

# "World crisis (2020): Plans and Reality for Implementation of the "Program of Development of the Coal Industry for the Period up to 2035"

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**Abstract.** The macroeconomic situation, both in the world and in Russia, is considered, which developed in 2020. COVID-19 made significant adjustments to the previously developed forecasts for the development of coal production and export. The results of calculations on the dynamics of coal production and export in the main countries of the world and in Russia are presented. The global crisis of 2020 forces us to revise (adjust) the "Program for the development of the coal industry in Russia for the period up to 2035" adopted in June 2020 (Program) [1], including coal export.

**Keywords.** Global crisis in 2020, Program for the development of the coal industry in Russia for the period up to 2035, forecasts of coal production and export in the world and the Russian Federation until 2040.

## Introduction

The macroeconomic situation in the world has deteriorated significantly: oil prices, and then coal prices, began to fall, which leads to a decrease in coal production and consumption. COVID-19 has made significant adjustments to the previously developed forecasts for the development of coal mining and export. The research in this article is devoted to the answer to the question: what is the reality of the implementation of the "Program for the development of the coal industry in Russia for the period up to 2035", including the export of coal.

## Macroeconomic situation and state of the coal industry in 2020

Starting in 2019, and especially in 2020, the macroeconomic situation both in the world and in Russia has changed significantly [2-6]. COVID-19 has led to the fact that the decline in global GDP in 2020, according to forecasts of the World Bank, may be about 5.2% compared with the level of 2019. The average world price of Brent oil in 2020 may "fall" by half compared to the level of 2019 - up to 32 dollars. US / bbl.

Coal production in the world in 2019 amounted to about 7.9 billion tons (+ 4.1% to the level of 2018), incl. in China - about 3.7 billion tons (- 5.3% by 2018), India - 769 million tons (- 0.9% by 2018), USA - 640 million tons (- 6.7% to 2018), Australia - 503 million tons (+ 3.7% by 2018), Indonesia - 616 million tons (+ 12.4% by 2018), Russia - 441.3 million tons (- 0.6 million tons by

2018) [2, 3]. In 2020, according to the forecast МЭА, world coal production may decrease by 8%, incl. in China - by 9%, in the USA - 25%, Japan and South Korea - by 5-10%, EU countries - by 20%.

The drop in oil prices, characteristic of 2019 and 2020 [2, 3], led, respectively, to a drop in world coal prices and a decrease in the average annual prices of Russian coal producers, and hence to a decrease in demand for coal and its production ... In the period from the second half of 2016 to 2018, oil prices increased, followed by an increase in gas and coal prices, and the growth of global coal production resumed. This allowed Russian producers to accelerate their production and export of coal. However, in 2019 the macroeconomic situation on the market changed: oil prices began to fall, while the average world prices of 1 ton of thermal coal on the world market decreased by 7.9%, to 108.6 USD. US / t, incl. in Europe - by 33.8%, to 60.9 dollars. USA. In turn, the average world prices for 1 ton of coking coal in 2019 decreased by 6.3% compared to the level of 2018 and amounted to \$ 148.5. USA / t. These prices, in fact, balanced at the self-sufficiency mark. Nevertheless, from January to July 2020, coal prices on the European market were in the range of \$ 54-59. USA for 1 ton at the port of importers, depending on contracts and delivery times. Prices in the Asia-Pacific market (APR market) also remain low. Contracts for the shipment of thermal coal (with a calorific value of 6300 kcal per 1 kg) in the Australian port of Newcastle were concluded at a price of \$ 50. USA / t.

In the period from 2000 to 2019. the average annual prices for coking coal increased 6.2 times, for thermal coals - 6.7 times. Some price dips in 2009 and 2014 can be explained by the financial and economic crisis and the

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fall in oil prices, which, in turn, "pulled" the price of coal.

In December 2019, average producer prices for 1 ton of Russian coal amounted to \$ 46.5. USA / t, including coking - 77.3 USD USA / t, energy - 36.0 USD. US / t, which is significantly less than in 2018.

High rates of growth in the prices of Russian coal producers "stimulated" the growth of the volumes of mined coal, especially coking coal, which were then exported in large volumes, given the need for high-quality coking coal. However, since the beginning of 2020, coal prices have dropped by 22%.

