RUDN Journal of Economics
Вестник РУДН. Серия: Экономика
ISSN 2313-2329 (Print); ISSN 2408-8986 (Online)
2022 Vol. 30 No. 2 168–178
http://journals.rudn.ru/economics

DOI: 10.22363/2313-2329-2022-30-2-168-178
UDC 327

Research article / Научная статья

Atomic Belt and Road: China's international nuclear market entry

Gleb V. Toropchin

Novosibirsk State Technical University,
20 K. Marksa Ave., Novosibirsk, 630073, Russian Federation,
Novosibirsk State University of Economics and Management,
52 Kamenskaya St, Novosibirsk, 630099, Russian Federation
glebtoropchin@mail.ru

Abstract. Rapid development of China's internal nuclear market, together with its rise on the international arena and the declared transition to green economy, gave a crucial impetus to its aspirations to enter the international atomic market as a global exporter of nuclear technology. The aim of this article is to define the political and ideological foundations underpinning such an ambitious endeavor, as well as predict the related development in the short and mid-term perspective. The author utilizes both general scientific methods as well as statistical and comparative analysis to single out the directions of China's nuclear market outreach, both regionally and globally. Pakistan, widely presented as a flagship example of China's exporting its know-how in nuclear engineering, remains the only partner of a kind in the broader Asia-Pacific. This article demonstrates that Belt and Road Initiative (specifically, the Green Silk Road), out of all multiple formats, was arguably chosen by the Chinese government as the most suitable framework for expanding its influence in the nuclear domain and filling a certain gap which formed after Westinghouse and Areva (now Orano) got reorganised after encountering financial problems. At the same time, China's bid for leadership in the sphere of nuclear technology is obstructed by some impediments. Among them are Russia's dominance in breakthrough areas of nuclear engineering and Rosatom's large market share, as well as lack of political will in some countries' elites to build ties with China in this strategic realm, opting for competition instead.

Keywords: China, nuclear power, nuclear market, BRI

Article history: received December 15, 2021; revised February 14, 2022; accepted March 12, 2022.

For citation: Toropchin, G. V. (2022). Atomic Belt and Road: China's international nuclear market entry. *RUDN Journal of Economics*, *30*(2), 168–178. https://doi.org/10.22363/2313-2329-2022-30-2-168-178

Атомный пояс и путь: выход Китая на международный ядерный рынок

Г. В. Торопчин

Новосибирский государственный технический университет,
Российская Федерация, 630073, Новосибирск, пр-т К. Маркса, д. 20,
Новосибирский государственный университет экономики и управления,
Российская Федерация, 630099, Новосибирск, ул. Каменская, д. 52
glebtoropchin@mail.ru

Аннотация. Стремительное развитие внутреннего атомного рынка Китая, сопряженное с подъемом страны на международной арене и декларированным переходом к «зеленой» экономике, явилось значительным стимулом, обусловившим стремление государства к выходу на международный ядерный рынок в качестве глобального экспортера ядерных технологий. Цель работы состоит в определении политических и идеологических основ столь амбициозного проекта, а также прогнозировании развития соответствующих событий в кратко- и среднесрочной перспективах. Автор использует как общенаучные методы, так и анализ статистических данных и сравнительный анализ для выявления направлений выхода КНР на ядерный рынок, как в региональном, так и в глобальном масштабах. Пакистан, который называется в качестве наиболее яркого примера экспорта китайских разработок в сфере ядерной техники, остается для Китая единственным в АТР партнером подобного рода. Показано, что проект «Один пояс — один путь» (в частности «Зеленый шелковый путь») был выбран правительством КНР в качестве наиболее подходящего формата из всех доступных для расширения влияния страны в ядерном секторе и занятия ниши, образовавшейся после реорганизации компаний Westinghouse и Areva (ныне Orano) в связи с финансовыми проблемами. В то же время заявке Китая на лидерство в области ядерных технологий мешает ряд препятствий. Среди них доминирование России в прорывных областях ядерной техники и проектирования реакторов, значительная доля «Росатома» на международном рынке, а также дефицит политической воли элит некоторых стран, предпочитающих вместо выстраивания связей с Китаем в этой стратегической сфере конкурировать.

