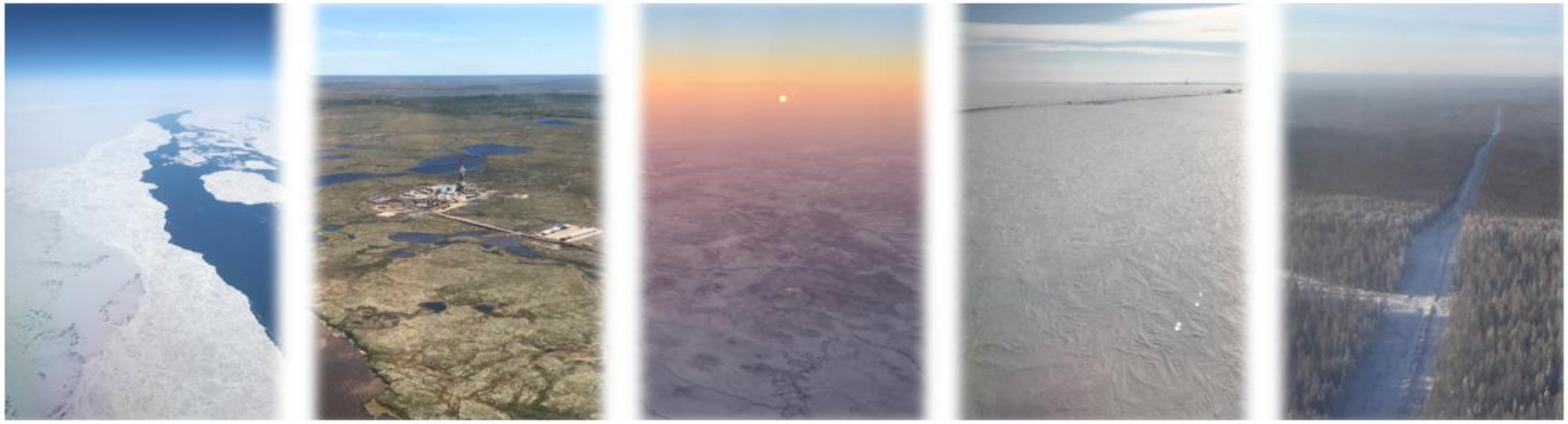
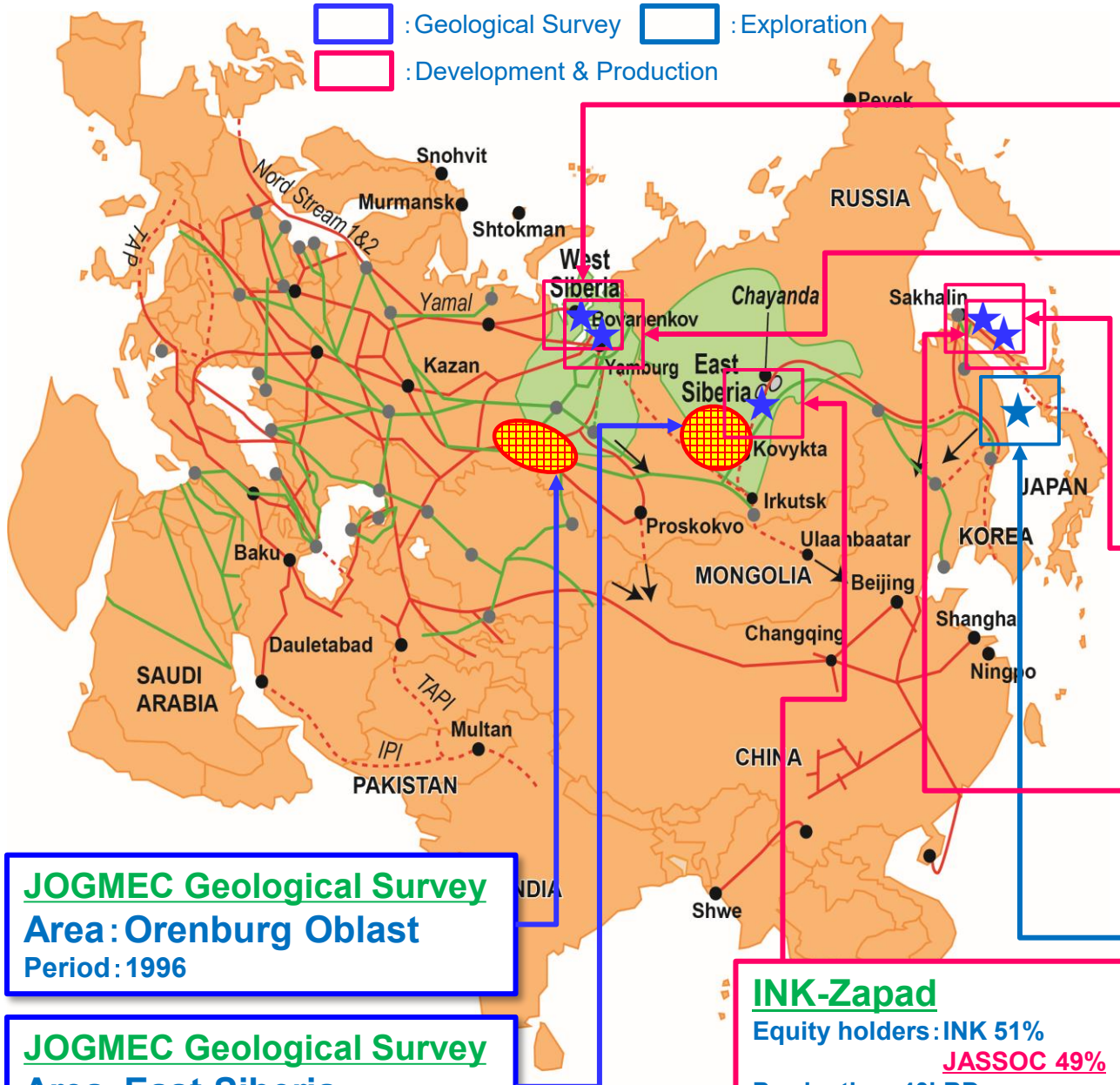
Global Gas Market at present

Aspects of Understanding Global Energy Landscape, Importance on Arctic and Preparing for Return of Russian Gas



HARADA Daisuke／原田大輔
Director General
Energy Business Unit
Japan Organization for Metals and Energy Security
独立行政法人　エネルギー・金属鉱物資源機構

Japan's Involvements in Russian Upstream Projects



Yamal LNG

Equity holders: NOVATEK 50.1%
TOTAL 20%
CNPC 10% Silk Road Fund 9.9%
Capacity: 16.5MMt (Actual: 19.4MMt)
Status: Production (Start: 2017)

【Japan's Involvement】
- EPC: JGC and Chiyoda Corp.
- Electrical Engeering: Yokogawa
- Icebreaker LNG tanker: MOL
- Finance: JBIC etc

Arctic LNG-2

Equity holders: NOVATEK 60%
TOTAL 10% CNPC 10% CNOOC 10%
Japan Arc10%
Capacity: 19.8MMt Status: Development

【Japan's Involvement】
- Investment: Mitsui and JOGMEC
- Liability Guarantee: JOGMEC
- Finance: JBIC etc

Sakhalin-1

Equity holders: ExxonMobil 30%
SODECO 30%
ONGC 20% Rosneft 20%
Production: 240kBD
Status: Production (Start: 2005)

【Japan's Involvement】
- Investment: Japanese Consortium (METI holds 15% equity substantially)
- Financial Support: JOGMEC
- Finance: JBIC etc

Sakhalin-2

Equity holders: Gazprom 50%+1stake
Shell 27.5-1stake
Mitsui 12.5% Mitsubishi 10%
Production: 100kBD (crude oil)
11.6MMt (LNG)
Status: Production (Start: Oil@1999・LNG@2009)

【Japan's Involvement】
- Investment: Mitsui and Mitsubishi
- Finance: JBIC etc

JOGMEC Geological Survey

Area: Orenburg Oblast
Period: 1996

JOGMEC Geological Survey

Area: East Siberia
Period: 1995～1996

INK-Zapad

Equity holders: INK 51%
JASSOC 49%
Production: 40kBD
Status: Production (Start: 2016)

【Japan's Involvement】
- Investment: Japanese Consortium
- Gas Chemical Plant: TEC

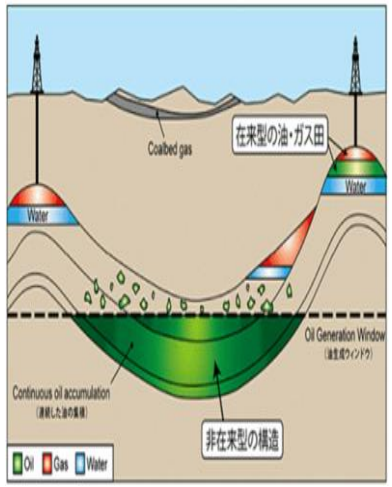
South West Sakhalin Offshore

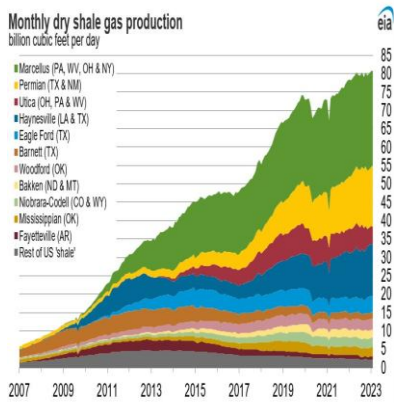
Equity holder: Rosneft 100%
Status: Exploration

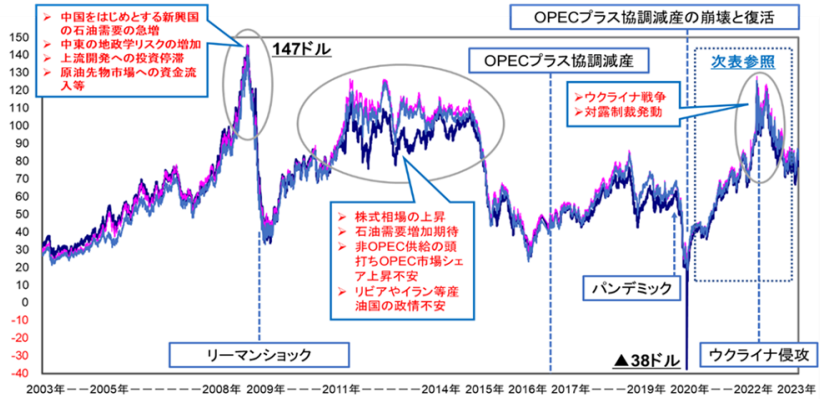
【Japan's Involvement】
- Implementing Joint Study by JOGMEC

Three Substantial Changes in Global Energy in the First Quarter of Century

Shale Revolution

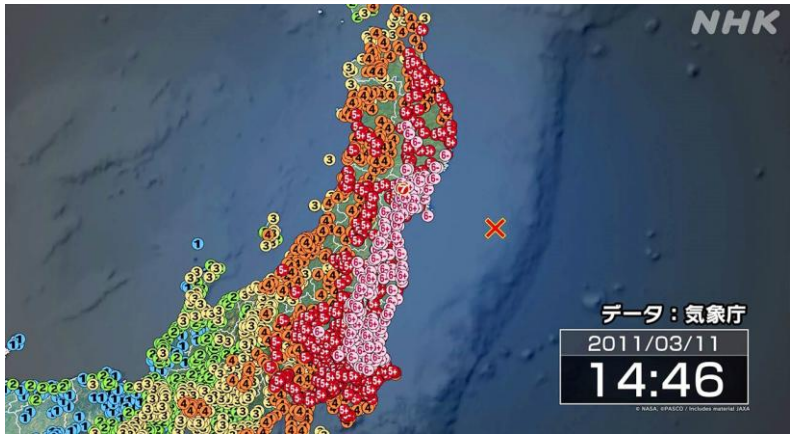


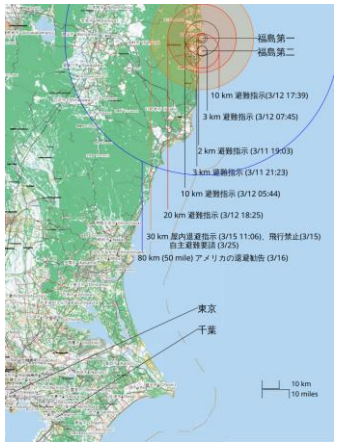




- Caused by Price Hike, Futures
- Giant consumer US becomes exporter
- Changing Balance in Middle East Geopolitics

Fukushima





- Global Allergy to Nuclear Power
- Focus on LNG as an Alternative Fuel
- Attention again in Carbon Neutrality era. Will it make a comeback?

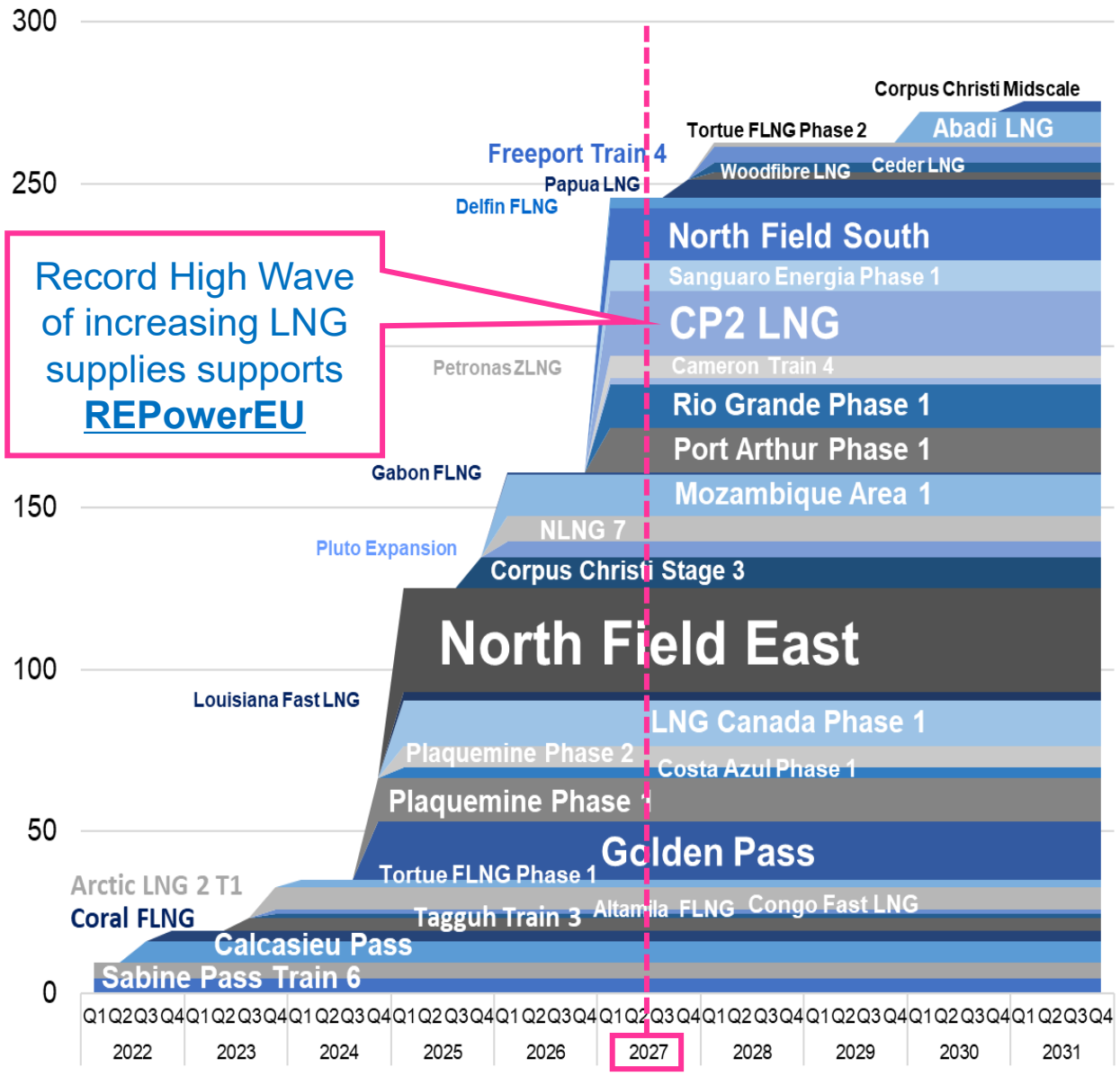
Decarbonization

Target Year	Announcement
By 2050 Carbon Neutral	EU Green Deal <December 2019> Long Term Strategy <March, 2020> Ahead of schedule by 2045
By 2050 Carbon Neutral	Ten Point Plan for a Green Industrial Revolution, Long Term Strategy <March, 2020>
By 2050 Carbon Neutral	Election Pledges <July, 2020> Climate Leaders Summit <April, 2021>
By 2060 Carbon Neutral	United Nations General Assembly Speech <September, 2020> 14th Five Year Plan <November, 2020>
By 2050 Carbon Neutral	Prime Minister's General Policy Speech<October, 2020>
By 2050 Carbon Neutral	Long Term Strategy Long Term Low Emission Development Strategy <December, 2020>
By 2050 Carbon Neutral	President's Speech at Earth Day <April, 2021>
By 2050 Carbon Neutral	Climate Leaders Summit <April, 2021>
By 2050 Carbon Neutral	Canadian Net-Zero Emissions Accountability Act <November, 2020> Cooperation on Climate Ambitions with US <February, 2021>
By 2060 Carbon Neutral	Net Zero Scenario by MED <August, 2021> Presidential Speech <October, 2021>
By 2060 Carbon Neutral	Crown Prince's Speech <October, 2021>
By 2050 Carbon Neutral	Prime Minister's Speech 'Australian Way' <October, 2021>
By 2070 Carbon Neutral	Prime Minister's Speech at COP26 <November, 2021>

- Driven by Covid-19
- Spotlighted as one of the measure for Economic Recovery by EU
- How long can it last after the 'Boom'?

