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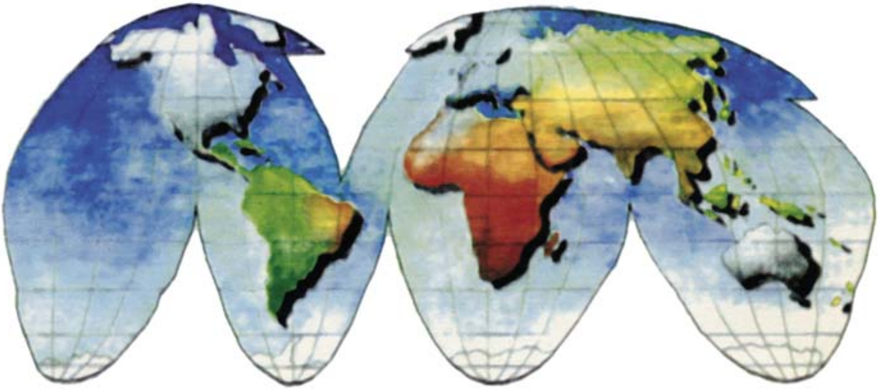

CENTRAL EUROPEAN ENERGY CHALLENGES

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Book reviews

Iana Dreyer

International energy security challenges for Europe in the coming years

Abstract: *The European Union's approach to "energy security" has strongly focused on diversifying its gas import sources and routes, and mitigating the risks of supply disruptions from Russia at home. Yet gas markets have changed dramatically recently: Liquefied Natural Gas trade and new suppliers of gas have emerged. The shale gas revolution in the United States has made markets more liquid. Today's key energy security challenge is domestic: increased recourse to intermittent sources of renewable energy has destabilized electricity markets and blackouts cannot be excluded. To prepare for the future, the EU will need to introduce coherence in its climate change policies, as recourse to coal – the most CO_2 emitting of all fossil fuels – is rising again. It could also engage more closely with China and India to deal with shared concerns about rising oil and gas import dependency and pollution from coal, and rethink its approach to Russia and other energy suppliers in its neighborhood.*

The international and European energy landscape has significantly changed in the last five years. The European Union's approach to "energy security," strongly focused on diversifying its gas import routes and sources and mitigating the risks of supply disruptions from Russia, its main supplier of hydrocarbons, is now facing new market realities.

The deepening economic and financial crisis in the EU, the so-called "shale gas revolution" in the United States, deepening rifts over nuclear power in Europe after the 2011 nuclear power plant accident in Fukushima Daiichi (Japan), the rising recourse to coal in the emerging economies and to some

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extent in Europe, and the accelerating shift of the world's economic and geopolitical gravity to the Asia-Pacific are questioning some key assumptions underpinning some of Europe's current energy policies.

If energy security is defined as the ability for an energy system to "keep the lights" on – in other words to ensure an uninterrupted supply of energy at stable and affordable prices – then a shift of policy priorities will need to occur soon. That shift will also require to integrate climate change and cost issues.

Recent approach to energy security in Europe and its broader policy context

An energy "security" policy cannot be conceived in isolation from wider considerations on the energy mix of an economy, energy-related environmental issues (notably climate change) and the overall structure and functioning of energy markets. There needs to be internal coherence in the way these policies are conceived. In the EU, this is not an easy task to as the treaties leave energy supply strategies and energy mix decisions to the member states, while market regulation, and, increasingly, climate policy, are dealt with at EU level.

Brussels' recent main focus on the energy policy front has been the completion of the single market in energy and fighting climate change through mandatory CO_2 and renewables targets. The 2009 Third Energy Package epitomizes this approach. The most notable measure in the Third Energy Package has been the obligation for vertically integrated energy companies in the gas and electricity sector to break up ("unbundle"), their production, transmission and distribution activities. On the climate policy front, the package included the introduction of binding targets for renewable energies and CO_2 emissions to 2020 (20 per cent of the energy mix and 20 per cent reduction compared to 1990). Previous measures have included the introduction of a CO_2 emissions trading scheme (ETS).

EU energy policies are projected into the bloc's international engagements.

One international dimension of the EU's approach to energy market regulation has been the expansion of the energy body of rules – *acquis communautaire* – to its neighbors in the Balkans (since 2005) and the Eastern partners more recently via the Energy Community. In return the partners gain access to the EU's markets and to financial and other assistance, for example to finance for infrastructure development. In climate matters, the EU's core strategy has been so far to seek binding CO_2 emissions reduction targets for a greater number of countries in the successor treaty to the 1997 Kyoto Protocol.

In the aftermath of the 2006 and 2009 gas crises, where Russian gas stopped flowing via Ukrainian pipelines amidst a political and commercial row between these countries, gas supply security has risen on the EU's agenda. That agenda encompasses domestic measures and new regional and international engagements. The policy in force since then involves a reinforced drive to make gas markets more open to competition by putting in question anticompetitive clauses in long-term supply contracts signed by European utilities with outside energy suppliers (mainly Russia's Gazprom), launching antitrust cases against energy utilities (including a landmark case against Gazprom as investor in Europe), setting standards and obligations for supply security (e.g. obligations to hold reserves) and promoting interconnections among isolated national markets in the new Central and Eastern European member states. This has facilitated the emergence of systems ensuring reverse flows in cross-border pipelines, and the building of interconnector pipelines in central Europe. Energy Community members outside the EU have also benefited from this policy. Joining the Energy Community in 2010 has allowed Ukraine to benefit from "reverse flows" of gas on its pipeline route to Europe and thus reduce its full reliance on Russian gas by importing gas from Germany. A pipeline to connect Romania and Moldova is under construction since the summer of 2013.

Brussels' recent main focus on the energy policy front has been the completion of the single market in energy and fighting climate change through mandatory CO_2 and renewables targets.

Another European response to the gas crises has been to actively pursue the diversification of energy supply routes and suppliers. This has contributed to a nascent EU energy diplomacy. The Southern Corridor project – which involves promoting the construction of a pipeline through Southern and Eastern Europe via Turkey to ship gas from Central Asia, the Caucasus and potentially the Middle East to Europe – has been one of the most visible initiatives. In this context, the EU member states even gave a formal mandate to the

EU Commission to negotiate treaties with Azerbaijan and Turkmenistan to obtain guarantees of gas deliveries. Other initiatives have included reinforced engagement with North Africa on energy (leading to the completion of a new pipeline from Algeria to Spain in 2011, Medgaz, and a draft Memorandum of Understanding on energy with Algeria in 2013).

The EU's more pro-active approach to diversifying energy supplies is also a response to the weakness of international treaties and dispute settlement mechanisms in the face of rising Russian assertiveness in its foreign policy, the weakening of the rule of law in the country, and the renationalization of the energy sector in the middle of last decade. The process started with the nationalization of the assets of the country's biggest oil company Yukos and the jailing of its CEO, and has involved asset-stripping of foreign investors from oil and gas extraction projects. In 1994, European countries from the West and the former Soviet bloc and former Soviet Union countries signed the Energy Charter Treaty (ECT). The latter sets rules for transit, establishes an open investment regime in energy markets (e.g. hydrocarbons exploration, transport infrastructure) that protects investors and ensures dispute settlement via investor-to-state arbitration procedures. It also promotes cooperation on environmental issues. Russia never ratified the ECT and pulled out of the agreement in 2009. The ECT was weakened at its very beginning when the US decided not to join.

A new energy security landscape for Europe

The 2006 and 2009 gas crises occurred amidst rising fears of global fossil fuel scarcity, a return of "resource nationalism" in oil and gas producing countries, and record high oil prices amidst rising demand from emerging economies. The global oil price peaked at about 150 US dollars in 2008 and has stabilized since then to around 100 US dollars. This discussion has now shifted.

Less oil and gas scarcity fears

Half a decade ago, the major geopolitical concern related to perceived scarcity was that import-dependent economies – notably the Western democracies – might be vulnerable to political pressures from oil and gas exporters and to strategic competition for resources with increasingly resource-hungry China (and to a lesser extent other Asian governments). The latters' supply strategies are not based on letting the free market organize supplies – as the West tends to do – but on state-led initiatives. This has fuelled perceptions that the level-playing field for Western importers was skewed against them.

In the US, oil and gas "scarcity" and "dependency" fears have abated, as the country is becoming more self-sufficient in its supplies. The developments of offshore oil and of tight oil in the country have contributed to reduce the US' imports, even though the country is still likely to import oil and its market linked to global oil prices. The shale gas revolution is even making the country a potential major exporter of gas on global markets. This reverses a trend of rising imports of gas and will accelerate the ongoing "globalization" of gas markets – which hitherto were of a more regional nature – via the opportunities provided by Liquefied Natural Gas trade (LNG).

Current developments in global gas markets are revolutionizing the way gas prices are fixed, with a rising role of so-called spot prices on short-term capacity markets – comparable to similar arrangements in the more liquid and global oil market. This makes the traditional model of gas pricing through oil-indexed long term contracts less attractive, and could over time significantly alter political relationships between oil and gas exporting and importing countries, in favor of the latter. Shale gas could start being developed in other parts of the world. Although this is not likely not to happen before the 2020s, the fact that significant reserves on all continents – Europe, Latin America, China – are known to be available already changes the geopolitics of gas in the world as consumers with domestic reserves feel they have more leverage and more potential choice in the suppliers they could contract with in future.

Current developments in global gas markets are revolutionizing the way gas prices are fixed.

Some major supply security concerns of the last decade continue, however, to be relevant: stubbornly high and volatile oil prices is one of them. This is partly due to continued demand pressures from Asia and the emerging world, but also diminished production capacity in some Middle Eastern countries, combined with the growth of domestic demand in that same region, political turmoil (Lybia, Syria, Iraq) and embargoes (Iran). In Europe, the continued exposure to political and commercial pressure of small energy-dependent neighbors to Russia on the bloc's Eastern fringes remains a stark reality.

International firm's access to oil and gas resources remains a problem. This compounds a rising concern with underinvestment in production capacity in North Africa and the Middle East, Russia, and Latin America. This could stoke up future supply gluts on global markets and even more volatile oil prices. Lingering resource nationalism in many producing countries could lead to them missing out on technical and organizational know-how of international firms able to face up to the costly and technically challenging task of extracting new sources of oil and gas in the future.

Globally, and for Europe, supply fears appear less salient than half a decade ago.

Nonetheless, globally, and for Europe, supply fears appear less salient than half a decade ago. The EU currently even faces the prospect of being able to import more LNG from the Americas in a few years' time. This is not least thanks to the recently signed free trade agreement (CEFTA) with Canada and the ongoing Transatlantic Trade and Investment Partnership (TTIP) negotiations with the US. These can lead to more energy as Canada seeks to diversify its hydrocarbons exports. The US will very probably be required to guarantee it will allow exports of gas – these currently require special licenses- to Europe if the TTIP deal materializes. The EU has also started importing massively from new LNG suppliers – such as Qatar or Trinidad and Tobago in the last decade. Russia, Norway and Algeria are likely to remain the EU's main suppliers, but greater diversity provides the EU with interesting alternatives and flexibility in regulating flows during demand peaks or in the face of shortages.

Climate policy conundrum

The suddenly rediscovered "abundance" of fossil fuels is a major challenge for climate policy.

Gas is displacing coal in the US. As a consequence global markets have been flooded with coal from the US. In Europe, the combination of currently low carbon prices and the pull-out of nuclear power in Germany initiated in 2011 have led to renewed recourse to coal to generate electricity. EU imports of coal rose 10 per cent between 2009 and 2011 (EU Commission 2013). As a consequence, despite the economic crisis, which has lowered overall energy consumption levels, CO_2 emissions have remained too high to ensure the bloc complies with its own CO_2 emissions targets by 2020.

Globally, coal is the fossil fuel for which demand has risen most in the last decades. Its share in the global primary energy supply has risen from 24.6 per cent in 1973 to 28.8 per cent in 2011 (IEA 2013). Coal contributed to 44 per cent of CO_2 emissions in 2011, whereas oil contributed 35.3 per cent and natural gas 20.2 per cent (IEA 2013). The global goal of a less than 2 degree Celsius rise in global temperatures by 2100 is increasingly considered impossible to sustain. Because coal is cheap and abundant, emerging markets, and in particularly fast-growing China and India with their billion-plus populations each, use it as their default resource to meet rising electricity demand. China is making significant investments into a more diversified and less coal–intensive energy system by developing hydroelectricity, nuclear power, renewable energy, and imports of gas (LNG). However, these investments do not offset the rise of coal-fired power: coal has kept a stable 70 per cent share in the country's energy mix over the last decades.

Coal is the fossil fuel for which demand has risen most in the last decades.

Electricity markets at the heart of energy security concerns

Back to energy security: the big energy security challenge today is not access to hydrocarbons: it is potential dysfunction of electricity markets. The need to reduce carbon emissions and rising urbanization across the world create challenges for electricity systems that have ramifications for energy mix decisions (how will electricity be generated?) and by extension international supply security strategies.

In advanced economies, and especially in Europe where intermittent renewable energies have been developing rapidly because of the EU-mandatory target to have 20 per cent renewable energy by 2020, transmission grids have increasingly difficulties coping with this irregular influx of power. What is more, renewable energy sources being often located in remote areas, new grids need to be built. Costs, licensing procedures and local opposition to such infrastructure developments are a major obstacle to the grids' rapid expansion. In Europe, conventional generation plants – gas, coal, nuclear – are becoming less competitive because they are "back-up" for intermittent renewables. EU countries – not least Germany – have seen temporary closures. There are rising fears of serious electricity blackouts.

Not only does Europe wish to alter the fuel mix of its electricity markets: it needs to ensure more capacity is available. One of the keys to fighting climate change is making road transport – responsible for about a third of CO_2 emissions on the continent – is less dependent on oil. For this to happen, electricity-based transport such as electric cars and other public transport using electricity needs to be developed. But a functioning market model for electricity transport, storage (adequate batteries) and generation is yet to be found.

Managing geo-economic decline in a global energy world increasingly focused on Asia

A final challenge for Europe will be to manage its relative economic decline so as to maintain its ability to shape its global environment. This is a general EU challenge, but it also applies to the energy sector.

On current trends, the EU28 could end up being the third largest economy and trading entity by 2030 after China and the US, down from first today (Dreyer, 2011). The crisis, the maturity of its economy, its stagnant demography and its efforts to reduce recourse fossil fuels as part of its climate policy – all are concurring to create expectations of low energy demand growth.

Despite overall stagnant energy demand, Europe's import dependency of fossil fuels is expected to rise. In particular gas import dependency is likely to rise to levels close to 80 per cent of European consumption by 2030, up from 67 per cent today (EU Commission, 2009 and 2013b). This is due to declining domestic conventional gas production in the United Kingdom and the Netherlands. The EU is believed to hold a significant amount of shale gas deposits that could contribute to diversifying its supply sources. But current prospects for the development of this fuel look bleak in many member states. There is strong opposition to development of hydraulic fracturing, the technology used to extract it, on environmental grounds, and much uncertainty remains about the real extent and of recoverable deposits and exact cost of extraction.

