# ORGANIZATION AND MANAGEMENT CHALLENGES OF RUSSIA'S ICEBREAKER FLEET

**ARILD MOE and LAWSON BRIGHAM**

ABSTRACT. The USSR and now Russia have employed a fleet of large icebreakers to gain access across the Russian maritime Arctic and facilitate traffic through the Northern Sea Route (NSR). Since 2008, Atomflot has played a very influential role, not only in the management and operation of Russia's icebreakers, but in laying premises for the NSR as a whole. The current NSR Administration within the Ministry of Transport does not appear to have roles in policy formation, icebreaker management, or planning. Several of the Soviet-era nuclear-powered icebreakers are in need of replacement, but the construction program for new ships is marked by controversies. There is no integrated management of nuclear and conventional icebreakers, and it is unclear how the icebreaker fleet will be used to enhance the effectiveness of NSR operations, and also to what extent the authorities will allow the independent navigation of icebreaking commercial carriers without convoy escort by icebreakers. *Keywords: Arctic Ocean, Atomflot, icebreakers, Northern Sea Route.*

The icebreaker fleet of the USSR and Russian Federation has always been a fundamental necessity to gaining marine access across the Russian Arctic and along the Northern Sea Route (NSR) (Figure 1). This access was gained by the pioneering use of nuclear-powered icebreakers and also the development of a fleet of diesel-electric icebreakers, many built in Finland. At the height of operations along the NSR during 1987, 6.6 million tons of cargo was carried by 331 cargo ships making a remarkable 1306 voyages (Brigham and Ellis 2004).

Most of this ship traffic was moved in convoys escorted by large icebreakers operated by Murmansk and Far East shipping companies. The NSR Administration within the USSR Ministry of the Merchant Marine (Minmorflot) was the central authority for management and planning of the icebreaker fleet, ice-capable cargo ships, and future NSR operations. From the late 1980s, traffic on the NSR contracted dramatically and infrastructure fell into disarray in the 1990s. In recent years, however, attention to this sea route has grown again, with increases in navigation and ambitious Russian plans and expectations for development (Moe 2014, 2016).

Several studies have been undertaken in recent years of the potential for transportation of cargo through the NSR (Lee and Song 2014; Moe 2014; Stephenson, Brigham, Smith, 2014; Farré and others 2015; Lasserre 2015). They address cost as well as market factors and also the impact of changing ice

Research for this article has been financed by the Fram Centre in Tromsø, Norway as part of the project *Drivers for Arctic Shipping*.

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*Geographical Review* 107 (1): 48–68, January 2017
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**The Northern Sea Route and Russian Maritime Arctic[1]**


FIG. 1—The Northern Sea Route and Russian Maritime Arctic.[1] Source: Fridtjof Nansen Institute / Claes Lykke Ragner.

conditions. They mention Russian administrative procedures and icebreaker escort fees as important determinants for development of shipping, but they do not discuss how icebreaking services are and will be organized. The purpose of the present article is to understand how Russian icebreaking fits into the new era of the NSR. How is icebreaking going to be organized and financed? What is the state of affairs in construction of new icebreakers? Will Russia experience an "ice pause" with insufficient icebreaker capacity to serve growing traffic? Is icebreaking well adapted to trends in international shipping, and is the icebreaker fleet being developed as part of an integrated policy for the NSR?

## The Organization of Icebreaking

The first nuclear icebreaker—*Lenin*—was put into operation in 1960 and it and the following nuclear icebreakers became a structural unit—Atomflot—in what after several reorganizations became the Murmansk Shipping Company (MSCO), subordinate to the Ministry of the Merchant Marine—Minmorflot.[2] In 1993, Murmansk Shipping Company was incorporated, and a majority of shares were subsequently sold to private owners. The nuclear icebreakers remained in state ownership, though, under the Agency of the Sea and River Fleet (Rosmorrechflot) in the Ministry of Transport. The operation of the fleet was left with Murmansk Shipping Company, from 1998 in trust management on five-year contracts. In 2008, it was decided to abolish the trust management and transfer ownership of Atomflot to the state nuclear-power corporation Rosatom. Arguments for this move, which was controversial, were commercial mismanagement of the fleet by MSCO, unhealthy management of a state asset by a private company, and competition issues, since MSCO was also one of several competitors for traffic on the sea route. Finally, it was maintained that transferring the nuclear icebreakers to Rosatom would ensure a better integration of nuclear technologies and fuel supply. At the time, there were also plans to develop a series of floating nuclear power plants and put them under Atomflot (Ekspert Online 2008; Kireeva 2011).[3]

Exactly what were decisive factors in this reorganization is impossible to say, but the result was clear: technological integration was increased at the expense of maritime operational integration. The nuclear icebreaker fleet left the chain of command in the Ministry of Transport, but it seems that Atomflot gained economically from the transfer. Whereas it is maintained that the Transport Ministry did very little to secure investments in the fleet prior to the transfer, Rosatom immediately managed to get substantial earmarked sums for this purpose over the state budget (Ekspert Online 2008).

