

**Deep Seabed Mining
Payment Regime Workshop #2
December 1-2, 2016
Workshop Summary**

The Deep Seabed Mining Payment Regime Workshop #2 took place December 1-2, 2016 in London at the Berwin Leighton Paisner (BLP) Offices. The Payment Regime Workshop series is focused on exploring the key elements of an International Seabed Authority (ISA) payment mechanism and the broader financial regulations that would apply to exploitation contracts for polymetallic nodules. At Payment Regime Workshop #2, participants focused on the financial aspects of deep seabed mining (DSM) in the Area and worked to build a common understanding of the variables in a financial model, identified variations in operating models across the contractor base, and identified unknowns and sensitivities in financial modeling. The workshop primarily engaged parties holding exploration contracts for polymetallic nodules with the ISA and individual experts who have been engaged in ongoing payment regime development deliberations, including some ISA Legal and Technical Commission (LTC) members. A participant list is included in [Appendix A](#). Action items identified during the workshop and confirmed by the Steering Committee following the workshop to advance the group's efforts are included in [Appendix B](#).

DSM Payment Regime Developments to Date

Timelines and Key Milestones in 2017

Michael Lodge, ISA, provided an overview of some key milestones for the ISA in 2017. He noted that the first priority for 2017 was to develop the Exploitation Code. The Zero Draft of the Exploitation Code, released in July 2016, addressed the exploitation application process and content, the basic rights and duties of contract holders, and the standards of the contract. Forty-five comments on the draft were submitted during stakeholder consultation following its release. In 2017, the ISA will review the comments received, submit the document for legal review, and revise the document. Environmental regulations for exploitation were not included in the Zero Draft, and instead will be developed separately this year. Mr. Lodge highlighted the following timeline for 2017:

- February:
 - Share Zero Draft Environmental Regulations broadly for stakeholder consultation (will be shared earlier with LTC in preparation for February meeting)
 - Release the First Draft of the Exploitation Code
- March 19-24: Environmental Workshop in Berlin
- Late April/Early May: Payment Regime Workshop #3
- By August Council meeting: Share full financial package, including Environmental Regulations and Exploitation Code
- Ongoing: Develop discussion papers on outstanding issues (e.g., responsibility for compliance and liability for damage)

Review of Payment Regime Workshop #1

Chris Brown reviewed the discussions and outcomes of Payment Regime Workshop #1, held in May 2016 in San Diego, California. The Workshop focused on advancing a payment mechanism for exploitation activities in the Area and explored issues related to the environmental aspects of DSM in the context of a payment mechanism. He also noted the group briefly explored the issue of inter-generational equity which may need further discussion. Early years of a financial regime should aim for stability, certainty,

and predictability. While the overall goal is to develop a financial package that reflects the environmental responsibilities of contractors and other actors and reduces the likelihood or magnitude of damage in a cost-effective way and generates financial and other economic benefits derived from activities in the Area. Possible policy approaches and instruments to achieve this discussed at the first workshop included regulation, environmental fees, responsibility and liability, insurance or bonds, and funds, such as an environmental liability trust fund or seabed sustainability fund. Participants identified a possible transitional approach that included economic incentives to attract investment, low-cost administration, an ad valorem royalty approach that starts low and increases over time, administrative costs plus a fixed fee, and alternative approaches such as rent models. A full summary of Workshop #1 is available on the [RESOLVE website](#). Brown's presentation is available [online](#).

Participants discussed and reflected on the outcomes of Payment Regime Workshop #1. One participant highlighted the importance of separating the regulatory and licensing roles to avoid conflicts of interest and promote safe operations, however, it was noted the operational framework of the ISA is bound by the United Nations Convention on the Law of the Sea (UNCLOS or the Convention). In this system, the ISA serves in the supervisory, regulatory, and licensing roles. The LTC makes recommendations to the Council. While related, these are separate entities. In addition, the Enterprise was identified in the Convention as the entity that could be activated to participate in exploitation; however it has not been activated.

