INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON POLLUTION PREVENTION AND RESPONSE
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Agenda item 14

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DEVELOPMENT OF MEASURES TO REDUCE RISKS OF USE AND CARRIAGE OF HEAVY FUEL OIL AS FUEL BY SHIPS IN ARCTIC WATERS

Impacts of a heavy fuel oil ban on shipping costs for Canadian Arctic mining operations

Submitted by FOEI, WWF, Pacific Environment and CSC

SUMMARY

Executive summary:	This document summarizes the findings of an analysis by the International Council on Clean Transportation (ICCT) titled *Arctic heavy fuel oil ban: Fuel and voyage cost effects on bulk carriers used in Canadian Arctic mining operations*. A key finding being that if ships do not use exhaust gas cleaning systems (EGCS), the fuel and voyage cost impacts of an Arctic HFO ban are expected to be negligible. A presentation with more details is included in the annex
Strategic direction,: if applicable	6
Output:	6.11
Action to be taken:	Paragraph 7
Related documents:	MEPC 73/9/1, MEPC 73/19; PPR 6/12, PPR 6/12/4, PPR 6/20 and MEPC 74/18

Introduction

1 At its seventy-first session, the Marine Environment Protection Committee (MEPC) agreed to include a new output on "Development of measures to reduce risks of use and carriage of heavy fuel oil as fuel by ships in Arctic waters" in the 2018-2019 biennial agenda of the Committee and assigned the Pollution Prevention and Response Sub-Committee (PPR) to complete the work on the development of such measures.

2 At its seventy-second session, MEPC considered several documents on the development of measures to reduce risks of use and carriage of heavy fuel oil (HFO) as fuel

by ships in Arctic waters to determine the scope of work to be undertaken by PPR. Based on that discussion, the Committee approved the following scope of work:

.1 develop a definition of HFO taking into account regulation 43 of MARPOL Annex I;

.2 prepare a set of Guidelines on mitigation measures to reduce risks of use and carriage of heavy fuel oil as fuel by ships in Arctic waters, taking into account document MEPC 72/11(Russian Federation); and

.3 on the basis of an assessment of the impacts, develop a ban on HFO for use and carriage as fuel by ships in Arctic waters, on an appropriate timescale.

3 At its sixth session, PPR invited submissions to PPR 7, especially those by Arctic States, containing impact assessments guided by, but not limited to the impact assessment methodology (PPR 6/20, paragraph 12.29).

4 At its seventy-fourth session, MEPC approved the impact assessment methodology developed at PPR 6.

Analysis

5 In September 2019, the International Council on Clean Transportation (ICCT) completed a study to assess the potential fuel and voyage cost impacts of an HFO ban for shipping related to Canadian Arctic mining operations. A key finding being that if ships do not use exhaust gas cleaning systems (EGCS, referred to as scrubbers in the annex), the fuel and voyage cost impacts of an Arctic HFO ban are expected to be negligible. A presentation with more details on the methodology, results and conclusions is included in the annex.

6 The key findings of the ICCT analysis include:

.1 An HFO ban will affect fuel costs and voyage costs for ships that service Canadian Arctic mines. However, these impacts are extremely sensitive to the relative fuel prices and depend on how ships comply with the 0.50% m/m sulphur limit in 2020. Specifically:

.1 for ships that use HFO in combination with EGCS, fuel cost may substantially increase (+33% to +54% in the ICCT analysis); however, total voyage costs, which include charter costs and port fees, would increase about half as much (+17% to +23%); and

.2 for ships that use very low sulphur fuel oil (VLSFO), a HFO ban would slightly increase fuel costs (+4% to +5%) and total voyage costs (+2% to +3%).

.2 If ships do not use EGCS, the fuel and voyage cost impacts of an Arctic HFO ban are expected to be negligible.

Action requested of the Sub-Committee

7 The Sub-Committee is invited to note the information contained in this document.

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Arctic Heavy Fuel Oil Ban: Fuel and Voyage Cost Effects on Bulk Carriers used in Canadian Arctic Mining Operations

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4 September 2019

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Research Question

What are the potential fuel and voyage cost effects of an Arctic HFO ban on bulk carriers serving Baffinland mines?

