

Yermakov, Vitaly; Henderson, James; Fattouh, Bassam

**Working Paper**

## Russia's heavy fuel oil exports: Challenges and changing rules abroad and at home

OIES Paper: WPM, No. 80

**Provided in Cooperation with:**

The Oxford Institute for Energy Studies, Oxford

*Suggested Citation:* Yermakov, Vitaly; Henderson, James; Fattouh, Bassam (2019) : Russia's heavy fuel oil exports: Challenges and changing rules abroad and at home, OIES Paper: WPM, No. 80, ISBN 978-1-78467-135-8, The Oxford Institute for Energy Studies, Oxford, <https://doi.org/10.26889/9781784671358>

This Version is available at:

<https://hdl.handle.net/10419/246550>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

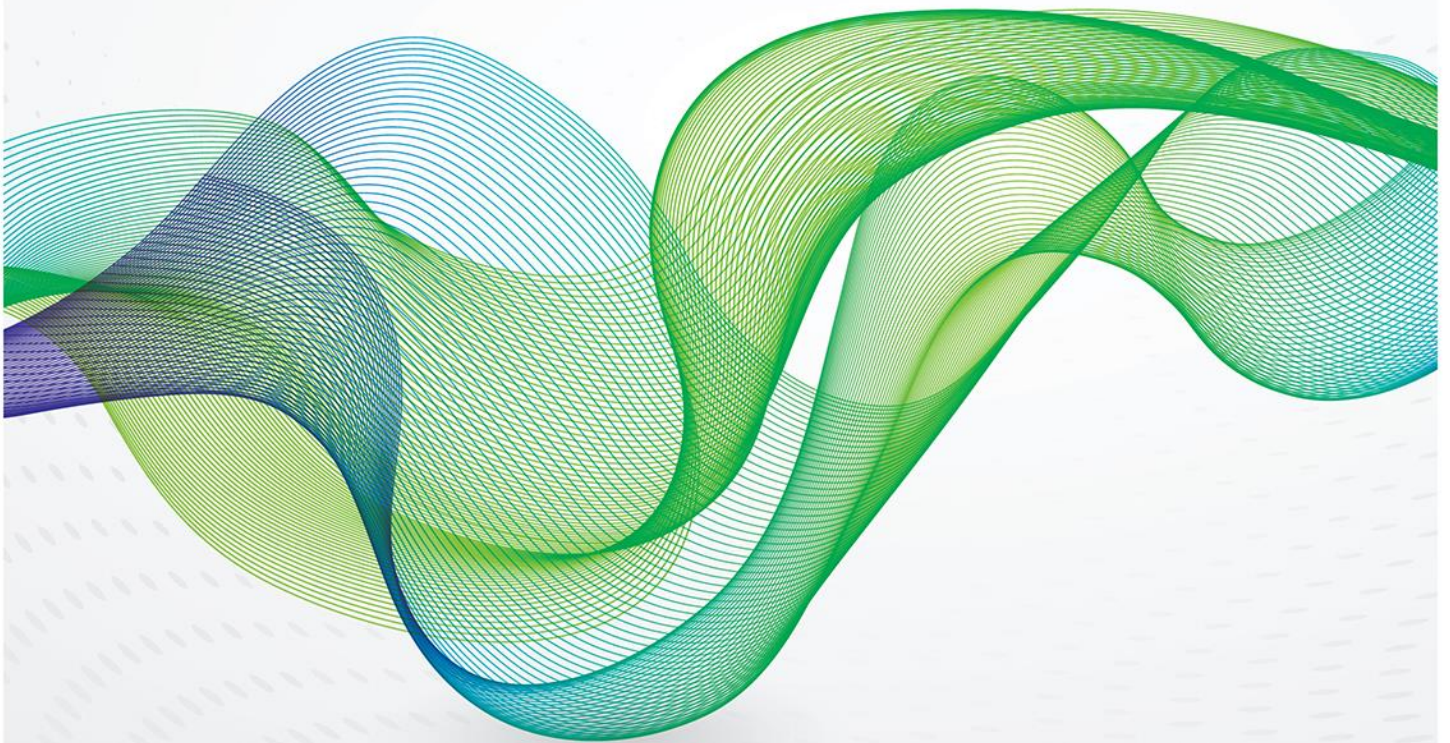
*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



THE OXFORD  
INSTITUTE  
FOR ENERGY  
STUDIES

April 2019

## Russia's heavy fuel oil exports: challenges and changing rules abroad and at home





The contents of this paper are the authors' sole responsibility. They do not necessarily represent the views of the Oxford Institute for Energy Studies or any of its members.

*Copyright © 2019*

***Oxford Institute for Energy Studies***

(Registered Charity, No. 286084)

This publication may be reproduced in part for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgment of the source is made. No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from the Oxford Institute for Energy Studies.

ISBN 978-1-78467-135-8

DOI: <https://doi.org/10.26889/9781784671358>



## Contents

<b>Figures</b> .....	<b>ii</b>
<b>Tables</b> .....	<b>iii</b>
<b>I. Introduction</b> .....	<b>1</b>
<b>II. Key features of Russia’s refining industry</b> .....	<b>2</b>
Complexity of refining processes .....	5
Organizational structure .....	6
Refinery throughputs .....	7
<b>III. The paradox of Russia’s refining: the subsidy that went too far and lasted too long</b> .....	<b>11</b>
Export taxes: the magic formula .....	11
While the state giveth, the refining sector taketh .....	15
<b>IV. Tax reform of 2009–2019 and its impacts</b> .....	<b>17</b>
The 60–66–90 system .....	17
Removing the fuel oil subsidy .....	18
The first results of the reform – a mixed bag – better yields, but excessive throughput .....	20
Limitations and risks of the reform .....	24
<b>V. The new plan for 2019–2024 and outlook for its final phase in 2020–2024</b> .....	<b>26</b>
<b>VI. Modernization of Russian refineries and outlooks for the future</b> .....	<b>30</b>
<b>VII. Conclusion</b> .....	<b>33</b>
<b>Appendix I. A brief history of Soviet and Russian refining industry and its current characteristics</b> .....	<b>34</b>
<b>Appendix II: Complexity of Russian refining system</b> .....	<b>35</b>

## Figures

Figure 1: Map of main Russian refineries, Western Russia .....	3
Figure 2: Map of Russian refineries, Eastern Russia .....	4
Figure 3: Russian refining throughput shares by company, 2018 .....	6
Figure 4: Refining throughput volumes and refining depth for Russia’s largest refineries in 2018 .....	7
Figure 5: Russia’s refining capacity, throughput, and capacity utilization .....	8
Figure 6: Russian crude oil and refined products output index .....	8
Figure 7: Russian refined product exports .....	9
Figure 8: Value lost to Russia by exporting refined products instead of crude oil .....	10
Figure 9: Refined product exports from Russia .....	10
Figure 10: Russian export duties for petroleum products .....	13
Figure 11: Effective annual average export duty rates for crude oil and main refined products in 2005–2010 .....	14
Figure 12: Differences in export duty rates between crude oil and main refined products .....	14
Figure 13: Incremental change in refined product output, 2014 versus 2005 .....	15
Figure 14: Incremental additions in throughput at Russian refineries, 2014 vs. 2005 .....	16
Figure 15: Changes in export taxes in 2011–2018 (actual annual average tax rates) .....	19
Figure 16: Marginal rates for petroleum export duties in Russia in relation to oil price .....	20
Figure 17: Russia’s refining throughput and output of main products, 2010–2018 .....	21
Figure 18: Incremental change in fuel oil output, 2018 versus 2014 .....	21
Figure 19: Distribution of Russian fuel oil production in 2018 by refinery .....	22
Figure 20: Fuel oil output by refinery, 2017–2018 .....	23
Figure 21: Russia’s refined product exports, 2010–2018 .....	23
Figure 22: Russian fuel oil exports via the Baltic and the northern ports .....	24
Figure 23: Russian fuel oil exports via the Black Sea ports .....	24
Figure 24: Why Russia got cold feet eliminating export taxes completely in 2017 .....	25
Figure 25: Eligibility requirements for excise tax refunds .....	27
Figure 26: Petroleum rent and its distribution in Russia in 2017 .....	28



Figure 27: Petroleum rent and its distribution in Russia in 2024 .....	29
Figure 28: Investment spending of refinery upgrades in Russia in 2011–2017.....	30
Figure 29: Planned capacity additions at Russian refineries in 2018–2024 by process type.....	31
Figure 30: Russia’s refined product balance, 2017 and outlooks for 2025.....	32
Figure A-II-1: Refining throughput and refining depth in Russia.....	35
Figure A-II-2: Light product share in Russian refining output .....	35

## Tables

Table A-II-1: Regional differences in key characteristics of complexity for refining industry .....	36
---	----



## I. Introduction

Russia is the world's second-largest exporter of refined products after the USA. Owing to the less complex nature of Russian refineries, heavy fuel oil (HFO) exports have been very high, both as a share of the export product mix, and in absolute terms. In 2012 the share of fuel oil in Russian product exports peaked at 53 per cent of the total. In 2014 they reached their absolute maximum level of 82.5 million tons (mt). From 2015, as a result of new export tax policies that changed the incentives for Russian refiners and forced them to optimize their output, Russian fuel oil exports started to decline. But in 2018 they still amounted to 52.6 mt (35 per cent of the total). Russia remains the number one exporter of HFO in the world and is now facing a problem: how to deal with a rapidly shrinking market for this product?

The global heavy fuel oil market has been under pressure for the past 40 years. Its niche has been constantly declining as the demand for fuel oil has been losing one battle after another to alternative fuels and cleaner substitutes. Coal and natural gas have pushed residual fuel oil (mazut) out of the power and residential heating sectors. At thermal power plants in Russia, its role has been reduced to that of emergency reserve fuel. Very few countries outside of the Middle East continue using mazut as the main fuel in the power sector, and in countries such as Saudi Arabia and Kuwait, which currently burn large volumes of HFO in their power plants, plans have been developed to replace it with natural gas. In the residential heating sector, natural gas and, more recently, renewables have provided cheaper and cleaner alternatives.

Marine bunkering had been one of the few remaining areas with robust demand for fuel oil, due to the expansion of maritime trade and growth of shipping turnover. It is now the world's largest consumer of HFO. However, the International Maritime Organization (IMO) has mandated a stricter sulphur emissions cap (0.5 per cent instead of 3.5 per cent) from January 2020 globally, which is a challenge for shippers. The new rules will force them to choose between switching to compliant fuels (compliant low-sulphur fuel oils and marine gasoil (MGO)), installing scrubbers, or refurbishing their ships for the use of LNG as bunker fuel. The change in bunker fuel specifications might become the most disruptive quality change for the refining and shipping sectors in this century. Most analysis of the IMO requirements taking effect in 2020 suggests a lower demand for HFO and very likely downward price pressure. Russia is going to be faced with the greatest exposure to this new challenge.

The key aim of this paper is to explore whether the Russian refining sector has the flexibility to deal with the problem by lowering HFO output and exports before the mismatch between supply and demand becomes excessive. This paper builds on the research conducted by OIES in 2012.<sup>1</sup> At that time, the Russian government and the Russian oil companies had announced an ambitious programme of modernization for the Russian refining sector, and planned a radical overhaul of the tax incentives that artificially supported HFO production. According to these plans, by 2020 Russia would have implemented investments in conversion refining processes with the effect of drastically reducing the production of residual fuel oil. This, in turn, would have cut the levels of Russian fuel oil exports to very low levels.

As we approach 2020, however, Russia appears to need several more years to reduce its still large volumes of HFO output. Moreover, the emergence of some systemic and social issues, associated with the shutting down of some inefficient refineries, suggests that some simple, die-hard Russian refining capacity is not going to go quietly and will continue its operations. This calls for the re-examination of some of the conclusions of earlier research and a review of the new circumstances.

The paper is structured as follows: first, it discusses the history, evolution, and key characteristics of the Russian refining sector and reveals the systemic causes of sustained high levels of HFO output;

---

<sup>1</sup> Fattouh B. and Henderson J. 'The Impact of Russia's Refinery Upgrade Plans on Global Fuel Oil Markets'. OIES Paper WPM 48, 2012.



then it reviews Russia's refined product exports and their profitability, and shows that Russia has incurred significant losses by exporting refined products instead of crude oil. Turning to the causes of this, the paper looks at the structure of the product export mix and Russia's regime of export duties for oil and refined products. This analysis highlights the distortive nature of the subsidies stemming from the design of Russian export taxes. Next, Russia's attempts to correct the distortions, and the consequences of these efforts, are evaluated. The paper continues with an overview of investments in the Russian refining sector that were made with the aim of rationalization and modernization. It concludes with the outlook for Russia's fuel oil output and the view on the global market of pricing developments for HFO after 2020.

## II. Key features of Russia's refining industry

There are several key principles that make refining a viable business in the long term.

- Refined product output should, as far as possible, match the demand for product mix in the market that the refinery is going to serve. This ensures the right choice for the type of capacity and its level of sophistication, resulting in high utilization, efficient runs, and low logistical costs on delivering products to customers.
- The type of crude available for the refinery determines the product slate from distillation and sets the requirements for secondary processing capacity.
- The location of the refinery is very often a trade-off between a desire to be closer to crude oil supply and a desire to be closer to the final consumers, in which the relative costs of transporting crude oil to the refinery and transporting refined products to the end customers should be evaluated.
- Investing in a refinery is a long-term business, and it is important to be able to respond to shifts in demand and new product requirements via necessary capacity upgrades, which introduces another important trade-off: the flexibility to rationalize and upgrade with regards to the crude oil 'diet' and the output mix.

In Russia, it is difficult to point to any refinery that optimizes the above trade-offs. This has to do with the history of Russia's petroleum industry, the legacy of Soviet industrial policy that influenced decisions on refinery locations, and the dramatic shifts in demand since the bulk of Russia's refining capacity was built.<sup>2</sup>

The Russian refining industry emerged in several waves: during the first stage of industrialization in the 1930s, then in the post-World War II Soviet push to rival US economic might, and finally in the late 1960s–early 1970s, on the back of the spectacular growth of Soviet oil output in Western Siberia. (See Appendix I for more details about the history of the Soviet and Russian refining industry.) Geography has always played a key role in the economics of Russia's refining sector. Because of the size of the country and the location of the bulk of its oil reserves deep inland, the transportation expenses associated with moving crude to the refineries, and products to the target markets, have represented a significant share of overall costs. Rail and river shipments have accounted for the lion's share of transportation turnover. The development of an interregional pipeline network for crude oil in the 1970s

---

<sup>2</sup> Thane Gustafson, in his canonical book about the Soviet energy sector, points to the accumulated effects of the system embodied in the physical infrastructure and, in a powerful metaphor, compares the Soviet economy to a 'gnarled tree' that had grown up 'leaning against the north wind of forced-draft industrialization': Its past is written into the composition and location of its capital stock, the patterns of its roads, the size and type of its plants, the distribution of its manpower, the kind of fuel it burns and ore it uses. ... The layout of pipelines and refineries embody decisions made over decades. The same is even more true of the consumption side, since the country map of energy demand is essentially that of its inherited structure of population and economic activity. Gustafson T. *Crisis amid Plenty. The Politics of Soviet Energy under Brezhnev and Gorbachev*. Princeton, 1989. pp. 11–12.



allowed Russia to optimize the costs of delivering crude oil to the refineries and to place new refineries closer to main consumption centres in the European part of the country. But for refined products, rail transportation has remained the dominant method of delivery. Only recently have new dedicated pipelines for refined products (low-sulphur diesel) allowed Russian refiners to diversify some of their transportation options.