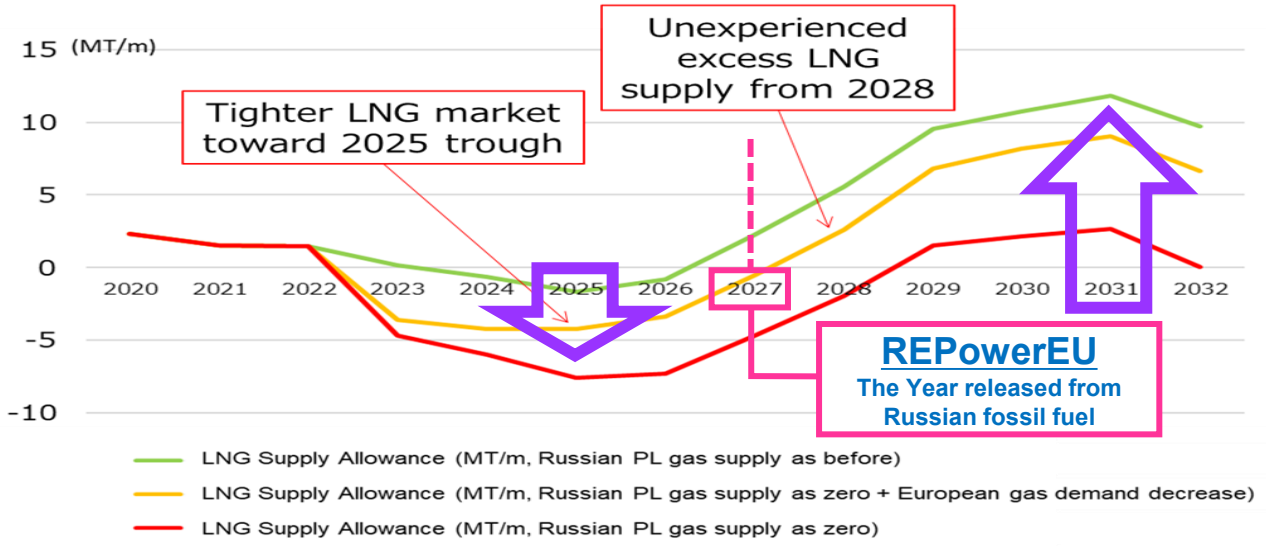
Mid and Long Term Outlook: Upcoming Ups and Downs

★Mid Term Supply Additions by FID Base

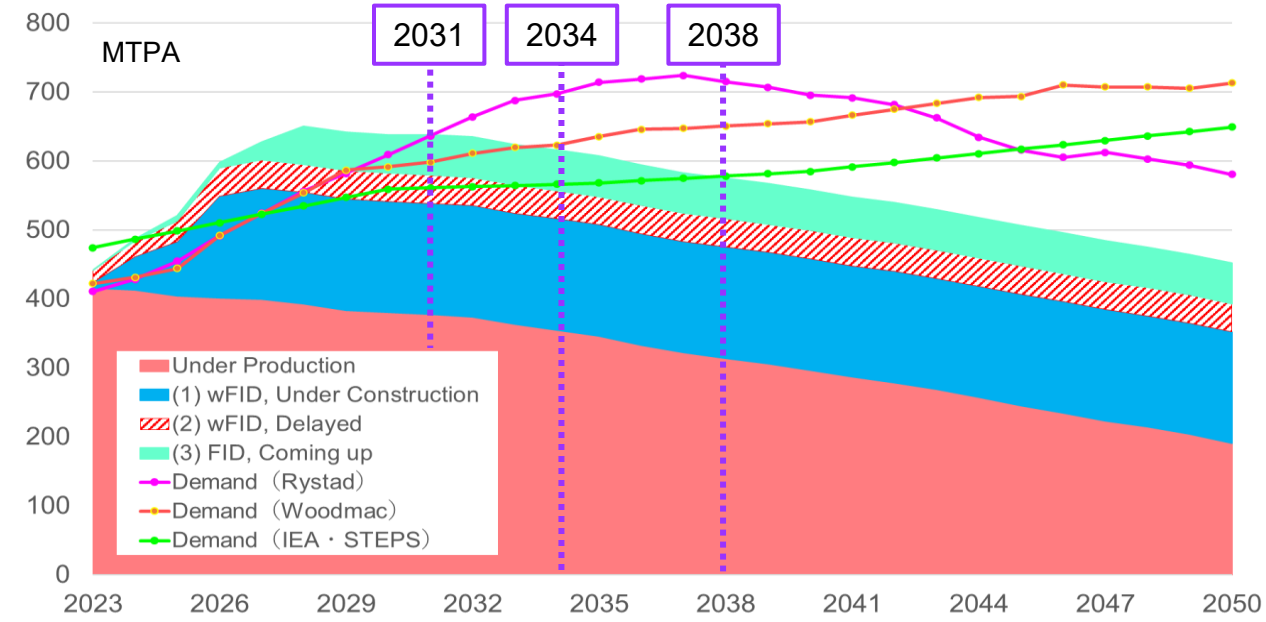


Source:JOGMEC

★Mid Term: upcoming valley and mountain



★Long Term: Demand & Supply gap starts from 2030s



Started from US-Russia Summit in Alaska on August 25, 2025?

15th August	US-Russia Alaska Summit	Russia Presidential Decree 556 related to S-1
		Arctic LNG-2 "Shadow LNG Fleet" begins southward journey
27th August	US imposes secondary tariffs on India	China's Terminal receives sanctioned LNG for the first time
31st Aug & 1st Sept	SCO (Tianjin)	No Sanctions in place despite continuous LNG offloading
2nd September	China-Russia Summit (Beijing)	Signed 'Legally Binding MOU' on POS2
13th September	Trump: Ready to impose additional sanctions if G7 and NATO countries stop buying Russian oil	

<RDIF Chairman Dmitriev & US Presidential Envoy Vitkoff: Proposal for US-Russia Arctic Energy Cooperation>

Dmitriev: 'US has lost hundreds of billions of dollars in investment opportunities due to sanctions against Russia. This time, we have proposed joint investment plans for Arctic development and rare earth exploration in Russia. These joint plans include the development of LNG in the Arctic and the joint development of resources in the Urals and the Donbas region of Ukraine.

➢ Specific examples of realistic U.S.-Russia Arctic energy cooperation

Based on past events, following two upstream development projects might have been immediately proposed by Russian side.

- Revival of JV between Rosneft and ExxonMobil in the Arctic (Kara Sea)
- Investing in Vostok Oil, the world's largest Rosneft's E&P project

➢ Tech, knowledge, and infrastructure that Russia can provide for Arctic energy development

While the Trump administration is interested in developing Alaska and acquiring Greenland, Russia possesses three tech, knowledge, and infrastructure that are ahead of US and that US government might find attractive:

- Nuclear icebreakers and fleets for Northern Sea Route
- Construction of GBS platform (ex: Arctic LNG-2)
- Arctic Cascade

Assumed US-Russia Arctic Energy Cooperation Proposal

＜RDIF Chairman Dmitriev & US Presidential Envoy Vitkoff: Proposal for US-Russia Arctic Energy Cooperation＞

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While the Trump administration is interested in developing Alaska and acquiring Greenland, Russia possesses three tech, knowledge, and infrastructure that are ahead of US and that US government might find attractive:

- ①Nuclear icebreakers and icebreaking fleets
- ②GBS construction for LNG plants
- ③Liquefaction Tech: Arctic Cascade
- ④Kamchatka Transshipment Terminal

Possible LNG Projects in Alaska

Federal Gov | Alaskan Gov.

President Trump (Republican)

'Japan, South Korea and other nations want to be our partner, with investments of trillions of dollars each.'
@12 March, Congress

PL Supports

100%

Governor Mike Dunleavy (Republican)

Former Ambassador Emanuel to Japan (Democrats)

Alaska LNG Project
https://alaska-lng.com

Alaska Gasline Dev. Corp (AGDC)

LNG | Upstream

Inviting Investors

Nov. 2017 (Trump's First Term)
MOU with Sinopec →✖

Later 2023
South Korea →✖

Jan. 2025: Agreed with Grenfarne on Framework

Invest?

Currently calling for *Japan, South Korea, Taiwan, Vietnam, and Thailand.*

Frank Rechards
President, AGDC
Petroleum Engineer

Brendan Duval
CEO & Founder

GLENFARNE ENERGY TRANSITION, LLC

Energy and infrastructure assets investment company based in NY and Houston. Founded in 2011. Main assets include power plants in Chile, Panama, and Colombia. In 2020, acquired Magnolia LNG (2.2MMt x 2 trains / export begins in 2027) near Lake Charles, Louisiana.

Mead Treadwell
former Alaskan Lieutenant Governor (Republican)
*Lost to Dunleavy in 2018 election.
*Strong connections with local companies and subcontractors.

KAMIKAWA Yoko,
Former Minister of Foreign Affairs
Secretary General of the Arctic Council (See below)
Met with Treadwell in January in Alaska

Qilak LNG Project
https://qilakIng.com/

Upstream | GBS (LNG) | Ice Class LNG tankers

Concept of Qilak LNG is based on Russian LNG projects (Yamal LNG and Arctic LNG-2) in order to reduce CAPEX by GBS modules. Shorter NSR navigation distances than Russia is also the sales point.

Russian Support?

On February 17, Russian Direct Investment Fund Chairman Dmitriyev, who attended a high-level US-Russia officials meeting in Riyadh, reportedly mentioned the "possibility of US-Russia cooperation in Arctic energy projects
Possibility 1: Northern Sea Route Cooperation (chartering Russian nuclear icebreakers, construction of GBS for LNG projects in Alaska)
Possibility 2: Revival of upstream development in Kara Sea, JV between Exxon Mobil and Rosneft. Inviting US majors for Vostok Oil Project.

Parliamentary League for Considering the Arctic Frontier (Arctic League)
Led by LDP Chairman SUZUKI Shunichi and Secretary-General KAMIKAWA Yoko, Arctic League was launched on October 28, 2013 with the aim of studying issues surrounding the Arctic and realizing the initiatives that Japan should undertake under political leadership. Latest council was held on February 18, 2025, for the first time in four years.

Transshipment

Arctic Cascade

Icebreakers

Interior's Burgum Floats Shipping Gas From Alaska North Slope＜Bloomberg@25th October 2025＞

US Secretary of the Interior Doug Burgum floated the concept of storing natural gas produced in Alaska's North Slope and shipping it directly from there, a proposal he said has drawn interest from unnamed foreign investors.
"It could be a second project, just tapping into that gas field and figuring out a way to move it out by ship"

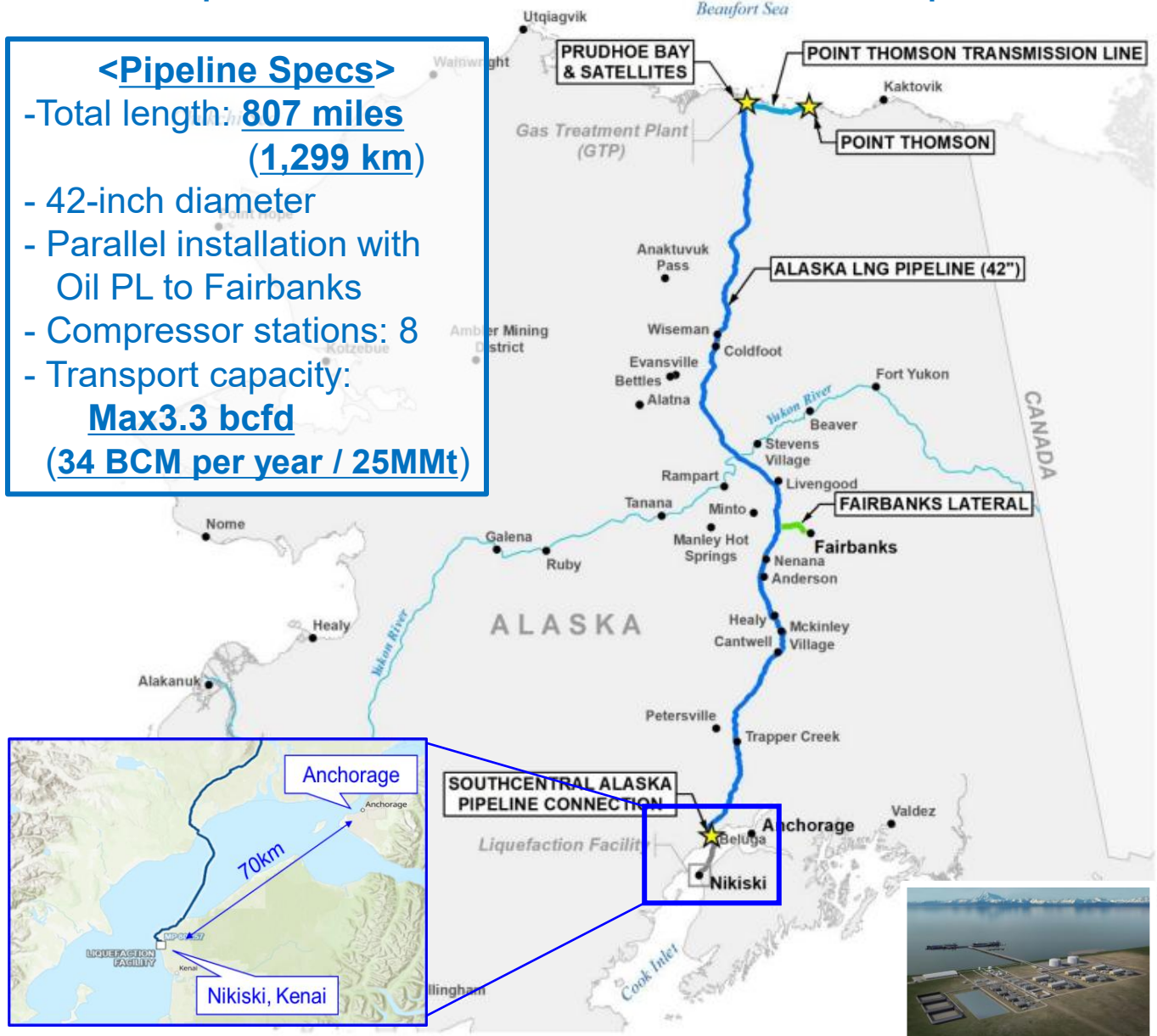
GBS

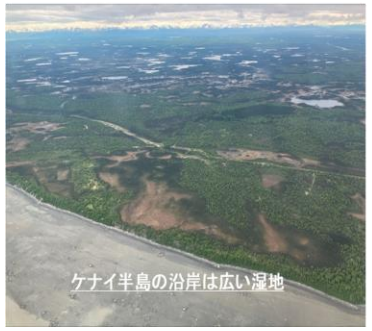
Planned construction site for the Kenai Peninsula LNG shipping terminal

Proposed route of the Alaska Gas Pipeline

<Pipeline Specs>

-Total length: **807 miles (1,299 km)**
- 42-inch diameter
- Parallel installation with Oil PL to Fairbanks
- Compressor stations: 8
- Transport capacity: **Max3.3 bcfd (34 BCM per year / 25MMt)**





Source：Alaska Gasline Development Corporation

Russian LNG Projects: operation(■), development(■) & under planning(■)

US Sanction in Nov 2023

US Sanction in Sept 2023

US Sanction in Jan 2025

US Sanction in Feb 2024

Yamal LNG (+Ob LNG)
Source: Yamal penninsula

Capacity : 16.5MMt (+4.8MMt)
Status: Operation (+Development)

NOVATEK, TOTAL, CNPC

Arctic LNG-2
Source: Gydan penninsula

Capacity : 19.8MMt
Status: Development

NOVATEK, CNPC, TOTAL, JOGMEC

Kamchatka & Murmask Transshipment Terminal
Source: Yamal&Arctic LNG-2

Capacity : 20.0MMt
Status: FS

NOVATEK, MOL, JBIC

中韓も関心表明

Portovaya LNG
Source: West Siberia
Capacity : 1.5MMt
Status: Development

ГАЗПРОМ

Cryogas-Vysotsk LNG
Source: West Siberia

Capacity : 0.66MMt
Status: Operation

NOVATEK, GAZPROMBANK

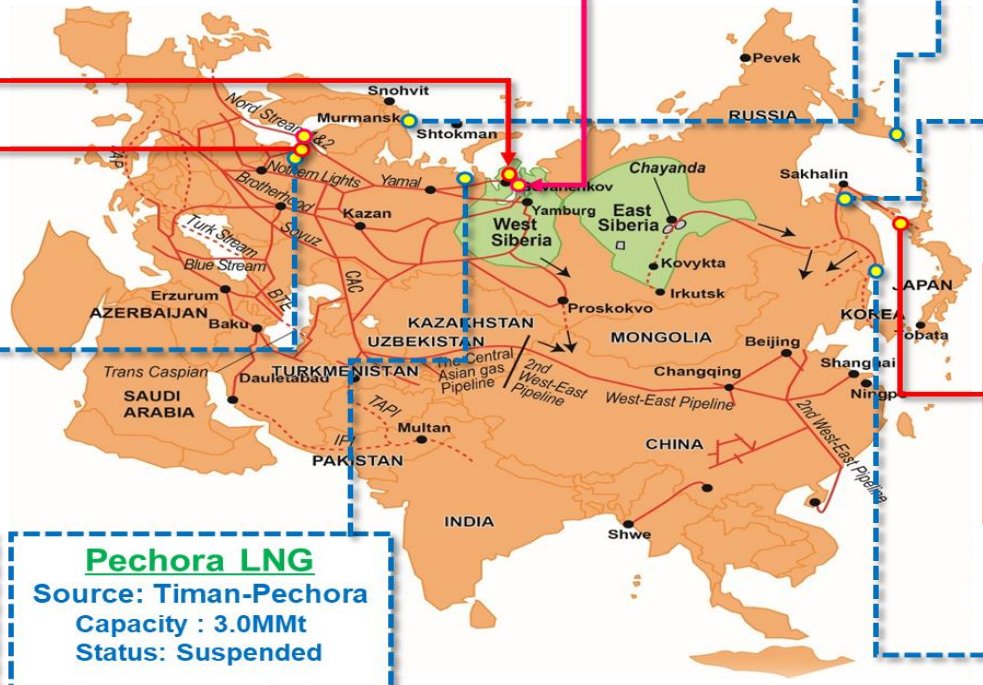
Ust-Luga (Baltic) LNG
Source: West Siberia

