Financial Model Updates Polymetallic Nodules

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Agenda

- Review of stakeholder feedback

- Model updates in response to feedback

- Identification of candidate payment systems and rates

- Analysis of relevant systems

Review of Stakeholder Feedback

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- Objective, framing, or scope of analytical approach
- Scope of systems to be considered
  - Basis of systems
  - Ultimate manganese product and basis of ad-valorem payments
- Fundamental modeling changes
  - Rate and scale of collection
  - Production start up
  - Metallurgical processing efficiency
- Sensitivity
  - Selection of target system return
  - Cost assumptions
  - Materials Prices
  - Taxes
  - Rate and level of collection of payments to environmental fund

Review of Stakeholder Feedback:
Objective, framing, or scope of analytical approach

- Explicit monetary exchanges among the directly involved stakeholders
  - Collector, metals processor, supply chain providers, ISA, sponsoring state
  - Does not consider externality costs – outside of scope
- Revenue to the ISA now prime focus of the analysis
  - Other secondary metrics considered:
    - Effective Tax Rates
    - Contractor IRR's
- Payment system should not unfairly subsidize (or disincentivize) seabed mining relative to land-based mining operations

Review of Stakeholder Feedback:
Scope systems to be considered

- Payment system basis
  - Outcome of last open-ended working group meeting was further refinement of two options
    - **two stage fixed ad-valorem**
    - **variable-rate ad-valorem**
  - Noted that all options, including profit-based systems, are still on-table

- Ultimate manganese product (plus 3 metals) used in:
  - Cost & Revenue Calculations
  - Basis of ad-valorem payments

- Product Systems Considered:
  - Four metal system
    - All cash flows, including revenues, costs, and royalty payments, based on producing four metals
    - (cobalt, copper, nickel and a basket of manganese metal and metal alloys)
  - Three metals system plus a manganese-rich slag (MRS)
    - All costs and revenues based on three metals plus MRS
    - Two options for calculation of royalty payment:
      - Royalties based on value of four contained metals (Metal Value)
      - Royalties based on value of three metals plus a manganese-rich slag (MRS Value)

Review of Stakeholder Feedback:
Fundamental modeling changes

- Rate and scale of collection
  - Previously analysis assumed extracted of 3 million dry tons of nodules per year
  - Stakeholder feedback about actual abundance and speed and size of collector – 2.3 million dry tons of nodules per year more reasonable for single collector
- Production start-up
  - Stakeholder feedback that ramp to full production would take longer
- Expected future price uncertainty
  - Stakeholder feedback that future price uncertainty was larger than previously considered
- Efficiency of metal recovery
  - Stakeholder feedback that metals recovery efficiencies should be lower

Review of Stakeholder Feedback:
Sensitivity to modeling assumptions

- Selection of target system return
  - Stakeholder requested that we examine 12%, 16%, and 20% IRR's for the contractor
  - Focus of work changed to ISA revenues.
    - However, we examined a wide enough range of ISA revenue scenarios to include those returns to the contractor
- Cost assumptions
  - Stakeholders requested analysis with costs +/-20% of base case
- Material prices
  - Stakeholders requested analysis with prices +/- 20% of base case
- Sponsoring state tax rate
  - Stakeholders requested analysis at three levels for the sponsoring state tax rate
    - 0%, 15%, and 25% marginal rate
- Rate of level of collection of payments to environmental fund
  - Stakeholders asked to evaluate cases where fund fills more rapidly

Model Updates in Response to Feedback

Modeling Updates in Response to Feedback:
Rate and Scale of Collection

Feedback: 3M dtpa not consistent with 1 collector (capability = 2.3M dtpa)

- Added explicit consideration of abundance distribution & collector speed to determine collection rate

- Factors that determine average abundance across collected area
  - Abundance distribution: Mean of 7.2 wet kg/m2 with a standard deviation of 6.1 wet kg/m2[1]
  - Number of collectors: Base case assumed two collectors (from two surface vessels)
  - Area that can be covered by collector over license period (including PRZs and IRZs), Adjusted for topology and other efficiencies

Resulting modeling assumptions
  - Average abundance modeled = 10.9 kg/m2 (over lifetime of the exploitation activities)
  - **Average annual collection = 3.86 million dry tonnes per year**

1) International Seabed Authority. A Geological Model of Polymetallic Nodule Deposits in the Clarion-Clipperton Fracture Zone and Prospector's Guide for Polymetallic Nodule Deposits in the Clarion Clipperton Fracture Zone. Technical Study: No. 6. 2010.