The geographical configuration of the Russian refining industry was largely completed in the 1970s, with most of the refineries being located deep inland serving domestic customers. A few Russian refineries were located closer to land borders (Kirishi in the Northwest) or in the seaports (Tuapse on the Black Sea); however, these were not designed as export-oriented facilities but to serve the regional areas of the domestic market. This setup – with the productive base kept away from the borders – reflected the security concerns of a country that had experienced foreign invasions and occupation of its territory. (See Figure 1 and Figure 2)

**Figure 1: Map of main Russian refineries, Western Russia**



Source: Argus Media ([www.argusmedia.com](http://www.argusmedia.com))



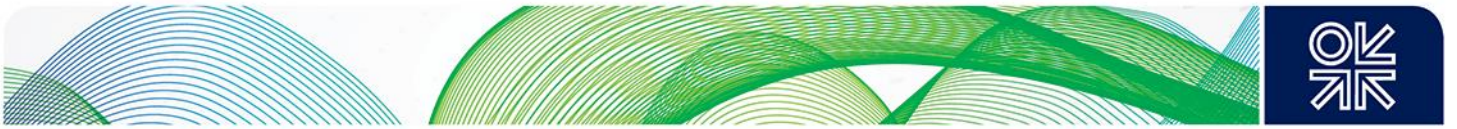


Figure 2: Map of Russian refineries, Eastern Russia



Source: Argus Media ([www.argusmedia.com](http://www.argusmedia.com))

The demand patterns of the Soviet planned economy have also left an enduring impact on the Russian refining sector. When Russia's refineries were built in the 1950s and 1960s, mazut, or heavy fuel oil (the largest and least desirable product of simple distillation) was widely used domestically, primarily as



a fuel for thermal power plants. By 1975 it accounted for almost a third of the fuel balance of thermal plants nationally.<sup>3</sup>

From the early 1980s, however, the availability of cheap and abundant natural gas became a game-changer. The Russian power sector switched from mazut to gas, and fuel oil was reduced to the role of emergency fuel – representing merely 2–3 per cent of the thermal plants’ fuel balance by the 1990s. Meanwhile, the new demand patterns favoured lighter and cleaner products, primarily motor fuels, at the expense of the traditionally important mazut. The transition from the Soviet command economy reduced the roles of industries and the military (traditionally large consumers of fuel oil) in the demand for refined products, and increased the shares of the commercial and services sectors. Individual and commercial car and truck ownership grew quickly, bringing up demand for high-octane gasoline and low-sulphur diesel.

From that period on, most of Russia’s fuel oil production had to be disposed of to markets located relatively far from the original marketing areas of the Russian refineries; this introduced additional logistical costs and created a drag on their overall profitability. This change initiated large-scale exports of fuel oil out of Russia. The export of excess refined products emerged as an important source of flexibility for refineries that had to face the problem of a fixed refinery slate, when domestic consumption patterns radically changed with the fast penetration of natural gas. These exports offered an alternative to costly investments in conversion processes at the refineries. By postponing such painful but necessary adjustments, this stop-gap solution also planted the seeds of a long-lasting problem. The mismatch between primary and secondary capacity remains one of the biggest challenges for Russia’s refining industry.

### Complexity of refining processes

Russia’s refining sector is not very sophisticated (see Appendix II for more details). The distillation process (primary refining), the method with the simplest technology and lowest costs has been dominant, while the share of cracking or other conversion refining processes is relatively low.

The Russian refining sector historically did not have enough secondary refining processes.<sup>4</sup> These processes either convert heavier, low-value products into lighter, premium products or improve the quality of products resulting from the primary distillation of crude. Recent expansion has occurred mostly in the area of hydrotreating capacity for desulfurization, allowing a significant reduction in the sulphur content of Russian middle distillates (especially diesel fuel) that are needed for the export market. At the same time, Russian refineries have been slow to come up with the big-ticket investments necessary to expand their upgrading capacity in visbreaking, catalytic cracking, and coking. As of 2017, Russia and the Caspian area managed to bring their Nelson Complexity Index (NCI) to the important threshold of 8.0, which sets apart good refineries from mediocre and bad. The conversion ratio also improved significantly over 2010 to 25 per cent, but it is way behind the 65–70 per cent seen in North America and Asia–Pacific. Russia needs sizeable investments in upgrading capacity if it wants the refining product slate to match current demand patterns that favour light clean products. This is one area where Russia’s refining sector is not only far behind that in advanced countries, but is below the world’s average by a wide margin.

---

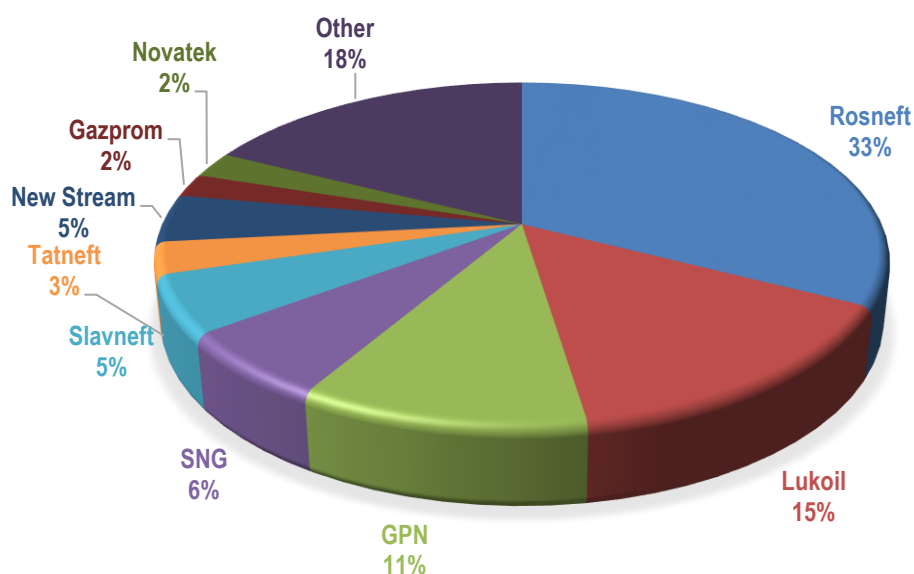
<sup>3</sup> In the Middle Volga region, where the concentration of refining capacity was the highest, mazut accounted for almost a half of the thermal power plants’ fuel needs. The overhang of distillation capacity over secondary processing capacity, thus, was not seen as a big problem.

<sup>4</sup> These include cracking processes that convert residue from primary distillation into varying yields of distillates, ranging from straightforward thermal cracking (visbreaking) to more complex catalytic processes such as catalytic cracking, hydrocracking, and combination cracking. Coking destroys residue altogether, producing a mixture of distillates and coke. Hydrotreating uses hydrogen to remove undesirable elements, mainly sulphur, from fuels and lubricants, especially diesel fuel. The catalytic reforming process converts naphtha into higher-octane gasoline components; it is also used in the petrochemical industry to produce aromatic hydrocarbons.

## Organizational structure

At present, Russia's refining capacity is about 329 mt, with the bulk being concentrated in 33 fully-fledged refineries and the rest in specialized gas condensate processing facilities, specialized lube plants, and a number of mini-refineries. Russian refining operations are highly concentrated, with over two-thirds of the output produced at the facilities being controlled by five vertically integrated companies (VICs). The Soviet oil industry was reorganized in the early 1990s into 16 large vertically integrated companies (VICs), each combining exploration, production, refining, distribution, and retailing. Following recent consolidation, only five large oil VICs remain: Rosneft, Gazpromneft, Lukoil, Surgutneftegaz, and Tatneft. Rosneft is the largest refiner in Russia with a share of 33 per cent; it processed over 101 mt in 2018, if its share in Slavneft's Yaroslavl refinery is included (see Figure 3). Taken together, the VICs accounted for 73 per cent of Russia's total refining throughput in 2018. The remaining throughput is distributed among large and small independent refineries, and a few dozens of small 'teapots'.

**Figure 3: Russian refining throughput shares by company, 2018**

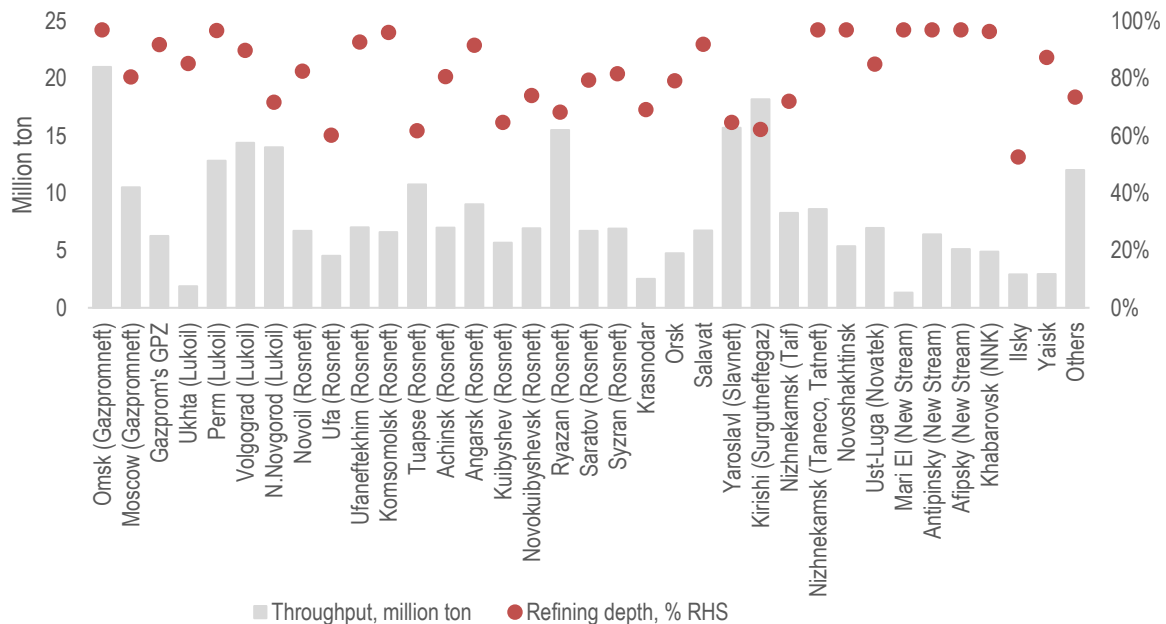


Source: Authors, data from Argus

Figure 4 illustrates the individual characteristics of Russia's main refineries. The modernization of Russian refineries over the past 10 years has improved the yields and the quality of the products, but as of 2018 the country's refining throughput is still very high relative to domestic demand – only about half of the refining output was consumed at home, and almost 150 mt of refined products were exported. The yields at some refineries belonging to VICs are still poor, and Russia's die-hard teapot refineries still account for a sizeable share of total output.



**Figure 4: Refining throughput volumes and refining depth for Russia's largest refineries in 2018**



Source: Authors's calculation, data from Argus

### Refinery throughputs

Russia's total primary distillation capacity reached 360 mt in 1990, with refining throughput at 299 mt, giving a capacity utilization of effectively 80 per cent (see Figure 5). But after the Soviet Union's collapse and the subsequent economic shock, its refining throughput dwindled to a low point of 165 mt in 1998, according to BP's *Statistical Review*.<sup>5</sup> Utilization rates dropped below 60 per cent. This was because Russia had too much obsolete simple distillation capacity and too little conversion capacity at its refining facilities.

In the early 2000s the pendulum swung back, and Russian refining throughput started to grow robustly (the reasons for the rebound are discussed later in the text). The 'big bounce' of Russian refining occurred on the back of spectacular crude oil output growth in the country in the early 2000s. Higher levels of refining helped alleviate the export bottlenecks for crude oil that emerged in the Transneft pipeline system in the early 2000s while it was trying to catch up with upstream developments. Russia's shortage of export capacity for crude oil was effectively eliminated, as the country's incremental production was redirected from exports to domestic refineries, starting in 2004/5. Refining throughput amounted to 285 mt in 2017, with utilization of 87 per cent, according to BP.<sup>6</sup> (See Figure 5)

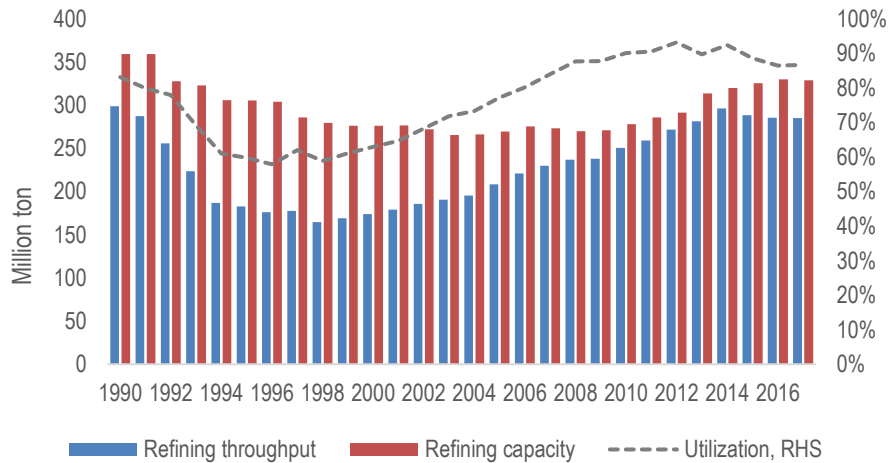
From the mid-2000s the rate of growth for Russia's refining throughput was consistently higher than that for its crude oil output. At the same time, the output of key refined products (including residual fuel oil) was following the rates of throughput growth, suggesting that the Russian refineries continued to yield a relatively poor mix of products through 2014. It was only in 2015 that fuel oil output nose-dived, and by 2018 it had returned to the level seen in 2000 (see Figure 6).

<sup>5</sup> BP. *Statistical Review of World Energy*. June 2018 <http://www.bp.com/statisticalreview>.

<sup>6</sup> BP reports Russian refining data in million barrels per day. In this report the coefficient of 7.3 was used to convert barrels to tons.

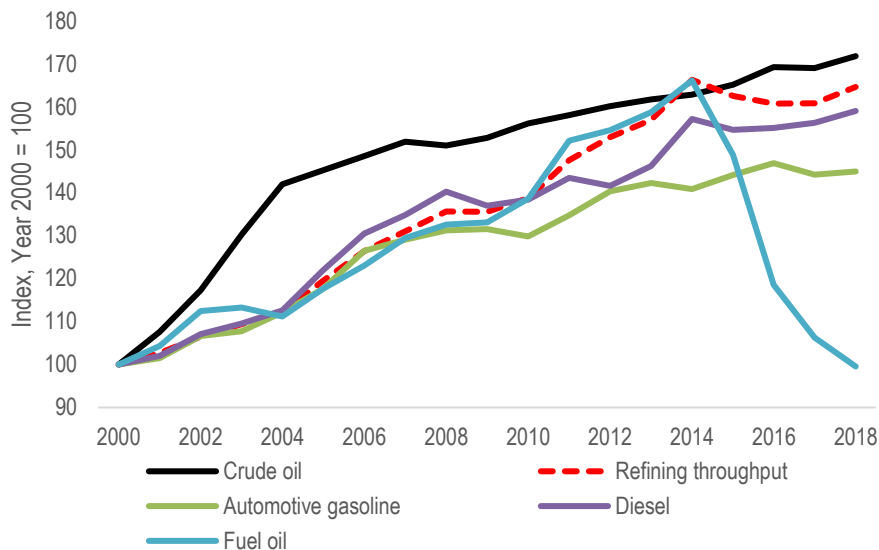


**Figure 5: Russia's refining capacity, throughput, and capacity utilization**



Source: Authors, data from BP Statistical Review, 2018

**Figure 6: Russian crude oil and refined products output index**



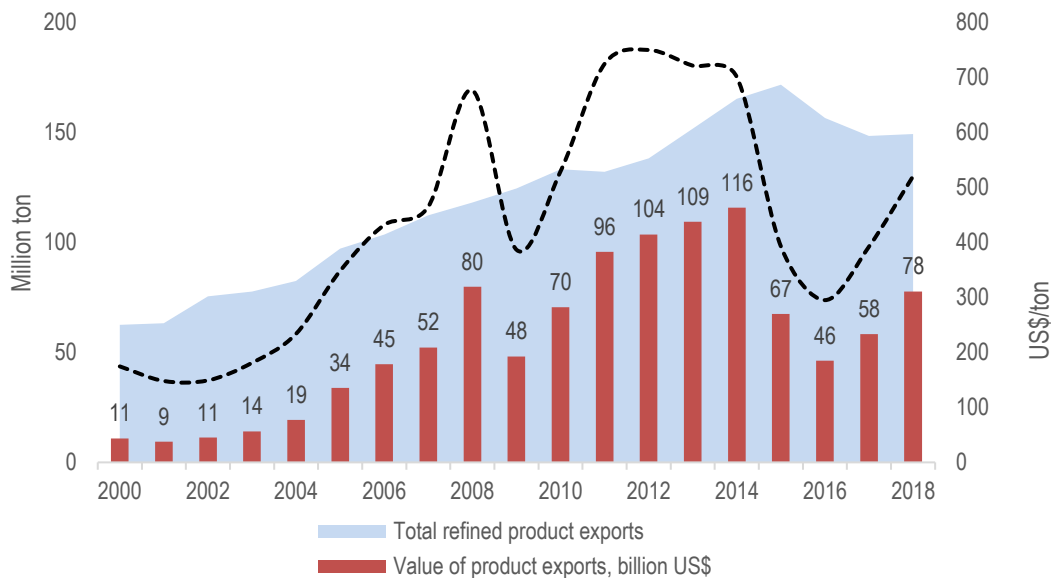
Source: Authors, data Minenergo, Rosstat

**Evolution of the product export mix and its impact on profitability**

Russia is the world's second-largest exporter of refined products (after the USA). Its total product exports peaked in 2015 at 171.7 mt and they were about 150 mt in 2016 and 2017, according to the official Russian statistics, based on customs data. In 2018, total product exports reported by the Russian Customs Service were 149.3 mt. In terms of value, Russian refined product exports reached a peak of US\$116 billion in 2014, resulting from the combined effects of high volume and record price. Since dwindling to US\$46 billion in 2016 they have recovered and in 2018 the figure amounted to US\$78 billion (see Figure 7).