Capacity : 13MMt
Status: FS

РусГазДобыча, ГАЗПРОМ, withdrawal

Pechora LNG
Source: Timan-Pechora
Capacity : 3.0MMt
Status: Suspended

PECHORA LNG, ROSNEFT →withdrawal



Far East LNG
Source: S-1

Capacity : 6.2MMt
Status: FS

ExxonMobil, ROSNEFT, SODECO, 経済産業省

S-2+Expansion<3rd Train>
Source: S-2 and S-3

Capacity : 10.8MMt+5.4MMt
Status: Operation
3rd Train: Pre-FEED

ГАЗПРОМ

Vladivostok LNG
Source: S-3 and East Siberia

Capacity : 1.5MMt
Status: FS

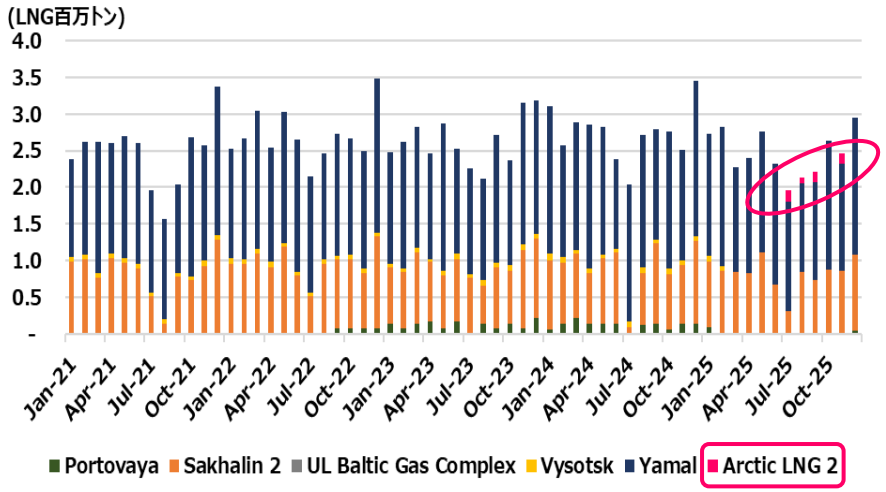
ГАЗПРОМ

写真・図出典：各プロジェクト公開情報より引用

Russian LNG Flow at present

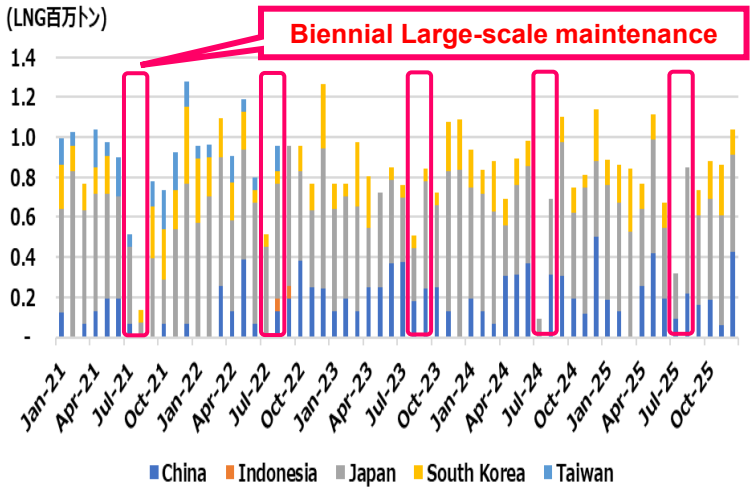
★Export Volume of Russian LNG

29.8 MMt @2021	32.4 MMt @2022	31.5 MMt @2023	32.9 MMt @2024	30.8 MMt @2025



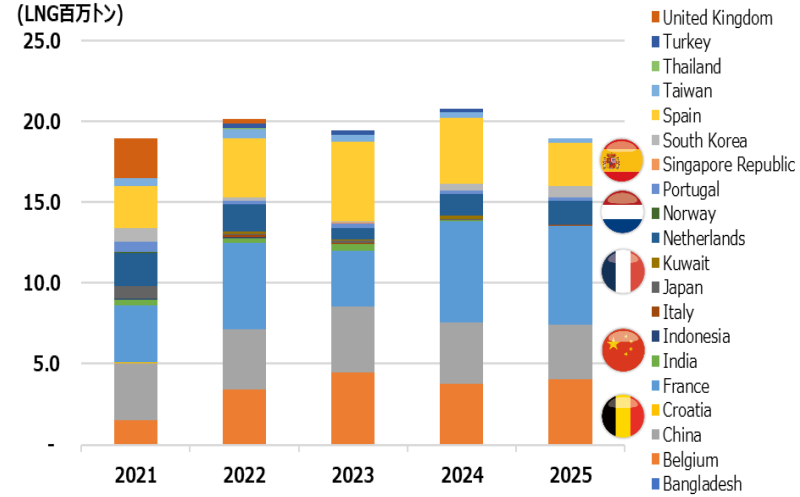
★Sakhalin-2 LNG

10.1 MMt @2021	11.3 MMt @2022	9.9 MMt @2023	9.8 MMt @2024	9.9 MMt @2025



★Yamal LNG

18.9 MMt @2021	20.1 MMt @2022	19.5 MMt @2023	20.8 MMt @2024	19.0 MMt @2025



★Russian LNG Share by Countries

	2022	2023	2024	2025
Japan	21%	19%	17%	19%
China	18%	21%	16%	23%
France	16%	11%	19%	20%
Belgium	11%	15%	12%	14%
Spain	11%	16%	14%	9%
Korea	6%	5%	6%	8%
Netherland	5%	2%	4%	4.8%
Taiwan	3%	1%	0.9%	0.9%
UK	1.1%	-	-	-
Turkey	0.9%	3%	1.4%	-
India	0.9%	1%	0.2%	-

	2022	2023	2024	2025
Indonesia	0.7%	-	-	-
Portugal	0.7%	0.9%	0.7%	0.7%
Finland	0.6%	0.5%	0.4%	-
Greece	0.4%	1.9%	0.4%	-
Kuwait	0.4%	0.2%	0.7%	-
Italy	0.4%	0.2%	0.2%	-
Sweden	0.2%	0.2%	0.2%	-
Thailand	0.2%	-	-	-
Lithuania	0.2%	-	0.01%	-
Norway	0.04%	0.2%	0.05%	-

★S-2 LNG buyers

	2022	2023	2024	2025
Japan	60%	58%	56%	59%
China	18%	25%	28%	24%
Korea	16%	17%	16%	17%
Taiwan	5%	-	-	-
Indonesia	1%	-	-	-

★Yamal LNG buyers

	2022	2023	2024	2025
France	26%	18%	31%	32%
China	19%	20%	18%	18%
Spain	18%	25%	20%	14%
Belgium	17%	23%	18%	21%
Netherland	8%	3.8%	6.3%	7.7%
Taiwan	3%	2.2%	1.4%	1.5%
UK	2%	-	-	-
India	1.4%	2.1%	0.4%	-

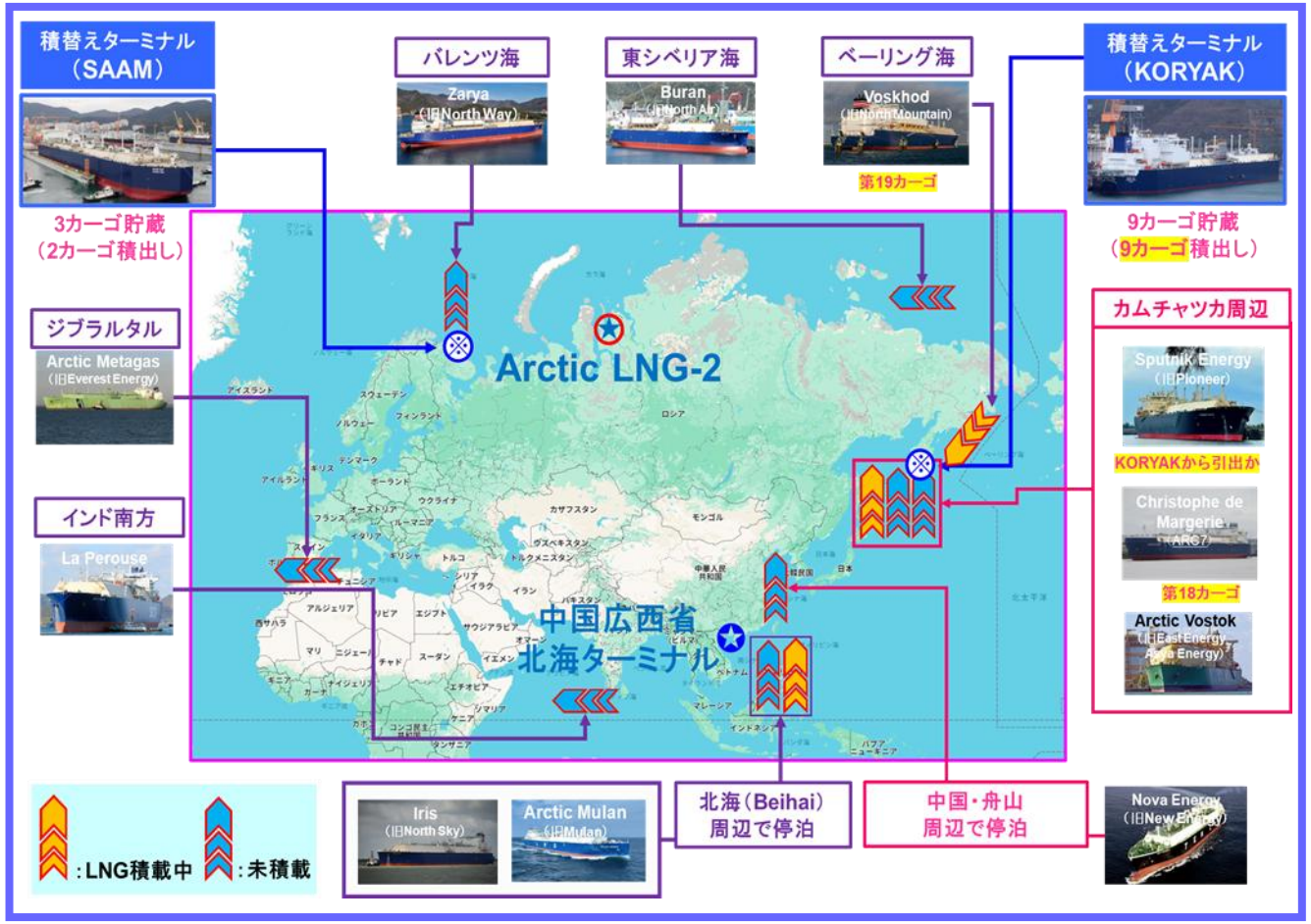
	2022	2023	2024	2025
Portugal	1.1%	1.5%	1.1%	1.2%
Korea	0.9%	0.4%	2.1%	3.8%
Turkey	0.7%	2.6%	0.4%	-
Kuwait	0.7%	0.4%	1.1%	-
Italy	0.7%	0.3%	0.4%	0.4%
Indonesia	0.6%	-	-	-
Thailand	0.4%	-	-	-
Japan	0.3%	0.7%	0.4%	-

US Sanctions targeting Arctic LNG 2 and Northern Sea Route

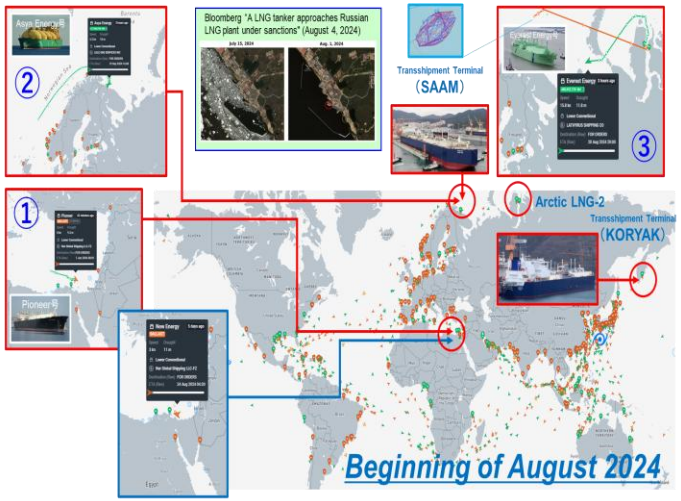
Why US started targeting Arctic LNG-2?

Date	Events and Contents of Sanctions	US Targets
19th May 2023	G7 Joint Statement in Hiroshima 'We will continue to reduce Russia's revenue to finance its illegal aggression by taking appropriate steps to limit Russia's energy revenue and future extractive capabilities..' https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/19/g7-leaders-statement-on-ukraine/	Atomflot, Gazprom Vnigaz, SNIIGGIMS, Gazpromneft Noyabrsk, Vygon Consulting, Gubkin Univ. etc. 
20th July 2023	DOS is designating multiple entities involved in expanding Russia's ability to finish construction of key future energy projects, as well as entities engaged in exploratory drilling throughout Russia. Russian shipping company that has provided key logistical support to multiple Russian future energy projects.	Nipigaz SASCO 
14th Sept 2023	DOS is imposing sanctions on over 70 entities and individuals involved in expanding Russia's energy production and export capacity.. https://www.state.gov/imposing-further-sanctions-in-response-to-russias-illegal-war-against-ukraine-2/	5 entities & 2 FSUs related to Arctic LNG-2
2nd Nov 2023	CONSTRAINING RUSSIA'S FUTURE ENERGY PRODUCTION AND EXPORT CAPACITY https://www.state.gov/taking-additional-sweeping-measures-against-russia/ https://www.state.gov/taking-additional-sweeping-measures-against-russia-3/	Arctic LNG 2 LLC
12th Dec 2023		3 entities related to Ust-Luga LNG
23rd Feb 2024	DOT imposed additional sanction related to Arctic LNG-2. https://home.treasury.gov/news/press-releases/jy2117	NOVATEK Murmansk, Smart LNG, Zvezda Shipyard, JSC Sovcomflot
1st May 2024	DOS imposed additional sanction related to Arctic LNG-2. https://www.state.gov/imposing-new-measures-on-russia-for-its-full-scale-war-and-use-of-chemical-weapons-against-ukraine-2/	Red Box Energy Services (Singapore), AUDAX, PUGNAX CFU Shipping Co Ltd (Hongkong), Hunter Star, Nan Feng Zhi Xing Eko Shipping LLC, Transstroy LLC Modmer Trading Uluslararasi Ithavat Ve Ihravat Ltd Sirketi (Turkey)
12th June 2024	DOS imposed additional sanction related to Arctic LNG-2. https://www.state.gov/taking-additional-measures-to-degrade-russias-wartime-economy/	RusGazDobycha, Arktik SPG 1, Obsky Gas Chemical Complex Gazprom Invest, Arktik SPG, 7 ARC7LNG tankers 蓬莱巨涛海洋工程重工有限公司 (China), LLC Murrmansk LNG YAMALDORSTROY (Vostok Oil Project related)
23rd Aug 2024	DOS imposed additional sanction related to Arctic LNG-2. https://www.state.gov/taking-additional-measures-to-degrade-russias-wartime-economy/	ZARA SHIPHOLDING CO, OCEAN SPEEDSTAR SOLUTIONS, 3 LNG tankers NOVATEK CHINA HOLDINGS CO LTD EKROPROMSTROY, WATERFALL ENGINEERING LTDWHITE FOX SHIP MANAGEMENT FZCO, 4 LNG tankers
5th Sept 2024	DOT imposed additional sanction related to Arctic LNG-2. https://www.state.gov/further-sanctions-to-degrade-russias-ability-to-operationalize-the-arctic-lng-2-%20project/	Gotik Energy Shipping Co, Plio Energy Cargo Shipping OPC PVT LTD 2 LNG tankers
30th Oct 2024	DOS imposed additional sanction related to Arctic LNG-2. https://www.state.gov/new-measures-targeting-third-country-enablers-supporting-russias-military-industrial-base/	SMART SOLUTIONS LTD (related to GBS construction and transportation) LNG ALPHA SHIPPING PTE LTD, NEW TRANS SHIPMENT FZE, LNG BETA SHIPPING PTE LTD, LNG DELTA SHIPPING PTE LTD LNG GAMMA SHIPPING PTE LTD