Ключевые слова: Китай, атомная энергетика, ядерный рынок

История статьи: поступила в редакцию 15 декабря 2021 г.; проверена 14 февраля 2022 г.; принята к публикации 12 марта 2022 г.

Для цитирования: *Toropchin G. V.* Atomic Belt and Road: China's international nuclear market entry // Вестник Российского университета дружбы народов. Серия: Экономика. 2022. Т. 30. № 2. С. 168–178. https://doi.org/10.22363/2313-2329-2022-30-2-168-178

Introduction

China remains one of the world leaders in terms of introducing nuclear power. When scholars and practitioners claim that Asia is the driver of global nuclear energy growth, it is China (and to a lesser extent India) that lies behind these affirmations. Even given the 2011 Fukushima Daiichi accident and its

impact on the public perception of nuclear power, which manifested itself in the shutdown of some NPPs (nuclear power plants) worldwide, China has been steadily increasing its reliance on peaceful use of nuclear energy, remaining one of the top three countries in the world in terms of so-called fleet of NPPs (Andrews-Speed, 2020). Moreover, Beijing is presuma-bly planning to take advantage of its engineering excellence and strengthen its positions as a nuclear technology supplier both regionally and globally.

This article is devoted to uncovering the political and ideological framework reinforcing China's activities aimed at entering the international nuclear market not only within the Asia-Pacific but also on a worldwide scale. Numerous organizations and projects have been established by Beijing to meet the goal of becoming a major exporter on the international nuclear market. Defining relations between these structures will contribute to understanding the motivation behind CCP's (China Communist Party's) ambitions in this sphere. For this purpose, it is necessary to scrutinize the status of the internal nuclear market in China, its international contacts in the field of peaceful use of atomic energy, considering the corresponding political context.

Literature review

Even though China's attempt at claiming its share of the nuclear pie is a momentous event for the global market, not many papers have been dedicated to this topic. Furthermore, the scholarly research hardly keeps pace with the rampant development of China's nuclear technologies which has taken place in the recent years, as it is indispensable to reflect on these events in a timely manner.

Key statistics and analysis pertaining to the issue under consideration are predictably provided by major organizations and think tanks dealing with nuclear power in general. In the first place these are, naturally, IAEA (International Atomic Energy Agency), WNA (World Nuclear Association), just to name a few of them.

B. K. Sovacool and S. V. Valentine use a political economy approach to analyze the implications of the nuclear boom in India and China (Sovacool, Valentine, 2010). They conclude that greenhouse gas emissions have been gaining a greater influence on the decision-making in this realm, to say nothing of the traditional factors, such as technological progress and relatively modest manifestations of anti-nuclear activists.

B. Lin, N. Bae and F. Bega rightly note the scarcity of research on the topic of China's international nuclear cooperation, especially within the BRI (Lin et al., 2020). Having discussed the role of regulators and state bodies, the authors underline the necessity of a closer collaboration in renewable sources of energy. In a later paper, B. Lin, and F. Bega state that the collaboration in the framework of BRI (Belt and Road Initiative) could also contribute to the formation of the green economy and accelerate the processes of decarbonization and energy transition (Lin, Bega, 2021). Indeed, one of the recent trends in China's economy is represented by the Green Belt and Road Initiative, aimed at reaching environmental sustainability (Zhou et al., 2018; Belova

and Egorycheva, 2020). Another similar term is Green Silk Road, and it presupposes a heavy reliance on nuclear infrastructure projects in the BRI countries. Curiously enough, other researchers also found a causal link between nations' participation in the Initiative and a decreasing amount of their CO_2 emissions in the long run. Moreover, nuclear power plays a great role in China's quest for achieving carbon neutrality by 2050, also expressing itself in internal implications (Mallapaty, 2020). At the same time, geopolitical implications of such development described in the literature are sometimes connected with the criticism of China's endeavors, especially in terms of equity (Harlan, 2021).

As it is demonstrated by one of the studies utilizing Monte Carlo simulation, regardless of the scarcity of publicly available information, China is one of the nation's developing cutting-edge technologies, including modern Generation III+ reactors with 12 completed projects by mid-2021, whereas further prospects seem quite promising (Wealer et al., 2021).