In considering the business model for DSM, participants highlighted the information important for investors, such as the impacts of regulations on investment risk and plans for the allocation of funds going to the ISA and for equitable sharing, taking into particular consideration the interests and needs of the developing States. One participant noted funds going to the ISA for equitable sharing would be distributed first to cover administration costs, and then distributed according to equitable sharing criteria taking into particular consideration the interests and needs of the developing States. The regulations will define how funds are distributed.

Cost Components of a Financial Model: Overview

Participants then reviewed and discussed the objectives and cost components of a financial model and key cost drivers.

The identified objectives of developing a financial model included:

- The standardization of variables to support consistency in the use of terms among parties, particularly those variables relevant to support the development of ISA financial rules;
- A focus on objective variables rather than absolute numbers and outputs;
- A total cost approach that explores the known and unknown sources of costs, including costs coming from regulatory compliance;
- Increased understanding, and consensus where possible, of key metrics and key cost drivers such as project phases (pre-feasibility, feasibility, construction), mine life, nodule content, and metal extraction scenarios;
- An increased understanding of the value chain and interdependencies between collection and processing;
- Clear, unambiguous rules and their application to facilitate industry development and access to funding, as well as a clearer understanding of the regulatory rules and principles for all stakeholders; and,
- Support for the development of substantive deliverables and to provide financial and other economic benefits derived from activities in the Area for equitable sharing.

Participants then reviewed a document outlining the cost components of a financial model, shared in advance of the workshop, highlighting the overarching cost drivers, including pre-feasibility components, feasibility components, timelines, mine life, collection, content, metal scenarios, transport and processing, financing, unknowns, key project or business metrics, and issues related to the definition of financial and other economic benefits derived from activities in the Area. The document was developed as a tool to support building a shared understanding of the key cost, economic, and risk components of a financial model and will be updated as consensus grows around the definition of specific terms. An updated version of the document is available [online](#).

During discussion of the cost components, participants noted contractors go through pre-feasibility, feasibility, and construction phases prior to beginning exploitation as stated in the Reporting standard of the ISA for mineral exploration results assessments, mineral resources and mineral reserves (ISBA/21/LTC/15, Annex V). While the exact analyses during each of these phases are somewhat different, participants indicated the pre-feasibility phase tends to be focused on confirming DSM is technically possible following a desktop study, and typically spans two to three years. The feasibility phase is focused on the economic, technical, environmental, regulatory and social viability of a project and typically spans three to four years. Individual contractors' feasibility studies often include component and pilot mine/processing testing. These phases are typically sequential rather than simultaneous. Contractors indicated the exploitation code, including the environmental regulations, would need to be in place prior to starting the feasibility stage, so they can understand the regulatory costs and associated environmental requirements of exploitation.

Participants also discussed the role of the exploration licensing timeline in reducing risk and increasing confidence for contractors, investors, and the LTC. Given the significant risk of premium built into securing investment funding, contractors require confidence they will receive a license before making the investments required for the feasibility stage; ideally they would have an exploitation license awarded before beginning the feasibility stage. The LTC wants confidence that a contractor will be successful before awarding a license, so information about the technical, environmental, and financial analyses from the contractor may be requested in the application. One participant noted that in some situations, such as in Norway's oil industry, a feasibility phase is included in the production license; if the feasibility phase is successful, a contractor has confidence it will be able to move forward towards exploitation.

During the discussion several questions related to timelines were highlighted for future discussion, including: At what point in the pre-exploitation process is a license awarded? How does the timing for awarding a license fit with contractor feasibility and construction phases and associated investments? At what stage does a contractor need to submit an Environmental Impact Assessment (EIA), and when would they have information needed for an EIA?

Cost Components of a Financial Model: Capital Expense (CAPEX) Variables

Norm Kaneshiro, UK Seabed Resources (UKSR), provided an overview of expected categories of DSM contractor capital expenditures. He noted that the mining system, ore transfer, and processing are expected to be the highest categories of CAPEX for a contractor. A study by Sharma (2011)¹, estimated these categories make up 29%, 32%, and 39% respectively of the CAPEX, however, some participants suggested processing could be as much as 50% of the CAPEX cost. ISA regulatory requirements for

¹ Rahul Sharma, Deep-sea mining: economic, technical, technological and environmental considerations for sustainable development, *Marine Technology Society Journal*, vol.45(5); 2011; 28-41.

sensors, on board ship berths and space requirements, and home office space requirements are currently unknown potential impacts on CAPEX. Regarding cost estimates for CAPEX, three or four different classes of estimates were presented: Order of Magnitude; Pre-Feasibility; Feasibility; and Detailed, with Order of Magnitude estimates having the largest margin of error and used in the very early phases of assessing project viability and detailed estimates having the lowest margin of error and used in the later phases when engineering is underway. Kaneshiro's full presentation and resources referenced during the presentation are available [online](#).

