Shale Gas Production in Germany: Ecology and Political Aspects

Oleg N. Nikiforov

Abstract The problem of the use of available reserves of shale gas in Germany is linked, above all, with the domestic gas prices and, significantly, with the security of energy supply. According to the experts of Wintershall, the leading gas supplier to the domestic market, natural gas has a crucial significance for energy supply of Germany and Europe. Company's CEO Rainer Seele said in April 2013 that the German industry was facing hard times and that it had itself created this problem (Nikiforov, Battle for gas. NG-Energia, 2013). It is connected with the rising energy prices, which is caused by the country's energy policy reform. Nevertheless, the prices are falling throughout the world both in the relative and absolute indicators. Gas prices in the USA are currently three times lower than in Germany. The Wintershall head believes that the fact that energy prices also affect competitiveness is too often neglected.

Germany's concern is caused, first of all, by the situation in the sphere of gas supply to the country's industry. Germany's energy strategy provides for a nuclear phase-out and a quick transition to renewable energy sources. This political decision was brought to the forefront after the accident at Japan's Fukushima nuclear power plant in 2011 and supported by the majority of the voting public in Germany. Gas, as the most environmentally friendly of non-renewable energy resources, should play an important role during the transitional period, that is, before the use of alternative energy sources becomes predominant.

Keywords Ecology, Germany, Policy, Shale gas

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1 Introduction

The stake on renewable energy sources and, in the context of Germany, on such sources as wind power is linked with the geographical position of the country and its energy infrastructure. Wind parks are built mainly in the north, and a considerable demand for electricity, taking the country's most industrially developed regions, exists in the south. Therefore, Germany badly needs the network infrastructure and standby capacities. And, whatever the European supporters of energy supply diversification say, to all appearances, Europe cannot do it without Russia's help. This time, not hydrocarbons, but electricity and power supply networks are meant here.

The experiment pursued by Germany, that is called "Energiewende" (energy transition), that is linked with the country's transition to green technology in the sphere of electrical power generation may fail. An initiator of the countrywide introduction of alternative energy sources in Germany, Chief Executive of DENA (the German Energy Agency) Stephan Kohler, believes that the problem is that the wind does not constantly blow and the sun shines not regularly. And these natural circumstances necessitate the construction of standby energy capacities for ensuring stable power supply for the whole country. To guarantee it, the country needs to have the same number of conventional power plants as the number of wind-driven power plants and solar panels that will be installed within the "Energiewende" programme. It should also be taken into account that this programme sets rather strict parameters of the introduction of green technology. According to them, 35% of the country's total electric power will be generated from alternative sources by 2020, and by 2050 – as much as 80%. It means that the required volume of standby capacities practically should be equal to the commissioned green energy capacities. But even the construction of conventional thermal power plants (on the condition of nuclear phase-out) is linked with considerable capital investment and long time of their construction. These circumstances considerably hinder the introduction of green technology both for Germany and the whole Europe. Kohler sees a way out of the situation in the unification of power transmission systems of Russia and Europe. The time difference between them will make it possible during the peak hours that do not coincide because of the different time zones to make large electric power transmissions from Russia to Europe and back, if necessary. The joint

network operation considerably removes also the problem of standby capacities, as in this case, the corresponding Russian power plants could be used.

In the view of the German side, taking into account the existing project of solar power plants in Sahara and the 4,000-km-long power transmission lines across the Mediterranean to Europe, called Desert, then the network connection with Russia appears to be easier and more low cost from the engineering and economic viewpoints, because in this case the distance would be only 2,000 km.

This project is of benefit to Russia, to all appearances, because on the one hand, it allows it to diversify energy supplies to Europe and overcome the image of a resource-based economy. On the other hand, it will help resolve the problem of power supply to the Kaliningrad enclave by means of power exchange with EU countries. It will allow Russia to save corresponding investment that would be otherwise used to build additional capacities in the region. However, this unified grid project has a considerable political component related to Poland and especially to the Baltic states that hold to conservative stances on many issues linked with Russia.

However, these are projects of tomorrow, which require uneasy political agreements not only between Moscow and Berlin but also with Brussels. But in recent years, generating concerns in Germany have been shutting down gas-fired power plants, placing their stake on inexpensive American coal, enormous amounts of which have been released as a result of substitution of coal in the US energy balance by shale gas. Therefore, the expert stresses, Germany's energy transition is going on without gas, although it is available at low prices in the country in sufficient quantities and also (unlike coal) is neutral in terms of CO_2 emissions.