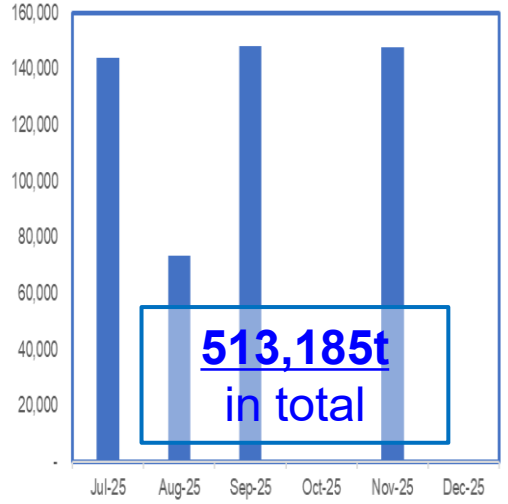
Shadow LNG fleet and its direction as of today



Trial Export in 2024 but failed



Export Volume 2025



China Beihai LNG Terminal

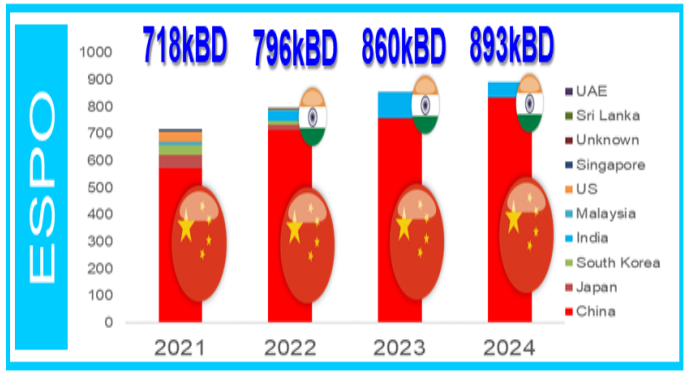
Stakeholders	Capacity	Tanks	Volume	Start Year	CAPEX
PipeChina：80% 広西北部湾国際港務集団：20%	6	4	0.64 MMkL	2016	17.78 Bil RMB

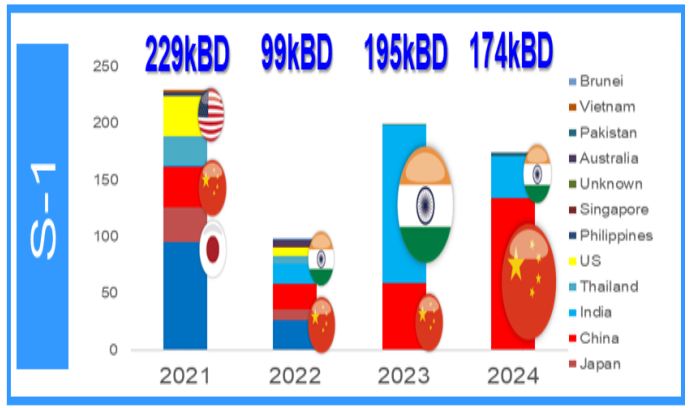
Current Status of Russian Upstream Projects with Japanese Investors

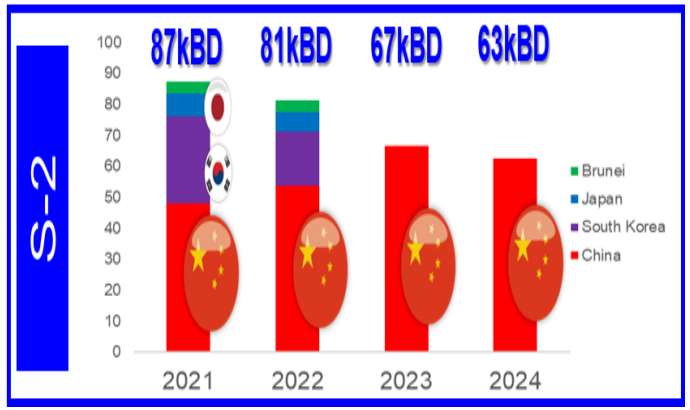
★Russian Upstream Projects with Japanese Investors

Project	JV format	Partners: Foreign Investors	Partners: Russian Investors	Production Scale	What Japan can do: Import Oil	Import LNG	Provide Engineering Service
S-1	Unincorporated JV Currently being transferred to a Russian entity by EO723	'Unfriendly Countries' ExxonMobil:30% (Withdrawing) SODECO:30% (METI・Itochu・Marubeni・INPEX・JAPEX) 'Friendly Countries' ONGC Videsh:20%	Rosneft:20% SakhalinMorNeftgaz-Shelf (11.5%) RN-Astra (8.5%) ROSNEFT	Crude Oil 230,000BD Gas 265mmcfd 270,000BOED	X	O	O
S-2	Incorporated Currently being transferred to a Russian entity by EO416&2	'Unfriendly Countries' Shell:27.5%-1share (Withdrawing) Mitsui:12.5% Mitsubishi :10.0%	Gazprom: 50%+1share GAZPROM	NGL 87,000BD Gas 1590mmcfd (10.8MMt・LNG) 357,000BOED	O	O	O
Arctic LNG-2	Incorporated (Russian entity)	'Unfriendly Countries' TOTAL:10% Mitsui/JOGMEC:10% 'Friendly Countries' CNPC:10% CNOOC:10%	NOVATEK:60% NOVATEK	NGL Expected 2-20,000BD Gas 868mmcfd @2024max (6.6MMt・LNG) 450,000BOED	X	O	O
INK-Zapad	Incorporated (Russian entity)	'Unfriendly Countries' JASSOC:49% (Itochu・INPEX・JOGMEC)	INK:51%	Crude Oil 15,000BOED	X	—	X

★Crude Oil Flow by Countries







★Long-term Contracts of S-2

Buyers	Volume (10000t)	Term of Contracts	Price Condition
JERA	50	2011 ~2026	DES
Hiroshima Gas	21.4	2008 ~2028	FOB
Saibu Gas	6.5	2014 ~2028	DES
KOGAS	150	2008 ~2028	FOB
Shell	100	2009 ~2028	DES
Gazprom	100	2009 ~2028	DES
JERA	150	2009 ~2029	FOB
Tohoku Electric	42	2010 ~2030	FOB
Kyushu	50	2009 ~2031	DES
Osaka Gas	20	2008 ~2031	FOB
Tokyo Gas	110	2009 ~2031	FOB
Toho Gas	50	2009 ~2033	DES

Source:JOGMEC

Putin's Visit to China: Agreed on POS-2 finally?

- The focal topics of the Presidential Meeting between Putin and Xi: **①Power of Siberia 2, ②China's commitment of non-participation in the Ukraine Peace Conference, and ③the expansion of business for Chinese financial institutions in Russia**.
- China and Russia reaffirmed their interest in realizing POS-2. Putin also mentioned **parallel construction of crude oil pipeline**. Deputy Prime Minister Novak: The crude oil pipeline project to be laid in parallel with POS-2,though the gas pipeline is still in the early stages. The capacity of the parallel crude oil PL could reach up to 30 million tons (600,000 barrels per day).

Upstream Stake

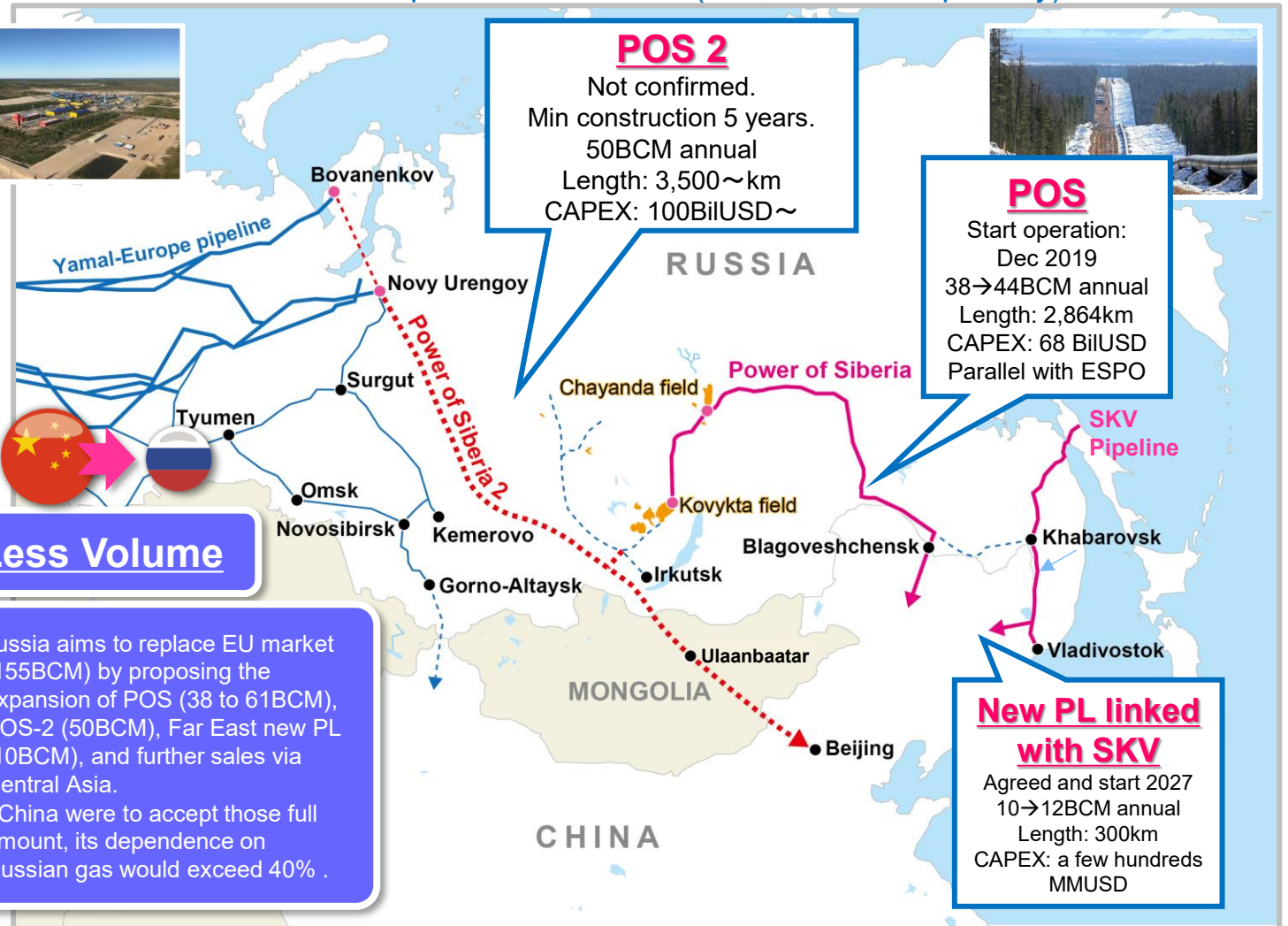
- In Jan 2024, Wintershal and OMV's asset in West Siberia were nationalized.
  - Achim Development
  - Achimgas
  - Sever Nefte Gazprom

Gas Price

- China insists the same and less level of gas price than current POS condition.
- Russia is required to cover the transit cost via Mongolia.
- Price factors include the domestic coal price in China and Yamal LNG offtake price.

Less Volume

- Russia aims to replace EU market (155BCM) by proposing the expansion of POS (38 to 61BCM), POS-2 (50BCM), Far East new PL (10BCM), and further sales via Central Asia.
- If China were to accept those full amount, its dependence on Russian gas would exceed 40% .



100 BilUSD Loan

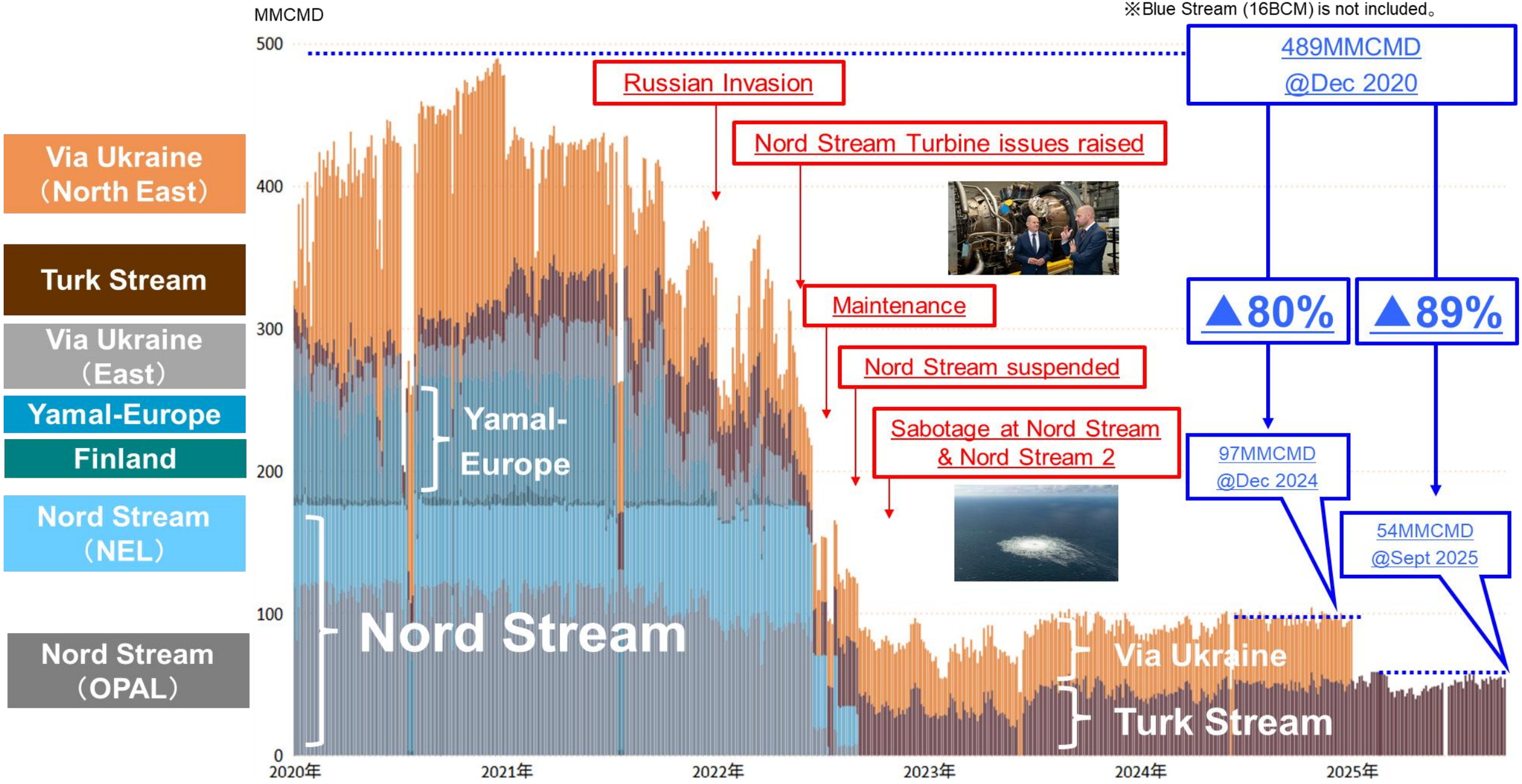
- POS-2 will be the world's longest and most expensive PL built on permafrost.
- Russia would like to hold hostage from China by advance in the form of a loan-purchase-gas agreement.
- On the other hand, Chinese loans will mean that China can control the PL substantially, upstream, middle and downstream processes.

Downstream Stake

- Gazprom has been exploring the possibility of participating in China's downstream market, but progress has been slow.
- Controlled retail gas prices, Monopolies such as CNPC, Sinopec and Pipe China makes Gazprom unattractive

Is this under their calculation?: Russia is losing golden market

※Blue Stream (16BCM) is not included。



Can Russia replaced its European Market by others

Point 1
China & India cannot replace European market.

Point 2
EU's ban on LNG equipment export will have a critical impact on Russia.

PL+LNG Export
201BCM

EU is heading for Zero hydrocarbon from Russia by 2027

EU's embargo on LNG equipment
(5th Package@8th April 2022)

LNG Export

PL Export

SKV+New Far East PL：12BCM
Power of Siberia 2：50BCM

Point 3
Russia will rush to build Power of Siberia 2 Pipeline in order to connect West & East.

Point 4
China will press Russia for gas price discount, but limits max volume up to 35BCM.