**Figure 7: Russian refined product exports**



Source: Authors, data from Russia's Central Bank and Customs Service

The official statistics also contain some troubling revelations. The striking result of a simple comparison of the effective realized export price of Russian crude oil with the effective realized price for the basket of exported products is that in the past 18 years, exports of refined products were value destroying. Russia would have been better off exporting its crude oil rather than the mix of refined products it did export.

The graphics vividly demonstrate that Russia experienced much lower export earnings from its aggregate oil exports. This was due to the significantly lower value of an average ton of Russian refined product exports than that of an equivalent amount of crude oil. Applying the price differential to the volume of exports, the value lost to Russia as a result of the poor export mix can be calculated. During 2005–2014, the cumulative losses amounted to the staggering figure of about US\$36 billion (see Figure 8). The value of Russian refined product exports relative to crude oil exports only finally moved into positive territory in 2017/18. The key reason for the change was a shift in the composition of the product export basket. Historically, this contained a very large share of unfinished or intermediate products. These were essentially surrogates that needed further processing before they could be used: straight-run gasoline (naphtha), high-sulphur diesel, vacuum gasoil (VGO), and high-sulphur fuel oil. These surrogates could only be sold at significant price discounts, putting downward pressure on Russia's export revenues.

The greatest drag on the value of product exports was high-sulphur fuel oil. In 2012 the share of fuel oil in Russian product exports peaked at 53 per cent of the total. In 2014 fuel oil exports reached their absolute maximum level of 82.5 mt. From 2015, as a result of new export tax policies discussed later in this text, Russian fuel oil exports started to decline. In 2018 they amounted to 52.6 mt (35 per cent of the total), according to data provided by Argus.<sup>7</sup> As soon as their share in Russia's overall export volumes started to decline, losses on total product exports stopped (see Figure 9).

<sup>7</sup> Argus reports the data on refined product shipments from ports and from land border crossings in the FSU. These numbers differ from the data on Russian product exports reported by the Russian Customs Service. The discrepancy might be due to the possible inclusion into Argus statistics of refined product exports from Belarus and Kazakhstan – members of the customs-free zone with Russia.

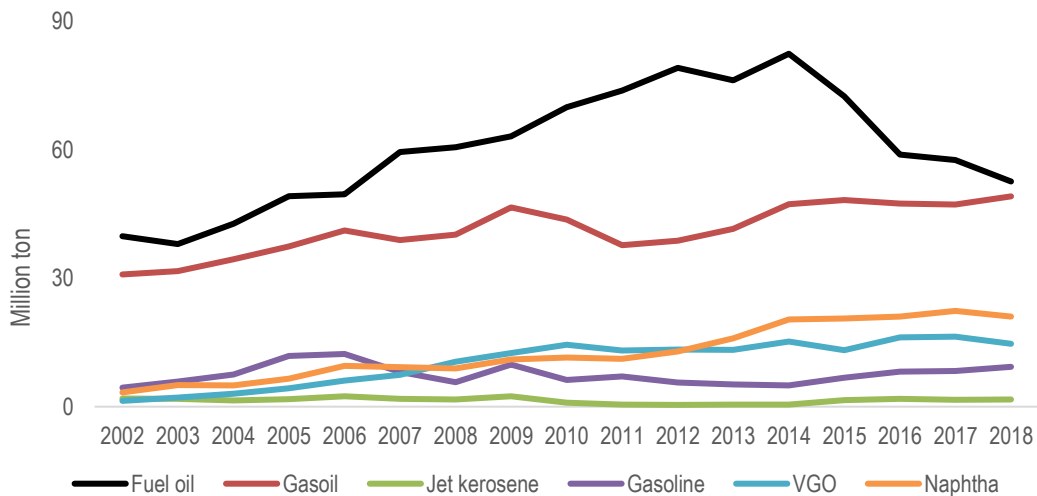


**Figure 8: Value lost to Russia by exporting refined products instead of crude oil**



Source: Authors' calculation, data from Russia's Central Bank and Customs Service

**Figure 9: Refined product exports from Russia**



Source: Authors, data from Argus

It is noteworthy that this calculation does not consider the additional costs associated with refining crude oil or the higher unit costs of transportation (transporting crude oil over long distances via high diameter pipelines costs less on a unit basis compared with transporting refined products by rail, which has been the dominant shipping mode for products in Russia). But the importance of these statistics is that the figures are official and simple to calculate. For many years the losses were well-known, but the correction happened only recently. So the question is, why did the government allow this situation to persist?

The explanation requires an analysis of the state of Russian refineries, and of Russian petroleum export regulations, which are discussed in the next chapter.



### III. The paradox of Russia's refining: the subsidy that went too far and lasted too long

This brief overview of the Russian refining sector's performance over the past two decades leaves us with a paradox: despite low sophistication, poor yields, mismatch between demand and output, and poor location and long transit distances for most of the refineries with regards to exporting refined products, the sector seemed to be living through a golden age. Refining throughput grew from 173.8 mt in 2000 to 287 mt in 2018, up 113.2 mt or 65 per cent for the period, implying a compound annual growth rate of 2.8 per cent. Exports of refined products almost tripled from 62.6 mt in 2000 to 171.7 mt in 2015, before declining to 149.3 mt in 2018 (but still demonstrating a compound annual rate of 4.9 per cent). How was this possible?

In short, the 'secret of success' for Russia's refining sector had been the state policies that channelled oil rent from upstream to downstream, resulting in massive subsidies to refining operations. These policies introduced significant price distortions in Russia's markets for crude oil and refined products and created artificial incentives to increase refining levels well over and above what was necessary to meet domestic demand. They also caused the postponement of much needed rationalization and modernization of the Russian refining industry and resulted in value destruction for Russia's economy measured in tens of billions of dollars. For a long time, many people raised concerns about the distorted signals and incentives,<sup>8</sup> but the systemic causes and regulatory mismanagement prolonged the agony of biased regulatory instruments. The regulators' failure to properly address the problem stemmed from short-term planning horizons, unstable and conflicting priorities, and improvised stop-gap solutions that introduced further distortions, making the ultimate task even more complicated.

#### Export taxes: the magic formula

The Russian government's two major goals in regulating the domestic petroleum market have been first, to keep refined product prices low for domestic consumers and, second, to avoid shortages, especially during seasonal peak demand periods (in the autumn and winter months for fuels used in electricity and heat generation, or in late spring and autumn for fuels needed by the agricultural sector). The government's main mechanisms for influencing product prices since the liberalization of crude oil and refined product prices in 1995 have been indirect, and have ranged from restrictions on exports (temporary, often seasonal bans on the export of selected products) to requirements for domestic delivery (compulsory deliveries of refined products to customers in the Far North), and agreeing pricing pacts with the oil companies.

Since 1999, crude production in Russia has grown very rapidly, but the expansion of its export pipeline capacity has lagged. This has had several consequences. Integrated companies (VICs) have been able to run surplus crude through their refineries and export the resulting refined products. Since the VICs controlled both upstream and downstream assets, they paid low prices to their production subsidiaries (through internal transfer pricing) while taking their profits downstream. The independents, however, lacking refinery capacity, had to sell their crude into the small domestic commercial market, turning them into captive suppliers to the Russian refineries. This caused domestic crude prices in the commercial sales segment to drop to very low levels, especially during winter, when available export facilities were even more restricted because of ice and bad weather. Low crude acquisition prices supported healthy margins for Russian refineries despite their poor yields. At the same time, a large portion of refined products (close to 40 per cent of total output) was flowing to export markets, which was enough to 'clear' the domestic market. Thus, in contrast to relatively low domestic crude prices,

---

<sup>8</sup> Sagers M. and Yermakov V. *Russia's Crude Oil Market and the Oil Refining Industry: Resting on a Razor's Edge*. CERA Decision Brief, March 2006; Yermakov V. and Sagers M. *A Potential Game-Changer: Implications of Recalibrating Russia's Oil Export Taxes*. CERA Decision Brief, November 2008.





refined product prices in Russia remained close to export parity levels.<sup>9</sup> Essentially, when Russian companies had been unable to export crude, they had exported refined products as a 'second-best' alternative. It is noteworthy that unlike crude oil (most of which moves through the state-controlled pipelines of Transneft), most refined products are moved by rail and were much harder for the state to control administratively.

In this environment, export taxes on crude oil and refined products emerged as the most important instrument of state regulation of the domestic petroleum market. They were easy to collect, and they offered to the state an instrument for transferring the tax paid by exporters to domestic oil consumers (by keeping domestic petroleum prices in Russia at lower levels compared with international prices, through the export parity price formation mechanism).<sup>10</sup>

Although abolished in July 1996 under International Monetary Fund pressure, the crude oil export tax was reintroduced in Russia in January 1999 and since February 2002 it has been set in federal law. It varies in accordance with a sliding-scale formula linked to the price of Urals Blend in international markets (with a two-month time lag). Under the original formula the crude oil export tax took effect when the price for Urals Blend in international markets was above \$15 per barrel (if the price was lower than that, the tax was zero-rated) and was calculated as follows:

- 35 per cent of the difference between \$15 and the actual price when Urals Blend ranged between \$15 and \$20 per barrel (\$109.50 and \$146 per ton);
- 45 per cent of the difference between \$20 and the actual price when Urals Blend ranged between \$20 and \$25 per barrel (\$146 and \$182.50 per ton);
- 65 per cent of the difference between \$25 and the actual price when Urals Blend exceeds \$25 per barrel (\$182.50 per ton).

Export taxes on refined products were initially left to the government's discretion rather than being set by law. This changed briefly in 2003 with the passage of an amendment to the law on customs tariffs that set export taxes on refined products at 90 per cent of the export tax on crude. This law was repealed at the end of 2003, and the government was again free to adjust the tax through discretionary administrative measures.

On 19 March 2005, a new law came into effect, establishing a new mechanism under which the export duty on refined products was tied to the export tax on crude oil. The export tax for products was calculated as the difference between the average export price of Urals Blend during the previous two months and a non-taxable minimum of \$109.50 per ton, multiplied by the coefficient 0.416 for light products, or 0.224 for heavy products.<sup>11</sup> Effectively, the linear formulae linked to the Urals price set the marginal tax rate for crude oil at 65 per cent, for light refined products at 41.6 per cent, and for dark refined products at 22.4 per cent. Different slopes in the linear formulae meant that in a low international

---

<sup>9</sup> The principle of 'export parity' is based on the concept of a producer being able to choose freely between selling its product to either the export or the domestic market. For producers in a net exporting country, the equilibrium price will be equal to the international price minus all costs associated with exports, such as transportation, customs fees, export duties, etc. If the export netback price is higher than the price in the domestic market, exports would go up, reducing domestic supply and pushing up domestic prices, until the market clears.

<sup>10</sup> Russia's export tax serves as a wedge between international and domestic prices for crude oil and individual refined products. Therefore, a change in the level of oil export taxes and the relative differentials has immediate consequences for domestic crude and refined product prices, via the mechanism of the export parity price formation. For example, reducing the export tax on crude oil would lead to much higher acquisition prices for Russian refineries and reduce their refining margin. Reducing the export tax on light refined products would increase domestic wholesale prices for gasoline and diesel (and support the refining margin) but would quickly increase end-user prices at the pump and feed into overall inflation. Increasing the export tax on heavy refined products (residual fuel) would bring prices of mazut down in the domestic market, but would create problems for the less sophisticated Russian refineries, where mazut constitutes a large share of output.

<sup>11</sup> In Russia, the distinction between light (gasoline, diesel, jet kerosene) and dark (mazut, VGO, bitumen, asphalt, tar) refined products is common.

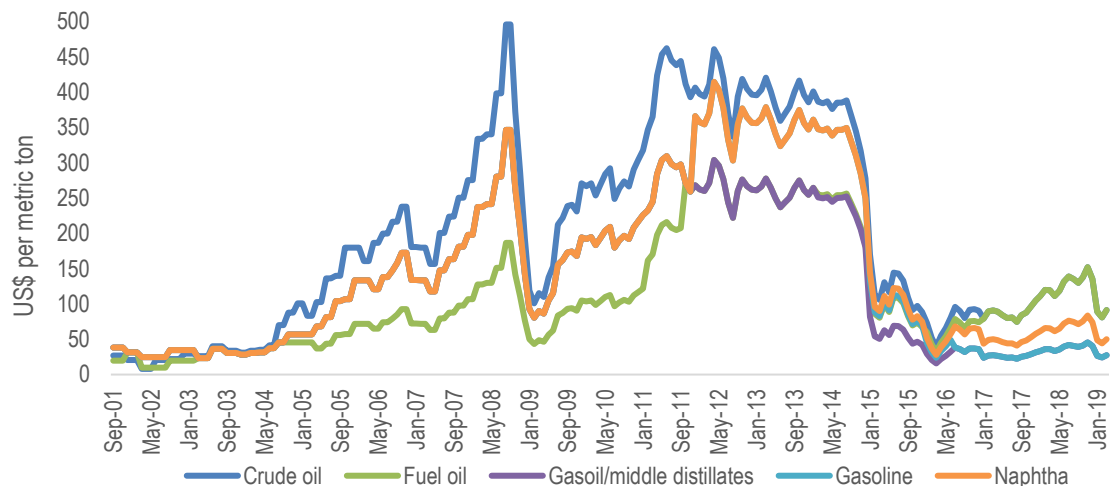


oil price environment the differentials between export taxes on crude and products would be relatively small, but in a high oil price scenario they could grow very significantly. This, in turn, would mean that with higher prices for Urals Blend, the share represented by the export tax on refined products, relative to the crude oil tax, declines. The same principle applied to the tax differential between gasoil and mazut. Even more importantly, the design of the tax implied that the higher the oil price, the better the netbacks from exports of refined products and downstream operations would be vis-à-vis the netbacks from exports of crude oil and upstream operations (assuming transportation costs would not change much as prices changed).

At the time when this mechanism was designed and calibrated (2004) hardly anyone expected that long-term oil prices would be higher than \$40 per barrel. Indeed, the conservative long-term plans of governments and companies alike assumed a real oil price of 25–30 dollars per barrel. Under these price assumptions, the weighted average for Russia’s refined product exports (based on the proportions for each major type of product in Russia’s actual export mix) worked out to about 58–60 per cent of the export tax on crude oil.

The government’s desire was to channel some rent from the more profitable upstream to the struggling downstream, by skewing the tax differentials between export duty for crude and products in favour of Russia’s refiners. But what had been originally intended as a moderate refining subsidy, turned into a completely different set of incentives in the high and rising oil price environment that brought the oil price to the level of \$143 per barrel in July 2008, and resulted in an average oil price of almost \$90 per barrel in 2006–2014 (see Figure 10). Under these price conditions, the absolute differentials between the export taxes for crude oil and refined products skyrocketed, more than offsetting the higher transportation and other costs involved in exporting refined products and making their export netbacks better than those for crude oil – even for refineries with a poor product mix.

