus of the work of the Authority was on the elaboration of the regulations for prospecting and exploration for polymetallic nodules in the Area. These regulations were approved by the Assembly in July 2000.²

3. In the light of the request made by the delegation of the Russian Federation, the Authority convened, in June 2000, a workshop on the mineral resources of the Area. The objectives of the workshop were to provide information on the occurrence, technical parameters, economic interest and potential resources contained in mineral resources other than polymetallic nodules, to identify existing institutional factors that have contributed to the discovery of such resources and continuing research on them and to provide information which would assist in drafting rules, regulations and procedures for prospecting and exploration for these mineral deposits, in particular deep sea polymetallic sulphide deposits and cobalt crusts. The workshop was attended by over 60 participants from 34 countries, including several members of the Legal and Technical Commission. Included in the proceedings of the workshop are technical papers on the geology and mineralogy of polymetallic sulphides and cobalt crusts, their distribution and resource potential, as well as the status of research on such resources and the technical requirements for their exploration and future mining.

4. The present document contains a brief summary of the discussions that took place during the workshop on a possible regime for prospecting and exploration for polymetallic sulphides and cobalt crusts and

examines some of the main policy issues that need to be addressed in developing a set of regulations for prospecting and exploration.

II. Characteristics of the resources

A. Polymetallic sulphides

5. High-temperature black smokers, massive sulphides and vent biota were first discovered in 1979 at the crest of the East Pacific Rise at 21° north latitude, off the coast of Baja California. Since then, polymetallic massive sulphides have been discovered at water depths of up to 3,700 metres in a variety of tectonic settings at the modern seafloor, including mid-ocean ridges,³ sedimented ridges, back-arc rifts⁴ and seamounts. Many of these deposits consist of a black smoker complex on top of a sulphide mound which is commonly underlain by a stockwork zone. It has been established that circulating seawater which is modified in a reaction zone close to a subaxial magma chamber is the principal carrier of metals and sulphur which are leached out of the oceanic basement. Precipitation of massive sulphides takes place in response to mixing of the high-temperature metal-rich hydrothermal seawater fluid with ambient seawater. Seafloor polymetallic sulphide deposits can reach a considerable size and often carry high concentrations of copper (chalcopyrite), zinc (sphalerite) and lead (galena) in addition to gold and silver. Currently, more than 100 sites of hydrothermal mineralization are known at the seafloor, including at least 25 sites with high-temperature black smoker venting. The majority of sites in the Pacific Ocean have been located at the East Pacific Rise, the South-east Pacific Zone and the North-east Pacific Zone. Many sites have been discovered in the Atlantic Ocean at the Mid-Atlantic Ridge. Only one site has so far been discovered in the Indian Ocean. However, it is estimated that only about 5 per cent of the 60,000 kilometres of oceanic ridges worldwide have been surveyed in any detail. Only about 10 of the currently known deposits may have sufficient grade and size to be considered for future mining, although it must be stressed that information on the thickness of most of these sulphide deposits is limited. Many of the potential known mine sites are in areas under national jurisdiction, including those of Canada, Ecuador, Fiji, Japan, Papua New Guinea and Tonga. The potential known sites in the Area are

located in the East Pacific Rise at 0°-13° north latitude and in the Atlantic Ocean at the Mid-Atlantic Ridge from 12° to 28° north latitude. At the TAG hydrothermal field at the Mid-Atlantic Ridge, scientific drilling carried out under the Ocean Drilling Programme revealed sulphide ores to a depth of 125 metres. Russian scientists have carried out studies of oceanic hydrothermal processes in the Pacific and Atlantic oceans since the 1960s. Large-scale investigations of oceanic massive sulphides began in the 1980s on the East Pacific Rise and are still continuing on the Logachev 1 and 2 fields and the Mir hydrothermal mound, located in the TAG hydrothermal field in the Mid-Atlantic. However, no deposit has been commercially evaluated.

