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# RUSSIAN LNG IN ASIA PACIFIC
## UNDER LOW PRICE MARKET ENVIRONMENT

***Jinsok Sung***

**Abstract**

*The past few years have seen substantial demand for liquefied natural gas in the Asia Pacific, attracting the attention of suppliers, due to import-dependent states like South Korea and Japan, with the latter's need to replace power generation from nuclear after the Fukushima accident, and rising economies like China and India. This demand has created a race for suppliers, from Australia to East Africa. For Russia, LNG exports are a vital part of its pivot to Asia, and Russian LNG projects have their own advantages over competitors due to geography and price.*

**Key words:** Russian LNG; Asian LNG market; JCC; Henry Hub.

Asia Pacific natural gas markets are continuing to attract the attention of exporters due to higher prices than other regional markets and increasing consumption. LNG imports in Asia are growing fast, especially since the 2011 Fukushima disaster. As nuclear power plants gradually went offline, they went through highly scrutinized safety inspections to get back online. Consequently, Japanese utilities were forced to import more gas, coal, and oil to meet electricity demand. Fukushima coincided with the nuclear scandal in South Korea, which forced several nuclear reactors to stop operations after audits found fake certificates issued for components of nuclear power stations. Import growth in the region was further accelerated by China and India, who have emerged as two of the biggest and fastest growing economies in the world. The top 5 LNG importers in the world are Japan, South Korea, Taiwan, China and India. Additionally, several other countries in Southeast Asia and Latin America increasingly have resorted to LNG import increases each year.

After the Fukushima disaster, gas took over much of the role of nuclear power generation in Japan and LNG imports increased considerably between 2011 and 2014. South Korea, almost entirely dependent on LNG for its gas consumption like Japan and Taiwan, beat predictions as annual LNG imports have risen by 7.9% between 2003 and 2013 and by 10% between 2009 and 2013.[1] In India, due to decreasing gas production and no pipeline connections with other countries, LNG imports remain the only option to fill the gap between consumption and production. Due to the expansion of infrastructure, the increasing share of gas in power generation and its advantage as an environmentally friendly energy resource, gas consumption in China has continued to exceed the projections of leading international organizations such as the IEA and EIA up until 2013. High LNG prices caused by increased demand and record oil prices of over $100/barrel gave excellent opportunities for LNG exporters. The number of LNG projects in the US, Australia, and Russia, with total production capacity over 50% of the global LNG trade, drove investment and swiftly started construction on projects. However, when the constructions of new LNG plants were in full swing in 2014, the market started to show signs of oversupply. Demand in South Korea recorded a sharp decrease and LNG import growth in China disappointed

1 ***GIGGNL, (2014), The LNG Industry 2014, International Group of Liquefied Natural Gas Importers.*** *Available at: http://www.giignl.org/sites/default/files/PUBLIC_AREA/Publications/giignl_2015_annual_report.pdf [Accessed 20 February 2016].*

as it purchased just 0.38 mtpa (0.52 bcm)[2] more than the previous year. Stagnating consumption and falling oil prices brought down LNG prices and the introduction of a large volume of new LNG projects further strengthened competition in the global market. The LNG import price in Japan and Korea returned to pre-Fukushima levels in 2015 with annual average LNG import prices around $10/mmbtu ($280/bcm).[3]

Total volume under construction and in planning to enter the global market is larger than total LNG trade volume in 2014.[4] Along with pipeline gas export to China, LNG is an important export diversification option for Russia. Three projects in planning in the Russian Far East (Sakhalin II LNG expansion, Vladivostok LNG, Sakhalin I) have a geographical advantage to their competitors in the Asia Pacific market. But how competitive Russia LNG will be with other major exporters and if there will be enough of a market niche for Russian companies under the current unfavorable market situation remains a subject of analysis. In this paper, the strengths and challenges of Russian LNG and price-competitiveness of Russian LNG in the Asia Pacific market are discussed.

## THE NEW WAVE OF LNG SUPPLY TO THE ASIA PACIFIC MARKET

LNG export projects in Russia, Australia, and USA are already under construction. Projects in Canada, Mozambique, and Tanzania are at the planning stage and some of these projects are hoping to begin construction in one or two years. Within this new wave of export projects, the Australians are the frontrunners. Queensland Curtis LNG, the first of them launched, reportedly shipped its first cargo in January of 2015 to China.[5] At the same time, Sabine Pass LNG, the first LNG project in the lower 48 states of the U.S., is expected to begin LNG exports in March of 2016. The historic debut of Sabine Pass LNG in the global market is the result of the "Shale Revolution" in the U.S. The Shale Gas Revolution has revived the American gas industry, which had previously experienced stagnating production.[6]

**Australian LNG: Racing for Number One.** When all LNG liquefaction plants in Australia under construction are completed, it will be the largest LNG exporter in the world with a production capacity of 86 mtpa (116.96 bcm), surpassing Qatar with a capacity of 77 mtpa (104.72 bcm). The liquefaction capacity of the new wave of LNG plants, 61.8 mtpa

| | Expected launch year | Volume |
|---|---|---|
| **RUSSIA** | 2017- | 16.5 mtpa (22.44 bcm) – under construction |
| **AUSTRALIA** | 2015-2018 | 62.1 mtpa (84.46 bcm) – under construction/Completed in 2015 and 2016 |
| **USA** | 2016-2019 | 75 mtpa (102 bcm) – under construction<br>19.5mtpa (26.52 bcm) (Approved by FERC, not under construction. Sabine Pass LNG train 5/Lake Charles LNG) |
| | Global LNG trade volume in 2014 = 239.1million tonnes (325.18 bcm)* | 153mtpa (208.08 bcm) (Under construction/ completed in 2015/2016) |

***Table 1. LNG export terminal projects in Russia, Australia, and USA***
*Source:* ***International Gas Union, (2016),*** *World LNG Report – 2015 Edition, IGU.*

2 *Million tons per annum. All units converted to billion cubic meters with BP conversion factors http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/using-the-statistical-review/conversion-factors.html*

3 *Korea Customs Office/Japan Ministry of finance.*

4 ***International Gas Union, (2016), World LNG Report – 2015 Edition, IGU.*** *Available at: http://www.igu.org/sites/default/files/node-page-field_file/IGU-World%20LNG%20Report-2015%20Edition.pdf [Accessed 20 February 2016].*

5 ***Schaps, K. (2014), UPDATE 1-BG to export first Australian LNG cargo to China, Reuters, 29 December.*** *Available at: http://in.reuters.com/article/bg-group-lng-qclng-idINL6N0UD0FR20141229 [Accessed 20 February 2016].*

6 ***EIA, (2016), Natural Gas Gross Withdrawals and Production, U.S. Energy Information Administration.*** *Available at: http://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcf_a.htm [Accessed 20 February 2016].*

| Project | Capacity mtpa (bcm) | Start production |
|---|---|---|
| **North West Shelf Train I/II** | 5 (6.8) | 1989 |
| **North West Shelf Train III** | 2.5 (3.4) | 1992 |
| **North West Shelf Train IV** | 4.4 (5.98) | 2004 |
| **Darwin LNG Train I** | 3.6 (4.9) | 2006 |
| **North West Shelf Train V** | 4.4 (5.98) | 2008 |
| **Pluto LNG Train I** | 4.3 (5.84) | 2012 |
| **Total in operation (2013)** | 24.3 (33.05) | |
| **Queensland Curtis Train I/II** | 4.3/4.3 (5.85/5.85) | 2015 |
| **Australia Pacific Train I/II** | 4.5/4.5 (6.12/6.12) | 2016 |
| **Gladstone LNG Train I/II** | 3.9/3.9 (5.3/5.3) | 2015/2016 |
| **Gorgon LNG Train I/II/III** | 5.2/5.2/5.2 (7.07/7.07/7.07) | 2016/2017 |
| **Wheatstone LNGTrain I/II** | 4.5/4.5 (6.12/6.12) | 2016/2017 |
| **Itchys LNG Train I/II** | 4.2/4.2 (5.71/5.71) | 2017 |
| **Prelude FLNG** | 3.7 (5.03) | 2017 |
| **Total** | 62.1 (84.46) | |

***Table 2. LNG export terminals in Australia***
*Source:* ***International Gas Union, (2016),*** *World LNG Report – 2015 Edition, IGU.*

(84.05 bcm), that started construction in the 2010's in Australia is almost 35% of all LNG consumption in Asia Pacific region in 2013, 178.04 Mt (242.13 bcm).[7] All of the Australian projects are planning to start operation before 2018, outpacing most of their competitors thus having an advantage in expanding their market shares in the Asian market ahead of others. Australian LNG projects are unlikely to compete with new LNG projects of other competitors for long term contracts, as almost all the production volumes are contracted with long term buyers. Australian companies have managed to maintain the oil indexation gas pricing system for their contracts, which is strongly preferred by many exporters. Amid strengthening competition, there are growing voices from buyers for lower prices and the inclusion of a hub pricing system in contracts. Considering that many projects have not taken final investment decision due to worries over finding buyers and right pricing, Australia is enjoying a significant advantage. However, since Australian LNG projects are among the most expensive in the world, the current low LNG price will remain a serious cause for concerns for Australian exporters.

**North American LNG projects: Shale gas reaches global market.** Due to the 'shale revolution', North America will transform into a net gas exporter. As of February 2016, three trains of the Sabine Pass LNG project are under construction in Louisiana and the first train has started operation. Cameron LNG, Freeport LNG, Cove Point LNG and Corpus Christi LNG received necessary government approvals in June, July, September and December in 2014 respectively and started construction in 2014 and 2015.[8] All of these

7 ***International Gas Union, (2016), World LNG Report – 2015 Edition, IGU.*** *Available at: http://www.igu.org/sites/default/files/node-page-field_file/IGU-World%20LNG%20Report-2015%20Edition.pdf [Accessed 20 February 2016].*

8 ***Federal Energy Regulatory Committee, (2016), North American LNG Import/Export Terminals Approved, FERC.*** *Available at: https://www.ferc.gov/industries/gas/indus-act/lng/lng-approved.pdf [Accessed 20 February 2016].*

| Project | Quantity mtpa (bcm) | Start year |
|---|---|---|
| **Sabine Pass LNG** | 21 (28.56) | 2016 |
| **Cameron LNG** | 13 (17.68) | 2018 |
| **Freeport LNG** | 13 (17.68) | 2018 |
| **Cove Point LNG** | 6 (8.16) | 2017 |
| **Corpus Christi LNG** | 16 (21.76) | 2018 |
| **Total** | 75 (102) | |

***Table 3. U.S.LNG export terminals***
*Source:* ***Federal Energy Regulatory Committee, (2016),*** *North American LNG Import/Export Terminals Approved, FERC.*

projects are brownfield projects and therefore require less development costs than the greenfield projects in other countries.

Twelve LNG export projects received approval for export from the National Energy Board in Canada but at the time of this article's publication, no LNG export terminal is under construction.[9] The majority of the proposed terminals are located in British Columbia on the West Coast of Canada. Therefore, they have a geographical advantage for accessing the Asia Pacific market, compared to American LNG. However, Canadian projects have been facing delays due to various reasons such as low LNG prices, difficulties with finding long term buyers, and disagreement with local residents and the government over environmental issues. In October 2014, the development of the Prince Rupert LNG project was paused.[10] The majority of Canadian projects are expected to start production after 2020 and it is likely that many will not be realized. Canadian projects have difficulties in finding long term buyers. This is largely due to disagreements with buyers regarding prices and pricing systems. Many Asian buyers insist that the price be indexed to the Henry Hub, but Canadian LNG developers would not agree on it due to worries over profitability of projects.

**East African LNG projects.** Considerable amounts of gas were found on the Southeastern Coast of Africa, namely in Mozambique & Tanzania. The East African governments are planning to transform their natural gas assets into an export center by building LNG plants. Projects in Mozambique are at a more advanced stage. Italian and American

| | Reserves | Capacity mtpa (bcm) | Planned production start |
|---|---|---|---|
| **Mozambique** | 945-1470 million tonnes recoverable natural gas (1285-1999 bcm) | Initial capacity 20 (27.2) with plans to expand to 50 (68) + FLNG (Initial capacity 2.6 (3.54). with plans to expand to 7.8 (10.6) | 2020 |
| **Tanzania** | 315 million tonnes (428 bcm) | 10 | 2020 |

***Table 4. LNG export terminal projects in Tanzania and Mozambique***
*Source:* ***Mozambique LNG, (2016),*** *Mozambique LNG. Available at: http://www.mzlng.com/ [Accessed 20 February 2016];* ***BG Group, (2016); TANZANIA, BG Group.*** *Available at: http://www.bg-group.com/288/where-we-work/tanzania/ [Accessed 20 February 2016].*

9 ***National Energy Board of Canada, (2016), Export and Import License Applications, NEB Canada.*** *Available at: https://www.neb-one.gc.ca/pplctnflng/mjrpp/lngxprtlcnc/index-eng.html [Accessed 20 February 2016].*

10 ***Morgan, G. (2014), BG Group puts Prince Rupert LNG plans on hold, Financial Post, 29 October.*** *Available at: http://business.financialpost.com/news/energy/bg-group-puts-prince-rupert-lng-plans-on-hold [Accessed 20 February 2016].*

operators, ENI and Anadarko, are planning to jointly build liquefaction plants and ENI intends to build a floating liquefied natural gas plant (FLNG) independently. Considering the volume of reserves and geographical advantage, Mozambique can be competitive supplier, not only for East Asian buyers but also for countries in emerging LNG markets, namely South Asia, South East Asia and Latin America.

**Russia's LNG projects.** The Russian energy company, Novatek, took a final investment decision to build an LNG plant on the Yamal peninsula in Northwestern Siberia shortly after the Russian Federation abolished Gazprom's gas export monopoly on December 1, 2013.[11] As Russia seeks to diversify gas exports, LNG, together with gas pipelines to China, is viewed as an important way to achieve this goal. Diminishing demand and increasing competitiveness with coal, renewables and other gas exporters makes the market situation in Europe less favorable to Russia than in the past. One advantage of LNG, compared with pipeline export, is demand security. Unlike pipelines, which can export gas only to limited buyers, LNG can reach all customers in with LNG import terminals. For example, Yamal LNG will export gas not only to Asia (China) but to European buyers as well.

Gazprom and Rosneft have additional plans to build liquefaction plants in Vladivostok and on Sakhalin Island. Sakhalin II LNG, Russia's first LNG project launched in 2009, has already established itself as a reliable partner to buyers in Asia. It has been producing LNG more than its nameplate capacity from 2010, the first year when production reached its production capacity (Figure1). It shows that demand for Sakhalin LNG is production-constrained, meaning that there is more demand for it. Considering there are projects that cannot fulfill their supply commitment for their buyers, Sakhalin LNG can be regarded as a reliable supplier to buyers.

The geographical proximity of projects in Vladivostok and Sakhalin Island to the biggest buyers in the world will

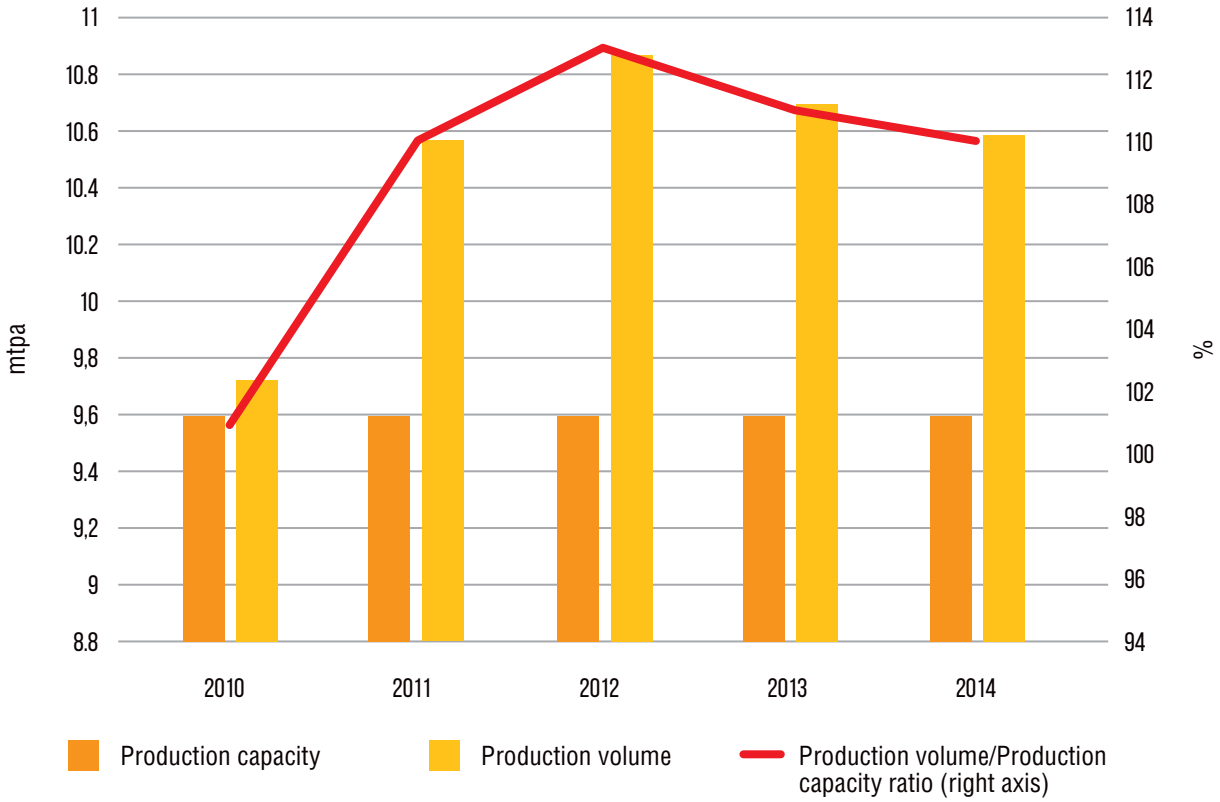


***Figure 1. Production volume/Production capacity ratio of Sakhalin II LNG project***
*Source:* ***Sung, J. (2015), Competitiveness of Russian Gas in Asian and European Market in Changing Market Environment*** *[Powerpoint slides] ENERPO program, European University at St. Petersburg, 24 April.*

11 *Gazprom Lost its Mononoly (У "Газпрома" отобрали монополию). Vedomosti, 3 December. Available at: http://www.vedomosti.ru/companies/news/19537411/u-gazproma-otobrali-monopoliyu [Accessed 20 February 2016].*

| Project | Capacity mtpa (bcm) | Current status | Start operation | Operator |
|---|---|---|---|---|
| **Sakhalin II** | 9.8 (13.3) | In operation | 2009 | Gazprom |
| **SakhalinII expansion** | 4.8 (6.53) | Planned | 2018 (Planned) | Gazprom |
| **Yamal LNG** | 16.5 (22.44) | Under construction | 2017 | Novatek |
| **Vladivostok LNG** | 15 (20.4) | Planned | 2020-? | Gazprom |
| **Sakhalin I** | 5 (6.8) | Planned | 2020-? | Rosneft |
| **Total** | 51.1 (69.5) | | | |

***Table 5. Russian LNG export projects for Asia Pacific market***
*Source:* ***Rudnitsky, J. (2012), Gazprom Expansion of Sakhalin-2 LNG Plant May Cost $7 Billion, Bloomberg, 30 January.*** *Available at: http://www.bloomberg.com/news/articles/2012-01-30/gazprom-expansion-of-sakhalin-2-lng-plant-may-cost-7-billion [Accessed 20 February 2016];* ***Gazprom, (2016), Vladivostok LNG project, Gazprom.*** *Available at http://www.gazprom.com/about/production/projects/vladivostok-lng/ [Accessed 20 February 2016];* ***Rosneft, (2014), Rosneft and ExxonMobil Extended Agreement on Implementation of the Far East LNG Project, Rosneft, 23 May.*** *Available at: http://www.rosneft.com/news/pressrelease/2305201415.html [Accessed 20 February 2016].*

serve as a great advantage to their competitors. If all of the planned projects in the Russian Far East are completed, together with Yamal LNG, the total LNG export volume could reach about 1/3 of Russia's total gas export volume.

## MAJOR LNG IMPORTERS IN THE ASIA PACIFIC REGION

**China: Will it continue to be a driver of LNG market growth?** China has been the fastest growing LNG market in the world in terms of volume. China's LNG imports have more than tripled over a five-year period from 5.7 mtpa (7.75 bcm) in 2009 to 18.60 mtpa (25.3 bcm) in 2013. The advantage of gas as a cleaner fuel helps drive market growth even further in China where air pollution has become a serious problem. China announced a plan to ban construction of new coal-fired plants in three key industrial regions around Beijing, Shanghai and Guangzhou. It also aims to cut coal's share of the country's total primary energy mix to below 65% by 2017, while increasing the share of nuclear power, natural gas and renewable energy. Coal consumption in China accounted for 67.5% of total energy use in 2013.[12]

However, China's role as a driver of LNG market growth has somewhat diminished. In 2014, its LNG imports had virtually no growth in comparison with the previous year. In 2015, China's LNG imports recorded its first ever decline.[13] Even before the slowdown of the economy and gas consumption, China was well-contracted or in other words, over-contracted. As a result of over-contracted long-term LNG import volumes and a reduction of gas demand, China is planning to resell part of the contracted volumes in the international market.[14]

There are mixed outlooks on whether between 2020 and 2025, after the construction of the Power of Siberia and Central Asia Line D pipelines, China will need new LNG contracts. This will largely depend on:

1. Whether pipelines can be constructed on time;
2. How fast the pipelines will reach full production capacity;
3. The level of gas demand in China;
4. Successes in the domestic development of unconventional gas.