The world energy structure is currently undergoing serious changes, and the driver of this process is shale gas. It is this gas that causes price structure changes and that becomes a driving force of competitive struggle. Kohler cites data of a City Bank research, according to which, the cost of US industrial production is just 7% higher than in China, but it is already 15% lower than in Germany. It is clear that German businessmen prefer to invest not in Germany, but in the USA [1].

2 Shale Gas in Germany

It is recognised that it is Germany that has particularly large reserves of nontraditional gas in Europe (Fig. 1). Various estimates suggest that their volume is from 0.7 trillion to 2.3 trillion cubic metres. The Federal Institute for Geosciences and Natural Resources (BGR) in Hannover believes that technically recoverable volume of the reserves is 1.3 trillion cubic metres. It will be sufficient for covering the country's natural gas requirements for 13 years or (which is more feasible) for maintaining the share of domestic gas on the German market over 100 years at the level of at least the current 12%.

Wintershall is involved in shale deposit scientific research. The concession areas are located in North Rhine-Westphalia, on the border with the Netherlands. It

Fig. 1 Shale basins in Germany (http://www.science-skeptical.de/wp-content/uploads/2012/07/Geologie-Deutschland.jpg)

should be noted that the company experts already have the experience of tight gas recovery. Because shale gas is deposited in source rock pockets and, in contrast to the conventional natural gas, it cannot get itself to the land surface. In this context gas recovery from tough rock in many ways is similar to shale gas production. It is the method of induced hydraulic fracturing or hydrofracturing, commonly known as fracking, applied in Germany since 1961. The difference is that for gas recovery from tough rock, a mixture of sand and water is used. And in the case of shale gas recovery, ceramic proppant agents or aluminium oxides are used instead of sand (or along with it), in order to keep induced hydraulic fracture open for pumping out

of gas. The problem is in the proppant agents. According to environmentalists, they may contaminate drinking water.

To date, the hydraulic fracturing method is banned in Germany. According to Wintershall data, starting from the middle of 2011, not a single request for the use of hydraulic fracturing, including in the conventional gas production, has been granted by the competent authorities [2]. As a result, the country's gas production in 2012 decreased by 10%. However, the company has long been using the hydraulic fracturing method in Europe, Russia and Argentina.

Germany's Federal Environment Ministry and Federal Ministry of Economics reached an agreement on the development of a joint draft law on shale gas recovery with the use of this technology. The draft law, in particular, prohibits using the hydraulic fracturing method in conservation areas and near drinking water boreholes. In addition, environmental impact assessment is necessarily made for each project. The problem is that in September 2013, Germany had parliamentary elections, and their winner – CDU/CSU (union of Germany's two main conservative parties, the Christian Democratic Union of Germany, CDU, and the Christian Social Union of Bavaria, CSU) – had to change the partner, as the Free Democratic Party (FDP) has failed to get into Bundestag. Therefore, the ministries, responsible for the economy and environment, may take tougher stances on the environment protection.

3 Priority of Ecology

As a matter of fact, according to data of a well-known German geology expert Martin Sauter from the Geoscience Centre of the University of Göttingen, there are considerable differences between Germany and the USA on the possibilities for the organisation of shale gas recovery. Therefore, Germany has more limited possibilities for shale gas production. It is caused by Germany's considerably higher population density. If the draft law is adopted, the use of the hydraulic fracturing method near zones of the sanitary protection of sources of water supply will be prohibited. In other regions it will be allowed only after a thorough analysis of the possible environmental impact. However, in recent years, the debate on the shale gas recovery methods continues in Germany [3].

It is the method of shale gas production – fracking – when a mixture of water, sand and chemical additives is injected under high pressure deep into the ground that causes concern, above all (Fig. 2). Ecologists believe that this creates the risk of groundwater contamination. Meanwhile, the President of Germany's Federal Institute for Geosciences and Natural Resources Hans-Joachim Kümpel believes that "if we start shale gas production in Germany, there will be no dense network of drilling rigs here and damage for agriculture as in the United States. We are ready to comply with the strictest norms in handling the fracking mixture. Protection of drinking water is top priority" [4].