In the Rules of Navigation on the Northern Sea Route that were adopted by the USSR in 1990 and which were in force until 2013, the NSR Administration was entrusted with coordination of traffic on the NSR. It was stated that it could perform this task through the Maritime Operations Headquarters established in Dikson, for the western part, and in Pevek, for the eastern part of the NSR (Rules 1990). The NSR Administration was dissolved in 1999, but the Maritime Operations Headquarters continued to function. However, when new regulations for NSR were under development in 2010–11, Atomflot argued that the Maritime Operations Headquarters, with responsibility for guidance and supervision of all traffic on the NSR, should be included in its organization, and the company helped formulate a draft regulation for this purpose (Atomflot 2010). Such a regulation would have given Atomflot a formal role as coordinator of traffic on the NSR.

However, in the new regulations for navigation on the NSR approved by the Ministry of Transport and in force since 2013, the Maritime Operations Headquarters are not mentioned, and these organizations have now been liquidated (Rules 2013). The new regulations imply that there is no single body following and directing the voyages of individual vessels. It is the responsibility of each captain to plan and carry out the voyage, based on requirements and information received from the NSR Administration in Moscow. But the practical planning, nevertheless, will have to be negotiated with the icebreaking company.

According to the regulations, icebreaker escort can only be performed by icebreakers under Russian flag. In addition to Atomflot, this means the Murmansk Shipping Company, the Far East Shipping Company (FESCO), the transport division of Norilsk Nickel, and Lukoil, which operates a modern icebreaker around its Varandey terminal in the Pechora Sea, and Rosmorport, a state enterprise under the Ministry of Transport (compare below). In theory, users of the sea route can negotiate with any of these companies over icebreaker escort; in practice, only Atomflot is relevant for the long hauls.

The situation with ice pilots is similar. Ice piloting is provided by three companies listed by the NSR Administration: Murmansk Sea Captains

Association, the Guild of Polar Pilots, and Atomflot (Northern Sea Route Administration 2016a). In practice, Atomflot provides most of the ice pilots.

The Law on the Northern Sea Route, which was passed in July 2012, aimed at clarifying the system for administration of the NSR (Russian Federation 2012). It established a new NSR Administration responsible for "organization of navigation in the water area of the Northern Sea Route." The new body—despite having the same name as the earlier, powerful administration—in reality got a very limited mandate and is subordinate to the Agency of the Sea and River Fleet (Rosmorrechflot) under the Ministry of Transport. The administration was set up in Moscow in 2013, after both Arkhangelsk, Murmansk, and St. Petersburg had lobbied for its location there.[4] Its main function is to process applications for navigation on the sea route and issue permits according to a set of criteria. It also provides information on the ice situation and hydrometeorological conditions, with data from Roshydromet and other agencies belonging to the Ministry of Natural Resources. This information is essential for the conditions included in the permits, and is also transmitted to users (Northern Sea Route Administration 2016b). The administration also regularly publishes long term ice forecasts produced by the Arctic and Antarctic Research Institute, which formally is subordinate to Roshydromet, but in reality a fairly independent body in the sphere of the Ministry of Natural Resources. The NSR Administration does not have the power to instruct other state bodies, and it does not seem to have any role in policy formation or icebreaker-acquisition issues.

The picture that emerges is one of two separate structures. On the one hand, we see the formal structure with the Ministry of Transport on top and subordinate bodies to implement policy, including use of private companies or other state bodies for technical support. But we also see another structure where one of the technical bodies—Atomflot—makes the key decisions and controls the most vital information. It is the tail that wags the dog.

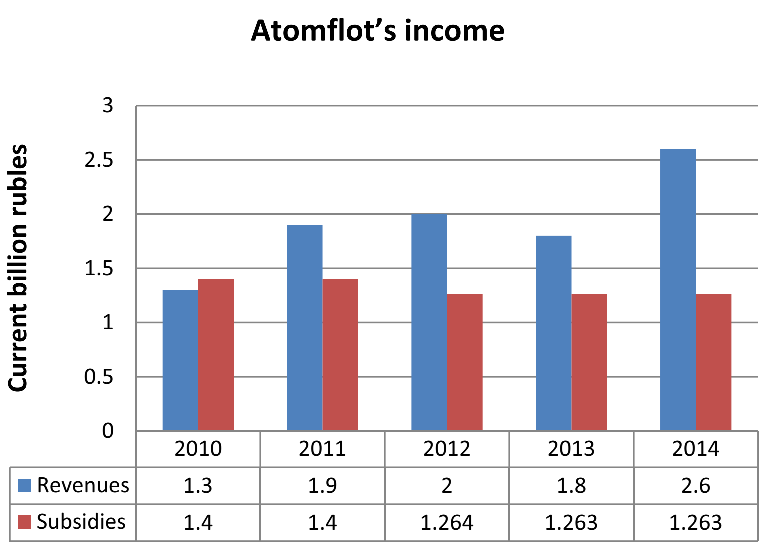
## Atomflot

Organized as a "federal state unitary enterprise," Atomflot is defined as a commercial organization, but without ownership to the assets it is exploiting—in this case, the icebreakers. It is obliged to have an annual audit conducted of its books, and it must disclose all its purchases. It cannot establish subsidiaries and its use of funds is circumscribed by law or the charter of the enterprise (Mikheev 2007). But whereas Atomflot may seem constrained in its operations, it is also a part of the State Atomic Energy Corporation: Rosatom. The state corporation, which includes all assets in the civilian nuclear industry, manages all aspects of civilian nuclear energy use on behalf of the state, and is also responsible for the production of nuclear weapons. It has regulatory functions, but at the same time it can operate as a market actor in domestic as well as international markets (Moroz 2012). It represents Russia in international negotiations and organizations on nuclear issues. It reports directly to the president and the government, and is not subject to any ministry. A special law was adopted detailing this unique combination of responsibilities and rights (Russian Federation 2007).