With the addition of pipeline imports (63 bcm with 36 bcm from Russia, 25 bcm from Central Asia), total pipeline import capacity will exceed 130 bcm. However,

12 ***Watt, L. (2013), China bans new coal-fired plants in 3 regions, Associated Press, 12 September.*** *Available at: http://bigstory.ap.org/article/china-bans-new-coal-fired-plants-3-regions [Accessed 20 February 2016]; BP Statistical Review of World Energy 2014/Country Insight/China.*

13 ***Sikorski, T., Tertzakian, A., (2016), China gas data, Energy Aspects, 26 January.*** *Available at: https://www.energyaspects.com/publications/view/china-gas-data [Accessed 20 February 2016].*

14 ***Wan, K. (2015), China's LNG surplus heads west, Argus, 8 September.*** *Available at: http://blog.argusmedia.com/chinas-lng-surplus-heads-west/ [Accessed 20 February 2016].*

it is clear that new pipeline imports will take much of the share of LNG imports and China will be in a good position as a swing buyer in international gas markets between pipelines and LNG.

**Japan: The return of nuclear reactors.** After the Fukushima disaster on March 11, 2011, all nuclear reactors in Japan underwent safety inspections. Of the 43 operable reactors that are potentially able to restart, 24 of them are in the process of restart approvals. As of February 2016, two nuclear reactors, Sendai I/II went back into operation in August and October of 2015 respectively, after receiving final approval from NRA[15] and local governments.[16] The capacity of nuclear generation was taken over by natural gas, coal and heavy oil with natural gas grabbing the largest share. As some operable nuclear reactors will gradually come back online, it is anticipated that gas consumption will slowly start to decrease although not as much as the electricity generation capacity of nuclear reactors since oil will be first forced out. Oil is primarily used as a pick shaving generation fuel in Japan. The restarting of nuclear reactors is a slow process and considering that many reactors are not going through the regulatory process for reoperation, it is unlikely that nuclear will regain its previous share of over 25% in electricity generation.

**South Korea: Natural gas loses shares in the domestic market.** South Korea's LNG imports rose by 7.9% between 2003 and 2013 annually[17] due to development of infrastructure and consumption increases in the industrial and power sector. In 2014, LNG imports decreased after the restart of nuclear reactors that were closed for safety inspections in 2013 when the scandal of faked certificates of components erupted and reactors were closed for the replacement of components. No other country in the world decreased LNG imports as South Korea had in 2014. According to the 2nd Energy Base Plan announced in January of 2014, the Korean government plans to cut its reliance on nuclear power to 29% of the total power supply by 2035, down from the previously planned 41 percent. By the outlook of Ministry of Trade, Industry and Energy of Korea, gas consumption will grow by 1.93% annually until 2035. It suggests that South Korea needs new long-term contracts to cover demand in the next couple decades. However, in 2015, South Korea gas imports recorded another shocking fall in LNG imports, down from 39.8 mtpa (54.13 bcm) in 2013 to 33.3 mtpa (45.29 bcm) in 2015, decreasing by almost 17% in two years. Worried by the contraction of demand, KOGAS has offloaded its excess long-term LNG import contracts equaling 4mtpa to EDFT of France in 2015.[18] It is believed that a large part of the 4 mtpa (5.44 bcm) offloaded volume includes LNG contracts with Sabine Pass LNG. KOGAS already sold 0.7 mtpa (0.95 bcm) out of its 3.5 mtpa (4.76 bcm) LNG import commitment from Sabine Pass LNG to TOTAL, which means it has resold all of its contracted volume with Sabine Pass to French companies.[19] Unlike many long-term LNG contracts that have destination clauses, long-term contracts with American LNG exporters are based on an FOB[20] basis. Therefore, LNG contracts with American exporters became the first to be resold.

**India: Leading importer in South/Southeast Asia.** Different outlooks suggest that current LNG contracted volume and domestic production cannot cover the domestic gas demand of India. The gap between India's needs and its domestic production will continue to grow as consumption is expected to increase and domestic production decreases. Natural gas production in India declined by 36% between 2010 and 2013.[21] The gap can only be covered by LNG imports for the time being since, at the time of this article's publication, it is not clear when or if the TAPI pipeline from

15 *Nuclear Regulation Authority*

16 ***World Nuclear Association, (2016), Nuclear Power in Japan, WNA, 29 March.*** *Available at: http://www.worldnuclear.org/info/Country-Profiles/Countries-G-N/Japan/ [Accessed 20 February 2016].*

17 ***Ministry of Trade, Industry and Energy of Republic of Korea, (2014), The 2nd Energy Base Plan, Ministry of Trade.*** *Available at: http://english.motie.go.kr/ [Accessed 20 May 2016].*

18 ***Vukmanovic, O. (2015), Korea Gas Corp offloads excess LNG supply on to France's EDF, Reuters Africa, 11 November.*** *Available at: http://af.reuters.com/article/energyOilNews/idAFL8N1363ZC20151111 [Accessed 20 February 2016].*

19 ***Lee, C. (2014), Korea Gas formalizes deal to resell part of US Sabine Pass LNG to Total, Platts Korea, 7 January.*** *Available at: http://www.platts.kr/latest-news/natural-gas/seoul/korea-gas-formalizes-deal-to-resell-part-of-us-27797547 [Accessed 20 February 2016].*

20 *Free On Board*

21 ***EIA, (2016), International Energy Statistics: Dry Natural Gas Production 2009-2013, EIA.*** *Available at: http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=3&pid=26&aid=1&cid=IN,&syid=2009&eyid=2013&unit=BCF [Accessed 20 February 2016].*

Turkmenistan will commence.[22]

**Emerging LNG markets – Southeast Asia, the Middle East and South America**. Countries in Southeast Asia, the Middle East and South America are expanding their LNG import facilities. Thailand was the first country in Southeast Asia to receive LNG cargoes in 2011. Indonesia and Malaysia, traditional LNG exporters in the region, started LNG imports in 2012 and 2013 respectively. In the Middle East, Kuwait was the first country to import LNG in 2009 and in South America, Argentina started LNG imports in 2008. LNG imports are growing fast in these regions and new regasification facilities are being built in Indonesia, Singapore, the Philippines, Jordan, Vietnam and other countries. The combined factors of population growth, economic development, and the growing popularity of gas for electricity generation are driving demand in these countries. Total combined LNG imports in Southeast Asia, the Middle East and Latin America in 2013 reached 28 million tons (38 bcm), exceeding LNG imports in China (18.6 Mt) and close to the combined LNG imports in China and India (31.65 Mt) (Figure 6). Argentina has substantial conventional and unconventional gas reserves but has been experiencing production declines. This caused a moratorium of pipeline gas exports to Brazil, Chile and Uruguay and at the same time, it accelerated LNG imports in Argentina, Brazil and Chile. In the short term, LNG imports in the region are anticipated to rise. If Brazil and Argentina succeed in expanding production considerably, realizing their vast potential, domestic production may meet increasing demand and decrease LNG imports in the long run. However, LNG imports in the Middle East have been steady for the past several years with annual imports stabilizing in the range of 3-4 mtpa (4-5.5 bcm). Low natural gas prices, population growth and rising demand for electricity and the industrial sector have given domestic natural gas production difficulties in meeting demand in some countries in the region. At the same time, natural gas is increasingly gaining its popularity as a replacement for crude oil in the power sector with the purpose to increase crude oil exports and on its merit as a cleaner energy resource.

Total capacity of regasification facilities in the Middle

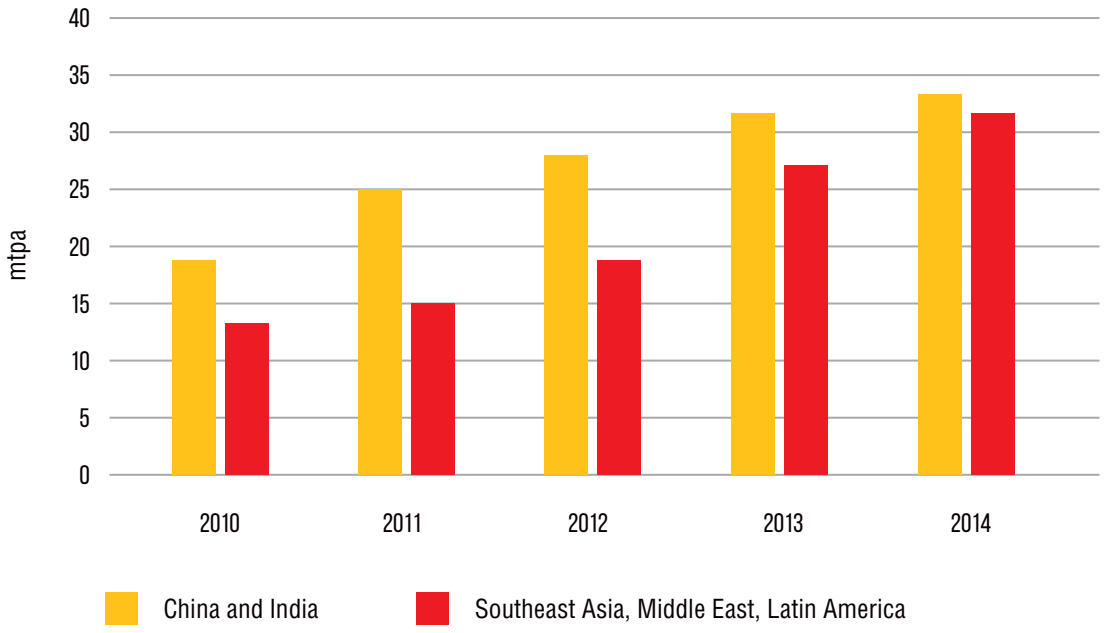


***Figure 2. Growth of LNG import at emerging markets***
*Source:* ***Sung, J. (2015), What to expect for Russian LNG? (Что ждет российский СПГ?), Neft Rossii, July-August.*** *Available at: http://www.neftrossii.ru/docs/magazines/NR/2015/NR-2015-7-8.pdf [Accessed 20 February 2016].*

22 ***Reyaz, M. (2015), TAPI pipeline: A new silk route or a pipe dream? Al Jazeera, 16 December.*** *Available at: http://www.aljazeera.com/news/2015/12/tapi-pipeline-silk-route-pipe-dream-151215211343976.html [Accessed 20 February 2016].*

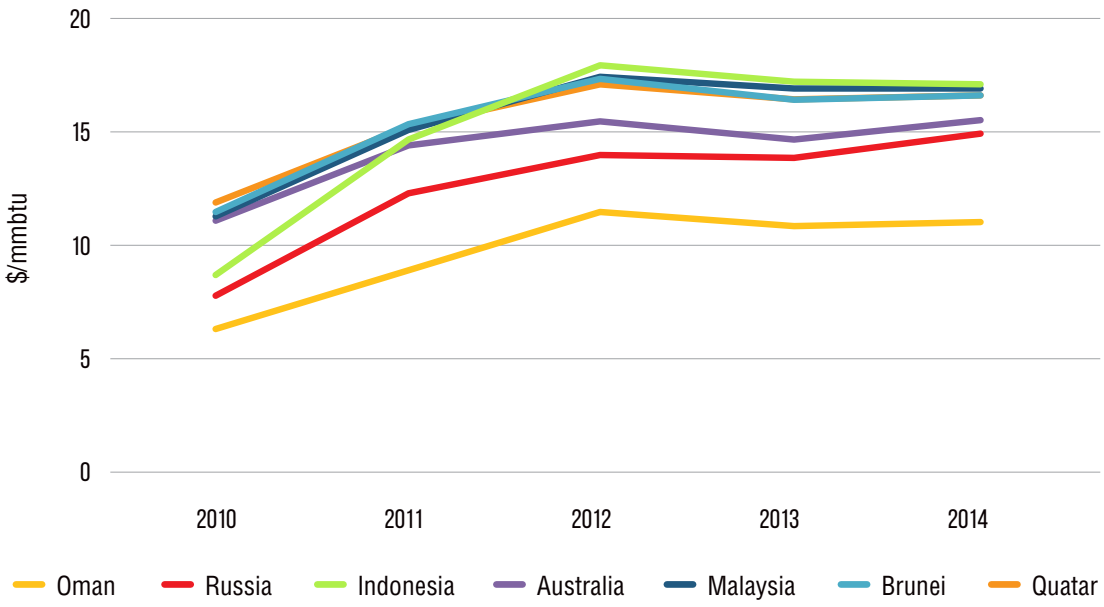


***Figure 3. Average annual LNG import price in Japan***
*Source:* ***Ministry of Finance Japan, (2016),*** *Trade Statistics, Ministry of Finance Japan. Available at: https://www.iea.org/publications/freepublications/publication/PartnerCountrySeriesTheAsianQuestforLNGinaGlobalisingMarket.pdf [Accessed 20 February 2016].*

East is expected to reach almost 40 mtpa (54.4 bcm) by 2020, which is around 4-fold of the current capacity. Abu Dhabi is planning to build a regasification plant with 9 mtpa (12.2 bcm) capacity to meet its electricity demand and in Kuwait, a new onshore regasification terminal is being developed to replace the current offshore terminal and expand their receiving capacity. Southeast Asian countries can be considered as the leading emerging LNG market as geographical characteristics of Malaysia, Indonesia, and the Philippines, and growing deficit of gas in the countries such as Thailand and Vietnam make LNG a more suitable way of gas supply. The IEA expects that gas consumption in Southeast Asia will rise by 80% to 250 bcm in 2035. At the same time, net exports of gas from Southeast Asian countries will decrease from the current 62 bcm to 14 bcm by 2035.[23] The outlook suggests that a large part of increased demand will be supplied by LNG imports as there are limited opportunities in the development of new international pipelines.

## PRICE-COMPETITIVENESS OF RUSSIAN LNG WITH TRADITIONAL LNG EXPORTERS

Terms of every long-term gas contract are different. Therefore, the price of each contract is different. As shown on Figure 3, price differentials between Omani LNG and Indonesian LNG to Japan in 2013 are around $5/mmbtu. LNG contracts signed between Yemen and KOGAS in 2004 and between Gazprom and KOGAS in 2005, were particularly favorable to the buyer as a strong buyers' market was formed at the time of signing the contract and also due to increased competition among new LNG projects. LNG prices for Japan from Sakhalin II, Russia's first LNG project started in 2009, is also maintaining its price-competitiveness over other exporters. Even though Russian LNG prices to Japan are higher than Korea, they were staying at more acceptable levels for Japan amid rocketing LNG import volumes and prices after Fukushima disaster. The price of Sakhalin II LNG for Japanese buyers remained lower than those of its competitors from 2010 to 2014 except for LNG from Oman.

23 *Tan, F. (2016), Southeast Asia's net oil imports to move than double by 2035-IEA, Reuters, 1 October. Available at: http://www.reuters.com/article/2013/10/02/iea-asia-oil-idUSL4N0HR0AV20131002 [Accessed 20 March 2016].*

| | Sakhalin (Aniva Bay) | Middle East |
|---|---|---|
| **Shipping days** | 3-5 days | ~20 days |
| **Shipping cost** | $0.5/mmbtu | $2/mmbtu |
| **Choking point** | No | Malacca straight (Pirates/Tanker congestion) |
| **Distance** | ~1500 km | ~15-6000 km (Qatar to Korea/Japan) |

***Table 6. Sakhalin II LNG and LNG from Middle East***
*Source:* ***IEA, (2014), The Asian Quest for LNG in a Globalizing Market, International Energy Agency.*** *Available at: https://www.iea.org/publications/freepublications/publication/PartnerCountrySeriesTheAsianQuestforLNGinaGlobalisingMarket.pdf [Accessed 20 February 2016];* ***Harada, D. (2014), Updating Russian Crude Status in Japan Rising LNG Projects Targeting Asia Pacific Market, Japan Oil, Gas, and Metals National Corporation, 17 April.*** *Available at: http://www.assoneft.ru/anons/Harada.pdf [Accessed 20 February 2016].*

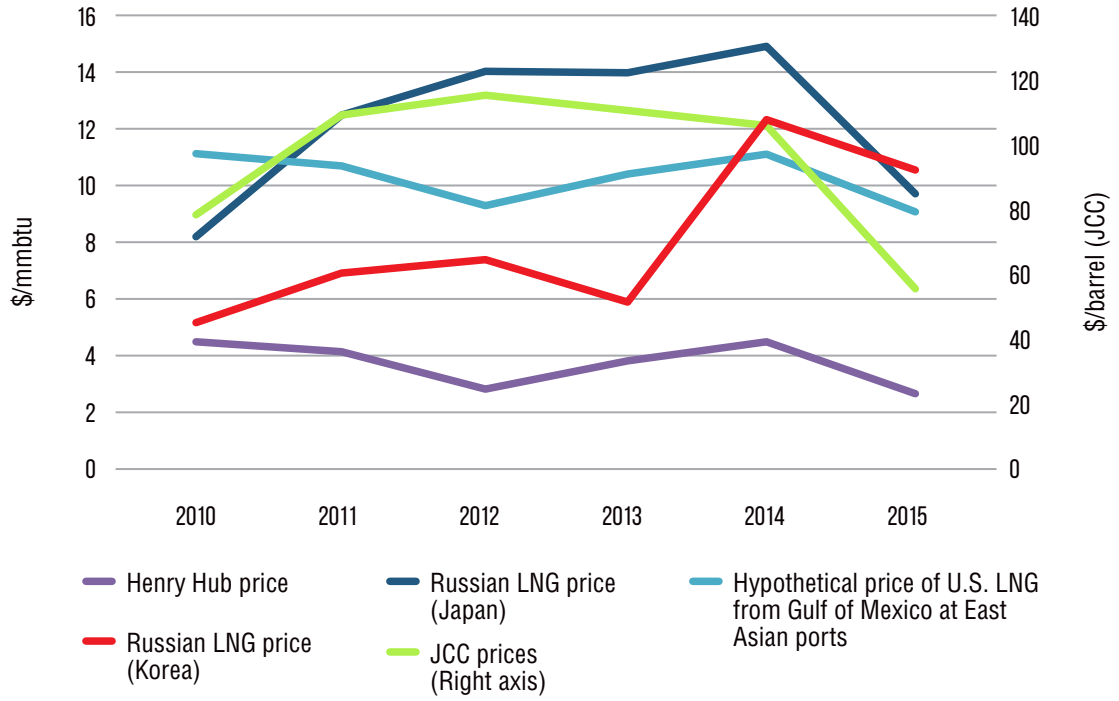


***Figure 4. Price-competitiveness of Russian and American LNG in Japan and Korea***
*Source:* ***Trade statistics, Korea Customs Office; Trade statistics, Ministry of Finance Japan modified by author; Petroleum Association of Japan, Oil import price; EIA, Natural gas price.*** *Data and statistics are modified by author.*

| Price | Price competitiveness of Russian LNG (JCC indexed LNG) | Price competitiveness of American LNG |
|---|---|---|
| **JCC ↗** | ↘ | ↗ |
| **JCC ↘** | ↗ | ↘ |
| **Henry Hub ↗** | ↗ | ↘ |
| **Henry Hub ↘** | ↘ | ↗ |

***Table 7. Price-competitiveness of LNG with crude oil and Henry Hub indexation***
*Source: Author's analysis.*

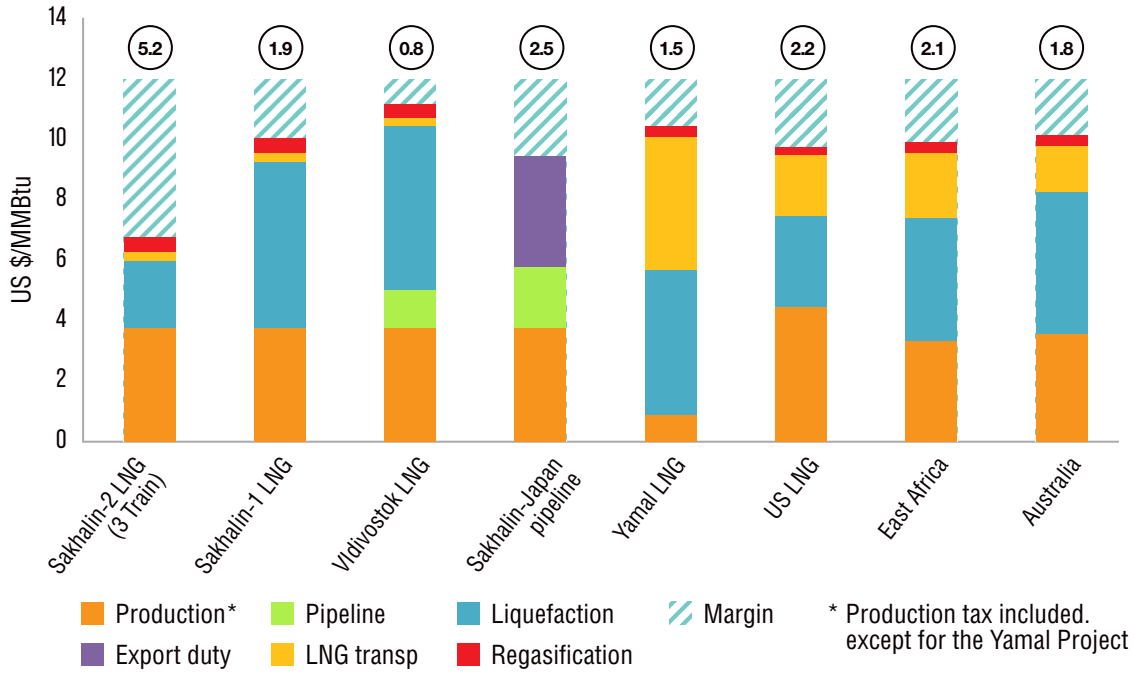


***Figure 5. Breakeven price of global LNG projects***
*Source:* ***Complied by ERI and IEEJ, based on various sources; Energy Research Institute of the Russian Academy of Sciences, (2014), A New Option for Russia's Gas Supply to Japan, ERIRAS, 16 May.*** *Available at: http://www.eriras.ru/files/A_New_Option_for_Russia-s_Gas_Supply_to_Japan.pdf [Accessed 20 February 2016].*

Planned Russian LNG projects in the Far East have a lot of merits such as lower transportation costs to major buyers such as Japan, South Korea, China and Taiwan. Shorter shipping days to buyers will make them more competitive in comparison with other exporters. Another advantage of Sakhalin LNG is that tankers do not have to pass so-called "choke points" such as the Malacca and Hormuz straits which are at times politically charged and heavily congested with tanker traffic.