6. Scientific research on polymetallic sulphide deposits is being carried out by various academic and government institutions worldwide. Leading countries in this field are Australia, Canada, France, Germany, Japan, the Russian Federation, the United Kingdom of Great Britain and Northern Ireland and the United States of America. Italy and Portugal have recently developed research programmes. Exploration programmes are dependent upon state-of-the-art multi-purpose research vessels which allow cost-effective exploration of large areas through advanced technology such as multi-beam swath mapping systems capable of mapping the seafloor to depths of several thousand metres. For detailed mapping of particular seafloor sites and precise small-scale sampling, including sampling of hydrothermal fluids at active black smoker chimneys, manned research submersibles or remotely operated vehicles are required, equipped with photographic and video systems, TV-guided grabs for controlled geological sampling and portable drilling and coring devices. However, technological advances are critical to future exploration. Currently available drilling and coring devices need to be further developed in order to make seafloor drilling to depths of 50 to 100 metres possible and to provide reliable information on the depth and extent of polymetallic sulphide deposits. Mining systems for polymetallic sulphides have not been specifically designed so far but are likely to focus on continuous recovery systems using rotating cutter heads combined with airlift of the ore slurry to the mining vessel for transport to a processing plant.

B. Cobalt crusts

7. Cobalt-rich ferromanganese crusts occur throughout the global oceans on seamounts, ridges and plateaux. Crusts precipitate out of cold ambient seawater onto hard rock substrates forming pavements up to 250mm thick. These crusts form at water depths of between 400m to 4,000m, with the thickest and most cobalt-rich occurring at depths of 800m to 2,500m. Crusts are important as a potential resource for cobalt, but also contain titanium, cerium, nickel, platinum, manganese, thallium, tellurium and other rare earth elements. The first systematic investigation of cobalt crusts was carried out in 1981 in the Line Islands (Kiribati) during the German Midpac I cruise on the RV *Sonne*. Subsequent investigations in the Central Pacific showed that crusts were enriched in cobalt, iron, cerium, titanium, phosphorus, lead, arsenic and platinum but relatively lower in manganese, nickel, copper and zinc compared to nodules. Research cruises conducted by the United States in the 1980s revealed that the most promising cobalt-rich crust deposits occur on seamounts in the equatorial Pacific within the exclusive economic zones of Pacific Island nations, including the Marshall Islands, the Federated States of Micronesia and Kiribati and the exclusive economic zone of the United States (Hawaii, Johnston Island), as well as in international waters in the mid-Pacific Ocean. Since the 1980s systematic research programmes, primarily in the mid-Pacific Ocean, have also been conducted by China, Japan, the Republic of Korea and the Russian Federation. It is estimated that the Pacific Ocean contains some 50,000 seamounts, of which fewer than 15 have been mapped and sampled in any detail. The Atlantic and Indian oceans contain far fewer seamounts and most cobalt crusts in these oceans are associated with spreading ridges. The distribution of crusts on individual seamounts and ridges is poorly understood and there is great variation in the physical and chemical characteristics of the deposits.

8. The primary objective of the initial stage of exploration for cobalt crusts is to locate extensive, thick, high-grade deposits. Later stages of exploration are dedicated to detailed mapping of the precise range of mineable crusts, continuously refined through ongoing sampling and surveying. This is accomplished through mapping of seamounts using multi-beam echo sounder, side-scan sonar and single- or multi-channel seismic systems, systematic sampling using dredges and corers, bottom video and photography, water

column sampling and laboratory analysis of crusts and substrates for composition and physical properties. As with polymetallic sulphides, exploration programmes require the use of state-of-the-art multi-purpose research vessels. During the advanced stages of exploration, the use of manned submersibles or remotely operated vehicles may be necessary for observations of small-scale topography and sampling. It is known that seamount biological communities vary considerably from seamount to seamount, even between communities from the same water depths on adjacent seamounts. Most studies of seamount biology to date have concentrated on seamounts with a sediment cap and on the biological communities living in and on that sediment. Fewer studies have addressed communities living on the rock outcrops and on the surface of the crusts and the bacterial or microbiological processes that may mediate the growth of cobalt crusts, and the concentration of trace metals has not been studied. Exploration programmes are likely, therefore, to include the collection of biological and ecological information that can be used in future environmental impact studies.

9. Actual mining of crusts is technologically much more difficult than recovery of polymetallic nodules. The crusts are attached to substrate rock, which means that, for successful mining, it is essential to recover the crusts without collecting substrate rock, which would significantly dilute the ore grade. Mining involves five separate operations of fragmentation, crushing, lifting, pick-up and separation. The most generally discussed method of recovery consists of a bottom-crawling vehicle attached to a surface mining vessel by means of a hydraulic pipe lift system. The mining vehicle provides its own propulsion and moves at a speed of about 20 cm/s. It has articulated cutters that would allow fragmentation of the crusts while minimizing the amount of substrate rock collected. The fragmented material would be processed through a gravity separator prior to lifting. Other possible methods, which require considerable further research and development, include a continuous line bucket system, water-jet stripping of crusts from the substrate and in situ leaching techniques.