Modeling Response to Comments:
Project timing, price uncertainty & metals recovery

- Project Timing:

		Start Year in Exploitation Contract	End Year
	Prefeasibility	Before exploitation contract	
	Feasibility	1	1
	Construction (Design & Build)	2	5
	Production (Ramp-Up)	6	7
	Commercial production	8	30
	Closure	See note in text	

- Production Ramp-up:
  - Collector collects 70% in year 1 and 85% in year 2, 100% of capacity thereafter
- Expected future price uncertainty
  - Re-evaluated based on current data on historic prices
- Efficiency of metal recovery
  - Updated to be 90% for manganese, nickel, and copper and 80% for cobalt

Identification of Candidate Payment Systems and Rates

System configurations analyzed

- Based on stakeholder comments and previous analyses, the research team has limited analysis in this report to

  - 1) a two-stage ad-valorem system (2AV),

  - 2) a metal price-based, variable-rate ad-valorem (VaV), and

  - 3) a blended system that combines a fixed ad-valorem through mining operations and a profit-based payment that begins in year 5 of operations

- To accommodate stakeholder requests, we analyze three levels of sponsoring state tax rate

Identification of Candidate Payment Systems

- We analyzed a broad range of system configurations
- We attempted to identify systems that met the following criteria
  - **Ad-valorem rates: 2 – 10% of value**
  - **Effective tax rate: 40 – 65%**

- To respond to stakeholder questions, we include contractor returns for informational purposes

Analysis of Relevant Systems

Analysis of Relevant Systems: Four Metal Assumptions
ISA Cumulative Revenue for a range of systems

Range of "Reasonableness"

- ISA Revenues should be at least **$3 billion** otherwise the Effective Tax Rate would be below 40%

- ISA Revenues should not exceed **$8 billion** otherwise the equivalent royalty rate would exceed 10%

Analysis of Relevant Systems: Four Metal Assumptions
Rates & Metrics for 3 Different ISA Revenue Levels

System	Median ISA Revenue ($M)	Effective Tax Rate	Equivalent Fixed Ad-valorem Rate	Collector Rate of Return
$3.0 billion Options				
Two Stage Ad Valorem: 2% → 4%	3,030	40%	3.7%	18%
Ad Valorem & Profit: 1% AV & 14% on Profits	3,030	40%	3.7%	18.2%
Variable Ad Valorem: 2% → between 3% & 7%	3,050	41%	3.7%	18%

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$4.5 billion Options				
Two Stage Ad Valorem: 2% → 6%	4,440	45%	5.4%	17.7%
Ad Valorem & Profit: 2% AV & 18.5% on Profits	4,430	45%	5.4%	17.8%
Variable Ad Valorem: 2% → between 5% & 9%	4,460	46%	5.5%	17.7%

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Variable Ad Valorem: 2% → between 5% & 9%	4,460	46%	5.5%	17.7%
$6 billion Options				
Two Stage Ad Valorem: 2% → 8.25%	6,000	50%	7.4%	17.3%
Ad Valorem & Profit: 2% AV & 28% on Profits	5,990	50%	7.4%	17.5%
Variable Ad Valorem: 2% → between 7% & 14%	6,000	52%	7.4%	17.3%