The drop in oil prices, characteristic of the second half of 2008, 2013, 2014, 2019 and 2020, led, respectively, to a decrease in the average annual prices of Russian coal producers, and hence to a drop in demand and volumes of production and supplies of Russian coal.

Coal supplies to the domestic Russian market continued their downward trend, and in January-August 2020 they decreased by 10.6% - to 103.6 million tons compared to the same period in 2019.

Nevertheless, despite the decline in coal production in Russia, Colombia and other countries, the supply of coal in the global market remains excessive, and weak competitiveness with gas also puts downward pressure on coal demand.

## **Global challenges generating a number of systemic problems and consequences for the coal industry in Russia**

For the period 2011–2019 some financial performance indicators of the industry worsened: the debt on loans and credits received increased 3.3 times (from 243.4 to 810.8 billion rubles); the share of unprofitable enterprises in the total volume of mined coal increased from 3.5 to 8.2% [5]. In the context of stagnation of domestic coal consumption in Russia, an increase in the supply of coal for export has been the main driver of growth in coal production for many years [6]. In 2019, Russia exported 192.3 million tons of coal, of which over 57% was supplied to the west. Compared to the level of 2010 in absolute terms, although they increased by 35.2%, the share of Russian coal supplied for export in the western direction fell from 84.3% in 2010 to 57.1% in 2019. of coal in the eastward direction in 2019 increased to 82.5 million tons (5.5 times more than in 2010), their share in the total volume of coal supplied for export in 2019 increased 2.7 times, amounting to 42.9%. Export prices of Russian coal supplied in the western direction in the period from 2010 to 2019 "fell" to 60.9 dollars. US / t, or 34.1%, incl. coking - up to 59 dollars. US / t (- 38.8%), energy - up to 80.7 dollars. US / t (-32.4%). Export prices of Russian coal supplied to the east in the period from 2010 to 2019 decreased to 80.8 dollars. USA / t, or by 23.3%, incl. coking - up to 105.9 dollars. US / t (- 28%), energy - up to 77.5 dollars. US / t (-20.3%).

Revenue from coal exports in the industry as a whole in 2019 amounted to about \$ 13.4 billion. USA (+ 46.8% to the level of 2010), incl. in the western direction - about 6.7 billion dollars. USA (- 10.9% to the level of 2010). To the east, revenue from coal exports increased 4.2 times compared to 2010. This indicates a reorientation of Russian coal supplies from West to East. Nevertheless, in January-August 2020, export supplies of Russian coal fell to 126.1 million tons, or 2.7% compared to the same period in 2019.

## **The main countries are consumers of Russian coal and factors that can lead to a drop in demand for coal**

The main consumers of Russian coal in recent years have been: China, Japan, South Korea, EU countries and Ukraine. The situation in these countries with the consumption of coal testifies to the beginning of its decline and the transition to other energy sources. For example, China is cutting coal consumption due to a gradual reorientation from coal to natural gas and green energy. Due to Covid-19, coal consumption in China fell by 8% in May 2020, while coal consumption fell by 9%. In the EU countries, the decline in coal and hydro generation is taking place against the backdrop of an increase in gas, solar and wind generation. This has been fueled by the rise in the price of carbon emissions and the decline in gas prices, as a result of which gas generation has become cheaper than coal.

Coal consumption in Japan is planned to be reduced, and 110 out of 140 coal-fired power plants will be closed by 2030, which will "hit" the traditional suppliers of thermal coal to the country - Australia, Indonesia and Russia. Therefore, Russia in the next 10 years may lose another of the significant Asian markets for coal.

For many years Russia remained the largest supplier of coal to Ukraine. In 2019, according to the Ukrainian State Statistics Service, 58% of the total volume of coal supplied to the territory of Ukraine accounted for Russian hard coal and anthracite. However, in May 2020, Ukraine imposed duties on coal imports from Russia (at 65%) to protect its domestic market.

All of the above indicates that the demand for coal in the prospective period will significantly decrease. Russian coal supplies, both to the west and to the east, may decline.