The light blue line of Figure 4 shows Henry Hub prices between 2010 and 2015 translated into possible American LNG DES[24] prices to East Asian countries according to pricing formula of the Sabine Pass LNG export contract with KOGAS. Sakhalin II LNG prices for Japan are in line with the JCC price movement as the price of Sakhalin LNG is indexed to crude oil prices and Henry Hub prices and American LNG indexed to Henry Hub prices are moving independently. During lower JCC prices and a higher Henry Hub price period (year 2010), prices of Russian LNG to Korea/Japan were lower than American LNG calculated by the Sabine Pass LNG pricing formula for the KOGAS contract.[25] As the JCC price moves upwards and Henry Hub prices downwards, possible American LNG prices gradually became lower than Russian LNG in 2011 and 2012. In 2013, the JCC[26] remained slightly lower than in 2012 and Henry Hub prices higher. However, increased Japanese spot imports due to suspension of nuclear reactors in Japan have raised LNG import prices, which made Russian LNG prices for Japan move not in line with JCC prices in 2013. Russian LNG prices to Korea maintained low levels until 2013 because long term LNG prices between Gazprom and Kogas were fixed at $3.5/mmbtu ($98/bcm).[27] However, it is difficult to be used as a reference for future contracts as it is unlikely such a condition will be repeated. It is not exactly known what caused the price hike of Russian LNG to Korea in 2014 and 2015. It is believed to be a result of price renegotiation between KOGAS and Sakhalin Energy or the influence of higher spot LNG im-

24 *Destination*

25 ***Sabine Pass LNG price formula for LNG export to Korea Gas Corporation*** *P (LNG) = Henry Hub price * 115% + fixed capacity fee ($3/mmbtu) [18] + transportation fee to Korea/Japan via Panama canal ($3/mmbtu);* ***Rogers, H., Stern, J. (2014), Challenges to JCC Pricing in Asian LNG Markets, Oxford Institute for Energy Studies, February.*** *Available at: http://www.oxfordenergy.org/wpcms/wp-content/uploads/2014/02/NG-81.pdf [Accessed 20 February 2016].*

26 *Japan Crude Cocktail: Average crude oil import price of Japan*

27 ***Revenkov, V. (2013), Prices for Russian LNG to South Korea unreasonably low, Gasweek via Institute for Economics and Finance, 9 October.*** *Available at: http://www.fief.ru/analytic/read.209.htm [Accessed 20 February 2016].*

port prices. Considering spot LNG prices remained below $10/mmbtu throughout 2015, it is believed that there has been pricing renegotiation between the two parties.

Despite the shocking price fall of the JCC from $105/barrel in 2014 to $56/barrel in 2015, possible annual average of U.S. LNG prices in Korea and Japan were slightly lower than Russian LNG prices. It is a result of very low Henry Hub prices, which decreased from $4.37/mmbtu in 2014 to average $2.62/mmbtu in 2015. Although it is expected that the Henry Hub price will rise due to the large volume of LNG export and pipeline export to Mexico, however, it is difficult to predict by how much. At a Henry Hub price level of $3/mmbtu, Russian LNG as well as LNG indexed to the JCC will require prices below $60/barrel to be competitive with U.S. LNG.

Despite huge volumes of planned LNG export projects around the world, few anticipate that all of the planned projects will be realized. Projects that cannot find long-term buyers will have to cancel or delay their projects. Under the current market situation with lower oil prices and increased competition, long term contract LNG prices as well as spot LNG prices plummeted at the end of 2014. The realization of LNG projects will depend on whether project development costs are low enough to maintain profitability with lower LNG price market environments and projects can be constructed in time to meet the buyers demand. According to Figure 5, researched by ERI RAS and IEEJ, the Sakhalin II expansion project requires the lowest break-even price among Russian projects, which is in the region of $6.8/mmbtu as expanding production capacity costs less than building a new plant. Project costs of Vladivostok LNG turned out to be the most expensive with a breakeven price at around $11.2/mmbtu. Current trends of lower LNG prices and growing competition are posing bigger risks for LNG project developers. Shell decided to abandon their Arrow LNG project in Australia[28] and Gazprom is looking at possibilities of dropping Vladivostok LNG and instead supplying more pipeline gas to China.[29] The future of the Sakhalin I LNG project by Rosneft also looks unclear due to combined factors of low international gas price and high development cost. Gazprom and Shell have agreed to expand Sakhalin II LNG,[30] however the Sakhalin II expansion plan may face delays and at the time of writing as it was included in the list of economic sanctions.[31]

## CONCLUSION

The Asia Pacific market had been the fastest growing LNG market with the highest prices in the world. Large price differentials between Asian markets and others together with growing demand motivated countries such as Russia, Australia, US/Canada and Mozambique/Tanzania to join the race for the lucrative market. However, as soon as the new wave of LNG projects was introduced into global market, Asia Pacific LNG markets stopped expanding and prices began to plummet as a result of oversupply and the oil price fall beginning from the second half of 2014. Price risks are posing problems on the profitability of projects that have high development costs.

Russian LNG projects have a clear advantage over their competitors. The location of projects in the Russian Far East makes them the closest LNG producers to major LNG importers in the world. Prices of Sakhalin LNG maintained reasonable levels for Japan when LNG prices to Japan skyrocketed after the Fukushima disaster and due to high oil prices. Transportation routes from Russia to the East Asian countries don't include choke points such as the Malacca Strait where there is tanker traffic congestion. Sakhalin LNG has a price advantage over its competitors from the Middle East and Australia thanks to low transportation costs. The oil price collapse made Russian LNG price-competitive with Henry Hub indexed U.S. LNG, a potent newcomer in the market. The fact that Sakhalin LNG has been

28 ***Wilkinson, R. (2015), Shell cancels Arrow LNG project, Oil and Gas Journal, 30 January.*** *Available at: http://www.ogj.com/articles/2015/01/shell-cancels-arrow-lng-project.html [Accessed 20 February 2016].*

29 ***TASS, (2014), Gazprom: exporting pipeline gas to China can be an alternative to Vladivostok LNG project, TASS, 10 October.*** *Available at: http://tass.ru/en/russia/753851 [Accessed 20 February 2016].*

30 ***Golubkova, K. (2015), Update 1-Gazprom, Shell agree to expand Sakhalin-2 project, Reuters, 18 June.*** *Available at: http://uk.reuters.com/article/gazprom-sakhalin-shell-idUKL5N0Z42Y220150618 [Accessed 20 February 2016].*

31 ***Pinchuk, D., Golubkova, K., (2015), U.S. sanctions put Gazprom-Shell alliance plans in jeopardy, Reuters, Reuters, 10 August.*** *Available at: http://uk.reuters.com/article/uk-russia-crisis-sanctions-gazprom-idUKKCN0QF1LU20150810 [Accessed 20 February 2016].*

selling more than its production capacity each year proves that it is one of the preferred suppliers for buyers.

While Russian LNG projects have their clear merits, they are not without problems. Except Yamal LNG, which is already under construction, other LNG projects under planning such as the Sakhalin II LNG expansion, Sakhalin I and Vladivostok LNG have been facing lengthy delays for various reasons.

It is anticipated that the Asia Pacific market will stay oversupplied and price will not return to previous levels in the region of $15/mmbtu for the foreseeable future. The launch of the Power of Siberia pipeline to China and the completion of restarts of nuclear reactors will clear market uncertainty and considering the prevailing unfavorable market situation with oversupply and stagnating demand, it is believed that there will be more opportunities for projects with higher development costs such as Vladivostok LNG and Sakhalin I going forward into the 2020's. However, the Sakhalin II expansion project will have fewer difficulties to find buyers as it has very low development costs and has established itself as one of the successful projects and most reliable suppliers.

**Jinsok Sung**

*Researcher and PhD candidate at Gubkin Russian State University of Oil and Gas. Jinsok's doctoral dissertation is titled "Gas pricing system in Asia Pacific market: influence of Europe and USA". Jinsok had previously worked at the Gazprom Institute on Yamal Peninsula (2011) and at the Moscow office of Japan Oil, Gas, Metal Corporation JOGMEC (2012).*

***Address for correspondence:***
*jinsok.sung@gmail.com*

EUROPEAN UNIVERSITY AT ST. PETERSBURG

**European University at St. Petersburg**
**International Office**

3 Gagarinskaya street, St. Petersburg, Russia
**Tel.:** +7 812 386 7648
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# YAMAL LNG: THE IMPLICATIONS OF THE SANCTIONS REGIME

***Patrick Osborne***

**Abstract**

*The sanctions regime led by the U.S. and E.U. against Russia has stalled many oil and gas projects. This paper will analyze the Yamal LNG project, led by Novatek, one of Russia's few independent producers. The Yamal LNG project plays a role in four key developments in Russia's gas strategy: development of the extensive reserves on Russia's Arctic shelf, motivations to develop LNG exports, Russia's efforts to 'pivot' to Asia, and growing competition between independent producers and the traditional exporter Gazprom. Access to financing and technology combined with low oil prices have significantly affected its development. This paper analyzes the effects of sanctions on Yamal LNG and argues that sanctions have postponed the project, while the largest challenges are presented by the inefficiency of the Russian energy sector. The paper was written as part of the ENERPO Research Internship program.*

**Key words:** Yamal; Russian LNG; Novatek; Gazprom; Arctic; pivot to Asia; sanctions.

At the beginning of 2016, Russia is still under a sanctions regime introduced by the Western powers following the outbreak of the Ukrainian crisis. The sanctions regime, coupled with overall stagnation trends that were apparent already throughout 2013-2014, has had wide-ranging effects on Russia's oil and gas industry. This paper will look at the sanctions regime's effect in one particular case: the Yamal LNG project.

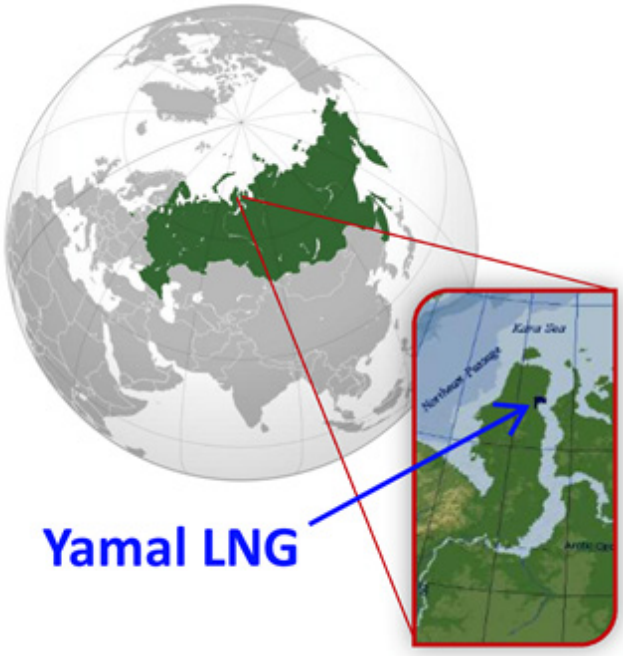


***Figure 1. Yamal LNG geographical location***
*Source:* ***Persily, L. (2013), Politics as much at play as economics for Russian LNG, Alaska Natural Gas Transportation Projects – Office of the Federal Coordinator, 8 July.*** *Available at: http://www.arcticgas.gov/politics-much-play-economics-russian-lng [Accessed: 23 February 2016].*

The Yamal LNG project is an important case: not only does it illustrate the implications of sanctions in the energy sector in general, but it also allows us to have a closer look at the past, present, and potential future organizational structures of the Russian LNG industry. One of the important aspects is that Yamal LNG is developed by Novatek, one of Russia's independent producers (i.e. 'non-Gazprom producers'), and its developments can demonstrate the evolving role of non-Gazprom players in Russia, and specifically their access to global natural gas markets.

The Yamal Peninsula is located in the Yamal-Nenets autonomous district of Northwest Siberia. There are significant hydrocarbon resources located on and around Yamal Peninsula; however the area is largely underdeveloped creating a need for permafrost structural development and expansion of pipeline infrastructure. Gazprom, Russia's "national champion" gas company has significant reserves in the Yamal Peninsula and is developing the project with long-term plans to exploit the vast natural gas reserves.

Concurrently, Russia's largest independent gas company, Novatek is developing an LNG export project on the peninsula (Figure 1).

Yamal LNG is one of the major projects of Novatek (the others being the development of the Gydan Peninsula and the Gulf of Ob, through new licenses acquired).[1] Novatek's Yamal-LNG is a strategic project, which enjoys support by the Russian government. The project incorporates gas field development, as well as the LNG export facility construction.

## OVERVIEW OF THE PROJECT

The South Tambeiskoe field on Yamal Peninsula will provide the gas for the Yamal LNG project[2] (Figure 2). The shareholder structure of Yamal LNG after the 2015 deal between Novatek and China's Silk Road Fund (SRF) is as follows: Novatek (50.1%), Total S.A. (20%), CNPC (20%) and SRF (9.9%). The agreement with CNPC was signed back in June 2013, and it is the reason why financial support from the Chinese banks possible. Chinese involvement not only promotes the project financing, but also attends to factory construction and other industrial chain support.[3]

Moreover, in October 2013, the purchase agreement for the sale of not less than 3 mtpa of LNG to CNPC from the project was confirmed. The two parties signed an outline agreement of LNG purchase and sale, 300 million tons for 15 years.

Novatek has been actively marketing its future output from the Yamal LNG project, where potential production of up to 16.5 mtpa is expected to come online in three

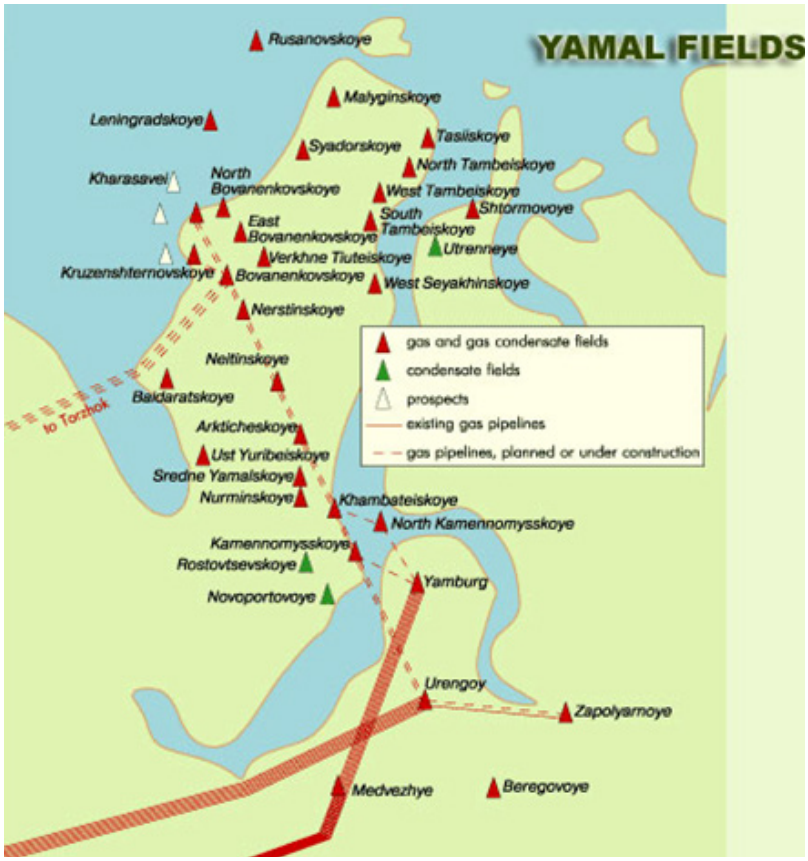


***Figure 2. Yamal fields***
*Source:* ***Rigzone (2005), Gazprom to Bring Bovanenkovskoye & Kharasaveiskoye Onstream in 2008.*** *http://www.rigzone.com/news/image_detail.asp?img_id=2382&a_id=24471 [Accessed: 23 April 2016].*

1 ***Novatek (2014), History, OAO Novatek.*** *Available at: http://www.novatek.ru/en/about/general/history/ [Accessed: 23 February 2016].*

2 ***Stern, J., Henderson, H. (2014), The Dynamics of Gazprom's Future Strategy. in Henderson, J., Pirani, S. The Russian Gas Matrix: How Markets are Driving Change.*** *Oxford University Press, Oxford Institute for Energy Studies. pp. 265-267.*

3 ***Zhen, W. (2015), Sino-Russian Energy Cooperation: Challenges and Opportunities.*** *Presentation – International Energy Center Conference, 2 October.*

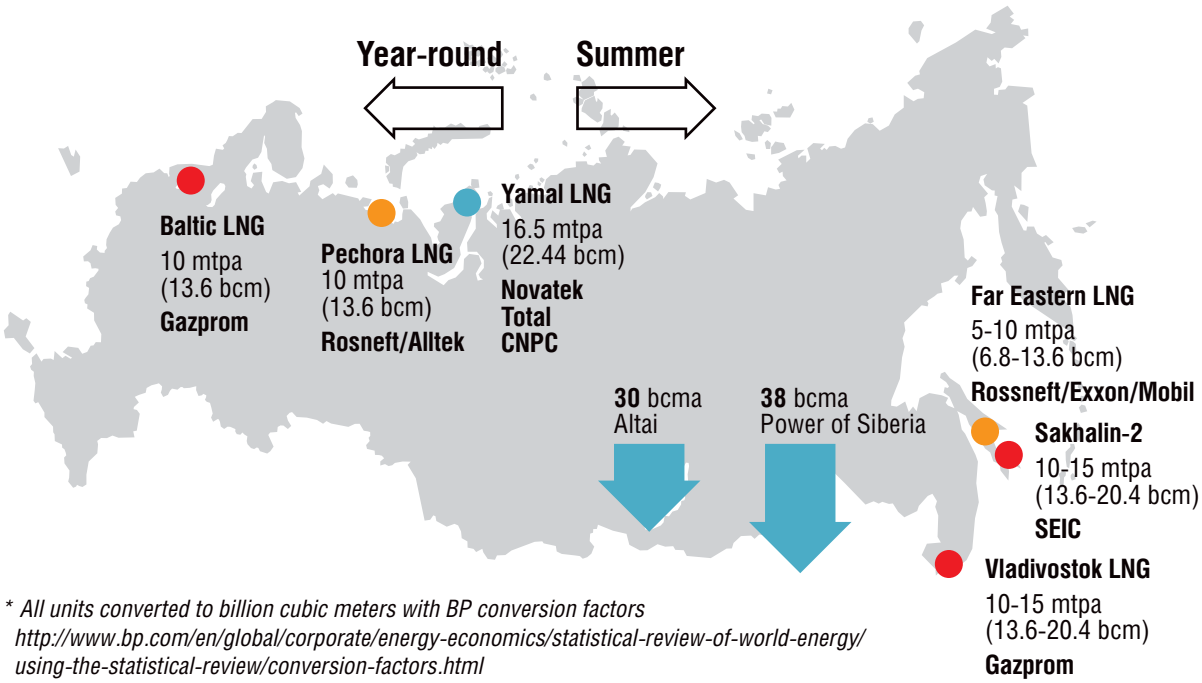


***Figure 3. Yamal LNG and other Russian LNG projects***
*Source: **Asia Pacific Foundation of Canada, (2015), Russia as a Natural Gas Supplier to the Asia-Pacific Region: A Conversation with Dr. Michael Bradshaw, 12 January.** Available at: https://www.asiapacific.ca/blog/russia-natural-gas-supplier-asia-pacific-region-conversation [Accessed: 23 February 2016]*

stages from 2017 onward, and LNG exports to Asian markets have been important for Yamal LNG moving forward (Figure 3). Overall, Novatek has secured sales of up to 92.5% of the Yamal volumes, including deals with India and various trading companies.[4]

The construction of 16 ice-class LNG tankers will be undertaken by Daewoo Shipbuilding of Korea, with financing to be provided by third-party shipping companies chosen by Yamal LNG.[5]

Importantly, the Asian dimension is not the only factor determining the perspectives of Yamal LNG. As noted by Henderson and Mitrova, "the majority of the LNG from Yamal will be travelling west to Europe rather than east to Asia, as the weather conditions in the Northern Passage mean that LNG can travel to China during only five months of the year".[6]

The importance of the Yamal LNG lies in several dimensions. Firstly, Yamal developments are central in developing the Arctic regions of Russia. Secondly, it is a major step in the implementation of Russia's Asian gas export strategy as well as LNG strategy. And finally, Yamal LNG is one example of evolving competition between Gazprom and non-Gazprom players in Russia (in this case, Novatek), both domestically and internationally.