Chinese scholars themselves underscore the speed at which nuclear technology has been developing in the country (Xu et al., 2018). They nonetheless claim that the competitiveness of nuclear power compared to other energy sources is likely to be "a major problem" in the short-term period, which is mainly connected with the noticeable investment costs. At the same time, the researchers draw a conclusion that thanks to the introduction of the third-generation reactors and possible funding through clean technology revenue atomic energy will pay off in the long run in the low-carbon transition process.

In a report for Center for International Private Enterprise, Chen Bing-Ming highlights the fact that the collaboration within BRI is held on a bilateral basis (Chen, 2021). The positive sides for recipient countries include access to eco-friendly technologies and comparatively low costs, the drawbacks being public pressure against nuclear power and/or China's rising influence.

Russian scholars and commentators have also offered their takes on this problem, which is quite understandable given Russia's role on the nuclear market and its special relations with China in this regard. Examining the diverse pool of Chinese reactors, A. Goncharuk claims that Westinghouse has won the battle for China against Rosatom (Goncharuk, 2012). Still, the author expresses well-grounded criticism as to Beijing's nuclear planning, reasonably pointing out that China's nuclear strivings captured in the CCP documents are often ahead of its real capabilities.

V. B. Kashin, a prominent Russian sinologist, together with his colleagues pays attention to the fact that nuclear power is perceived as a renewable source of energy in China (Kashin et al., 2021). As far as the 13th 5-year Plan (2016–2020) is concerned, while new nuclear facilities – including power reactors – have been introduced extensively, the performance targets in have not been met in their entirety. Regarding the 14th Plan, it is symptomatic that atomic energy development is envisaged in the context of "green economy", considering the decarbonization trend and net zero goals.

Overall, recent developments (from BRI on out to geopolitical shift and exacerbation of U.S.-China rivalry) and their impact on China's role on the nuclear market have not yet been fully conceptualized in scholarly literature. While it is

painstaking to cover all the named aspects, this paper is an attempt to fill the gap in understanding the prospects of institutionalizing Beijing's bid at entering the global nuclear market.

Methods

General scientific methods are actively utilized in this study: analysis and synthesis, induction and deduction, extrapolation and interpolation. Assessments and analyses by international researchers are presented in the Literature review section, which enables to see the scope of coverage offered by the existing studies. Apart from that, in the Results section the author understandably resorts to elements of statistical and comparative analysis to reveal the most promising areas of development for China's nuclear sector. As such, the statistical data, readily available from the open sources, is presented in the form of tables in the chronological order, thus disclosing the underlying trends in Beijing's atomic industry since 2015. Scenario analysis is also of assistance in predicting the conceivable trajectories in the near future, contingent upon the circumstances. While it is vital to admit that using political economy as a theoretical framework for studying the problem would be most beneficial, the limitations of the paper make it possible to unveil the full potential of this school of thought in the future work.

Results
China's internal nuclear market: state of the art

China is generally regarded as one of the most prominent regional and global drivers of atomic energy given the significant pace of the country's nuclear power market expansion. Historically, Chinese atomic industry was created in the 1950s thanks in no small part to the Soviet assistance, being predictably linked with the establishment of a military nuclear program at first. NPPs were largely connected to the grid starting from the 1990s. Regarding the legal framework in terms of nuclear non-proliferation, China has remained one of the parties to the 1968 Treaty on the Non-Proliferation of nuclear weapons as a nuclear-weapons-state (Abe, 2020), having signed a voluntary offer safeguards agreement with the IAEA given its status.

The role of the "world's factory" China has been playing in the recent decades explains the urgent need for stable and predictable energy sources, as atomic power helps to meet sharp energy demand predetermined by industrial development (Reshetnikova, 2020). The green economy trend and the goal of decreasing greenhouse gases emissions also shapes China's energy policy directed at lowering the country's dependency on fossil fuels. From a historical point of view, coworking with Russia and other leading states in atomic energy was of great assistance for Beijing in the development of its nuclear industry thanks in no small part to the impressive, accumulated experience and extensive use

of reverse engineering. China, one of the five official nuclear-weapons-states, developed an advanced closed nuclear fuel cycle together with radioactive waste management capabilities as well as nuclear waste disposal capacity (Xia et al., 2021). As a result, China reportedly already replaced France as world's second largest producer of energy[1].