Given the above trends, the EU's consumers could well be less able to benefit from the bloc's global market power: it might become more difficult for importing European firms to negotiate attractive oil and gas deals with external suppliers. Resilience to shocks, energy efficiency and a strategic outlook by policy-makers on energy issues will matter more than ever.

Europe's position in the current "geo-economic" energy game is being further put in question by the fact that its key military ally and security guarantor, the US, are becoming more self-sufficient energetically whilst at the same time being strongly tempted by a strategic retreat from the European continent and the Middle East as they seek to concentrate on their engagements in Asia.

The post-war western European alliance with the US has facilitated the creation of the International Energy Agency (IEA) after the 1973 oil shock. The IEA's role is to engage in information sharing on energy markets and in managing strategic oil reserves. The IEA's relevance in future is increasingly under discussion. Tomorrow's key consumer and oil and gas importers will be located in Asia – China, India, Japan and Korea chiefly among them. China and India are not members of the rich-country Organization for Economic Cooperation and Development (OECD) and hence not members of the IEA. Yet in coming years, Europeans will share more common energy security concerns with these countries than with the US.

The International Energy Agency's relevance in future is increasingly under discussion.

In this context, a key geopolitical challenge for European governments will be the management of political crises in the Middle East, where oil and gas play a major role in the countries' economies and political systems. The EU will need to take into account the fact that Asian buyers are likely to offer more attractive prices and long-term export perspectives for oil and gas producers in the region than Europe. The rising role of China and India as buyers of oil and gas from the region are an issue Europeans will face. Their views on the political crises in the region (e.g. in Iran, Iraq Syria, Libya) tend to differ from Western ones – be it on the nature of regimes, the need to intervene in conflicts, or on the urgency of non-proliferation of nuclear weapons.

The last decade has seen the emergence of new producing countries. Various African (notably East African countries and Mozambique) and Latin American countries in particular are or will be new producers in the world's global oil and gas markets for whose production consumers will likely compete strongly in the coming years. This matters to Europe as the marginal price of oil (the one that sets global prices) will likely strongly be determined by demand in Asia.

Key priorities for a future European international energy strategy

Whereas the fundamental goals of Europe's approach to energy at home and beyond its borders remain as valid as ever, adjustments will need to be made to the way it aims to achieve them.

Greater coherence between climate, market design and energy security goals at home and abroad

The EU will need, in future, to build greater coherence between its international energy goals and its own energy policies. Some examples of how it could do so in future follow below.

The fact that the EU's domestic climate strategy is currently revealing limits as to its efficacy in reducing CO_2 emissions will likely reduce the EU's influence on the global climate policy arena. The international translation of the EU's climate policy – mandatory targets for parties to the 1997 Kyoto Protocol treaty – is also under question. The EU has two key opponents to mandatory targets: the US and China, which both pursue their own domestic decarbonization strategies. The US is currently partially substituting gas for coal in electricity generation and liquid gas for oil in transport thanks to cheap shale gas. It has introduced more stringent emissions standards for vehicles. As a result, it has been very effective in reducing the country's carbons emissions, without the need for mandatory targets. Despite lip-service paid to the possibility of mandatory targets during the last UN-hosted summit in Durban in 2012 on the Kyoto protocol successor treaty, China remains very reluctant to them and would only accept such targets if domestic political considerations favor this option. It would be advisable for the EU to seek alternative ways of promoting swift reduction of CO_2 emissions internationally. The EU could consider engaging its strategic partners China and India on "clean coal" technologies and projects to reduce pollution and CO_2 emissions at coal-fired power plants, on competitive renewable energies and safe nuclear power. This could help reduce political tensions – and hence

The fact that the EU's domestic climate strategy is currently revealing limits as to its efficacy in reducing CO_2 emissions will likely reduce the EU's influence on the global climate policy arena.

facilitate discussions on a common approach to hydrocarbons imports that is based on collaboration rather than competition.

The EU also has ambitious goals in its neighborhood in terms of carbon-free energy and renewables. For instance, as part of its neighborhood policy, the EU is promoting the development of renewable energy with its neighbors. The Mediterranean Solar Plan launched in 2008 aims to provide a framework for the development of large-scale solar plants that would produce for export to Europe, and help diversify its partners' economies. Alas, such a project has hardly a chance to materialize unless – among others – the EU's electricity market is sufficiently integrated and interconnected so as to be able to provide adequate demand to make large-scale investments in power plants and cross-country and cross-continental grids pay off. Today, only 3 per cent of the EU's electricity consumption is traded across internal EU borders, and connections between Southern European and Northern European electricity markets are rare. The EU aims to reach a 10 per cent rate of interconnection, but progress is slow. This makes it difficult to organize a more cost-effective allocation of renewable energy resources on the European continent and to integrate a massive inflow of stable solar power from across the Mediterranean into the European system.

A strategic approach to gas to ensure visibility for gas infrastructure investments

Future gas supply strategies need to be based on cost-benefit considerations and part of a clear picture of what role gas will be expected to play in the European energy and electricity mix in future.

Recently, the IEA announced a *golden age* for gas, where natural gas would play major role in the global energy mix as countries try to reduce recourse to coal to reduce carbon emissions and pollution. If gas is playing indeed a rising role in major economies like China and the US, its future is all but certain in Europe. Among advocates of climate friendly policies, gas is divisive: some argue that gas is an ideal "transition fuel" to a carbon-free economy, others reject gas outright, and sceptics arguing that fossil fuels will continue to play a role in the global energy mix say that gas is the lesser

If gas is playing indeed a rising role in major economies like China and the US, its future is all but certain in Europe.

evil. The aim here is not to take sides on this matter: the broader issue here is that there is no open discussion and overarching vision over the issue at EU level. This is notable in the policy debates on shale gas in Europe, where – in line with the framework provided by current treaties which leaves the choice of energy mix to national governments – individual member states take their own decisions over whether to allow hydraulic fracturing on their territory, without consideration being made to issues of the EU's overall energy dependence, economic competitiveness, and climate strategy. There needs to be coordination at EU-level on such strategic decisions over energy technologies and sources, because they impact the EU as a whole and have repercussions on its global supply strategies and climate change policies.

Costly investments are required to improve the EU's "gas import security." For example the cost of the Nabucco pipeline across South Eastern Europe to ship gas from the Caspian – estimated at up to 14 billion euros – has been one key element in the projects failure this year. Many observers noted that there were not enough gas supplies to ensure its viability. Given current trends, one could also have asked whether there would have been enough consumers. A minimum of visibility over the future of gas in European markets is vital to help investors make decisions to become involved in infrastructure projects, LNG terminals, generation capacity – among others. It is all well to supply security but it is also important to avoid costly overcapacities in a time of scare capital and scare public finances. One must bear in mind that in the face of currently low gas demand, the Medgaz pipeline connecting Algeria to Spain underutilized.

The imperative for the EU to finalize the process of interconnection and de-monopolization of gas markets in Central and Eastern Europe remains.

Finally, the imperative for the EU to finalize the process of interconnection and de-monopolization of gas markets in Central and Eastern Europe remains. This is the key to bettering the EU's relationships with Russia. In this regard, the very recent finalization of the list of energy "Projects of Common Interest" featuring accelerated procedures and better financing conditions for reverse flow connections and gas pipelines in CEE are a new and welcome step in the right direction. Interconnecting Southern Eastern European markets with the rest of the EU will be the next priority for Europe as the decision taken this year by Azerbaijan, Turkey and European energy companies to construct

Table 1. Top external suppliers to the EU – 2011

crude oil ('000s of tones)		gas (terrajoules)		hard coal ('000s of tones)	
175,634	Russia	4,101,546	Russia	52,691	Russia
63,687	Norway	3,715,398	Norway	47,904	Colombia
41,108	Saudi Arabia	1,767,006	Algeria	36,307	United States
31,075	Nigeria	1,485,596	Qatar	17,851	Australia
29,495	Iran	589,290	Nigeria	15,902	South Africa
29,215	Kazakhstan	158,134	Egypt	10,281	Indonesia
24,615	Azerbaijan	140,996	Trinidad and Tobago	4,461	Canada
18,197	Iraq	92,597	Libya	4,590	Ukraine
14,223	Libya	29,662	Yemen	1,158	Norway
13,068	Algeria	27,405	Turkey	1,094	Venezuela

Source: Eurostat

a pipeline to Italy as part of a minimalist version of the "Southern Corridor" project – a blow to the Nabucco project.

The considerations above on the EU's domestic choices over its gas markets are of crucial importance to the EU's relationships with its key oil and especially gas suppliers in its wider neighborhood – Russia, but also Azerbaijan, Kazakhstan, Turkmenistan, Libya or Algeria (see table above). Diminished expectations for the Southern Corridor project and the aftermath of the so-called Arab Spring provide a window to assess the EU's recent engagements with these suppliers.

All these countries are authoritarian regimes subject to what is commonly called the *resource curse* – i.e. non-diversified economies stuck in dependence on the oil and gas sector, authoritarian rule, and high levels of corruption. Some are what political scientists call *anocracies* – semi authoritarian regimes with elements of democratic rule (such as elections). These are considered particularly vulnerable to political instability (Gaub 2013, Martinez 2010). Yet strongly authoritarian regimes such as Muammar Qaddafi's Libya and the Assad family's Syria, although "stable" for long time periods can also suddenly be swept away, causing long-term turmoil – and oil supply disruptions – as recent events have amply demonstrated. For economies whose regimes are dependent on the revenues generated by hydrocarbons exports, a negative shock on energy prices is a real political risk as their ability to redistribute the oil rent to the population is put in question.

The EU faces a fundamental dilemma here. The general view in Europe is that by spreading democracy and prosperity, the EU can ensure long-term peace and stability in its neighborhood. In its engagements with its neighbors – e.g. through Association Agreements with its eastern partners or North African countries – it applies what is called conditionality. Better access to EU market and EU funds is made conditional on the countries applying various political or economic reforms. However, the EU's strong reliance on the exports of these hydrocarbon producers undermines conditionality. Recognizing this problem, the EU has set up an European Endowment for Democracy under the supervision of the European parliament and the member states, which has started functioning in the summer of 2013.

The current economic climate, where the EU's gas demand is low, offers the EU more leverage over countries like Algeria or Azerbaijan and a window of opportunity to engage them on terms that resemble those of other Eastern partners and Mediterranean countries – with whom the EU is seeking Association Agreements with strong free trade deals (called Deep and Comprehensive Free Trade Agreements or DCFTAs). This is a good time to engage these countries politically and to press for more democratic and institutional reforms without which longer-term stability and prosperity will remain elusive. These countries should also be more actively than thus far encouraged to join multilateral institutions such as the World Trade Organization and the Energy Charter Treaty so as to foster reform and create the basis for future trade deals with the EU.

Pursuing energy multilateralism – including with Russia – and strengthening the EU's voice in the global governance of energy markets

The EU could strengthen its position in the current rapidly shifting energy world through closer engagements with multilateral and regional organizations, especially when it comes to dealing with large economic powers.

There have recent been moves in Russia to selectively open up exploration of oil and gas as the country seeks to develop new oil and gas fields. The Kremlin no longer resists the rise of competitors to Gazprom in the domestic gas market and to export LNG to Asian customers. This reveals that Russia is seriously concerned with the viability of its energy sector as it faces fiercer competition on global markets in the aftermath of the shale gas revolution and amidst lower demand from Europe its single most important export market for the foreseeable future. At the same time, the antitrust case brought against Gazprom by the EU Commission – soon to be brought to a close – is likely to result in important changes in the gas market structures of Europe, especially in central and Eastern Europe.

Now is a good moment to attempt to start a new dialogue with Russia on key issues related to mutual investments in each other's energy sectors – notably the protection of investment into exploration, infrastructures and distribution. The EU could seek an overall "reset" of energy relations with Russia. This could only happen once the ongoing antitrust case against Gazprom is brought to a close and an arbitral ruling based on past ECT commitments of Russia in favor of former shareholders of Yukos is made (the latter, launched in 2014, is expected in the first half of 2014 and appears to have a good chance of being in favor of the shareholders). The expropriation of this company has significantly contributed to deteriorating relationships with the West and ultimately to Russia's ECT pull-out. The EU and its member states would need to demand that Russia comply with antitrust and arbitration rulings if Russia is in fact found to have breached international law. Russia would need to reintegrate the ECT under some form. Yet in this putative process, the EU would need make concessions itself. The could involve accepting some Russian proposals on ECT reform made in 2009, for instance, and to remove the "reciprocity clause" – dubbed informally the "Gazprom clause" – introduced in its Third Energy Package to bar foreign investors into Europe's energy markets if their country of origin does not apply EU "unbundling" requirements (Once the antitrust case is over and there is a *de facto* guarantee that Gazprom respects EU law on EU territory there is no more justification for maintaining this clause). The EU should also propose – for example within an ECT framework – to help Russia and other suppliers anticipate on European oil and gas demand so as to ensure visibility for its exports. Indeed, if the EU seeks "supply security," suppliers like Russia are clamoring for "security

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of demand." The latter cannot be guaranteed. But information exchange mechanisms can help European partners adjust to changes. This year, the EU and Russia have issued a joint Roadmap on EU Russia Energy Cooperation to 2050 – this is a first if modest step in that direction.

Globally, the EU should clearly be made to be represented as the EU28 in the IEA. Whereas many EU member states are members of the IEA, not all are. The ideal way of proceeding would be to have a single EU representation to ensure a strong common EU voice in the global governance of energy markets – a voice that matches its actual market size. A less optimal alternative would be to have the EU alongside the already present member states join the organization – such as is the case in the ECT and the international renewable energy association IRENA. EU institutions should launch exploratory talks with EU member states, the OECD and the IEA on legal and political possibilities.

The EU would certainly be well advised to support any move by the IEA to engage more closely with China and India and encourage their ultimate membership to the organization – regardless of whether they become OECD members, which is the current prerequisite to join the IEA.

Selected references

A. Bressand, "The changed geopolitics of energy and climate," *Clingendael International Energy Programme paper*, No. 4, 2012. Available online: http://www.clingendaelenergy.com/inc/upload/files/The_changed_geopolitics_of_energy_and_climate_bressand.pdf (accessed on October 30, 2013).

"Energy outlook 2030," British Petroleum, 2012.

I. Dreyer, F. Erixon, "Vested and invested interests. The role of investor protection in EU Russia relations," *ECIPE Policy Brief* No 2, 2010. Available online: http://www.ecipe.org/media/publication_pdfs/vested-and-invested-interests-the-role-of-investment-protection-in-eu-russia-relations.pdf (accessed on October 30, 2013).

I. Dreyer, "Potential contours of the world economy by 2030. Stakes for the European Union," August 2011. Background paper to the EU-sponsored 2011 European Strategy and Policy Analysis System.

I. Dreyer, G. Stang, "The shale gas 'revolution': challenges and implications for the EU," EUISS *Brief*, No. 11, 2013. Available online: http://www.iss.europa.eu/uploads/media/Brief_11.pdf (accessed on October 30, 2013).