**Figure 10: Russian export duties for petroleum products**



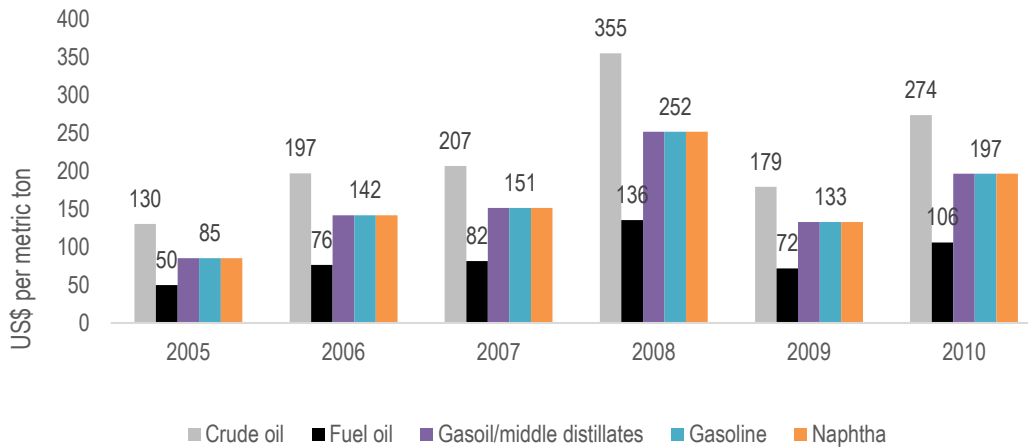
Source: Authors, data compiled from multiple RF government resolutions

But not only was the Russian government providing direct financial incentives to export refined products rather than crude oil, the higher effective tax rate on crude kept export parity levels depressed at home and lowered crude oil acquisition prices for refineries in Russia. On the other hand, the relatively lower export tax rates on refined products artificially raised the domestic price levels for diesel and mazut (relative to a situation of equal tax treatment for crude oil and refined products), giving Russian refiners another booster shot. As a result, Russian refining margins became the highest in the world and



stimulated higher levels of refinery operations. Unfortunately, the effective subsidy for residual fuel oil became so high that even simple distillation and subsequent substantial exports of mazut were resulting in higher netbacks than those from crude oil exports. (See Figure 11)

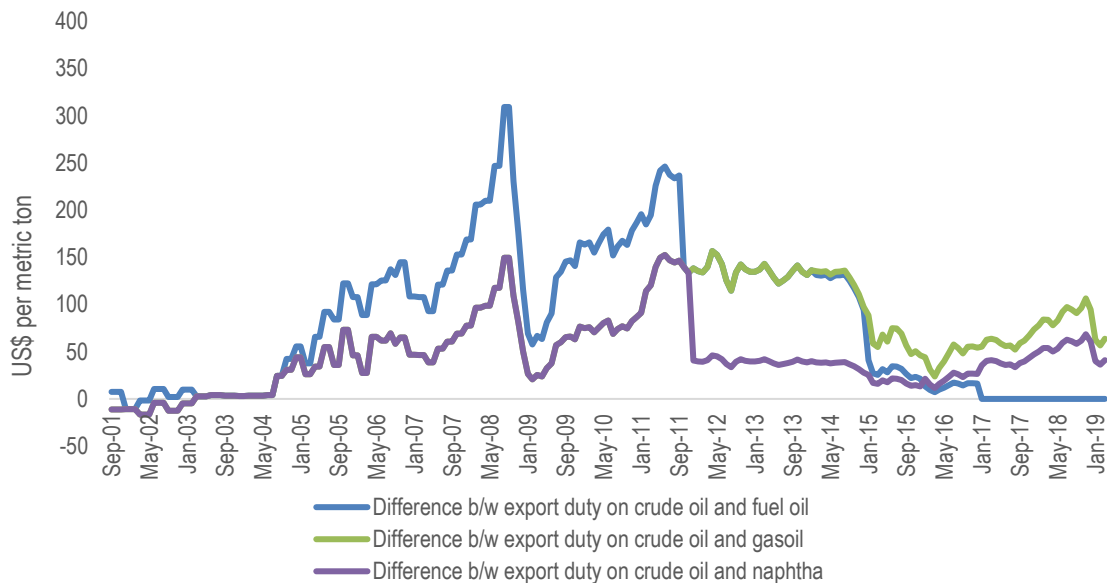
**Figure 11: Effective annual average export duty rates for crude oil and main refined products in 2005–2010**



Source: Authors, calculation on the basis of multiple RF government resolutions

As a by-product of this massive distortion (one that was giving wrong incentives to the industry to expand simple distillation even at refineries that would never be competitive absent the subsidy) another distortion emerged with regards to refinery modernization programmes that were already under development. This problem stemmed from the existence of too large a difference in export taxes for light and dark products. (See Figure 12)

**Figure 12: Differences in export duty rates between crude oil and main refined products**



Source: Authors, data compiled from multiple RF government resolutions



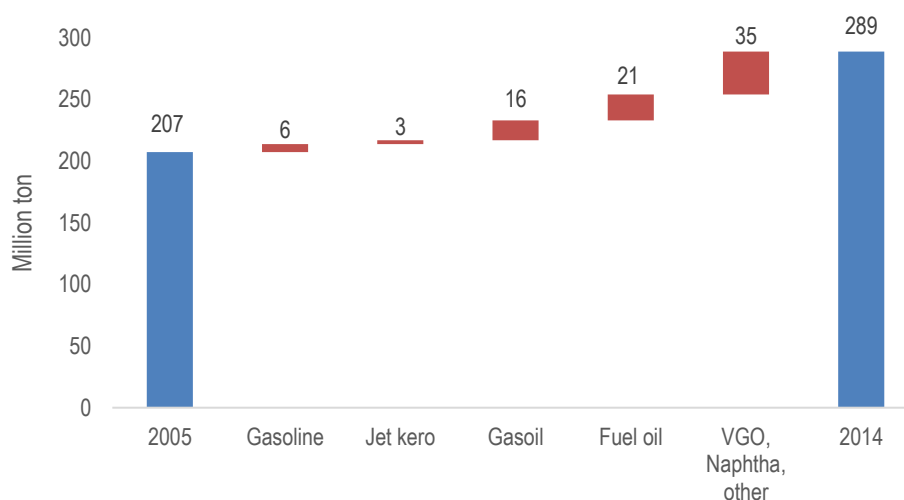
A consequence of this was the narrowing of price differentials (also called the crack spreads) in Russia's domestic market between mazut on the one hand and high-octane gasoline and diesel on the other. The crack spread is an important stimulus to invest in the refinery upgrades needed to transform mazut into premium products. Thus, to achieve a quick fix to the problem of profitability of residual fuel oil exports in the near term, the policy actually reduced incentives to invest in the refinery upgrades needed to cut the amount of residual fuel oil volumes produced in the long term.

### While the state giveth, the refining sector taketh

In the artificial but attractive conditions created by state policies, the Russian refineries started to expand their operations – cautiously at first, then with greater assertiveness. On a positive note, the redirection of crude flows from export to domestic refineries allowed Russia to solve the problem of export pipeline bottlenecks. The domestic market cleared, and domestic commercial prices reached export parity levels. Since 2005, prices for both crude and products in the domestic market have generally been at parity with export netbacks.<sup>12</sup>

During 2005–2014, refining throughput increased from 207.4 mt to 288.9 mt, up 38 per cent. The increase in refinery throughput over the period amounted to 81.5 mt nationally, but the composition of the corresponding incremental product output suggests little progress with regards to improving the yields. (See Figure 13)

**Figure 13: Incremental change in refined product output, 2014 versus 2005**



Source: Authors, data from Argus

With regards to individual refineries, incremental additions varied significantly, evidently suggesting that not all were able to take advantage of the situation to significantly expand their crude throughput. Certain refineries in Russia were already running at high capacity utilization factors and so were simply unable to take advantage of the incentives to significantly expand throughput, at least initially. Typically, these were either refineries with high conversion ratios due to their superior secondary processing capabilities, which made their previous level of throughput close to their maximum effective capacities (such as Perm, Volgograd, Yaroslavl), or those with favourable market positions (Moscow). Others could not expand significantly because they had such poor conversion ratios that the product slate would deteriorate too much with significantly higher throughput, making it economically unattractive (for

<sup>12</sup> High-octane gasoline was one exception, usually priced with premium to export netbacks.

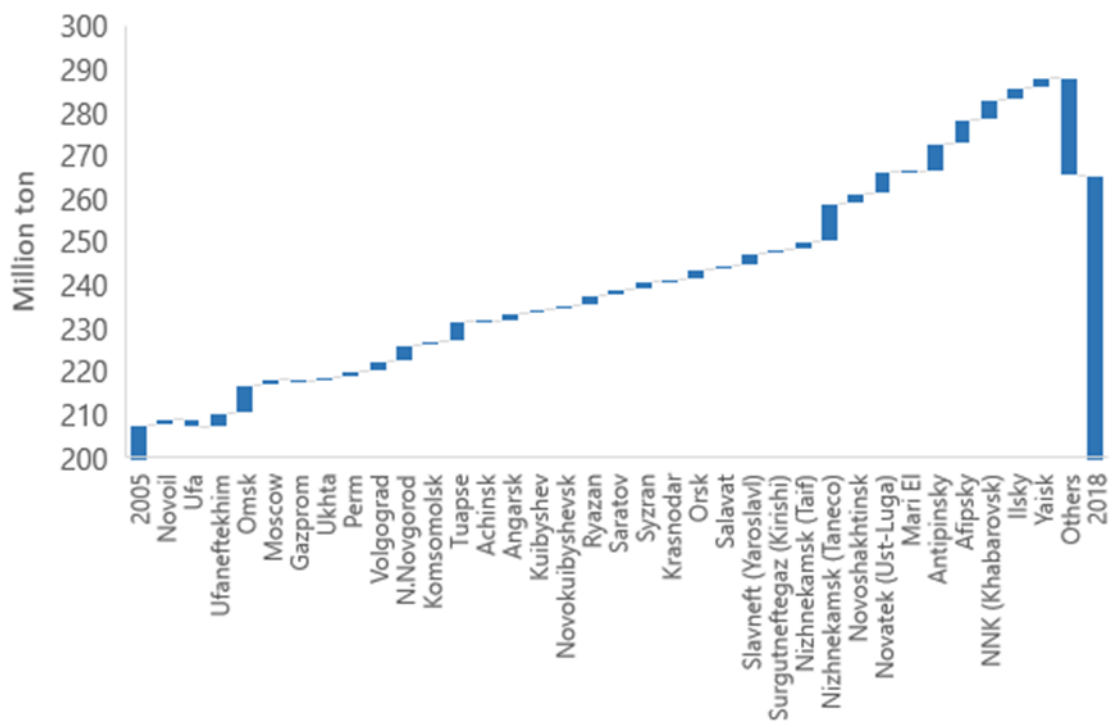


example Orsk). But as incentives grew stronger, most Russian refineries expanded. Moreover, new refineries emerged – both relatively sophisticated (Antipinsky) and simple (Afipsky, Ilsky, Yaiskiy) – as well as Novatek’s gas condensate processing plant in Ust-Luga, and a few smaller ‘teapot’ facilities. The key beneficiaries were the less sophisticated refineries and those with poor location, because the new incentives allowed them to economically utilize their idle primary processing capacity (see Figure 14). Thus, the expansion was of the wrong type – it boosted simple distillation and put upgrades on the back burner.

A key question is: why was the situation not corrected immediately? For example, a ceiling could have been put on the absolute differentials between crude oil and refined products, and a proper set of incentives developed for each Russian refinery, ensuring that the subsidy was used for modernization and necessary upgrades. In retrospect, it appears that neglecting this question has had dire consequences for the industry and resulted in multi-billion losses, as demonstrated earlier.

One explanation is the ideology of promoting the ‘value-added’ processing at the expense of crude oil exports, especially when Russian refineries had such underutilized production capacities. The fact that the Russian refineries were not adding value (because they had to produce lots of ‘wrong products’ owing to a lack of conversion capacity and then dispose of the surplus at a loss) was simply ignored.

**Figure 14: Incremental additions in throughput at Russian refineries, 2014 vs. 2005**



Source: Authors, data from Argus

Another explanation for the lack of action by regulators was uncertainty over the continuity of the high oil price environment and policy inertia. Indeed, the distortive features of the petroleum export taxes appeared only when oil prices were high. In 2006 and 2007, many still believed that the high price was transitory in nature and was going to give way to a return of moderate and even low oil prices. The sharp price correction in 2008–2009 seemed to support this theory. Only when oil prices returned to \$100 per barrel territory in 2011–2014 and losses (arising from exporting refined products instead of crude oil) sky-rocketed, did the necessity to act become inevitable. Unfortunately, it was too late. The damage had been done.



## IV. Tax reform of 2009–2019 and its impacts

An important meeting of the Russian government with oil industry leaders in Kirishi (the site of the Surgutneftegaz refinery) in February 2009 launched tax reform initiatives. The necessity of reining in the refining subsidy was gradually emerging within the Russian government due to the realization of the magnitude of the distortions it was causing to the downstream. But the immediate pressure to change the export duties regime came from the upstream side and was caused by oil companies' concerns over their ability to sustain oil output.

In 2009 Russia's crude oil output reached a level of 10 million barrels per day, supported by several new projects launched before the oil price collapse that year. But the fall of oil prices caused concerns about the high costs of the next generation of Russia's oil. In the absence of a new generation of upstream projects, it would become critical to control decline rates in the old producing fields in the mature Russian oil-producing basins (primarily West Siberia and Volga–Urals). Oil prices recovered in 2010, but diminishing returns at the brownfields and the high tax take were preventing Russian oil companies from realizing their fields' full potential. A barrel of oil could be priced at \$100 in international markets, but the wellhead netback for a Russian oil producer in West Siberia (after deducting export tax, production tax, and transportation expenses) was only about \$25 per barrel. Some of the marginal fields in Russia, especially the ones with high water cuts<sup>13</sup> and high operating costs, were becoming unprofitable, placing up to 10 per cent of Russia's output into the 'danger zone'.

One easy recipe for preventing a possible oil production decline was to reduce the marginal rate of the export duty on crude oil. Once the export tax regime became subject to closer investigation, the government decided to adjust marginal export tax rates for refined products as well.

### The 60–66–90 system

In 2011, in a move that started the latest round of tax reforms in the Russian oil industry (this became known as the 'tax manoeuvre'<sup>14</sup>), the Russian government decreased the marginal rate of export tax on crude from 65 to 60 per cent and equalized the export taxes for light and dark refined products at the level of 66 per cent of the tax on crude (resulting in a marginal rate of 39.6 per cent). Previously, the tax rate for heavy refined products was much lower than that for light products. The export tax rate for gasoline and naphtha was increased to 90 per cent of the export tax on crude oil (resulting in a marginal rate of 54 per cent). The new system became widely known as '60–66–90'.

This final element of the new design – introduced to curb domestic gasoline shortages – was probably unnecessary. The intention of a higher export tax on gasoline was to keep the domestic market for gasoline well-supplied and to have naphtha available to domestic petrochemical plants. But the effect of the change was also to increase the spread between the domestic price of gasoline and diesel. The government had introduced a wrong incentive yet again.<sup>15</sup>

High-octane gasoline had not been exported from Russia in any significant volumes before the higher export duty rate was introduced. Russia's gasoline output was limited by insufficient conversion capacity, but the volume produced matched domestic demand. Domestically, gasoline commands healthy premiums over export netbacks. Simple distillation in Russia results in a yield of about 20 per cent of gasoline and naphtha, and the higher export tax on these products was expected to reduce incentives for the less sophisticated refineries. However, the 60–66–90 regime did not achieve its main goal: to remove the foundation from export-oriented simple refining. The new calibration would have

---

<sup>13</sup> Water-flooding, to increase reservoir pressure, is a traditional method of oil extraction in West Siberia. The pumping of large amounts of oil/water mix using electric pumps increases electricity usage and contributes to higher operating costs.

<sup>14</sup> Shifting the tax burden from upstream to downstream was apparently considered as being similar to troop redeployment, hence the rather unusual term 'manoeuvre' started to apply to tax reform efforts.

<sup>15</sup> This tax differentiation increased the spread between the domestic price for diesel and for gasoline. It also promoted investments in hydrocracking that resulted in a higher output of diesel fuel (already available in excess in Russia) but prevented investments in catalytic cracking that would have increased the output of high-octane gasoline, the product that Russia needed.



been enough if oil prices had remained below \$90 per barrel. But they did not. In fact, from 2011 through the first half of 2014, the oil price was higher than \$100 per barrel; this maintained the favourable conditions for expansion of simple refining and for exports of its inferior surplus products (because in a high oil price environment, the absolute differentials between export taxes on crude oil and on products are high).

In this situation, the government proposal to equalize export taxes on mazut and crude oil by 2015 appeared as a game-changer; it would completely change the commercial incentives for exports of Russian refined products.

Another harbinger of change was the displeasure of state officials at the lack of progress in the upgrading of refineries. At another summit of senior government and oil industry officials at Kirishi in July 2011, the then Prime Minister Vladimir Putin criticized the oil companies for neglecting to invest sufficiently in refinery modernization. As a result, the meeting concluded with an announcement of an ambitious programme for 2011–2015 with the following key elements:

- Increasing isomerization capacity by 50 per cent;
- Raising alkylation capacity by 100 per cent;
- Boosting hydrocracking capacity by 200 per cent;
- Expanding the share of Euro-4 and Euro-5 gasoline output from 17 per cent of the total to 84 per cent, and increasing the share of Euro-4 and Euro-5 diesel fuel to 72 per cent.