Demand Increase@2030
+73BCM

＜Breakdown＞
Doemstic：30BCM
PL：－
LNG：43BCM
※Not including TAPI-PL (Turkmenistan) import。

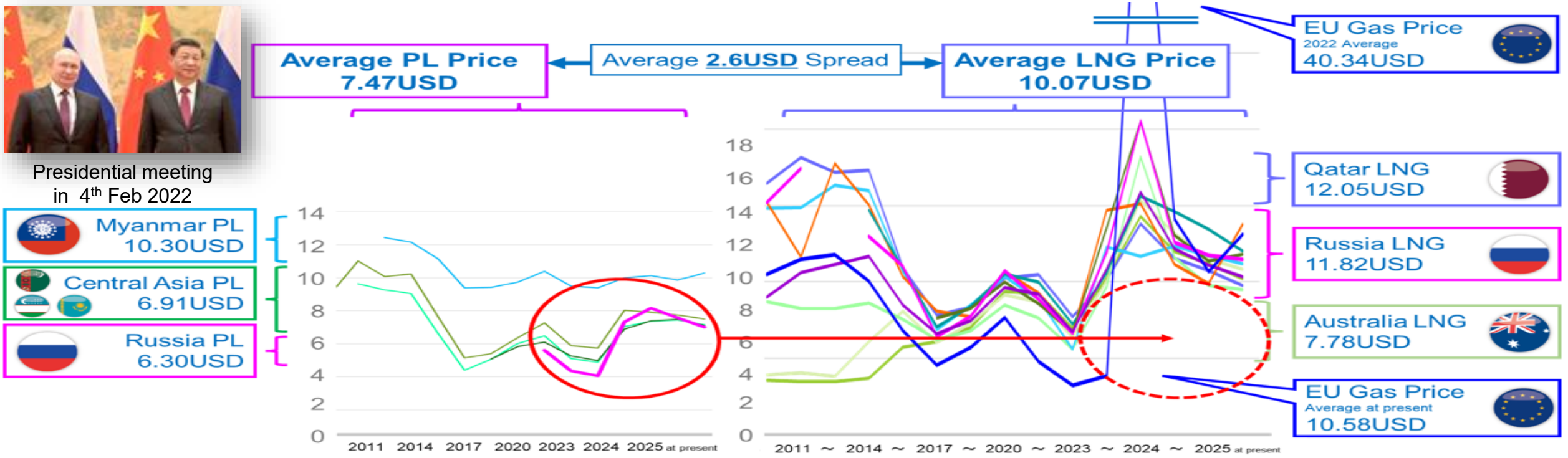
Demand Increse@2035
+124BCM

＜Breakdown＞
Domestic：58BCM
PL：35BCM
LNG：31BCM

国内生産対輸入=47：53
内、輸入：PL対LNG=54：46

Comparison of Prices of PL & LNG suppliers in China

Presidential meeting
in 4th Feb 2022



PL

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 at present	Average
Turkmenistan	9.11	11.01	10.08	10.23	7.64	5.14	5.41	6.38	7.27	5.89	5.75	8.03	7.92	7.74	7.51	7.67
Uzbekistan		9.63	9.27	9.03	6.63	4.40	5.06	6.03	6.48	5.11	4.88	7.05	7.36	7.45	7.15	6.82
Kazakhstan (China border)							5.08	5.83	6.10	5.27	4.97	6.89	7.39	7.48	7.12	6.24
Myanmar			12.44	12.17	11.14	9.39	9.43	9.75	10.39	9.50	9.39	10.00	10.14	9.86	10.28	10.30
Russia									5.61	4.36	4.06	7.32	8.16	7.58	7.01	6.30

LNG

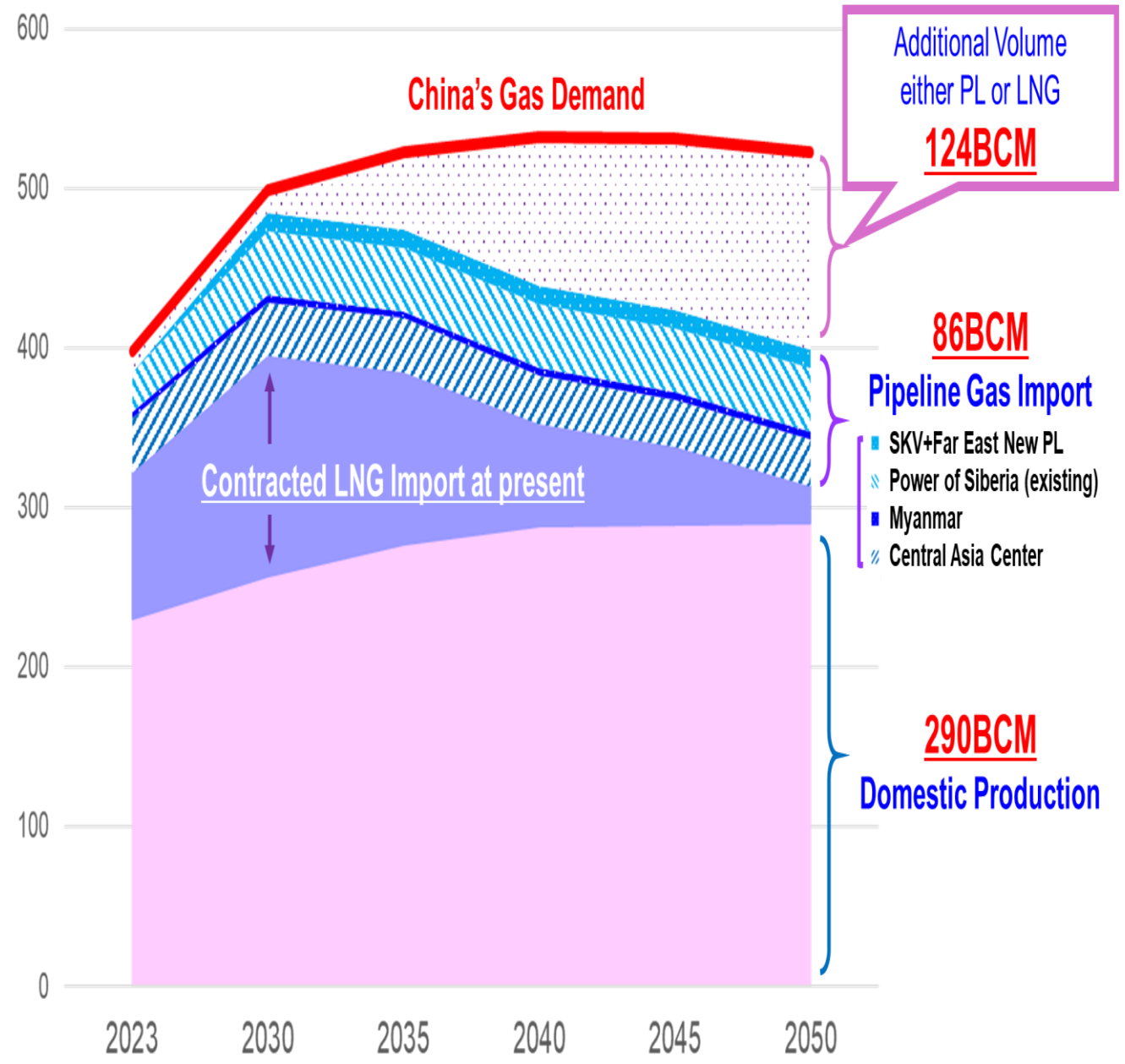
Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 at present	Average
Qatar	16.45	18.17	17.18	17.32	10.91	7.83	8.37	10.28	10.48	7.72	10.14	13.79	11.56	10.77	9.78	12.05
Australia	3.55	3.46	3.48	3.69	5.76	6.11	7.03	9.39	9.24	6.96	10.26	14.32	12.00	11.18	10.23	7.78
Indonesia	3.93	4.06	3.81	6.10	8.09	6.03	7.28	9.16	8.70	6.40	10.09	15.37	13.18	11.49	10.86	8.30
Malaysia	8.69	8.26	8.28	8.64	7.54	6.24	6.79	8.49	7.65	5.62	9.68	18.18	11.60	9.79	9.51	9.00
Nigeria	14.81	14.86	16.35	15.99	10.69	6.91	8.48	10.37	8.90	5.61	12.29	11.69	12.33	11.72	11.20	11.48
Trinidad Tobago	15.21	11.63	17.78	15.05	10.37	8.08	7.73	10.72	9.27	6.73	14.71	15.16	11.16	9.91	13.76	11.82
Papua New Guinea				14.70	10.89	7.09	8.42	10.51	10.01	7.26	10.59	15.63	14.60	13.46	12.03	11.27
US	16.09					7.64	8.25	9.98	8.57	6.74	13.55	20.51	13.07	11.37	11.80	11.60
Russia (S-2 & Yamal)	15.21	17.43		13.00	11.05	6.42	7.74	10.72	8.85	6.65	11.97	20.55	12.61	11.77	11.48	11.82
Average Price of all LNG	9.02	10.62	11.16	11.69	8.50	6.61	7.47	9.64	9.20	6.75	10.86	15.91	12.19	11.10	10.35	10.07

PL

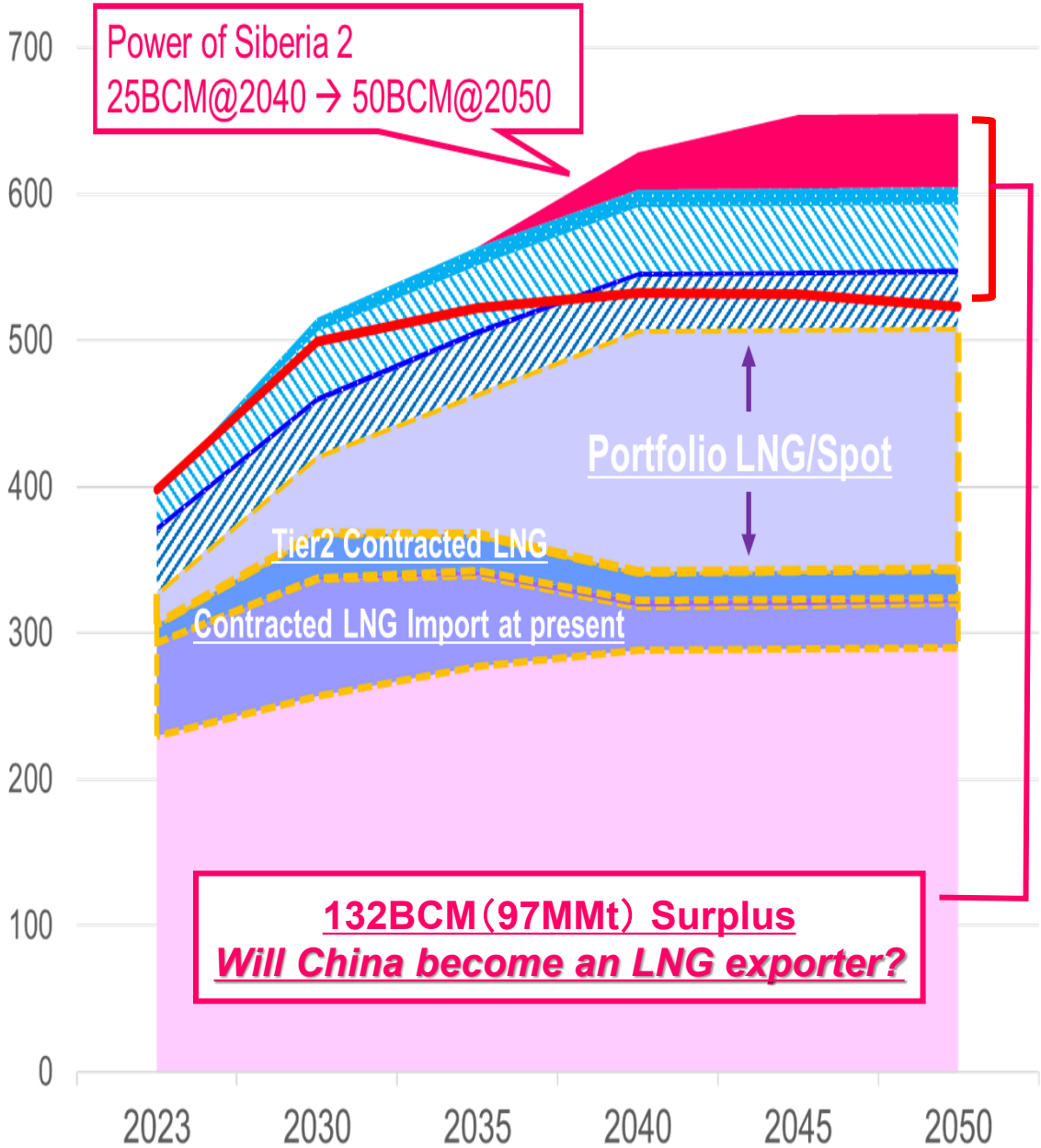
Russian Gas Price for Europe	10.52	11.47	11.79	10.05	6.82	4.56	5.72	7.68	4.80	3.24	3.85	40.34	14.09	10.70	13.14	10.58

China's Gas Demand Outlook: "Power of Siberia 2" Really Necessary?

★Case A：Existing LNG Contract Base



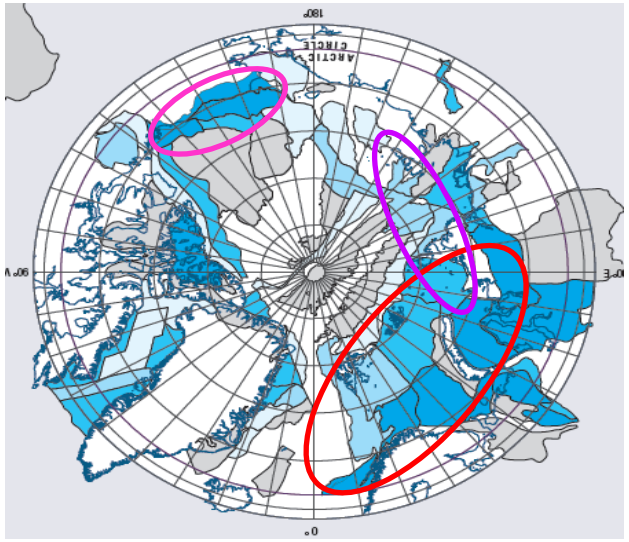
★Case B：Portfolio・Spot ＋ Resale & Export



