Development of Arctic Icebreaking Fleet to Provide Navigation in the Russian Arctic
I. The History of the Northern Sea Route Development and Ecological Rehabilitation Activities.
Russian “route to India” was named the Northern Sea Route in 16th century

1525 year – Dmitriy Gerasimov, the Envoy of Russian Tzar Vasily the III, compiled the first project of the Northern Sea Route and the map of the Arctic Ocean shores of Moscovia;

50-s of the 16th century – the first maritime expedition to discover sea route to China was organized in Moscow;

1648 year – researcher and seafarer Semen Dezhnev was the first to pass the straight that divides Asia and America;

18th century – Kamchatka expeditions were organized, the second of which made it into history as the Great Northern Expedition. The general map of the Great Northern Expedition was compiled in 1746.
In the beginning of the XX century development of the Northern Sea Route became an essential task for Russian economy

July 02, 1918 – Order by Sovnarcom on appropriation of 1 mln. Roubles for the expedition to explore the Arctic Ocean.

May 21, 1919 – Russian Provisional Government of the Northern Area order “On establishing interdepartmental committee for organization of a maritime expedition to Siberia”.

1920 year – Kara expeditions put start to regular navigation through the Kara sea. 11 thousand tons of bread and other goods were exported from Siberia during the first expedition.

from 1923 during 10 years period 19 polar radiometeorological stations were built on the coast and islands of the Arctic Ocean. During this period previous name Northern East Passage was replaced by the Northern Sea Route.

1932 - the transit voyage of Otto Schmidt expedition onboard icebreaking steamship Alexander Sibiryakov was the starting point for transit navigation along the Northern Sea Route.

1932 г. – Main NSR Department established– manages all hydro-meteorological and radio stations on the islands and coast of the Arctic Ocean, icebreakers, transport vessels, ports and polar stations. Is charged with infrastructural and cultural development of the Far North areas including trade, natural resources extraction, science and research, transport. Disbanded in 1964, functions transferred to Main Department of Navigation of Minmorflot of USSR.
Lend-lease and repositioning of Pacific Fleet ships via NSR during World War II

Northern maritime transport routes: outer for transportation of cargoes to USSR from England and USA and inner via the NSR to provide supplies from USSR East and escort vessels from USA with lend-lease cargoes. Northern Navy ships were escorting cargo vessels on particular parts of the NSR, especially in the Kara sea where 2568 vessels were escorted.

Totally during the War period Arctic Convoys transported about 22% of lend-lease cargoes – 3 964 000 tons. Of them 120 vessels transited NSR with 450 000 tons of cargo.

Destroyers Baku, Razumniy and Razyarenniy transit from Vladivostok to the Kola Bay via the NSR 15.07 – 14.10.1942
Main Milestones of the Atomic Icebreaking Fleet Development

**Ib Lenin**

November 20, 1953 – the Decree of the Cabinet Council of USSR to commence construction

**August, 25, 1956** – the IB is laid at A. Marti Shipyard (from 1957 – «Admiralty Shipyard»)

**December, 03, 1959** – accepted by the Ministry of Maritime Fleet

1989 year – decommissioned

**Escorted: 3741 vessels**

The necessity to provide and develop the functioning of Norilsk Industrial Area.

The demand for year-round navigation in the Wester Arctic.

Building of a powerful atomic icebreaking fleet and infrastructure on the coast of the Kara sea and Yenisey river.

August 17, 1977 – atomic IB Arktika reaches the North Pole as the first vessel to do it above surface.

Building of modern atomic icebreaking fleet, including Leader icebreakers, maintenance vessels and port fleet to provide the year-round export of Arctic products to Asian-Pacific and European markets.