Participants discussed the processing needs and costs, and noted that costs will be higher initially, when new, expensive processing plants would need to be constructed, given the complex minerology of polymetallic nodules and the fact that existing plants are not suitable for processing such polymetallic ore in an economically sustainable fashion. While the processing plant could be operated by a contractor or a separate entity, the construction costs impact the overall financial model. The location of a processing plant and costs associated with moving material to and from the plant also impacts the overall financial model. Once a market is established and other entities develop processing plants, the processing costs could decrease. In response to a question regarding construction timelines, one participant noted collection and processing infrastructure could be built concurrently after successful pilot tests onshore and offshore.

Cost Components of a Financial Model: Operational Expense (OPEX) Variables

Kris Van Nijen, Global Sea Mineral Resources (GSR), provided an overview of categories of OPEX variables, which includes both operational and technical aspects of collecting the nodules at sea and transferring ore to processing plants on land. Operational aspects such as environmental conditions, the mining path and system dynamics, crewing and logistics, and spares and fuel supply, as well as technical aspects such as the mining vessel, slurry dewatering, hopper loading and self-unloading systems, riser design, slurry transport, umbilical handling system, and waste water return affect the overall OPEX. OPEX may also include a site office, financing costs for operations, insurance, taxes or royalties, port fees, import duties, financial payment for the ISA, safety and emergency services, and production guarantees.

Expenses differ for owned and chartered vessels. Contractors may own some vessels, such as the mining and crew vessels, and charter some others, such as the bulk carrier used to transfer ore or the offshore supply vessel. Expenses for vessels a company owns may include maintenance and repair, crewing, insurance, fuel and lubricants, and environmental monitoring, among others. Chartered vessels may only incur expenses for the charter rate and fuel and lubricants.

Principles of availability are also important to consider when calculating OPEX. Calculated for each major component defined, this accounts for delays to operation, due to system failures or system recovery (planned maintenance), which may affect the overall OPEX.

With a clear understanding of the spectrum of operational and technical needs for exploitation, and consideration of principles of availability, it is possible to identify a cost for each component, which leads to an overall picture of operating expenses. Van Nijen's full presentation is available [online](#).

During the discussion about OPEX, participants highlighted both the interdependency of CAPEX and OPEX and those expenditures with regulations. For example, if the ISA were to require that a company have 6 high-speed vessels for crew transport, it would have an impact on both the capital and operational expenditures.

In response to a question about the OPEX categories, participants did not identify any different or additional categories. One participant noted the nodule abundance and speed and width of the collector affect both CAPEX and OPEX; in turn these affect the size and number of collectors required to achieve the target tonnage.

In response to a question regarding the probability of error in expenditure estimates, participants highlighted the higher risk of error when estimating expenditures with a large number of variables, but noted estimates have a lower probability of error as a company moves from pre-feasibility to feasibility and construction.

During the discussion, several participants highlighted the value of discussing issues, such as CHM and intergenerational equity, important to a broader group of stakeholders, and how they relate to the payment regime and the requirements of the Law of the Sea Convention, which does not define CHM and does not mention inter-generational equity. Participants suggested that for a payment regime to be accepted, the support of a broad group of stakeholders may be needed.

Cost Components of a Financial Model: Revenue

Robert Heydon, Nauru Ocean Resources, Inc., provided an overview of revenue considerations, including production rates, ore value, and metal pricing. Regarding production rates, Heydon noted contractors set production rates to cover their required rate of return. Operating, technical, and market forces will also impact the production rates. Different contractors will have different production rates, depending on their technology and cost profiles. Echoing comments from earlier presentations, Heydon suggested onshore processing would be a major direct or indirect cost for contractors and vary greatly depending on location.