Changes in the volumes of coal production and supplies are significantly influenced by the following factors: changes in the conjuncture for energy resources on the global and domestic markets, which in turn leads to a drop (or growth) in demand for coal, as well as the devaluation of the ruble. So, if in 2012 for 1 US dollar on average they "gave" 31.07 rubles, then in 2019 - 64.97 dollars. USA. At the same time, investments in fixed assets of Russian coal enterprises, which in 2019 amounted to \$ 3,010.6 million. The US may also fall. In the current macroeconomic situation, Russia's GDP in 2020, according to experts' estimates, may decrease by 4-7% compared to the level of 2019.

## Plans for the implementation of the "Program for the development of the coal industry in Russia for the period up to 2035"

In such a difficult macroeconomic situation, in June 2020, the Program for the Development of the Russian Coal Industry for the Period up to 2035 was adopted. (approved by the order of the Government of the Russian Federation dated June 13, 2020 No. 1582-r.) (Table 1).

**Table 1.** Forecast of production and export of Russian coal until 2035

	2019	2020		2025		2030		2035	
		I	II	I	II	I	II	I	II
Coal production, total, mln t	441	435	466	459	593	476	659	485	668
incl. coking	99	102	107	120	145	136	149	140	150
energetic	343	333	359	339	449	341	510	345	518
Coal exports, total, mln t	192	195	215	218	297	228	341	241	349

The question arises: how realistic are the plans for the implementation of the "Program for the development of the coal industry in Russia for the period until 2035" As mentioned earlier, an increase in coal production in the Russian Federation is possible only through an increase in the volume of coal supplied for export, due to the stagnation of the domestic market. In this regard, an assessment was made of the possibilities for increasing the export supplies of Russian coal in the period up to 2040 for the main coal-consuming countries of the world.

## Scenario options for economic development in the post-crisis period

Two scenarios for the development of the world economy, widely discussed in the expert community, were analyzed.

Option I, providing for a rapid "V-shaped recovery of the world economy" within one - maximum two years with the achievement of the growth rate of the world's gross domestic product (GDP) at the level of the pre-crisis period (2020) and equal to about 3 -3.5% per year. Option I is the trajectory of continued sustainable global GDP growth. At the same time, the depth of the fall in the world's GDP in 2020 in this variant is taken, in accordance with the estimates of the World Bank, equal to approximately 5.0-5.5%.

Alternative to the above option I is option II, which provides for a slow "L-shaped recovery of the world economy." In option II, the world GDP growth rates are taken at the level of the pre-crisis period (2020) - about 3-3.5% per year. Option II is a trajectory that implements stabilization trends in development, based on innovative development of the economy. The depth of the fall in the world's GDP in 2020 is taken according to the World Bank estimates - 5.0-5.5%. The decline in the world's GDP, starting from 2020, will continue until 2024, after which the GDP will first reach a stabilization

level, and then move to a systematic growth with its low rates.

## Forecasts of oil prices until 2040 in scenario scenarios for the development of the world economy

In option I, the tendencies formed in the pre-crisis period will, in fact, scale. The world oil price, after falling to \$ 32 in 2020. US / bar., According to the World Bank, will recover to the maximum levels of 2011-2012. in 2040 and will be about 115-120 dollars. US / bar.

In option II, these tendencies will be broken, as a result, the economy will switch to global resource conservation, including energy conservation. The world oil price will fall to \$ 21-22. US / bar.

## Possibilities for the implementation of scenario options in individual countries of the world

To answer the question about the implementation of the considered scenario options, forecasts were developed until 2040 for two scenario options for individual countries (China, India, Japan, South Korea, EU countries, USA, Russia, countries of the western direction and countries of the eastern direction -ni) the following indicators: average annual GDP growth rates; GDP dynamics; share of the GDP of each of the above countries in the world's GDP.

As shown by the calculations, the growth rate of China's GDP by 2040 is almost 2 times higher than the corresponding growth rate of world GDP. This largely determines the growth of China's share in the world economy. In accordance with forecast calculations, China's share in the world economy over a 20-year period will increase 1.7 times in option I, and 1.5 times in option II. By 2040, China will occupy about 20-24% of the global economy. Therefore, there will be a fairly high impact of China on the export of Russian coal.

India's GDP growth rates by 2040 in the options under consideration are also almost 2 times higher than the same world GDP growth rates, which will ultimately lead to an increase in India's share in the world economy. In option I, over a 20-year period of time, India's share in the world economy will increase 1.7 times and will be approximately 6%, and in option II, accordingly, the share will increase 1.4 times and will be 5% in the world GDP. This determines a rather significant potential of India's influence on the export of Russian coal.