These plans made most analysts expect that the rationalization of Russia's refining industry was imminent and that fuel oil production and exports would be phased out relatively quickly.<sup>16</sup> But the much higher-than-expected world oil prices (in comparison with expectations when the 60–66–90 system was introduced) muted the intended impact of the reform on the refining sector. As a result, the output of relatively low-value fuel oil for sale in export markets, especially at unsophisticated 'teapot' mini-refineries,<sup>17</sup> continued to grow notwithstanding a significant hike in the fuel oil export tax resulting from '60–66–90'.

### Removing the fuel oil subsidy

The Russian government's 2013 'tax manoeuvre' charted the course for a phased reduction of export taxes for both crude oil and diesel fuel in 2014–2016 and a significant hike in the fuel oil export tax beginning in 2015. Concurrently, Russia's mineral resource extraction tax on crude oil (MRET) was supposed to increase, maintaining the overall tax revenue for the state budget at almost the same level. Specifically, the marginal rate of the crude oil export duty declined from 60 per cent to 59 per cent of the international oil price during 2014, and to 42 per cent in 2015. It was supposed to go down to 36 per cent from 1 January 2016, but was kept at the previous year's level. The marginal tax rates on light refined products were going down and the rates for mazut up, but not as briskly as originally planned.

The government planned to equalize the crude oil and mazut export duties in 2015, making refined product exports unprofitable for many less-sophisticated plants. However, a combination of the economic crisis, the fall of global oil prices, and international sanctions in 2015 and 2016, made the Russian government smooth out the transition to the equalization of crude oil and fuel oil export tax rates, and postpone this key change until 2017. Absolute levels of export taxes went down because of the much lower oil prices and also because the marginal export duty rate for crude oil was gradually being reduced under the government's plan. By 2017, the export duty rates for diesel and gasoline were

---

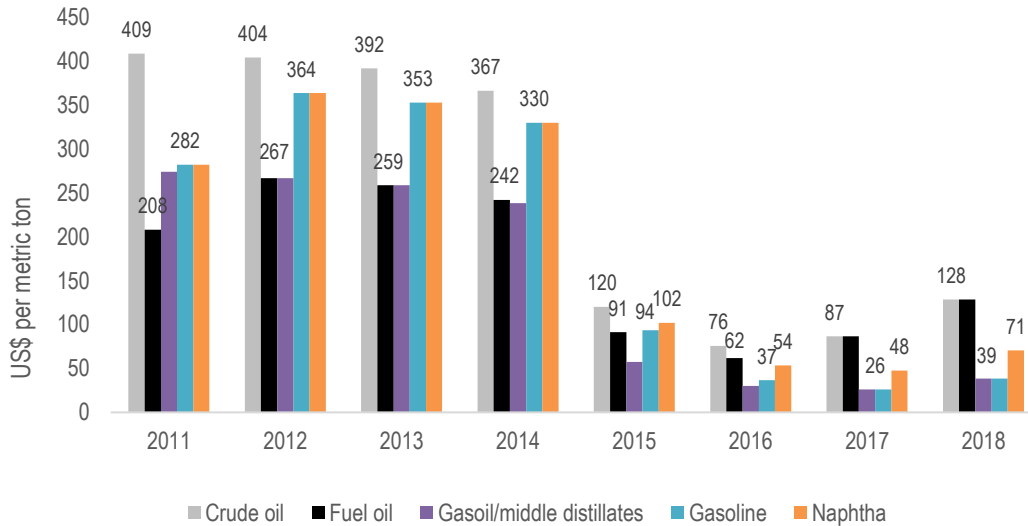
<sup>16</sup> Fattouh B. and Henderson J. 'The Impact of Russia's Refinery Upgrade Plans on Global Fuel Oil Markets'. OIES Paper WPM 48, 2012.

<sup>17</sup> As of 2015 there were almost 200 such opportunistic, simple distillation type mini-refineries in Russia that emerged and flourished due to the inefficiencies of the tax system.



unified at the level of 30 per cent of those on crude, and the export duty on mazut was gradually increased to the same level as that for crude oil. (See Figure 15)

**Figure 15: Changes in export taxes in 2011–2018 (actual annual average tax rates)**



Source: Authors, calculation on the basis of multiple RF government resolutions

When the combination of export duty rates originally targeted by the government finally took effect in 2017, the marginal rate of export tax on crude oil was set at 30 per cent of the price of the Urals Blend in international markets, and for refined products the marginal rates were as follows:

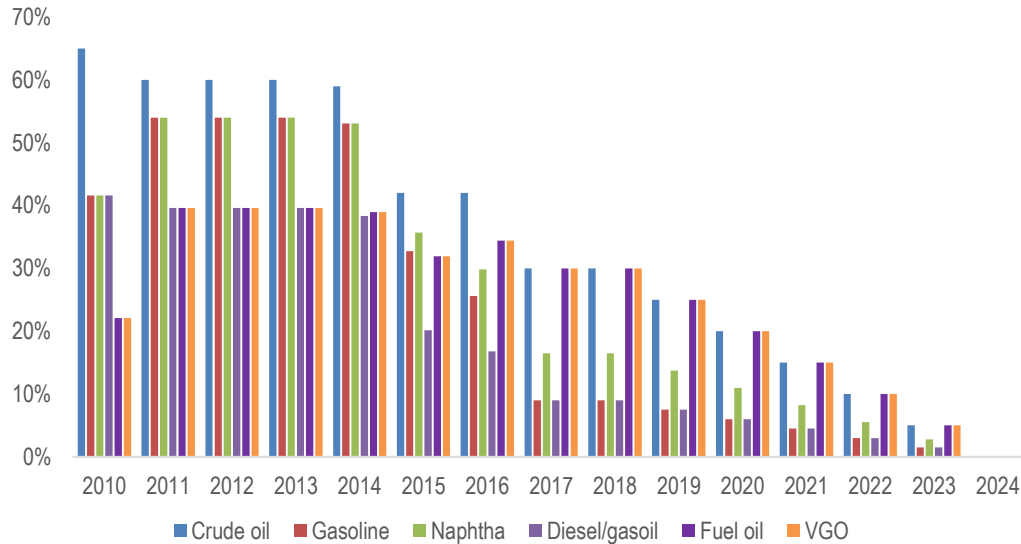
- 9 per cent for gasoline and diesel;
- 16.5 per cent for naphtha;
- 30 per cent for fuel oil and VGO.

From this point on, the fuel oil subsidy was eliminated. The Russian government is continuing with the final stage of the ‘tax manoeuvre’ – increasing the rates of MRET and gradually phasing out export taxes on crude oil and refined products. In 2019 the marginal rates are 25 per cent for crude oil, fuel oil, and VGO; 13.8 per cent for naphtha; and 7.5 per cent for gasoline and diesel. In accordance with the latest government plan, by 2024 there will be no export taxes on petroleum in Russia. (See Figure 16)





**Figure 16: Marginal rates for petroleum export duties in Russia in relation to oil price**



Source: Authors, based on multiple RF governmental resolutions, actual for 2010-2019, planned for 2020-2024

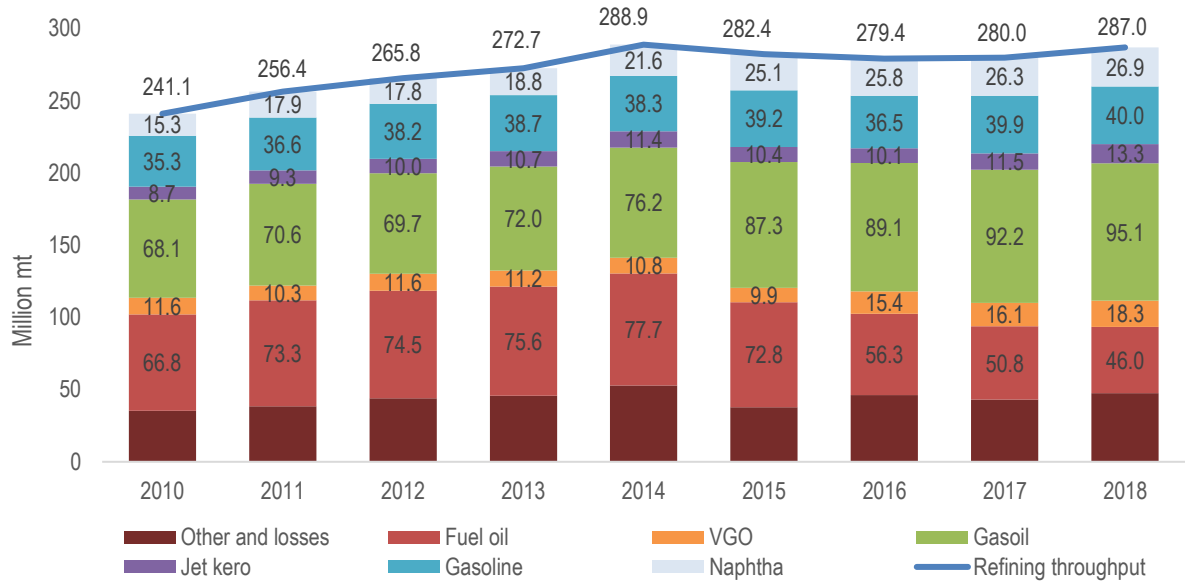
### The first results of the reform – a mixed bag – better yields, but excessive throughput

During 2015–2018, Russian refining throughput initially fell slightly, but then recovered and reached 287 mt in 2018, just a notch lower than the 2014 record. Production of light refined products increased, and mazut output fell substantially. The data provided by Argus suggests a jump in production of gasoil in 2015–2018 compared with 2014, but this is apparently the result of rearranging the reported statistical categories of refined products, as the numbers for ‘other’ products declined correspondingly.<sup>18</sup> (See Figure 17)

<sup>18</sup> From 2015 Argus reports the breakdown of gasoil production by sulphur content. Also, a separate category of ‘other gasoil’ has been introduced as part of reporting gasoil output. It amounted to 14.3 million tons in 2015. Before 2015, gasoil with substandard specifications was apparently included into ‘other refined products’ (the balancing item in the statistical reporting on Russian refined products). The numbers reported as fuel oil in 2015–2018 also seem to understate the actual residual fuel output which seems to have ‘moved’ partially to the ‘other refined products’ category. These ‘classification games’ make the intertemporal comparisons more difficult.



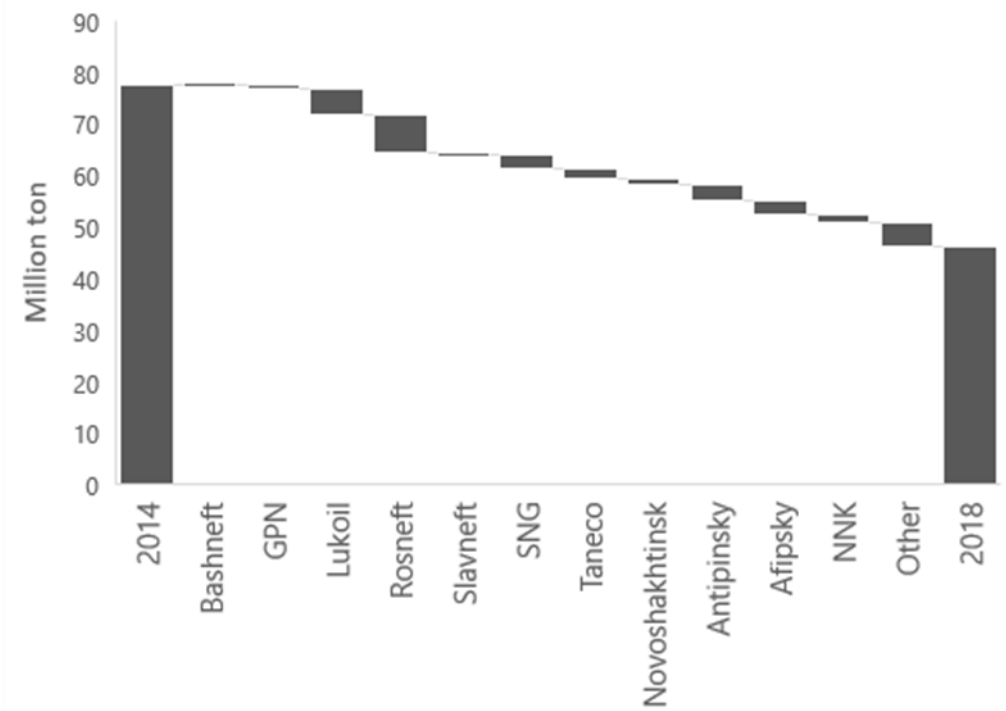
**Figure 17: Russia’s refining throughput and output of main products, 2010–2018**



Source: Authors, data from Argus

Fuel oil production declined at all categories of Russian refineries: those owned by VICs, large independent refineries, and smaller teapots. (Figure 18)

**Figure 18: Incremental change in fuel oil output, 2018 versus 2014**

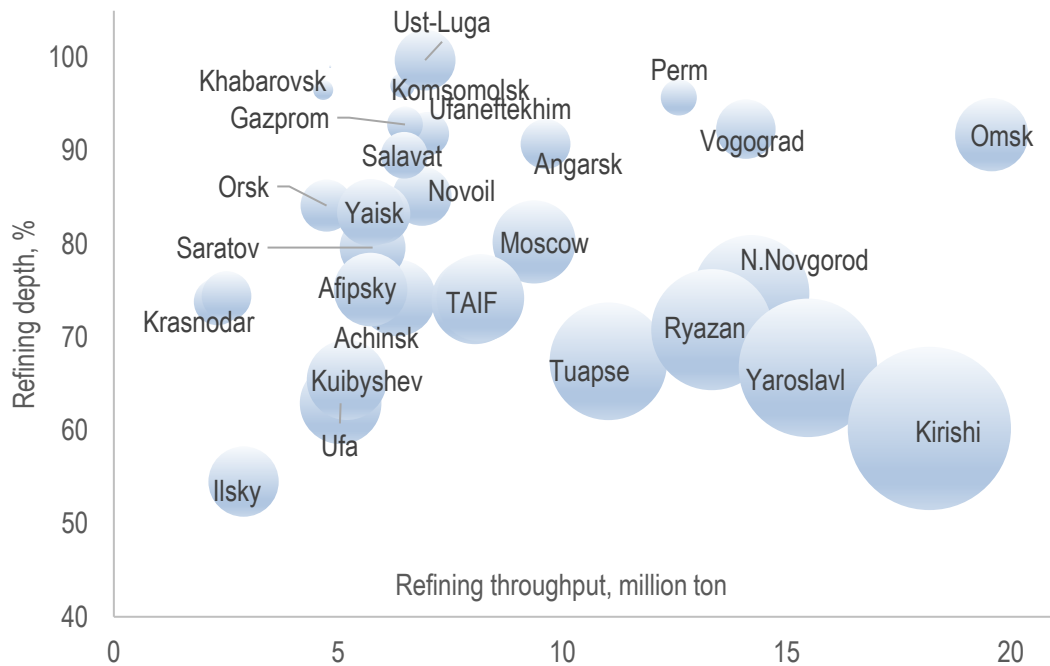


Source: Authors, data from Argus



In 2018, fuel oil production by individual Russian refineries was distributed among several larger refineries such as: Kirishi, Ryazan, Nizhniy, and Yaroslavl; a dozen middle-sized refineries in the Middle Volga region and Central Russia; and several large and small refineries throughout Russia, each of which had a relatively minor share of fuel oil in their total production. (Figure 19)

**Figure 19: Distribution of Russian fuel oil production in 2018 by refinery**

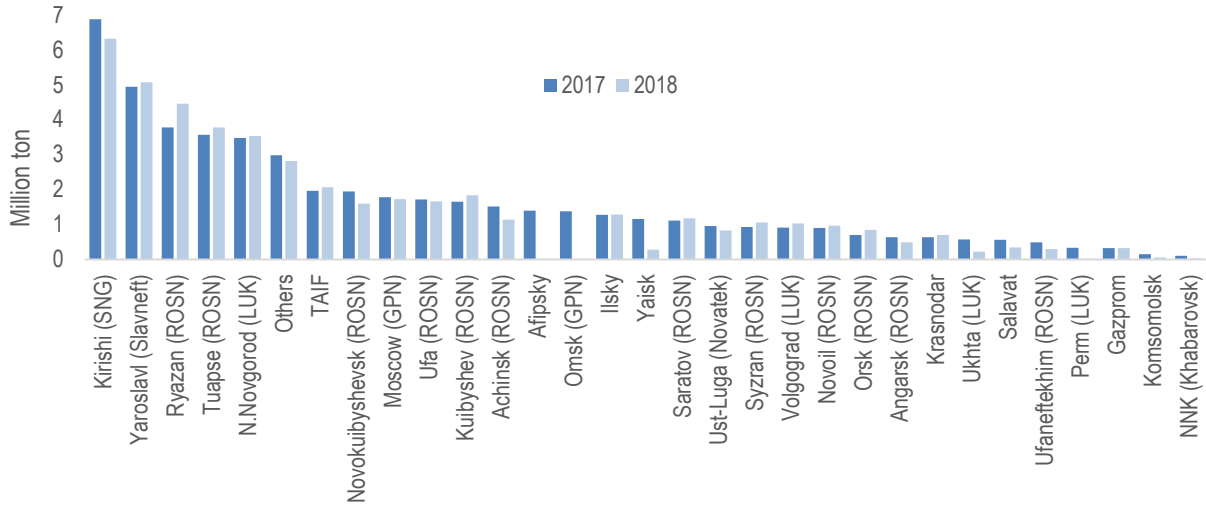


Source: Authors, data from Argus and CDU TEK  
 Note: Bubble sizes indicate volume of fuel oil output