III. Considerations relating to the regime for prospecting and exploration for polymetallic sulphides and cobalt crusts

10. Participants in the workshop exchanged views on the possible elements of a regime for prospecting and exploration for polymetallic sulphides and cobalt crusts in the Area. It was noted that at the heart of the regime for the Area established in Part XI of the Convention and the Agreement was the so-called “parallel” system. This is elaborated in article 153 of the Convention. The essential elements of the parallel system include assured access for States Parties and their nationals to seabed mineral resources along with a system of site-banking, whereby reserved areas are to be set aside for the conduct of activities by the Authority through the Enterprise either by itself or in association with developing States. A fundamental principle is that activities in the Area, which include all activities of exploration for, and exploitation of, the resources of the Area, shall be carried out in accordance with a formal written plan of work drawn up in accordance with Annex III to the Convention and Part XI Agreement and approved by the Council after review by the Legal and Technical Commission.

11. It should also be noted that the negotiation of Part XI of the Convention was based upon a number of assumptions regarding the expected scale of seabed mining operations for polymetallic nodules advocated by the scientific community and industry. These assumptions related to the prices of the metals contained in polymetallic nodules, the technical feasibility of mining operations and the need to ensure an adequate rate of return on investment in deep seabed mining and resulted in a model which required each mine site to be capable of sustaining an annual commercial production of 3 million tonnes of dry nodules per year over a period of 20 years. Whether these assumptions are also valid for polymetallic sulphides and cobalt crusts is an issue which needs consideration. No economic analysis of the viability of mining such resources has been carried out in recent years and it is evident that information on the ore resources at the known sites of deposits of both polymetallic sulphides and cobalt crusts is scarce. It is clear, however, that individual deposits are rather small in size and, according to the state of current knowledge, no single discovered site would be capable

by itself of sustaining an economically viable mining operation. Further studies, including drilling, would be necessary to determine the precise size of deposits. It is reasonable to assume, however, that potential contractors would need to have the flexibility to operate simultaneously in several different locations.

12. The workshop participants noted that one problem was that it was very difficult to make a comparison between, on the one hand, polymetallic sulphides and cobalt crusts and, on the other hand, polymetallic nodules. The nature of the resources was very different. In the case of nodules, which are two-dimensional in nature, it was relatively easy to divide a potential nodule field into two areas of equal estimated commercial value. In the case of polymetallic sulphides and cobalt crusts, which are three-dimensional in nature, no two occurrences are the same and there may be substantial variation in grade of deposits even within one seamount. It would be impossible to determine two sites of equal estimated commercial value without substantial and costly exploration work on the part of the would-be contractor. Furthermore, it was pointed out that, in the case of polymetallic nodules, those who applied for pioneer status under resolution II had in fact already undertaken substantial exploration work and incurred high levels of expenditure prior to the establishment of the Convention regime, and had therefore not undergone the same level of risk as a new prospector coming in under the Convention. Consequently, it appeared to several participants that it would be impracticable to implement a site-banking system for polymetallic sulphides and cobalt crusts in the same manner as for polymetallic nodules. It was suggested that, instead of providing the Authority with a reserved area, which the Authority might never be in a position to utilize in any event, another possible option would be to require the contractor to give the Authority, through the Enterprise, the right of first refusal to enter into a joint venture with the contractor, subject to certain specified terms and conditions. It was considered that equity participation in this manner would constitute a mechanism to avoid monopolization and ensure participation by the international community in the development of the common heritage.

13. It was also noted that another significant difference between polymetallic sulphides and cobalt crusts and polymetallic nodules was that, whereas most

deposits of polymetallic nodules occurred in the Area, the vast majority of deposits of polymetallic sulphides and cobalt crusts discovered so far have been found in areas under national jurisdiction. In seeking to develop such resources, the Authority would therefore be in competition with States seeking to develop the same resources in areas under national jurisdiction. These resources may be in shallower water and will be found closer to land, thus reducing the cost of prospecting and exploration. In addition, national regimes for prospecting and exploration may be more favourable to potential investors than the Convention regime, thus making it difficult for the Authority to generate interest in exploration in the Area. In this regard, the workshop recalled that the Convention itself requires the Authority to promote the development of the resources of the Area, which are the common heritage of mankind. The regime for prospecting and exploration for polymetallic sulphides and cobalt crusts in the Area should therefore be such as to encourage prospecting and not such as to discourage long-term investment.