In addition, processing costs are higher for the polymetallic nodules from DSM than for land-based sulphide ores. Processing nodules recovered from DSM involves a complex and expensive physical separation process; any rates applied to DSM products should be reflective of the complex processing requirements and transfer costs. One participant suggested that while the convention states the royalty rates for DSM products should be in the range of rates for terrestrial rates, the rates cannot be copied because the process for upgrading the ore from the polymetallic nodules is, at least in an earlier stage, more difficult and expensive. Reflecting on the discussions at Payment Regime Workshop #1, Heydon supported an ad valorem royalty rate applied to the value of ore when transferred from the production vessel to the bulk carrier, as well as an initially light royalty to incentivize contractors that transitions into a potentially full royalty.

Heydon also discussed metal price forecasting as a tool to develop a revenue estimate for the financial model, and highlighted several challenges in setting a royalty rate and outstanding questions. Heydon noted metal prices change quickly and frequently, presenting a challenge when determining the appropriate royalty rate. In addition, each operator will receive different metal prices because they are producing different products. Heydon recommended setting a royalty rate based on a pre-agreed basket of constituent metals rather than individual operator revenue for their specific end-products. Discussing different approaches to pricing (spot, long term, short term), several participants suggested using a scientific, objective method, such as a time series approach or a Monte Carlo method for forecasting metal prices. Heydon's full presentation is available [online](#).

One of the biggest outstanding questions related to setting a royalty rate is determining which constituent metals to include when setting the value for the ore. There was general agreement that using

a “basket approach,” or valuing ore based on the value of the minerals it contains, would be an appropriate method for setting royalty rates. While copper, manganese, nickel, and cobalt are common metals in the ore, polymetallic nodules also contain other metals which may have value but could be more expensive to recover. Participants discussed different options within a basket approach:

- Which metals are included in the basket?
 - All metals in the ore;
 - A specific number of metals in the ore, determined by abundance (e.g., the three, four, or five most common metals); or
 - A specific number of metals in the ore, determined by value.
- How is the rate on those metals determined?
 - The rate is determined based on a percentage of the six-monthly London Metal Exchange (note: not all metals are traded on the LME) average for those metals included in the basket;
 - A specific, fixed price is set for elements without commercial value; or
 - A third party is employed by the ISA to develop an approach for forecasting metal prices.

Over the course of the workshop, methods for valuing ore and forecasting metal prices were discussed several times. Related discussions throughout workshop are summarized below.

- Location: In addition to discussing the methodology for valuing ore, participants also discussed the relevance of the location to valuing ore. Once ore leaves the Area, ISA jurisdiction is limited. In addition, it becomes difficult to trace ore to the processing plant. Therefore, one participant suggested valuing ore based on the quantity of material as it moves from the collection point to the ore transfer stage.
- Flexibility and Incentives: Reflecting on the basket approach to valuing ore and the question of which metals to use to set the value, several participants expressed support for a method of valuing ore that gives processing plant operators the flexibility to make decisions about managing the metals according to their business models. Others suggested an approach that would provide an important incentive to recover all metals in the ore and reduce waste if economically feasible.
- Stability: Payment regime and royalty rates could change over time, as the market and technology changes. Participants suggested, as per LOSC, Annex III, Section 8, Art 13 (e), it would be problematic for contractors if the payment regime changed during a license, however different systems could be implemented for consecutive contractors applying at different times.
- Standardized Metal Pricing Approach: Contractor companies each have their own proprietary method to forecast metal pricing and predict revenue. However, to develop a shared financial model to support efforts to set royalty rates, it would be helpful to have a shared, standardized approach, ideally defined by ISA, to project metal prices and revenue.
- CHM and Changing the Payment Regime: Some stakeholders have expressed concern around “an appropriate return to CHM” given potential changes in the market. Stakeholders have asked whether a payment regime would change if a metal not included in the valuation basket becomes more valuable after the regime is established, leading to high profits for industry, but no change in the royalty payments to CHM. It must be noted that “presence” of a certain metal, does not equal “value” as it may be economically impossible to extract the metal. It must also be noted that the LOSC/IA do not provide for either “an appropriate return to CHM” or “payments to the CHM,” but for the “equitable sharing of financial and other benefits.” These are not identical.