## THE PLACE OF YAMAL LNG IN RUSSIA'S GAS STRATEGY

**The role in Arctic developments.** The Yamal peninsula and Novatek's LNG project are important to the ongoing development of the Russian economy. In a 2008 Ministry of Finance report, the North accounts for 20% of Russia's GDP and 22% of all Russian exports.[7] With the Arctic in context to the Russian economy, projections indicate that a sizable portion of the world's remaining undiscovered reserves of oil and gas are in the circumpolar Arctic. In 2011, it was reported that 25% of Russia's exports and 14% of GDP comes from its Arctic North. By 2020, the Russian government aims to further increase that start, into the country's foremost base for natural resource development.[8]

4 ***Henderson, J., Mitrova, T., (2015), The Political and Commercial Dynamics of Russia's Gas Export Strategy,*** *The Oxford Institute for Energy Studies, September. Available at: http://www.oxfordenergy.org/wpcms/wp-content/uploads/2015/09/NG-102.pdf [Accessed: 23 February 2016] p. 71.*

5 ***Henderson (2014)*** *p. 323.*

6 ***Henderson, Mitrova (2015)*** *p. 70.*

7 ***Wilson-Rowe, E., (2009), Introduction: Policy Aims and Political Realities in the Russian North.*** *In: Wilson-Rowe, E. ed., (2009) Russia and the North. University of Ottawa Press. p. 1.*

8 ***Zysk, K., (2011), Military Aspects of Russia's Arctic Policy: Hard Power and Natural Resources.*** *In: Kraska, J. ed., (2011) Arctic Security in an Age of Climate Change. Cambridge University Press. p. 95.*

Overall, Yamal LNG is the leading project in the Russian Arctic, and its success will unlock access to the natural gas reserves of the Russian Arctic. The development of ice-class carriers is a major development, which can have implications for other projects in the region (e.g. Arctic LNG). Exports from this facility most importantly will open a new LNG sea transport route to Asia.

**The role in Russia's Asian gas export strategy.** Russia's Eastern gas strategy goes all the way back to the 1990ies, but currently Asian exports do not play a major role in Russia's overall natural gas exports. Asian direction is important because of the need of diversification of the market (to cope with the effects of strong dependence on the European market, which currently is not growing and where niche for natural gas is actually narrowing), and because of the need of development of Russia's eastern regions through, among other things, development of gas pipeline network.

Russia's overall attention to the eastern direction is justified by the fact that there is little hope for any significant export growth in the European market. Still, as noted by Tatiana Mitrova in her 2016 report, the Asian exports are unlikely to have potential for growth to replace the European market. "Until the mid-2020ies, eastward oil and gas exports will not be able even to replace lost exports to Europe. Even in the long term, with supply volumes to Asia growing steadily, neither absolute volumes nor Russian market share in Asia are likely to come close to levels already reached in the Eastern markets".[9]

The significance of Yamal LNG in this respect is that it would allow for increase of export volumes in the Asian direction, as well as serve as the cooperation platform for Novatek and its Asian counterparts.

**The role in Russia's LNG strategy.** There are several reasons for the Russian government to pay specific attention to the development of LNG exports.[10]

- They would allow the increase of overall export volumes.
- The implementation of the LNG strategy leads to the geographic diversification of exports, since LNG supplies are characterized by flexibility of routes, as opposed to pipeline.
- There are no transit risks associated with LNG supplies as well as a possibility to control the entire route to the regasification plant (a form of vertical integration).
- LNG allows exporter to arbitrage (or make profit based on the price differential between various regional markets); the key to this arbitrage role is capability to physically supply various markets as well as re-direct the supplies.

Yamal LNG takes a prominent role since it would definitely allow Russia in reaching the above objectives. Moreover, it allows for the development of the Arctic region (and development of the Arctic as well as the Far East are priorities in regional development programmes), goes hand in hand with the development of the Northern Sea route (which has wider implications for interregional trade flows than just LNG), as well as securing Russia's position in the Arctic and the Asia Pacific.

## COMPETITION BETWEEN GAZPROM AND THE INDEPENDENTS

Natural gas production in Russia is still for the most part carried out mainly by Gazprom, but with the increasing involvement of other companies (primarily Novatek and Rosneft) over time. The responsibility for gasification has increasingly shifted towards them.[11] Gazprom is still a monopolist when it comes to exports. Novatek, historically cooperating with Gazprom to a large extent, is now in a position to developing into Gazprom's competitor within Russia's gas production network.

There are two major implications from Novatek's activities. Firstly, it is already posing stronger competition to Gazprom

9 ***Mitrova T., (2016), Shifting Political Economy of Russian Oil and Gas. CSIS.*** *Available at: http://csis.org/files/publication/160323_Mitrova_RussianOil-Gas_Web.pdf [Accessed: 23 April 2016] p. VIII.*

10 ***Mitrova T., (2015), Russian pipe gas VS LNG.*** *Presentation at Global LNG. Singapore, 10 February.*

11 ***Mitrova, T., (2014), The Political and Economic Importance of Gas in Russia, in Henderson, J., Pirani, S., The Russian Gas Matrix: How Markets are Driving Change.*** *Oxford University Press, Oxford Institute for Energy Studies. p. 20.*

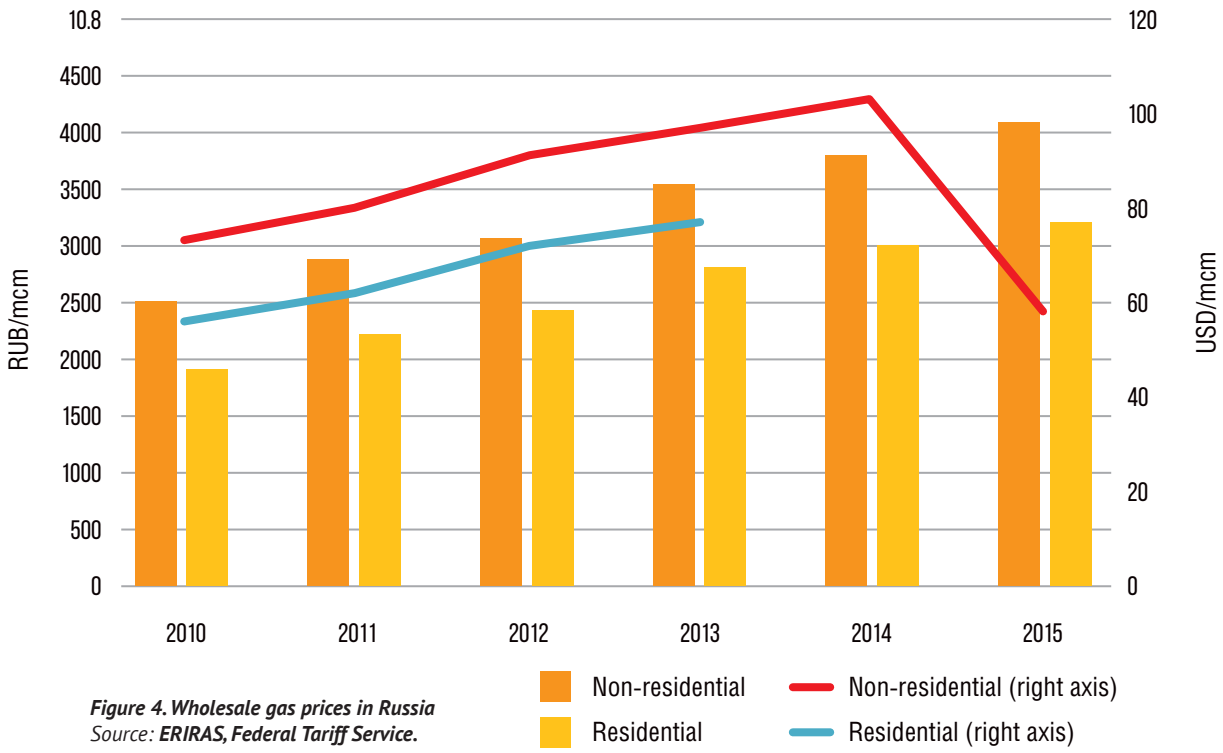


***Figure 4. Wholesale gas prices in Russia***
*Source:* ***ERIRAS, Federal Tariff Service.***

in the domestic market. Secondly, Novatek has a chance to enhance its role as Gazprom's competitor in the external markets as well.

**Domestic competition.** Novatek and Rosneft, as the two largest independents, managed to gain larger share in Russia's domestic natural gas market. They historically have had limited potential due to such factors as insufficient access to trunk pipeline system, low domestic gas prices, and lack of direct access to gas consumers. In the past years, the conditions have changed however, with independents gaining access to pipelines (pipeline system owned and operated by Gazprom, tariffs set by the Federal Tariff Service, but since 2009 other companies are guaranteed access to the network) as well as end consumers domestically. The price levels have also played in favor of the independents: Gazprom's sales price in the domestic market are regulated by the Federal Tariff Service, while non-Gazprom suppliers can price their gas themselves, but regulated price serves as the benchmark. As regulated prices increased sufficiently by 2012-2013 (Figure 4), by 2012 the independents received an opportunity to cover their costs and sell gas below Gazprom's regulated prices (Figure 5), therefore regulated price began to play a ceiling rather than floor.

Overall, these factors added to the active marketing strategies of both Novatek and Rosneft has led to the increase in their share in Russia's natural gas production as well as their share in the domestic market (Figure 6).

**International competition.** Gazprom is facing competition from its domestic counterparts for the right to sell gas into the world's fastest growing energy economy, i.e. China.[12] This is evident in the legal changes that have taken place in the last decade in Russia that have seen the rise of the independents, and the contracts that have been negotiated considering Sakhalin I LNG (Rosneft) and Yamal LNG (Novatek), and is evident in the Russian government approving the bill on LNG export liberalization.[13] According to the bill, those projects with an LNG plan written into the licensing agreement (Novatek's Yamal LNG project) could export their output, as well as projects involving an

12 ***Priddy, B., (2013), Novatek Eyes Big Role in Russian LNG Exports to China as Sechin Seeks Market Liberalization. Oil and Gas Eurasia.*** *Available at: https://www.oilandgaseurasia.com/en/news/novatek-eyes-big-role-russian-lng-exports-china-sechin-seeks-market-liberalization [Accessed: 18 May 2015] and* ***Henderson, J., (2014), Asia: A Political New Outlet for Russian Pipeline Gas and LNG, in Henderson, J., Pirani, S., The Russian Gas Matrix: How Markets are Driving Change.*** *Oxford University Press, Oxford Institute for Energy Studies. p. 216*

13 ***Reuters, (2013), Russian government committee approves LNG exports liberalization.*** *Reuters. 29 October. Available at: http://www.reuters.com/article/2013/10/29/russia-lng-exports-idUSL5N0IJ19U20131029 [Accessed 18 May 2015].*

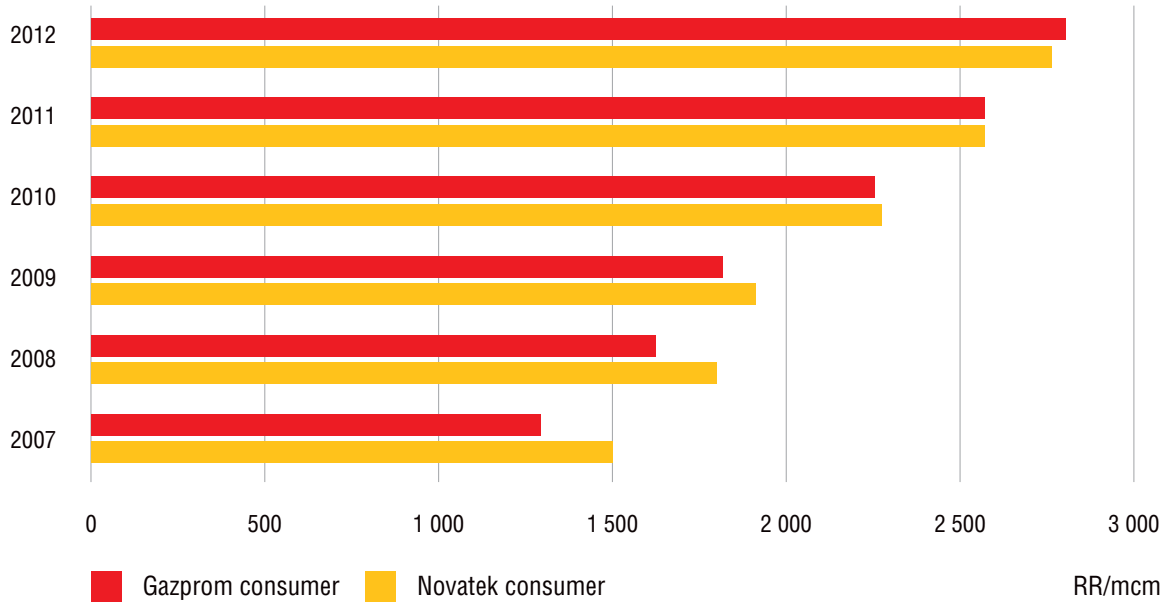


***Figure 5. Comparison of Gazprom and Novatek gas sales prices***
*Source:* ***Henderson, J., Pirani, S., Yafimava, K. (2014), Russia's Domestic Gas Market Development, Prices, and Transportation, in Henderson, J., Pirani., S., The Russian Gas Matrix: How Markets are Driving Change.*** *Oxford University Press, Oxford Institute for Energy Studies.*

offshore gas field operated by a state-controlled company (Rosneft's proposed Sakhalin I LNG scheme, called the Far East LNG) could sell gas overseas in liquid form.[14] Thus, Gazprom's monopoly over exports has been undermined in the LNG market, where even its own plans have not come to fruition while the government has increased its support for alternative Russian options.[15]

Yamal LNG may take Novatek to the next level, allowing it to turn into a global player in natural gas markets, as opposed to a company with only activities within Russia.

Novatek is planning to export not only to Asia but also to Europe, thus stepping into Gazprom's main export market. Novatek is certainly positioning itself for sales of Yamal LNG into the European market, as evidenced by its October 2013 agreement to sell 2.5 mtpa to Gas Natural of Spain.[16]

There is effectively a gas bubble in Russia, meaning Russian companies are very eager to find new markets for its output.[17] A new source of exports in Asia could provide an important commercial and geopolitical bargaining chip with traditional customers in the West and their respective governments.[18] Russia has emerged as a potential exporter of up to 68 bcm of gas via pipeline plus further LNG cargoes from Yamal LNG and Sakhalin.[19]

There are four core reasons why Yamal LNG is crucial to this story. Firstly, the development of this project falls into Russia's strategy of developing the Arctic and the Northern Sea route. Secondly, it is an important stone in LNG strategy, where new players are emerging with the core aim to strengthen Russia's presence in the LNG markets worldwide. Thirdly, Yamal LNG, although being directed at various destinations, still plays a role in Russia's Asia strategy. And finally, it evidences the rise of non-Gazprom producers in Russia, but takes one of them – Novatek – potentially into the league of international players, thus providing for competition not only in Russian domestic gas market, but also in various international markets.

## HOW HAVE SANCTIONS AFFECTED THE YAMAL LNG PROJECT?

Russia is highly vulnerable to a global slowdown and especially low oil prices. The energy sector in Russia accounts for about 25% of GDP, nearly half of government revenues,

*14* ***Henderson, Mitrova (2015)*** *p. 67.*
*15* ***Henderson, Mitrova (2015)*** *p. 22.*
*16* ***Henderson (2014)*** *p. 324.*
*17* ***Henderson, Mitrova (2015)*** *p. 6.*
*18* ***Henderson, Mitrova (2015)*** *p. 7.*
*19* ***Henderson, Mitrova (2015)*** *p. 14.*

| US Sanctions | EU Sanctions: |
|---|---|
| 1. Wider list of companies, including gas companies<br>2. Specify what projects can be considered deep-water<br>3. Limit transfer of software for deep-water, Arctic and shale oil projects<br>4. Documents:<br>• *Russian Oil Industry Sanctions and Addition of Person to the Entity List*<br>• Office for Foreign Assets Control. *Sectoral Sanctions Identification List*. September 12, 2014.<br>• Bureau of Industry and Security. Export Administration Regulations: Supplement No. 4 to Part 744 – Entity List. September 18, 2014. | 1. Since March 17, 2014 – nine packages of sanctions<br>2. Individuals and entities<br>3. General measures against energy, financial and defense sectors<br>4. Include restrictions on financing and supplies of equipment and technology according to the license regime<br>5. Documents:<br>• *Council regulation (EU) No 833/2014 of 31 July 2014*<br>• *Council regulation (EU) No 960/2014 of 8 September 2014* |

***Table 1. Summary of sanctions***
*Source:* ***Mironova, I. (2014), Russia: Still-life Under Sanctions. European Energy Review. 20 November.***
*Available at: http://europeanenergyreview.eu/site/pagina.php?id=4278 [Accessed 25 January 2015].*

and about 70% of export revenues.[20] The financial and economic crisis of 2008 emphasized the extent to which Russia is dependent on revenues from oil and gas exports specifically in the European direction, forcing it to rethink its Energy Strategy. Measures were introduced to support the expansion of gas and LNG supply to the North East Asian markets, including China.

The imposition of sanctions following the deterioration of political relations with the EU have accelerated attempts by the Russian government to consolidate relationships with its Eastern partners.

The combined effect of sanctions and the slide in the oil price has had a negative impact on the Russian economy. Lower export revenues, increased capital outflow, and interruption in international lending have led to a liquidity crisis in foreign exchange and a sharp decline in the value of the ruble. This in turn has led to an estimated cost on the Russian economy of USD 100 billon, caused by the decline in oil prices and USD 40 billion in relation to sanctions themselves.[21]

Sanctions and their impact on future production were put into action in the context of an expected decline on onshore production after 2020, which led the US and EU sanction authorities to focus on Arctic offshore and tight oil projects, requiring advanced technology, international experience and financing. There were also implications for the gas sector, albeit much more pronounced in the US package. Overall, US and EU sanctions restrict access to financing and designated technology and services.

Table 1 summarizes the sanctions introduced against Russian companies by the US and the EU.

The US and the EU sanctions differ in scope, but both packages hit the segment of the Russian energy sector that is critical for its future growth – new technologically complex upstream projects – by limiting financing and technology transfer.

The analysis below studies the implication of sanctions to the case of Yamal LNG.

**Access to capital.** Sanctions are hindering access to capital by:

1. US controls: Prohibition on US Persons "transacting in, providing financing for, or otherwise dealing in new debt of longer than 90 days maturity for the listed persons, their property, of their interests in property" after

20 ***ABN AMRO Bank, (2014), Russia Watch – An Energy Driven Olympic Giant, Group Economics Emerging Markets and Commodities, 21 January.*** *Available at: https://www.abnamro.com/en/images/035_Social_Newsroom/040_Blogs/Hans_van_Cleef/2014/Files/Russia_Watch_2014.pdf [Accessed 23 February 2016] p. 4.*

21 ***Mirror Weekly, (2014), Minister: Russia to lose $140 billion a year from sanctions and cheap oil. 24 November.*** *Available at: http://mw.ua/ECONOMICS/minister-russia-to-lose-140-billion-a-year-from-sanctions-and-cheap-oil-515_.html [Accessed 23 February 2016].*

the date of their designation.[22]

2. EU controls: "Authorization required for provision by an EU entity of financing or financial assistance related to the items referred to in Annex II, for any sale, supply transfer or export of those items, or for any provision of related technical assistance for their use in Russia". Plus, the Operator and its EU registered sharholders must obtain authorizations from the competent authorities of their EU member state to provide such financing and financial assistance.[23]

Rosneft, Novatek, Transneft and Gazprom Neft were listed in September 2014 on the US sanctions list. This applies to entities owning 50% or more by these companies.

The Yamal LNG project was directly affected by the US package, since the majority owner in the project is Novatek. Sanctions have increased the cost of borrowing from the United States and the European and Asian markets, "since the institutions in these regions are also very cautious toward dealing with Russia and they are ready to take a risk only at a high price. If previously companies were able to attract financing at an interest rate of 4-5%, now they can borrow only at rates closer to 12-13%".[24]

It was initially planned that 30-40% of investment capital for Yamal LNG will be provided by the shareholding parties, and the rest will be provided by project financing. Back in 2013, the parties which were expected to provide financing besides Russian and Chinese banks included Arab funds, the US-based Export-Import bank, and European banks (including French). After Novatek was included in the sanctions list, the negotiations centered on the Chinese partners (China Development Bank, China Exim Bank etc.). It was announced that the Russian parties involved would include Sberbank, Gazprom Bank and Vneshekonombank. Problems appeared in getting funding from the French banks, since the French side would like to have guarantees that they will not suffer from their activities in relation to the Yamal LNG project.[25]

Overall, access to financing is one of the major difficulties now for Novatek, but parties seem to be finding ways to overcome these difficulties. Importantly, EU sanctions did not include Novatek and thus European partners.

**Access to technology.** Sanctions are hindering access to technology by:

1. US export controls: Prohibits US Persons from "the provision, exportation, or re-exportation, directly or indirectly, of goods, services, or technology in support of exploration or production for deep-water, Arctic offshore, or shale projects that have the potential to produce oil in the Russian Federation, or in maritime area claimed by the Russian Federation and extending from its territory, and that involve any person determined to be subject to this Directive, its property, or its interests in property".[26]
2. EU export controls: Prior authorization required for the sale, supply, transfer or export, directly or indirectly, or items as listed in Annex II, whether or not originating in the EU, to any natural or legal person, entity or body in Russia, including its Exclusive Economic Zone and Continental Shelf or in any other State, if such items are for use in Russia , including its Exclusive Economic Zone and Continental Shelf.[27]

Competent authority shall not grant authorization for any sale, supply, transfer or export of the items included in Annex II if they have reasonable grounds to determine that the sale, supply, transfer or export of the items are destined for the following categories of exploration and production projects in Russia:

22 ***US Department of Treasury, (2014), Directive 2 of Executive Order 13662, Office of Foreign Assets Control, 12 September.*** *Available at: https://www.treasury.gov/resource-center/sanctions/Programs/Documents/eo13662_directive2.pdf [Accessed 23 February 2016].*

23 ***Official Journal of the European Union, (2014), Article 4(3)(b) of Reg. 833, Council Regulation (EU) No 833/2014 concerning restrictive measures in view of Russia's actions destabilizing the situation in Ukraine, 31 July.*** *Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2014_229_R_0001 [Accessed: 23 February 2016].*

24 ***Mitrova (2016)*** *p.10.*

25 ***Todorova M., (2016), French Banks will Finance Yamal LNG. Vedomosti, 25 January.*** *https://www.vedomosti.ru/business/articles/2016/01/25/625424-frantsuzskie-yamal-spg [Accessed 23 February 2016].*

26 ***US Department of Treasury, (2014), Directive 4 of Executive Order 13662, Office of Foreign Assets Control.*** *12 September. Available at: https://www.treasury.gov/resource-center/sanctions/Programs/Documents/eo13662_directive4.pdf [Accessed: 23 February 2016].*

27 ***Official Journal of the European Union, (2014), Article 3 (1) of Reg. 833, Council Regulation (EU) No 833/2014 concerning restrictive measures in view of Russia's actions destabilizing the situation in Ukraine, 31 July.*** *Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2014_229_R_0001 [Accessed: 23 February 2016].*

- Oil exploration and production in waters deeper than 150 meters;
- Oil exploration and production in the offshore area north of the Arctic Circle;
- Projects that have the potential to produce oil from resources located in shale formations by way of hydraulic fracturing.[28]

This means that firstly, it is not possible for Novatek to get technology it needs from any US company, and secondly, even if they have technology on hand (as a result of cooperation with Total), related technical assistance could still be problematic.