Background

- The International Maritime Organization (IMO) has instructed its Pollution Prevention and Response (PPR) subcommittee to develop a ban on the use and carriage for use of heavy fuel oil (HFO) by ships in Arctic waters.
- An Arctic HFO Ban could be in place as early as 2023.
- An Arctic HFO Ban could affect fuel costs for ships that sail in Arctic Waters, including bulk carriers that serve Arctic mining operations.
- Baffinland's Mary River Mine is a large, open pit iron ore mine in the Canadian Arctic. Its Milne Inlet port is located within the IMO Polar Code Arctic but outside the North American Emission Control Area (ECA)

A	B	C	D	E	F	G
60°00'.0N 056°37'.1W	58°00'.0N 042°00'.0W	64°37'.0N 035°27'.0W	67°03'.9N 026°33'.4W	(Sørkapp, Jan Mayen) 70°49'.56N; 08°59'.61W	(by the Island of Bjørnøya) 73°31'.6N; 019°01'.0E	(Cap Kanin Nos) 68°38'.29N; 043°23'.08E

2017 Baffinland Bulk Carrier Activity and Ambitions for the Future

- In 2017, 23 bulk carriers completed 56 round-trip voyages, shipping 4.1 million tonnes (Mt) of ore, averaging 72,600 tonnes per ship.[1] At $70/t (average iron ore price Jul-Oct 2017), that implies a revenue of $US 287 million.
- In 2018, Baffinland shipped a record 5.1 Mt of iron ore, requiring 71 voyages. This included, for the first time, two trans-Arctic shipments to Asia via the Northern Sea Route.[2]
- In the long-term, Baffinland's goal is 30 Mt per year,[3] implying over 400 voyages each year using panamax vessels.

Vessel Name	# of Round Trips	Vessel Type	Max Speed	Median Speed	% of travel > 10 knots
Arkadia	2	Bulk carrier	9.7	7.2	0.0
Golden Amber	2	Bulk carrier	11.7	8	11.3
Golden Diamond	3	Bulk carrier	10.9	6.6	0.4
Golden Ice	3	Bulk carrier	10.7	5.1	0.5
Golden Opal	3	Bulk carrier	10.2	5.9	0.0
Golden Opportunity	2	Bulk carrier	10.6	3.4	0.0
Golden Pearl	2	Bulk carrier	10.5	8	1.4
Golden Ruby	2	Bulk carrier	10.5	1.2	0.2
Golden Saguenay	2	Bulk carrier	11.6	0.9	0.1
Golden Strength	2	Bulk carrier	9.6	6.6	0.0
MV Golden Brilliant	2	Bulk carrier	10.5	2.6	0.1
MV Golden Bull	2	Bulk carrier	10.1	6.1	0.0
Nordic Oasis	3	Bulk carrier	11.3	7.1	0.5
Nordic Odin	3	Bulk carrier	10	7.8	0.0
Nordic Odyssey	2	Bulk carrier	10.1	2.8	0.0
Nordic Olympic	3	Bulk carrier	13.1	7.2	0.6
Nordic Orion	3	Bulk carrier	9.8	2.3	0.0
Nordic Oshima	3	Bulk carrier	10.4	8	1.5
NS Energy	3	Bulk carrier	11.2	7.6	0.6
NS Yakutia	2	Bulk carrier	9.9	0.5	0.0
AM Buchanan	1	Bulk carrier	9.1	8.3	0.0
Rio Tamara	3	Bulk carrier	9.7	8	0.0
Sagar Samrat	3	Bulk carrier	9.8	6.4	0.0

Source: Baffinland's Mary River Project 2017 NIRB Annual Report, March 2018
Table 4.27 "Project-related ship speeds during transits on northern shipping route -2017 shipping season"

[1] http://www.baffinland.com/latest-news/baffinland-iron-mines-concludes-record-setting-shipping-season-with-4-1-million-tonnes-of-iron-ore-shipped-over-75-days/?lang=en
[2] http://www.baffinland.com/latest-news/baffinland-iron-mines-set-new-5-1-million-tonne-shipping-record/?lang=en
[3] http://www.baffinland.com/downloadocs/201903312018-nirb-annual-report_2019-04-56-56.pdf

Basic Methodology (1/4)

1. Identify bulk carriers that have transported materials from Bafflinland mines in the past.
2. Randomly select a bulk carrier for analysis.