"Roadmap on EU Russia Energy Cooperation to 2050," European Commission, March 2013. Available online: http://ec.europa.eu/energy/international/russia/doc/2013_03_eu_russia_roadmap_2050_signed.pdf (accessed on October 30, 2013).

EU Energy in Figures.Statistical pocketbook 2013. European Commission, 2013b. Available online: http://ec.europa.eu/energy/publications/doc/2013_pocketbook.pdf (accessed on October 30, 2013).

B. Fattouh, "Shifting landscapes in MENA and implications on oil & gas markets," Presentation at EUISS seminar, October 16, 2013.

F. Gaub, "Civil wars – a very short introduction," EUISS Brief, No. 36, 2013. Available online: http://www.iss.europa.eu/uploads/media/Brief_36_Civil_wars.pdf (accessed on October 30, 2013).

J. Henderson, "The potential impact of North American LNG exports," Oxford Institute for Energy Studies, *Working Paper*, No. 68, 2012. Available online: http://www.oxfordenergy.org/wpcms/wp-content/uploads/2012/10/NG-68.pdf (accessed on October 30, 2013).

J. Henderson, "Competition for customers in the evolving Russian gas market," Oxford Institute for Energy Studies *Working Paper*, No 73, 2013. Available online: http://www.oxfordenergy.org/wpcms/wp-content/uploads/2013/01/NG_73.pdf (accessed on October 30, 2013).

World Energy Outlook 2012, International Energy Agency, 2012.

Key World Energy Statistics, International Energy Agency, 2013.

L. Martinez, *Violence de la rente pétroli re – Algérie, Lybie, Irak*, Presses de Sciences Po, 2010.

Jarosław Ćwiek-Karpowicz, Aleksandra Gawlikowska-Fyk

Reindustrialization versus climate change. An evolving energy agenda?

Abstract: *In the European Union the discussion of a post-2020 framework for climate and energy policies has already commenced. Yet the fight against climate change – considered to be a solid driver for a more ambitious EU policy – has been constrained by the economic crisis in the Union and an insufficient international approach. As this paper reveals, the ongoing debate is increasingly shaped by the issue of the greater competitiveness of the EU's economies in the world, and the development of industrial sectors. Taking advantage of the opportunities offered by the growing importance of re-industrialization and the boosting of the EU's competitive edge, the V4 countries – which face similar energy and economic challenges – should be active in this debate and present a well-considered approach.*

The European Union's energy policy is based on three strands: construction of the internal energy market, security of energy supply, and the development of a low-carbon economy to combat climate change. With the enactment of the 2008 Climate and Energy Package and its ambitious targets, climate change has become a strategic goal with far-reaching consequences for the EU's energy and economic policies, as well as in law in general, as it is one of the core environmental goals of the Lisbon Treaty. In 2008 the EU27 agreed on three main targets (the first being merely indicative, and the second and third legally binding):

1. the total primary energy supply should be decreased by 20 per cent across the EU;
2. the goals of the Kyoto protocol should be exceeded and carbon emissions should be reduced by 20 per cent by 2020 as compared to 1990 (and, if other industrialized countries such as the US, India and

Ćwiek-Karpowicz, J., Gawlikowska-Fyk, A., "Reindustrialization versus climate change. An evolving energy agenda?," *International Issues & Slovak Foreign Policy Affairs* Vol. XXII, No. 3, 2013, pp. 20–32.

China were to commit themselves to similar policies, the EU would be willing to reduce emissions by 30 per cent);

3. a 20 per cent share in the energy mix should be provided by renewable energy sources (while biofuels should account for a 10 per cent share in the transport sector).

The fight against climate change paved its way in EU primary law as one of the principal aims of the broader environmental policy envisaged in the Treaty of Lisbon. This treaty introduced the long-awaited legal basis (article 194) for a common approach in the field of energy. It concerns the main goals of the EU energy policy that were shaped in the context of globalization, and the rising risk to energy supply security and to the environment itself – that is, the energy was to be competitive, secure, and clean.[1]

Until recently, the energy policy priorities of EU countries were considered equivalent, and despite some difficulties in balancing they became largely consistent throughout the member states. This was considered to be a solid basis for a common EU policy on energy.[2] But now, the EU discussion on energy and climate issues has been increasingly confronted with a situation in which the environmental factor and the fight against climate change dominates and thus inhibits the addressing of other issues, such as the construction of the internal energy market and the security of supply. Therefore the reconciliation of the EU's various objectives – i.e. mitigating climate change, and those objectives meant to ensure market competitiveness and security of the EU's energy supply – has become a pressing issue.

In the context of the global recession, the EU debt crisis, and the internal debate over moving beyond a 20 per cent target post-2020, experts have

In the context of the global recession, the EU debt crisis, and the internal debate over moving beyond a 20 per cent target post-2020, experts have argued for a need to reassess the balance of targets and instruments contained in the Climate and Energy Package.

1 A. Dobroczyńska. L. Juchniewicz, *Polityka energetyczna Unii Europejskiej – nowa sytuacja*, in E. Kryńska, ed., *Tworzenie i realizacja polityki społeczno-ekonomicznej w Polsce. Aspekty teoretyczne i praktyczne*, Łódź, 2008, p. 74.

2 B. Leimbach, F. Müller, "European energy policy: balancing national interests and the need for policy change," *Climate and Energy Papers*, No. 1, 2008, p. 6.

argued for a need to reassess the balance of targets and instruments contained in the Climate and Energy Package.[3] This discussion – which can lead to a reformulation of the EU's strategic interests in the energy sphere – will involve a longer term outlook. It began with the publication of the 2050 Energy Roadmap, in which the European Commission proposed reducing greenhouse gas emissions by 80–95 per cent by 2050.[4] That document was eventually rejected (due to a Polish veto). However, in March 2013, having noticed the need for a deep assessment of the further development of climate and energy policy, the Commission presented a green paper entitled "A 2030 framework for climate and energy policies."[5] This green paper is designed only to initiate discussion about the new climate and energy strategy for the EU for the period 2020–2030. Nevertheless it already shows a change in accent as the Commission has acknowledged the need to foster the competitiveness of the EU economy. Concurrently, a comprehensive re-industrialization plan was adopted in the European Commission's Communication on industrial policy.[6] In order to unleash specifically a third industrial revolution in Europe – involving, inter alia, the reconfiguration of the EU economy towards a strong and modern industry – the Commission adopted a mid-term industrial strategy, which focuses on more innovative sectors and ready-to-use advanced technologies. Taking advantage of the opportunities offered by the growing importance of this re-industrialization and increasing of the competitiveness of the EU, the Visegrad countries (V4) – which face similar energy and economic challenges holding them back from the fight against climate change – should be active in this debate and present a well-considered approach.

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[3] T. Spencer, A. Korppooo, A. Hinc, "Can the EU budget support Climate policy in Central and Eastern Europe," *FIIA-Working Paper*, No. 70, April 2011.

[4] "Energy Roadmap 2050. Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions," COM(2011) 885/2 final, European Commission, Brussels 2011.

[5] "Green Paper. A 2030 framework for climate and energy policies," COM(2013) 169 final, European Commission, Brussels, March 27, 2013.

[6] "A stronger European industry for growth and economic recovery. Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions", COM(2012) 582 (final), European Commission, Brussels, October 10, 2012.

Inconsistent policy aims

The European Commission's energy demand management strategy has always emphasized diversification in energy supply and the promotion of renewable energies, and has had a neutral stance towards nuclear energy. After years of discrediting coal, the Commission also admitted coal again as an important energy source for the future, which can contribute to enhancing the security of supply in the EU.[7] The inclusion of all available sources and technologies in the EU strategy was also visible in the Energy and Climate Package. Experts shared the view that the Commission was trying, for the first time in such a comprehensive way, to solve simultaneously all the major problems facing energy policy.[8]

However, the primacy of climate policy assured the submission of proposals for the decarbonization of the EU economy.[9] Nevertheless, calling for the premature withdrawal from coal, and the replacement of aging coal-fired power plants with more efficient and much less polluting ones, is particularly dangerous and unrealistic – even for countries determined to decarbonise the economy. For instance, Germany already has one of the highest electricity costs in Europe and, simultaneously, its renewable support scheme is very generous and puts pressure on energy bills. On the one hand, the worldwide use of coal causes 40 per cent of the global CO_2 emissions, and even modern coal-fired power plants produce up to twice as much CO_2 per unit of electricity as natural gas ones. On the other hand, however, coal, gas and/or nuclear power are still needed along with the expansion of renewable sources, which need back-up reserves

Calling for the premature withdrawal from coal, and the replacement of aging coal-fired power plants with more efficient and much less polluting ones, is particularly dangerous and unrealistic.

7 "Report on the Green Paper on energy. Four years of European initiatives," European Communities, Brussels-Luxembourg, 2005. Available online: http://userpage.fu-berlin.de/ffu/realise_forum/www.realise-forum.net/pdf_files/05_EC_green_paper_report_en_2005.pdf (accessed on October 31, 2013).

8 D. Helm, "European energy policy: meeting the security of supply and climate challenges," *EIB Papers* Vol. 12, No. 1, 2007, p. 37.

9 "Energy Roadmap 2050," op. cit., p. 4.

(when wind and sun are not available) for the countries' base load. Moreover, the dynamic development of renewable energy sources is only possible due to financial support, which increases the production costs of electricity and is not a shining example of a free competitive market approach.

It should also be underlined that supporting natural gas as the cleanest fossil fuel, instead of coal and nuclear energy, without taking into account the economic and political aspects of its supply, does not seem to be reasonable. Gas as the only alternative is too expensive an option, with its operational costs being so linked to the high global price of oil in most long-term contracts.[10] Moreover, it would further increase the overall dependency on gas import from Russia – running contrary to the EU's objective of strengthening its (gas) security of supply. No matter how appealing the vision of gas as a transition fuel, it seems that a world without coal appears unrealistic in the mid-term perspective – i.e. before, presumably, 2050.

The contradictions between the goals of energy security and climate change mitigation, both included in the EU's environmental legislation, may increase the need for a faster phase-out of coal. The UK is already confronted with this problem, as it has been forced to shut down many coal plants (with a total capacity of 11 GW). This premature shutdown, which can cause power shortages, has already – paradoxically – made the British government work out a more interventionist approach in this sphere. Electricity supplies are increasingly becoming a problem also in Poland and the Czech Republic. In addition, the rapid development of renewable energy sources in the northern part of Germany, and the insufficiency of the German internal grid, are making it necessary to burden the electricity networks of neighboring countries (so-called loop flows), threatening operational security – especially in Poland, where the internal network is weak.[11]

Until the nuclear accident in Fukushima in March 2011, nuclear power was experiencing a renaissance in the world and in Europe alike. Regarding it as a way to reduce CO_2 emissions and stabilize energy prices, over 60 countries had formally expressed interest in developing nuclear energy.[12] This

[10] J. Ćwiek-Karpowicz, "Poland's energy security: between German nuclear phase-out and energy dependency from Russia," *International Issues & Slovak Foreign Policy Affairs* Vol. 20, No. 1–2, 2012.

[11] J. Ćwiek-Karpowicz, A. Gawlikowska-Fyk, K. Westphal, "German and Polish energy policies: is cooperation possible?," *PISM Policy Paper*, No. 1 (49), January 2013.

[12] B.K. Sovacool, S.V. Valentine, *The national politics of nuclear power: Economics, security, and governance*, London and New York: Routledge, 2012, p. 3.

trend was particularly strong in Asian countries (China, India, South Korea), but also in Europe, where France and Finland had begun construction on new nuclear power plants, and many other countries had announced such plans, including the United Kingdom, Lithuania and Poland. After the Japanese accident, despite the ending of the expansion of nuclear power in some EU countries, it currently still plays a vital role accounting for 28 per cent of total electricity production in the member states.[13] Together with renewables, it is also the only commercially mature energy source with negligible greenhouse gas emissions, and one which can be expanded dependent on the political will of the member states. Annually, it avoids some 300 million tonnes of carbon dioxide emissions – equivalent to half of the amount produced by all cars in the EU. Therefore it seems obvious that – in the face of the EU's ever-increasing dependence on external energy suppliers and the delayed integration of national markets – EU countries cannot reasonably focus their efforts solely on the fight against climate change.

Ambitious climate targets vs. competitiveness and economic growth

With the present economic crisis in Europe as the backdrop, along with the fact that no other larger country ever backtracks on their commitments to the legally binding targets, the criticism towards the EU's climate and energy policies – as being too expensive, too ambitious, too complex and ineffective – have increased.[14] This state of affairs is largely the result of an improper estimation of the effects on other sectors of regulation in the area of climate and energy.

Although the EU's 2050 Energy Roadmap is conditional on emission goals (reduction of CO_2 emissions by 80–95 per cent in 2050 as compared to the 1990 level) and the expansion of renewables (from 14 per cent presently up to a 50 per cent share in electricity generation), the main instrument of the EU's decarbonisation, the emission trading system (ETS), is ineffective and does not deliver cost-effective reductions. This is due to the drop in prices (from 18 euro per tonne of GHG in March 2011 to around 5 euro at present)

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[13] Eurostat.

[14] A. MacKillop, "Europe's green energy chaos," *European Energy Review*, October 31, 2011; and D. Helm, *The carbon crunch: how we're getting climate change wrong – and how to fix it?*, New Heaven, London: Yale University Press, 2012.

which are the result of the lasting economic recession and the continued oversupply of emission allowances. This indicates that the tools for meeting the EU's climate targets are not proper ones, but also that its aims are formulated with a disregard of the economic reality of many member states – i.e. the economic downturn, which is responsible for the low price of carbon dioxide, and the inability to finance a number of infrastructure projects in the area of energy. At the same time, the European Commission has estimated that Europe needs some 1 trillion euro in infrastructure investment solely for the period ending in 2020.

Not only is ineffective climate policy becoming more of an issue for member states, but likewise is its impact on the rise in fuel and energy prices, and – consequently – on a decrease in the competitiveness of European industry. During the last decade, industry's share in the EU GDP decreased from 22 to 15 per cent.

The tools for meeting the EU's climate targets are not proper ones.

In the recent Communication on Industrial Policy, the Commission clearly pointed out that the EU had lost its leadership in the world in terms of industrial development, but still occupied a leading position in some important industrial sectors such as automotive, aeronautics, space, chemicals, and pharmaceuticals. Industry still accounts for around 80 per cent of the annual export of the Union.[15] However, several recent developments have decreased the overall competitiveness of European industry. In 2011, the EU27 spent more than 488 billion euro on energy imports – six times more than in 1999, and amounting to 3.9 per cent of GDP.[16] In contrast to the US, the dependence of the majority of EU states on energy imports will rise continuously – at least in the mid-term perspective, before the post-2030 energy transformation towards a low carbon energy system substantially materializes. In Poland, the situation may be reversed, as the decreasing domestic production of coal might be replaced with external supplies of fossil fuels, mainly gas, and only to a certain extent with renewables.

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15 "A stronger European industry for growth and economic recovery," op. cit.