Overall, technology sanctions are less painful than financial sanctions in the short-term. In should be understood in the context that Russia does need Western technology for liquefaction (equipment for industrial purification of natural gas is part of the sanctions): "To take the Yamal LNG project off the ground, Russia needs to import the technology to build LNG facilities, in particular the cooling system that allows liquefaction of gas".[29] Sanctions on the use of Western technology would thus be a challenge, adding that the "project was relying on US technology for its cooling system".[30] Current operational activities were not affected by technology access, it is reported by Novatek.

**International cooperation.** From the shareholding structure of Yamal LNG it is clear, that none of the parties have to withdraw from the project (like it happened in case of Rosneft's cooperation with BP on Domanik shale, Lukoil's cooperation with Total on Bazhenov rock, and Gazprom Neft's cooperation with Shell on Salym project).[31]

One of the clear implications for Novatek in terms of cooperation with international partners is, nevertheless, the declared 'Pivot to the East': "Russian companies are looking to Asia (primarily China and India) for equipment supplies and financing. So far, their technological involvement is very limited, as these companies for the most part do not possess these technologies themselves".[32]

Entry into the Asian Market is seen as key not only for Novatek's project, but for Russia's gas export strategy in general. Russia needs this market, most importantly because of China – the largest Asian economy with increasing energy needs and limited domestic reserves. Between 2000 and 2009, China's natural gas consumption increased from 24.5 bcm to 88.7 bcm, an annual growth rate of 15.4%.[33] In 2014, natural gas consumption increased by +8.6%.[34] By 2035, China is expected to account for 25% of global energy consumption. China will also become the world's largest energy importer, overtaking Europe, as import dependence rises from 15% in 2014 to 23% in 2035. China's share in global energy demand rises from 23% in 2014 to 25% in 2035, while its growth contributes 32% to the world's net increase. China's energy mix continues to evolve with natural gas more than doubling to 11% in 2035. Demand for all fossil fuels expands as well (+193%).[35] The key here is China needs more gas and is interested in upstream projects to deliver this gas to China.

What Russia needs beyond just a market with sizeable demand is what it lost due to sanctions: capital, megaproject management experience, and available technology for LNG and Arctic. Some of these issues are becoming aspects for cooperation with China.

28 ***Official Journal of the European Union, (2014), Article 3 (5) of Reg. 833, Council Regulation (EU) No 833/2014 concerning restrictive measures in view of Russia's actions destabilizing the situation in Ukraine, 31 July.*** *Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2014_229_R_0001 [Accessed: 23 February 2016].*

29 ***The Oil and Gas Post, (2014), Economic Sanctions to Russia Could Challenge Yamal LNG Project. 9 July.*** *Available at: http://www.oilgaspost.com/2014/07/09/economic-sanctions-russia-challenge-yamal-lng-project/ [Accessed 23 February 2016].*

30 ***Sputnik New, (2014), Further US Sanctions May Hamper Russia's Yamal LNG, 19 June.*** *Available at: http://sputniknews.com/russia/20140619/190618443/Further-US-Sanctions-May-Hamper-Russias-Yamal-LNG--Report.html#ixzz44OKmoGc1 [Accessed: 23 February 2016].*

31 *For details of these projects which were either frozen or partners' shares were transferred, see:* ***Mitrova (2016)*** *p. 12*

32 ***Mitrova (2016)*** *p. 15.*

33 ***Paik, K.W., (2012), Sino-Russian Oil and Gas Cooperation – The Reality and Implications, The Oxford Institute for Energy Studies.*** *Oxford University Press Inc., New York, p. 199.*

34 ***BP – Statistical Review, (2015), China's energy market in 2014.*** *Available at: http://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-china-insights.pdf [Accessed: 24 February 2016].*

35 ***BP – Energy Outlook, (2016), Country and regional insights – China – 2016.*** *Available at: http://www.bp.com/content/dam/bp/pdf/energy-economics/energy-outlook-2016/bp-energy-outlook-2016-country-insights-china.pdf [Accessed: 24 February 2016].*

Financial sanctions have a larger impact than technological sanctions at the moment. Technological sanctions concerning technologies and equipment for deep-water, the Arctic and shale projects, are of less concern because these resources are not produced on a significant scale yet.[36] Since the time horizon for megaproject management experience is stretched out for longer periods, China and Russia could learn from each other. But at the moment Chinese and Indian NOCs do not yet have the technology and expertise for deep-water and the Arctic as well as they do not have the experience of operatorship and management of large-scale integrated projects.[37] Finally yet importantly, none of those NOCs has sizeable experience in natural gas liquefaction.

With Total remaining on board, CNPC increasing its share, the situation for Yamal LNG does not seem as troublesome. Sino-Russian energy cooperation had arguably increased in the aftermath of Western sanctions. Political representatives from China and Russia have recently been highlighting the importance of the Sino-Russian relationship and have created bilateral initiatives in order to demonstrate the closeness of the two nations.[38] China's strategic interests lie in creating new enterprises overseas due to the fact that their key industrial production areas, i.e. steel and aluminium, need new markets to supply their products and machinery.[39] However, it may still be said that potential for cooperation between Russia and China is underdeveloped (or lagging behind what was expected from the Russian side).

The impact of sanctions has to be seen in combination with the overall economic situation in Russia as well as low energy prices. Sanctions will contribute to the decline of Russian oil production and only partial utilization of gas producing potential. "The immediate impact of Western sanctions has been less intense than expected, and Western economic sanctions are likely to have little aggregate impact on the Russian oil and gas sector in the short to medium term, while hurting independents more than state-owned enterprises because of their weaker links to the government and their lack of access to capital".[40] Alternative strategic partnerships are being pursued, but are not yet delivering on their potential and cannot replace old relationships for the foreseeable future.[41]

The LNG strategy, which had made a significant step forward in 2013 after the partial liberalization of LNG exports (Novatek with Yamal LNG being an important winner in that process). However, it came under significant stress with the introduction of sanctions. Yamal LNG remains as the one project with realistic exports outlook. Novatek is included in the list of sanctioned entities within the US package. The implications of sanctions are as follows. Firstly, Novatek is experiencing difficulties with financing the project. Access to capital is a major issue, and attempts are being made to seek capital in Asia, thus strengthening Russia's Eastern strategy overall. Secondly, technology could be troublesome, but so far Total, the main partner in terms of technology (as well as financing) is committed to the project and stays on board. Thirdly, the question of alternative strategic partnerships is acute for the case of Yamal LNG, and core negotiations are taking place with the Chinese partners. The latter are nevertheless very cautious about their activities and many plans are being postponed.

The main risk Yamal LNG faces is falling behind schedule with going onstream. It is especially dangerous since nearly all projected output is already contracted. To cover the contracts in case of the project falling behind the schedule, Novatek might be forced to purchase needed volumes in the spot LNG market.[42]

## CONCLUSIONS

Yamal LNG plays a significant role in Russia's gas strategy because of four core reasons. Firstly, the development of this project falls into Russia's strategy of developing

36 ***Poussenkova, N., (2015), Sanctions against the Russian Oil Sector: National Disaster or Blessing in Disguise? IMEMO RAS, 2 October.*** *International Energy Center Conference – European University at Saint Petersburg.*

37 ***Poussenkova (2015)***

38 ***Nochevnik, D., Logan Green, L., (2015), After Sanctions: Implications for Energy Cooperation Between Russia, Europe and Asia. European Energy Review 4 November.*** *Available at: http://www.europeanenergyreview.eu/after-sanctions-implications-for-energy-cooperation-between-russia-europe-and-asia/ [Accessed: 23 February 2016].*

39 ***Nochevnik, Logan Green (2015)***

40 ***Mitrova (2016)*** *p. VIII.*

41 ***Mitrova (2016)*** *p. VIII.*

42 ***Insider Pro, (2015), Sanctions Slow Down Yamal LNG, 31 August.*** *Available at: https://insider.pro/ru/article/42455/ [Accessed 23 February 2016].*

the Arctic and the Northern Sea route. Secondly, it is an important stone in LNG strategy, where new players are emerging with the core aim to strengthen Russia's presence in the LNG markets worldwide. Thirdly, Yamal LNG, although being directed at various destinations, still plays role in Russia's Asia strategy. And finally, it reveals the rise of non-Gazprom producers in Russia, but takes one of them – Novatek – potentially into the league of international players, thus providing for competition not only in Russian domestic gas market, but also in various international markets.

Russia needs companies like Novatek to complete LNG projects like the one on Yamal to further advance its gas export business, so it does not miss out on the LNG market in the next couple of decades. This process needs to be done without taking away from building a sustainable pipeline infrastructure throughout Russia and abroad.

The government is giving massive support to the project. The difficulties are coming from the investors and entrepreneurs , on top of the difficulties that are caused by the sanctions regime. The biggest problems are the inefficiencies of the Russian energy sector.

Russia's energy sector is being affected by sanctions. There are six Russian LNG projects under construction, and all of them face commercial, technical or regulatory challenges. Large investment needs as well as risks with equipment availability threaten the future of these projects. The Yamal LNG project was directly affected since the majority owner in the project is Novatek and it was included in the US list of entities. The implications for the Yamal LNG are as follows. First, there are difficulties with accessing capital for exploration costs and further project financing because of sanctions. Second, difficulties with access to technology, which is critical for Russia's development of LNG exports. And third, difficulties arise with participation of international partners. What this means is that the realistic date when LNG exports may actually start from Yamal is probably now postponed until 2020 or beyond. Sanctions seem to have caused a delay, but the project will go on.

**Patrick Osborne**

*MA candidate in Russian Cultural History and the Arts (MARCA) at the European University at Saint Petersburg. Patrick has previously earned a BA degree in Russian History and Slavic Languages & Literatures from the University of California. He has completed two other MA programs at EUSP: Russian and Eurasian Studies (IMARES, 2008) and Energy Politics in Eurasia (ENERPO, 2016 expected). Between those programs, he has studied international economic affairs at The George Washington University and worked as banker in wealth management for AXA and HSBC.*

***Address for correspondence:***
*posborne@eu.spb.ru*

# ENERPO RESEARCH CENTER

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The new research platform at EUSP will also enable domestic energy stakeholders to compare their experiences with that of other resource-rich nations in order to facilitate a more informed approach to the development of energy resources. Our contribution to a better understanding of the challenges faced by energy consuming nations and the needs of producing countries will help policymakers and companies to navigate the quickly evolving energy sphere.

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## CONTACT DETAILS:

**Maurizio Recordati**

Executive Director, ENERPO Research Center

**e-mail:** mrecordati@eu.spb.ru
**phone:** +7 (812) 386-76-22

# LITHUANIA: ENERGY SECURITY THROUGH LIBERALIZATION

***Aaron Wood***

**Abstract**

*Following independence from the Soviet Union in the 1990s, the main concern for Lithuania was achieving energy independence. While this was achieved in part through the use of Ignalina NPP, it would prevent the development of liberalized markets and accession to the European Union. This article will show through a historical recount, how Lithuania made temporary sacrifices in energy independence in order to develop a more liberalized energy market, through which it has been able to secure a variety of suppliers, and by extension, energy security. The new developments allowed for covering lacking power generation capacity through imports, as well as diversifying sources of natural gas for gas-fired domestic power generation. Lithuania, in securing its energy supplies, has chosen a path far from straightforward.*

**Key words:** nuclear power; Russian gas; LNG; European Union; Baltic energy; liberalization.

In 1990, Lithuania started its path as a newly independent state, in charge of national energy policy and energy security strategy. Following independence from the Soviet Union, Lithuania gained an important asset, the Ignalina Nuclear Power Plant (NPP), which allowed the small Baltic nation to be self-sufficient in providing a vast majority of its electricity demand and place itself in a stronger position with Russia in regards to energy dependency. However, in order to join the European Union, Brussels demanded the plant be closed. Protestations from the Seimas (Lithuanian legislature) were of no effect, with EU leadership remaining firm in the closure of Ignalina NPP, making it a caveat for assimilation into the European Union.

As a result, Lithuania unwillingly became more reliant on Russian natural gas for electricity generation as few alternatives were left available. However, given recent events we can see that the political will for diversification away from Russian gas has remained in Lithuania, vis-à-vis the LNG project that is currently being realized on the Baltic Coast and recent developments in electro-connectivity with Europe.

In this paper, I examine the fallout from the decision to integrate with the EU while sacrificing energy independence from Russia. I examine the perceived trade-offs and why Lithuania eventually chose the path to integration, despite becoming more dependent on Russian natural gas. Lastly, I examine whether post-integration Lithuania has succeeded in securing other means of energy independence from Russian gas and whether these are not simply related to, but a result of the liberalization goals set by the EU. I argue that despite the temporary loss in energy independence due to the shutdown of Ignalina NPP, Lithuania has been able to achieve energy independence because of EU integration and liberalization efforts.

## ENERGY INDEPENDENCE THROUGH NUCLEAR POWER

While struggling for its independence, Lithuania dealt with the expected politicization of gas and supplies from the Soviet Union, which fueled a desire to move away from dependence on Russia in terms of politics and well as energy. Lithuania was forced to find creative means to achieve that. The country was not a significant transit

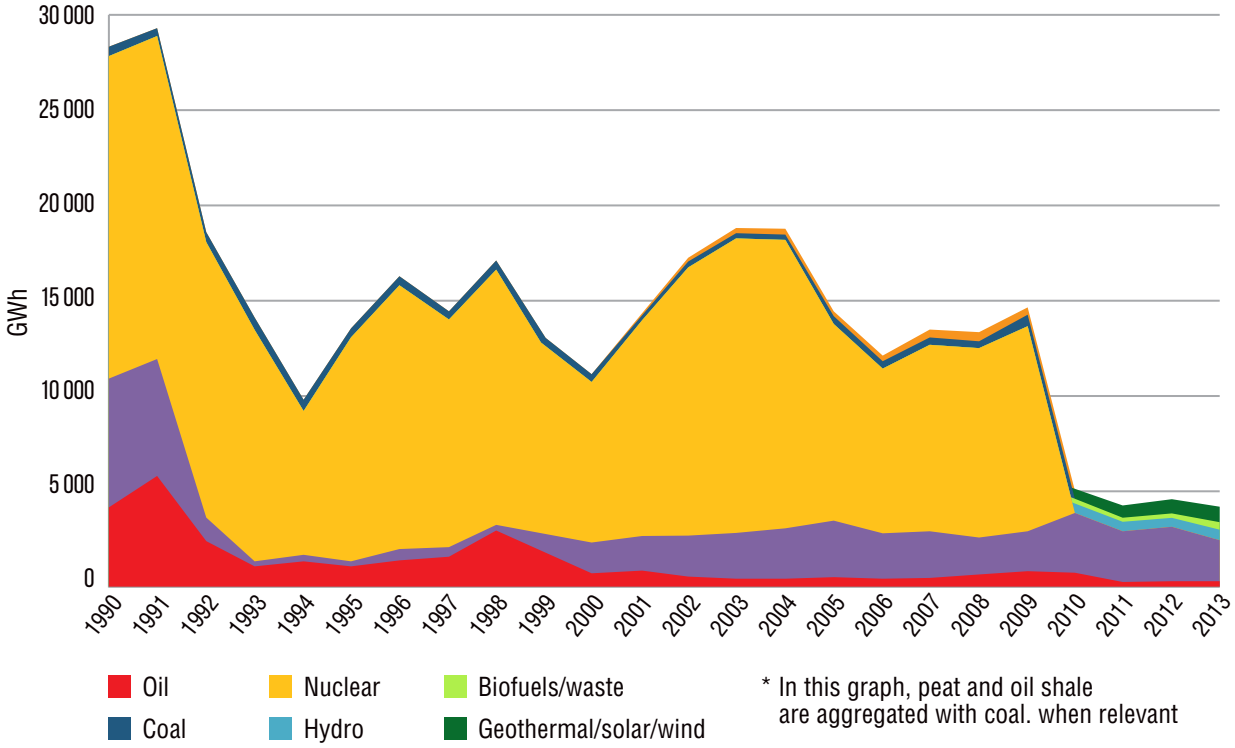



***Figure 1. Power generation in Lithuania***
*Source: IEA.*

state for gas deliveries, and the general feeling among Lithuanian policy makers was that Russia could not be trusted to deliver hydrocarbons. Although Lithuanian politicians were largely opposed to nuclear power generation following the disaster at Chernobyl, upon the realization of independence, despite a lack of a unified voice in Lithuanian parliament in many other regards, there was wide, multi-partisan support for using nuclear energy as means of gaining energy independence from Russia. Ignalina NPP would serve as this crucial asset in the early days of Lithuania's independence for guaranteeing security and avoiding full energy dependence. Ignalina provided nearly 80% of electricity in Lithuania 1994-2004.[1]

Despite running on an isotope produced only in Russia, RMBK type fuel, and being run by a mostly Russian team at the time of Lithuanian independence, Lithuania was able to move swiftly enough to secure the plant and not allow it to fall to political pressures and be used as a pawn by the Soviet Union in its last days, and the Russian Federation in its first ones. The Russian crew that was 'grandfathered in' with the plant was offered Lithuanian citizenship and highly competitive salaries in an effort to make them stay in Lithuania with their technical expertise. It was largely successful. Even the director of the plant, Victor Shevaldin, was retained and was even given a vote of confidence by the Lithuanian Finance Minister when embroiled in a tax scandal. He stayed until the plant closed in 2009.[2]

Ignalina NPP was originally built as an effort to supply the entire Baltic region under the Soviet Union (for location and connections to the electricity grid, see Figure 2), and it had been 'lost' by the USSR and the Russian Federation following Lithuanian independence. Lithuania could use its newly gained asset to its advantage. In order to increase its power relative to Russia, Lithuania traded electricity via existing Russian infrastructure to Kaliningrad in exchange for the uniquely Russian isotope of fuel they needed. In this way, Lithuania was able to secure some form of energy security. The ease of providing reliable power to Kaliningrad through contracts with Lithuania was enough to assuage the Russian government to not interfere with delivery of necessary isotopes.

1 ***Balmaceda, M. (2013), The Politics of Energy Dependency: Belarus, and Lithuania between Domestic Ukraine, Oligarchs and Russian Pressure.*** *Toronto: University of Toronto.*

2 *Ibid.*

## IGNALINA: OBSTACLE TO LIBERALIZATION?

While Lithuania was building its government and establishing itself as a sovereign nation, in 1992 the European Union was making efforts to greater liberalize the electricity and natural gas infrastructure within Europe. Much of the existing infrastructure of the day was the result of initiatives guided towards self-sufficiency at the national level and did not take into consideration the supply and demand differences of neighboring countries.[3] By integrating national markets, the EU sought to increase efficiency and match supply and demand through creating a unified market. While the Ingalina NPP provided an important element of energy independence, especially in the early days after Lithuanian independence, it was not able to participate in the liberalized markets that were being constructed in the European Union.

First, electricity is hardly a fungible source of energy. It was very limited in its application to transport and the lack of connections to Europe and insufficient storage facilities made it difficult to trade. Also, Lithuania still relied on Russian infrastructure to the deliver the power, an element that limited its level of energy independence. Existing infrastructure from Soviet times only allowed for transmission between Russia, the Baltic States, and Kaliningrad. While remaining self-sufficient, this limited the degree to
which Lithuanian electricity could participate in a liberalized market.[4]

In the early 1990s Lithuania, by geological and historical default, could not participate in a liberalized electricity market. Ignalina essentially provided all of the country's electricity, effectively creating a domestic monopoly. The little trade in electricity that did exist, transmission to Kaliningrad and the other Baltic States, was based on long-term contracts and an exchange for RMBK isotopes. As a result, prices were not liberalized and were set in a political environment rather than by market forces.