Nordic Oasis panamax bulk carrier (IMO 9727120)
Deadweight: 75,800 t
Flag: Panama
Built: 2016

Basic Methodology (2/4)

3. Use Automatic Identification System (AIS) data to identify one round trip voyage.

4. For each hour, estimate fuel consumption using ICCT's Systematic Assessment of Vessel Emissions (SAVE) model, described in detail in this report: https://theicct.org/publications/GHG-emissions-global-shipping-2013-2015.

5. For each hour, identify when the ship was:
   a) Inside or outside an Emission Control Area (ECA)
   b) Inside or outside the IMO Polar Code Arctic (the Arctic)

Basic Methodology (3/4)

6. Estimate fuel costs under four scenarios:

		Fuel Choice[1]				
	Scenario (2020 compliance option)	**ECA** (from Europe)	**Open Sea** (to mine)	**In Arctic**	**Open Sea** (from mine[2])	**ECA** (to Europe)
1	No Ban (HFO + Scrubbers)	HFO + scrubbers[3]	HFO + scrubbers	HFO + scrubbers	HFO + scrubbers	HFO + scrubbers
2	Ban (HFO + Scrubbers)	HFO + scrubbers	HFO + scrubbers	MGO	MGO	MGO
3	No Ban (VSLFO)	MGO	VLSFO	VLSFO	VLSFO	MGO
4	Ban (VSLFO)	MGO	VLSFO	MGO	MGO	MGO

Fuel	Price ($US/t)[4] large spread	Price ($US/t)[5] typical spread
MGO	530	622
VLSFO	500	583[6]
HFO	302	425

[1]HFO is heavy fuel oil (<3.5% S); MGO is marine gas oil (<0.10% S); VLSFO is very low sulfur fuel oil (<0.50% S)
[2]Assumes HFO or VLSFO cannot be bunkered on the return trip if an Arctic HFO ban is in effect
[3]Scrubber operating and maintenance costs are not included
[4]Rotterdam, Aug 9, 2019: heavily influenced by upcoming 2020 regulations that may have artificially lowered HFO prices that could rebound as the market stabilizes post 2020
[5]Rotterdam, Aug 9, 2018: representative of typical MGO-to-HFO price spreads in recent years.
[6]Estimated because VLSFO was not yet on the market in Aug 2018; assumes 80%/20% MGO/HFO blend.