16 "European competitiveness report 2012: reaping the benefits of globalization. Commission staff working document," SWD(2012)299 final, European Commission, Brussels, October 10, 2012.

The North American shale gas revolution has not only become a game changer for the US and its energy independence efforts, but has also triggered fundamental changes in the global gas markets. As a result of the spike in unconventional gas production, the US share of coal in power generation fell from 48 per cent in 2008 to 34 per cent in March 2012. Simultaneously, the share of gas increased from 21 to 38 per cent between 2010 and 2012. The combination of the coal-to-gas-switch, historically low gas prices, improvements in fuel efficiency, and the expansion of renewables, have decreased US energy-related GHG emissions by 450 million tonnes (or 7 per cent) during the past five years, faster than in any other country in the world.[17] Another repercussion of this situation is that cheap gas is pushing more expensive coal out of the American market, and this coal, being competitive in Europe, has actually increased the share of this fuel in the EU energy mix. This stands in obvious contradiction with CO_2 reduction efforts.

The strategic implications of the shale gas revolution in the US are increasingly affecting Europe's industrial energy consumers.

The strategic implications of the shale gas revolution in the US are increasingly affecting Europe's industrial energy consumers. As the price gap between the North American and European oil and gas markets is increasingly widening, a re-industrialization of energy-intensive and other industries is already underway on the US side, whilst the future economic competitiveness of Europe and Asia towards the United States is being increasingly challenged with much higher gas prices. American chemical companies – but also beverages, food industries, machinery, paper, pharmaceuticals, plastics and rubber, textiles and fabrics – are already reaping the benefits of affordable natural gas and are putting increased pressure on the competitiveness of European industry. In the future, European energy-intensive users may be more willing to invest in the US rather than in Europe, and/or may relocate their production and research facilities in the US, or in other countries and regions outside Europe.

If new legislation such as the proposed backloading of allowances in the ETS were to further increase the industrial prices of energy, the energy intensive

[17] M. Kuhn, F. Umbach, "Strategic perspectives of unconventional gas in Europe: a game changer with implications for the EU's common energy security policies," *EUCERS-Strategy Papers* Vol. 1, No. 1, 2011.

sectors in Europe would face even higher pressure and more problems with their competitiveness.[18] At the same time, many member states, as well as environmental organizations and the Green Party (MEPs representing green factions) – and also the European Commission itself – are applying pressure for an increase both in the price of emission allowances and the cost-effectiveness of clean energy production (the Nordic countries, Germany). Not without significance is the ambition of individual commissioners, who see the European Commission as an institution which has a special right to determine the main direction of development of the European Union. Increasing the influence of the member states over the process of preparing the legislation of the European Commission could reduce the risk of an excessive focus on environmental aspects at the expense of other policies in the Union, and make legislative proposals prepared by the Commission more realistic.

One of the latest European Environmental Agency reports – assessing the progress of the EU and European countries towards achieving their climate mitigation and energy policy objectives – reads that while the EU as a whole is largely on track to meet its GHG emission reduction and renewables goals, only four member states are on their way to achieving a 20 per cent increase in energy efficiency by 2020.[19] Hence the European Commission is preparing to undertake new initiatives, whilst some member states and the Commission have called for increasing the 20 per cent objective for reducing CO_2 emissions unilaterally, and no longer making that objective dependant on the rest of the world. However, this unilateral approach may just result in more free-riding policies of other states, and would also threaten the survival of energy-intensive industries, such as the European metals industry. Moreover, even should the EU want to expand the EU's 2020 carbon reduction targets from 20 to 30 per cent, the difference is equal to just two weeks of CO_2 emissions in China.[20]

[18] A. Walstad, "EU to address closure of energy-intensive industries," *Natural Gas Daily*, November 8, 2012. Available online: http://interfaxenergy.com/natural-gas-news-analysis/european/eu-to-address-closure-of-energy-intensive-industries/ (accessed on October 10, 2013).

[19] "Trends and projections in Europe 2013. Tracking progress towards Europe's climate and energy targets until 2020," European Environmental Agency, *EEA Report*, No 10, 2013, p. 124. Available online: http://www.eea.europa.eu/publications/trends-and-projections-2013 (accessed on October 17, 2013).

[20] A. Forbes, "Depressing … disappointing … bad news. Fatih Birol's sombre perspective on our energy future," *European Energy Review*, November 14, 2011. Available online: http://www.europeanenergyreview.eu/site/pagina.php?id=3350 (accessed on October 31, 2013).

While critics want to replace the ETS with a more efficient carbon tax – offering more predictability in order to stimulate investment in green technology, renewables and planned CCS-projects – the European Commission still views the ETS as its flagship instrument. Its proposals envisage a reform for reducing the surplus of allowances in the third phase of the scheme (2013–2020), by decreasing their number by 900 million allowances out of the total 3.5 billion. Such a solution would increase the cost of electricity production, thereby reducing the competitiveness of many industrial sectors, in the worst case leading to carbon leakage. That is why the EU's energy-intensive sectors – as well as countries where the energy mix is dominated by fossil fuels – are opposed to backloading. This is in conflict with the objectives of industrial policy aimed at increasing the industrialization of the member countries.

While many EU officials may demand even more EU activity leading to climate protection, due to the amount of GHG emissions being at a global record high, it should be noted that the unconditional priority of climate protection and the setting of reduction targets has been weakened. Europe is facing a great challenge to maintain its competitive edge, made greater by the cost of the climate policy (including subsidies for renewable sources) which it has itself shouldered.[21] The Commission, having acknowledged the need for a deep analysis of the future development of energy and climate policy, introduced in March a Green Paper on EU policy, on the framework for climate and energy up to 2030.[22] It could provide an opportunity to assess the costs and benefits of an ambitious climate policy, and its impact on the economic growth and competitiveness of the Union.

Europe is facing a great challenge to maintain its competitive edge, made greater by the cost of the climate policy which it has itself shouldered.

[21] D. Helm, "The European framework for energy and climate policies," *Energy Policy*, In Press, Corrected Proof, June 27, 2013, p. 2. Available online http://www.sciencedirect.com/science/article/pii/S0301421513004151 (accessed on September 30, 2013).
[22] Ibid

How to shape the debate?

The costs of such a far-reaching and ambitious climate policy are getting higher, and are unevenly distributed among the member states. The latest report of the World Bank, and the analysis of the consulting firm Ernst & Young, have both confirmed that the implementation of these ambitious climate objectives by the new EU members may result in an incomparably greater burden on their economies than on those of Western European countries, mainly due to existing differences in the structure of energy balances.[23] This was evidenced by the Polish opposition to the long-term aims proposed in the Energy Roadmap 2050, and the document was ultimately not accepted. The Polish government will probably hold the same position during the already commenced discussion on objectives up to 2030. This is justified by the need for greater solidarity and a better understanding of individual member states, especially those of Central and Eastern Europe which are less developed.

The position of the Polish government – against the adoption of more ambitious reduction targets for mitigating climate change and the reform of the ETS – has deeper grounds. It results from an imbalance in the shaping of EU policies, such as the excessive focus on climate issues at the expense of competitiveness of the energy market and security of supply. The Polish approach is reinforced by the larger world situation, in which the ambitious EU climate policy is not shared by other major emitters of greenhouse gases, such as China, the United States, India, Russia, or Japan.

Meanwhile, it's not only Poland that is critical of a more ambitious EU climate policy leading to higher greenhouse gas emission reductions after 2020 (from 20 per cent to 30 per cent). The EU energy commissioner Günther Oettinger also seems to be against increasing the EU climate goals. In recent months he has warned repeatedly of the danger of de-industrialization in the EU, suggesting that a greater focus be placed on the needs of industry.[24] Thus he has become one of the first major EU representatives advocating for an increased participation of European industry in the EU's GDP, from

[23] "The Prague report: analysis of Central Europe's energy sector," Ernst & Young, 2012; F. Pflüger, "European climate policy must distinguish between East and West," *European Energy Review*, September 13, 2012. Available online http://www.europeanenergyreview.eu/site/pagina.php?id=3850 (accessed on October 23, 2013).

[24] "EU-Energie Kommissar warnt vor neuen Klimazielen," *Financial Times Deutschland*, October 5, 2012.

its current level of around 16 per cent of GDP to 20 per cent by 2020.[25] The re-industrialization plan adopted by the Commission gives the impression that the EU has re-discovered the importance of its industry as a source of wealth creation, and that Europe wants to reverse the negative trend of the decreasing importance of industry in its economy.

Evidently economic issues – building well-functioning markets capable of generating the necessary investment, and creating conditions for the development of European industry – are becoming priority issues in the EU. However, with the new re-industrialization plan, existing contradictions between energy and industrial policies on the one hand, and climate on the other, are not waning. Increasingly, these inconsistencies can be eliminated only at the expense of the higher requirements of the climate policy. This stems not only from the need to complete the internal energy market or to secure supplies, but also from a serious economic slowdown and the crisis in the euro-zone. The V4 have jointly underlined the importance of both competitiveness and internal market rules, which should not be hampered. They have also expressed their willingness to enhance cooperation within the (informal) Competitiveness Council on issues concerning the further development of the internal market and European industry. The new "rhetoric of re-industrialization" is a chance for Poland and other V4 countries to have an important voice in this debate.

Convincing the EU to take into consideration the diversity of the member states, based on their primary energy balance and GDP, is in the interest of all V4 countries.

In regard to the European Council debate scheduled for March 2014 – which aims to adopt a comprehensive policy framework for EU energy and climate policy up to 2030 – the constructive cooperation of V4 countries is needed. Maintaining a real impact on the shape of the policy should be a strategic goal for these countries, as their domestic economies are facing investment challenges, the construction of a competitive market, the need to enhance further market integration, and also issues relating to security and diversification of energy supply. Convincing the EU to take into consideration the diversity of the member states, based on their primary energy balance and GDP, is in the interest of all V4 countries. Since the Commission has

[25] "A stronger European industry for growth and economic recovery", op. cit., p. 4.

signaled the need to address the equal distribution of efforts among member states, the close partnership of those countries within the EU which share similar views may result in a strong negotiation position.[26] The V4 in its expanded format (V4 plus Bulgaria and Romania) has agreed on guidelines for developing a joint position on a post-2020 climate and energy policy framework, which should be conditioned by the results of negotiations on a new global and legally binding agreement on climate change.[27]

Conclusions

Integrated energy and climate policy is shaped by medium and long-term planning instruments, such as road maps. In the epicenter of the eurozone debt crisis and the growing unemployment in the majority of member states, the EU has lost its former power to be a leader in climate protection. What's more, internal criticism of a too ambitious common climate policy has increased significantly. The Union may not, perhaps, be able to adopt more ambitious reduction targets before the upcoming parliamentary elections in 2014.

In order to overcome the economic stagnation in Europe and to promote new jobs, member states should focus more on the use of domestic natural resources (including shale gas), in addition to the development of renewable energy and energy efficiency. In this context, a more pragmatic and integrated energy policy would encourage lower energy prices, increasing the competitiveness of the economies of the EU in the world and the development of industrial sectors.

[26] A. Gawlikowska-Fyk, "What is the climate for EU energy policy," *Bulletin PISM*, No. 49, May 14, 2013.

[27] "Polish presidency of the Visegrad Group," Executive Summary, Warsaw, June 2013. Available online: http://www.msz.gov.pl/resource/42e96dc8-2ac5-4f29-afcd-d487a5a60a21:JCR (accessed on October 13, 2013).

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The European methane belt

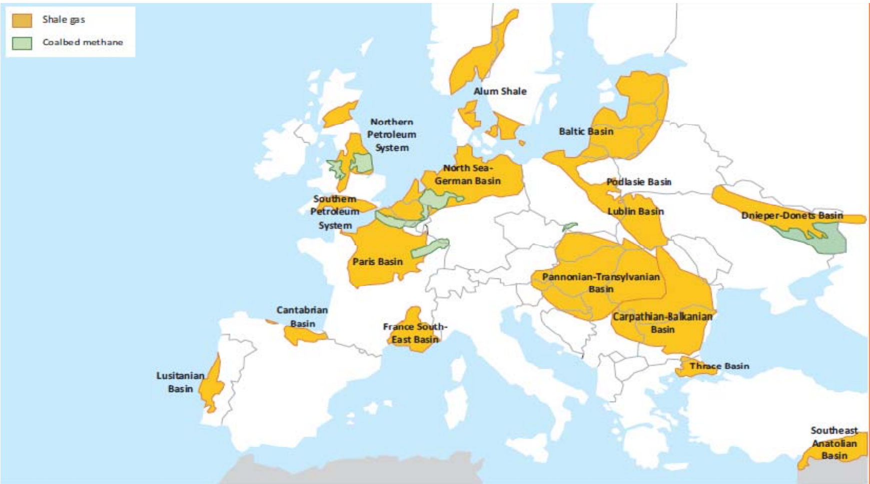
Abstract: *On the background of European counterpoints regarding unconventional gas, Poland and Ukraine currently stand out as the advance-guard of unconventional gas exploration in continental Europe. In this article an attempt is made to forecast the different scenarios of unconventional gas production in Ukraine and Poland with the aim of anticipating the consequences of these scenarios. Concerning the formation of a unique methane axis of Europe formed by Poland and Ukraine: the actual realization of the optimistic scenario of gas extraction would allow us to say that such an axis could be expanded in future by means of other countries, like Romania and Bulgaria, which have the prospect of new offshore discoveries in the Black Sea. The realization of this scenario could be a factor in significant geopolitical changes in Europe, in particular the reduction of the dependence of vulnerable Central and Eastern European countries on the monopolistic gas suppliers of the East.*

European unconventional gas perspectives

Revolutionary changes in North America's energy market, due to unconventional hydrocarbon production, are drawing the attention of business groups and politicians in Europe to the possibility of using these tested technologies. A replication of the American success in Europe, even on a smaller scale, is connected with the possibility of a reduction in gas prices, the development of certain industries, the creation of additional jobs, etc. Incentives and perspectives are very important for the European economy, which is still suffering from the crisis and continues to lose its competitiveness as compared with other global centers of development – Eastern Asia and North America. In Europe, however, there are quite opposed approaches towards unconventional hydrocarbons, caused by existing differences in the energy mixes of countries, the level of dependence on external supplies,

Gonchar, M., Chubyk, A., Ischuk, O., "The European methane belt," *International Issues & Slovak Foreign Policy Affairs* Vol. XXII, No. 3, 2013, pp. 33–54.

Figure 1. Location of main unconventional gas fields in Europe



Source: "Golden rules for a golden age of gas. World energy outlook. Special report on unconventional gas," International Energy Agency, 2012. Available online: *http://www.worldenergyoutlook.org/media/weowebsite/2012/goldenrules/weo2012_goldenrulesreport.pdf* (accessed on October 30, 2013).

the intensity of influence from internal and external political factors, etc. It is obvious however, that Europe should respond to the shale gas challenge. Industries and ecologists, whose motivation usually differs, are urging the political establishment to react and take certain decisions, which are not always based on the reality of the situation or an adequate understanding of the subject – concerning natural gas from unconventional sources and the only effective production technology of today: hydraulic fracturing.