The two companies dominating the market in China are CNNC, China National Nuclear Corporation, primarily operating nuclear power plants in the northeast of the country, and CGNPG, or China General Nuclear Power Group, responsible for the NPPs located in the southeast part of the republic. The majority of Chinese NPPs are situated along the seaside, which can be attributed to the fact that in modern reactor designs (including the VVER (The water-water energetic reactor) family developed by Rosatom) water acts both as a coolant and a moderator.

According to various authoritative sources, China now has around 50 nuclear power reactors operating on its territory. They account for approximately 51 GW of atomic energy, while it is planned to reach the figure of as much as 70 GW by 2025 and an overwhelming 200 GW by mid-2030s. Talking about relative indicators, the share of atomic power in China's nuclear mix has also been increasing recently, being around 5% in 2021. Nuclear power has only been surpassed in China by renewables from the growth rate per annum point of view in 2009–2019[2].

Table 1 illustrates steady growth shown by the China's nuclear energy sector lately. It should be noted that there is still some potential of furthering the share of atomic power in the mix in the short- and mid-term perspective.

Table 1

Share of nuclear power in China's energy mix

Year	2015	2016	2017	2018	2019	2020
Nuclear power share, %	3.04	3.60	3.95	4.33	4.88	4.94

Source: Country Nuclear Power Profiles — China 2020. IAEA Country Nuclear Power Profiles. Retrieved June 10, 2021, from https://cnpp.iaea.org/countryprofiles/China/China.html; China's SNTPC Nuclear Power Development Report The Country Builds its Own Capacity Retaining Global Leadership for Many Years. Retrieved June 10, 2021, from http://finance.people.com.cn/n1/2021/0418/c1004-32080738.html.

[1] Retrieved June 10, 2021, from China Overtook France in Nuclear Power Generation. World Nuclear Industry Status Report. URL: https://www.worldnuclearreport.org/China-Overtook-France-in-Nuclear-Power-Generation.html

[2] Statistical Review of World Energy – 2021. BP. Retrieved June 10, 2021, from https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-china-insights.pdf

In absolute terms, China's nuclear power capacity has also exposed quite impressive an increment. Table 2 contains figures signaling that this indicator has almost doubled within several years.

Table 2

Operable nuclear power capacity in China

Year	2015	2016	2017	2018	2019	2020
Reference unit power, MWe	26,754	31,364	34,494	42,838	45,498	47,508

Source: Nuclear Power in China, World Nuclear Association. Retrieved June 10, 2021, from https://world-nuclear.org/information-library/country-profiles/countries-a-f/china-nuclear-power.aspx.

With these statistics in mind, it is not difficult to find substantiation for China's intentions on entering the global nuclear market. Multiple reactor designs[3] that have been implemented domestically, research and development efforts, as well as geopolitical endeavors are the most significant factors prompting Beijing to make its entry on the international nuclear technology market.

BRI as a Framework for China's Exports on the Global Nuclear Market

The Belt and Road Initiative, an extensive complex of infrastructure development projects, includes several undertakings in the energy realm. Moreover, this area is regarded as the key part of the format. Geographically, the BRI is not confined to Asia and extends to other parts of the world, counting Africa.

Even more than that, given the development of a solid and diverse nuclear fuel cycle infrastructure and technological capacity, China could fill the market niche which appeared after the bankruptcy of Toshiba's Westinghouse (previously jointly owned by the U.S. and Japan) and restructuration of Areva (France) to Orano.

The relevance of BRI consists in institutionalization of China's economic policies through creating state-supported companies. As such, China Marine Nuclear Power Development Co, capitalized at RMB 1 billion, was established in 2017 within the BRI for the purpose of funding nuclear power development projects.