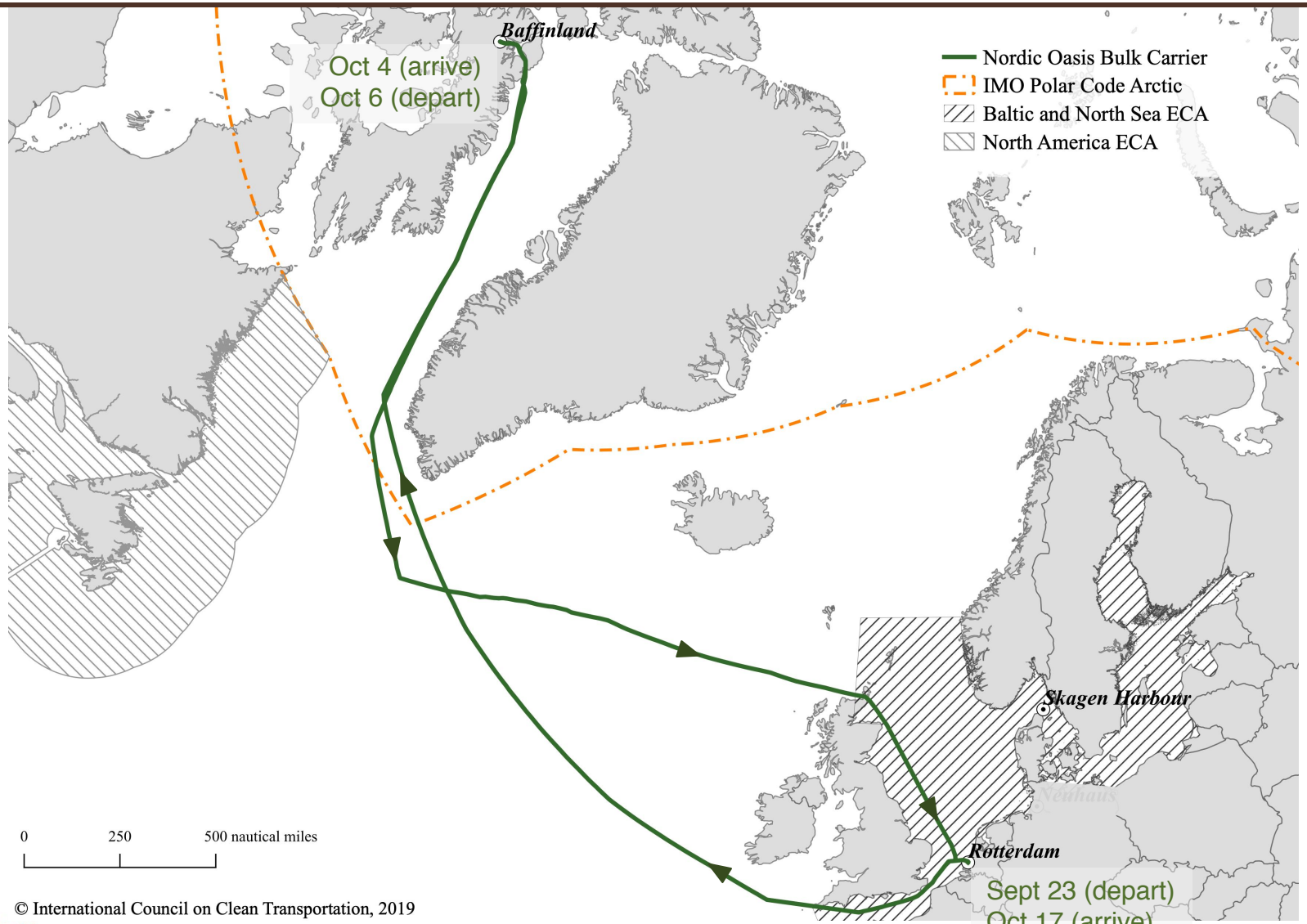
Basic Methodology (4/4)

7. Estimate round-trip voyage costs
   a) Total voyage costs, which are paid by Baffinland = daily charter rate + fuel costs + additional fees such as port dues.
      i. Time charter rates for panamax bulk carriers were about $10,000/day (USD) in Oct 2017 (UNCTAD, 2018)
      ii. Rotterdam port dues are approximately $50,000 for a panamax bulk carrier
         1) Rotterdam port tariffs explained here: https://www.portofrotterdam.com/en/shipping/sea-shipping/port-dues/seaport-dues