14. Given that, under the Convention, prospecting confers no exclusive rights on the prospector, participants suggested that it would be difficult to envisage a situation where any entity would be willing or able to carry out the work necessary to identify two sites of equal estimated commercial value without some form of legal protection. On the other hand, it was noted that the prospecting regime set out in the Convention and the Regulations places no obligation on the prospector beyond that of notifying the Authority of the broad area or areas in which prospecting is taking place and that the best way for a prospector to protect its interests would be to enter into a contract for exploration at the earliest possible opportunity.

IV. Content of the regulations

15. In general, it is recommended that the regulatory regime for exploration for polymetallic sulphides and cobalt crusts should be as close as possible to that for polymetallic nodules. Nevertheless, a number of adjustments are required in order to reflect the different nature of the resources in question and the different political and economic considerations which apply. The most significant differences in the new regime would relate to prospecting, the size of the area to be allocated to the contractor for exploration, the

application of the site-banking system and the procedure for dealing with overlapping claims. These issues are examined in more detail below.

16. The annex to the present document contains model clauses indicating the main areas in which there would need to be differences between the Regulations for Prospecting and Exploration for Polymetallic Nodules in the Area and any new regulations covering polymetallic sulphides and cobalt crusts. The basic procedures for submitting applications, the rules relating to the qualifications of applicants, the procedures for considering applications in the Legal and Technical Commission and the Council, and most of the standard clauses of exploration contracts would remain the same as in the Regulations for Prospecting and Exploration for Polymetallic Nodules in the Area. For the most part, the Regulations on these matters merely reflect the provisions of the Convention and the Agreement and no substantive adjustments would be necessary to deal with resources of a different nature.

A. Definitions

17. New definitions of the terms “polymetallic sulphides” and “cobalt crusts” would be required. In addition, it is suggested that, for the allocation of areas, a block system should be adopted, and it would be necessary to define a “block” (model clause 1).

B. Prospecting

18. There is no reason why prospecting for sulphides and crusts may not be undertaken simultaneously. The prospecting regime would remain substantially the same as that for polymetallic nodules, except that a new clause could be added to the regulations to prevent prospecting from being undertaken in an area covered by an approved plan of work for exploration for or exploitation of other resources if such prospecting might cause undue interference with activities under such an approved plan of work (model clause 2). Such a provision is intended to give effect to Annex III, article 17, paragraph 2 (d) (ii), of the Convention, as read in conjunction with Annex III, article 16, and article 153, paragraph 6. A contractor for other resources is entitled to security of tenure and the Authority has a duty to ensure no “undue interference”. At the same time, however, Annex III, article 17, of the

Convention, recognizes that some resources can be developed simultaneously.

C. Size of area and relinquishment

19. The size of area to be allocated for exploration will require adjustment because of the different physical characteristics and distributions of crusts and sulphides. It is necessary to address both the size of the area to be allocated to contractors for exploration as well as anti-monopoly provisions. Owing to the geographical distribution of polymetallic sulphide deposits and cobalt crusts, it is not appropriate to allocate broad areas to contractors. It is suggested that the new regulations could be based on a self-selected block system. Each rectangular block, which may be up to 150 square kilometres in size, would be defined by the applicant. The grid or block system is a common feature of offshore oil and gas licensing regimes and should not create difficulties for either the prospective contractor or the Authority. In most national legislation, a grid is established by the licensing authority and the prospective contractor is allowed to apply for a specified number of pre-determined blocks. This would not be feasible in the case of the Area and consequently prospective contractors would be given the flexibility to select the location of blocks.

20. In the case of polymetallic sulphides it is proposed to allocate up to 200 blocks of 150 square kilometres each, or a total of 30,000 sq km to each contractor as the exploration area. It is considered that 150 sq km should be sufficient at any one location, but a potential marine miner may well justify several contiguous blocks in one area and may have several such sites scattered around the ocean. In these days of global positioning system (GPS) navigation, low-cost computers and well-developed, low-cost geographic information systems (GIS) software, it is an easy task to keep track of a large number of claim blocks. Any explorer capable of exploring the deep seabed will be able to handle accurately large numbers of claim blocks without significant overhead costs. In order to protect against the monopolization of a particular area by a single contractor, model clause 3 also provides that no more than 6,000 sq km of the total area may be made up of contiguous blocks. The exploration area would be progressively relinquished over the duration of the contract until, at the end of the 15 years, the contractor would be left with 25 blocks (3,750 sq km)

for exploitation, which need not be made up of contiguous blocks.