Early on, Rosatom took the initiative to change the status of Atomflot to a joint-stock company and by 2011 it got support from President Medvedev for such a step. Rosatom argued that organization as a joint-stock company would be much more preferable to a unitary state enterprise. It would make it easier to attract credits, and conduct a more flexible financial and tariff policy. Whereas Rosatom stated that Atomflot and the icebreakers would remain 100 percent state owned (by Rosatom), ideas of later selling shares to other state companies— notably Sovcomflot and the United Shipbuilding Corporation—were floated (Chernov 2011).[5] Apparently this process has now been stopped (President of the Russian Federation 2013).

As long as Atomflot remains a unitary state enterprise, it does not publish an annual report that could give a comprehensive insight into the economics of the icebreaker service. A data series compiled by the data-company Integrum, appears to conform with individual numbers cited in statements and interviews with the top management of Atomflot.

As shown in Figure 2, revenues have risen over the last years. Interestingly, they fell in 2013, the top year for transits, and increased in 2014, when transits fell to a minimum. This underscores the impression that NSR ship transits have meant little for the income of the company. The general director reported that transits in 2012 only yielded about 300 million rubles (~ 10 million USD),[6] some 17 percent of total revenues (Ruksha 2013). Reportedly, by 2013, servicing of polar stations and supporting scientific research on the continental shelf were more important sources of revenue (Kashka 2013). Later, extensive




| | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Revenues | 1.3 | 1.9 | 2 | 1.8 | 2.6 |
| Subsidies | 1.4 | 1.4 | 1.264 | 1.263 | 1.263 |

FIG. 2—Atomflot's income. Sources: Revenues–Integrum data base; subsidies—2010: estimate; 2011–2012: Novosti (2011); 2013–2014: Golovinskiy (2015).

support for the construction of the port in Sabetta on the Yamal peninsula and the escort of military convoys have been important generators of revenue.

Atomflot is receiving annual subsidies. They were reduced somewhat after Atomflot was transferred to Rosatom, but have been kept stable in recent years (Golovinskiy 2015). According to Atomflot's general director, "in practice almost all the subsidies [. . ..] are used [to pay] for the safe handling of objects that have been taken out of use—Arktika, Sibir', PTB Lepse, and Volodarskiy. . . The working fleet maintains itself. . ." (Ruksha 2011).

Nevertheless, the stated goal is to achieve full coverage of running costs by 2018 (Golovinskiy 2015). The goal is connected with an expectation of increased traffic to 10 million tons (Kashka 2013). This goal seems to be within reach; if not in 2018, then shortly after when the Yamal liquefied natural gas (LNG) project, as well as the Novoportovskoe oil project, are expected to be on stream (Moe 2016). Atomflot seems intent on offering a broader range of services to these projects by building a special fleet for this purpose consisting of a conventional port icebreaker, a tugboat with icebreaking capacity, as well as three other ice strengthened tugboats (Golovinskiy 2015).

## The Design of Icebreakers and Technical Advances

The design and construction of heavy icebreakers for use in the Russian Arctic represents a unique technological development where Russia rightly considers itself the world leader, although Finnish ship designers have been at times influential partners (Table 1). The geographic remoteness and shallow shelf seas and rivers along the NSR have influenced the design of the icebreakers for more than six decades. Key icebreaker characteristics important to NSR operations include icebreaking capability (propulsive power), beam (for creation of a wide ice track astern), and draft. The most notable technical innovation was the introduction of the nuclear-powered icebreaker *Lenin*, commissioned in 1959, which provided high power (32.3 MW), unlimited endurance, and sustained operations along the NSR. *Lenin* was capable of escorting ships during winter operations in the Kara Sea to the port of Dudinka on the Yenisey River, paving the way for eventual year-round navigation on the western NSR. The next generation of nuclear icebreakers following *Lenin* were the ships of the *Arktika* class, which had more power (54 MW), a greater beam (30 m), but with a draft of 11 m, which limited their use to the main offshore traffic routes. Their large physical size and wide beam made them particularly effective at escorting the cargo carriers of the Soviet era. In 1989 and 1990, two nuclear shallow-draft icebreakers, *Taymyr* and *Vaygach,* came into service and these ships with an 8 m draft were well suited for icebreaking in the Ob and Yenisey rivers (Figure 3). Combining Finnish icebreaker design and Soviet nuclear-power technology (single reactor), these ships operating today represent a classic example of technological adaptation to overcome the challenges of endurance and shallow-water icebreaking operations (Brigham 1991).

**The Atomflot nuclear icebreaker facility in Murmansk**


FIG. 3—The Atomflot nuclear icebreaker facility in Murmansk.
Alongside can be viewed the nuclear icebreaker Yamal (with the jaws that have been painted on the bow sine 1994), currently among the class of most powerful Russian icebreakers, and the shallow-draft, nuclear-icebreaker Taymyr. Both icebreakers operate along the entire length of the NSR. Taymyr, and sister ship Vaygach, have also supported ice operations related to the development of the LNG port of Sabetta on the Yamal Peninsula. (Photo Credit: Thomas Nilsen).