8. Compare change in round-trip fuel costs and total round-trip voyage costs under each scenario.

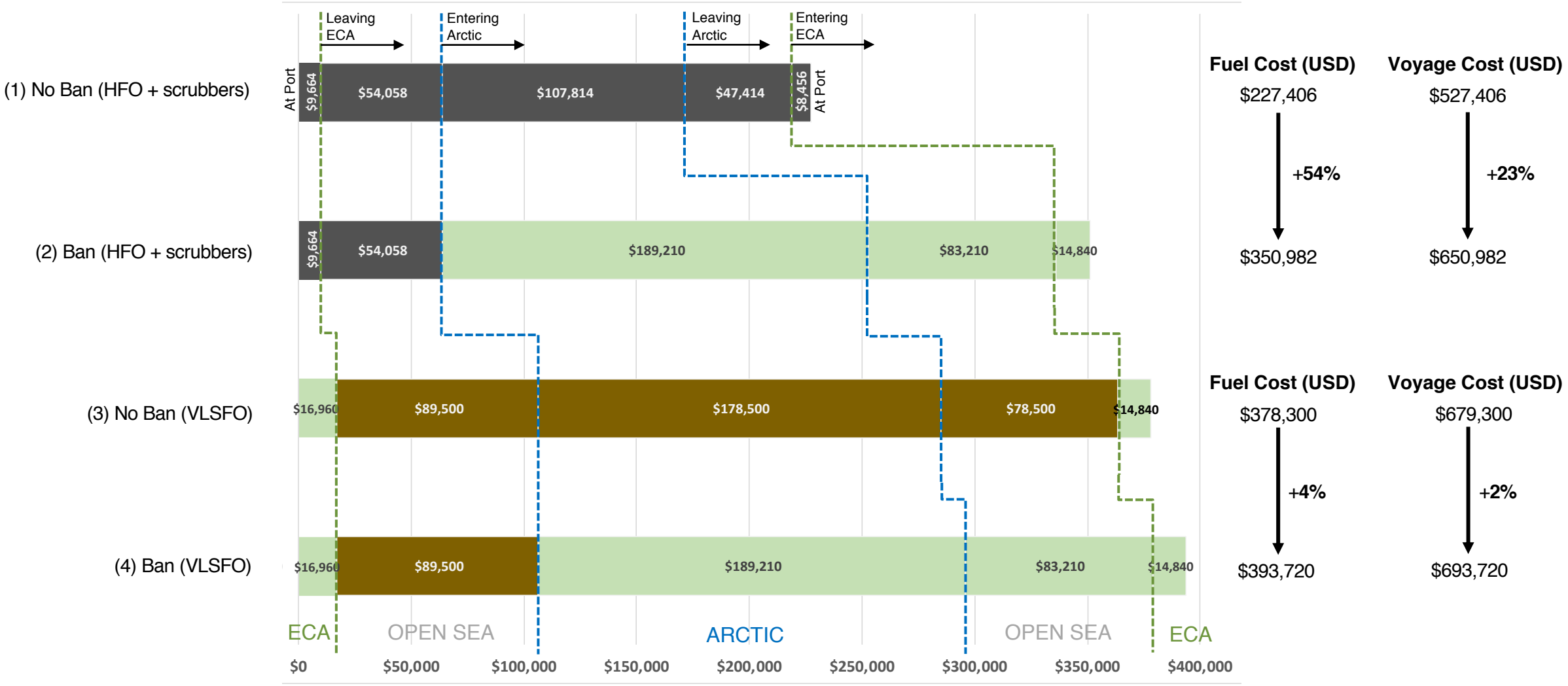
UNCTAD (2018). Review of Maritime Transport 2018. United National Conference on Trade and Development. Available at https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=2245

Nordic Oasis Route, Autumn 2017



Nordic Oasis round-trip costs (high fuel price spread)

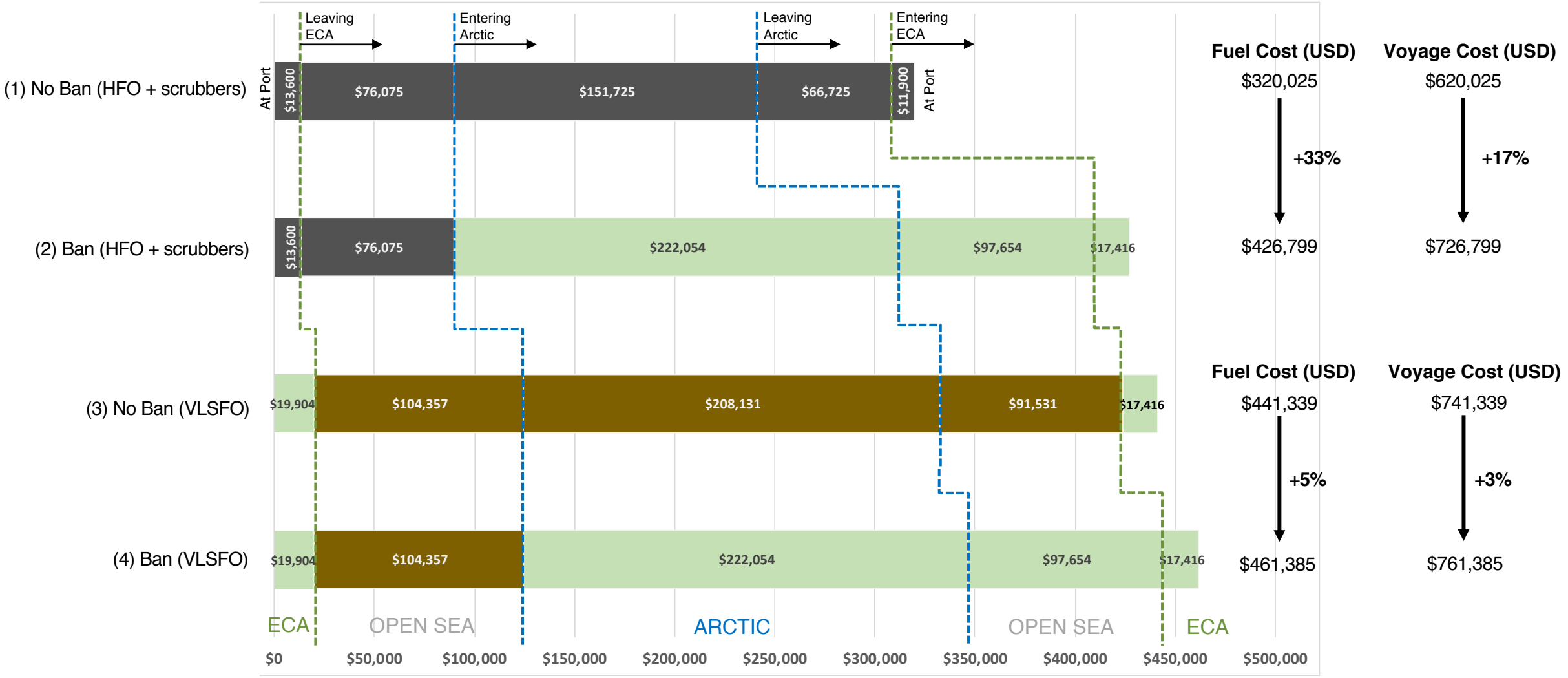
25 days = ~$250,000 charter fee + fuel + $50,000 port dues