Preliminary geological estimations allow us to consider the availability of several huge fields with prospective unconventional gas deposits on the territory of continental Europe. The most massive fields are located mainly in Western Europe (Germany and France), and in Central and Eastern Europe (Poland, Slovakia, Ukraine, Hungary, Romania and Bulgaria).

Currently in Europe, unconventional hydrocarbon production has its supporters (including Poland, Great Britain, Ukraine, Romania, and Lithuania), its "neutrals" (represented by Germany, Hungary, Slovakia, Portugal, and Sweden), and its opponents (Bulgaria, France, and the Czech Republic). This quite nominal belonging to this or that group is based on actual permissions or bans on production technology with hydraulic fracturing, and on intentions or plans to explore and extract unconventional gas in the near future.

Against the background of opposing European views regarding unconventional gas, Poland and Ukraine currently stand out as the advance guard of unconventional gas deposits exploration in the continental Europe. It can be assumed that the example of these countries may to a certain extent determine the attitude of other countries in Europe towards this issue. The judgment of the French Academy of Sciences illustrates this. On January 14, 2013 it presented its report "La recherche scientifique face aux défis de l'énergie," which emphasizes the need to start research on unconventional gas production immediately. It states that a moratorium has been imposed prematurely and without detailed scientific analysis. In addition, it points out that under the current economic decline, France cannot afford to neglect additional energy sources, let alone the necessity of resource evaluation. It points out the need for cooperation with those countries which have already begun to develop unconventional gas deposits – in particular the USA, Poland, and Ukraine.

The latter two countries (Poland and Ukraine) are in the very first stage of resource assessment and calculation of commercially recoverable reserves. Poland started dynamically in 2010, if exploration drilling can be regarded as a starting point. Ukraine did the same two and a half years later. Both countries managed to attract powerful international companies with appropriate technological potential, and (as of now) the best possible experience in the field of unconventional hydrocarbons and high investment capacities. As of October 2013, there have been 51 wells drilled in Poland, while in Ukraine there has been only one. Each country in its own way has had to contend with hampering factors which have significantly slowed progress. It appears it will be possible to speak affirmatively of the success or fiasco of unconventional gas extraction in Poland or Ukraine only at the end of the current decade.

Despite current difficulties, however, the governments of both countries are making efforts to create favorable conditions for the development of unconventional gas projects. We do not intend in this study to consider in detail all the internal factors – whether accelerating or hampering – which have already been widely presented in a number of publications both in Poland and Ukraine, and more generally in Europe. Our goal is rather to model the situation for the success of these projects under different scenarios. The geopolitical locations and potentials of both countries suggest that in the event of the successful development of unconventional gas production projects, Poland and Ukraine would not only solve the problem of gas dependence on a traditional monopolistic supplier, but could also bring about profound changes in European geo-economics and geo-politics. Perhaps this is exactly why the energy resource monopolists and Eurasian hegemons are disturbed, and are trying everything to preserve the existing status quo.

Poland. A short overview[1]

Poland became the biggest enthusiast of unconventional hydrocarbons development in Europe immediately after the American "shale gas boom" in the second half of the last decade, and has maintained its leading status. In quite a short period of time – due to the state's high investment rating, its EU membership, and the positive attitude of its population – it managed to attract large foreign companies and pique the interest of the national gas producing companies. Although optimistic forecasts of potential reserves were significantly reduced, and foreign companies were faced with the unwillingness of Polish authorities to make further concessions – particularly financial ones – the country nonetheless managed to carry out the main part of its exploration activities in Europe and to test American technologies.

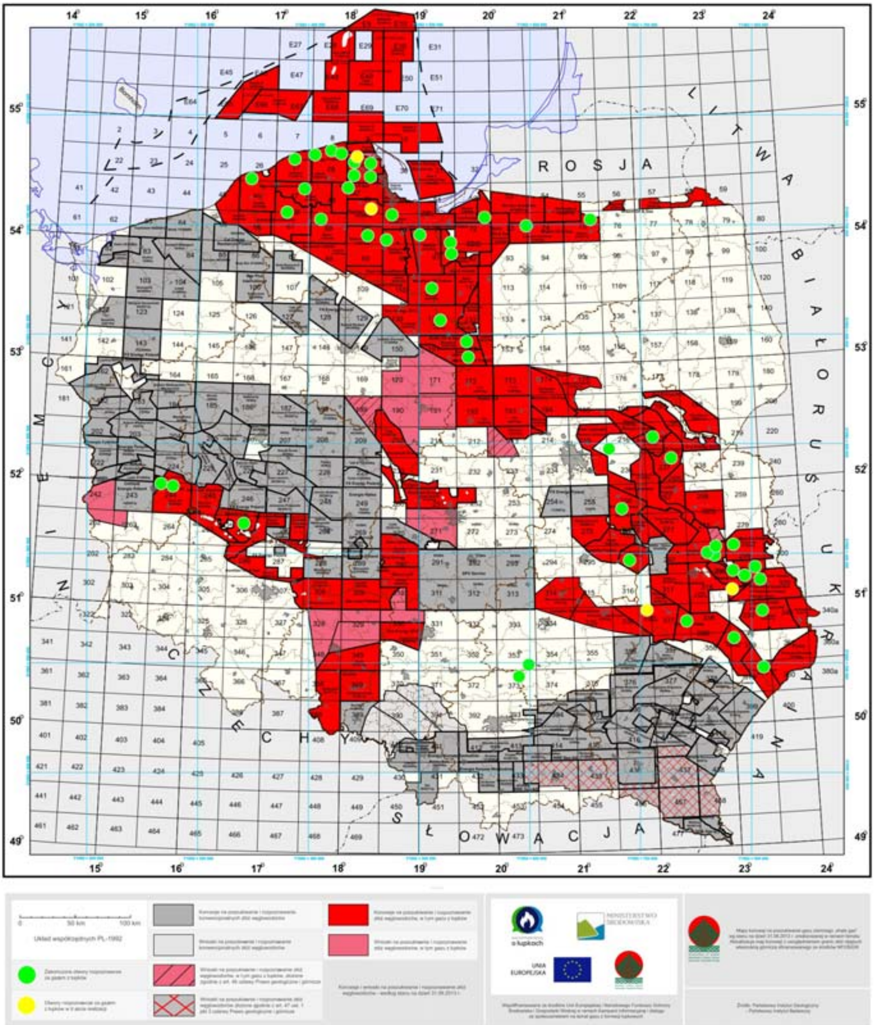
Despite this progress, assessments of unconventional gas that can be extracted are still quite theoretical. According to various assessments from different sources, technically recoverable shale gas resources on the territory of Poland vary over quite a wide range:

- 1.37 TCM (Wood Mackenzie, 2009);
- 1.87 TCM (EUCERS, M. Kuhn, F. Umbach, 2011);
- 2.83 TCM (ARI, V. Kuuskraa, S. Stevens, 2009);
- 4.14 TCM (US EIA, 2013).

It should be noted that US Energy Information Administration estimations have been changed. While in 2011 technically recoverable shale gas resources in Poland were estimated at 5.23 TCM, in the Review of 2013 this estimation was reduced to 4.14 TCM. However, the possibility must not be ruled out that further progress in exploration will alter these figures upwards.

[1] A. Sikora, "Exploration of Natural Gas from Unconventional Sources in Poland. Experience for Ukraine," prepared for NOMOS Center project "Methane Sphere," October 2013.

Figure 2. Schematic map of concession areas and drilled test wells on the territory of Republic of Poland as of September 2, 2013



Source: "Gazlupkowy.pl." Available online: http://gazlupkowy.pl/wp-content/uploads/2013/09/Mapa-otwor%C3%B3w-za-gazem-z-%C5%82upk%C3%B3w.jpg (accessed on October 30, 2013).

Scenarios for Polish gas production

Traditional natural gas reserves on the territory of Poland reach 0.14 TCM, while the current production level is about 4.3 BCM. Consequently, the Resources and Production index (R/P) equals 32.5. It is one of the highest ratios in Europe.

Taking into account the specified R/P ratio in the case of unconventional gas, we will get volumes of potential production which are significant for Poland:

- 42.1 BCM according to Wood Mackenzie;
- 57.5 BCM according to EUCERS;
- 87.07 BCM according to Advanced Resources International (ARI);
- 127.4 BCM according to US Energy Information Administration for 2013.

These deposits will come on stream within a 15–20 year period – in the late twenties or early thirties – but only provided that all necessary geological, technical, ecological and investment conditions are completely met.

To arrive at more precise estimations of the unconventional gas production potential in Poland, we must compare them to the shale gas production estimations in the USA, while keeping in mind the relevant geological and operational differences. Taking into account the geological conditions, stage of development, size, and location in more urbanized terrains, some experts have compared the Polish unconventional gas plays with Marcellus in the USA. The R/P ratio for the Marcellus play for the period 2020–2030 is 60–45 (considerably higher than for the Fayetteville and Haynesville plays: 30–25 and 25–15 respectively), thus being closer to the Polish case. The Marcellus play could therefore be taken as an analog for further modeling. We should also make use of the available data on the resources of Wood Mackenzie, EUCERS, ARI, and EIA, as a basis for estimations of Polish shale gas production levels. Let us take for our calculations an average R/P ratio for Marcellus play, at the level of 52.5. Correspondingly, we can have four scenarios of the annual production in 15–20 years (full development stage):

- 26.0 BCM/year by reference to the Wood Mackenzie resources estimation;
- 35.6 BCM/year according to EUCERS;
- 53.9 BCM/year by reference to the ARI estimation;
- 78.8 BCM/year by reference to the US EIA assessment.

The scenario based on the Wood Mackenzie estimation seems too understated, while on the other hand the scenario referring to the EIA evaluation appears definitely exaggerated, so the lower end of the range of our shale gas production forecast is set by the EUCERS estimation and the upper end of the range by the ARI assessment – that is, between 36–54 BCM/year. This volume is higher by an order of magnitude as compared with the current level of conventional natural gas production in Poland. Thus, even a moderate scenario means a "gas revolution" in the case of Poland.

Ukraine, A short overview[2]

Ukraine's unconventional gas deposits are concentrated mainly in the two traditional energy resource basins: the Dnieper–Donets Basin (DDB) in the east of the country and the Lviv–Volhynia Basin (LVB) in the west. Shale gas deposits are located in the west, while tight gas and coal bed methane are to be found mainly in the east. Estimations taken as the basis for the project of the revised "Energy strategy of Ukraine until 2030" show us the following picture of unconventional gas in Ukraine. According to the preliminary estimation, tight gas is the most prospective unconventional gas resource. This is different from the situation in neighboring Poland with its mainly shale gas deposits, the extraction of which requires much more drilling – in particular, horizontal drilling with larger volumes of hydrofracturing activities.

Estimated reserves of tight gas within national estimations range quite widely between 2 and 8 TCM and are found at depths of between 4 and 5 km. Estimated shale gas reserves range between 5 and 8 TCM. The volume of potential coal bed methane deposits is expected to range between 12 and 25 TCM with deposits located mainly in DDB. (A serious problem is posed by the fact that coal deposits in Ukraine lie rather deep, at between 0.5 km and 5 km, and are quite thin, 0.5–2 m. As a result, production requires considerable financial outlays). American assessments of technically recoverable unconventional gas reserves[3] in Ukraine in 2011 were at the

[2] M. Gonchar, "First steps into the unknown. The prospects of unconventional gas extraction in Ukraine." NOMOS Center on request of Polish OSW, April 27, 2013. Available online: http://www.osw.waw.pl/en/publikacje/osw-commentary/2013-04-27/first-steps-unknown-prospects-unconventional-gas-extraction-ukr (accessed on October 30, 2013).

[3] Calculated in trillion cubic meters according to the conversion from tcf to tcm, ratio – 0,028 . See BP website. Available online: http://www.bp.com/conversionfactors.jsp (October 30, 2013).

level of 1.17 TCM,[4] and according to the EIA Review in 2013 have been raised to 3.58 TCM.[5] The most promising areas for unconventional gas production in Ukraine are the Yuzivska and Oleska fields.

The Yuzivska field is a promising region with tight gas resources on the territory of Kharkiv and Donetsk Oblasts (see Figure 3), which is being developed by the company Shell Exploration and Production Ukraine Investments (IV) B.V. The area provided under the PSA agreement comprises 7,886 km^2.[6] It includes all sedimentary deposits (gaseous and liquid hydrocarbons) located within the field's perimeter and limited by the depth of oil and gas production activities to 10,000 meters below the surface or by the geologic basement (depending on which is reached first). The reserves of the Yuzivska field are estimated at 4.054 TCM.[7]

The Oleska field is a promising region with shale gas resources in the territory of Lviv and Ivano-Frankivsk Oblasts (see Figure 4), which will be developed by the company Chevron upon PSA signature. The total area is 6,324 km^2. Similar to the Yuzivska field, the tender conditions include the extraction of all deposits of gaseous and liquid hydrocarbons located within the field's perimeter and limited by the depth of oil and gas production activities to 10,000 meters below the surface or by the geologic basement. According to preliminary estimations, the shale gas reserves are forecasted to be 2.98 TCM.

Apart from the Yuzivska field, Shell is also the operator of six neighbored concession areas with a total area of 1,300 km^2, under the Joint Operation Agreement (updated on September 1, 2011) with Ukraine's biggest state-owned gas producing company, UkrGasVydobuvannia, which is a part of NAK Naftogas of Ukraine.[8] The above-mentioned areas are estimated as promising

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4 "EIA releases worldwide shale gas resource report," *oilprice.com*, April 8, 2011. Available online: http://oilprice.com/Energy/Natural-Gas/EIA-Releases-Worldwide-Shale-Gas-Resource-Report.html (accessd on October 30, 2013).