In accordance with the forecast calculations, the growth of the Japanese economy by 2040 in the two considered options is significantly lower than in China and India. Thus, in option I of the "V-shaped economic recovery", the growth rates of Japan's GDP are almost 2 times lower than the rates of world GDP, and in option II, the L-shaped economic recovery, they are comparable to the same rates of world GDP. A more restrained development of the Japanese economy in the options

under consideration, in comparison with China and India, will lead either to stabilization or to a drop in its share in world GDP.

Forecast calculations point to high average annual GDP growth rates in South Korea under option I "V-shaped economic recovery", averaging 5.6%. In option II "L-shaped economic recovery" South Korea's GDP will grow at a rate of approximately 2.2-3.5% per year. Such average annual growth rates ensure an increase in South Korea's GDP over the 20 years of the coming period in option I by 1.6 times, and in option II - 1.4 times.

In option I, the share of South Korea in the world's GDP for the upcoming forecast period increases from 1.7% to 2.8%, and in option II - to 2.4%. Such an increase in indicators positions South Korea as a country that ensures the growth of the export potential of the Russian coal market GDP of the Eastern Direction countries in option I, in accordance with the calculations, will grow at an average rate of 5% per year, and in option II, respectively, 1.9-3% per year.

Such growth rates ensure an increase in the GDP of the Eastern Direction countries in the 20-year forecast period in option I by 2.8 times, and in option II - by 1.5 times. In accordance with the accepted scenario options, the share of the Eastern Direction countries increases from 26 to 34-38%. This is a very significant share, which determines the development potential of the Russian coal industry in the Eastern direction.

In the Western direction, the demand for Russian export coal is formed mainly by the EU countries. The projection of scenarios for the development of the world economy testifies to the actual identity of the dynamics of the GDP growth rates of the EU countries and the world as a whole. Both the depth and the average GDP growth rates of the EU countries in the post-crisis period have a slight discrepancy with the values adopted in the whole world in options I of the "V-shaped economic recovery". Similarly, for option II of "L-shaped economic recovery" such an identity is characteristic. The active recovery of the EU economy in option II begins in 2025. The GDP growth rates of the EU countries adopted in the scenario options determined the volume values of this indicator achieved in the forecast period. The average annual GDP growth rate of the EU countries in the forecast period, averaging 3%, makes it possible to increase the absolute value of this indicator by 2040 by 1.8 times (relative to 2019). In option 2, the average annual GDP growth rate of the EU countries is 0.5-1.5%. Such rates ensure the recovery of GDP volumes only by 2040. In fact, option 2 is an option for the stabilization development of the EU countries. It is obvious that under these conditions one cannot expect an increase in the share of EU countries in the world economy. Moreover, in accordance with forecast calculations, the share of EU countries in the world's GDP even slightly decreases to 19.2 - 19.5%. In contrast to the Eastern direction of development of Russian coal exports, the Western direction is gradually reducing its growth potential for Russian coal supplies.

The USA in option I of "V-shaped economic recovery" almost completely repeats the accepted profile of changes in the world economy. The depth of the

decline in US GDP, as well as the rate of its recovery, is about the same as in the whole world. The dynamics of the US GDP in option II "L-shaped slow economic recovery" is projected in a similar way. This recovery, in accordance with forecast calculations, in option II should be carried out no earlier than 2025. In option I, with an average annual GDP growth rate of 3.1% for the forecast period, US GDP will increase by 2040 (relative to 2019) almost 1.9 times. In Option II, the average rate of GDP growth in the post-crisis period is 0.5-1.5% per year, which will increase the absolute level of US GDP by 2040 - by only 1.1 times. Despite the large difference in the values of the US GDP by the options reached by the end of the forecast period, the share of the US economy in these options will practically not increase. The share of the United States in the world economy will be at the level of no more than 21-22%.