Proposals for construction of a new series of icebreakers have been put forward over many years and designs were made. Renewal of the icebreaker fleet was mentioned in the Maritime doctrine from 2001 (Russian Federation 2001), and new nuclear icebreakers were listed as one of the top priorities in the Strategy for Development of the Shipbuilding Industry in the Period until 2020 and in the Longer Perspective, from 2007 (Ministry of Industry and Energy 2007). State support for construction of icebreakers was again mentioned in the "Arctic strategy" from 2008, but not prominently (Russian Federation 2008).

The design arrived at—the LK-60 nuclear icebreaker—would be the largest and most powerful icebreakers ever built. The new ships would be longer (173 m), have a greater beam (34 m), and have more propulsive power (60 MW) than the two Arktika class icebreakers currently in service, *Yamal* and *50 Years of Victory*. The high power generated from the twin reactor plant would allow year-round operation along the entire NSR and continuous icebreaking in 3 m thick sea ice. The LK-60 has also been designed with a dual-draft capability to allow operations in the shallow rivers and straits. Reports indicate a 10.5 m loaded (full) draft with a minimum draft of 8.55 m, which will allow operations

Table 1—Icebreakers working in the Arctic and under construction as of 2015.

| NAME OR PROJECT NO. | POWER IN MEGAWATTS | LENGTH METERS | WIDTH METERS | DRAUGHT METERS |
|---|---|---|---|---|
| **Diesel-electric icebreakers:** | | | | |
| Varandey | 23,040 (4 9 Wartsila 12V32) | 100,0 | 21,7 | 10,06 |
| Yuriy Topchev | 15,0 (2 9 7500) | 99,3 | 19,0 | 8,0 |
| Vladislav Strizhkov | 15,0 (2 9 7500) | 99,3 | 19,0 | 8,0 |
| Dikson | 9,560 | 88,49 | 21,17 | 6,5 |
| Kapitan Nikolayev | 18,264 | 122,5 | 26,5 | 8,5 |
| Kapitan Dranitsyn | 18,264 | 122,5 | 26,5 | 8,5 |
| **Nuclear icebreakers:** | | | | |
| 50 years of victory | 54,0 (2 reactors) | 159,6 | 30,0 | 11 |
| Yamal | 54,0 (2 reactors) | 148,0 | 30,0 | 11 |
| Taymyr | 35,0 (1 reactor) | 151,8 | 29,2 | 8,1 |
| Vaygach | 35,0 (1 reactor) | 151,8 | 29,2 | 8,1 |
| **Under construction** | | | | |
| **Diesel-electric:** | | | | |
| 21900M | 18,0 | 119,4 | 27,5 | 8,5 |
| 21900M | 18,0 | 119,4 | 27,5 | 8,5 |
| 21900M | 18,0 | 119,4 | 27,5 | 8,5 |
| 22600 | 25,0 | 146,8 | 29,0 | 9,5 |
| **Nuclear:** | | | | |
| Arktika | 60,0 (2 reactors) | 172,2 | 33 | 10,5/8,5 |

Adapted from Nikitin et al. (2015).

in the mouths of the Yenisey and Ob estuaries (RT.com 2013). The LK-60 icebreakers will be ideally suited to escort a range of large bulk carriers, tankers, and LNG carriers expected to sail along the NSR during extended seasons of ice navigation.

## Status of Construction Program

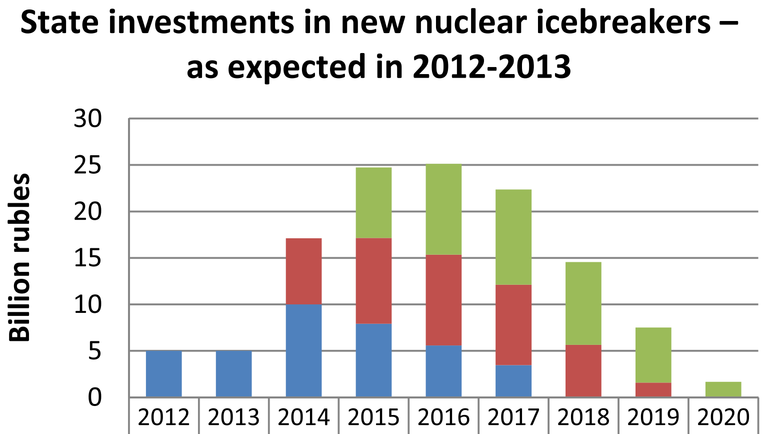
Soon after Rosatom took over the responsibility for Atomflot, in October 2008, the head of Rosatom, Sergey Kirienko, stressed the need to construct new ice-breakers in a meeting with then Prime Minister Putin: "If we do not introduce new icebreakers, then after 2015 our possibilities in the Arctic will begin to fall....According to a preliminary estimate we need to start building no less than 3–4 icebreakers of the new generation in the coming years" (Putin 2008). These comments reflected a widespread concern in Russia that much of the existing nuclear-icebreaker fleet would be decommissioned before new ones could be operative and that icebreaking capacity would be insufficient to serve the expected growth in navigation, referred to as an "ice pause" *ledovaya payza*. Even with costly extensions of service life, it looks like only *50 Years of Victory* and *Yamal* with certainty will be operative after 2020 (Moe 2014).

