DSM Payment Regime Workshop

DSM System Annual Revenue Variables

Overview of Nodule Collection – Production Rates

- Production rates will be set by Contractors at a level necessary to cover their required rate of return
- Production rates will differ between Contractors depending upon their technology and cost profile
- Onshore Processing Plant is the largest cost item (multiple $Billions), and will differ significantly between Contractors.
    - E.g. CAPEX/OPEX will differ between locations : Tax / Labour / Infrastructure / Power / Reagents
- Important that it is left to Contractors to determine the rate of production required to provide an adequate return for their particular operation
- Contractors must also have the flexibility to respond to operating, technical and market forces which will come into play and impact operations
- A Contractor's Production rate, and changes to its production rate, are commercial decisions that should not be influenced by the Regulatory Body

Overview of Nodule Collection – Production Rates

- Largely driven by the Processing Plant, which requires Economies of scale
- Current benchmarks for major nickel Processing Plants:
  - Goro – 60,000 tpa Nickel metal
  - Ambatovy – 60,000 tpa Nickel metal – US$8 Billion
  - Koniambo – 60,000 tpa Nickel metal
- In order to achieve 60,000 tpa Nickel metal from a polymetallic nodule operation in the CCZ, approximately 5 Million dry tonnes per annum must be harvested
- Nodules contain 20% to 30% moisture - Contractor incurs the cost of transporting this additional weight

Ore Values

- Ad Valorem Royalty
- Applied to the value of the ore transferred from the production vessel to a bulk carrier
  - Avoids having to deal with complex issues such as “transfer pricing”
- Profit based royalty may be too difficult given the difference between Contractors (e.g. State owned enterprises may not need to generate a profit, but rather may place more importance on obtaining security of supply)
- Suggest light (e.g. 2%)Ad Valorem royalty for the First Movers, and then a full royalty regime for those Contractors that follow

Ore Values

Further rationale for a lower royalty rate, particularly for First Movers:

A factor should be used to discount the value of the ore and take in to account that it is not a high value concentrate

Polymetallic nodules **cannot** be upgraded using physical characteristics to an intermediate product prior to transportation. Rather, polymetallic nodules will need be transferred to another jurisdiction in a RAW FORM.

Land based sulphide ores (e.g. from copper and nickel sulphide deposits) can be **upgraded relatively simply** to a product for sale to a smelter. E.g. through CRUSHING, GRINDING AND FLOTATION a copper or nickel sulphide ore can be upgraded to a high grade concentrate product. In that case the ore is crushed down to a size that separates the individual copper (or nickel) sulphide particles in to separate particles to the other elements in the ore, and then those particles can be separated using physical processes such a gravity or froth flotation to separate the copper (or nickel) part of the ore from the rest of the waste rock and therefore produce a high grade product for sale to a smelter.

This is not the case with polymetallic nodules which are oxide deposits where the metals like copper and nickel are not in discrete particles that can be separated physically from the rest of the ore. Rather, all of the polymetallic nodule ore needs to be processed (e.g. hydro/pyro metallurgy), which is far more costly and capital intensive than less complex physical separation.

Ore Values

Froth flotation

Grinding Mill

Ore Values

Consequently, the royalty rate for polymetallic nodules should be lower than that which applies on land for nickel and copper sulphide deposits.

For example, consider a royalty rate of (e.g. 2%) applied to the value of the Ni, Cu, Mn and Co contained in the nodules recovered

It would not be appropriate for the royalty rate for nodules to be similar to the rate that exists in those countries where the ore can be upgraded in the same jurisdiction by using physical characteristics

Rather, because polymetallic nodule ore cannot simply be upgraded close to the mine site it will be shipped as a raw material, and as such is more analogous to a bulk commodity such as coal or iron ore. The royalty rate should take account of this and reflect the fact that:

- shipping nodules in raw form results in higher transport costs per tonne of metal produced; and
- processing nodules is far more costly and complex than physically upgrading terrestrial ores to intermediate products

Metal Pricing

- Long Term vs Short Term vs Spot
- Short term prices – e.g. analysts / traders / brokers.
- Given anticipated production date for nodule projects, most logical is to use long term pricing, underpinned by solid fundamentals (e.g. supply/demand dynamics)
- Long term forecasts are available from such organizations as Wood Mackenzie and CRU

Metal Pricing

- KEY PRINCIPLES RELATED TO METAL PRICES:
  - The mining industry, and in particular metal prices, change quickly, and the operator must have the flexibility to respond to such changes and market forces. E.g. by changing production rates/head grades (abundance).
  - When metal prices increase, typically the price of input costs increase as well (e.g. oil / labour / reagents)
  - Whatever metal prices we use in the model will be wrong