The concentration of fuel oil output in just a handful of refineries suggests that the problem with which the Russian regulators have been struggling could be addressed with the right industrial policy – one that focuses on an ‘individual’ approach to the specific circumstances of each of these refineries. It is instructive to see which refineries were reducing their fuel oil output in 2018. (Figure 20)



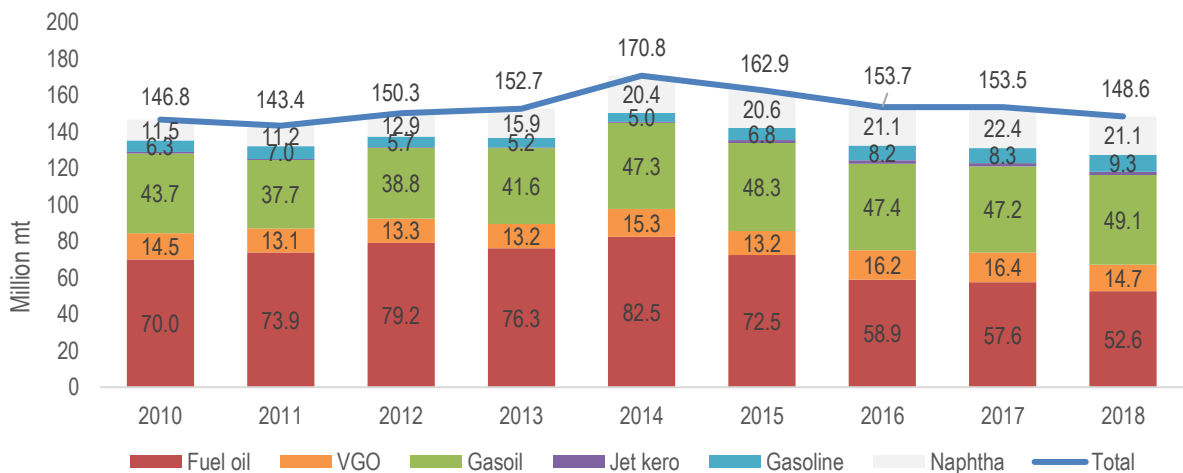
**Figure 20: Fuel oil output by refinery, 2017–2018**



Source: Authors, data from Argus

The results of the past four years of the reform can be characterized as a mixed bag: residual fuel oil output, the intended target of the new policies, started to decline slowly, but the overall level of throughput remained very high, necessitating high levels of exports of refined products. Russian refined product exports declined from the peak of 170.8 mt in 2014 to 148.6 mt in 2018, down 22.2 mt, or 13 per cent. Fuel oil exports dwindled by 29.9 mt during this period, according to Argus. (Figure 21)

**Figure 21: Russia’s refined product exports, 2010–2018**



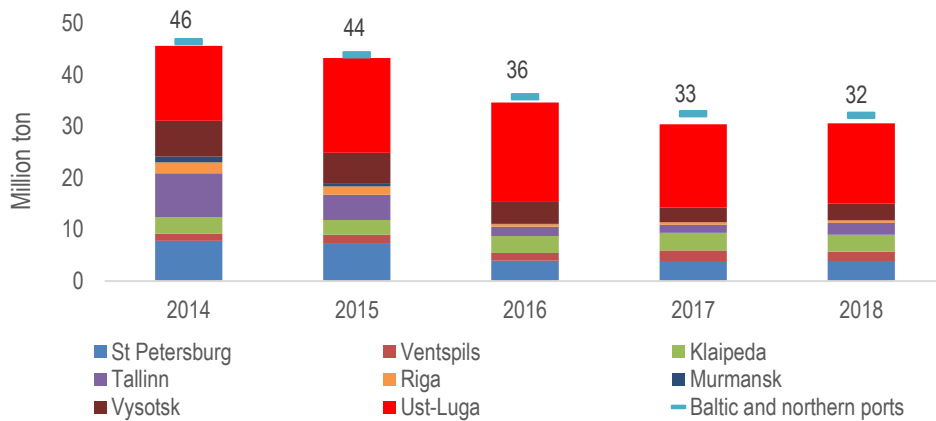
Source: Authors, data from Argus

Russian exporters optimized their sales channels and delivery routes. The reduction of shipment volumes primarily concerned fuel oil, because it was the product with the highest netback sensitivity to rising export costs. The routes to the export ports with higher logistical costs (such as Tallinn in the



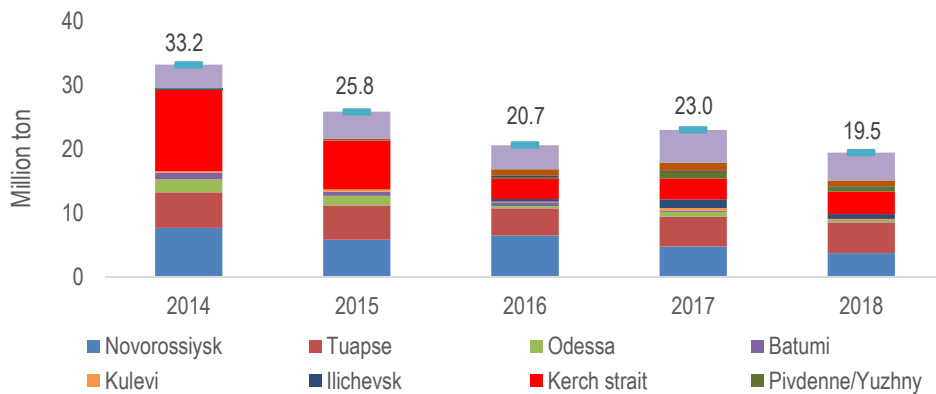
Baltics, Vysotsk in the north, and the Kerch Strait in the Black Sea) have been affected most. (Figures 22 and 23)

**Figure 22: Russian fuel oil exports via the Baltic and the northern ports**



Source: Authors, data from Argus

**Figure 23: Russian fuel oil exports via the Black Sea ports**



Source: Authors, data from Argus

With 50 mt of annual exports, Russia remains the world's largest supplier of fuel oil to international markets and is thus exposed to the upcoming changes with regards to more stringent specifications for bunkering fuel. Moreover, after the initial reduction of fuel oil output, Russia has run into some limitations on further optimization, as will be shown in the next section. All the signs are set for a significant mismatch between supply and demand, at least initially while the shipping industry is looking for the best solution to its choice of future bunkering fuel.

### Limitations and risks of the reform

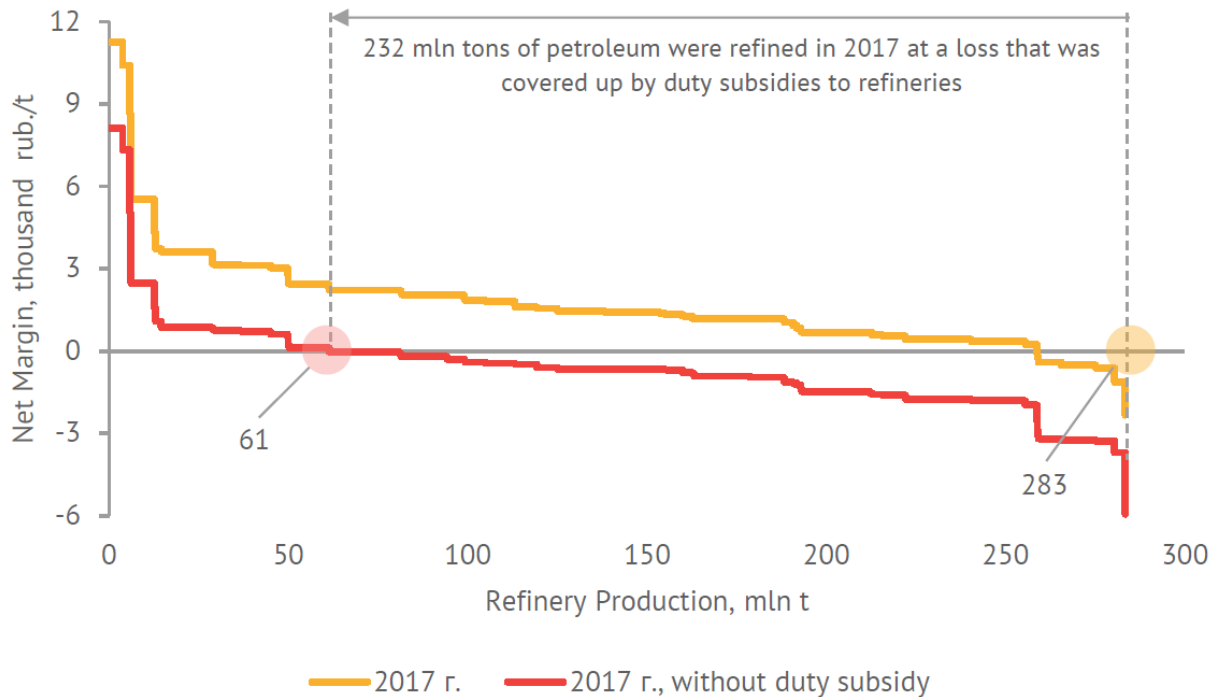
The transition to a new taxation system that shifts the tax take to upstream, via a significant increase of MRET, will conclude the 25-year saga of Russia's experimentation with the instruments (export taxes) that were relatively easy to administer but which opened a Pandora's box of price distortions and



unforeseen industrial consequences. Export taxes were supposed to shield Russian consumers from the volatility of international crude and product markets and make petroleum products affordable to motorists and other users. But the crises on global oil markets have gained access to Russia's economy by a back door, for example via the forced depreciation of the local currency in the low international price environment, while prices for motor fuels in Russia have been at (and, if measured in purchasing power terms, even higher than) levels seen in the USA. The Russian government is now trying to figure out other means of dealing with the impact of volatile global petroleum markets, returning to pricing pacts with oil companies.

Why has Russia decided to prolong the implementation period of the new mechanism? After all, the subsidies could be eliminated in one go. The reason why Russia's regulators got cold feet was simple: the 'shock therapy' would have made the refining margin negative for most of Russia's refineries. According to modelling by Petromarket Research Group, in 2017 only 61 out of 283 mt of refining output<sup>19</sup> would have been economically justified without the export tax subsidy. (Figure 24)

**Figure 24: Why Russia got cold feet eliminating export taxes completely in 2017**



Source: Petromarket Research Group

The related problem was that many of the affected refineries were the largest employers in the so-called 'mono-industry cities', the economies of which revolved around a single dominant industrial enterprise. Shutting down these refineries would result in tremendous social problems and the necessity for the state to come up with aid packages for the affected population. Among such were the Kirishi refinery owned by Surgutneftegaz and the independent Novoshakhtinsk refinery, with 2017 refining throughputs of 18.2 mt and 4.8 mt correspondingly. The population of Kirishi is 50,000, and the population of Novoshakhtinsk is 109,000. Other refineries in Russia that are the largest employers in their respective cities include Tuapse, Afipsky, Ilsky, Salavat, TAIF, TANECO, and Angarsk.

<sup>19</sup> This number is slightly higher than the 280 million tons of refining throughput reported by Argus.



A research paper developed by the Center for Strategic Research (CSR), a Russian think tank, investigated the costs of liquidating ‘mono-industry’ cities in Russia and came up with an estimate of 1.6 million rubles (about \$27,600) per resident for the necessary social package.<sup>20</sup> The liquidation of mono cities with unprofitable refineries would produce a bill running to about 260 billion rubles (about \$4.5 billion). For a crisis-stricken Russia, that was not a policy option.

Another problem was how to deal with the opportunistic simple distillation refineries (about 70 facilities) that emerged and flourished in Russia on the back of the export tax subsidy. Without the subsidy, the operations of these refineries would not make economic sense. The largest of these refineries included Novoshakhtinskiy, Slavyanskiy, Yaiskiy, and Ilskiy. These facilities refined about 20 mt of crude oil in 2017 and produced lots of unfinished surrogate products that nevertheless found a market in Russia.<sup>21</sup>

Retail sales of refined products in Russia are subject to excise taxes. But many simple refineries sold their out-of-spec products in the ‘grey’ market without paying excise taxes, which allowed them to give significant discounts to the buyers. The production of such surrogates usually involves mixing the components of non-spec fuels, either at the tank farms or in petrol vehicle tanks, right before the sale. Non-spec gasoline is usually a mixture of naphtha, automotive gasoline, and special additives that improve octane number. Non-spec diesel fuel usually has a high sulphur content. According to Petromarket Research, the new opportunistic simple refiners sold about 6 mt of non-spec refined products in Russia in 2017 without paying excise taxes.<sup>22</sup> The buyers of the surrogate fuels are attracted by the price discounts of up to 20–25 per cent of the price of the regular grades. High-sulphur gasoil represents the lion’s share of this market. These ‘moon-shining’ activities have allowed many simple refineries and teapots to effectively increase their refining margins and remain in the game.

## V. The new plan for 2019–2024 and outlook for its final phase in 2020–2024

By 2017 two things had become obvious: first, Russia’s refining sector would need some form of continued subsidy/support to remain profitable, and second, a one-size-fits-all approach to setting incentives for the modernization of refineries was not working. It was necessary to find a mechanism for a new industrial policy that would give the state the means to promote refineries that would be profitable in the future (after the investments into upgrading capacity had been made), control the timing and implementation of these investments, and maintain some influence over domestic market fuel prices. At the same time, the ‘wrong’ non-sustainable simple refining operations had to be demoted. Trying to maximize these goals simultaneously would almost inevitably involve some trade-offs. To find a solution, the regulators came up with the idea of excise tax refunds on refined products; this was to replace the old inefficient subsidy with a new mechanism. (Figure 25)

---

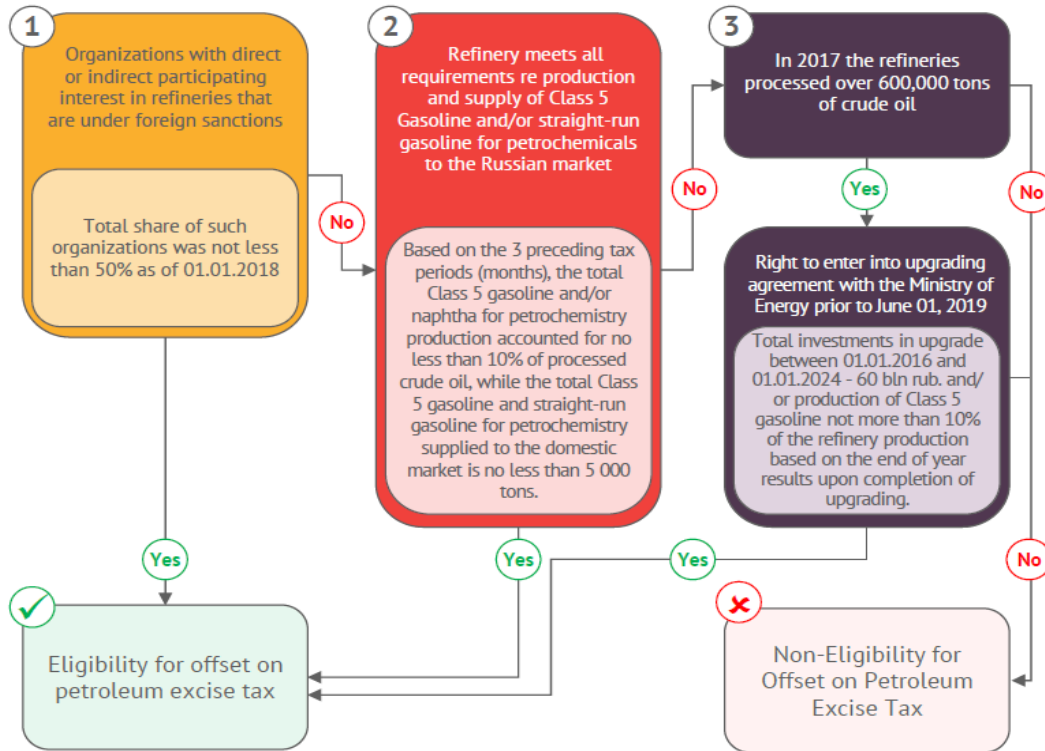
<sup>20</sup> *Mono-cities Reloaded*. White paper by the Center for Strategic Research, 2014 as cited at <https://www.rbc.ru/economics/29/01/2014/570416ac9a794761c0ce62a6>

<sup>21</sup> The size of the non-spec gasoil market in Russia is about 9 million tons per year, according to Petromarket.