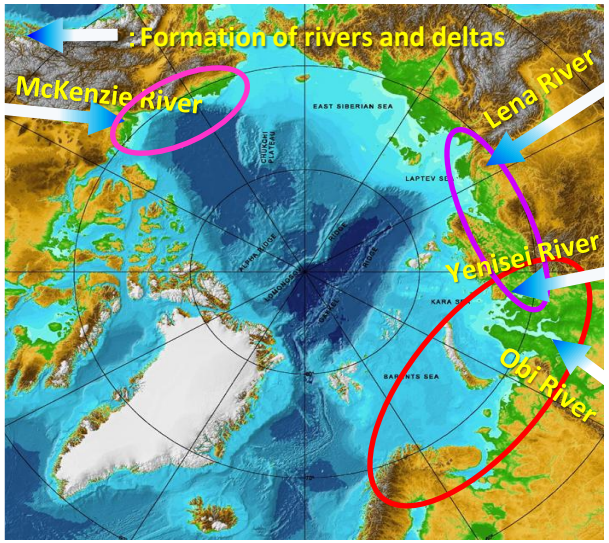
Reference materials

Oil and natural gas potential in the Arctic

★USGS Research 'CARA'@2008

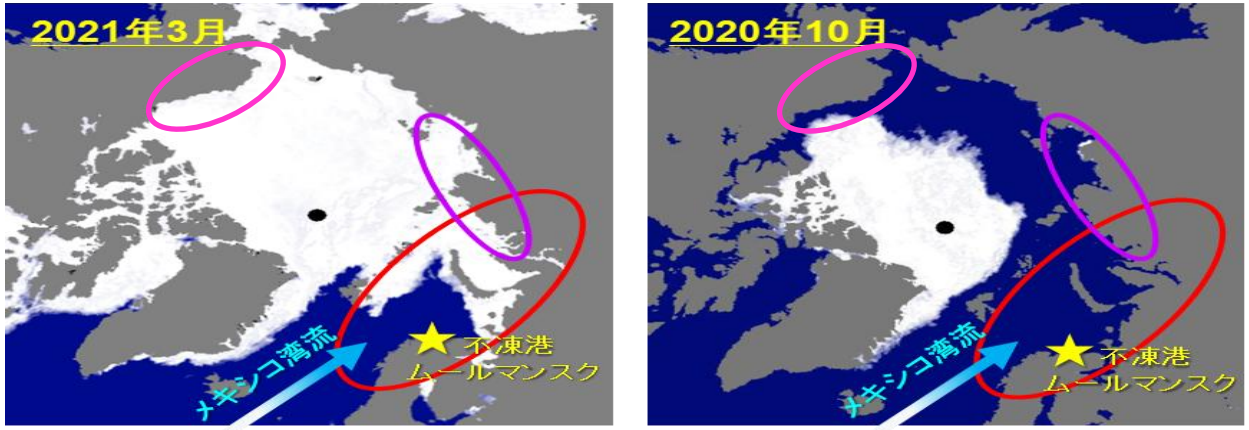


★Arctic Ocean continental shelf



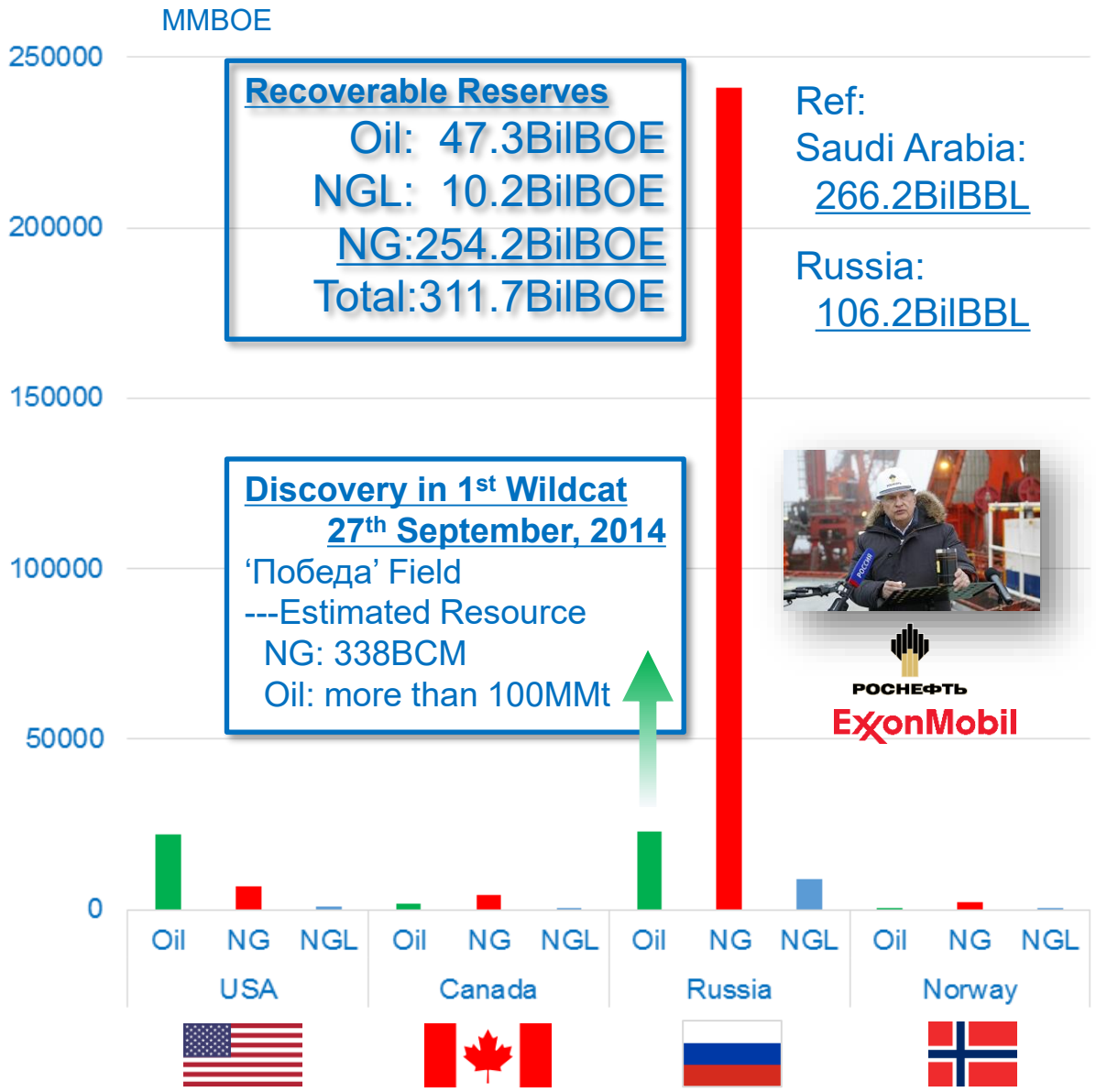
- Out of world's undiscovered resources, Arctic accounts for 13% of oil and 30% of natural gas.
- Out Of the five Arctic coastal countries (Russia, Norway, Denmark, US, and Canada), Russia has the highest potential in terms of the extent of its continental shelf, sea ice conditions, and resource in place.

★Comparison of Arctic sea ice conditions



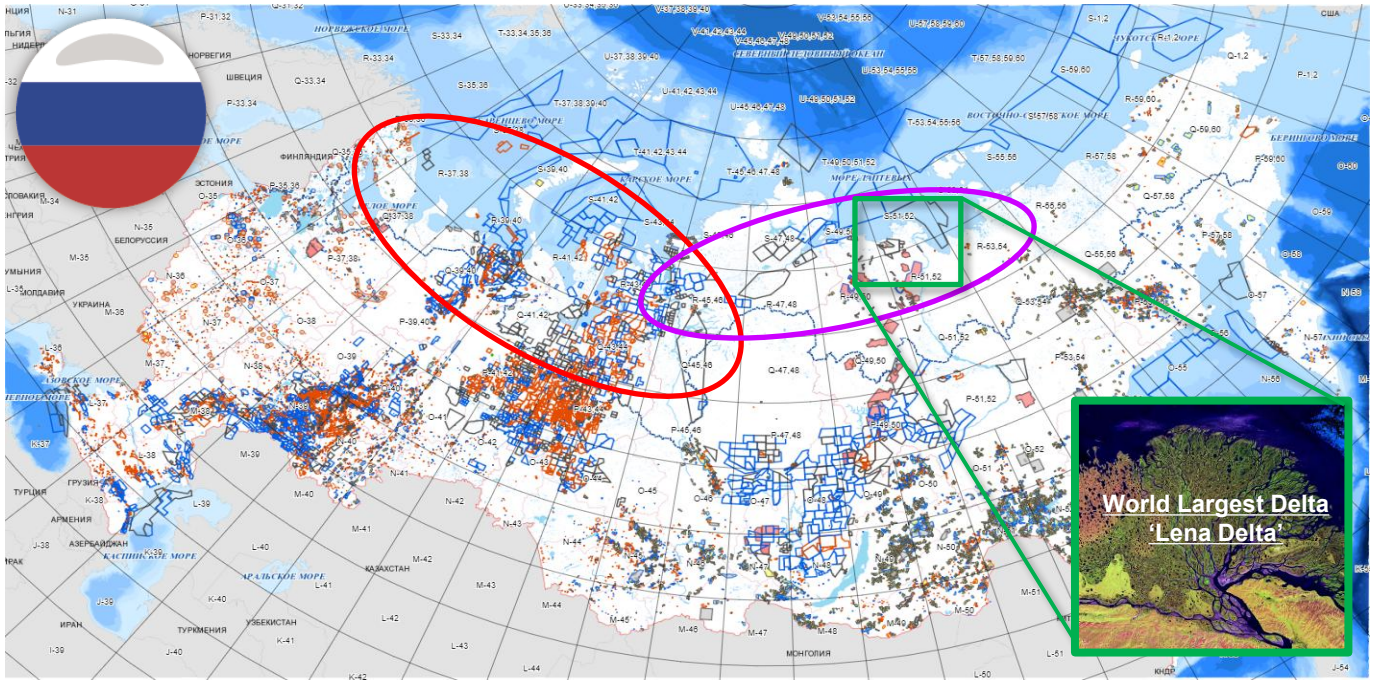
- Reduction in sea ice due to climate change has created ice-free conditions along the Russian coast during the summer window. The northwestern Barents Sea does not freeze even in winter due to the Gulf Stream.
- On the other hand, sea ice grows and exists in the eastern Barents Sea during winter.

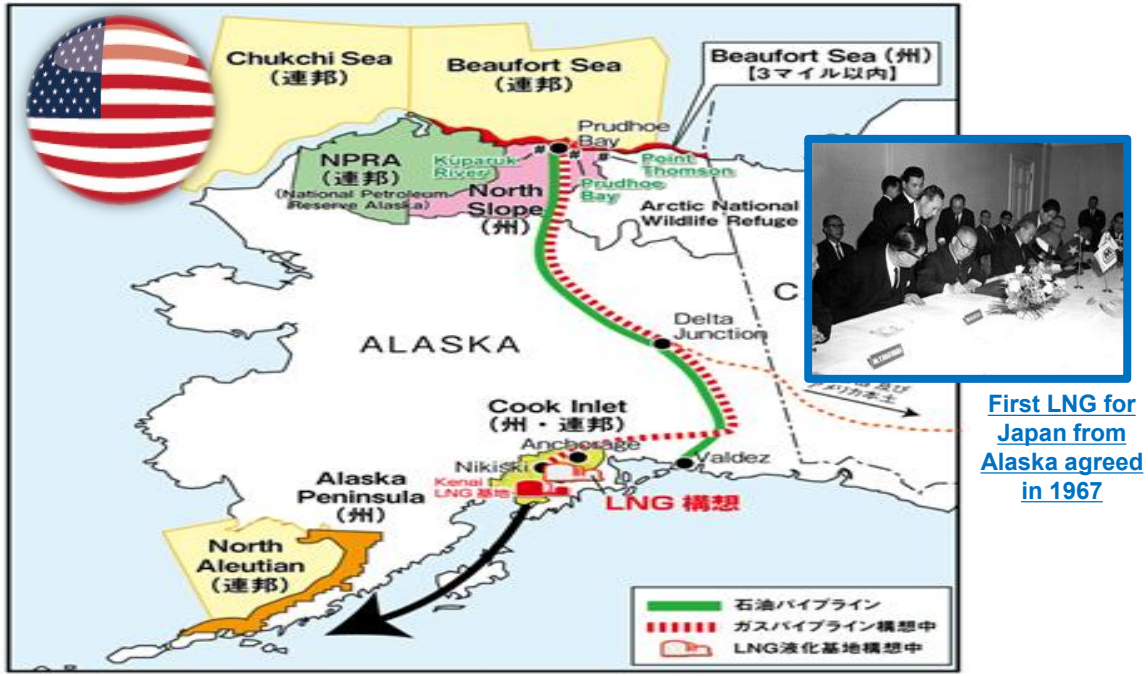
★Comparison of Potentials among Coastal States



Source: Public information from each projects, IHS-JOGMEC Research

US, Norway and Russia: 3 Gigantic Areas for Oil and Gas Development



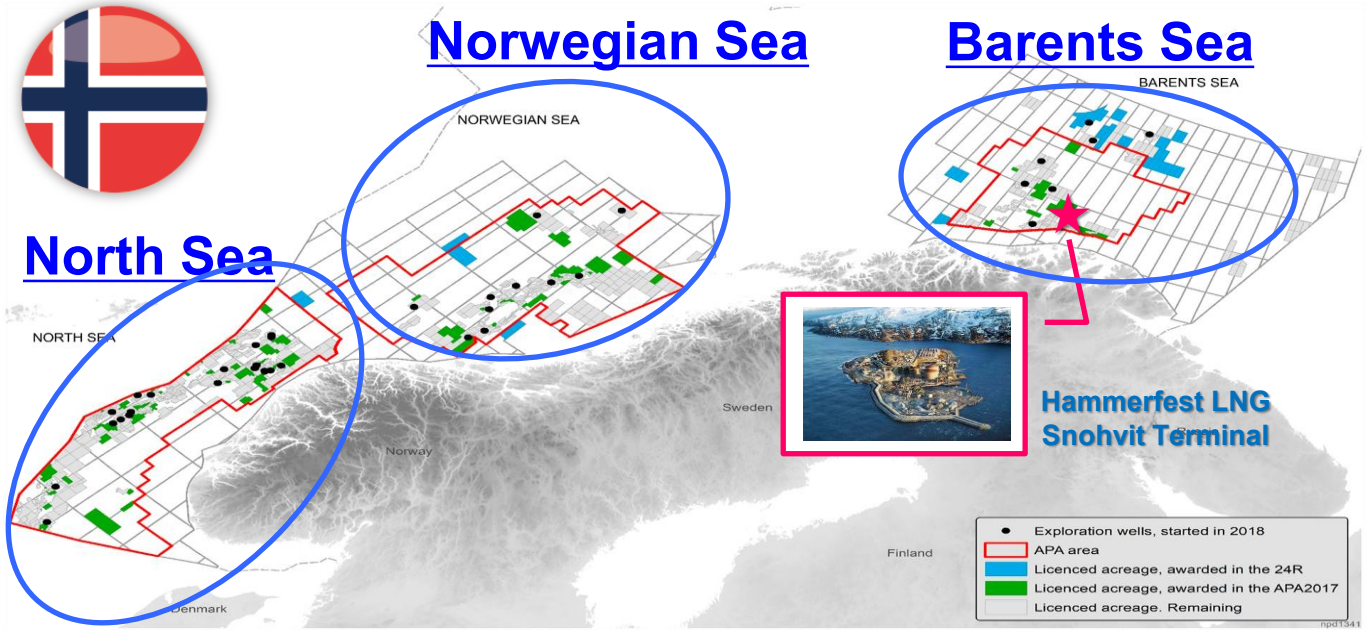


First LNG for Japan from Alaska agreed in 1967

Norwegian Sea

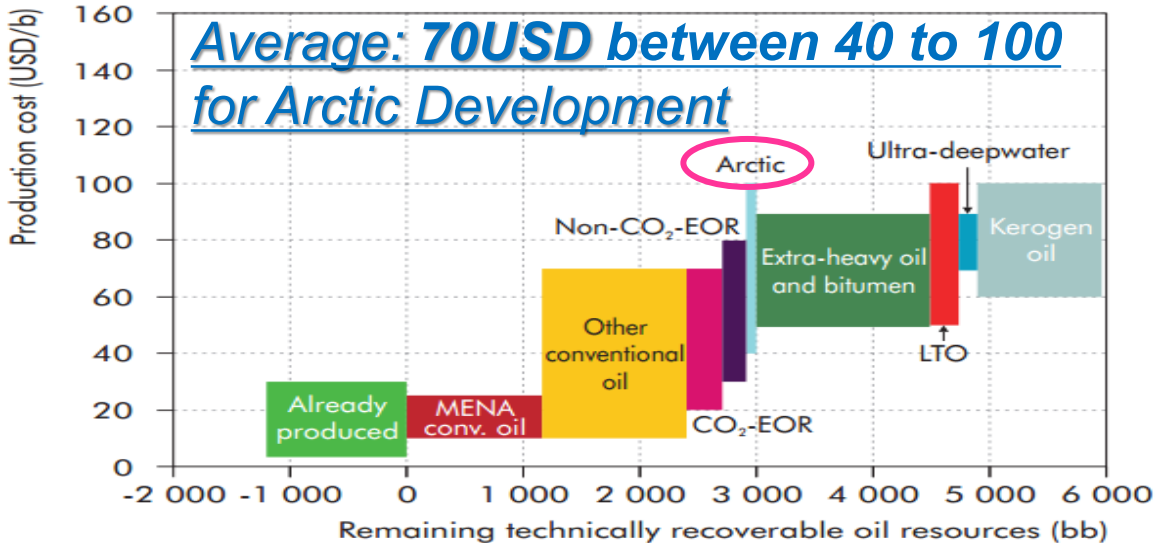
Barents Sea

North Sea



Hammerfest LNG
Snohvit Terminal

Comparison of Production Cost in Frontier



Comparison of conditions for oil and gas development in Russia and Alaska

	Russia	Alaska
Hydrocarbon Potential	**273 billion BOE** **Natural gas: 240.9 billion barrels** **Oil: 23.1 billion barrels** **Condensate: 9 billion barrels**	**29.8 billion BOE** **Natural gas: 6.8 billion barrels** **Oil: 22.1 billion barrels** **Condensate: 900 million barrels**
Government involvement	➢ Large-scale government initiatives and subsidies. ➢ Priority for offshore mining areas goes to state-owned companies. ➢ Development accelerates as a political strategy towards Europe and to supplement dwindling reserves.	➢ The government was heavily involved until World War II. ➢ Offshore mining areas were under direct federal control. ➢ State's initiative to secure revenue.
Tax Incentives	◎ （Huge tax deductions = Government guarantees?）	× （Market-based/private sector-led basically）
NSR Infrastructures	➢ Operating nuclear icebreakers with government subsidies ➢ Promoting ARC7 LNG tankers' transshipment scheme	× （Undeveloped/Difficult due to whale preservation area）
Upstream Infrastructures	➢ Sufficient infrastructure onshore ➢ Untouched offshore development and technology	➢ Upstream infrastructure is mature. ➢ Huge investment required for natural gas PL construction ➢ Economics is the issue for upstream suppliers (EOR or PL+LNG)
Environmental Sensitivity	Low	High
Indigenous Sensitivity	Low	Low, but politicized
Restraining factors	➢ Western sanctions following the annexation of Crimea in 2014 target the Arctic Ocean, which has "future potential for refined oil production." ➢ Prohibition of new energy resource investments due to the 2022 Ukraine war (G7 and others).	➢ Depending on the government's decision, there is a possibility that huge upside potential (NPRA) will be activated. ➢ With the global trend towards decarbonization, additional development will be put on hold.
CCS Potential	◎（Depleted gas fields in Western Siberia）	◎（Cook Inlet depleted gas fields）

Behind Arctic Resource Development :Politics & Oil Price hold the key

- The development of Arctic resources in Russia has been influenced by 3 factors
  (1) 2008 Strategic Foreign Investment Restriction Law (2) EU Third Energy Package
  (3) Western sanctions in 2014 after Crimea Annexation
- Crude oil prices above a certain level and the application of tax incentives are essential for project execution.
- Projects currently underway during the period of high oil prices from 2011 to 2014 are bearing fruit. That means, the launch of subsequent projects may be delayed or stagnant under low price level.
- Even though the price of oil is high due to the invasion of Ukraine, new projects involving foreign investment have been suspended. There is also the possibility that Western companies will accelerate their withdrawal from existing projects.