By September 2011 Prime Minister Putin announced that three new nuclear and six new diesel-electric icebreakers would be built before 2020 (Putin 2011). But a formal decision to build the first new nuclear icebreaker was only taken in June 2012 with a resolution from the Russian government (Russian government 2012). A tender was announced on the 29 June 2012, and in August a contract was signed with Baltiyskiy zavod (Baltic Shipyard)in St. Petersburg, which had been the only participant in the tender, to build and deliver the icebreaker by December 2017, with a price of 37 billion rubles (~US$1.2 billion) (RBK-Daily 2012). The heavily indebted Baltiyskiy zavod had been transferred to the state-owned holding company United Shipbuilding Corporation in 2011, to save it from bankruptcy (Kommersant 2011). The corporation, set up in 2007, now controls more than sixty Russian shipyards (United Shipbuilding Corporation 2016).

Even if it was declared that the new ship should be in operation by 2017, there was no clear plan for how the construction should be financed. It was stated that budget money would be set aside for the construction, but the government resolution also urged "…Rosatom, the Ministry of Economic Development, the Ministry of Finance together with other interested federal executive organs to present proposals for attraction of external financial sources, taking into account the possibility of entering into long-term contracts for services by the nuclear-icebreaker fleet and optimization of the tariff regulation of these services, for making a decision about financing of the icebreaker in 2015-2017" (Russian Government 2012). Clearly the hope was that big users like Novatek, Rosneft, Gazprom, or Sovcomflot would contribute and in exchange be given a discount on the escort fee. The attempt was not successful. By September 2012—after the tender had been concluded; it was declared that the Ministry of Finance had found room in the state budget for financing the first two years of construction, 2013–2014 (Ponomarev 2012). But the financing only covered one new icebreaker.

The start of the construction process did not go smoothly. In July 2013, a conflict erupted between the United Shipbuilding Corporation and its subsidiary, the shipyard Baltiyskiy zavod, when the former accused the latter of using subquality steel, which was overpriced as well. As a result, management of the yard was replaced (Petrov 2013). On the 5$^{th}$ of November 2013, it was announced that metal was cut for the first new nuclear icebreaker: *Arktika*.

Meanwhile, earlier in January 2013, Rosatom announced a tender for construction of two more 60 MW icebreakers. The Ministry of Finance insisted on external financing for these two icebreakers and was only prepared to cover 30–40 percent of the construction sum over the state budget (Popov and Serov 2013) (Figure 4). Again, a period of wrangling over the budget ensued, and again Rosatom won the battle (Atomny ekspert 2013). By August 2013, the government had promised to fully finance also the second and third new




| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Ural | | | | 7.586 | 9.771 | 10.24 | 8.912 | 5.927 | 1.666 |
| Sibir | | | 7.11 | 9.236 | 9.771 | 8.66 | 5.645 | 1.581 | |
| Arktika | 5 | 5 | 10 | 7.916 | 5.584 | 3.46 | | | |

FIG. 4—State investments in new nuclear icebreakers – as expected in 2012-2013. Note: The costs are in current rubles, i.e. they include assumed inflation over the construction period. Source: Russian Government (2012—attachment); Russian Government (2013—attachment).

icebreakers. But the tender for construction was annulled since the only participant, Baltiyskiy zavod, had delivered a higher bid—86.1 billion rubles (~US$2.6 billion), equaling the sum set aside by the government—than the maximum set by Rosatom: 77.5 billion rubles (~US$2.3 billion) (Kommersant 2014a).

A new tender for building the next two icebreakers was announced by Rosatom, after delays, in December 2013, this time with a maximum price tag of 84.4 bill rubles (~US$2.5 billion). The winner of the tender was supposed to be announced on 27 January 2014. Hitherto, Baltiyskiy zavod had been regarded as the only plausible alternative for construction of nuclear icebreakers. But Rosatom was very unsatisfied with the performance and costs at Baltiyskiy zavod and started calling for assigning the contract for the two next icebreakers to its own subsidiaries, in cooperation with foreign yards (Kommersant 2014b). Conclusion of the tender process dragged out.

The financial situation of Baltiyskiy zavod was already precarious and it was clear that denying the shipyard orders for the two next icebreakers would create serious problems (Kommersant 2014b). The United Shipbuilding Corporation lobbied hard to get the contract to Baltiyskiy zavod, arguing that dividing the order between several subcontractors, as the Rosatom bid implied, would be risky (Kommersant 2014b). As late as 28 March 2014, the major Rosatom subsidiary OKBM Afrikantov, mostly known as constructor of nuclear reactors, announced that it was ready to participate in the tender if it got the required license (Itar-TASS 2014). However, by 14 April 2014 it was reported that Rosatom and Baltiyskiy zavod had arrived at a compromise. Baltiyskiy zavod would get the order, but had to accept the price set by Rosatom, 84.4 bill rubles, which it had previously declared would make the project a loss-making venture. Moreover, Rosatom demanded full control of all financial flows within the project (Kommersant 2014a).

Building icebreakers is an investment that should be amortized over many years. If, for the sake of simplicity, the investments are amortized linearly over twenty-five years (a reasonable expected service life for the icebreakers), we arrive at an annual capital cost of 5 billion 2013 rubles (~US$150 million), plus interest. Can such a cost be covered by income from escorts? It seems clear that traffic volume or fees, or both, would have to increase drastically for this to take place. High fees will deter many potential users and may reignite international controversy over the extent of regulatory rights granted Russia by the UN Convention on the Law of the Sea Article 234—"the ice clause"—(United Nations 1982) and also the status of straits—internal waters (national) or international (Farré and others 2015, 309–310).