21. In the case of cobalt crusts, the initial exploration area would be 6,000 sq km or 40 blocks. Fifty per cent of the initial area would be subject to progressive relinquishment over the duration of the contract for exploration. Subject to further guidance by the Legal and Technical Commission, it is considered that these areas are adequate for effective exploration.

22. The anti-monopoly provision contained in Annex III to the Convention, which is restated in the Regulations,⁵ cannot be applied to sulphides and crusts and, even in the case of nodules, is difficult to apply in practice. On the other hand, it may be noted that under resolution II, pioneer investors were limited to one exploration site each. Subject to further guidance from the Legal and Technical Commission on this issue, it is suggested that the regulations should prevent multiple applications by affiliated applicants in excess of the size limitations referred to above. Model clause 3 provides that applicants are affiliated if they are directly or indirectly, controlling, controlled by or under common control with one another.

23. Other commonly applied methods used to counter monopolistic practices include the application of performance standards through due diligence clauses and the use of a variable exploration fee rather than a fixed fee. While the fixed-fee approach reflected in the Regulations governing polymetallic nodules acts as an incentive to claim the maximum permissible area, a variable fee, based on the size of the area, would operate as an incentive to keep claims as small as possible and would discourage speculative ventures.

D. Site-banking

24. In the light of the discussions in the workshop on the issue of site-banking, model clauses 4 and 6 provide for a system whereby the Authority could be given the opportunity to participate in the development of the resources by achieving equity participation in a mining operation. At the election of the contractor, equity participation would be granted in lieu of contributing a reserved area for the Authority. Equity participation in this manner is a practice which is by no means uncommon in land-based mining and offshore petroleum exploitation operations. The application of such a scheme would give meaning to the parallel

system and would enable the Authority to participate effectively in future exploitation. It would also be consistent with the principles contained in the 1994 Agreement.

25. Each applicant, at the time of submitting an application for approval of a plan of work, would be required to make an election, either to provide a reserved area or, in lieu thereof, to offer to the Authority an equity interest in a joint venture arrangement. Such a joint venture arrangement would commence from the time of exploitation and would be subject to negotiation, based on certain parameters to be set out in the regulations. Such parameters would include a minimum guaranteed equity participation with the opportunity for the Authority to obtain up to a 50 per cent equity participation on the basis of *pari passu* treatment with the applicant.

E. Overlapping claims

26. The regulations governing exploration for polymetallic nodules make no reference to the problem of overlapping claims. It may be recalled that it was not necessary to deal with this issue in the context of polymetallic nodules because all overlapping claims to potential mine sites had in fact been dealt with under resolution II⁶ or by arrangements reached during the Preparatory Commission. Clearly, this would not be the case with polymetallic sulphides and cobalt crusts. In dealing with overlapping claims, the basic principle should be first-come, first-served. However, in the recognition that initial applications may be submitted for overlapping areas, model clause 7 contains a procedure similar to that contained in resolution II for resolving such claims on a fair and equitable basis. It should be noted that the intent of the Convention and the Part XI Implementation Agreement is clearly that the Legal and Technical Commission is a technical body which should not be required to make qualitative decisions between one applicant and another. Consequently, overlapping claims would be approved by the Commission providing they satisfied the technical requirements as prescribed in the regulations. Model clause 7 provides that, in the event of an overlapping claim, the Secretary-General will notify the applicants before the matter is considered by the Council. Each applicant would then have the opportunity to amend its claim. In the event of a conflict, the Council shall determine the area or areas

to be allocated to each applicant on an equitable and non-discriminatory basis. To this could be added a procedure for binding commercial arbitration similar to that contained in paragraph 5 (c) of resolution II.

V. Conclusion

27. The present paper and the model clauses contained in the annex have been prepared as an aid to discussion in the Council of the system to be applied to prospecting and exploration for polymetallic sulphides and cobalt crusts taking into account the nature of the deposits, the status of knowledge of the resources and the need to adopt a market-oriented approach. In giving consideration to the issues raised in the paper, the Council may wish to give appropriate guidance to the Legal and Technical Commission to enable it to formulate draft regulations.