Other Components of Financial Model: Financing

Peter Jantzen, Capital Power Management, Ltd., provided an overview of other financing-related components of a financial model for DSM, including the weighted average cost of capital (WACC), internal

rate of return (IRR), net present value (NPV), and the different factors investors consider around financing DSM activities. Jantzen noted investors ask the following questions when considering whether to invest in a project: how much is needed; what is the risk; what is my return; and when can I get out of the project. Investors use tools such as WACC, IRR, and NPV to evaluate a financial investment. Jantzen also discussed the differences between financing in the pre-feasibility, feasibility, and construction phases of development. Investors require much higher rates of return on the earlier phases, when risk is higher. For example, an investor might want 20-40 times their investment in the pre-feasibility phase versus 10-20 times their investment in the feasibility phase. The financing costs for the pre-feasibility, feasibility, and construction phase should be taken into account in financial modeling. Jantzen's full presentation is available [online](#).

Following the presentation, participants discussed additional considerations related to financing costs included in financial models. One participant noted financing costs and considerations are different for state contractors and their subcontractors. In some circumstances, a state government will sponsor initial research that would typically take place in the pre-feasibility or feasibility phase. That data and research will then be given to private sector companies to use in their activities.

Discussing the challenges for obtaining financing for DSM, participants indicated DSM often does not fit within investor portfolios (e.g., they may fund land-based mining but not have a mandate for water-based activities) and there is a high amount of risk, particularly due to the lack of clear regulations, the lack of certainty about the tonnage of the deposit, and the first-of-a-kind effort involved in creating an end-to-end collection and processing solution. Participants discussed the following terms adopted by the ISA reporting standard (ISBA/21/LTC/15) and used to describe the increasing level of confidence around the amount of resource that exists:

- Inferred resource: estimate of material that exists based on historical, public, and private data, not necessarily of economic interest;
- Indicated resource: estimate of material that exists based on exploration results which is potentially valuable, or for which reasonable prospects exist for economic extraction;
- Measured resource: a calculation of the material that exists;
- Probable reserve: the amount of material that could economically be brought to the surface following a set of regulations, environmental and social permits;
- Proved reserve: the amount of material that is proven, based on feasibility studies, pilot mining/processing tests and following a set of regulations, environmental and social permits;

Classification is governed by statutes, regulations and industry best practice norms. There are several classification schemes worldwide, however the Canadian Institute of Mining, Metallurgy, and Petroleum classification, the Australian Joint Ore Reserve Committee Code, and the South African Code for the Reporting of Mineral Resources and the Mineral Reserves are the general standards. Modifying factors that impact the size of the reserve, (e.g., environmental regulations, the time frame for the exploitation license, the size of the area a contractor is awarded under an exploitation license) impact investor considerations and the financial model.

Participants also discussed the different instruments that could be used for environmental regulation, such as incentive based instruments or direct regulations. Incentive based instruments, such as transferrable habitat credits or offsets, allow regulators to set a target and gives the industry flexibility in how the target is met. These instruments can be effective and efficient. Direct regulations, sometimes called "command and control," can also be effective.

Financial Model: ISA and Sponsoring State Components

LTC member Harald Brekke provided an overview of potential additional components of the financial model, related to ISA and sponsoring state costs, such as fees, bonds, or royalties. Brekke described the basic breakdown for contractor royalty payments and contributions, indicating that after ISA administrative costs are deducted, the remainder of the payments and contributions would be allocated towards payments to state parties and economic assistance funds.

ISA components of fees might include an exploration license application fee, an exploration annual fee, an exploitation application fee, and exploitation annual fee, an acreage fee, and an inspectorate fee. The acreage fee, which could be a fee for the portion of the exploitation award that goes unused, could serve as a mechanism to encourage contractors to operate rather than hold an unused license for an area. The fee is not yet included in the exploitation regulations and needs further discussion. Funds and bonds could include the environmental liability trust fund, the seabed sustainability fund, an environmental bond, and an economic assistance fund that would be covered by the royalty. Participants discussed the suggested funds identified in the presentation, noting that the ISA could also combine them into one fund and divide that fund to address the various identified needs particularly those needs which may evolve over time (e.g., total cost approach from a contractor's perspective and according to LOSC, Annex III, Section 8, Art. (c), stating the payment system should not be complicated). The presence of multiple funds could appear as a risk to investors.