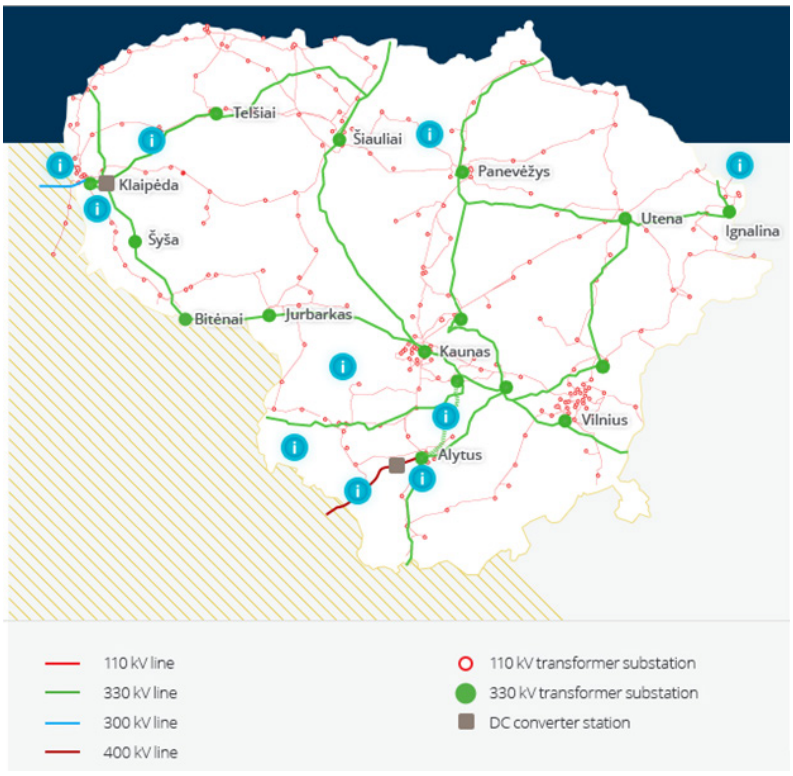



***Figure 2. Lithuania's electricity grid***
*Source:* ***Litgrid (2016), Grid Development: Electricity Transmission Grid Ten-Year Development Plan.*** *Available at: http://www.litgrid.eu/index.php/grid-development-/electricity-transmission-grid-ten-year-development-plan/134# [Accessed 23 February 2016].*

*3* ***EU Communication from the Commission to the Council 1992/553 Final on Electricity and Natural Gas Transmission***

*4* ***Balmaceda, M. (2013), The Politics of Energy Dependency: Ukraine, Belarus, and Lithuania between Domestic Oligarchs and Russian Pressure.*** *Toronto: University of Toronto.*

## LITHUANIA'S FIRST STEPS IN LIBERALIZING ELECTRICITY

While Europe attempted to create an integrated and open electricity market, albeit somewhat unsuccessfully through the first liberalization packages, Lithuania would institute a series of reforms. Initially, the road to reform was slow. The former communists, known as the Lithuanian Democratic Labor Party following independence, controlled the Seimas from 1992-1996. Under the LDLP the litas was formed, but unprofitable industries were kept running via public subsidy, and eventually Lithuania began to lag behind its Baltic neighbors in terms of development. With the victory of the Conservative Party/Homeland Union in 1996, developments could begin in earnest such as opening to foreign direct investment (FDI). In 1996-97, Lithuania saw nearly triple growth in FDI as positive legislation was passed in the Seimas.[5]

In the late 1990s and early 2000s, political momentum and public interest were building toward integration with the European Union. In April of 2000, 42% of Lithuanians favored integration.[6] With the formation of a coalition government in 2001, Lithuanian policy makers began in earnest to implement liberal policy measures in concert with the EU that would liberalize price structures and open up Lithuanian markets, especially in regards to electricity generation.

In 1997, Lithuania created the independent National Control Commission for Prices and Energy (NCCPE). This Board would set energy prices based on market and economic principles not only in electricity, but in district heat, water and natural gas, all industries where there was serious lack of competition. Measures were also taken to coincide with EU liberalization requirements for integration following the invitation to Lithuania to participate in the European Council summit in Helsinki in 1999. In order to ensure the implementation of the EU's Energy and Gas Initiatives, the Seimas passed the Law on Gas in 2001, and the Law on Electricity in 2002. These pieces of legislation assured third party access to previously monopolized systems. The Law on Gas saw an increase in the number of consumers that were theoretically able to choose a supplier.[7] The Law on Electricity also met unbundling goals as the national company Lietuvos Energija was separated into generation, transmission, and distribution companies. Prices went up marginally for domestic consumers as prices began to be set on the costs of transmission and distribution.

To this point, we see Lithuania's relative success in liberalizing internal markets, especially considering that little infrastructure existed to tie it to the rest of the continent. Joining the continent, particularly through integration with the European Union, would come at a cost however. Following the liberalization efforts of Lithuania, including the privatization of Mazeiku Nafta (national oil company) and Lietuvos Dujos (national gas company), was the debate with EU officials over the future of Ignalina.

## IGNALINA: FALLOUT

Primary among the concerns of EU officials was the type of reactor being used. The RMBK fuel type reactor was notorious in that it was the same type of fuel used in the Chernobyl reactors. RMBK was rather popular and some plants still exist in Europe today, albeit with security and safety upgrades, which are expensive and can take years to implement and complete. The obvious monopoly of power that the nuclear power plant created in Lithuania was also of concern to European officials. As we have observed, Lithuanian energy demand was well met by the NPP and the comfort of self-sufficiency in this regard was damaging to any possible moves to liberalization and security through diversity, which were primary goals for European electricity markets via the European

5 ***Runewicz, M. (2002), "The Inflows of Foreign Direct Investments into Lithuania: Main Determinants, Trends and Developments 1996-2002." IDM Studien 1.*** *Available at: http://www.tiger.edu.pl/onas/runiewicz/inflows.pdf [Accessed 20 March 2016].*

6 ***Mažylis, L., and Unikaite, I. (2003), Referendum Briefing No8: The Lithuanian EU Accession Referendum 10-11 May 2003. European Parties Election and Referendums Network at University of Sussex.*** *Available at: https://www.sussex.ac.uk/webteam/gateway/file.php?name=epern-ref-no-8.pdf&site=266 [Accessed 19 December 2015].*

7 ***Balmaceda, M. (2013), The Politics of Energy Dependency: Ukraine, Belarus, and Lithuania between Domestic Oligarchs and Russian Pressure.*** *Toronto: University of Toronto.*

Union's liberalization efforts. In short, the plant was both perceived as too dangerous, and not sufficient to meeting liberalization requirements of member states to continue to be allowed to operate.[8]

Those opposed argued that the plant had been crucial and would remain crucial in assuring independence from Russian energy. They also argued that the price of energy, electricity, hot water, etc., would all increase even more dramatically as were Russian gas prices were increasing at the time. Despite protests to its closing, the Lithuanian government went ahead with the deal. They agreed to close the first reactor by 2004. Having agreed to this much, Lithuanian officials had hoped to assuage Brussels to agree to keeping the second reactor open and operational. The second reactor alone still provided for 70% of Lithuania's electricity after the closing of the first. Brussels insisted that the safety standards were not up to European standards and held firm. Despite lengthy negotiations and much sturm und drang from the Seimas, the plant was entirely shut down in 2009.[9]

The EU is currently providing financial assistance to safely close and decommission the plant. The EU recognizes that:

> *"...the decommissioning of the Ignalina Nuclear Power Plant with two 1500 MW RBMK-type reactor units inherited from the former Soviet Union is of an unprecedented nature and represents for Lithuania an exceptional financial burden not commensurate with the size and economic strength of the country and that this decommissioning will continue beyond the Community's current Financial Perspective [...]" – Protocol No. 4 of the Accession Treaty of Lithuania to the European Union.*[10]

The cost will be substantial indeed. In the period from 2014-2020, the EU will provide EUR 1.12 billion to decommission the plant, having already allocated EUR 1.4 billion from the closing till 2014.[11] The fallout in terms of human capital and energy security, was substantial. The Ignalina region itself suffered as the four thousand workers who were employed at the plant lost their jobs. Demonstrations took place in the city, decrying the government for abandoning its people to higher energy prices and joblessness. Financially, the cost of heating, electricity, and hot water all increased as Lithuania was forced to import more gas for gas-fired power stations. Electricity costs alone went up by 30%, and that which they could not produce, had to be imported from Russia.[12] This happened in the midst of increases in the price of Russian gas from USD 85 per thousand cubic meters in 2005 to USD 345 in 2008. Lithuania became entirely reliant on Russian for its energy supply.[13]

In a measure to regain energy independence and in hopes to mitigate the increased projected future cost of gas electricity generation, Lithuania planned to construct a newer, modern nuclear power station that was not reliant on a Russian isotope of fuel. Plans for such are mentioned in the Lithuanian Energy Strategy of 2007.

> *"Key problems include the long-term reliability of natural gas supply, construction of the prospective new nuclear power plant and integration of the electricity system into EU systems. Implementation of these strategic tasks could be facilitated only by close co-operation with other Baltic countries – Estonia, Latvia and Poland."*[14]

A possible Baltic project in tandem with Poland was proposed but failed as concerns over price and location

8 ***Štreimikiene, D. (2015), Lithuania. In: UN Energy Indicators for Sustainable Development, ed. 2013. 129-92.*** *Available at: http://www.un.org/esa/sustdev/publications/energy_indicators/chapter5.pdf [Accessed 19 December 2015].*

9 ***World Nuclear News, (2010), Lithuania Shuts Ignalina Plant. World Nuclear News, 4 January.*** *Available at: http://www.world-nuclear-news.org/NP-Lithuania_shuts_Ignalina_plant-0401104.html [Accessed 19 December 2015].*

10 ***Ivanica, M. (2003), An Overview of the Treaty of Accession of Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia to the European Union. [working paper] EIPA.*** *Available at: http://publications.eipa.eu/en/details/show/&tid=1708 [Accessed 18 December 2015].*

11 ***Anon, (2015), Financing in 2014-2020. Ignalina Nuclear Power Plant.*** *Available at: http://www.iae.lt/en/financing-2014-202/ [Accessed 18 December 2015].*

12 ***Štreimikiene, D. (2015), Lithuania. In: UN Energy Indicators for Sustainable Development, ed. 2013. 129-92.*** *Available at: http://www.un.org/esa/sustdev/publications/energy_indicators/chapter5.pdf [Accessed 19 December 2015].*

13 ***Balmaceda, M. (2013), The Politics of Energy Dependency: Ukraine, Belarus, and Lithuania between Domestic Oligarchs and Russian Pressure.*** *Toronto: University of Toronto.*

14 ***Lithuanian Energy Institute, 2003. National Energy Strategy. Minister of Energy.*** *Available at: http://web.stanford.edu/class/msande290/LEI03%20NAtl%20Energy%20Strat.pdf [Accessed 20 December 2015].*

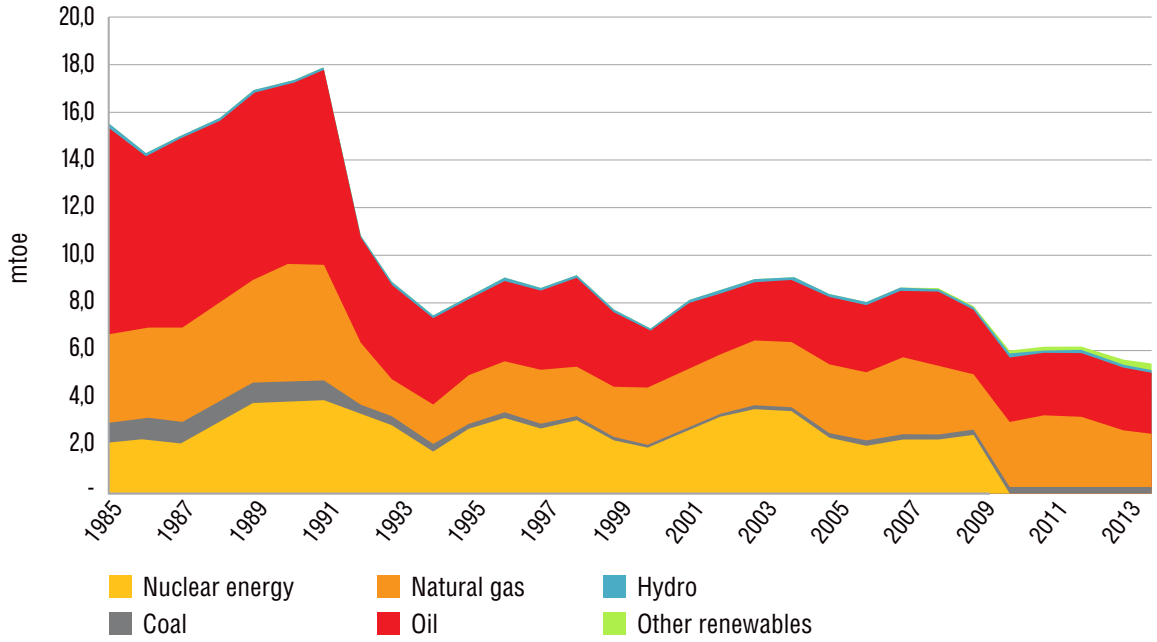



***Figure 3. Lithuania's primary energy consumption by fuel***
*Source: BP Statistical Review of World Energy 2015 (workbook).*

of infrastructure chipped away at commitment. Poland was also concerned that the availability of cheaper nuclear energy could harm its domestic coal industry. Estonia and Belarus also announced plans to build their own NPP. Particularly disastrous to Lithuania's NPP hopes was the announcement of a new NPP to be built in Kaliningrad. Electricity sales to the region were a major cost factor of Lithuania's new NPP plans. With no co-investors, the plan was not economically viable for Lithuania.

The closure of the plant and the subsequent price increases could not have come at a worse time for Lithuanian consumers. The global financial crisis of 2008 hit Lithuania especially hard. Lithuania's GDP sank dramatically from 9.8% annual growth in 2007 to -14.7% in 2009.[15] The Lithuanian economy shrank overall by 22.4%, the worst in the EU.[16] FDI plummeted from USD 1,900 million in 2008 to just under USD 18 million in 2009.[17] Austerity measures were implemented, and domestic industry suffered as a result of a lack of investment. Export industries however, remained producing incredibly well. This was more in spite of austerity measures than because of them, as the decrease in wages allowed exporting firms to gain a wider profit margin on exported goods.[18] The Lithuanian government stepped up its use of EU funds, sharply raising its absorption of such grants from EUR 1.2 billion in 2008 to EUR 1.75 billion in 2009, that is, from 3.7% of GDP to 6.6% of GDP.[19] This in combination with a still growing export industry contributed to growth and recovery in the Lithuanian economy.

At the end of the 2000s Lithuania, despite making moves toward liberalization, had still not managed to diversify sufficiently in terms of sources of supply. While the country recovered from the economic crisis and GDP recovered, they were still wholly dependent on Russian gas at increased prices being sold via long-term contracts. Lithuania suffered terrible losses both financially and in terms of energy security. Despite its difficult way toward recovery (energy consumption never returned to pre-crisis level, see Figure 3), Lithuania has not lost sight of its goals to diversify and become energy independent in the framework of liberalization set forth by the EU.

15 ***World Bank, (2015), GDP at Market Prices 2006-2010.*** *Available at: http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?page=1 [Accessed 20 December 2015].*

16 ***World Bank, (2015), Foreign Direct Investment, Net Inflows 2006-2010.*** *Available at: http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD/countries?page=1 [Accessed 20 December 2015].*

17 ***Seputyte, M. (2009), Lithuanian Economy Shrank 22.4%, EU's Worst Recession. Bloomberg. 28 July.*** *Available at: http://www.abovetopsecret.com/forum/thread486162/pg1 [Accessed 18 December 2015].*

18 ***Aspen Institute Prague, (2013), Austerity the Lithuanian Way.*** *Available at: http://www.aspeninstitute.cz/en/article/3-2013-austerity-the-lithuanian-way/ [Accessed 19 December 2015].*

19 ***Åslund, A., (2011), Lithuania's Remarkable Recovery. EU Observer. 28 November.*** *Available at: https://euobserver.com/opinion/114419 [Accessed 19 December 2015].*

## SECURITY THROUGH LIBERALIZATION

In the subsequent energy strategies set forth by the Seimas from 2007 onward, the language reflects a strong prioritization of energy security and strictly adhering to the liberalization goals set forward by the European Union, stating that it is a matter of "national security". The Strategy also very narrowly defined liberalization goals to be absolutely in accord with those set forth by the European Commission, by updating outdated directives from the Commission and passing domestic legislation that is completely in line with the new directives. In general, the Seimas, while still relying on coalition governments as no single party is popular enough to attain the majority, enjoys broad support for staunch adherence to its obligations and goals in the EU.[20]

One such requirement for Lithuania was to secure alternative gas supply by December 3, 2014. This measure, in an effort to ensure that Lithuanian efforts at liberalized gas networks were not underutilized, also addressed the importance of energy security through acquiring different sources of energy. While natural gas companies in Lithuania had been unbundled as part of the liberalization measures in the early 2000s, they still relied not only on one exporter for gas i.e. Gazprom, but on one pipeline that entered Lithuania via Belarus. The desire for more diversification of gas supplies in combination with the increasing price of natural gas made LNG a viable option and as a result Lithuania started its first LNG project at the port of Klaipėda.[21]

In addition to domestic efforts by Lithuania to align its domestic legislation with EU regulation, the EU started initiatives to promote the liberalization of electricity and gas in the Baltics. Notable of these was the Baltic Energy Market Interconnection Plan (BEMIP) as it would set out to define and reaffirm among member states a shared set of goals towards integration in the Baltic. BEMIP provided a platform of cooperation for member states, contractually binding them through Memoranda of Understanding, Actions Plans, and keeping policy makers updated with the latest developments in EU programs to support the region.

The goals of BEMIP were ambitious. Based on a 10% minimum standard of electro-interconnectivity, the initiative aims to remove cross-border restrictions to the trade of energy, reduce electricity congestion across borders and establish common energy reserves, remove regulated energy tariffs, fully open the retail market, and establish a common power exchange in the Nordic and Baltic areas. In addition to these efforts in electricity, the Plan called for the implementation of reverse flows such as through the proposed Amber PolLit pipeline between Poland and Lithuania, LNG facilities in Estonia and Latvia, and gas storage facilities in Latvia. Two projects that are crucial for the development of Lithuanian energy security have been realized under the auspices of this project.[22]

First, Klaipėda LNG FSRU was a huge step in furthering energy independence for Lithuania. The Floating Storage and Regasification Unit is currently being rented from the Norwegian company Höegh LNG Ltd, and is strategically located in one of the few warm water ports in Baltic so that it can receive shipments year round. The first shipment of LNG arrived there in February 2016.[23] It can store between 15-30 days' worth of natural gas for priority consumers in a time of emergency and at maximum capacity the facility can import 4 bcm of gas per annum, which is enough to satisfy 75% of all gas demand in the Baltic States.[24]

While there are still fewer suppliers of LNG than oil, it is more comparable to oil as its fungible nature allows it to be imported from a variety of suppliers.

20 ***Lithuanian Energy Institute, (2003), National Energy Strategy. Minister of Energy.*** *Available at: http://web.stanford.edu/class/msande290/LEI03%20NAtl%20Energy%20Strat.pdf [Accessed 20 December 2015].*

21 ***Lithuanian Academy of Sciences, (2012), LNG Terminal Project in Lithuania in Conference on Energy Security: Outlook & Perspectives in the Baltic Sea Region.*** *Available at: http://www.lei.lt/energy-security-conference/index_files/Masiulis.pdf [Accessed 15 December 2015].*

22 ***European Commission, (2015), Baltic Energy Market Interconnection Plan.*** *Available at: https://ec.europa.eu/energy/en/topics/infrastructure/baltic-energy-market-interconnection-plan [Accessed 18 December 2015].*

23 ***LNG World News (2016), Lithuania Gets First 2016 LNG Cargo.*** *Available online: https://www.lngworldnews.com/lithuania-gets-first-2016-lng-cargo/ [Accessed 1 March 2016].*

24 ***Lithuanian Academy of Sciences, (2012), LNG Terminal Project in Lithuania in Conference on Energy Security: Outlook & Perspectives in the Baltic Sea Region.*** *Available at: http://www.lei.lt/energy-security-conference/index_files/Masiulis.pdf [Accessed 15 December 2015].*

By participating in the LNG market, Lithuania hopes to be able to secure LNG in a global market, with price dictated by global market forces, rather than by the conditions of a long-term contract. Lithuania in the past year has been searching as far afield as North America for LNG supply.[25]

Another means by which Lithuania has expanded its energy security while simultaneously participating in a liberalized market is its very recent developments in electro-connectivity to the integrated EU market. On December 14, 2015, with the inauguration of NordBalt electricity connector with Sweden and its LitPol Link with Poland, Lithuania has permanent energy links going westward (Figure 4). This program is incredibly important not only because Lithuania now has a permanent link in which its electricity generation can compete and therefore be priced by market forces, but it also has a permanent link away from the Russian northwest electro-transmission system known as BRELL (Belarus, Russia, Estonia, Latvia, Lithuania), upon which it had been dependent following the closure of Ignalina NPP.[26]


***Figure 4. BEMIP connections***
*Source: [European Commission, 2016].*

25 ***Adomaitis, N., (2015), Lithuania Signs Non-binding Deal for U.S. LNG. Reuters. 28 February.*** *Available at: http://www.reuters.com/article/lithuania-lng-usa-idUSL5N0W207O20150228 [Accessed 15 December 2015].*

26 ***Braw, E., (2015), The Baltic States' Vital Step Toward Energy Independence. World Affairs Journal. 17 December.*** *Available at: http://www.worldaffairsjournal.org/blog/elisabeth-braw/baltic-states-vital-step-toward-energy-independence [Accessed 19 December 2015].*

Both of these projects received critical funding from various EU initiatives in order for them to be realized. LitPol Link featured on the Commission's list of Projects of Common Interest, which gave it access to a EUR 27.4 million Connecting Europe Facility grant for works carried out in Lithuania. It also benefitted from the EU's structural funds for construction works carried out in Poland, a loan from the European Investment Bank of EUR 55 million and a Nordic Investment Bank loan of EUR 50 million.[27]

While the Klaipėda platforms rent must be paid for by Lithuania itself, the EU's Innovation Network Executive Agency (INEA) provided financial support for the construction of the Klaipėda-Kuršenai gas transmission pipeline, which was completed in October of 2015. The project received EUR 27.6 million under the Connecting Europe Facility (CEF) program.[28] The pipeline was designed to create sufficient capacity so that re-gasified LNG from Klaipėda LNG FSRU can be distributed to domestic facilities in Lithuania as well as to other states in the Baltic.