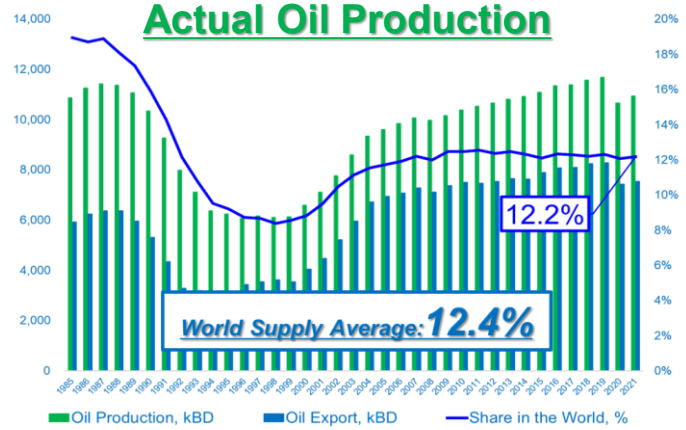
Year	Price	Foreign Entities	Target	Russia	Notes
2007	72	TOTAL Statoil	Arctic, Shtokman field in Barents Sea	Gazprom	Politically decided between Russia and France. Inevitable Statoil's experience
2008	97	*'Strategic Investment Law' signed by President Putin →Promising Blocks in Continental Shelf are monopolized by Gazprom and Rosneft*			
2009	62	*No particular events, due to the influence under 'Lehman Shock' and decline of oil price*			
2010	80				
2011	111	Adoption of '*Third Energy Package*' by EU *→Stipulates the 'Unbundling', separation of energy suppliers and transporters, targeting Gazprom's monopoly.*			
		BP	Arctic development	Rosneft	Cancelled by shareholders of TNK. Exxonmobil took over the role. Consequently, Rosneft purchased TNK-BP and BP became 20% shareholder of Rosneft.
		TOTAL	Yamal LNG Project	NOVATEK	Politically reflected by Sarkozy's visits, decided to firm in 20%.
2012	112	*President Putin re-elected for the third term (2012-2018)*			
		ExxonMobil	Arctic development	Rosneft	In 2014, wild-cat drilled under the Sanction, confirming potentials of gas and oil.
		Statoil	Arctic, Okhotsk development Shale formation in Caucasus	Rosneft	In 2016, wild-cat in Okhotsk resulted dry.
			WITHDRAWAL, Shtokman	Gazprom	In response to the suspension by Gazprom.
		ENI	Arctic, Black Sea	Rosneft	In 2018, wild-cat in Black Sea is under planning.
2013	109	CNPC	Yamal LNG Project	NOVATEK	Politically and strategically, decided to firm in 20%.
2014	99	*'Annexation of Crimea' by Russia and Intesification of conflicts in Eastern Ukraine→ Sanctions by EU & US*			
2015	52	TOTAL	WITHDRAWAL, Arctic, Shtokman field in Barents Sea	Gazprom	In response to the suspension by Gazprom and influence of the Sanctions
		Silk Road Fund	Yamal LNG Project	NOVATEK	Politically, decided to firm in 9.9%.
2016	44	*No particular events, decline of oil price*			
2017	52	*No particular events*		NOVATEK	Yamal LNG started operation and dispatch first LNG cargo.
2018	72	TOTAL	Arctic LNG-2 Project	NOVATEK	Decided to participate in 10% (opt. +5%).
2019	65	CNPC, CNOOC, and JOGMEC & Mitsui	Arctic LNG-2 Project	NOVATEK	Decided to participate in 10% each, total 30%.
2020	43	Trafigura	Vostok Oilプロジェクト	Rosneft	Decided to participate in 10% (opt. on offtake contract) →Withdrawal
2021	71	Vitol, Mercantile & Maritime	Vostok Oilプロジェクト	Rosneft	Decided to participate in 5% (opt. on offtake contract) →Withdrawal
2022	99	*Ukraine Invasion by Russia and Imposition of Weastern Sanctions*			
2023	85	-	-	-	-
2024	93	-	-	-	-
2025e	62	-	-	-	-

Russia's out of pocket expense for Arctic development and NSR

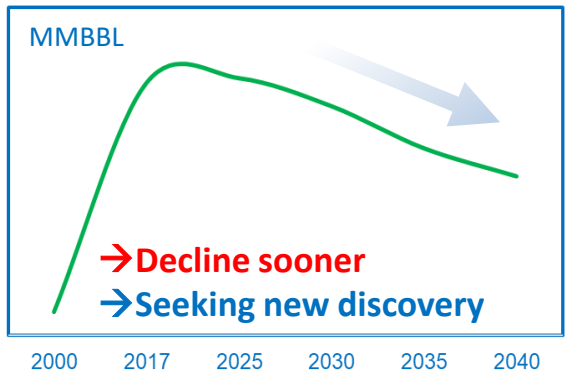
Tax Incentives for Yamalo-Nenets Autonomous Okrug

Taxes	Crude Oil		Condensate		LNG	
	In general	Yamalo-Nenets	In general	Yamalo-Nenets	In general	Yamalo-Nenets
MET	Yes	A	Yes	B	Yes	B
Export Duty		Yes		C		C
Corporate Tax				D	Yes	D

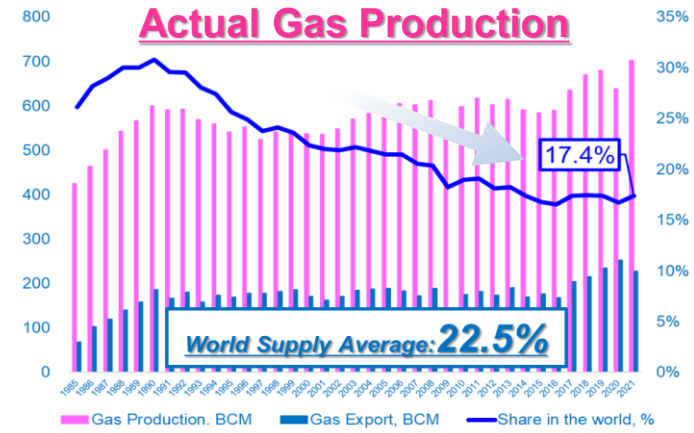
Actual Oil Production



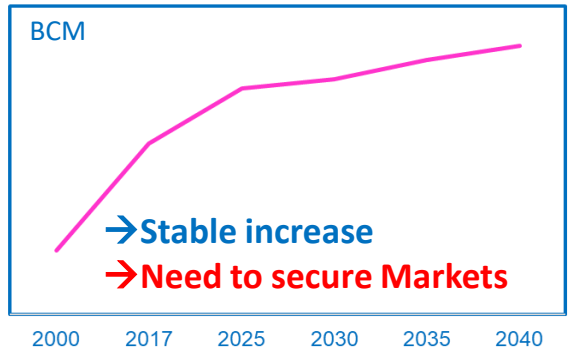
Outlook of Oil Production



Actual Gas Production



Outlook of Gas Production



A Exempted (incl. Black Sea and Okhotsk Sea) from Jan. 2012, until reaching the certain amount of production or the certain period of Production License.

B Exempted specially for LNG projects from Oct. 2010, until reaching the certain amount of production.
Exempted for gas utilization for EOR.

C Exempted for LNG projects all over Russia. In Yamal area, the export of condensate is also to be exempted.

D Exempted for gas and condensate projects until reaching the certain amount of production or the certain period of Production License.

E Infrastructure for the Sea Port, the Air Port at Sabetta.

F Priority for using governmental budget: NWF, Reserves

Source: Yamalo-Nenets Autonomous Okrug, JOGMEC-Research, IEA-WEO

Deployment of Russian Nuclear Icebreaker Fleets Holds Another Key

- Yamal LNG and Arctic LNG-2 charters 32 ARC7 ice-breaking LNG tankers in total.
- A convoy of up to eight groups to be organized, with four vessels in each. Six groups will head to Asia and two to Europe.

50 Let Pobedy
(2007)
In service

Yamal
(1993)
In service



Arctika・Sibir・Ural・Yakutia
(2020・2021・2022・2024)
In Service

Chukotka・Leningrad
Stalingrad・Rossiya
Under construction

Murmansk Transshipment Terminal

POMOR SECTOR

NSR SECTOR

KAMCHATKA SECTOR

I II III IV V VI VII

Murmansk
Varandey
Arkh
Kolguev
Dikson
Tanalau
Dudinka
Khatanga
Tiksi
Yana
Kolyma
Anadyr
Provideniya
Pevek
Kamchatsky

Kamchatka Transshipment Terminal

1300海里（2408km）

680海里（1259km）

615海里（1139km）

720海里（1333km）

600海里（1111km）

640海里（1185km）

380海里（704km）

315海里（583km）

- By allowing convoys to pass through constantly, NSR corridor would be maintained so that tankers can pass through at 10 knots even in winter.
- When sea ice conditions are severe, deployed nuclear icebreakers maintain the corridor.

New LNG Transport Scheme offered by NOVATEK

Shuttle transport by ARC 4 to 7 class LNG tankers (Max: 170,000CM)

Murmansk LNG Transshipment Terminal (plan)

NOVATEK

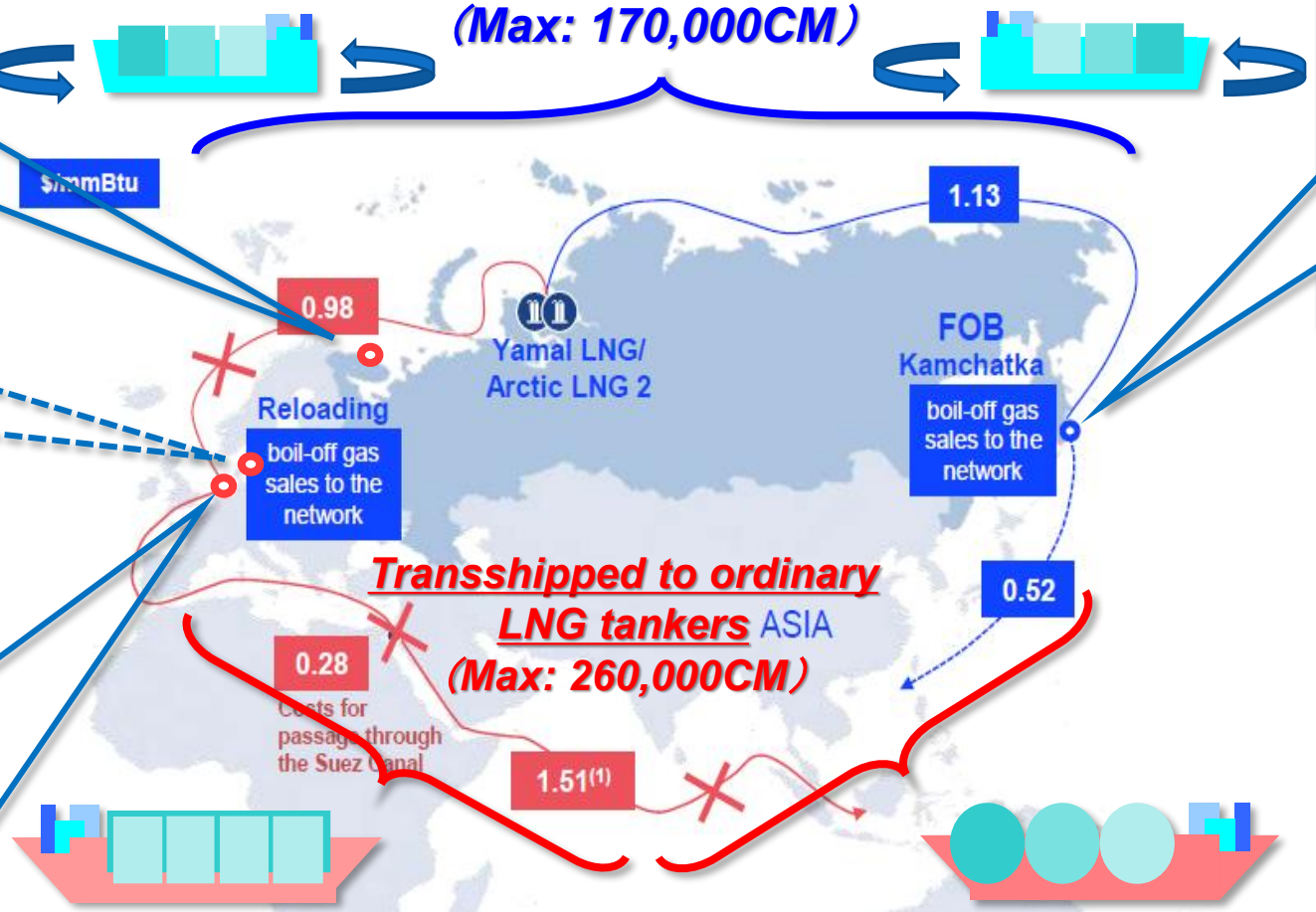
Rosstock LNG Trans-shipment Terminal (plan)

NOVATEK FLUXYS

Zeebrugge LNG Transshipment Terminal (operation)

Operated by

FLUXYS



Western route to Asia(2)	36 days	2.49 $/mmbtu
Eastern route to Asia (via transshipment on Kamchatka)	19 days	1.65 $/mmbtu

- Decrease costs by ~ 0.8 $/mmbtu for volumes delivered via the Suez Canal
- Increase LNG sales volumes due to lower boil-off gas volumes from the shorter transport distance
- Direct access to premium markets and full control of the supply chain

(1) Including costs for passage through the Suez Canal
(2) NOVATEK

Kamchatka LNG Transshipment Terminal (plan)

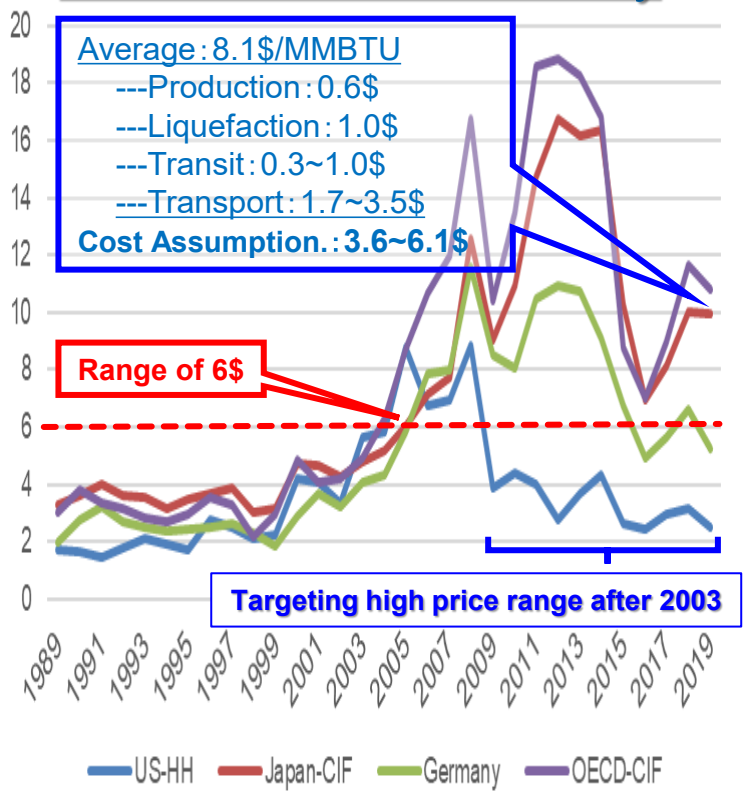
Japanese companies intereted

Marubeni MOL JBIC

Also China & Korea

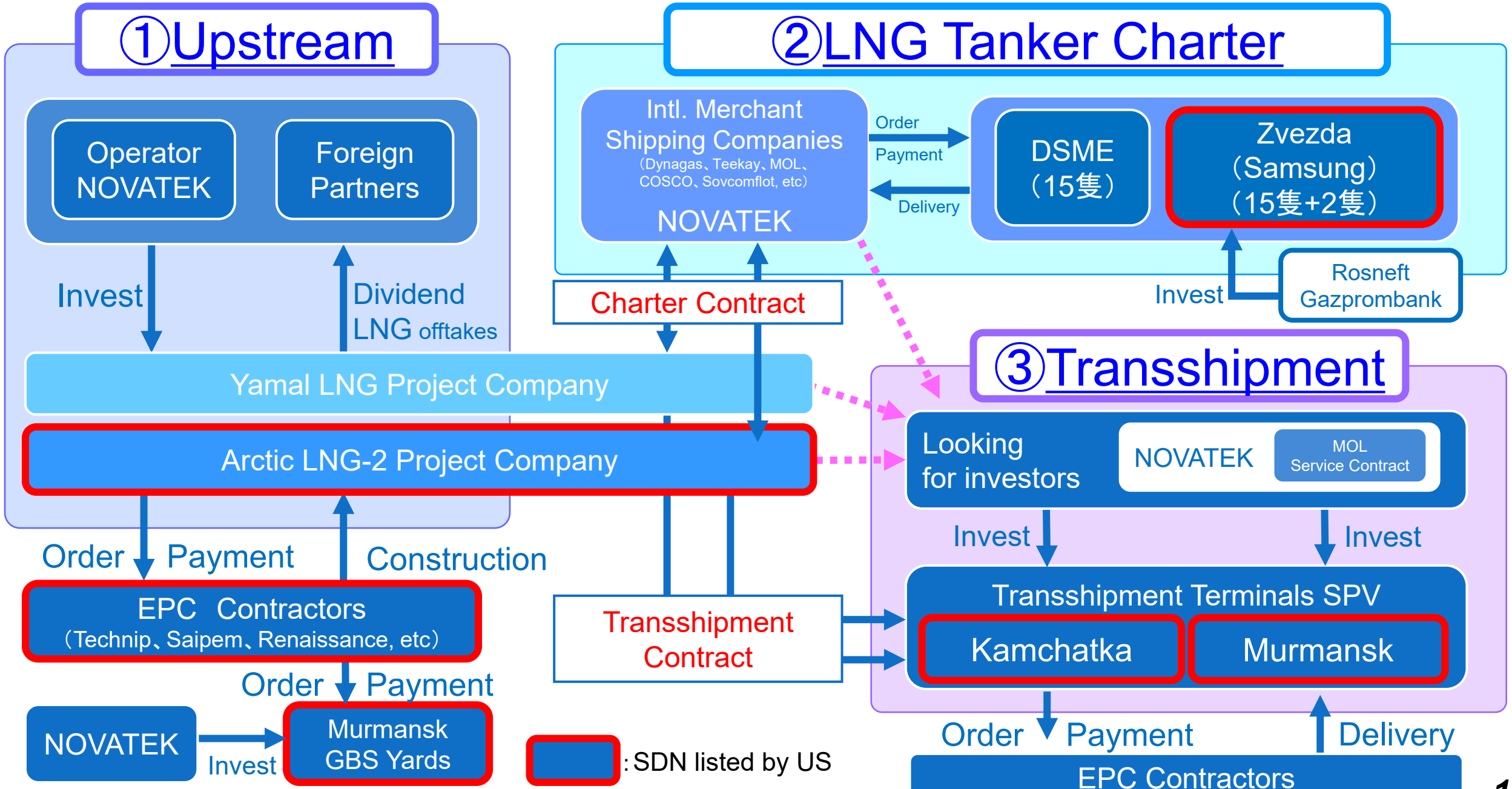
★Natural Gas Price History

Average : 8.1$/MMBTU
---Production : 0.6$
---Liquefaction : 1.0$
---Transit : 0.3~1.0$
---Transport : 1.7~3.5$
Cost Assumption. : 3.6~6.1$