## Forecast estimates of world coal production and export

The scenario parameters of the development of the world economy, adopted in the considered options, made it possible to develop forecasts of world volumes of coal production until 2040. The assessment at the first stage of calculations provides for forecast calculations of the coal intensity of the world's GDP. In 2010-2013, the coal content of the world's GDP reached its "peak", after which the process of its systemic decline began. By 2019, the coal content, compared to the maximum levels of the period 2010-2013, decreased by 17%. Further decrease in coal capacity, in accordance with the scenario options, will be carried out in two ways:

- the first (option I), assumes a low rate of decline, approximately until 2030-2052, and more intense decline after this period;
- the second (option II), assumes a more intensive decrease in carbon intensity at the first stage.

Despite the reduction options of different intensity, the carbon intensity of GDP in both options will fall by 38% by 2040 (compared to 2019). Different trajectories of a decrease in the coal intensity of the world's GDP, envisaged in the scenario options, determined the opposite dynamics of changes in the volumes of world coal production - by 2035 - 5.2-9.7 billion tons, by 2040 - 4.4-9.4 billion tons. Forecast dynamics of coal intensity of the world's GDP (for thermal coals) is practically identical to the dynamics for the accepted scenario options. In general, by 2040, the coal intensity of the world's GDP will decrease by 38% compared to 2019.

According to calculations, the global production of steam coal will increase by 17% by 2040 under Option I, to 8020 million tonnes. Under Option II, on the contrary, the production of steam coal will decrease by 30% by 2040, to 4,820 million tonnes.

The dynamics of the coal intensity of the world's GDP (for coking coal) has a high differentiation according to scenario options. In option I, the coal content by 2040 (for coking coal) should decrease by 30% by 2040, and in option II - by almost 50% (relative to 2019). In option I, by 2035, the stabilization of coking

coal production at the level of 1470 million tons is achieved. Outside this period, the world production of coking coal slightly decreases, reaching values equal to 1390 million tons by 2040.

Option I provides for a further increase in the capacity of ferrous metallurgy for smelting metal used in the economy. The metal intensity of the economy is increasing. Option II is characterized by a systemic decrease in the production of coking coal, reaching 580 million tons by 2040. In option II, the opposite trend of a decrease in coke consumption and, consequently, a decrease in the volume of metal used in the economy is set. In this variant, the use of metal is replaced by the use of more advanced materials used in various machines and structures. This option is more innovatively focused. It is carrying out an intensive withdrawal from the economic turnover of the economy of coking coal and metals.

With a favorable price environment for energy resources (option I, the volume of coal exports is growing: from 1,420 million tons in 2019 to 1990 million tons in 2035, with a slight decrease by 2040 to the level of 1,880 million tons.

The overall growth of coal exports by 2040 is 32% (relative to 2019). Such volumes can only be achieved with a 4-fold increase in energy prices. At the same time, it is assumed that by 2040 the world oil price should recover to \$ 120 / bbl. (2020 estimate - 38 USD / bbl.). In option II, with an unfavorable situation on the energy market and an almost 2-fold decrease in prices for them by 2040, the volume of coal exports will systematically decrease: from 1,420 million tons (2019) to 790-795 million tons (2040).), i.e. on average by 44%.

Global exports of thermal coal under Option I (favorable energy market conditions) will increase from 1,090 million tons (2019) to 1,580 million tons in 2035 and 1,486 million tons in 2040. Growth in the volume of energy coal exports over the entire forecast period will amount to 36%.

In option II (unfavorable conditions on the energy market), the volume of thermal coal exports will systematically decrease to the level of 580-585 million tons. The overall decline over the entire period will be 46% on average.

The dynamics obtained indicates that the drop in exports in option II is to a greater extent associated with thermal coals than with coking ones. With a more intensive reduction in consumption of the latter, most likely, this indicates the direction of the export of coking coal, to a greater extent, to developing countries.

Developed countries are likely to move their coking coal off the market. The forecast dynamics of export volumes of coking coal also significantly depends on the price environment and parameters of the world economy. In option I, the export volumes of coking coal increase from 330 million tons (2019) to 404 million tons in 2035 and 390-395 in 2040. The average growth in export volumes in this option for the entire forecast period is 19%. In Option II, the average GDP growth rate in the post-crisis period is 0.5-1.5% per year, which will increase the absolute level of US GDP by 2040 - by only 1.1 times. Despite the large difference in the values of

the US GDP by the options reached by the end of the forecast period, the share of the US economy in these options will practically not increase. The share of the United States in the world economy will be no more than 21-22%.