This financial support from the EU is especially important for Lithuania as the expense of renting the LNG platform begins to mount up. At EUR 151,500 per day to rent the platform, the burden on the Lithuania national budget is huge. A total of EUR 521 million will have to be paid to Höegh LNG for the lease. Funding from the EU will be critical for Lithuania to maintain the high cost of renting the platform in order to maintain energy security.[29]

In these important examples, we see that the EU has provided a vital framework in which Lithuania has been able to not only plan and coordinate with fellow member states, but also receive funding and information for its projects to be realized. It has been able to do this so successfully

27 ***European Commission, (2015), Baltic Energy Market Interconnection Plan.*** *Available at: https://ec.europa.eu/energy/en/topics/infrastructure/baltic-energy-market-interconnection-plan [Accessed 18 December 2015];* ***European Commission, (2015), New electricity connections between Lithuania, Poland and Sweden create "Baltic Ring".*** *Available at: https://ec.europa.eu/energy/en/news/new-electricity-connections-between-lithuania-poland-and-sweden-create-baltic-ring [Accessed 18 December 2015].*

28 ***Woodward, K., (2015), EU Funding Lithuania Gas Pipeline. LNG Industry, 15 May.*** *Available at: http://www.lngindustry.com/liquid-natural-gas/15052015/EU-funding-for-Lithuanian-LNG-pipeline-760/ [Accessed 18 December 2015].*

29 ***Vaida, P., (2015), Klaipeda LNG Terminal Already Cost Lithuania EUR 128 Mln. The Baltic Course.*** *29 May. Available at: http://www.baltic-course.com/eng/energy/?doc=106846 [Accessed 19 December 2015].*

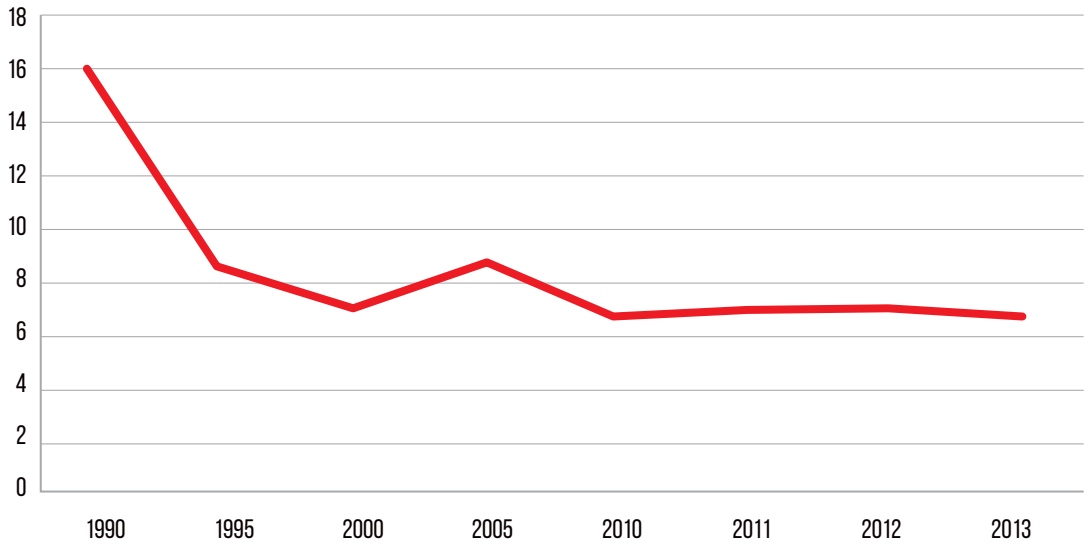



***Figure 5. Lithuania's gross inland energy consumption, mtoe***
*Source: Eurostat.*

because of a popular consensus among policy makers that integration with the EU and its energy security measures is concomitant with Lithuanian national security. Lithuania has achieved the ability to meet its energy demands through a fungible resource, LNG, sold on the world market, and purchase electricity at competitive prices from its neighbors in Europe. So overall, the gross inland energy consumption has actually remained rather stable (Figure 5), unlike the supply picture that we have seen above (Figure 1, Figure 3).

## CONCLUSION

Lithuania has navigated a long road in order to achieve energy independence and success through liberalization. With the initial successes of the Ignalina NPP in providing energy security to the Baltic nation, there were tradeoffs in regards to possibilities for integration and liberalization in a larger market. The supposed benefit of entering the EU for reasons of economic security outweighed the degree to which Lithuania would need to rely on Russia for its energy consumption, and despite protests from people and lawmakers alike, the majority decided to close Ignalina in favor of integration.

Following recovery from a crippling economic crisis, the Lithuanian government strictly adhered to its obligations to integrate with the European Union by codifying integration efforts related to energy into their energy policy and acknowledging the possibility of achieving energy security through integration and diversification. In turn the EU set an overarching initiative, the BEMIP, to provide a platform on which policy makers from the Baltic and Nordic states could meet to coordinate efforts to integrate into a common European market. They also provided substantial financial assistance when Lithuania was recovering from a crippling economic crisis in order to help fund these ambitious projects, which was critical for a small nation like Lithuania. As a result of coordination efforts with the EU and its member states, Lithuania has been able to become, and looks to become, more energy secure in the future. This is exemplified through the NordBalt electricity project. Lithuania imported 70% of its electricity from Russia in 2014, but following the realization of NordBalt, new connectivity will result in an additional 1,200 megawatts of capacity, allowing Lithuania to meet 66% of its energy[30] needs from sources outside of Russia via European markets. This is a substantial step forward in breaking from the BRELL electro-connectivity infrastructure which is perceived to be controlled by Moscow.

At the basis of Lithuania's energy policy lies its political decision to distance itself from Russia and integrate into the European region. Thus, the rhetoric of energy security in this country follows what is often heard in Brussels and evolves around the necessity to decrease dependence

30 ***Braw, E., (2015), The Baltic States' Vital Step Toward Energy Independence. World Affairs Journal. 17 December.*** *Available at: http://www.worldaffairsjournal.org/blog/elisabeth-braw/baltic-states-vital-step-toward-energy-independence [Accessed 19 December 2015].*

on Russian supplies. After the closure of the Ignalina NPP, requested by the EU in the process of Lithuania's assimilation and on the basis of its technical characteristics, Lithuania has found itself in a position of being even more dependent on Russian supplies of hydrocarbons than ever. This was the reason for pushing ahead with LNG import terminal in Klaipeda. Throughout the past years, Lithuania has both constructed the terminal and developed electricity grid connections with Poland and Sweden, thus smoothing the effect of Ignalina NPP decommissioning: these new developments allowed for covering lacking power generation capacity through imports, as well as diversifying sources of natural gas for gas-fired domestic power generation. Lithuania, in securing its energy supplies, has chosen a path far from straightforward.

**Aaron Wood**

*MA candidate in Energy Policy at the European University in St. Petersburg; managing editor of the ENERPO Newsletter. Aaron holds a BA in Political Science and Russian Studies from Luther College.*

***Address for correspondence:***
*awood@eu.spb.ru*

# MYANMAR'S ENERGY SECTOR: AN OVERVIEW

***Alissa Nicole Thompson***

**Abstract**

*Myanmar is straddling a new national development plan. Since the new civilian government took office in 2011, reforms were necessary after the changes resulting from the sanctions previously imposed on the country. Energy will undoubtedly play a role Myanmar's growth, and the country is expected to receive significant amounts of foreign direct investment to jumpstart the economy. Using energy as a strategy to emerge from isolation, Myanmar is striving to take advantage of new technologies and foreign investments, in order to reach its developmental goals under the new government. This paper looks at plans for improving living standards by promoting the wider use of renewables, increasing energy efficiency and conservation, and promoting the use of alternative fuels in household use to meet energy demand predictions. The findings of the various implemented measures show stagnation. The paper concludes that the government must first make internal adjustments to enable effective policies and achieve their goals.*

**Key words:** Myanmar; economic development; biomass; renewable energy; solar; hydro; wind.

Myanmar, after a static period of isolation and with sanctions in place since the late 1980ies, is undergoing a serious transition. The country's new civilian government took office in March 2011 with a goal of integrating into the modern world through economic development. The new national development plan has a goal to implement positive changes.

However, this comes with no easy formula. In 2012, Myanmar was ranked 161 out of 180 in the International Monetary Fund's listing of the poorest countries, and was ranked 149 out of 187 in the United Nation's Human Development Index.[1] This reflects the poor standard of living amongst the population of 53 million, the fifth most populous country in ASEAN.

As a result, we find a country trying to overcome their domestic energy deficiency while taking advantage of foreign investment, the majority of which is funneled to the energy sector.

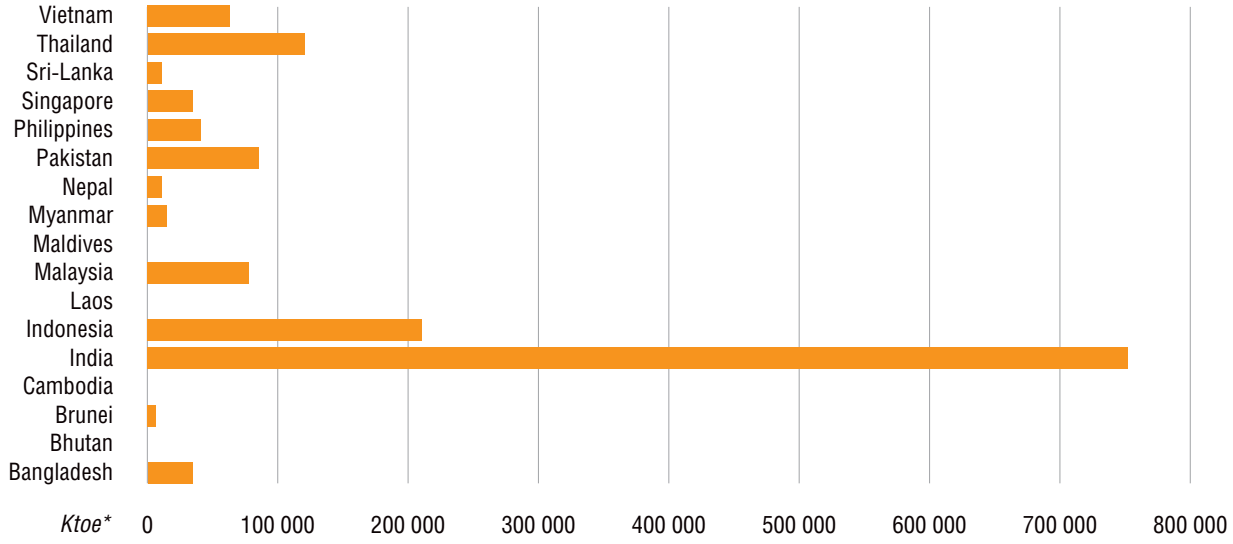
## MYANMAR'S ENERGY: ASSETS AND CHALLENGES

Considered by many to be the 'last frontier', Myanmar has great potential to develop into a relatively important country within the region. From its reputation as a pariah state through Ne Win, the country isolated itself from energy-intensive globalization, as the outside world was withdrawn from access due to U.S.-led sanctions, giving way to a xenophobic government that formed a special friendship with China due to their mutual offenses during the violence of protests in Myanmar and the Tian'anmen Square protests a year later.

Today, under Thein Sein's leadership, seen as a transitioning bridge between the military and civilian government, the country has regained a certain degree of respectability amongst its neighbours, evident during the 2014 ASEAN Regional Forum in Nay Pyi Taw, as well as with the United States, when in 2011, Hillary Clinton become the first U.S. Secretary of State to visit in over 50 years, and in 2012, Barak Obama became the first sitting president to visit Myanmar. Likewise, Thein Sein was received in Washington, D.C., the following year.

1 ***Accenture, (2013), New energy architecture: Myanmar report 2013.*** *Available at: https://www.accenture.com/us-en/insight-new-energy-architecture-myanmar.aspx [Accessed 01 December 2015].*

Additionally, this reformation period is seen in Myanmar's foreign relations. Even though the Shwe project, exporting Myanmar oil and gas to China, was completed, China cut direct investments in the country by 90% from 2011 to 2012.[2] The renewed interest in Myanmar was evident in the U.S., when Derek Mitchell became the first U.S. appointed ambassador to Myanmar in over 20 years. This has lead from previous loophole sanctions in the energy sector, enabling international companies such as Chevron and Total to continue business, in addition to regional companies such as PTTEP, Petronas and Daewoo to have dominance in the field, to total legitimate development, opening a portal of opportunity for foreign investments. Myanmar understands energy will be an inevitable element of the expansion of their economy.




* *Thousand tonnes of oil equivalent*

***Figure 1. Energy use (2011)***
*Source: World Bank.*

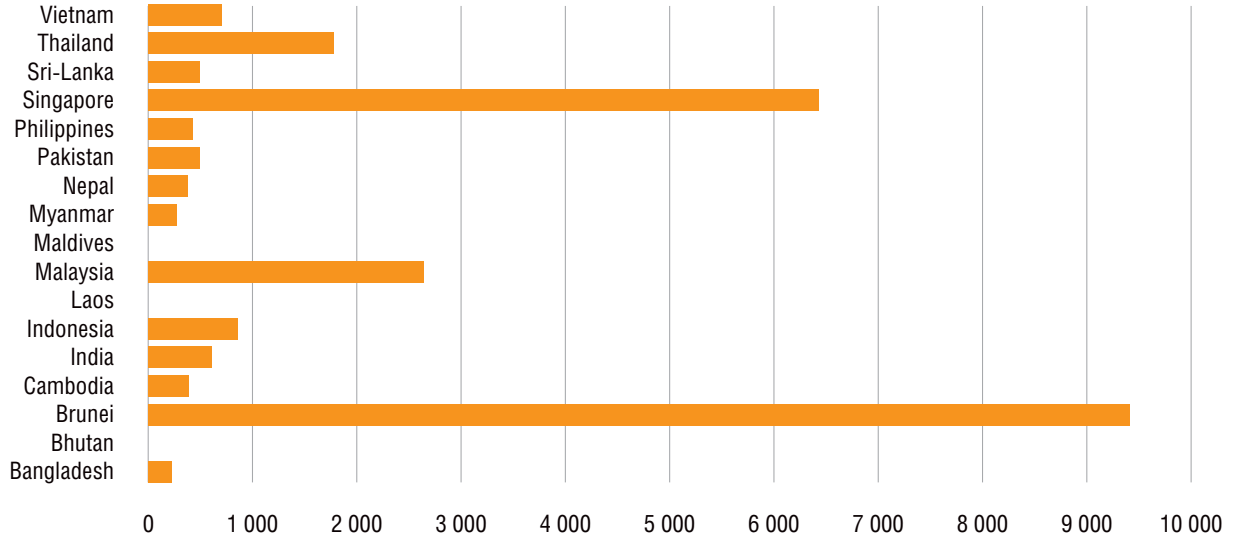



***Figure 2. Energy use (2011, kg of oil equivalent per capita)***
*Source: World Bank.*

2 ***Wong, G., (2014), Myanmar: From Investment Abroad to Improvement at Home. 17 August.*** *Available at: http://thediplomat.com/2014/08/ myanmar-from-investment-abroad-to-improvement-at-home/ [Accessed 01 February 2016].*

The exploitation of **natural resource deposits** are the cornerstone of development of Myanmar. The official estimates are humble, at 50 million barrels of oil and 8 billion cubic meters (bcm), according to the Economist.[3] Nevertheless, it is the unofficial estimates and great potential for new reserve discoveries that secure new investments. In terms of **energy consumption**, Myanmar is a relatively small player – comparable with Sri Lanka, Nepal and Bangladesh (Figure 1). Per capita energy use in Myanmar is lower than Sri Lanka, Nepal, Cambodia, Philippines, and is comparable with Bangladesh (Figure 2). Myanmar especially appears underdeveloped in terms of energy use and energy access in comparison with Thailand and Indonesia – its two neighbours, who together consume 58% of ASEAN's energy.

Myanmar's **total primary energy mix**, according to the IEA in 2013 (Figure 3), presents a rudimentary image. The majority at 65.3% is from traditional biofuels and waste; 90% of this is fuel wood, an issue that promotes deforestation and continued illegal timber trade. This is a very high share, especially in comparison with both Thailand's and Indonesia's share of biofuels and waste in their fuel mixes. The oil share comes in second at 16.8% of total primary energy mix. Domestically produced natural gas contributes to a 11.1% share in the fuel mix. Much of this is transformed into electricity, of which 60% goes to gas-fired power plants, specifically towards the industry, transport, and chemical/petrochemical sectors (12% for fertilizer production). Hydropower is modest at 4.6%, contributing 2,520 MW. This is a particular feature of Myanmar's natural renewable energy availability, as both Thailand and Indonesia have very low shares of hydro. The least of all the shares is coal at 2.2%. Myanmar typically uses lignite and other bituminous coal for electricity generation and the industry sector.

**Exports and imports of energy resources.** Myanmar imports refined sources such as motor gasoline, jet kerosene and diesel to be consumed within the industry, transport, and agricultural sectors.

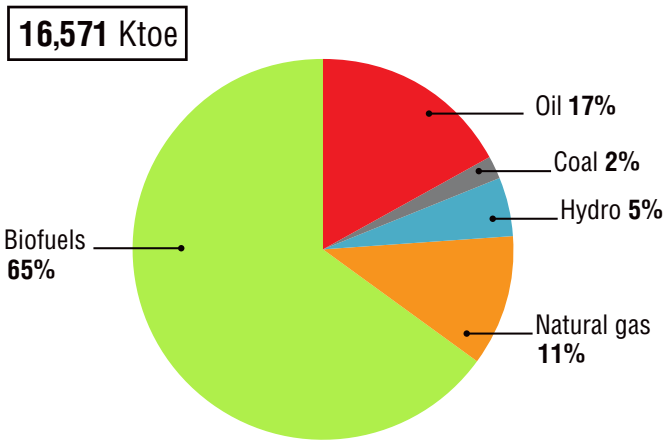



***Figure 3. 2013 Myanmar total primary energy mix***
*Source: IEA.*

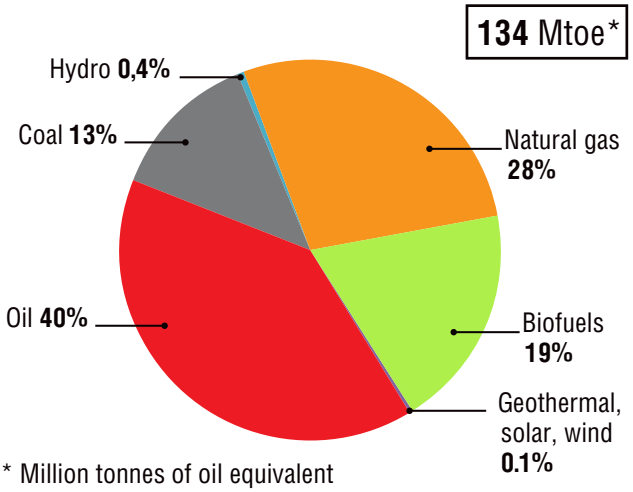



***Figure 4. 2013 Thailand total primary energy mix***
*Source: IEA.*

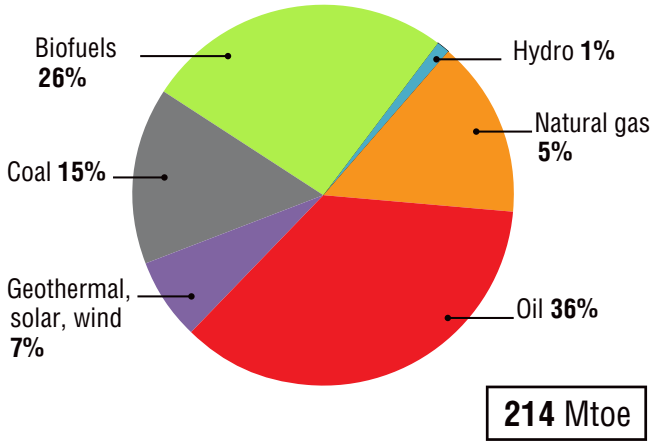



***Figure 5. 2013 Indonesia total primary energy mix***
*Source: IEA.*

The majority of Myanmar's natural gas is exported, Myanmar has been providing natural gas to Thailand since

3 ***The Economist, (2014), Drilling in the Dark. 29 March.*** *Available at: http://www.economist.com/news/business/21599810-compa- nies-will-soon-find-out-how-much-oil-and-gas-there-really-offshore-drill- ing-dark [Accessed 01 December 2015].*

1998 from the Yadana gas field, eventually expanding to the Yetagun gas field in 2000, then the Zawtika gas field that commenced production in 2014. This natural gas, which is the 2nd largest share after oil, accounts for 53% of the 28.4% of Thailand's share of total primary energy supplies in 2013.[4]

Overall, there is a great need to (1) improve the domestic energy mix and (2) develop the infrastructure. The energy grid concentrated in urban areas allowed 26% of the population connection and is unbeneficial to the 70% living in rural areas, where average electrification rates are 16%.

## CURRENT ENERGY INITIATIVES

Energy is a significant element within Myanmar's national development plan. The interest of fulfilling their energy potential both locally and in trade is in line with in Myanmar's new energy policy goals.[5] The new civilian government, motivated by potential of the energy sector to become a catalyst for Myanmar's economy expansion, finally integrated the nation's energy sub-sectors under one umbrella. In doing so, they have formed new committees for the main purpose of increasing coordination: the National Energy Management Committee (NEMC) is tasked to formulate energy policies and arranges cooperation between energy ministers, while the Energy Development Committee (EDC) will implement these policies.