Notes

¹ ISBA/4/A/18; reproduced in *Selected Decisions* 4, p. 64.

² ISBA/4/A/18; reproduced in *Selected Decisions* 6, p. 31.

³ East Pacific Rise, Mid-Atlantic Ridge and Central Indian Ridge.

⁴ Such as the Central Manus Basin and the Mariana Trough.

⁵ Regulation 21, para. 6.

⁶ Final Act, resolution II, para. 5.

Annex

Model clauses for proposed regulations for prospecting and exploration for polymetallic sulphides and cobalt-rich ferromanganese crusts in the Area

Introductory note

The following model clauses indicate the main areas in which there would need to be differences between the Regulations for Prospecting and Exploration for Polymetallic Nodules in the Area and new regulations covering prospecting and exploration for polymetallic sulphides and cobalt crusts. References to the corresponding provisions of the Regulations for Prospecting and Exploration for Polymetallic Nodules in the Area are given in parentheses after the number of the model clause.

Model clause 1 (Regulation 1)

Use of terms and scope

For the purposes of these Regulations:

(a) “block” means the seabed and subsoil of the Area that lies under a grid laid over the surface of the Area constituted by:

- (i) lines running along meridians drawn through each degree of longitude and the minutes or fractions thereof between those degrees; and
- (ii) lines running along parallels drawn through each degree of latitude and the minutes or fractions thereof between those degrees;

(b) “cobalt crusts” means oxidized deposits of cobalt-rich ferromanganese crust formed from direct precipitation of minerals from seawater onto hard substrates containing concentrations of cobalt, manganese, iron, other metals and rare earth elements;

(c) “polymetallic sulphides” means hydrothermally formed deposits of sulphide minerals which contain concentrations of metals including, inter alia, cobalt, copper, lead, nickel, zinc, gold and silver;

Model clause 2 (Regulation 2)

Prospecting

Prospecting shall not be undertaken in an area covered by an approved plan of work for exploration for or exploitation of other resources if such prospecting might cause undue interference with activities under such an approved plan of work.

Model clause 3 (Regulation 15)

Total area covered by the application

1. The area covered by each application for approval of a plan of work for exploration shall be comprised of one or more blocks. Each block shall cover a total area not exceeding 150 square kilometres and shall be defined by a list of coordinates in accordance with the most recent generally accepted international standard used by the Authority.

2. The total area covered by an application for approval of a plan of work for exploration in respect of polymetallic sulphides shall not exceed 200 blocks or 30,000 square kilometres, whichever is less, of which no more than 6,000 square kilometres shall consist of contiguous blocks. For the purposes of this regulation, two blocks that touch at any point shall be considered to be a contiguous block.

3. The total area covered by an application for approval of a plan of work for exploration in respect of cobalt crusts shall not exceed 40 blocks or 6,000 square kilometres, whichever is less.

4. The total area covered by applications by affiliated applicants shall not exceed the limitations set out in paragraphs 2 and 3 of this regulation. For the purposes of this regulation, an applicant is affiliated with another applicant if an applicant is, directly or indirectly, controlling, controlled by or under common control with another applicant.

Model clause 4 (Regulation 15 bis)

Applicant's election of a reserved area contribution or joint venture participation

Each applicant shall, in the application, elect either:

(a) To contribute a reserved area to carry out activities pursuant to Annex III, article 9, of the Convention, in accordance with regulation ...; or

(b) To offer an equity interest in a joint venture arrangement in accordance with regulation ...

Model clause 5 (Regulation 16)

Data and information to be submitted before the designation of a reserved area

Where the applicant elects to contribute a reserved area, the area covered by the application shall be sufficiently large and of sufficient estimated commercial value to allow two mining operations. The applicant shall divide the blocks comprising the application into two groups, which need not be composed of contiguous blocks, of equal estimated commercial value. The area to be allocated to the applicant shall be subject to the provisions of regulation ...

Model clause 6 (Regulation 18 bis)

Joint venture participation

1. Where the applicant elects to offer an equity interest in a joint venture arrangement, it shall submit data and information in accordance with regulation ... The area to be allocated to the applicant shall be subject to the provisions of regulation ...