Metal Pricing

- One price does not necessarily fit all
  - Different operators will produce different products
    - One operator may produce a manganese product for the steel industry, while another may produce a manganese product for the battery industry – the operators will therefore receive different prices for their manganese production
    - The specifications of each operators' product will differ (e.g. may contain deleterious/penalty elements), and this will impact the price they obtain

- Not always possible to simply input LME prices into the model, as that assumes metal is being produced, and assumes the price of the product is directly related to the metal price.
  - One operator may produce a Nickel sulphide precipitate while another may integrate a refinery and produce Nickel metal. Note, simply adding a standard refinery in order to produce Nickel metal can cost US$400 million
  - Some plants may make a metal concentrate that requires further processing and refining. This product may be directly related to metal prices at a discount. However, it may be the case that there are only certain plants that can take the particular intermediate product, and if others are producing a lot of that intermediate product then the price may come down as there is little space in the refinery. In this instance the price achieved is related to supply conditions at the time for that particular intermediate product, rather than necessarily the LME price at the time for the metal.

Which metals to include in payment regime

- Ni, Cu, Mn and Co, … ?
- Metallurgical processes will differ between operators
- It would likely not be equitable to charge a Contractor a higher royalty simply because they are able to recover additional elements in their process. This may also have the effect of inhibiting innovation and creating waste
- There may be some by-product materials that can be extracted from the ore and sold for no profit or a small loss to ensure it reduces the waste from the processing plant. However, if the Contractor was charged a royalty for the sale of that by-product then there would be little incentive to find a market to sell into and rather it may be left as waste
- By charging a royalty for these "other" minerals it creates a disincentive for Contractors to find environmentally friendly processing solutions to ensure minimum waste and to ensure best use of the resource

Industry Revenue verse Single Operator Revenue

- The ISA's royalty revenue will should be measured against the industry, not a single operator
- Royalty revenue will be long term and will survive the lifetime of any single operation
- Suggest look at the revenue from the perspective of an industry operating over a long period of time, rather than look at the revenue generated from any single operator
- 50% of nodules in CCZ at 2% royalty rate = $125 Billion
- Priority is to incentivize the industry to commence. Suggest light 2% Ad Valorem royalty for the First Movers, and then a full royalty regime for those Contractors that follow:
  - E.g. assume 4 First Mover operators harvesting 3 to 4 Million dry tpa each
    - 2% Royalty revenue to the ISA ≈ $100M per annum

CHM Impacts/Concerns

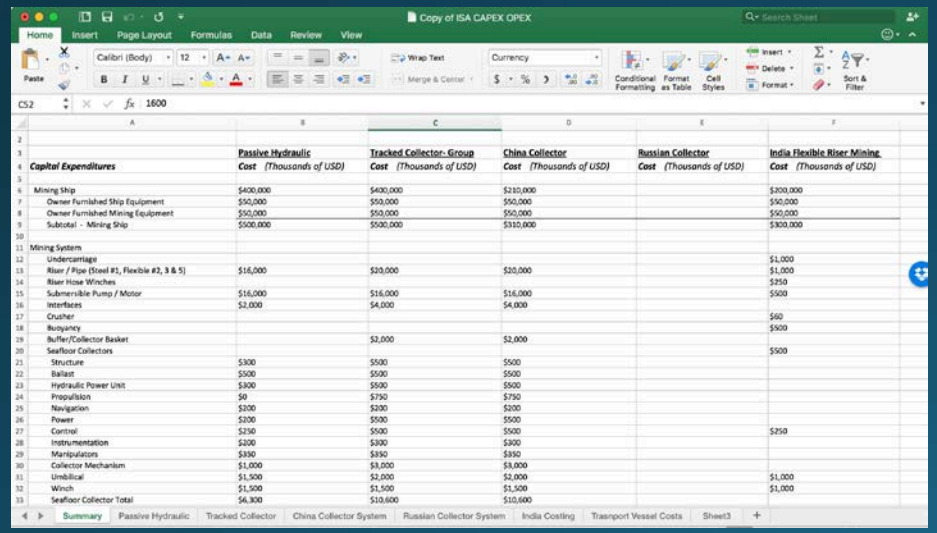
- Overarching Principle: Contractor's decisions need to be driven by market forces, and not by the regulatory body
- If society does not extract metals from polymetallic nodules today, then the social and economic progress that would result from such metals will be delayed (cost to mankind)
- The delay in the development of the seafloor polymetallic nodule industry since the 70's has already increased the pressure on land based Ni, Cu and Mn deposits (cost to the land based environment)
- The concept of "preservation for the future" or "current verse future consumption" is relevant to hydrocarbons, which are consumed and then "lost" to society, and as such no longer available for future generations to use. Metals can be differentiated from hydrocarbons because they are recyclable
- The metals derived from polymetallic nodules extracted today are still available for use by future generations, as the metals are still in circulation and are able to be recycled and reused.