The overall goals of Myanmar's energy policy, according to the Asian Development Bank's Initial Energy Sector Assessment,[6] center on:

- Maintaining energy independence;
- Promoting wider use of renewable sources of energy;
- Promoting household use of alternative fuels;
- Promoting energy efficiency and conservation.

It seems that the ultimate goal of maintaining energy independence is to be achieved through the aforementioned three supportive goals. This is the basis of the structuring of this section, where the goals of Myanmar's energy policy will be evaluated in the current measures the government is implementing to achieve these goals, to lead to the overall concluding goal of whether maintaining energy independence is feasible.

**Promoting wider use of renewables.** Renewable sources of energy are currently key in two dimensions of Myanmar's energy system: their role in electricity generation (and improvement of access to electricity), as well as in direct final use. Direct final use is a massive segment – wood and waste are used in the residential sector for heating and cooking. Consumption of primary solid biofuels, based on gross calorific value, is close to the volume of natural gas production of the country (453107 versus 483794 TJ respectively). This segment will be discussed in the next section, while here I will focus on the power generation sector.

Myanmar's current level of electricity production, according to the IEA statistics, is at 11,890 GWh, and 8878 GWh is provided by the hydropower sector. On the one hand, renewable energy (in the form of hydro) is a major share pf electricity generation mix (Figure 6); on the other, it is the only renewable energy source that is actually used in the country's electricity generation (Table 1).

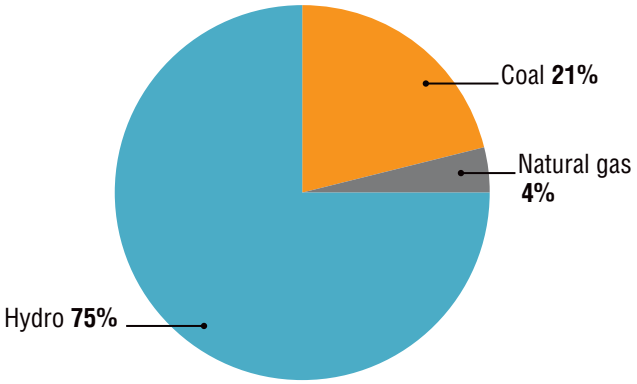



***Figure 6. Myanmar electricity production***
*Source:* ***International Energy Agency, (2013), Myanmar: Electricity and Heat for 2013.*** *Available at: https://www.iea.org/statistics/statistics-search/report/?year=2013&country=Myanmar&product=ElectricityandHeat [Accessed 1 December 2015].*

4 ***OEC, (2013), Where does Thailand Import Petroleum Gas from?*** *Available at: http://atlas.media.mit.edu/tbmuyy [Accessed 01 February 2016].*

5 ***Sovacool, B. (2013) Accelerating Energy Access for All in Myanmar.*** *Available at: http://www.mm.undp.org/content/dam/myanmar/docs/Accelerating%20energy%20access%20for%20all%20in%20Myanmar.pdf [Accessed 1 December 2015].*

6 ***Asian Development Bank, (2012), Myanmar: Energy Sector Initial Assessment.*** *Available at: http://www.adb.org/documents/myanmar-ener- gy-sector-initial-assessment [Accessed 01 December 2015].*

| | Unit | Gross elec. generation |
|---|---|---|
| **Municipal waste** | GWh | 0 |
| **Industrial waste** | GWh | 0 |
| **Primary solid biofuels** | GWh | 0 |
| **Biogases** | GWh | 0 |
| **Liquid biofuels** | GWh | 0 |
| **Geothermal** | GWh | 0 |
| **Solar thermal** | GWh | 0 |
| **Hydro** | GWh | 8878 |
| **Solar PV** | GWh | 0 |
| **Tide, wave, ocean** | GWh | 0 |
| **Wind** | GWh | 0 |

***Table 1. Electricity generation in Myanmar from renewable energy sources, 2013, GWh***
*Source: International Energy Agency, (2013). Myanmar: Renewables and Waste for 2013. [online] Available at: https://www.iea.org/statistics/statisticssearch/report/?year=2013&country=Myanmar&product=RenewablesandWaste [Accessed 1 December 2015].*

Overall, to ensure sustainable and environmentally clean energy development in the long term, Myanmar seems to be focusing on long-term growth through the usage of renewable sources of energy, rather than short-term electrification through hydrocarbon resources. Myanmar possesses the resources to develop renewables, such as hydro, tidal, wind and solar, making renewables in general a feasible option for the development of the energy system.

Renewables, among other things, can assist in solving a problem of access to electricity and electrification. Currently, for local consumers, connections to energy grids nationwide start at 595 USD, leaving many villages without access to electricity.[7] To counter purchasing connections, renewables can be used within the small-scale systems ('distributed generation').

**Hydropower** is a major source of energy for Myanmar, but there are two major factors impeding its expansion. Firstly, during the dry season, the amount of hydropower generated decreases drastically. As it is unpredictable, sometimes it is reduced to nothing. Secondly, hydropower projects are unpopular nationwide due to the forced relocation of villagers, as well as the environmental degradation it could bring through erosion and unnatural flooding of previously dry areas.

A viable source of energy in Myanmar is **tidal energy** in coastal areas: the tide rises and falls twice a day, and powerful water currents reaching up to eight knots. The schedule of the tides is reliable and predictable.

Another type of renewable energy that follows from Myanmar's large coastal areas is **wind energy**. With a coastal strip of 2,832 kilometres and southwesterly wind for nine months and northeasterly wind for three months available, the wind energy in Myanmar has a potential of 365 terrawatt hours (TWH) per year.[8] Three areas stand out as promising for wind harnessing: the regions of Chin and Shan states, southern and western coastal regions, and central Myanmar.

**Solar power** is at early stages of its development in Myanmar as well. Solar power within Myanmar has a potential of providing 51,973 TWH per year.[9] At the moment, solar power is harnessed through photovoltaic cells used for battery-charging stations and water pumping for irrigation. One challenge solar development faces is the lack of trust for this technology by villagers, due to the prevalence of low-quality solar products, which has led to poor experience. Currently solar stand-alone systems have been installed at more than 200 places nationwide.

The Ministry of Science and Technology's research and development department has also been designing **hybrid renewable systems** with capacities around 30 kW based on biogas and solar energy.

7 ***Sovacool, B. (2013) Accelerating Energy Access for All in Myanmar.*** *Available at: http://www.mm.undp.org/content/dam/myanmar/docs/Accelerating%20energy%20access%20for%20all%20in%20Myanmar.pdf [Accessed 1 December 2015].*

8 ***U Hla Kyaw, (2009), Myanmar: Country Assessment on Biofuels and Renewable Energy.*** *Available at: https://www.asiabiomass.jp/biofuelDB/k/myanmar/pdf/Biofuel_Myanmar_Report_%20finaledited.pdf [Accessed 1 December 2015].*

9 ***Ibid.***

| Project | Capacity | Companies involved | Notes |
|---|---|---|---|
| Chaung Thar Hybrid Power Supply System Project | Includes 40 kW wind power system | Japan's Fuji Heavy Industries Ltd | Hybrid system<br>• Street lighting for a safer environment<br>• Night lighting to increase productivity of the village<br>• Clinic lighting to allow more power for medical equipment usage and vaccine refrigeration |
| Wind power plant in Mon State | 32 MW | Zeya & Associates Co., Ltd., Vestas Wind Systems | Wind system |
| Magway region | Up to 220 MW | Black & Veatch | Solar system<br>Will supply electricity for local communities and industry, and the construction is scheduled to start in the first quarter of 2016. Southeast Asia's largest solar power plant |

***Table 2. Summary of selected renewable energy projects in Myanmar***
*Source: Asia Biomass Office, 2015. Current Status of Wind Power in Myanmar. [online] Available at: https://www.asiabiomass.jp/english/topics/1509_05.html [Accessed 1 December 2015]; Zeya & Associates, 2015. ZEYA & ASSOCIATES SIGNS MOU WITH VESTAS FOR COLLABORATION ON WIND POWER PROJECTS IN MYANMAR [online] Available at: http://www.rgkzna.com/content/zeya-associates-signs-mou-vestas-collaboration-wind-power-projects-myanmar [Accessed 1 December 2015]; Black & Veatch, 2015. Black & Veatch starts work in Myanmar on Southeast Asia's largest solar power plant [online] 13 October. Available at: http://bv.com/home/news/news-releases/black-veatch-starts-work-in-myanmar-on-southeast-asias-largest-solar-power-plant [Accessed 21 December 2015].*

The commercial potential of both wind and solar is overall underutilized, but the current implementation of these sources is usually catered towards areas without access to the national grid. The summary of the projects is provided in the table below (Table 2).

A mere 30% of the population has access to electricity, leading to the country being the lowest amongst ASEAN in terms of per capita electricity consumption. This is all a result of inadequate maintenance of generation capacity, the lack of investment to upgrade gas and coal power plants. This means a significantly lowered potential capacity. Even in urban areas blackouts are frequent and a common occurrence; In Yangon, 60% have access to electricity.

**Promoting household use of alternative fuels.** In implementing the policy of wider use of renewables, promoting household use of alternative fuels should be considered a consequential task. This section will provide the details of alternative fuel potential, specifically the development of modern biomass in Myanmar, both for household and industrial usage.

The population in rural areas relies on off-grid sources such as fuel wood (or 'traditional biomass') and kerosene. The Ministry of Agriculture and Irrigation is considering substituting gasoline and diesel consumption with modern biofuels; gasoline is to be substituted by bio-ethanol, and diesel is to be substituted by diesel-blends and bio-diesel. In doing so, the possibility of biofuels competing with food production needs to be evaluated. To counter this, the government has claimed almost six million hectares can be used for biofuel crops without displacing 11 million hectares dedicated to food and industrial crops. Although this seems harmless, it also means the 5.9 million hectares of uncultivated land will be deforested in order to grow fuel crops.[10] Apparently, the production

10 ***Asian Development Bank, (2009), Status and Potential for the Development of Biofuels and Rural Renewable Energy. Greater Mekong Subregion Economic Cooperation Program.*** *Available at: http://www.adb.org/ sites/default/files/publication/30311/biofuels-myanmar.pdf [Accessed 1 December 2015].*

| Project | |
|---|---|
| Bio-ethanol | Sugarcane, maize, cassava, sorghum, sweet sorghum, potato, toddy palm, nipa palm, root crops. Since 2002, the Myanmar Chemical Engineer's Group constructed four ethanol plants to produce 7.4 million liters annually. In 2008, the Myanmar Economic Cooperation built two ethanol plants, adding a capacity of 6.8 million liters annually. Beyond the public sector, private companies such as Great Wall have constructed two ethanol plants, based on sugarcane and cassava. |
| Bio-diesel | Palm oil, rapeseed, jatropha, coconut, niger, neem seed, cotton seed, soy bean, sesame, peanuts. |
| Gasification | Rice husk, sawdust, waste of forest products, agricultural waste, urban waste |
| Biogas | Livestock wastes |

***Table 3. Myanmar's potential biomass energy sources***
*Source: Ministry of Agriculture and Irrigation.*

of biofuels will ensure rural energy security, which is true, and create jobs, since rural-to-urban migration is expected, as jobs move from the agricultural sector to services. Various feedstocks are being considered – the potential biomass energy sources is summarized below (Table 4).

Since 1986 a compressed natural gas and natural gas vehicle program was implemented. By 2011, 27,000 buses and cars were converted.[11] The number looks impressive, yet once compared to the 356,580 registered passenger and commercial vehicles in the country in 2011 (summing up the number of cars and 4-wheeled light vehicles, buses, and trucks),[12] this is merely 7.6%. Furthermore, the past government's Jatropha Plantation Project in 2006 to produce 40,000 daily barrels of bio-diesel to replace oil imports failed, as costs were too high and yields were too low.[13] Nevertheless, it seems the failure is to be blamed on dependent variables such as weak implementation, that can be improved in the future through better planning and cooperation, rather than independent variables, allowing a positive outlook to remain on other biomass potential. In addition, due to the strong, already existing agricultural sector within the nation, modern biomass has the greatest commercial prospects.

In addition to energy crops, other sources can be produced into biomass, such as agricultural waste, industrial waste, livestock waste, and municipal solid waste. Biogas has multiple uses that make it attractive to develop, including cooking, lighting, preservation of grains, preparation of fodder, and driving internal combustion engines. This essentially constitutes the energy needs of a household.

Biomass usage in villages is implemented through biogas plants and biomass gasifiers. An example can be demonstrated by the 33 million tons of rice Myanmar produces annually. The rice mills that function continuously all year excrete large amounts of rice husks that can then be used to generate steam for steam engines, or in motors or diesel engines.

In fact, Wuxi Teneng Power Machinery Co., Ltd., installed a 1000 Kw biomass gasification power plant using rice husk in 2014, at one of Myanmar's largest rice mills. On the household aspect, a village-scaled rice husk gasifier-engine-generator system with 50 kW capacity was constructed in Dagoon Daing village, distributing electricity to 304 houses in the population of 1,496 people. Subsequently, a similar model has been developed for the utilization of rice husk by Indigo Energy (Figure 7), "a company dedicated to improving the reliability of electricity in Myanmar and the three quarters

11 ***Asian Development Bank (2012).***

12 ***World Health Organisation, (2013), Violence and Injury Prevention, Road Safety: Myanmar Excerpt.*** *Available at: http://who.int/violence_injury_prevention/road_safety_status/2013/country_profiles/myanmar.pdf [Accessed 1 December 2015].*

13 ***Aung, N.N., (2012), Lessons learned from Jatropha?*** *Available at: http://www.mmtimes.com/index.php/special-features/151-energy-spotlight/2928-lessons-learned-from-jatropha.html [Accessed 1 December 2015].*

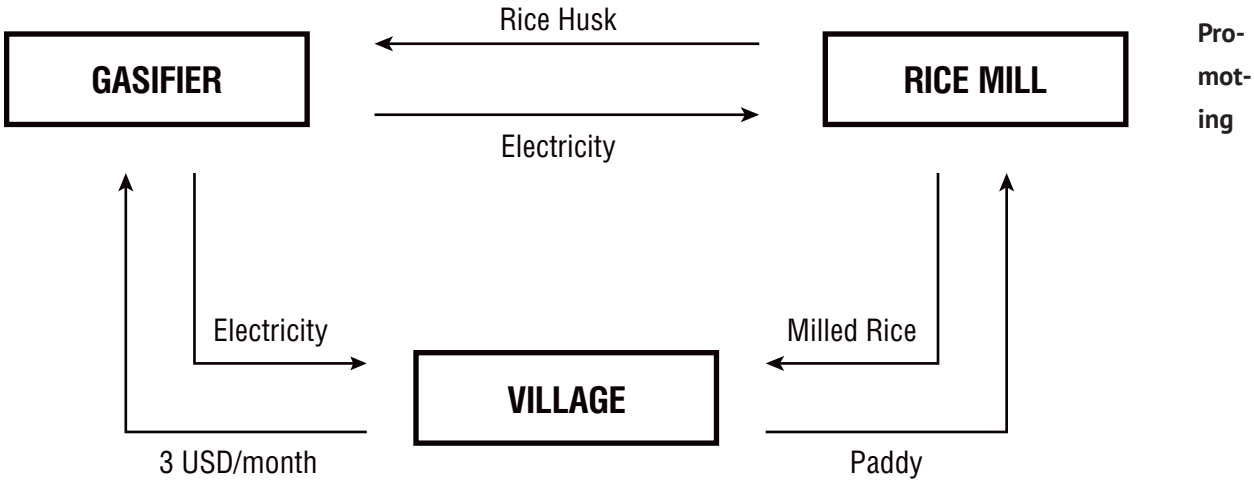



***Figure 7. System if using Rice husk in the process of energy production***
*Source:* ***Indigo Energy, 2015. Our Company.*** *Available at: http://www.indigoenergy.net/our-company/ [Accessed 22 December 2015].*

of the country who do not have it."[14]

However, construction of this model has yet to be completed. In 2012, the U.S. company, Viaspace signed an agreement with the government to bring King Grass to Myanmar. King Grass is a high yield biomass clean energy crop and low-carbon fuel, enabling it to supply clean electricity generation. In 2013, an update stated King Grass was growing well locally and two projects were being worked on: an 1 MW anaerobic digestion power plant to serve as a nationwide model for rural areas, and a larger direct combustion power plant to be connected to the national grid or to provide electricity for industrial purposes. In 2013, a joint project between the Asian wing of Nation First Economic Development and Myanmar's Hisham Koh & Associates was signed to develop algae farms within the country. Algae can be produced for biofuel or commercial animal feeds, making it a worthwhile investment.

The fact that statistics are hard to find in these new development projects reveal that modern biomass production in Myanmar is still in a preliminary stage, perhaps even at a discouraging sight, as the initially hopeful projects seem to have stagnated in their updates. Another element to be blamed is the fact that a national biofuel plan with clear targets and a road map for their achievement has not yet been properly designed.

**Energy Efficiency and Conservation**. According to the Asian Development Bank, the lack of energy efficiency in Myanmar is a result of the lack of a legal and regulatory framework, also there are no institutions dealing with the issue of energy efficiency.

Improvements are being made locally. Some sporadic examples include:[15]

- New building codes and standards to improve energy use by buildings in Yangon (Yangon Master Plan with the Japan International Cooperation Agency's assistance);
- The use of PE-coated pipelines to supply Yangon's power plants and gas-fired factories (improved longevity of these pipelines of at least 15 years, as there is better protection against rust);
- Improvement of coal-fired power plants' efficiency to above 40% (the use of ultra-supercritical boiler technology imported from Indonesia, which promises very high efficiency levels and lower emissions).

Nevertheless, not one sector has overall responsibility regarding energy efficiency, and as a result, there is very limited progress. For example, there is no analogue of Thailand's Department of Alternative Energy Development

14 ***Indigo Energy, (2015), Our Company.*** *Available at: http://www. indigoenergy.net/our-company/ [Accessed 22 December 2015].*

15 ***Shin, A., (2014), MOGE starts new gas pipelines to boost Yangon supply. 8 December.*** *Available at: http://www.mmtimes.com/index.php/ business/ 12448-moge-starts-new-gas-pipelines-to-boost-yangon-supply. html [Accessed 1 December 2015].*

and Efficiency which is within the Ministry of Energy.

Energy should be recognized as as a scarce and valuable resource. This will transform the culture of energy conservation. Overall, there is great need for energy efficiency regulation and proper rehabilitation of existing facilities.

## CONCLUSION: PATH FORWARD

Through observing Myanmar's energy policy goals and measures, we can deduct that hydropower and biomass energy is seen as the government plan's core potential power source, whilst solar power and wind energy has less aspirations due to its unreliability and, as of now, poor commercial aspects and short-term factors. As a result, Myanmar has shifted towards trying to control household energy consumption through promoting alternative fuels as the primary source of civilian energy resource to reduce any substantial growth and cost in energy imports, reducing energy dependency.

The government's ultimate goal of maintaining energy independence can be rationalized by xenophobic tendencies, and to avoid any devastating consequences of possible external pressures. In addition, perhaps it is meant to avoid the "resource curse" and the potential in becoming a "petrostate." In both these matters, there appears to be a popular idea to prevent the population's dependence on foreign fuel imports, as well as on their own hydrocarbon resources. This could be rationalized in another perspective for the sake of economic purposes, as the government hopes to maximize the profit of selling their natural resources, instead of using it domestically, in turn opting for using the initial revenues towards existing alternative fuels aspirations, and newer renewable resources development to satisfy their local energy consumption.

However, the expansion of Myanmar's economy also means that citizens are going to start earning more and consuming more, increasing the amount of energy consumption per capita. In regards to their overall progress so far, alternative resources and fuels cannot meet these needs. Myanmar will confront many hindrances to achieving their energy policy goals. The country lacks human and technological capacity. The institutional foundation is not strong enough to lead to reasonably consistent cooperation for reliable results. This means the ultimate goal of maintaining energy independence will not to be achieved until these improvements are made; perhaps for some time to come, as although democratic hope is brimming due to Aung San Suu Kyi's National League for Democracy party, even the installation of a democratic civilian government is not a precursor of miraculous development. Realistically, we are looking at a change that will only begin to show after at least ten years.

For now, the government should focus on removing these barriers while at the same time, focus on construction and maintenance of local gas pipeline infrastructure. This contradicts the idea of focusing on long-term growth, rather than short-term electrification through hydrocarbons; however, it is a likelier source to satisfy the predicted increase in local energy needs, to make sure it can deliver consistent amounts with high efficiency, as renewables development in the country does not yet have the means to prosper and be fully implemented, since many of these projects are still in research and development stages.

**Alissa Nicole Thompson**

*Exchange student as part of the USSR semester abroad program at the European University at Saint Petersburg. Alissa graduated from Bangkok Patana School and plans to pursue a BA in human geography, governance, and economics.*

***Address for correspondence:***
*alissanfthompson@gmail.com*

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The journal was established in 2013 and is a publication produced by the Energy Politics in Eurasia (ENERPO) Master program of the European University at St. Petersburg. One of the main goals of the journal is to give students an opportunity to have their work published, hence a large part of our portfolio consists of articles written by MA-level students who approach their graduation. ENERPO quality standards for analysis and research are at a professional level, while young researchers are often the ones providing creative solutions for the existing challenges. Thus, the work produced by the students will be useful for experts and industry professionals.

The journal also sets out to bring exposure to the activities held at the ENERPO program. Most issues contain reviews of workshops and seminars held at ENERPO: in a Workshop Review subsection, students relay and comment on the content of guest lectures within the Workshop Series. The ENERPO Workshop Series is a specialised cycle of meetings hosted by the European University, with lectures delivered by prominent experts in the field of energy policy, as well as representatives of the energy business in Russia and the CIS countries.

The content of each article is the author's opinion and does not necessarily reflect the views of European University at St. Petersburg.

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