## **Coal consumption in the countries of the western and eastern directions**

To assess the possible volumes of coal consumption by the countries importing Russian coal, calculations were also carried out on the predictive estimate of the coal capacity of China, India, Japan and South Korea. The higher rates of decline in the coal intensity of the GDP of China and India indicate that coal consumption in these countries, at the same rate of GDP growth, will decline more intensively than in Japan and South Korea, which are advanced economies. Coal consumption under option 1 in South Korea in the forecast period may increase by almost 2.5 times, and in option 2 - by 14%. South Korea is quite a promising consumer of Russian coal.

In general, the countries of the Eastern vector may increase their coal consumption (option 1). However, due to the decrease in coal consumption (option 2), one can expect, at best, a stabilization or even a decrease in Russian export supplies, especially for coking coal.

The coal intensity of the EU countries has a higher rate of decline than the countries of the Eastern vector. In option 1, coal consumption in the EU countries by 2040, under the most favorable conditions, may increase by a maximum of 11%. In option 2, coal consumption in the EU countries will fall at a significant rate and by 2040 will decrease (compared to 2019) by 83%.

Considering that the total consumption of coal determines the volumes of Russian coal exports, it should be noted that the potential of Russian exports to the West has decreased. In the forecast period, it is more likely that the potential of Russian exports will be determined by the consumption of coal by the countries of the Eastern vector. In option 1, despite the decrease in coal content, the volume of coal consumption, in the context of intensive economic development and favorable conditions on the energy carriers market, may increase by 2040 by a maximum of 18%. If option 2 is implemented, which provides for the intensive development of the economy, in the face of unfavorable conditions on the primary energy market, the volume of coal consumption in the economy by 2040 may decrease.

With a high probability, in the forecast period, option 2 will be implemented - intensive development of the economy, significantly increasing labor productivity. The development of the world economy according to this option can lead to a reduction in coal consumption, which can significantly reduce the development potential of Russian coal exports.

Over the entire forecast period, the coal intensity of Russia's GDP may decrease by 48-52% by 2040. In accordance with the forecast calculations, the volumes of coal consumption in Russia under Option 1 are practically stabilizing in nature. If in 2019 the volume of

consumption was 249 million tons, then by the end of the forecast period (2040) - 250-255 million tons. The average growth in consumption volumes is about 1.8%. According to option 2, the consumption of coal is systemically decreasing, most likely due to its "squeezing out" by gas and non-traditional energy sources.

In general, for the entire period (2019-2040), the volumes of coal consumption may decrease according to option 2 from 249 million tons to 160 million tons. Therefore, the volumes of coal production in the forecast period will largely be determined not by the domestic Russian market, and the export coal market.

According to Option 1, the export of Russian coal may increase from 192 million tons in 2019 to 283 million tons in 2040, i.e., by 47%. Option I aims at further increasing the export of natural resources in the Russian economy. Option 2 is aimed at reducing the dependence of the Russian economy on the export of natural resources.

Thus, based on the scenario scenarios of the development of the world economy, the possible volumes of Russian coal production were obtained: 2035 - 285-498 million tons; 2040 - 271-536 million tons. Calculations showed that even in the most favorable conditions (option I), coal production in Russia can be 498 million tons in 2035, and 536 million tons in 2040 (2019 - 441 million tons). For the entire forecast period, its growth will not exceed 20-22%. In option II, with a drop in global coal consumption, the production of Russian coal may decrease from 441 million tons in 2019 to 285 million tons in 2035 and to 271 million tons in 2040. Over the entire forecast period, the total decrease may amount to 38- 39%.

## Conclusion

Based on the scenario options for the development of the world economy and taking into account the intentions of coal companies, the following possible volumes were obtained:

Russian coal production: 2035 - 328-365 million tons (at best);

Russian coal exports: 2035 - 145-168 million tons.

At the same time, according to the "Program for the development of the coal industry in Russia for the period up to 2035" Possible coal production volumes: 2035 - 485-668 million tons; exports: 2035 - 324-370 million tons.

Achievement of high volumes of coal production in Russia for the period up to 2035, provided for in the Program, seems unlikely. The global crisis in 2020 requires government bodies to significantly adjust the long-term guidelines for the development of the industry adopted in the Program.

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