Thus a strong government role in financing the icebreakers seems inevitable. This is not unnatural as the vessels can be regarded as basic Arctic infrastructure. But how big is this financial burden? To assess the size, the relevant object of comparison is not Atomflot's revenues, but other state investments, particularly in the nuclear sector. In 2013, Rosatom reported that annual investments in the whole nuclear-energy sector were some US$10 billion (Rosatom 2013). This number indicates that the cost of building three icebreakers, at a price corresponding to more than US$1 billion each, is far from trivial.

As we have seen, wrangling within the government over financing of the new series of icebreakers was already evident when the overall economic situation in Russia was quite good. Given the new, very tight budget situation, which is likely to persist in the coming years, new battles for financing are likely to take place (Fadeeva 2014). Because of the depreciation of the ruble—and need for imported components—the shipyard has raised the question of revising the budget set aside for the construction (Vedomosti 2015a).

Formal budget allocations have only been made for the first years. With the deterioration in the Russian economy and ensuing problems in the state finances, expenditures are likely to be revisited and cost cutting will move to the top of the agenda. How many and what kind of icebreakers does Russia really need?

## The Role of Diesel-Electric Icebreakers

Whereas most attention, both in Russia and abroad, is given to Atomflot and the nuclear icebreakers, Russia also has a large fleet of conventional, diesel-electric icebreakers operating in the Arctic (see table 1). It consists of large polar icebreakers as well as port icebreakers. The question is if we see signs of an integrated strategy for icebreaking, where the use of nuclear and diesel-electric icebreakers is coordinated. One indicator will be the scope and thrust of new construction.

The conventional icebreaker fleet is also aging, and plans for renewal of the fleet have been discussed for many years in much the same way as for the nuclear icebreakers. Only in 2011 did the Russian president sign an order giving the United Shipbuilding Corporation (USC) the role as sole executor of the government's plans to build new sixteen and twenty-five MW diesel-electric icebreakers (President of the Russian Federation 2011b). A contract to build the twenty-five MW-icebreaker *Viktor Chernomyrdin*, which would be one of the most capable non-nuclear icebreakers in the world, was subsequently signed with Baltiyskiy zavod in December 2011 (Ministry of Transport 2012), with a finish date of October 2015. Orders for construction of three eighteen MW icebreakers were at the same time given to the Vyborg shipyard (VSZ), with the USC-owned Arctech in Finland as an important subcontractor for one of them (PortNews 2015b), also to be finished by 2015. The contract sum was 7.9405 billionrubles (~US$250 million) for the twenty-five MW icebreaker and 4.055 bill rubles(~US$127 million) for each of the smaller ones—as of 2011.

But the construction of the new icebreakers met with problems. By end 2014 Rosmorport reported that the twenty-five MW icebreaker was only 17.5 percent finished, and the three 16 MW icebreakers 87, 68, and 58 percent, respectively (Rosmorport 2015). Progress in construction was heavily criticized in a report from the Accounts Chamber of the Russian Federation (2014).

A major problem with *Viktor Chernomyrdin* was the heavier actual weight of the icebreaker, which turned out to be 2500 tons more than in the contract's design specifications. As a consequence, the draft of the icebreaker would be 0.7 m deeper than designed, complicating its operation in shallow waters. Work on the icebreaker stopped for almost a year as a redesign was studied and decided upon. By end of 2014, it was deemed impossible to completely eliminate the deeper draft, and an increase of 0.2 meters was accepted. To speed up construction, it was decided to see if the Russian-owned Nordic Yards in Germany, which already had signed an important subcontract in 2013 for the deckhouse, could take over more work on the icebreaker (Rosmorport 2015, 39–41). By early 2015, it was announced that completion of *Viktor Chernomyrdin* would be postponed until 2018 (Sudostroenie 2015). The decision to transfer more work to Germany was overturned, however, and the contract to Nordic Yards in Germany reportedly annulled in August 2015 (Vedomosti 2015b), with reference to increasing costs abroad caused by the deteriorating exchanges, whereas the budget was fixed in rubles (Popov 2015). This decision indicates that it is easier to get acceptance for a delay in the completion of the vessel than to get additional government funding to realize a contract that would save time.

The plan is to use the large twenty-five MW icebreaker independently in the shallow sectors of the Arctic and in the mouth of rivers running into the Arctic Ocean, but also as an assisting vessel in complex convoys on the NSR. In the winter season it will be used elsewhere, notably in the Baltic Sea (Ministry of Transport 2012). It will be operated by Rosmorport, a state unitary enterprise (FGUP) under the Ministry of Transport. This structure was set up in 2002 to manage federal property in Russian ports. Later, its remit was extended to take a more general part in development of maritime infrastructure. Regional branches were established in several port cities, including Murmansk and Arkhangelsk. An important part of its function in Arctic ports is to operate port icebreakers. But when *Viktor Chernomyrdin* is brought into service, it will have the potential to play a very significant role on the NSR.

However, there is no sign in official documents, or in Rosmorport's own strategy document from 2014, that the company is seen or sees itself as a competitor to Atomflot, and the substantial delays in construction of the new diesel-electric icebreakers may indicate that there is less political pressure to keep the schedule than the case is with the new nuclear icebreakers.