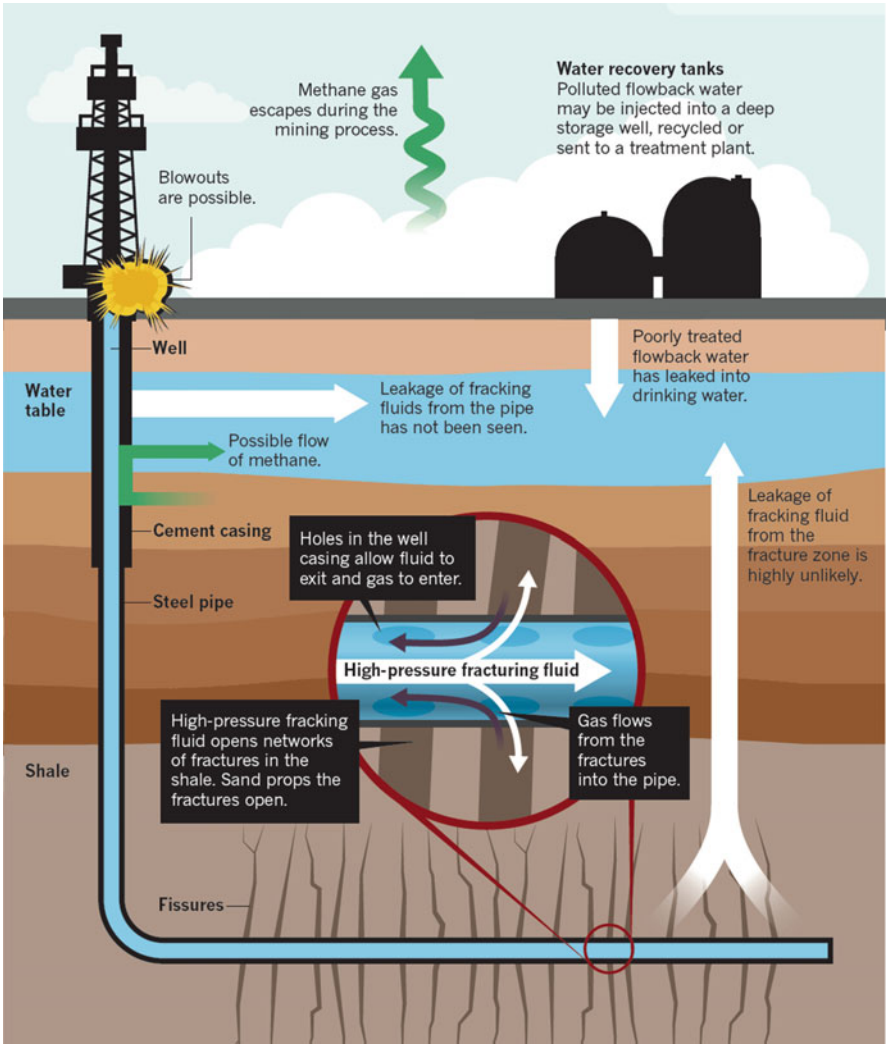

Fig. 2 Environmental consequences from the shale gas fracking (https://millicentmedia.com/2012/03/07/british-geological-surveys-shale-gas-groundwater-study-to-omit-cuadrillas-fracking-sites/)

Germany describes itself as an example to follow in the environment protection sphere. However, Dieter Helm, Professor at Oxford University, an expert in energy problems, believes that "Germany time and again speaks about climate protection and simultaneously is boosting the construction of coal-fired power plants. As Germany depends on gas, it is necessary to allow at least probe drilling in order to locate shale deposits. So long as a ban on fracking is in effect, Germany will be burning more and more coal. As a result, carbon dioxide emissions will be

increasing". His opinion is shared by Esther Chrischilles, an expert at the Cologne Institute for Economic Research, who is against the unconditional ban on fracking. "The chances and risks of new technology should be carefully and responsibly assessed. But the openness to new technology improves the country's competitiveness. Therefore, advanced technology should not be rejected without reasonable grounds", the expert said. In this connection, there is no necessity for Germany to play a lone hand. Correspondingly, the question of the development of single production norms for the whole European Union now arises.

Research on the so-called water-free shale gas production is already underway. It was first mentioned in Russia in October 2013 by Professor at the Higher School of Economics Leonid Grigoriev at a seminar at the Institute of World Economy and International Relations (IMEMO), dedicated to the electric power industry's development prospects until 2040. The fundamental work says that if the test of the water-free shale gas production technology proves successful, it will be possible to speak of a "Shale breakthrough scenario" [5]. This means a gradual, relatively even expansion of the resource base, which, in the final count, is expressed in curbing the growing extraction costs, but not in the retail price collapse. The implementation of this scenario would cause an increase in shale gas production by 2040 up to 825 billion cubic metres, predominantly by means of production outside the USA. Thus, the US shale gas production volumes will reach 504 billion cubic metres; in China it will reach 164 billion cubic metres and will exceed 150 billion cubic metres in the total production volume of other countries. Shale gas recovery will be conducted in all world regions, except the Middle East. Increasing self-sufficiency of countries owing to shale gas production will be inhibiting the world gas trade volumes' growth rates. By 2040, compared to the baseline scenario, gas imports in the Asia-Pacific region will decrease by 100 billion cubic metres, and gas exports from the Commonwealth of Independent States (CIS), North America and Africa will decline.