HFO ($302/t) + scrubbers | VLSFO ($500/t) | MGO ($530/t)

Nordic Oasis round-trip costs (typical fuel price spread)

25 days = ~$250,000 charter fee + fuel + ~$50,000 port dues



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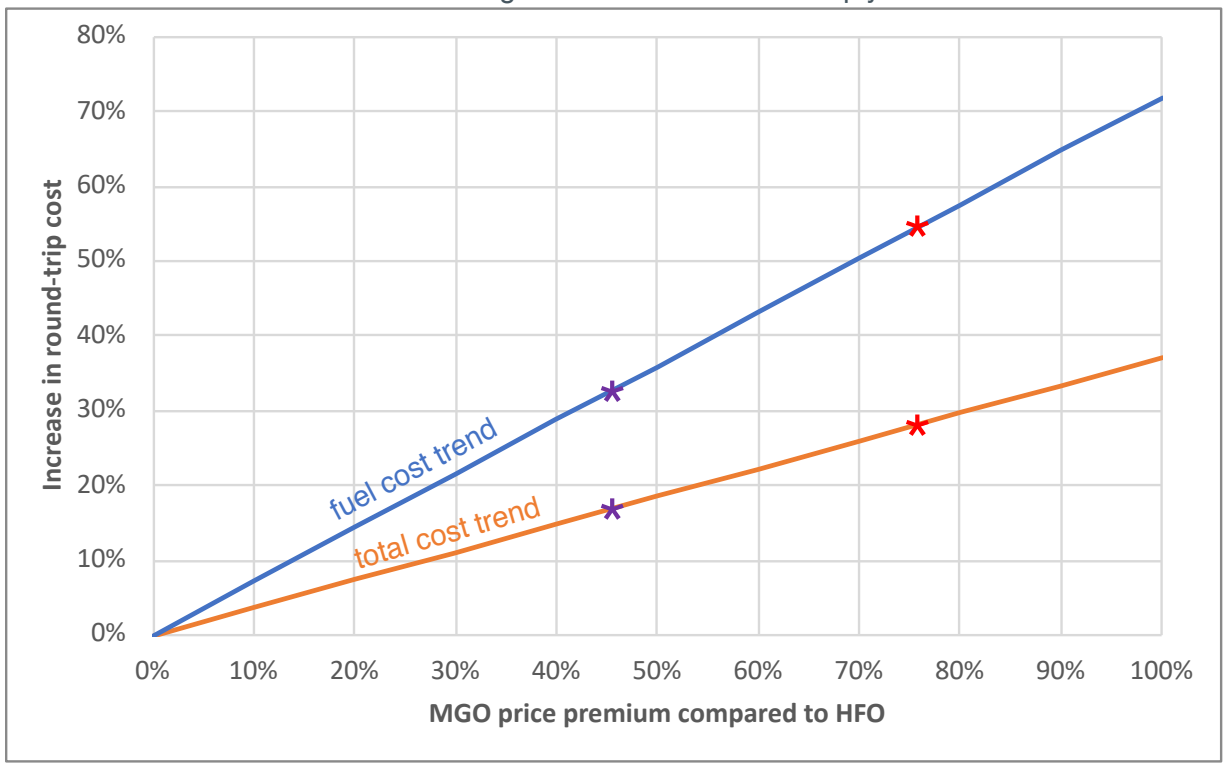
HFO ($425/t) + scrubbers | VLSFO ($583/t) | MGO ($625/t)