Analysis of Relevant Systems: Four Metal Assumptions
Impact of Future Price Conditions on Each System
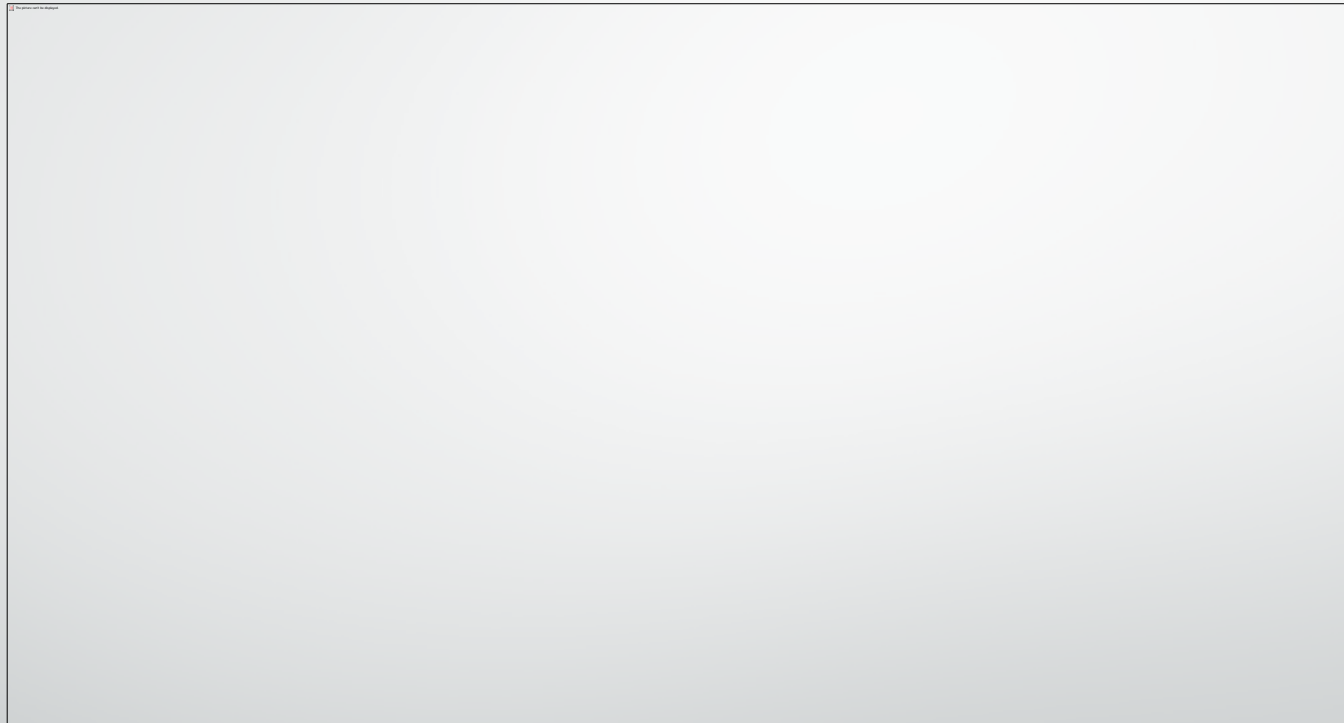
- Variable Ad Valorem:
  - Captures more upside gain
  - With no more downside risk than profit based system

Analysis of Relevant Systems:
3 Metal plus Mn-Rich Slag (MRS) Assumptions

	4-Metal System	3-Metal & Mn Rich Slag (MRS)
OPEX ($/yr)	$840 million	$200 million
CAPEX	$2,730 million	$2,720 million
Mn Product Price	$1,560/t of Mn metal mix	$400/t of MRS

Analysis of Relevant Systems:
Comparison of Two Stage Fixed Ad Valorem Systems

Basis of Payments (Mn fraction)	System	Median ISA Revenue ($M)	Effective Tax Rate	Equivalent Fixed Ad-valorem Rate	Collector Rate of Return	Average Gross Nodule Value ($/t)	Average Nodule Transfer Price ($/t)
Metal Value	Two Stage Ad Valorem: 2% → 6%	4,430	52%	5.4%	13.4%	$859	$265
MRS Value	Two Stage Ad Valorem: 2% → 6%	2,720	44%	5.4%	14%	$527	$257
MRS Value	Two Stage Ad Valorem: 2% → 10%	4,430	52%	8.9%	13.5%	$527	$264

To maintain ISA Revenues at $4.43 billion, ad valorem rate on 3-Metal + MRS system must rise to 10% in the second period

Analysis of Relevant Systems:
Difficult to Achieve ISA Target Revenues with Current MRS Data

ISA Revenue = ~$4.5 bn requires an equivalent single stage ad valorem rate of 10%

This leads to:
65% Effective Tax Rate
Contractor IRR ~12%

Concluding Remarks

4-Metal System:

- Recommend a two stage variable ad valorem system
  - 2% for 1st five years, rising to between 5% & 9% thereafter depending on the prices of the metals
  - This provides ISA with $4.43 billion in undiscounted lifetime revenues and potential for large upside benefits if prices are high with minimal downside risks
- Alternate recommendation is a fixed two stage ad valorem system
  - 2% for 1st five years, rising to a fixed rate of 6% thereafter
  - This also provides ISA with $4.43 billion in revenues assuming base case future metals prices, but with only limited upside potential if prices rise

3-Metal plus MRS System

- More work is needed to better understand costs
  - Current CAPEX assumptions are nearly identical to those in the 4-metal system