**Universal atomic icebreakers**

of 22220 projects (IB60)

Propulsion power – 60 MW;

Water displacement 33530 / 25 540 t;

Draught – 10.5 / 8.5 m;

Icebreaking capability – 2.9 m

**Icebreakers:**

1st IB60 – I1Q, 2020

2nd IB60 – I1IQ, 2021

3rd IB60 – I1IQ, 2022
II. Major Projects in the Northern Sea Route and Development of the Arctic Icebreaking Fleet.
We are facing ambitious tasks of the Arctic and the Northern Sea Route development. This does not mean mineral resources production and creation of such gas liquefaction enterprises only, it means further development of nuclear shipbuilding. Development of the icebreaking fleet and the Northern Sea Route will make it possible to perform shipments from the Yamal LNG to all parts of the globe and all year round”.

President of the Russian Federation Vladimir Putin
Sabetta, December 08, 2017

I already mentioned this but I would like to repeat – rephrasing the great Lomonosov who said that Russia will expand through Siberia. Now Russia should expand through the Arctic, since there we have our main supply of mineral resources.

President of the Russian Federation Vladimir Putin
major press-conference December 14, 2017
Natural Resources Reserve
Of Russian Federation

CONDENSATE

2.7 bln. tons

NATURAL GAS

55 trln. m³

OIL

7.3 bln. tons

* courtesy of the Ministry of Natural Resources of Russia
Northern Sea Route Cargo Traffic, Generated by the Projects already Active and Potential Projects

mln. tons

- active in 2018
- potential projects

USSR Max Traffic

<table>
<thead>
<tr>
<th>Year</th>
<th>Traffic (mln. tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>6.1</td>
</tr>
<tr>
<td>1985</td>
<td>6.5</td>
</tr>
<tr>
<td>1990</td>
<td>5.5</td>
</tr>
<tr>
<td>1995</td>
<td>2.3</td>
</tr>
<tr>
<td>2000</td>
<td>1.5</td>
</tr>
<tr>
<td>2005</td>
<td>2.0</td>
</tr>
<tr>
<td>2010</td>
<td>2.5</td>
</tr>
<tr>
<td>2015</td>
<td>5.3</td>
</tr>
<tr>
<td>2018</td>
<td>29</td>
</tr>
<tr>
<td>2020</td>
<td>60</td>
</tr>
<tr>
<td>2024</td>
<td>80</td>
</tr>
<tr>
<td>2025</td>
<td>36</td>
</tr>
<tr>
<td>2028</td>
<td>45</td>
</tr>
<tr>
<td>2030</td>
<td>90</td>
</tr>
</tbody>
</table>
15. Government of the Russian Federation to prepare in accordance with Strategy of spatial development of Russian Federation in collaboration with regional public authorities and by 01 October adopt a comprehensive plan of modernization and expansion of backbone infrastructure, which should ensure by 2024:

a) Development of “West-East” and “North-South” transport corridors for cargo transportation, through, among others:

Development of Northern Sea Route and increase flow of goods through it to 80 million tons.
The “Two Keys” Approach to Managing the Northern Sea Route according to the Federal Law #525 dd December 27, 2018

**Government of the Russian Federation**

- Adopts the Rules of Navigation on the Northern Sea Route;
- Adopts the Plan of the Northern Sea Route Infrastructure Development.

**Ministry of Transport**

- Regulation of navigation via the Northern Sea Route;
- International obligations of Russian Federation;
- Federal state supervision in the sphere of transport;
- State port control of vessels;
- Legislative regulation, control of navigation safety;
- Harbour masters management;
- List of port dues adoption.

**ROSATOM**

- Management of state Arctic icebreaking fleet;
- Proposals for state policy implementation on the NSR, building sea ports and objects of infrastructure;
- Management of state property;
- Organization of navigation;
- Provision of safety of navigation.