For ships that use HFO + scrubbers, cost impacts depend on MGO-to-HFO price premium

Relationship between fuel price spread and round-trip fuel costs and total costs for a Baffinland bulk carrier using HFO + scrubbers to comply with IMO 2020



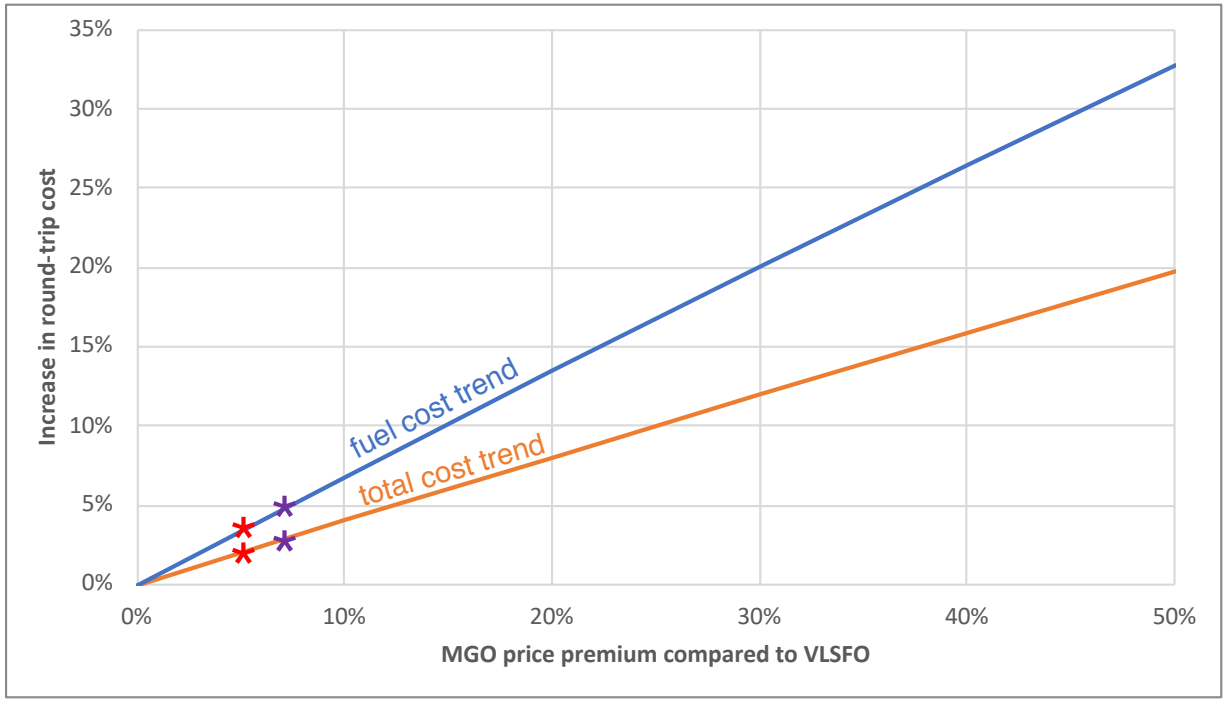
For the ship we analyzed:

*When MGO costs 75% more than HFO (e.g., Aug 2019), round-trip fuel costs increase 54% but total round-trip voyage costs (charter + fuel + port dues) increase only 23%.

*When MGO costs 46% more than HFO (e.g., Aug 2018), round-trip fuel costs increases 33% but total round-trip voyage costs (charter + fuel + port dues) increase only 17%.