By 2018, China secured agreements to build nuclear power reactors in more than 10 countries, among them were also European states, such as the United Kingdom and Romania. CAP1000 and Hualong One are the two reactor designs that China plans to export widely, both are improved versions of imported reactor designs. It is projected that by 2030 30 power units be built globally. With regards to China's visible inclusion in multiple international formats (BRICS, SCO), it is important to look at how Beijing

[3] Review of Nuclear Industry in 2021: Nuclear Renaissance after Carbon Neutrality, CGN vs. CNNC vs. SPIC. Retrieved June 10, 2021, from https://pdf.dfcfw.com/pdf/H3_AP202107021501285829_1.pdf?1625221757000.pdf

assesses the opportunity to use its vast network of international connections for ensuring its position on the world nuclear market.

Theoretically, SCO could also represent one of the potential frameworks for cooperation between China and regional powers in the nuclear sphere. In accordance with the SCO Development Strategy until 2025, the idea of collaboration in the peaceful use of atomic energy is raised only once in the section entitled "Political Cooperation", whereas security challenges related to nuclear nonproliferation are described in more detail. The Energy Club under the SCO aegis was established to empower the cooperation in the energy sector among the member states (which also includes nuclear power by definition).

The outlook on interaction of the SCO countries in nuclear power is heavily dependent on their technology options. The Central Asian non-nuclear-weapons-states, with quite humble ambitions in terms of nuclear power introduction and united by a nuclear-weapons-free-zone under the so-called Semipalatinsk Treaty hardly express any actual demand for the construction of NPPs, regardless of minor exceptions. India and Pakistan, as de facto nuclear-weapons-states not having joined the NPT, have nevertheless developed indigenous civilian nuclear programs. A certain dichotomy presents itself in this respect, since India is strengthening its ties in the nuclear dimension with Russia based on political motives, and the Kudankulam NPP is the most vivid example. At the same time, Pakistan acts as a recipient of nuclear technology from China. As far as the two official nuclear powers within the SCO are concerned, both China and the Russia have a lot to offer other member states when it comes to nuclear fuel cycle. Beijing and Moscow have been collaborating closely in the peaceful use of atomic power, and this synergy is underpinned by several bilateral documents (Golobokov, 2015). Still, there is a probability of the two countries entering into competition with each other on the regional and global nuclear market – unless they agree on sharing it based on the "Divide et impera" principle, most likely in an informal manner.

As is demonstrated in Table 3, the scope of China's reactors currently exported is limited to Pakistan. The content of the table is only exhausted by operating Chinese reactors and those under construction in this country, according to World Nuclear Association.

Table 3

China nuclear reactors under construction in Pakistan

NPP units	Reactor type	Company	Status (as of mid-2021)
CHASNUPP-3&4	CNP-300	CNNC	Operating
KANUPP-2&3	HPR-1000 (Hualong One)	CNNC	Unit 2 is connected to the grid, Unit 3 is under construction

Source: China Nuclear. World Nuclear Association. Retrieved June 10, 2021, from https://world-nuclear.org/information-library/country-profiles/countries-a-f/china-nuclear-power.aspx

All the more, as exemplified by A. Gu and X. Zhou, Pakistan represents one of the most interesting case studies in terms of joint energy projects within the BRI (Gu A., Zhou X. 2020). At the same time, nuclear power only accounts for a minor term of the overall equation, while cooperation between China and Pakistan in traditional hydrocarbon energy sources and renewables appears more significant.

As such, Asia-Pacific, widely understood, forms the spatial core of interest for China as an aspiring exporter on the nuclear technology market. Even so, Beijing's nuclear export capabilities in terms of geographical footprint do not visibly end here. BRI, as a transregional project, is aimed at channeling China's assertiveness on the global energy market, and nuclear power is one of the most striking showcases for that matter.