2. The joint venture arrangement, which shall take effect at the time the applicant applies for a contract for exploitation, shall include the following:

(a) The Enterprise shall obtain a minimum of 20 per cent of the equity participation in the joint venture arrangement on the following basis:

(i) Half of such equity participation shall be obtained without payment, directly or indirectly, to the applicant and shall be treated *pari passu* for all purposes with the equity participation of the applicant;

(ii) The remainder of such equity participation shall be treated *pari passu* for all purposes with the equity participation of the applicant except that the Enterprise shall not receive any profit distribution with respect to such participation until the applicant has recovered its total equity participation in the joint venture arrangement;

(b) Notwithstanding subparagraph (a), the applicant shall nevertheless offer the Enterprise the opportunity to obtain up to 50 per cent of the equity participation in the joint venture arrangement on the basis of *pari passu* treatment with the applicant for all purposes;^a

(c) In the event that the Enterprise elects not to accept 50 per cent of such equity participation, the Enterprise may, notwithstanding subparagraph (a), obtain a lesser per cent on the basis of *pari passu* treatment with the applicant for all purposes for such lesser participation;

(d) Except as specifically provided in the agreement between the applicant and the Enterprise, the Enterprise shall not by reason of its equity participation be otherwise obligated to provide funds or credits or issue guarantees or otherwise accept any financial liability whatsoever for or on behalf of the joint venture arrangement, nor shall the Enterprise be required to subscribe for additional equity participation so as to maintain its proportionate participation in the joint venture arrangement.

Model clause 7 (Regulation 22)

Consideration and approval of plans of work for exploration by the Council

1. The Council shall consider the reports and recommendations of the Commission relating to approval of plans of work for exploration in accordance with paragraphs 11 and 12 of section 3 of the Annex to the Agreement.

2. If the Commission has made recommendations for the approval of applications in the same area or areas by more than one applicant, the Secretary-General shall so notify such applicants and the applicants may, within 45 days of such notification, amend their applications so as to resolve conflicts with respect to such applications. If such conflicts are not resolved within said period, the Council shall determine the area or areas to be allocated to each applicant on an equitable and non-discriminatory basis.

Model clause 8 (Regulation 25)

Size of area and relinquishment

1. In the case of a contract for exploration for polymetallic sulphides, the total number of blocks allocated to the contractor shall not exceed 200. The contractor shall relinquish the blocks allocated to it in accordance with paragraphs 2, 3 and 4 of this regulation.

2. At the end of the fifth year from the date of the contract, the contractor shall relinquish:

(a) 50 per cent of the number of blocks allocated to it; or

^a The terms and conditions upon which such equity participation may be obtained would need to be further elaborated in the regulations.

(b) If 50 per cent of that number of blocks is a whole number and a fraction, the next higher whole number of the blocks.

3. At the end of the tenth year from the date of the contract, the contractor shall relinquish:

(a) An additional 25 per cent of the number of blocks allocated to it; or

(b) If 25 per cent of that number of blocks is a whole number and a fraction, the next higher whole number of the blocks.

4. At the end of the fifteenth year from the date of the contract, or when the contractor applies for exploitation rights, whichever is the earlier, the contractor shall nominate 25 blocks from the remaining number of blocks allocated to it, which shall be retained by the contractor. The remaining blocks shall be relinquished.

5. In the case of a contract for exploration for cobalt crusts, the total number of blocks allocated to the contractor shall not exceed 40. The contractor shall relinquish the blocks allocated to it in accordance with paragraphs 6, 7 and 8 of this regulation.

6. At the end of the third year from the date of the contract, the contractor shall relinquish:

(a) 20 per cent of the number of blocks allocated to it; or

(b) If 20 per cent of that number of blocks is a whole number and a fraction, the next higher whole number of the blocks.

7. At the end of the fifth year from the date of the contract, the contractor shall relinquish:

(a) An additional 10 per cent of the number of blocks allocated to it; or

(b) If 10 per cent of that number of blocks is a whole number and a fraction, the next higher whole number of the blocks.

8. At the end of the eighth year from the date of the contract, the contractor shall relinquish an additional 20 per cent of the number of blocks allocated to it or such larger amount as would exceed the exploitation area decided upon by the Authority.

9. Relinquished blocks shall revert to the Area.

10. The Council may, at the request of the contractor, and on the recommendation of the Commission, in exceptional circumstances, defer the schedule of relinquishment. Such exceptional circumstances shall be determined by the Council and shall include, inter alia, consideration of prevailing economic circumstances or other unforeseen exceptional circumstances arising in connection with the operational activities of the Contractor.