Sponsoring State components not affected by ISA regulations could include a corporate tax rate, insurance, and environmental bonds or funds. There may also be Sponsoring State-related costs associated with the ISA regulations, such as costs to adopt laws to ensure compliance with ISA regulations or costs associated with monitoring and inspections.

Highlighting the responsibility regarding the financial and other economic benefits to be derived from activities in the area, Brekke asked whether the payments mechanism included compensation for all elements in the nodules, rather than the three-five most common elements, and whether the payments and royalties would cover the whole value of the resource in full. One idea the group explored was to apply one rate for the common elements and another to catch all the other items.

In response to the discussion of benefits, one participant highlighted the question of how to present the benefit of using a resource when some stakeholders see a benefit in preserving the resource for future generations. Members of the group noted positive externalities of DSM which may include: 1) bringing the constituent metals into circulation for future generations through recycling; 2) providing payments for developing and land-locked countries; and 3) a step change in deep sea research conducted or funded by industry. One participant suggested another benefit could be future refining the waste products (tailings) into additional materials. Brekke's full presentation is available [online](#).

Following the presentation, participants discussed the potential acreage fee, expressing concerns about how that fee would interact with contractor plans to conduct feasibility studies at the start of an exploitation license and a contractor's mining plan. Participants also highlighted a need for further discussion related to the size of an area licensed for exploration as compared to the size of an area licensed for exploitation, how the size of an area licensed for exploitation would be determined and vary among contractors, and how conservation areas within areas identified for exploitation would be identified. Specific issues, such as seamounts in an exploitation area award, could limit the amount of mining possible; participants suggested potential acreage penalties should not include areas that cannot be mined (e.g., seamounts).

Moving Towards a Financial Model

Participants wrapped up the meeting discussing next steps required to advance the discussion around the financial model and ultimately to develop a payment regime. They identified the following discussions and activities:

- Share details about financing and the cost components with a broader group of stakeholders to help everyone understand the complexity and risk for contractors, and that a first mover advantage is needed because DSM is expensive, complex, and requires investors with considerable patience
- Make a set of general principles, parameters, and constraints available to help guide a discussion around payment regime.
- Share details about ISA administrative costs, so stakeholders (including industry) understand ISA needs and how they will use funds raised through the payment regime.
- Develop and share a financial model in advance of a workshop with a broader group of stakeholders to enable concrete and productive discussions.
- Discuss what information contractors might need to make their case to a broader group of stakeholders.

Participants emphasized the value of having a financial model that the LTC, industry, and other stakeholders can trust, reflects the financial situation for contractors accurately, and can help advance the discussion about a payment regime. The financial model will eventually need to include estimated numbers for the various cost components to help the LTC understand the financial situation for contractors (taking into account differences amongst contractors' approaches), and the implications of different royalty rate and regulation scenarios, in order to help the LTC make decisions about the payment regime. However, it will be difficult for contractors to share specific numbers given the proprietary, and commercially sensitive, nature of the information, as well as potential anti-trust aspects. Rather than one number for each component, the model could include ranges; this would allow a financial model to reflect the variability in operating and processing costs and product revenue for different contractors and protect contractor confidentiality. If contractors are unable to share information of a proprietary and commercially sensitive nature, numbers for the different cost components could be identified through published data. Alternatively, a third-party firm could compile data from the contractors for the model while taking steps to keep the information confidential or the models could be developed using representative data; industry could review and give input on the accuracy of the data.

Participants discussed the timing for developing the exploitation code and how it aligns with contractor information needs. Participants expect exploitation licenses will be awarded following the five-year extension of exploration licenses, which began in 2016. Three years before exploitation licenses are available, contractors will need to understand what information is needed for the exploitation application, as well as the exploitation code, environmental code, royalty rates and fees, and what they will be applying for. This will help contractors understand the financial planning, research, and business needs for operation.