For ships that use VLSFO, cost impacts depend on MGO-to-VLSFO price premium

Relationship between fuel price spread and round-trip fuel costs and total costs for a Baffinland bulk carrier using VLSFO to comply with IMO 2020



For the ship we analyzed:

*When MGO costs 6% more than VLSFO (e.g., Aug 2019), round-trip fuel costs increase 4% but total round-trip voyage costs increase only 2%.

*When MGO costs 7% more than VLSFO (best estimate of "typical" spread), round-trip fuel costs increase 5% but total round-trip voyage costs increase only 3%.

(Note the shorter x- and y-axes compared to the previous slide because the price spread between MGO and VLSFO has been relatively small.)

Conclusions (1/2)

- An HFO ban will affect fuel costs and voyage costs for ships that service Baffinland's Mary River Mine. However, these impacts are extremely sensitive to relative fuel prices and depend on how ships comply with IMO 2020:
  - For ships that use HFO + scrubbers, an HFO ban may substantially increase fuel costs (+33% to +54% in this analysis); however, total voyage costs would increase less dramatically, about half as much (+17% to +23%).
  - For ships that use VLSFO, an HFO ban would only slightly increase fuel costs (+4% to +5%) and total voyage costs (+2% to +3%).

[1] https://lloydslist.maritimeintelligence.informa.com/LL1128795/Golden-Ocean-sees-dramatic-recovery-in-dry-bulk-rates

Conclusions (2/2)

- If ships servicing the mine do not use scrubbers, we expect the fuel and voyage cost impacts of an Arctic HFO ban to be negligible.
  - None of the bulk carriers serving the mine in 2017 had scrubbers installed, as far as we can tell from publicly available data.
    - Golden Ocean Group owns 11 of the 23 ships that served the mine in 2017. While they are installing scrubbers on 23 of their capesize ships,[1] these are twice as large as the panamax ships that serve the mine. We have seen no plans for using scrubbers on their panamax fleet.
    - Nordic Bulk Carriers owns 6 of 23 ships that served the mine in 2017; we have not seen any announcement that they plan to use scrubbers.

[1] https://lloydslist.maritimeintelligence.informa.com/LL1128795/Golden-Ocean-sees-dramatic-recovery-in-dry-bulk-rates

Keep in mind… (1/2)

- Many factors influence the profitability of mining operations, especially the market price of iron ore.
  - From Aug 2017 through Aug 2019, the price of iron ore has ranged from $60/t to $120/t, with an average of $77/t according to marketindex.com.
  - Over that same period, the price of HFO has ranged from $282/t to $482/t, with an average of $395/t according to shipandbunker.com.
  - The Baffinland Mary River Mine has been in operation since 2015 and has weathered these ore and fuel price fluctuations.

- Scrubber operating and maintenance costs are not included in this analysis and could increase the costs of using HFO + scrubbers post-2020.

Comer, B. (2019). *Transitioning away from heavy fuel oil in Arctic Shipping.* International Council on Clean Transportation. Available at https://theicct.org/sites/default/files/publications/Transitioning_from_hfo_Arctic_20190218.pdf

Keep in mind… (2/2)

- The benefits of an HFO ban (economic, environmental, and social) are not considered in this analysis.
  - These benefits should be considered when assessing the net effect of an HFO ban on Baffinland mining operations.
    - ICCT research finds that:
      - The costs associated with spilling even a small amount of HFO outweigh the fuel cost savings of using HFO instead of MGO (Comer, 2019).
      - Large 2-stroke engines, such as those used in panamax bulk carriers, can emit up to 80% less black carbon when operating on MGO instead of HFO (Comer et al. 2017).

Comer, B., Olmer, N., Mao, X., Roy, B., and Rutherford., D. (2017). *Black carbon emissions and fuel us in global shipping 2015*. International Council on Clean Transportation. Available at https://theicct.org/sites/default/files/publications/Global-Marine-BC-Inventory-2015_ICCT-Report_15122017_vF.pdf

Comer, B. (2019). *Transitioning away from heavy fuel oil in Arctic Shipping.* International Council on Clean Transportation. Available at https://theicct.org/sites/default/files/publications/Transitioning_from_hfo_Arctic_20190218.pdf

Questions? Comments?

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