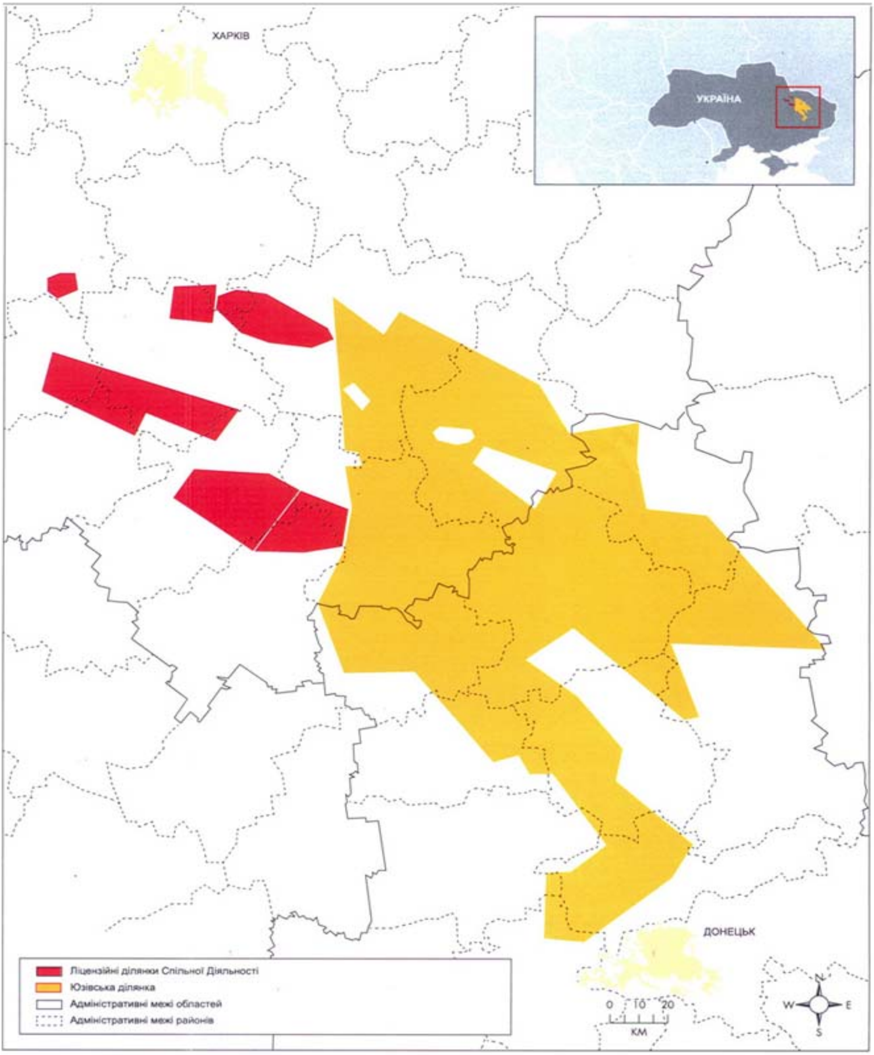
5 "Technically recoverable shale oil and shale gas resources: an assessment of 137 shale formations in 41 countries outside the United States," U.S. Energy Information Administration, June 2013. Available online: http://www.eia.gov/analysis/studies/worldshalegas/pdf/overview.pdf (accessed on October 30, 2013).

6 Hydrocarbon sharing agreement, which will be extracted within the Yuzivska field. Annex 1 – area provided under PSA agreement, p. 209.

7 "Уряд затвердив розробників Юзівської та Олеської," May 15, 2012. Available online: http://www.kreschatic.kiev.ua/ua/4084/art/1337021639.html (accessed on October 30, 2013).

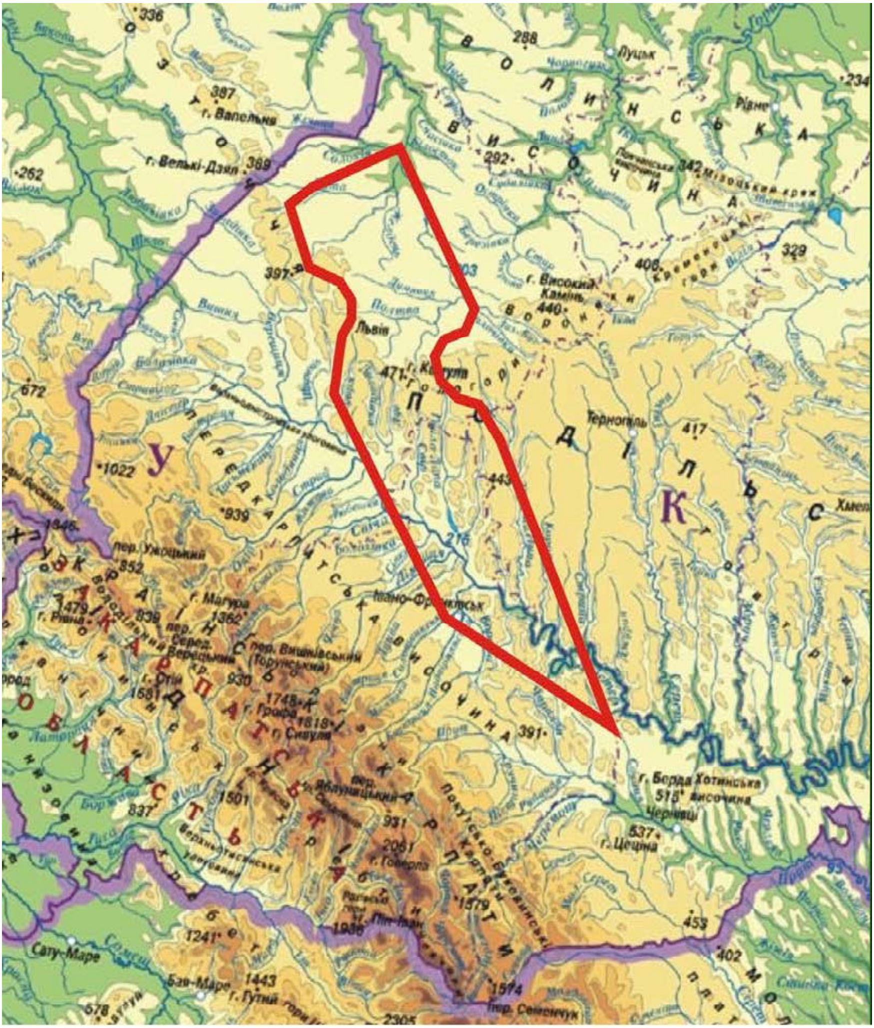
8 "Укргазвидобування" і Shell Exploration and Production Ukraine підписали договір про інвестиції на 800 млн дол," *RBC Ukraine*, September 1, 2011. Available online:

Figure 3. Schematic map of Yuzivska field (light color) and concession areas according to Joint Operation Agreement between Shell and UkrGasVydobuvannia (dark color)



Source: "Грехем Тайлі: У випадку повномасштабної розробки Юзівського родовища інвестиції сягнуть 3,75 млрд дол," *RBC Ukraine*, August 8, 2012. Available online: http://www.rbc.ua/ukr/interview/show/grehem-tayli-v-sluchae-polnomasshtabnoy-razrabotki-yuzovskogo-08082012104200/ (accessed on October 30, 2013).

Figure 4. Oleska field on the geographical map of the Western region of Ukraine



Source: Ivano-Frankivsk National Technical University of Oil and Gas, November 14, 2012.

for traditional natural gas production, a goal which the Joint operation has set for itself as well. The Joint Operation Agreement enabled Shell to start with drilling of the first exploration well on October 25, 2012, thus accelerating Ukrainian progress in the search and development of unconventional hydrocarbons, and partially narrowing the gap between Ukraine and Poland in this matter.

Production projects for the two fields are each scheduled to last 50 years. The start of commercial development is expected in 2018–2019, provided that before that time the availability of commercially recoverable resources is confirmed. If the investor decides to start commercial production, then the investments should earn:

- on the Oleska field, at least 3.125 billion US dollars;
- on the Yuzivska field, at least 3.75 billion US dollars.[9]

It is hard to say whether the amount of these investments will be sufficient. If we take the estimations contained in the IHS CERA study, "Natural gas and Ukraine's energy future" (conducted at the request of Ukraine's Ministry of Energy and Coal Industry in 2012), then commercial development of unconventional hydrocarbons (shale gas, tight gas, coal bed methane) in Ukraine with a total production performance of 25 BCM/year will be possible, provided that investments into the fields amount to 2–3.5 billion US dollars annually, and that during certain periods they are increased to up to 10 billion US dollars.[10] By "the fields" here we mean not only the two above mentioned fields; other prospective areas are also taken into account.

Black Sea prospects

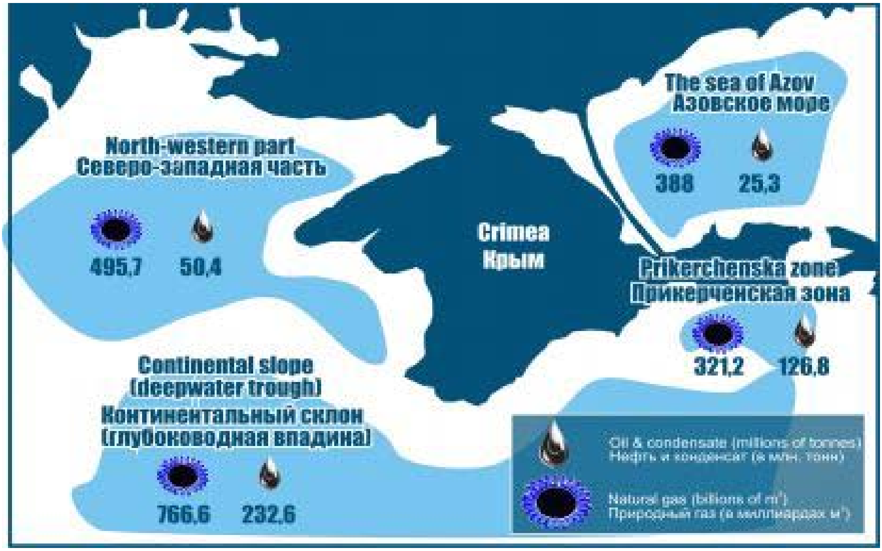
The gas production potential of Ukraine is not limited to onshore unconventional hydrocarbons alone. Besides this, the development of the Sea of Azov, as well as the Black Sea shelves (ABSS) with their highly promising hydrocarbon potential, will be gaining in importance. In the 2020s, the Black Sea may have the same success, in terms of natural gas, as the Caspian Sea oil success of

http://www.rbc.ua/ukr/top/show/-ukrgazdobycha-i-shell-exploration-and-production-ukraine-podpisali-dogovor-01092011103600 (accessed on October 30, 2013).

9 M. Gonchar, "Unconventional gas resources in Ukraine," *Review for UGOS*, 2012.

10 "Презентовано модель видобутку газу в Україні до 2035 року," May 25, 2012. Available online: http://www.kmu.gov.ua/control/uk/publish/article?art_id=245244792&cat_id=244277212 (accessed on October 30, 2013).

Figure 5. The most promising gas fields in Ukrainian sectors of the Sea of Azov and the Black Sea



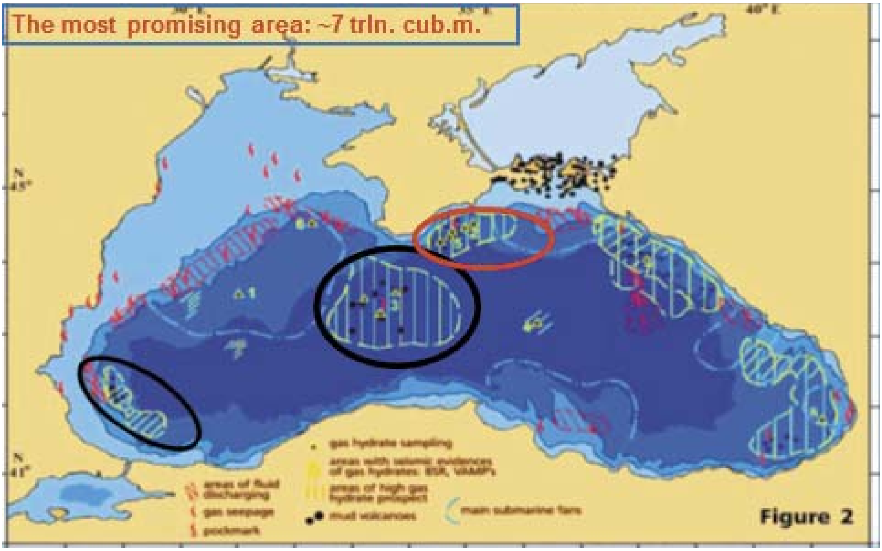
Source: ChornomorNaftoGas. Available online: http://chernomorneftegaz.com/index.php/ukr/investoram-2 (accessed on October 30, 2013).

the 1990s. Speaking of gas, the total volume of predicted traditional natural gas resources in four sectors of Ukrainian ABSS comes to 1.97 TCM (see Figure 5). Generally this is in line with the global tendency to enhance offshore hydrocarbon production on sea and ocean shelves.

The tendency to enhance the production of underwater energy resources will keep growing, because onshore energy resource deposits are almost entirely explored, while on the continental shelf, particularly in deep water, only a small part of them has been explored so far. For instance, on the Black Sea continental shelf, hydrocarbon deposits at a depth of more than 200 m are poorly explored, and the most promising oil and gas fields are located at depths of 1,500 – 2,000 m.[11]

[11] O. Volovich, "Порівняльний аналіз освоєння континентального шельфу Чорного і Азовського морів державами регіону," *Чорноморська безпека*, April 20, 2012. Available online: http://nomos.com.ua/content/view/429/86/ (accessed on October 30, 2013).

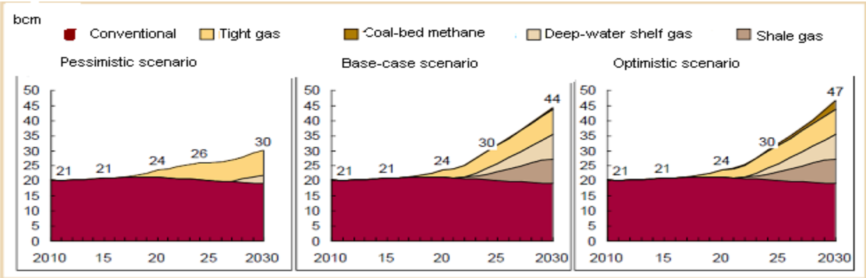
Figure 6. The most promising areas of gas hydrates accumulations in the Black Sea



Source: "A 2020 vision of the Black Sea region in the EU strategies," NOMOS Center's international conference, Burgas, September 21, 2012.

The Ukrainian Black Sea sector also contains gas hydrate accumulations. During 1988–1989, exploration expeditions revealed gas hydrate accumulations under the sea bed at depths of 300–1,000 m. According to different estimations made at different times in different countries of the region, the Black Sea contains roughly 45–75 TCM of projected natural gas resources in the form of gas-hydrates. Due to the "shale gas revolution" we are also observing an increased interest in the gas-hydrates issue, both in several EU states and in Ukraine. Back in 1993, the Government of Ukraine had approved the "The Black Sea Gas Hydrates Program," stipulating that there be ample geological exploration and development of production technologies. Seismic surveys were conducted, and several scientific expeditions were carried out. However, the economic crisis of the 90s, a lack of investments, and the inability of governments to implement long-term programs, all inhibited the development of gas hydrates in Ukraine. Now, with Japan's success of March 12, 2013 – that is, the first experimental production of

Figure 7. Gas production scenarios in Ukraine until 2030



Source: According to the project of the revised version of the Energy Strategy of Ukraine until 2030

natural gas from marine methane gas hydrates deposit – has given rise to more active discussions on this topic in leading countries. And Ukraine is not an exceptional case. In the Ukrainian Black Sea sector – in the Feodosia Gulf in particular – there is a significant potential for gas hydrates (up to 7 TCM, see Figure 6), which was reaffirmed during the joint German–Ukrainian expedition in 2010, on the German research vessel "Maria S. Merien."