4 Where to Recover Gas?

World gas market globalisation opens up for Germany new opportunities for shale gas production in other countries. It should be said that German companies do not plan to engage in shale gas recovery in the USA. However, Europe and South America are a different matter.

In South America, the most promising market is Argentina where Wintershall works since 1978. And on the European continent, the company intends to recover shale gas in Eastern Europe. This means for Russia that Germany's gas market will become more independent from the conventional gas supplies.

On the order of WINGAS GmbH, that is, part of Wintershall group, the European public opinion research institute TNS Emnid polled 400 energy industry experts from Germany, Austria, the Netherlands and Belgium, asking their opinion on how the European energy system would be developing in the future and which

place natural gas would occupy in the energy system. The poll results confirmed that Russia, and old partner of Europe in the energy sphere, remains a key player on the European energy market and will play an important role for European energy consumers.

An overwhelming majority of German experts expect that the share of natural gas from Russia in the EU will be growing in the future, although only 52% of the polled experts called Russia a reliable supplier of natural gas to the EU. This circumstance in combination with a possible technological breakthrough in shale gas recovery determines a heightened interest in this issue.

In the meantime, Germany is placing a stake on renewable energy, which is fraught with deindustrialisation of the country. The annual conference EWI/FAZ-Energietagung in September 2013 discussed prospects for the development of the German renewable power generation, the danger of deindustrialisation of Germany, the US shale gas revolution and coal renaissance. It focused, above all, on electricity price rises in Germany, which makes the German industry uncompetitive.

Germany's business community sees the main reason for this unfavourable trend in shortcomings in the implementation of the Renewable Energy Act (in German: Erneuerbare-Energien-Gesetz, EEG) and expects the introduction of considerable amendments to it. The businessmen call for more consistent fitting of the national energy policy into the overall strategy of the European Union. Speeches of the leading representatives and experts of the German energy industry at the conference prove this conference. EU Energy Commissioner Günther Oettinger sounded the keynote for the debate. He urged the compatriots to slow down the accelerated development of renewable power generation, because its ultimate customers – both enterprises and households – have to subsidise it, which leads to the aggravation of the social and economic problems. "Already now Germany has the world's highest electricity prices, which are second only to that of Japan, Denmark and Cyprus. And in the next three years their annual growth will be 10 percent for sure", said the EU official, warning that this would only accelerate the already begun process of withdrawal from the country of especially power-consuming production facilities, referring to nonferrous metallurgy and chemical industry companies.

The head organisation of German large and medium businesses – Federation of German Industries (BDI) – is very concerned over the threat of the country's deindustrialisation. BDI Director General Markus Kerber confirmed: major companies are already exploring the possibilities for the transfer of certain production facilities from Germany to other countries, because with the current electricity prices, their competitiveness on the world market is declining. However, they are looking not to China any more, but to the USA [6]. The BDI director general compared the operation of two chemical giants: the German concern BASF and the US corporation Dow Chemical. "The manufacturing costs of their plants in Germany are by some 30 percent higher than the costs of their plants in the United States. Such difference cannot be endured for long", the BDI representative said.

The gradual deindustrialisation of Germany is unfolding against the background of dynamic reindustrialisation of the USA. The main reason for this is the US shale gas revolution, which has also caused the aggravation of the problems originated by

the EEG law (Renewable Energy Act). “Germany has always sought to reduce its dependence on the imports of oil and natural gas. Accelerated development of renewable power generation, supported by all sections of society was supposed to promote the achievement of this goal and simultaneous improvement of our competitiveness”, said Markus Kerber.

All the calculations were based on the assumption that the prices of fossil fuels – oil, natural gas, coal – in the next 20–30 years would be steadily rising. In these conditions, the previous pace of the renewable power generation development no longer justifies itself. In the conditions of the existing restrictions on the production of shale gas in Germany, the chances of foreign suppliers, including Russia’s Gazprom, to increase natural gas sales in Germany will be growing.

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