Source: Fluxys (picture on the left), NOVATEK Presentation in public, BP Statistical Review 2018

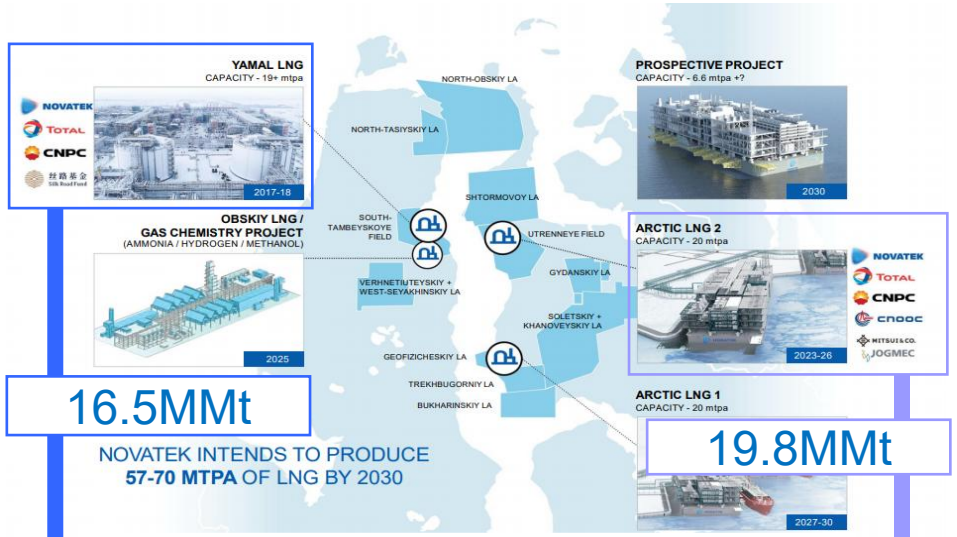
Upstream, LNG Tanker Charter & Transshipment Terminals Investment Scheme



出典: JOGMEC-Research

Actual Utilization of the NSR fromYamal LNG project

★Yamal LNG & Arctic LNG-2



★Upstream Stakeholders

Yamal LNG	
NOVATEK	51%
TOTAL	20%
CNPC	20%
Silk Road Fund	9.9%

Arctic LNG-2	
NOVATEK	60%
TOTAL	10%
CNPC	10%
CNOOC	10%
Japan Arctic LNG	10%

★Buyers of Yamal LNG Supply Contracts

Long Term Contracts concluded with Yamal LNG					
TOTAL	330万t	20%	Gazprom	300万t	18%
Naturgy	250万t	15%	ENGIE	100万t	6%
CNPC	300万t	28%	Shell	90万t	5%
(Silk Road Fund)	160万t		他、NOVATEKも販売。		

★New LNG transportation scheme from Arctic by NOVATEK

Year	2018	2019	2020	2021	2022	2023	2024	2025
Destination	8.3MMt	18.5MMt	18.6MMt	18.9MMt	20.1MMt	19.5MMt	20.8MMt	19.0MMt
France	34.9%	14.2%	27.5%	18.8%	26.5%	17.6%	29.9%	32.4%
Belgium	7.0%	8.0%	22.7%	7.7%	16.9%	23.1%	18.2%	21.4%
Spain	7.0%	7.0%	11.8%	13.5%	18.2%	25.2%	19.8%	14.1%
Netherland	32.5%	9.5%	11.4%	10.8%	8.3%	3.8%	6.3%	7.7%
UK	11.6%	3.4%	10.9%	10.7%	1.8%	–	–	–
Norway	–	54.0%	3.0%	24.4%	–	–	–	–
Portugal	–	–	2.5%	3.1%	1.1%	1.5%	1.1%	1.2%
Italy	–	–	–	–	0.7%	0.3%	–	0.4%
Kuwait	–	–	–	–	0.7%	0.4%	1.1%	–
Turkey	–	–	–	–	0.7%	2.6%	0.4%	–
China	7.0%	3.8%	8.1%	18.5%	18.4%	20.9%	18.2%	17.8%
Taiwan	–	–	0.9%	2.6%	2.8%	2.2%	1.7%	1.5%
Japan	–	–	0.8%	3.9%	0.3%	0.7%	0.4%	–
Korea	–	–	0.4%	4.4%	0.9%	0.4%	2.0%	3.8%
Bangladesh	–	–	–	0.5%	–	–	–	–
Singapore	–	–	–	0.5%	–	0.3%	–	–
India	–	–	–	0.5%	1.4%	2.1%	0.4%	–
Indonesia	–	–	–	–	0.6%	–	–	–
Thailand	–	–	–	–	0.4%	–	–	–

注目される北極海航路利活用の実際

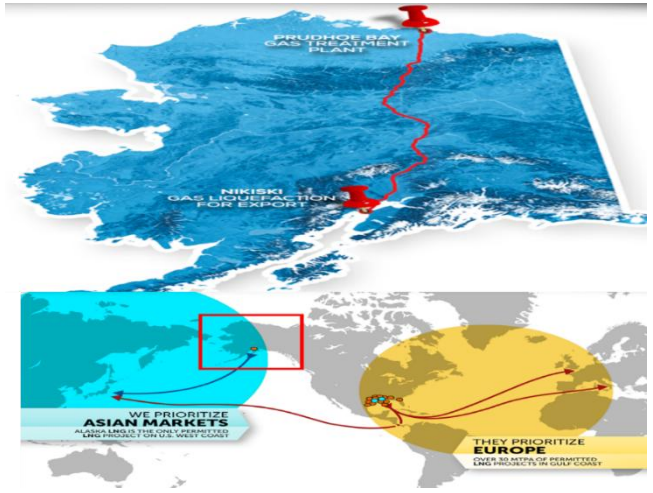
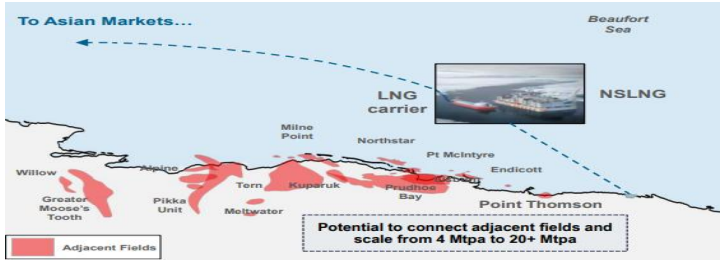
West bound:77%

- Most of flow has been delivered to Europe.
- Transshipment (Norway, Belgium & Netherland) includes the LNG export for China, indicating that East bound has difficulties to forecast delivery schedule.

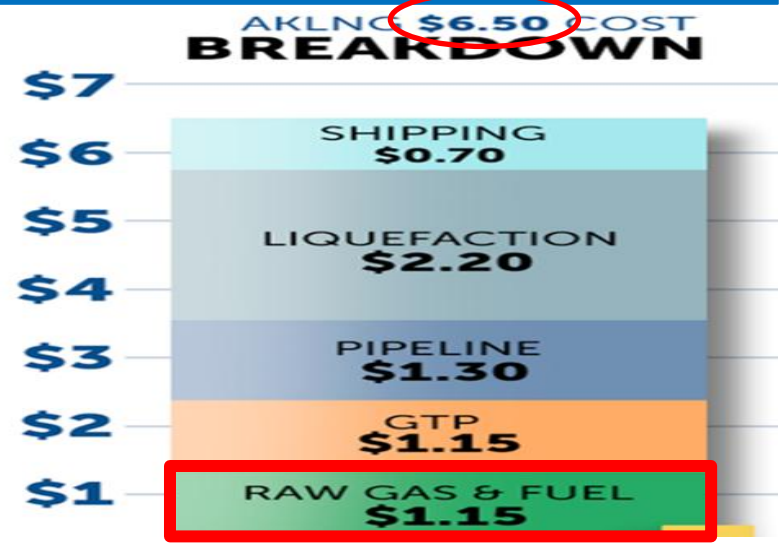
East bound:23%

- Transportation via the Northeast Passage (Bering Strait) has restrictions due to the unpredictable climate condition.

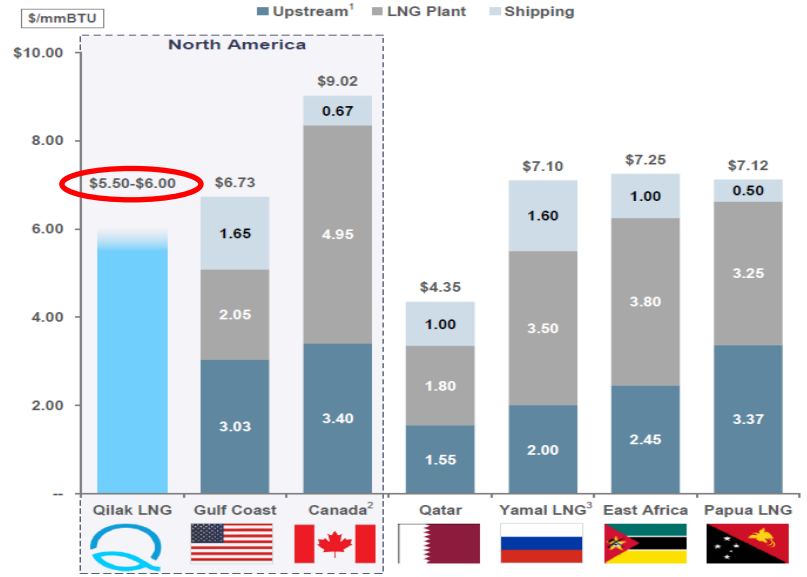
Comparison of Alaska LNG Project and Qilak LNG Project

	Alaska LNG Project	Qilak LNG Project
Concept	 Natural gas produced in Prudhoe Bay to be transported across Alaska via a new trans-Alaska pipeline, liquefied at Nikiski near Kenai.	  Offshore PL to be constructed 20km from Point Thomson, and LNG plant (GBS) to be built offshore (under federal jurisdiction). Exports via the Northern Sea Route.
LNG	Max 20MMt	Staring from 4MMt. Max 20MMt
Cost	CAPEX：38.7Billion USD OPEX:740MM USD	1250USD/t （evaluating AK-LNG: 1850USD/t）
Interests	Alaska Gasline Development Corp	Llyoid Energy（Singaore・UAE）
Upstream	Though there is no confirmed information at this time, natural gas will be procured from mining areas owned by ExxonMobil, HilCorp and ConocoPhilips.	Point Thomson Block owned by ExxonMobil
Challenges	The complexity of investment structure (separation of upstream, mid-stream and downstream) means that a stable supply cannot be ensured, and there is uncertainty about raising huge investments for PL.	How can sea exports be made possible given the limited number of icebreakers available from Prudhoe Bay, where ice accumulates? Environment concerns.
At Present	Export License was obtained again in April 2023. FID is scheduled for 2025, with operations expected to start in 2028 for domestic and in 2030 for export.	HOA signed with ExxonMobil in September 2019. Aiming for FID in 2025 and start of operations in 2029.

Alaska LNG Project Price Estimate



Qilak LNG Project Price Estimate



Russia is still as a Reasonable LNG Supplier for Japan

1000yen/ton	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Average	USD/MMBTU
Oman	53.2	48.8	65.4	33.6	32.3	39.5	48.9	57.3	62.7	51.9	44.1	47.8	52.1	49.9	46.3	54.4	96.5	98.1	85.9	56.2	**9.36**
Russia	-	-	-	32.1	38.3	52.7	59.5	71.5	83.3	62.7	37.2	42.9	53.7	52.7	41.0	56.7	98.6	97.6	96.4	61.1	**10.16**
USA	36.2	36.7	41.3	40.7	55.5	54.2	65.9	-	85.4	47.9	-	66.9	60.8	53.3	47.1	66.8	137.9	87.7	85.6	62.9	**10.47**
Australia	38.8	42.0	61.4	42.9	52.2	61.2	65.6	75.6	86.3	63.4	41.0	47.5	58.4	58.3	44.4	57.9	118.3	107.5	96.1	64.1	**10.67**
Malaysia	39.1	47.2	68.2	46.0	53.7	64.1	73.6	86.6	93.5	67.4	38.3	46.0	54.2	52.7	40.1	52.8	106.9	98.1	92.0	64.2	**10.69**
Brunei	35.2	38.4	69.3	50.3	52.7	63.1	72.9	84.0	92.3	69.9	43.0	48.9	57.9	58.7	44.1	52.0	97.9	98.9	94.6	64.4	**10.72**
Trinidad Tobago	69.2	63.8	86.6	46.5	45.6	42.7	52.6	80.3	92.7	70.4	46.4	47.0	58.5	-	-	-	80.0	68.9	75.2	64.2	**10.67**
Nigeria	72.9	63.9	91.7	56.0	38.1	54.8	66.9	81.4	90.5	67.0	41.9	47.3	48.1	38.9	37.5	68.2	126.0	-	104.4	66.4	**11.05**
Yemen	-	-	-	-	36.0	60.0	68.1	83.9	84.8	58.0	-	-	-	-	-	-	-	-	-	65.1	**10.84**
Indonesia	48.7	51.4	62.2	36.3	42.7	62.2	75.1	87.8	94.2	68.0	42.2	48.9	57.4	58.5	44.1	55.1	131.8	105.7	100.2	67.0	**11.14**
Qatar	45.8	49.5	71.7	53.0	56.4	64.6	71.8	84.6	92.2	66.5	35.6	44.2	57.4	58.4	41.4	52.3	139.6	119.3	98.8	68.6	**11.41**
UAE	40.7	43.6	60.6	43.3	52.8	63.3	71.7	85.0	91.4	62.7	37.2	46.4	59.9	57.1	44.1	57.4	190.9	131.1	97.7	70.4	**11.71**
Papua New Guinea	-	-	-	-	-	-	-	-	78.3	64.5	40.1	48.8	60.5	57.9	44.2	63.4	129.2	102.2	100.4	71.8	**11.94**
Angola	-	-	-	-	-	-	-	84.4	86.6	-	-	41.7	54.3	-	-	-	82.7	-	-	70.0	**11.64**
Algeria	60.8	61.6	94.8	-	34.3	58.5	70.6	79.9	91.9	58.8	41.8	71.1	-	40.8	-	75.7	152.4	-	77.1	71.3	**11.87**
Egypt	67.4	66.3	87.3	87.6	60.1	65.0	72.8	83.2	93.3	-	36.0	41.8	60.1	56.3	46.8	72.6	143.3	167.8	-	76.9	**12.80**
Peru	-	-	-	-	-	57.2	68.1	86.6	104.6	82.6	-	49.1	55.4	53.9	43.4	46.2	120.1	159.6	110.3	79.8	**13.27**
Equator Guinea	-	58.9	87.9	56.9	58.4	71.2	75.4	87.7	99.6	64.6	39.4	46.3	44.1	52.7	-	68.1	117.3	229.1	91.7	79.4	**13.21**
Mozambique	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91.1	72.5	81.8	**13.61**
Korea	-	-	-	-	-	-	-	-	-	52.9	34.0	33.8	-	-	32.4	-	-	118.9	-	54.4	**9.05**
Singapore	-	-	-	-	-	-	-	-	-	51.9	36.5	42.6	58.6	-	-	223.1	88.0	-	108.4	87.0	**14.48**
France	-	-	-	-	-	-	71.7	86.1	-	54.6	39.4	45.2	59.7	-	-	171.3	-	-	-	75.4	**12.55**
Brazil	-	-	-	-	-	-	63.9	-	-	-	-	-	-	-	-	-	-	-	-	63.9	**10.63**
Spain	-	-	-	-	-	-	69.2	83.7	79.9	67.1	-	-	-	-	-	-	-	-	-	75.0	**12.48**
Norway	-	-	94.6	-	-	54.1	64.8	87.8	84.3	74.6	-	-	62.2	-	-	-	-	-	-	74.6	**12.42**
Netherlands	-	-	-	-	-	-	-	-	101.2	-	-	-	64.4	-	-	-	-	-	-	82.8	**13.77**
Belgium	-	-	-	-	-	-	64.8	-	101.2	-	-	-	-	-	-	-	-	-	-	83.0	**13.81**
China	-	-	-	-	-	-	-	-	-	-	-	-	-	31.9	-	-	167.6	113.4	116.1	107.2	**17.84**
Thailand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92.2	-	-	-	92.2	**15.34**
Canada	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	189.8	189.8	**31.57**
Cameroon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93.3	93.3	**15.52**

Earthquake & Fukushima

Source: MOF-Japan

*Conversion factor: 1USD=106.37yen (average from 2006 to July 2023), 1t=39.68MMBTU

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