<sup>22</sup> Khomutov, Ivan and Baranov, Nikolay *Simple Refining: Buying Time*, Neftegazovaya Vertical, 2017 <http://www.ngv.ru/magazines/article/prostaya-neftepererabotka-vremya-vyshlo/>.



**Figure 25: Eligibility requirements for excise tax refunds**



Source: Petromarket Research Group

Starting in 2019, the eligible refineries (those that had invested in modernization and produced high-quality refined products) could claim back the refund on excise tax. Under the amendments to Russia's Tax Code<sup>23</sup> these refineries would not only receive excise tax refunds but would also be compensated for the entire amount of the export duty-related subsidy they were no longer receiving (fixed at the 2018 level). A series of coefficients introduced differentiation of the subsidy based on the logistical disadvantages of some facilities, with higher refunds for the Angarsk and Achinsk refineries in the eastern part of the country and for Ukhta in the north. The important difference from the old subsidy mechanism was a selective approach to the eligibility of refining facilities, based on a set of specific requirements. The eligibility requirements would rule out a state subsidy to eight Russian refineries which together accounted for production of about 17 mt of refined products in 2018, as follows: Anzherskiy, VPK-Oil, Krasnodarekoneft, Novoshakhtinskiy, Pervyi Zavod, Slavyansk Eco, Tomskneftepererabotka, and Transbunker.

The Tax Code amendments also stipulated that a refinery eligible for a tax refund on petroleum excise tax would also be eligible for supplemental tax offset – a so-called 'offsetting markup' – provided the average wholesale prices for high octane gasoline (Russian AI-92 grade) and diesel fuel across the country did not exceed certain specified target price levels by more than 10 per cent. The target price levels would be defined in relation to export prices of the corresponding refined products. The aim of this provision is to give the state the means to indirectly control the price levels of refined products in Russia. Under the proposed scheme, the state was effectively announcing that it would compensate refineries for losses they may incur as a result of selling gasoline and diesel fuel in the domestic market at prices below export parity, when the price of the Urals Blend in international markets exceeds \$55

<sup>23</sup> Federal law 301-FZ, On Amending Part II of the RF Tax Code, dated 3 August 2018.

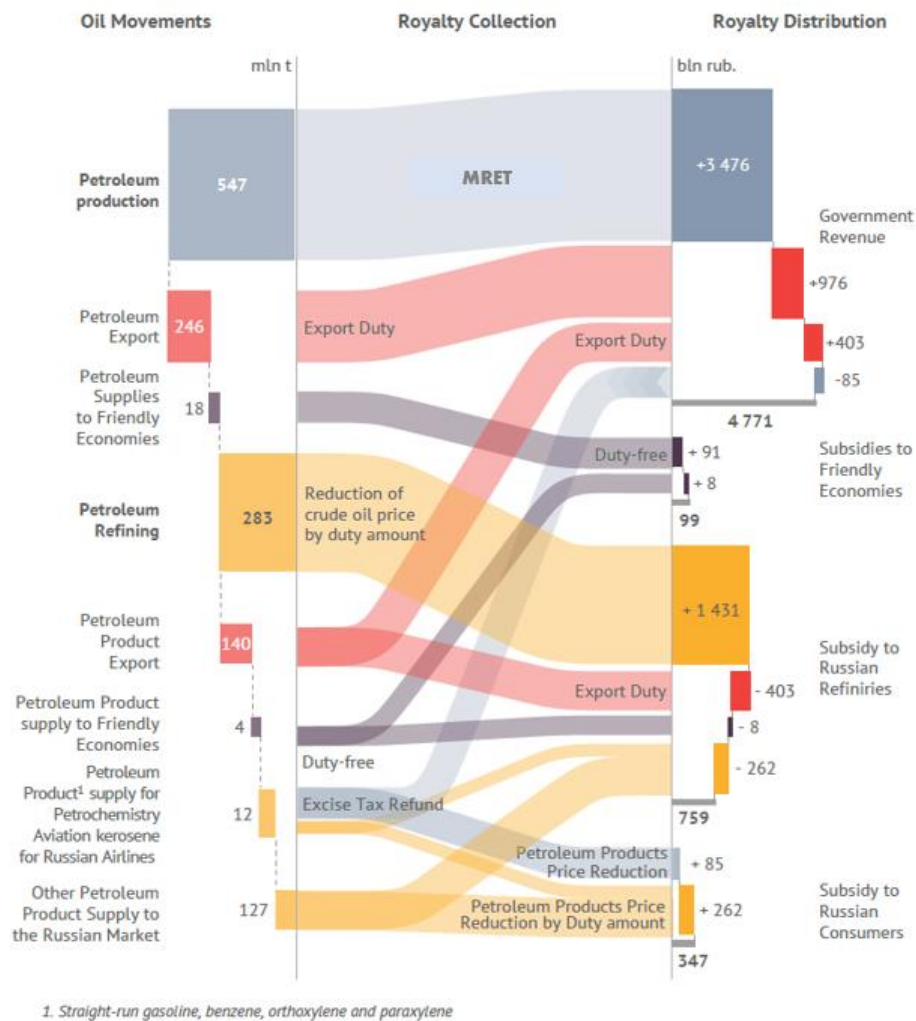




per barrel. But in a low international price environment (when the price for the barrel of oil is lower than \$55) the companies would not be compensated and would end up paying the excise taxes to the state.

The study conducted by the Russian Petromarket Research Group<sup>24</sup> provides a comprehensive graphic summary of the starting and ending points of the last stage of the ‘tax manoeuvre’ with respect to Russia’s petroleum balance and the distribution of oil rent through the value chain. According to Petromarket, from the total oil rent generated in Russia in 2017, the state take was 4771 billion rubles or 80 per cent (collected as MRET and crude oil and refined product export duties), the subsidy to the refining sector amounted to 759 billion rubles or 13 per cent, the transfer to ‘friendly economies’<sup>25</sup> was 99 billion rubles or 1 per cent, and the transfer to domestic consumers was 347 billion rubles, or 6 per cent of the total.<sup>26</sup> (See Figure 26)

**Figure 26: Petroleum rent and its distribution in Russia in 2017**



Source: Petromarket Research Group

<sup>24</sup> Petromarket Research Group *Tax Maneuver Completion: What Are We to Expect?* Moscow, October 2018 [http://www.petromarket.ru/?r=public\\_10](http://www.petromarket.ru/?r=public_10).

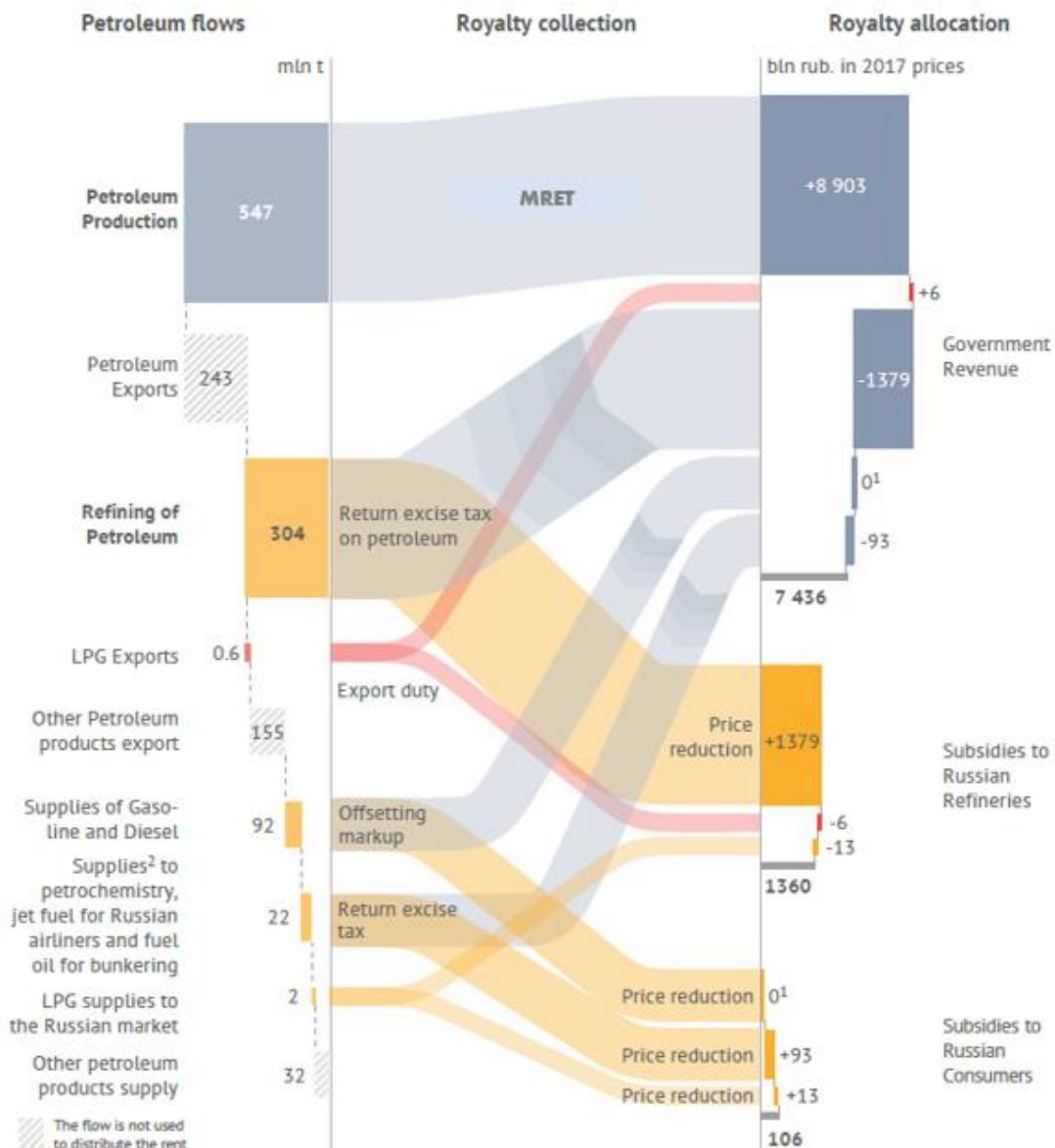
<sup>25</sup> Belarus, a member of the customs-free zone with Russia, was free-riding on the system of Russian export taxes by purchasing crude oil for its refineries at a low price and selling its refined products to Europe at high prices without paying export taxes.

<sup>26</sup> Percentages calculated from the numbers, in billions of rubles, provided by Petromarket on Figure 26.



The projected rent distribution in 2024, under the assumptions of gradual removal of export taxes and compensation of Russian refineries based on their commitments to invest in necessary upgrades via the so-called 'reverse excise', results in optimization of rent distribution. State tax take increases to 84 per cent, the subsidy to refineries (under the new mechanism) also increases, to 15 per cent, the subsidy to Belarus disappears with the elimination of export taxes, while the transfer to Russian consumers dwindles to 1 per cent of the total as domestic fuel prices go up. (Figure 27)

**Figure 27: Petroleum rent and its distribution in Russia in 2024**



Source: Petromarket Research Group

It is noteworthy that Russia's prospective petroleum balance for 2024 envisages higher refining throughput and higher exports of refined products compared with 2017. Thus, the new plan would fail

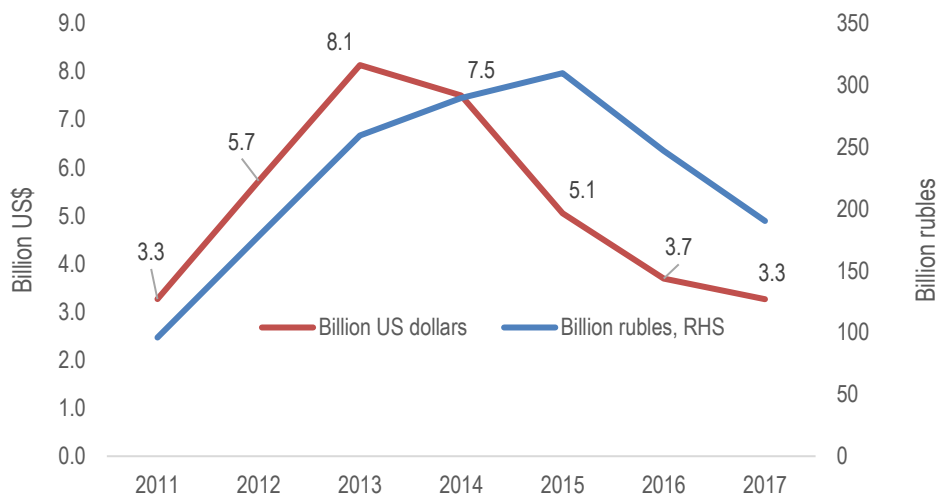


in rationalizing the overall level of refining throughput in Russia, as it remains at unnecessarily high levels. In addition to traditional surpluses in the production of naphtha, middle distillates, and fuel oil for domestic consumption, the production of gasoline (historically the bottleneck product) will also move into the surplus zone, with about 10 mt produced in excess of domestic requirements by 2024. This will be the result, on the one hand, of investments in the modernization of the more advanced refineries and, on the other hand, of the survival of the ‘teapots’ connected to Russia’s regional authorities that will continue to sell surrogate fuels on the ‘grey’ and ‘black’ market at heavily discounted prices, avoiding the payment of excise taxes and thus taking some market share away from compliant fuels.

## VI. Modernization of Russian refineries and outlooks for the future

There have been plans for a steep rise in refinery investment since the refinery modernization agreements made between Russian oil companies and the Russian government in October 2011 (envisioning the construction or upgrading of 116–124 secondary processing units by the end of the decade). However, actual annual investments made in 2011–2017 turned out to be lower than the initially announced plans, especially in the second part of this period. (Figure 28)

**Figure 28: Investment spending of refinery upgrades in Russia in 2011–2017**



Source: Author, data from Russia’s Ministry of Energy

The key reason for the shortfall was the significant decline in oil prices relative to the levels most mid-range plans had assumed before 2015, lower revenues, and hard constraints on investment budgets. In 2012, 15 units were completed, at an estimated cost of \$5.7 billion. In 2013 the Russian oil companies ended up spending over \$8.1 billion (260 billion rubles) on refinery upgrades, a 46 per cent increase over their 2012 investment, according to the Energy Ministry, with 13 new secondary processing units being commissioned. Most of these were upgrading units, aimed at improving motor fuel quality, either for gasoline (isomerization, reforming) or diesel (hydrotreating), so processing depth did not increase much in 2013. Despite the progress being achieved, some refineries – notably the Ryazan, Syzran, Afipsky, and Mari – were falling behind their planned modernization schedules.

In 2014, investments amounted to \$7.5 billion (290 billion rubles), with 15 new secondary processing units being brought online (many of these, however, represented carryovers from 2013). One of the long-awaited units finally completed in late 2013 was the big hydrocracking complex at Surgutneftgaz’s Kirishi plant, located near St. Petersburg. (Kirishi is Russia’s second-largest refinery by throughput, after GPN’s Omsk plant.) Surgutneftgaz spent around \$2.6 billion (88.5 billion rubles) on construction



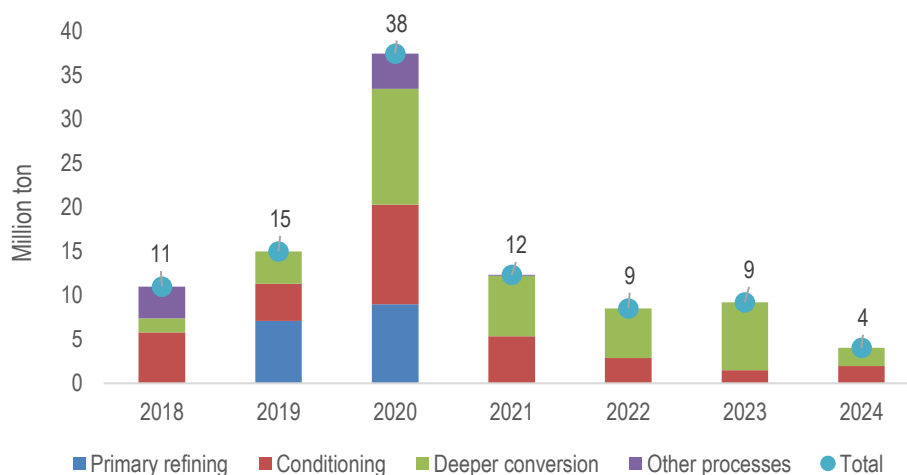
of the complex over about 10 years. The complex comprises 86 individual units, including those for hydrocracking, vacuum distillation, visbreaking, and steam reforming, and Surgutneftegaz plans to use it to process 4.9 mt per year (87,000 barrels per day) of fuel oil, producing diesel and jet fuel.