Ministry of Transport adopts after approval from Rosatom

- Mandatory regulations in the seaport;
- Rules of icebreaking assistance on the NSR, rules of ice piloting of vessels, etc.;
- List of port dues charged in each NSR seaport;
- Decision to establish a seaport on the NSR, etc.
State Corporation ROSATOM is the Infrastructural Operator of the Northern Sea Route

Competence according to the Federal Law # 525 dd December 27, 2018

Proposals for state policy implementation on the NSR

Organization of navigation

State Service Delivery

State Property Management

Directorate of the Northern Sea Route

FSUE Atomflot

FSUE Hydrographic Enterprise

Navigation Headquarters

Auxiliary Services

Navigation and Hydrographics

NSR Infrastructure Management

NSR Infrastructure Construction

Recommended Navigation Routes

Vessel Positioning Systems

Sea Canals

Vessels Traffic Control System

Hydro-technical Installations

Information Provision to Arctic going Vessels

Icebreaking Assistance

Port Services

Pilot Services

Emergency Response & Rescue

Atomic Icebreakers

LNG Icebreakers

Support Fleet

Arctic Fleet Building

NSR users provision with safe, sustainable, economically feasible and year-round navigation
It Is Possible to Reach 80 mln tons of the Northern Sea Route Traffic by 2024 Provided all Planned Projects are Launched

<table>
<thead>
<tr>
<th>№</th>
<th>Cargo</th>
<th>Project</th>
<th>Volume, mln tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Liquefied natural gas and condensate</td>
<td>Yamal LNG</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arctic LNG-2</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Crude Oil</td>
<td>Noviy Port Area, Arctic Gate terminal</td>
<td>7,1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Payakha Field</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vankor Field</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Уголь п-ва Таймыр</td>
<td>Lemberovskaya Area</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Syradasayskoe Field</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Non-ferrous &amp; precious metals</td>
<td>Norilsk Nickel</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>General Cargo</td>
<td>Delivery building materials to projects and supplies</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to remote areas</td>
<td>3,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transit</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Railroad Cargoes for Maritime Export</td>
<td>Northern Latitudinal Way</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>92,6</strong></td>
</tr>
</tbody>
</table>
YamalMax Tankers built for Yamal LNG

YamalMax Technical Data:
- Cargo capacity: 170,000 m³
- Power: 45 MW
- Ice class: ARC7
- Length: 299 m
- Beam: 50 m
- Draught: 13 m

YamalMax at a loading berth and ib 50 Let Pobedy in the ice canal
Novy Port Tankers Icebreaking Pilotage

Novy Port Tankers Tech Data:
Deadweight – **41 455 t**
Power – **22 MW**
Ice class - **ARC7**
Length - **249 m**
Beam - **34 m**
Draught – **9,5 m**

Pilotage of a Novy Port tanker by a low-draught atomic icebreaker
Norilsk Nickel

Technical Characteristics of Arctic Express type vessel:

Deadweight – 18 095 tons
Power - 13 MW
Ice Class - ARC7
Length – 169 m
Beam – 23,1 m
Draught - 10 m

Combined volume of final product (non-ferrous and precious metals) and supplies, transshipped through Port of Dudinka is 1,3 mln. tons per year.

Atomic icebreakers provide icebreaking support to Norilsk Nickel vessels during 80 days per year.
Arctic Fleet Positioning by 2035

Europe
30 mln. tons
Western sector

30 mln. tons

Year-round

Asian-Pasific
70 mln. tons
Eastern sector

Port of Sabetta – Yamal LNG
Noviy Port
Arctic LNG 2
Payaha
Dudinka
Taimyr Coal
Khatanga Licensed Area

50 Let Pobedy
615 миль
720 миль
680 миль

1-IB40
2-IB40
3-IB40
4-IB40

will be built by 2022
Active icebreakers
(the last one will be decommissioned in 2035)

Decision to be adopted when cargo traffic reaches 50 mln tons in the Eastern part of the NSR

Pevek
Baimskaia Ore Area

Atlantic
Pacific
Europe
Asian-Pasific

Western sector
Eastern sector

2028
2022
2035

1 IB40
2 IB40
3 IB40
4 IB40

Transportation of LNG from Obskaya Bay (Yamal Peninsula / Gydan Peninsula)

Eastbound navigation through the NSR brings reduction of a voyage from 14 to 22 days and enables much faster transportation of LNG to Asia-Pacific.