Conclusion

This paper argues that the BRI project represents the most suitable out of all existing frameworks for China directed at exporting Beijing's nuclear technology. It can be viewed as an attempt to institutionalize China's growing ambitions to become one of the global leaders on the international nuclear market. Closed nuclear fuel cycle technology and capacity to recycle spent nuclear fuel (even if inferior to that of Russia) are among China's competitive advantages. It is no wonder that China concentrates in the first place on cooperation in the nuclear field with its allies in the Asia-Pacific, but without limiting itself to this region exclusively. Non-nuclear-weapons-states in Central Asia, participating both in the SCO and BRI, hypothetically could count on China's technical assistance in peaceful use of nuclear technologies. However, deficit of political will and an overloaded security agenda in the mentioned subregion diminishes the possibility of creating NPPs here, at least anytime soon. Among the problems China is likely to encounter entering the global nuclear market are the tough competition, market tightness, as well as uncertainty on the part of potential stakeholders (oftentimes linked with political and even cultural apprehensions). Another issue is tangible dependency on uranium purchased from Kazakhstan and Namibia, which forces Beijing to concentrate on ensuring its long-term supplies of nuclear fuel. Besides, one should keep in mind that it is ostensibly more problematic to enter the already occupied market niche.

Unsurprisingly, nuclear industry is controlled – or at least regulated – by the state in most countries, and China is, naturally, no exception. On the flip side of the coin, corporations retain their role in the generation of nuclear energy and have their say in negotiations with international partners. One can conclude that Beijing's relationship with Russia (specifically with Rosatom), will determine its position on the international nuclear market. It will most likely be expressed in a whimsical blend of cooperation and competition, as both parties will balance between their national and corporate interests and pursuance of good-unneighborly partnership.

The recent developments in Ukraine only contribute to this possible cohesion, particularly given the fact that even the Western countries are so far (as of mid-March 2022) reluctant to impose any serious sanctions on Rosatom. Washington's depen-

dence on the uranium fuel imported from Russia is one of the most serious factors in this case. Other large players, including both global actors, such as U.S., Canada, France, and regional stakeholders (South Korea) are to be taken heed of as well.

In general, it is possible that the interrelation between Russia and China will develop in accordance with one of the following two scenarios. The first of them is built around, first and foremost, collaboration, such as joint projects in China and – most optimistically – in third countries, advanced R&D projects, whereas adopting further intergovernmental agreements would not be out of the question, too. The second scenario is related with the parallel development of Russian and Chinese undertakings in multitudinous nations of the Asia-Pacific, without immediate stiff competition, but with a clear distinction of the influence areas (which is also unlikely to prevent Russia from fulfilling its obligations as to the Tianwan and Xudapu NPPs). It is also not improbable that some separate elements of the two scenarios could be intertwined in a fanciful manner.

As it has been shown, China's nuclear industry follows the evolvement pattern which is directed from saturating the receptive internal market to extrapolating its nuclear technology internationally. Given that inference, it is possible to outline the prospects of China's global nuclear market entry based on its domestic development. As stated in the 14th Five-Year plan, the government will focus on increasing its nuclear capacity by 40% during the five years. Thus, it is admissible to hypothesize that it will have an influence on China's intent on expanding its global outreach on the nuclear market.

References

Abe, N. (2020). The NPT at fifty: Successes and failures. *Journal for Peace and Nuclear Disarmament*, *3*(2), 224–233. https://doi.org/10.1080/25751654.2020.1824500

Andrews-Speed, P. (2020). The governance of nuclear power in China. *The Journal of World Energy Law & Business*, *13*(1), 23–46. https://doi.org/10.1093/jwelb/jwaa004

Belova, I. N., & Egorycheva, E. A. (2020). Belt and Road Initiative: prerequisites for China's modern foreign economic policy. *RUDN Journal Of Economics, 28*(3), 620–632. (In Russ.) https://doi.org/10.22363/2313-2329-2020-28-3-620-632

Chen, B.-M. (2021). China's "Nuclear Dragon" Goes Abroad: Exporting Nuclear Power Infrastructure through the Belt and Road Initiative. Center for International Private Enterprise, 2021.

Golobokov, A. S. (2015). Various forms and mechanisms of Chinese-Russian cooperation in the energy sphere and the role of non-governmental structures. *Pacific Science Review B: Humanities and Social Sciences*, *1*(1), 45–48. https://doi.org/10.1016/j.psrb.2016.01.002

Goncharuk, A. (2012). China Reactor Row: Present and Future. *Innovations* (2), 60–65. (In Russ.)