In 2015 Russian refineries installed 25 secondary processing units (including 19 new and six reconstructed units) at a cost of 310 billion rubles (\$5.1 billion). However, this was the last year in which investments increased, year-on-year in ruble terms, as in 2016, most of the Russian oil majors submitted requests to governmental authorities for changes to their mandatory refinery upgrade schedules, due to the economic crisis. The same situation then occurred in 2017.

The ‘new deal’ of 2018 gives more certainty to the regulators that Russian oil companies will continue big-ticket investments in upgrading the Russian refineries. But, as always, the devil is in the details. The rules that specify the eligibility requirements for excise tax refunds may result in new distortive effects – by allowing the refining subsidiaries of Russian vertically integrated oil companies that are subject to international sanctions to downgrade their modernization efforts to the minimums that would still allow them to receive a subsidy. For example, Rosneft recently announced that it is postponing the completion of new units at Tuapse, Komsomolsk, and Novokuibyshevsk refineries until 2021, and those at Achinsk refinery until 2022. These units were originally scheduled for 2020.

The plans of the Russian refiners with regards to the planned capacity additions in 2018–2024 are presented in Figure 29. The big additions of new secondary capacity anticipated in 2020 are now clearly at risk because of the falling refining margins and regulatory uncertainty. This probably means that the phasing out of high-sulphur fuel oil production in Russia will take much longer than initially anticipated. As a result, the change that is coming to international high-sulphur fuel oil markets in 2020 will have a big impact on the Russian refining industry.

**Figure 29: Planned capacity additions at Russian refineries in 2018–2024 by process type**



Source: Petromarket Research Group

With regard to investments into the deep conversion upgrades that could reduce mazut output in Russia, the preferred solution for the industry has been to add slow coking units. In 2015–2019 the most important developments in this area have been as follows:

- 2.1 mt per year unit at Lukoil’s Perm refinery, launched in the end of 2015.
- 2 mt per year unit at TANECO refinery in Tatarstan started in 2016.

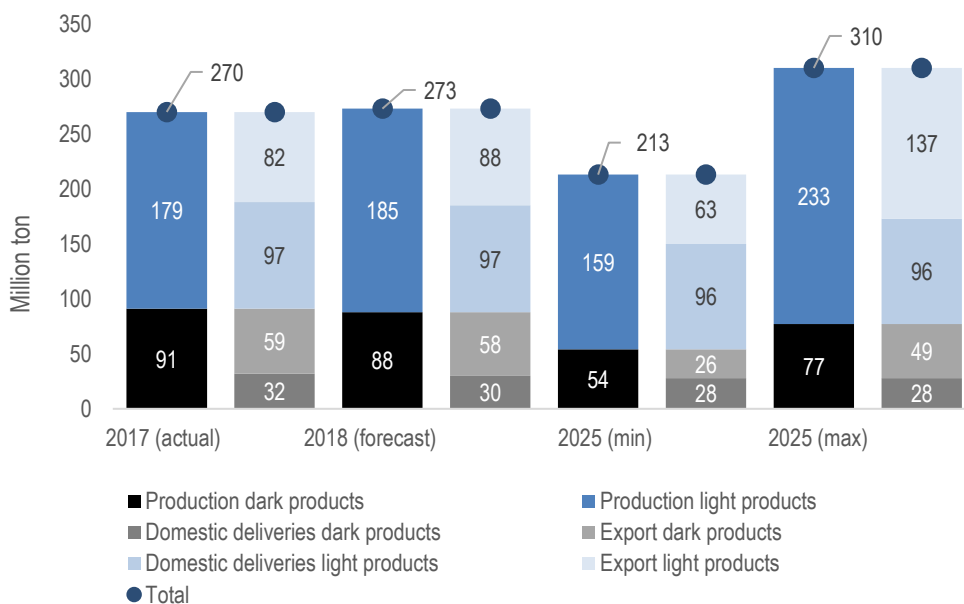


- 1.7 mt per year unit at Antipinsky refinery in Tyumen started in 2016.
- Investments have been approved for the construction of a 2 mt per year unit at Gazpromneft's Omsk refinery (completion is scheduled for in 2020). Gazpromneft was also planning the same type of addition at its Moscow refinery.
- Investments have been approved for a 2.1 mt per year unit at Lukoil's Nizhniy Novgorod refinery. Under the current plan, this unit is supposed to start in 2021; it would cut the mazut output at the refinery and increase the refining depth to 95 per cent and the light product yield to 76 per cent.

The resulting higher output of light products is going to be accompanied by incremental growth in the output of solid products (petroleum coke and pitch) with high sulphur content. Marketing these products also represents a problem for Russian refiners, so it effectively replaces one problem with another.<sup>27</sup>

Most outlooks for Russian refining give consolidated numbers that are not differentiated by product. One exception is the forecast by Vygon Consulting from March 2018.<sup>28</sup> (Figure 30)

**Figure 30: Russia's refined product balance, 2017 and outlooks for 2025**



Source: Vygon Consulting

For 2025, Vygon Consulting has produced two scenarios, with minimum and maximum outputs of refined products ranging from 213 to 310 mt. The output of dark products in Russia is projected to fall from 91 mt in 2017 to 54 mt in 2025 in the minimum scenario and to 77 mt in the maximum scenario. With domestic market usage of dark products stable at 28 mt, the range of dark product exports in 2025 is 26–49 mt, according to Vygon Consulting. Developments in 2018 and 2019 suggest that both the total refined products output and the dark products share in Russia are following the maximum scenario, at least so far.

<sup>27</sup> Kotlomin, V. 'Heavy Oil Upgrading: Solid petroleum product use and disposal issues'. *Oil & Gas Journal - Russia*, Issue 3, 2019. pp. 70–72.

<sup>28</sup> Ezhov, S. and Tyrtov, E. *Zavershenie nalogovogo manevra*. Vygon Consulting, November 2018.



## VII. Conclusion

The Russian refining system still has a significant legacy from its Soviet past, when refineries were located in relatively remote regions to serve the military and industrial complex and output of fuel oil was encouraged to supply heavy industry. However, this focus on the lower end of the barrel left a significant need for upgrading as Russia entered the post-Soviet era and demand for lighter products increased.

The government has tried to provide a series of incentives to encourage Russia's major oil companies to invest in upgrading. Differentiated tax rates, adjust of export tariffs, re-alignment of upstream and downstream taxes and even a command by the then Prime Minister Vladimir Putin that the industry must act to improve its performance have produced some results, particularly since 2015. Since then fuel oil output has declined rapidly, but with demand also falling Russia continues to produce a surplus.

Plans for further additions of more complex refining units have been made, thanks to yet more tax incentives, but it would still appear that not all the players will respond as the government hopes. A number of small players may continue to focus on the simpler and less expensive processes, and companies that are the subject of international sanctions have also been given an effective dispensation to slow their upgrading efforts. Many independent refineries are likely to continue using the tactics of selling surrogate refined products without paying excise taxes, to remain afloat. Lower margins for those refineries that are part of Russian vertically integrated companies are likely to be cross-subsidized by profitable upstream operations. Also, the adjustment could take longer than expected due to the social risks of shutting down inefficient facilities. As a result, it would seem that the planned decline in Russian fuel oil output will be at the slow end of the planned range.

This is a concern because the global market for fuel oil is set to be further constrained by the introduction of tighter IMO rules on the use of high sulphur fuel oil in the maritime sector from 2020. As shipping companies are forced to use more environmentally friendly fuel and reduce emission, Russian refiners which produce excess fuel oil could find their margins significantly squeezed.



## Appendix I. A brief history of Soviet and Russian refining industry and its current characteristics

The first wave of construction of Russia's refineries occurred in the 1930s, during the time of rapid industrialization in the Soviet Union. At that time most Soviet crude oil was produced in Baku and in the north Caucasus. New refineries built in Tuapse (1929), Ukhta (1934), Saratov (1934), Orsk (1935), Khabarovsk (1936), Moscow (1938), and in Bashkiriya (1938) covered most important regional demand centres and were supplied with crude by rail and river shipments, over long distances. Refined products, in turn, also had to be distributed by rail and river over wide-ranging areas.

In the 1950s, two important changes happened. First, the Volga–Urals emerged as a new major oil province. Second, Russia started the construction of the oil pipeline network that would ultimately become an integrated interregional system stretching from Europe to Russia's Far East. The surge of oil output in the Volga–Urals initially led to the construction of new refineries closer to production sites in Samara (1945), Novokuybyshevsk (1951), Ufa (1951), and Salavat (1952). But the expansion of the oil pipeline network between 1960 and the 1970s, combined with the fast penetration of petroleum into Russia's energy balance, and the realization of the enormous potential of the newly discovered oil in western Siberia, made the Soviet planners optimize the distribution of the refining industry in the country. They decided that the economically much more efficient transportation of crude oil by high-diameter pipelines over long distances (compared with shipment by rail) enabled the building of new, larger sized, refining complexes closer to the centres of consumption. Refineries in Omsk (1955), Volgograd (1957), Nizhniy Novgorod (1958), Perm (1958), Ryazan (1960), Yaroslavl (1961), and Kirishi (1966) had much larger throughput capacities and they, as a rule, were more sophisticated.

The shift of Russia's oil production from Volga–Urals to western Siberia in the 1970s, and a geographical dispersion of Soviet refining operations, led to some decentralization of the Russian petroleum industry. At that time, it reflected the consumption patterns of the Soviet economy relatively well. The Volga–Urals remained the Soviet refining industry powerhouse, with a combined refinery capacity of over 120 mt, but its share in total refined product output declined from over 50 per cent to about 30 per cent. Thus, by the mid-1970s, the geographical configuration of the Soviet refining industry had been set. Most of the refining capacity was located deep inland serving domestic consumers. Some of the refineries were located closer to border and port locations, like Tuapse or Kirishi, but none was built as an export-oriented facility. Two refineries in Russia's Far East were built during the first wave of industrialization – Khabarovsk (1936) and Komsomolsk (1942). The petroleum refinery in Angarsk in Irkutsk region started operations in 1957, and that in Achinsk in Krasnoyarsk province in 1982.

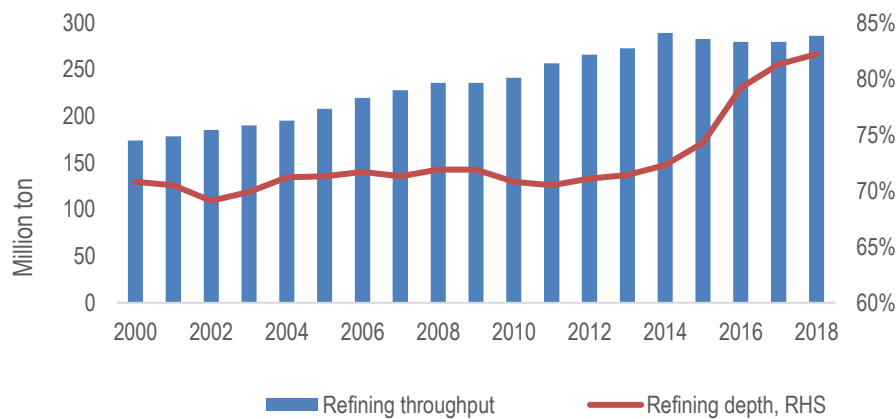


## Appendix II: Complexity of Russian refining system

Russia’s refining sector is not very sophisticated. The distillation process – primary refining, the method with the simplest technology and lowest costs – has been dominant, while the share of cracking or other conversion refining processes is relatively low. Historically, Russia has been using two metrics to assess the efficiency of its refining industry – ‘refining depth’ and ‘light product share in the output’.

The first indicator (*refining depth*) is calculated (in percentage terms) by subtracting mazut output, losses, and own use of products, from the refinery total throughput, dividing it by throughput and multiplying by 100. It is an indirect and not very reliable metric, but it has been useful in demonstrating the ‘mazut addiction’ of the Russian refineries. Refining depth held at about 70 per cent from 2000 to 2014, but in the past two years it has jumped to over 80 per cent nationally, indicating that Russia has started to cut its production of residual fuel oil. (See Figure A-II-1)

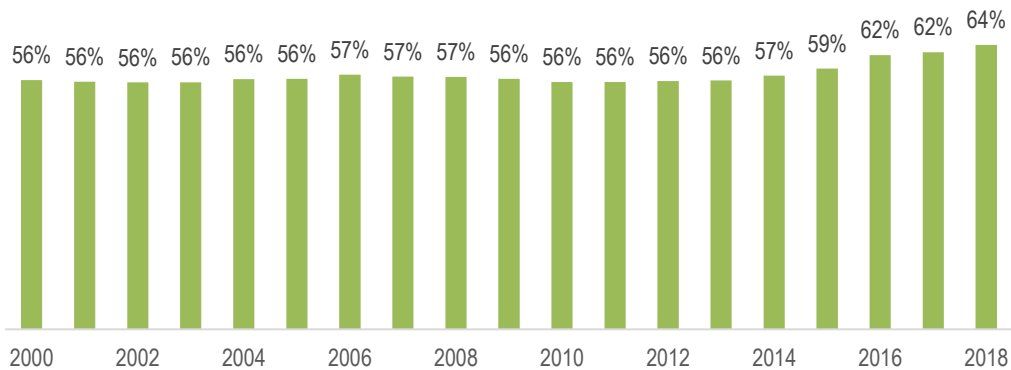
**Figure A-II-1: Refining throughput and refining depth in Russia**



Source: Author, data from Russian Ministry of Energy

The second indicator (*light product share in the output*) had been stubbornly hovering around 56 per cent until 2014; it then improved to 64 per cent in 2018, indicating some progress with the introduction of conversion processes. It is still significantly lower than the 85–95 per cent seen in the best international refineries. (See Figure A-II-2)

**Figure A-II-2: Light product share in Russian refining output**



Source: Author, data from Russian Ministry of Energy



In an international context, the level of sophistication and complexity of refining operations is usually measured by the ratio of fluid catalytic conversion (FCC) to primary capacity. The Nelson complexity index (NCI) also represents a useful indicator for the degree of sophistication, by assigning complexity factors to different conversion units. Judging by these metrics, Russia has been lagging the best-in-class refineries in North America, Europe, and recently those in Asia–Pacific. (See Table A-1)

**Table A-II-1: Regional differences in key characteristics of complexity for refining industry**

	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2017</u>
<b>Complexity ratio, FCC to Primary Capacity</b>				
Europe	31.5%	34.1%	36.8%	41.7%
Russia and Central Asia	13.6%	17.0%	17.4%	24.8%
Middle East	16.0%	16.9%	20.1%	29.5%
Africa	11.3%	16.5%	17.0%	19.5%
Asia-Pacific	35.6%	44.7%	53.6%	65.5%
North America	66.1%	68.6%	69.8%	70.9%
Central and South America	40.5%	45.1%	48.0%	51.1%
<b>Nelson Complexity Index (NCI)</b>				
Europe	8.3	8.7	8.9	9.3
Russia and Central Asia	5.8	6.7	6.9	7.7
Middle East	5.4	5.5	6	7.2
Africa	4.9	5.6	5.7	5.9
Asia-Pacific	7	7.4	8.3	9.7
North America	10.8	11.1	11.5	11.5
Central and South America	7.1	7.3	7.4	7.8

Source: ENI World Oil Review, 2018, Vol. 1

Russia needs sizeable investments in upgrading capacity if it wants its refining product slate to match current demand patterns that favour light clean products. This is one area where Russia's refining sector is not only far behind those of advanced countries, but is also below the world's average by a wide margin. On the other hand, Russia's refining sector fares relatively well with regards to hydrotreating capacity, with the desulphurization capabilities for middle distillates in Russia being generally in line with refining sectors in North America, Europe, and Asia–Pacific. Russia's current gasoline production capacity is also in line with the world's average. Most of Russia's gasoline is produced from reformate. Investments in isomerization processes over the past decade have provided a cost-efficient way of improving the octane number and increasing the share of high-octane gasoline in the overall pool.