Cargo transportation time

- **Asia-Pacific (summer route)**
- **Asia Pacific (winter route)**
- **Europe**
- **Latin America**

**LNG projects on Yamal and Gydan**

**14 days**
- **USA**
- **Middle East**
- **Kuwait**
- **India**
- **Korea**

**12 days**
- **Europe**

**8 days**
- **Russia**

**26 days**

**2015 - 2040**

**2015 - 2040**

**2015 - 2040**

**2015 - 2040**

**2015 - 2040**

**2015 - 2040**

**2015 - 2040**

Export gas
Import

Mln. ton per year
Mln. ton per year

200 100 - 100 - 200

200 100 - 100 - 200

200 100 - 100 - 200

200 100 - 100 - 200

200 100 - 100 - 200

200 100 - 100 - 200

200 100 - 100 - 200
Number of Icebreakers will be increased from 4 to 13 Vessels to Ensure Cargo Volume Growth and Year-Round Navigation via the Northern Sea Route

<table>
<thead>
<tr>
<th>Icebreaker</th>
<th>2017</th>
<th>2019</th>
<th>2021</th>
<th>2023</th>
<th>2025</th>
<th>2027</th>
<th>2029</th>
<th>2031</th>
<th>2033</th>
<th>2035</th>
<th>2037</th>
<th>2039</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taimyr</td>
<td></td>
<td></td>
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<tr>
<td>Vaygach</td>
<td></td>
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</tr>
<tr>
<td>Yamal</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>50 Let Pobedy</td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Active Atomic Icebreakers

- Arktika
- Sibir
- Ural
- IB60 - 4
- IB60 - 5
- LNG IB - 1
- LNG IB - 2
- LNG IB - 3
- LNG IB - 4
- Leader 1
- Leader 2
- Leader 3

- Contract signed
- commissioned
- Resource prolonged
- decommissioned

50 Let Pobedy + 5 IB60 + 4 LNG IB + 3 Leaders = year-round navigation

Resource prolonged to 260,000 hrs.
Resource prolonged to 200,000 hrs.
New Generation Icebreakers is the Basis for Year-round Navigation along the Northern Sea Route

**Universal atomic icebreaker** Project 22220 (IB60) with the propulsion power of 60 MW

**KM Icebreaker9 [2] AUT2-ICS EPP**

Length - 173,3 m, beam - 34 m, draught maximum - 10,5 m, minimum operating draught - 8,55 m. Water displacement – 33 540 tons.

IB60 is equipped with dual-reactor nuclear power plant RITM-200 with the overall power of 175 MW.

**Icebreaking capability:**
The icebreaker navigates with even speed of 1,5-2 kn at full draught and power through flat solid ice with maximum thickness of 2,9 – 3,0 m.

**Atomic turbo-electric icebreaker** Project 105010 (IB Leader) with the propulsion power of 120 MW

**KM Icebreaker9 [2] AUT2-ICS EPP SDS<60 HELIDECK-H Special purpose ship**

Length – 209,0 m, beam – 47,5 m, maximum draught – 13,0 m, water displacement – 70 674 tons

IB Leader is equipped with dual-reactor nuclear power plant RITM-400 with the overall power of 315 MW.

**Icebreaking capability:**
The icebreaker navigates with even speed of 1,5-2 kn at full draught and power through flat solid ice with maximum thickness of 4,1 m.

**Line Icebreaker Aker ARC 123**

Ice class: **Icebreaker8 (designed for RMRS)**

Propulsion power: 40 MW
Length overall: 154,8 m (with towing notch – 160.0 m)
Beam: 31,4 m
Draught max: 9.0 m

Main fuel type: Liquefied Natural Gas

**Icebreaking capability:** flat ice 2,85 m thick with constant speed 2 knots
III. Development of International Transit Navigation along the Northern Sea Route
Pilotage of mt Vladimir Tikhonov via the NSR
The Largest Vessel that Transited NSR