## Operational Issues and Conflicts of Interest

Two key operational issues have significant influence over the use of Russian icebreakers and the overall effectiveness of the NSR. The length of the ice navigation season to be maintained on the eastern and western sections of the NSR is an important factor in icebreaker deployment. The western NSR has been maintained year-round to the port of Dudinka on the Yenisey River since the late 1970s. Initially, icebreaker-led convoys serviced the western route, but in recent years modern icebreaking carriers of the *Norilsk* class operate year-round without icebreaker support. Icebreaking LNG carriers departing the port of Sabetta on the Yamal Peninsula and sailing westbound may be capable of winter voyages without icebreaker escort in convoy. The eastern NSR—routes across the Laptev, East Siberian, and Chukchi seas to the Bering Strait—is where the length of the ice navigation season remains uncertain. While it may be technically feasible with nuclear icebreakers to escort ships year-round along the eastern NSR, the safety and economic issues of doing so have not been fully addressed.

The design of a new 120 MW icebreaker with the provisional name *Lider*, twice as capable as the new *Arktika* class, reflect a vision of year-round escort in all directions on the NSR of large cargo ships up to 100,000 tons deadweight (PortNews 2015c). However, a decision to go forth with construction has not been made.

Modern icebreaking carriers such as the *Norilsk* class and other commercial carriers operating in the Canadian Arctic are designed for independent operations without icebreaker support or escort. Such ships are capable of operating alone along the entire NSR during the summer months, and through the winter (year-round) on the western NSR. Unknown is the role these highly ice-capable ships play in determining the level of service to be provided by the Russian icebreaker fleet throughout the year. Moving natural resources out of the Russian Arctic by independent carriers is a more economic and efficient mode of marine transport when compared with convoy escort by icebreaker. One assumes with independent sailings that icebreaker fees would not be levied, although ice pilotage would be provided as a mandatory NSR requirement. In the ongoing strategic planning for new icebreakers and the future operation of the NSR, the issue of the expanding use of icebreaking carriers must be addressed as a practical reality and a distinct departure from the convoy escort model developed during the Soviet era.

However, there is a clear conflict of interest on this issue. Atomflot maintains that as a general rule the best and safest solution for shipping on the NSR is convoys—or individual ships—escorted by icebreakers. This permits the use of ships with a low ice class, which are cheaper to build and operate than ice-strengthened ships designed for independent navigation. For Atomflot as a company, the escort model is definitely preferable, since it is the basis of their business. But for the Russian government as well, escort may be regarded as preferable—as long as there is unused icebreaking capacity. Escorts will help alleviate the financial burden of maintaining the icebreaker fleet. The problem for the government would be that insisting on this model may keep potential independent-minded users away from the NSR.

But this is not necessarily an either/or question, as various combinations of independent and escorted navigation can be envisaged, particularly during extension of the NSR navigation season. And users preferring independent navigation should, and probably would, recognize the crucial role icebreakers can play in an emergency situation. In summary, finding a proper balance for roles of the icebreaker fleet in a modern shipping world is crucial.

## Conclusions and the Future

Today's Russian icebreaker fleet, as it was during the Soviet era, is an integral component of Arctic infrastructure. These icebreakers are key to the convoy-escort system along the NSR, to the extension of the NSR navigation season, and to providing marine access for the Russian navy and for the resupply of remote coastal communities. However, it remains unclear how many new icebreakers, diesel- and nuclear-powered, will be required to maintain the various levels of service needed for an extended navigation season along the entire NSR, and in particular, along the eastern reaches of the route.

It is clear to most that the driving force for developing the NSR is to facilitate the movement of natural resources (oil, gas, and hard minerals) out of the Russian Arctic to global markets (AMSA 2009). Making the NSR a safe and economically viable national waterway tied to natural-resource development will require significant investment in marine infrastructure, including a modern icebreaker fleet, but not only and necessarily a nuclear fleet. Official Russian policy is also to develop the NSR as an international waterway. It is unclear what levels of state investment will be made to attain this goal, if realistic at all. Also, it is unclear how Russia will implement the International Maritime Organization's (IMO) Polar Code that is to come into force in all polar waters on 1 January 2017. Integrating the IMO Polar Code with the current NSR rules and regulations will indicate how far international rules and regulations will be adopted for the Russian maritime Arctic (Zagorski 2016). Icebreakers will fall under the provisions, if they are not categorized as government vessels.

Undecided is the level of sustained state financing for the new fleet of icebreakers. In a period with strained state finances, securing external funding for the construction will continue to be a priority. This review has identified quite extensive problems and conflicts around the ongoing construction of nuclear as well as conventional diesel-electric icebreakers, suggesting that it may be difficult to complete the vessels according to schedule. Even so, a delay does not spell undercapacity or "ice pause" in few years. Traffic outlook is now more modest than when the construction program started, even if official Russian projections remain expansive (Moe 2016).

Atomflot is the dominant NSR organization providing icebreaker escort and ice pilots. With its extensive operational experience and presence in the Arctic, combined with active external information, it undoubtedly plays a key role in shaping policy for the NSR, including allocation of resources. Atomflot is also increasing the range of services it can offer by establishing a fleet of nonnuclear vessels. But this development also entails the risk of further monopolization of maritime services.

Atomflot conducts all its work outside the structure of the Ministry of Transport, which is assigned development of government policy. State policy with regard to management of NSR remains undecided, however. In principle, it is based on competition between service providers, state and privately owned; in reality, Atomflot plays a dominant role. On the other hand, there is no attempt to coordinate the icebreaking services of other state agencies with the nuclear fleet. This begs the question whether the state investments in icebreakers, as well as other infrastructure, are used in an optimal way.