Overall, therefore, Ukraine has considerable volumes of technically recoverable resources of both traditional natural gas (located mainly on the Sea of Azov and the Black Sea shelves), and unconventional gas (both onshore and in the Black Sea). In general, Ukrainian gas deposits could comprise a significant part of European natural gas resources from unconventional sources.

Gas Production Scenarios in Ukraine

According to the revised version of the "Energy strategy of Ukraine until 2030," three gas production scenarios are projected: pessimistic, optimistic and basic scenario.

According to the calculations of the Energy strategy's authors, gas production in Ukraine could reach the following levels by 2030:

- Deep-water shelf gas – 7–9 BCM/year
- Shale gas – 6–11 BCM/year
- Tight gas – 7–9 BCM/year
- Coal-bed methane – 1–3 BCM/year.

Conventional natural gas production may vary within the range of 15–24 BCM/year.[12]

Current natural gas production in Ukraine ranges from 20 to 21 BCM annually. A little-known fact is that in the seventies Ukraine produced over 60 BCM of natural gas annually (the highest production level of 68.11 BCM was registered in 1975),[13] which came to an average of one fourth of the total gas production in the USSR at that time. Before Russian Siberian gas ever crossed the borders of the People's Republic of Poland, the Czechoslovak Socialist Republic, or the People's Republic of Hungary – the state-predecessors of the current Visegrad Four countries – these countries were supplied with Ukrainian gas. Ukraine was one of the "gas Klondikes" of the former USSR. Because of the strategic redirection of the Soviet regime towards hydrocarbon production development in Western Siberia, there was a significant decrease in investments into the oil and gas fields in Ukraine, although the country's mineral wealth, in spite of the depletion of easy-to-reach deposits, still contained significant resources – in particular those natural gas deposits which were difficult to develop.

Nearly four decades later, Ukraine now has the chance to regain the status of a powerful upstream country, with all its evident advantages and hidden challenges. According to the projections of the IHS CERA experts, gas production in Ukraine after 2030 could surpass 73 BCM annually (see Figure 8).

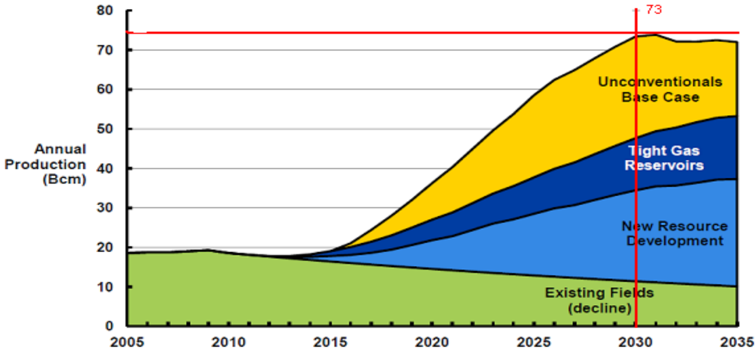
Certainly, the above mentioned scenario is not predetermined. The Government of Ukraine must satisfy a range of legal, regulatory, economic and ecological requirements in order to make the described virtual scenario come true.

> If one assumes that government policy succeeds in providing a conducive environment for investment, and as a result the production scenario described above is achieved, this would imply levels of investment in gas development far greater than those recently seen in Ukraine…Total capital investment for the production scenario could reach levels of approximately $10 billion per year during some periods between 2012 and 2035. This figure does not include related investment in support

[12] See the website of the Energy Ministry of Ukraine. Available online: http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50358 (accessed on October 30, 2013).

[13] M. Kovalko, *Oil and gas of Ukraine*, Kiev: Scientific voice, 1997, p. 176.

Figure 8. Dynamics of gas production on the basis of IHS CERA's projection



Source: "Презентовано модель видобутку газу в Україні до 2035 року," [Natural Gas and Ukraine's Energy Future], HS CERA, 2012. Available online: http://www.kmu.gov.ua/control/uk/publish/article?art_id=245244792&cat_id=244277212 (accessed on October 30, 2013).

infrastructure – this is the American "winning formula" for unconventional gas in Ukraine, defined in the analysis of IHS CERA in 2012.[14]

The question is whether Ukraine will be able to provide the required favorable environment for such amounts of investment influx. It is quite difficult to give an affirmative answer from the perspective of past state investment. The European Commissioner for Energy, Günther Oettinger, in a special article on the eve of the Ukraine–EU Summit in Brussels on February 25, pointed out: "The signing of the Production Sharing Agreement on January 24, 2013 with Shell is a positive example. Now it is important for Ukraine to provide the needed conditions in order that investors may operate as planned." However, it is not only Shell and Chevron that intend to implement unconventional hydrocarbon E&P projects in Ukraine. The Austrian company RAG is planning to develop shale gas deposits in the western part of the country, jointly with the Italian company Sorgenia. The Italian company ENI is also considering exploiting shale gas deposits in Ukraine.

Therefore, within both national and foreign forecasts, the best prospect is associated precisely with unconventional gas located in the traditional areas of gas extraction in the east and west of Ukraine.

[14] "Природний газ та енергетичне майбутнє України," *IHS CERA*, 2012, pp. 1–10.

Ukraine + Poland = Geomethane axis of Europe

Nevertheless, it is premature to speak about the success of unconventional gas production in Poland and Ukraine, as in Europe generally. There are no successful unconventional gas projects apart from those in North America. In fact, Ukraine and Poland together have formed a kind of vanguard on the path towards the unknown. To a large extent, the success of UCG projects in Ukraine will depend upon the process of development of similar projects in Poland, which are a few steps ahead. In particular this concerns the Oleska field, which is a part of the Lublin gas basin located on the territory of both countries. Correspondingly, the success of Chevron in Poland will stimulate the development of projects in Ukraine. Moreover, and by the same token, the failure of the Polish projects will lead to similar consequences in Ukraine. The first steps towards the unknown in Ukraine have been made, steps which can be characterized as quite dynamic and confident. Poland, on the other hand, has to some extent been losing its initial dynamic quality. In regard to this, the Polish government intends to introduce penalties for companies that have shale gas concessions but fail to meet the work deadlines specified under the license agreements. In turn, the companies are reluctant to invest because of the lack of necessary legislation, and concerns about whether legislative amendments planned for approval will be favorable to their activities in Poland. This causes uncertainty about the profitability of shale gas production.

However, if one assumes that the current difficulties of various origin which exist in Ukraine and Poland will be overcome, and that technological progress in the sphere of unconventional gas extraction will mitigate the resistance of ecologists (or even cause them to withdraw it) and neutralize external confrontation, then in future both countries will be able to improve their energy status significantly.

Here we would like to present the matrix of future gas production scenarios in both countries proceeding from predictive calculations made in this article that are based upon the data from reputable research centers, industry-specific estimates, and official documents.

Therefore, if one takes into consideration that the level of gas consumption in Ukraine as of 2030 will be 49 BCM per year (according to the revised Energy Strategy's average basic case), and the average gas consumption in Poland will be 31 BCM per year (according to ISE), then both countries combined could have a total gas production in the range of 59 BCM (minimum) to 155 BCM (maximum) under the total gas consumption level of 80 BCM per year.

Table 1. Matrix of scenarios for total gas production volumes from conventional and unconventional sources in Poland and Ukraine by 2030

Poland* **Ukraine**	**29 (Wood Mackenzie)**	**39 (EUCERS)**	**57 (ARI)**	**82 (US EIA)**
30 (pessimistic scenario)	30+29=**59**	30+39=**69**	30+57=**87**	30+82=**112**
44 (basic scenario)	44+29=**73**	44+39=**83**	44+57=**101**	44+82=**126**
47 (optimistic scenario)	47+29=**76**	47+39=**86**	47+57=**104**	47+82=**129**
73 (IHS CERA forecast)	73+29=**102**	73+39=**112**	73+57=**130**	73+82=**155**

* In the case of Poland the estimates of unconventional gas production were taken and added to the conventional gas production at a level of 3 BCM per year, on the assumption that, as in Ukraine, it will drop from the level of 4.3 BCM per year due to resource depletion.

Such a wide range means that each country to some extent has the possibility of minimizing import and obtaining a self-sufficient status, or of becoming a gas exporter. Let us consider the situation in detail, taking into account up-to-date forecasts for natural gas consumption in Ukraine and Poland by 2030.

Summarizing the data in both proposed tables, we can forecast the following scenarios for Ukraine and Poland.

A. Import minimization. Due to a significant increase in internal gas extraction, both Ukraine and Poland (but mainly Poland) reduce the need for importing Russian gas, to the level at which the energy security of less than a third of consumption is threatened.

B. Gas self-sufficiency "at halves." The level of domestic gas production in both countries allows them to cover consumption and offers the possibility of exporting small volumes of gas. The possibility of export is true largely for Poland, which will be able to export a part of its gas surplus to Ukraine given attractive market prices. Both countries therefore can ensure gas self-sufficiency "at halves."

B1. Gas self-sufficiency in the V4. The level of gas production in both countries (but mainly Poland) allows them to export gas surplus, especially to the neighboring countries of Central and Eastern Europe, including the

Table 2. Matrix of scenarios for potential deficits and surplus of natural gas, giving due consideration to the forecasted levels of consumption in Poland and Ukraine by 2030

scenarios-2030		**Poland-2030**			**Ukraine-2030**		
		production	**consumption (ISE)***	**+ / -**	**production**	**consumption**	**+ / -**
		BCM per year			*BCM per year*		
PL	according to estimate of Wood Mackenzie	29	31	-2			
	according to estimate of EUCERS	39	31	**+8**			
	according to estimate of ARI	57	31	**+26**			
	according to estimate of US EIA	82	31	**+51**			
UA	pessimistic case (according to Energy strategy of Ukraine)				30	47	-17
	basic case (according to Energy strategy of Ukraine)				44	49	-5
	optimistic case (according to Energy strategy of Ukraine)				47	53	-6
	according to estimate of IHS CERA				73	55	**+18**

* The level of consumption being considered is an average according to Polish Institute of Energy (ISE) calculations. As the lower and upper consumption scenario options do not diverge much (30 and 32 BCM), the average number is 31 BCM.

Visegrad Group. Being the most powerful V4 state and the political leader of the group, Poland will focus primarily on Visegrad countries, taking into account the integration of V4 gas transport systems, as well as the ambitious plans of Warsaw to turn this into the most harmonized integration group in the EU.

C. Geo-methane belt of Europe. The total export potential of the two countries combined ranges from 26 to 69 BCM, thus enabling the Ukrainian–Polish tandem to compete successfully with certain other traditional upstream countries that are located far beyond the EU, in the sensitive regions of the South Caucasus, the Middle East, and North and West Africa.

An analysis of the considered scenarios shows that the majority of them will bring both countries to a level of gas self-sufficiency, thereby releasing their current import volumes to the EU market and increasing competition between current suppliers. "Ukraine has great potential, it should not rely on gas import but can become independent in the natural gas sector" – this is the estimate of the IHS CERA experts on the prospects of UCG in Ukraine.[15]

If scenario C were to become a reality, this would make possible the emergence of two new suppliers to the European internal gas market, and would bring to nothing any attempt of external suppliers to dictate terms to consumers in Central and Eastern Europe.

Although at present scenario C seems to be over-optimistic, and appears rather unrealistic against the background of the general difficulties with unconventional gas in Europe, nevertheless the probability of its becoming a reality is quite significant allowing for technological progress, changes of market realities, and global trends.

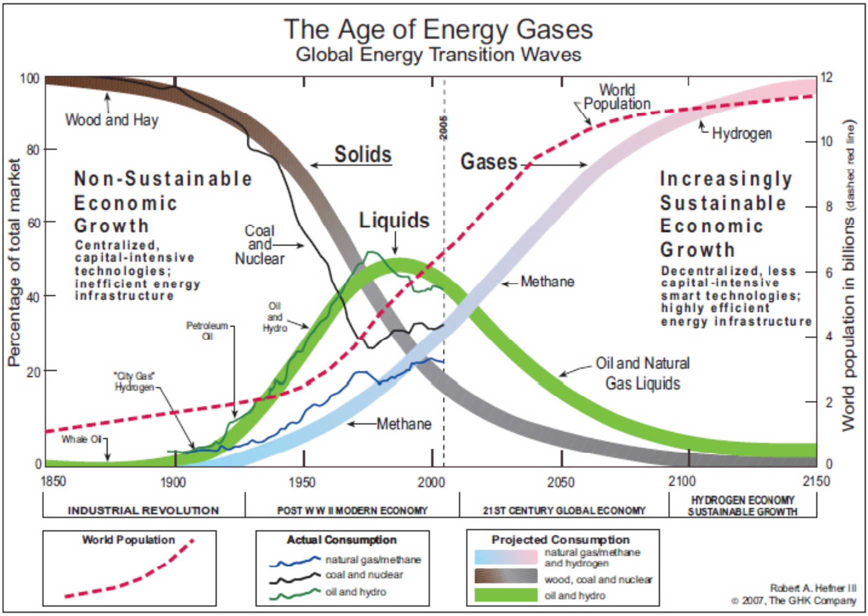
One such trend is the gradual but steady "gasification of the future," which is dictated largely by the environmental attractiveness of natural gas as the cleanest of the fossil fuels (given the need to reduce industrial CO_2 emissions in the fight against climate change), as well as by the rapidly growing electricity demand. Modern civilization, especially in Europe, is moving fast towards an electricity powered future. Electricity produced from "energy gases" – methane and in the long run hydrogen – is the most suitable for the goal of reducing industrial CO_2 emissions.

In 2007, the American researcher Robert Hefner (III) visually demonstrated the movement of industrial civilization towards "gasification" and the shift from the solid and liquid energy resources of the carbon-hydrocarbon group, by processing statistical data by types of energy resources consumed during the industrial period. This projection into the future based on real data allows us to predict the invisible approach of the "Golden Age of Gas," as it was successfully tagged by the International Energy Agency.

Methane is more than just an energy resource and a raw material for the chemical industry. Largely it is the basis of the industrial energy activities of modern civilization, which consumes and requires more and more eco-friendly and safely extracted fossil fuels. Methane is among them. Natural gas resources, previously unavailable for extraction, are becoming available. After the First and Second gas revolutions – that is, the beginning of the industrial production and use of natural gas in the twentieth century, and unconventional gas production in the early twenty-first century – the Third

[15] "Презентовано модель видобутку газу в Україні до 2035 року," op. cit.

Figure 9. The age of energy gases



Source: R.A. Hefner III. The GHK Company, 2007.

revolution is afoot, the revolution of methane hydrates. Methane with its various types remains the main actor of all three revolutions. It can also be considered as "policymaking" gas, if you look at countries such as Russia, Qatar, Turkmenistan, and lately the USA. Every form of existing methane has its own destined time within the peculiar methane sphere of the planet. As soon as each new technical improvement takes place, Nature opens up to humanity the possibility of extracting new methane resources. It is important to ensure that this extraction proceeds as safely as possible for the environment, which already suffers from the growing demographic and industrial load.