CHM Opportunities and Benefits

- The metals derived from seafloor polymetallic nodules are critical to global social and economic development, as well as clean energy technology and clean energy infrastructure
- A significant component of the world's future nickel supply is expected to come from nickel laterite deposits, which are predominantly located in the equatorial rainforest regions. Seafloor polymetallic nodule harvesting provides an opportunity to replace part of that nickel production and take the pressure off these unique rainforest environments
- Revenues generated by the ISA from seafloor polymetallic nodules are to be shared equitably, taking into particular consideration the interests and needs of developing States
- Advancement of deep sea scientific research and technological development
- As an educational tool, it is recommended that the ISA publish a study that demonstrates the benefits to mankind that will be derived from the sourcing metals from seafloor polymetallic nodules

Final Thoughts

- 40 years since first trial harvesting in CCZ
- UNCLOS Article 151 contained uncommercial terms – removed in 1994 Agreement
- Chennai Workshop 2008 - Meeting of Contractors to discuss status of mining and processing technology
- A DSM financial model was produced at the end of the Chennai Workshop, some 8 years ago



Copy of ISA CAPEX OPEX

Capital Expenditures	Passive Hydraulic Cost (Thousands of USD)	Tracked Collector- Group Cost (Thousands of USD)	China Collector Cost (Thousands of USD)	Russian Collector Cost (Thousands of USD)	India Flexible Riser Mining Cost (Thousands of USD)
Mining Ship	$400,000	$400,000	$210,000		$200,000
Owner Furnished Ship Equipment	$50,000	$50,000	$50,000		$50,000
Owner Furnished Mining Equipment	$50,000	$50,000	$50,000		$50,000
Subtotal - Mining Ship	$500,000	$500,000	$310,000		$300,000
Mining System					
Undercarriage					$1,000
Riser / Pipe (Steel #1, Flexible #2, 3 & 5)	$16,000	$20,000	$20,000		$1,000
Riser Hose Winches					$250
Submersible Pump / Motor	$16,000	$16,000	$16,000		$500
Interfaces	$2,000	$4,000	$4,000		
Crusher					$60
Buoyancy					$500
Buffer/Collector Basket		$2,000	$2,000		
Seafloor Collectors					$500
Structure	$300	$500	$500		
Ballast	$500	$500	$500		
Hydraulic Power Unit	$300	$500	$500		
Propulsion	$0	$750	$750		
Navigation	$200	$200	$200		
Power	$200	$500	$500		
Control	$250	$500	$500		$250
Instrumentation	$200	$300	$300		
Manipulators	$350	$350	$350		
Collector Mechanism	$1,000	$3,000	$3,000		
Umbilical	$1,500	$2,000	$2,000		$1,000
Winch	$1,500	$1,500	$1,500		$1,000
Seafloor Collector Total	$6,300	$10,600	$10,600		

- To expedite the Payment Regime process, suggest agree upon a simple Ad Valorem royalty of 2% applied to the value of the metal contained in the nodules recovered
- Once mining is taking place in the CCZ the ISA's revenues will be long term. As such, arguably more important to encourage mining operations to commence in the first place, rather than trying to predict what the optimal royalty will be for the First Movers
- Suggest we are not looking to come up with the final payment regime, merely the payment regime that is applicable to the First Movers, who will be taking on the greatest technological risk and highest cost of capital
- Consider erring on the side of caution and implement a royalty rate for First Movers that gives the industry the best chance of getting up and running, otherwise we run the risk of making the same mistakes as in 1982 with Article 151 Production Policy.

CHM Impacts/Concerns

- There is a growing need for society to place greater emphasis on recycling to meet the sustainable development objectives of the planet
- Of the classes of resources seeing wide use in modern technology, **metals are different from other materials in that they are inherently recyclable**
- In a society increasingly concerned with sustainability and recycling, metals are becoming the preferred material of choice, which in turn puts even greater upward pressure on metal demand
- However, so long as global metal use continues to increase and metals are used in products with extended lifetimes, even complete recycling can satisfy no more than a modest fraction of demand (UNEP, 'Recycling Rates of Metals', 2011)
- Per capita resource intensity is increasing across the globe and **in order for all citizens of the world to enjoy the same levels of use as the industrialized countries, the amount of global in-use metal stocks needs to be increased by an estimated 39 times those existing at present (UNEP, 'Metal Stocks in Society, Scientific Synthesis', 2010)**