One could, for instance, envisage the stationing of icebreakers along the coast for seasonal deployments—90 to 150 days—away from Murmansk. This would require multiple crewing/manning strategies. Also, some new port infrastructure would be needed in viable ports such as Pevek and Tiksi. In a combination with diesel-electric icebreakers this might entail a more flexible service to users and of less cost to Russia, since fewer nuclear icebreakers would be required.

Many modern icebreaking commercial carriers can operate independently (outside loading areas) without icebreaker escort in convoy. But it seems that the potential for expanded operation of such carriers—like the *Norilsk*-class ships sailing to Dudinka and icebreaking shuttle tankers in the Pechora Sea—is not fully appreciated in Russian thinking about the NSR. How will these ships be accommodated along the NSR and how will these independent ship operations influence the need for icebreakers and the size of the Russian icebreaker fleet—a fleet that is built around the ice escort and convoy system developed during the Soviet era? This is epitomized in the discussion, or rather negotiations, concerning how the icebreaker fleet will support the movement of large LNG carriers from the port of Sabetta on the Yamal Peninsula, with the project owner Yamal LNG wanting to minimize icebreaker use and Atomflot in favor of maximizing (Moe 2014). An LNG icebreaking carrier is planned to depart the port of Sabetta every forty hours when the LNG plant is producing at full capacity (Kogtev 2015). Icebreaker escort of the carriers along the Yamal Peninsula will probably be required during the winter. West-bound traffic to Europe should be maintained year-round with or without icebreaker escort. East-bound traffic to Asia through the Bering Strait will require a navigation season extension provided by icebreaker escort. The length of the navigation season along the eastern NSR is currently unknown.

The icebreaker fleet is not solely dedicated to escort operations. How will coordination be handled when there is competition between state needs—for example support to the navy—and commercial traffic escort along the NSR? Future close operational coordination of the Russian icebreakers and commercial traffic should be a cornerstone of an effective, safe, and secure NSR. But what organization would conduct this coordination?

Since the new NSR Administration in Moscow and Atomflot have yet to issue annual reports, understanding how the two organizations presently work together and along with other private companies (for example, Murmansk and Far East shipping companies) and state enterprises, remains elusive. A comprehensive NSR annual report, which would include icebreaker services provided for ship escort and complete shipping statistics, issued by the Ministry of Transport, would be a significant body of information for the global maritime community, akin to annual reports issued by the Suez and Panama canals. The traffic data published by the Norway-sponsored Northern Sea Route Information Office rely mainly on input from Atomflot and are not comprehensive; escort fees actually paid remain confidential (2016). The current information provided does not define adequately the term "transit", causing significant confusion in the global media and inaccuracies in numbers of trans-Arctic voyages (Moe 2014, 2016).

The future of the NSR and coordination of the Russian icebreaker fleet remains uncertain. A proposal put forward in 2016 by Deputy Prime Minister Dmitriy Rogozin, who heads the State Commission for Development of the Arctic, to create a "unified operator" for the sea route, seems to imply an administrative superstructure, directing operations as well as investments (TASS 2016). It is an attempt to address fundamental problems in development of the

NSR, but is probably not the last word in the discussion. It collides with an alternative vision based on separation of roles, clear regulations, transparency, and competition (Kryukov 2016).

With no reforms the emerging management and operational roles of the Ministry of Transport, Atomflot, and other private and state maritime enterprises, indicate a highly complex system that will challenge the effectiveness and economic viability of the NSR.

## Notes

[1] Official Russian definition: "*The water area of the Northern Sea Route shall be considered as the water area adjacent to the Northern coast of the Russian Federation, comprising the internal sea waters, the territorial sea, the adjacent zone and the exclusive economic zone of the Russian Federation and confined in the East with the Line of Maritime Demarcation with the United States of America and Cape Dezhnev parallel in Bering Strait, with the meridian of Cape Mys Zhelania to the Novaya Zemlya Archipelago in the West, with the eastern coastline of the Novaya Zemlya Archipelago and the western borders of Matochkin Strait, Kara Strait and Yugorski Shar.*" (Russian Federation 2012).

[2] A detailed presentation of the early organizational issues can be found in State archive of Murmansk oblast' 2016.

[3] The program for constructing floating nuclear power stations has not been given up, but has proceeded slowly. In 2016 it was announced that the first station will be completed in 2017 (Neftegaz.ru 2016).

[4] A branch office was opened in Arkhangelsk, however (Northern (Arctic) Federal University 2013). Its functions are unclear and it was perhaps mainly a political concession. By 2016 it seemed to have been closed or have no functions. But proposals to move the administration out of Moscow continue, including from the chairman of the State Commission for Development of the Arctic, Deputy prime minister Dmitriy Rogozin, at the commissions first meeting 13 April 2015 (Yemelyanenkov 2015).

[5] The support from the President was indirect, though, as Atomflot was exempted from a list of state enterprises not to be transformed into joint-stock companies (President of the Russian Federation 2011a). Nevertheless, this was widely interpreted as a go-ahead from President Medvedev for Rosatom's plans. In a new edict signed by President Putin two years later, privatization of the nuclear icebreaker fleet was explicitly forbidden, however (President of the Russian Federation 2013).

[6] Dollar values have been calculated according to historical exchange rates retrieved from X-Rates 2016.

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