Discussing the process for identifying the royalty rate, participants expressed an interest in working towards a mutual gains solution and moving forward to avoid repeating the situation from the 1970s and 1980s when companies tried to start DSM but dropped out because the regulatory system was developed slowly and too costly. In response to a suggestion to identify a fair royalty rate, participants indicated a "fair" royalty rate changes based on the industry, timing, and member states. One participant suggested reviewing Technical Study #11, which includes research on effective tax rates.

Next Steps

The group briefly discussed possible next steps and provided a broad outline of ideas but ultimately felt the Payment Regime Workshop #2 Steering Committee should reflect on the results of the conversations and identify the next steps in light of planning efforts for the third workshop. The Steering Committee subsequently met on December 13 and the actions items from the call were distributed to all the Workshop participants (see [Appendix B](#)).

Appendix A: Attendance

- **Pater Balaz**, Interoceanmetal Joint Organization
- **Maya Breitburg-Smith**, RESOLVE
- **Harald Brekke**, Norwegian Petroleum Directorate
- **Chris Brown**
- **Paul De Morgan**, RESOLVE
- **Robert Heydon**, Nauru Ocean Resources Inc.
- **Peter Jantzen**, Capital Power Management, Ltd (UK)
- **Norman Kaneshiro**, UK Seabed Resources
- **Michael Lodge**, International Seabed Authority
- **Kurt Machetanz**, LBEG
- **Pedro Madureira**, EMEPC
- **Aziz Merchant**, Keppel Offshore & Marine Technology Centre and Ocean Mineral Singapore
- **Conn Nugent**, Pew Charitable Trusts
- **Petero Okotai**, Cook Islands Investment Corporation
- **John Parianos**, Tonga Offshore Mining Limited
- **Anthony Rogers**, Pew Charitable Trusts
- **Carsten Rühlemann**, Federal Institute for Geosciences and Natural Resources (BGR)
- **Dale Squires**, UCSD Economics
- **John Stevens**, UK Seabed Resources Ltd.
- **Kris van Nijen**, Global Sea Mineral Resources
- **Philomene Verlaan**, University of Hawaii
- **Xiangxin Xu**, COMRA

Appendix B: Action Items

I. Payment Regime Workshop #2 (PRW #2) – Follow-up

Action Items	Who	To be Completed by
1. Circulate action items to all participants	RESOLVE	Friday, Dec. 16
2. Discuss approach to developing PRW #2 summary	RESOLVE, Dale S.	Friday, Dec. 16
3. Circulate PRW #2 summary to workshop attendees for review and comment	RESOLVE	Friday, Dec. 23
4. Submit comments on summary	Workshop Participants	Friday, Jan. 6
5. Finalize summary and post on website	RESOLVE	Friday, Jan. 13

II. Financial Model Development

Action Items	Who	To be Completed by
1. Reorganize and revise glossary of components of a financial model	Norm K., John S., Kris V.	Friday, Dec. 23
2. Share plan for developing ‘skeleton’ financial model (and approach to populating with contractor information as possible)	Norm K., John S., Kris V.	January Steering Committee call
3. Share plan for developing revenue forecasting models (using different scenarios to identify range of possible outcomes)	Peter J., Norm K., Dale S., Kris V.	January Steering Committee call
4. Share update on ability to hire independent consultant to help review contractor results and develop “range of numbers” for financial model	Michael L.	January Steering Committee call
5. Share update on development of cost estimate for ISA operations once exploitation is underway	Michael L.	January Steering Committee call
6. Share update on next steps for development of metal pricing forecast model	Michael L.	January Steering Committee call
7. Develop task schedule and responsibilities chart for model development	Steering Committee	Post January Steering Committee call

III. Planning for Payment Regime Workshop #3 (PRW #3)

Action Items	Who	To be Completed by
1. Schedule Steering Committee call in early/mid-January	RESOLVE	Wednesday, Dec. 21
2. Share list of potential participants from the environmental community (and their locations)	Conn N., Anthony R.	Friday, Dec. 23
3. Circulate draft agenda	RESOLVE, Chris B.	Friday, Dec. 23