Gu, A., & Zhou, X. (2020). Emission reduction effects of the green energy investment projects of China in belt and road initiative countries. *Ecosystem Health and Sustainability*, *6*(1), 747–767. https://doi.org/10.1080/20964129.2020.1747947

Harlan, T. (2021). Green development or greenwashing? A political ecology perspective on China's green Belt and Road. *Eurasian Geography and Economics*, *62*(2), 202–226. https://doi.org/10.1080/15387216.2020.1795700

Kashin, V. B., Piatachkova, A. S., Smirnova, V. A., Litvinov, A. A., & Potashev, N. A. (2021). Chinese experts on new five-year plan of PRC. Analytic note. Analytical Note. Centre for Comprehensive European and International Studies (CCEIS). (In Russ.) Retrieved July 2, 2021,

from https://cceis.hse.ru/ (accessed: 02.07.2021).

Lin, B., Bae, N., & Bega, F. (2020). China's Belt & Road Initiative nuclear export: Implications for energy cooperation. *Energy Policy*, *142*, 511–519. https://doi.org/10.1016/j.enpol.2020.111519

Lin, B., & Bega, F. (2021). China's Belt & Road Initiative coal power cooperation: Transitioning toward low-carbon development. *Energy Policy*, *156*, 112–138. https://doi.org/10.1016/j.enpol.2021.112438

Yu, G., Li, Y., Cai, J., Yu, D., Tang, J., Zhai, W., & Qin, J. (2019). Short-term effects of meteorological factors and air pollution on childhood hand-foot-mouth disease in Guilin, China. *Science of the Total Environment*, *646*, 460–470. https://doi.org/10.1016/j.scitotenv.2018.07.062

Mallapaty, S. (2020). How China could be carbon neutral by mid-century. *Nature*, *586*(7830), 482–484. https://doi.org/10.1038/d41586-020-02927-9

Reshetnikova, M. S. (2020). China's AI experience: industrial digitalization. *RUDN Journal Of Economics, 28*(3), 536–546. https://doi.org/10.22363/2313-2329-2020-28-3-536-546 (In Russ.)

Sovacool, B. K., & Valentine, S. V. (2010). The socio-political economy of nuclear energy in China and India. *Energy*, *35*(9), 3803–3813. https://doi.org/10.1016/j.energy.2010.05.033

Wealer, B., Bauer, S., Hirschhausen, C., Kemfert, C., & Göke, L. (2021). Investing into third generation nuclear power plants-Review of recent trends and analysis of future investments using Monte Carlo Simulation. *Renewable and Sustainable Energy Reviews*, *143*, 110–136. https://doi.org/10.1016/j.rser.2021.110836

Xia, F., Zhao, J., Cai, J., & Liu, J. (2021). Dynamic cost analysis for disposal of low and intermediate level nuclear waste in China. *Annals of Nuclear Energy*, *154*, 108–197. https://doi.org/10.1016/j.anucene.2020.108097

Xu, Y., Kang, J., & Yuan, J. (2018). The prospective of nuclear power in China. *Sustainability*, *10*(6), 20–86. https://doi.org/10.3390/su10062086

Zhou, L., Gilbert, S., Wang, Y., Cabré, M. M., & Gallagher, K. P. (2018). Moving the Green Belt and Road Initiative: from words to actions. World Resources Institute, Global Development Policy Center Working Paper. Retrieved from https://files.wri.org/d8/s3fs-public/moving-green-belt-and-road-initiative-from-words-to-actions.pdf

Bio note / Сведения об авторе

Gleb V. Toropchin, Candidate of Science (in History), Associate Professor at the Department of Foreign Languages for Engineering Programmes, Novosibirsk State Technical University; Associate Professor at the Department of World Economy, International Relations and Law, Novosibirsk State University of Economics and Management. ORCID: 0000-0002-8055-1202. E-mail: glebtoropchin@mail.ru

Торопчин Глеб Вячеславович, кандидат исторических наук, доцент кафедры иностранных языков технических факультетов, Новосибирский государственный технический университет; доцент кафедры мировой экономики, международных отношений и права, Новосибирский государственный университет экономики и управления. ORCID: 0000-0002-8055-1202. E-mail: glebtoropchin@mail.ru