Tanker deadweight: 160 000 tons (Suezmax)
Cargo: 120 000 tons gas condensate of JSC NOVATEK
NSR navigation period: 23.08 – 30.08.2011
Average speed: 14,0 knots
Atomic Icebreaker Escorts mv Nordic Orion via the NSR with the cargo of 66 000 tons of Iron Ore Concentrate from Murmansk to Lanshan, China
July 07, 2013

Bulker deadweight: 75 000 tons (Panamax)
Cargo: 66 000 tons iron ore of JSC EUROCHEM
Ice Class: ARC 4
mt Propontis
deadweight: 117 055 t

Caro: naphtha 79 846 t
Port of load: Mongstad, Norway
Port of discharge: Mizushima, Japan
NSR time: July, 24 – August, 05 2013

Cargo: gasoil 109 090 t
Port of load: Ulsan, Korea
Port of discharge: Skaw, Denmark
NSR time: Sept. 25 – Oct. 06, 2013
NSR Caravan Escorted by Atomic Icebreakers
July 2012 Eastbound

Mv Nordic Odyssey, ttb Vengeri, mt Marilee, mv Kapitan Danilkin
escorted by ib Yamal and Vaygach
July 12 – 22, 2012
NSR Caravan Escorted by Atomic Icebreakers
July 2013 Eastbound

Mt Two Million Ways with 61 000 tons of gas condensate is the part of the caravan escorted by ib Vaygach and Taimyr
LNG Transit via the Northern Sea Route

LNG Ob River
Ice Class: 1A (Arc 4)
Cargo capacity: 149 755 m³
Ballast:
Westbound 08-16.10.2012
Cargo:
Eastbound 09-18.11.2012

LNG Arctic Aurora
Ice Class: 1A (Arc 4)
Cargo capacity: 150 000 m³
Ballast:
Westbound 06-18.08.2013
Cargo:
Eastbound 22.09-06.10.2013
International Transit Voyages via the Northern Sea Route in 2018

COSCO

Nordic Bulk Carriers

Maersk
International Transit Voyages via the Northern Sea Route in 2018

Number of Vessels: 27
- Russian Flag: 8
- China: 8
- Portugal: 2
- Panama: 2
- Liberia: 2
- Denmark: 1
- Netherlands: 1
- Finland: 1
- Antigua & Barbuda: 1
- St. Kitts & Nevis: 1

Cargo Total: 491 342 tons
- Bulk: 306 620
- Liquid: 98 977
- General: 48 738
- Container: 32 716
- Fish: 4 291

Largest Vessel: 76 180 dwt bulk

Average Time on NSR: 9.7 days
1st Voyage Start: July 24 Eastbound
Last Voyage Completed: December 04 Westbound
Ice Conditions During Winter-Spring Period of 2018

- **Ice Concentration**:
  - 1-6 points
  - 7-10 points

- **Ice Types**:
  - Nilas
  - Old Ice
  - Young Ice (10-30 cm)
  - Fast Ice
  - One-Year Ice (30-200 cm)
  - Open Water
  - Ice Limits

- **Dates**:
  - 10-12.12.17
  - 14-16.01.18
  - 11-13.02.18
  - 11-13.03.18
  - 15-17.04.18
  - 13-15.05.18
Ice Conditions During Summer-Autumn Period of 2018

<table>
<thead>
<tr>
<th>Date</th>
<th>Ice Concentration 1-6 points</th>
<th>Ice Concentration 7-10 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-26.06.18</td>
<td>Nilas</td>
<td>Old Ice</td>
</tr>
<tr>
<td>22-24.07.18</td>
<td>Young Ice (10-30 cm)</td>
<td>Fast Ice</td>
</tr>
<tr>
<td>12-14.08.18</td>
<td>One-Year Ice (30-200 cm)</td>
<td>Open Water</td>
</tr>
<tr>
<td>18-16.09.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-23.10.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23-25.11.18</td>
<td></td>
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</tr>
</tbody>
</table>
Thank you for your attention!
Contacts of the person in charge:

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Directorate of the Northern Sea Route
State Corporation Rosatom

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Viacheslav LUNIN

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