The revolutionary changes in the global energy sector can be, and have already become, a principal factor of geopolitical metamorphosis. As a result, not only will the world economy be changed through the transformation of the global energy balance, but also the world geopolitical order. These changes being anticipated, the powers of the Eurasian energy hegemony are incited to counteract their effects. Although these attempts are ultimately in vain, they do occur. Their manifestations are not only in direct anti-shale gas campaigns, but also in hidden actions disguised as care for the environment but aimed at disrupting or hindering projects of natural gas exploration from unconventional sources.

The methane axis of Europe, which is now being formed by Ukraine and Poland, may with time be expanded by means of those other countries, Romania in particular, whose estimated resources according to US EIA forecasts amount to 1.43 TCM[16] – that is, comparable to certain estimates of Polish and Ukrainian UCG resources. Besides that, in the Ukrainian, Romanian and Bulgarian sectors the Black Sea offers significant prospects for natural gas discoveries on the shelf and continental slope. In addition, it is important to consider the prospects of gas hydrates exploration, which for the time being seems to be a science- and application-oriented objective, but could turn into the next wave of the gas revolution. Turkey is also engaged in researching the UCG deposits on its territory and is actively implementing the Black Sea research program.

The geopolitical methane belt of Europe will materialize, therefore, sooner or later. Its foundational structure has been formed by Poland, Ukraine and a group of powerful transnational corporations possessing the appropriate technologies, expertise and investment potential. The question is, how quickly will the described prospects be realized: at the beginning of the twenties or beyond the thirties?

Perhaps in future Central and Eastern Europe will play a more important role in the politics and economy of the border region between two geopolitical and geo-economic platforms: the Euro–Atlantic and the Eurasian. The geo-methane belt of Europe has the potential to increase the resistance of CEE countries to adverse Eurasian impacts, and to reinforce the eastern periphery of the EU, thus making CEE countries less vulnerable to the uncertainties of gas supplies from the East.

[16] "Technically recoverable shale oil and shale gas resources: an assessment of 137 shale formations in 41 countries outside the United States," op. cit.

Pavol Szalai

Playing down the shale gas hype, inventing a sober policy

Abstract: *Europe will not repeat America's experience and will not witness a shale gas revolution in the short term. Extracting unconventional gas is economically less interesting, socially less acceptable – France being a typical case – and, in terms of energy security, not motivating enough, beyond countries very dependent on Russian imports such as Poland. Nevertheless, the American experience looms over Europe, with some European capitals wishing to emulate it and others wanting to avoid it. This controversy is part of a larger debate about the European Union's climate-energy strategy until 2030. The European Commission, representing the common European interest, has seized the opportunity. By the end of 2013, it wants to present new measures to better regulate the environmental impact of possible extraction. The Union should not stop here: the positive consequences in the US for the climate, economy and energy security on the one hand, and Europe's own troubled climate and energy policy on the other, should make the Union think beyond environmental constraints.*

Talking about a revolution

The American shale gas revolution took root deep inside Texas and Louisiana in the 1970s. The Southern states served as the first theatres of the new gas extraction method: horizontal drilling. When it was combined in the 1990s

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This article is based on a policy paper published by the Paris-based Robert Schuman Foundation (P. Szalai, "Révolution du gaz de schiste: peut-elle traverser l'Atlantique?," Question d'Europe, No. 293, November 4, 2013. Available online: http://www.robert-schuman.eu/fr/questions-d-europe/0293-revolution-du-gaz-de-schiste-peut-elle-traverser-l-atlantique (accessed on November 4, 2013).

Szalai, P., "Playing down the shale gas hype, inventing a sober policy," *International Issues & Slovak Foreign Policy Affairs* Vol. XXII, No. 3, 2013, pp. 55–73.

with hydraulic fracturing – a method applied since the 1940s on conventional hydrocarbon reserves – the extraction of shale gas became possible. Yet the pioneers were not the giant oil companies, but rather small to mid-size producers – who historically had formed the backbone of the American hydrocarbon sector and had been open to commercial risk. As gas prices in North America reached record levels, unconventional gas extraction suddenly became attractive for the big players, too. Production spread rapidly across the country.

Among the various types of unconventional gas, shale gas accounts for most of the production.[1] From 2001 to 2010, shale gas output increased 12-fold,[2] reaching a 39 per cent share in US total gas production in 2012.[3] In fact, towards the end of the 2000s, unconventional gas production – mainly thanks to shale gas – started to offset the decline in conventional gas output. The increased gas production led to a supply surplus on the American natural gas market. As recently as in 2007, the US wanted to import liquefied natural gas[4] through coastal degasification terminals. Presently, production is increasing faster than demand and the terminals are being transformed to allow the liquefaction and export of gas. According to the Reference case of the US Energy Information Administration, US total gas production will increase by 44 percent between 2011 and 2040: from 23.0 TCF (0.644 TCM) in 2011 to 33.1 TCF (0.927 TCM)[5] in 2040. This growth can be attributed essentially to the development of shale gas, which is the main contributor (113-per cent growth), but also to tight gas and coal bed methane.[6]

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1 This article uses the classification of unconventional gas applied, for example, by the International Energy Agency. The IEA recognizes the following types of unconventional gas: "shale gas," "tight gas" and "coalbed methane." "Golden rules for a golden age of gas," International Energy Agency, 2012, p. 18. Available online: http://www.worldenergyoutlook.org/media/weowebsite/2012/goldenrules/weo2012_goldenrulesreport.pdf (accessed on October 30, 2013).

2 R. Newell, "Shale gas and the outlook for US natural gas markets and global resources," presentation made in Paris on November 21, 2011 in Paris, France. Available online: http://www.eia.gov/pressroom/presentations/newell_06212011.pdf (accessed on October 30, 2013).

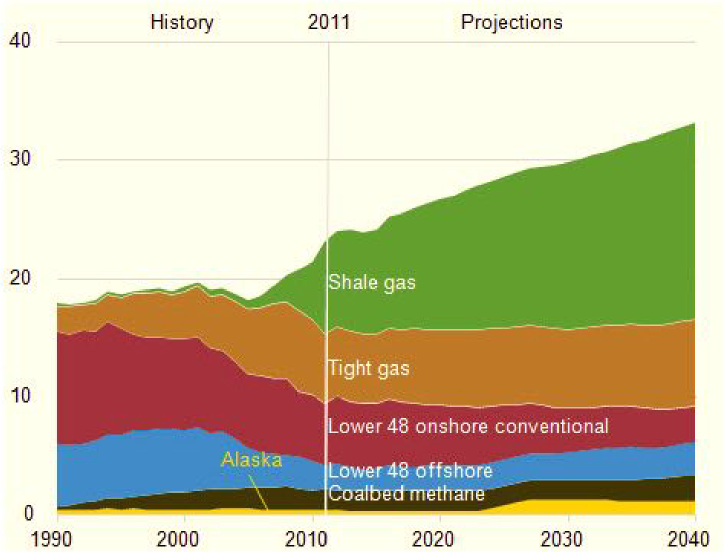
3 "North America leads the world in production of shale gas," *Today in Energy,* US Energy Information Administration, October 23, 2013. Available online: http://www.eia.gov/todayinenergy/detail.cfm?id=13491 (accessed on October 30, 2013).

4 Liquefied natural gas (LNG) is natural gas cooled to -162 C, which allows for a volume reduction by 600 times and for transport by special sea vessels.

5 1 trillion cubic feet (TCF) = 0.028 trillion cubic meters (TCM).

6 "Annual energy outlook 2013: market trends – natural gas," US Energy Information Administration, April 15–May 2, 2013. Available online: http://www.eia.gov/forecasts/aeo/MT_naturalgas.cfm (accessed on October 30, 2013).

Figure 1. US natural gas production by source, 1990–2040 (TCF)



Source: US Energy Information Administration, June 2013.

Some experts are, nevertheless, less optimistic about the future of unconventional gas in the United States. A March 2013 report by the Post Carbon Institute, "Drill, Baby, Drill", claims that American gas output reached its peak in December 2011; 80 per cent of the production in the United States comes from five great "plays" (fields), some of which are declining. In fact, shale gas wells are characterized by fast decline, which implies a high investment flow in order to maintain the global level of production. When the most productive "sweet spots" dry up, both the number of wells and the need for investment in a play grow. It is uncertain whether these obstacles – geologic and economic – can be overcome while gas prices are falling. The author of the report, J. David Hughes, takes a skeptical position and predicts the "gas bubble" will burst in the next 20 years.[7]

[7] J.D. Hughes, *Drill, Baby, Drill,* Santa Rosa, California: Post Carbon Institute, February 2013. Available online: http://www.postcarbon.org/reports/DBD-report-FINAL.pdf (accessed on October 30, 2013); "La bulle du gaz de schiste bon marché 'explosera d'ici 2 4 ans', selon un expert," *EurActiv.fr*, May 23, 2013. Available online: http://www.euractiv.fr/energie/la-bulle-du-gaz-de-schiste-bon-m-news-519947 (October 30, 2013).

Threatening the environment?

Western public opinion, however, is not concerned by the spectre of a declining production of unconventional gas in the future, but by its environmental impact at present. Hydraulic fracturing ("fracking") is applied in combination with horizontal drilling, and by means of injecting a liquid under pressure in order to crack the rock. The liquid is composed mostly of water, supplemented with chemical additives and with sand in order to keep the fissures open. The composition of the liquid used at the Marcellus formation in the United States is typical in this respect: water (94.62 per cent), chemicals (0.14 per cent) and sand (5.24 per cent).[8]

The use of hydraulic fracturing has spurred local protests which, in turn, have led to a moratorium on the use of "fracking" for the extraction of shale gas and tight gas being imposed by the states of North Carolina, New York, New Jersey, and Vermont, as well as by 100 local governments.[9] Although a number of incidents are associated with the extraction, it is difficult to assess their causes with certainty; they are subject to a polarized debate between the advocates and the opponents of hydraulic fracturing. In order to identify environmental problems linked to extraction in this article, the word "risk" appears to be most appropriate. Thus, the experience of the US suggests risks in the following domains:[10]

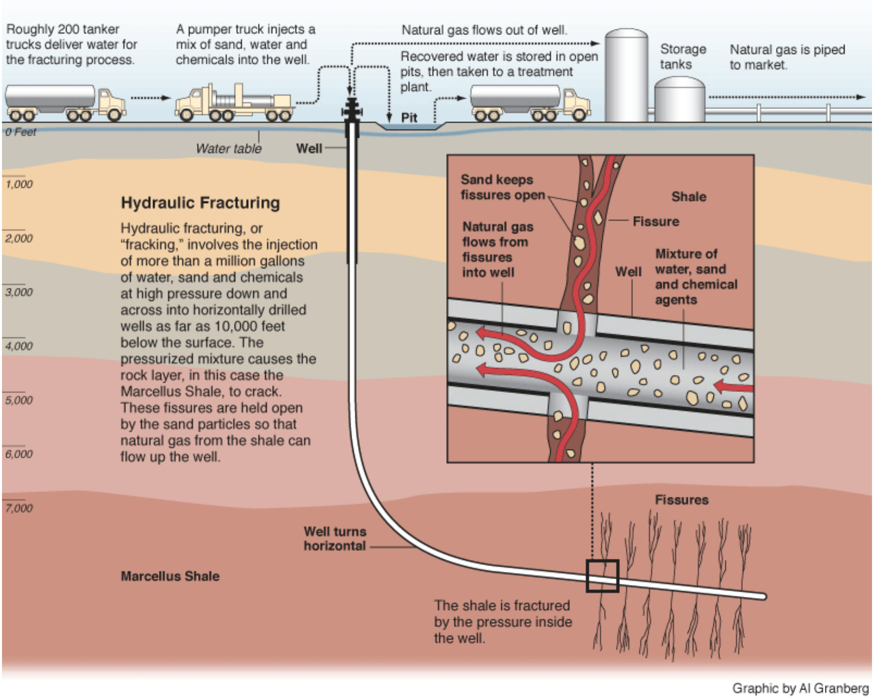
- *Water*. The risk is both qualitative and quantitative. The extraction allegedly pollutes potable water, both by the liquid used and by the gas extracted. The risk related to the "fracking" itself is less important than the one stemming from the integrity of the wells and from the surface retention of water. The quantitative risk is associated with the large quantities

[8] "Etude de faisabilité d'un rapport relatif aux 'Techniques alternatives à la fracturation hydraulique pour l'exploration et l'exploitation des gaz de schist,'" Office parlementaire d'évaluation des choix scientifiques et technologiques, December 2012. Available online: http://www.assemblee-nationale.fr/14/cr-oecst/faisabilite_hydrocarbures_non_conventionnels.pdf (accessed on October 30, 2013).

[9] "European Parliament resolution of 21 November 2012 on the environmental impacts of shale gas and shale oil extraction activities (2011/2308(INI))," European Parliament, November 21, 2012. Available online: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P7-TA-2012-0443+0+DOC+XML+V0//EN (accessed on October 30, 2013).

[10] Office parlementaire d'évaluation des choix scientifiques et technologiques, December 2012. Available online: http://www.assemblee-nationale.fr/14/cr-oecst/faisabilite_hydrocarbures_non_conventionnels.pdf (accessed on October 30, 2013).

Figure 2. Diagram of a typical hydraulic fracturing operation



Source: ProPublica, retrieved in November 2013

of water needed. It can bring trouble to regions where potable water resources are rare. It should be noted, nevertheless, that the volume of water required for "fracking" in the US is much less important than the volume of water consumed in the residential, agricultural, and electricity sectors.

- *Soil*. "Fracking" may lead to a release of radioactive elements contained in the rock. Hydraulic fracturing does not, however, provoke seismic events at a level sensible on the surface, the earthquake recorded in the UK's Blackpool in 2011 being a possible exception. The strongest earthquakes observed in Texas and in Arkansas are not attributed to hydraulic fracturing, but to the reinjection of used water into the underground. There are still local disturbances linked to exploration and production work: soil footprint, impact on the countryside, and heavy-weight truck traffic.

- *Air*. While burning natural gas releases less CO_2 than burning coal, nevertheless the methane leaks during production and transport, and the use of gas can have a negative impact on the climate (the effect of methane on climate change during a century being 25-times greater than that of CO2). On a different note, hydraulic fracturing requires the application of compressors generally powered by diesel, thus emitting into the atmosphere CO2 and other greenhouse gases.

When examining each environmental risk, it is important to look at it from the perspective of the production of other fossil resources like conventional gas, oil, and coal. As for the specific technique of hydraulic fracturing, no single major ecological catastrophe directly linked to this has been observed in the US.[11]

If certain environmental risks persist in the United States, it is because of light regulation. In fact, it is not the government – but rather its retreat – which favored the rise of unconventional gas. The regulatory framework for the development of unconventional gas is provided by legislation at the national, regional, and local levels, and applies to all phases of the development of unconventional hydrocarbons. Yet the majority of this legislation was passed before the rise of shale gas in order to regulate the production of conventional hydrocarbons. The US Environmental Protection Agency has recently put in place measures to reduce the emissions of greenhouse gases during the production of unconventional hydrocarbons. The institutions in charge of water and soil protection in some states have voted in legislation which makes the composition of the "fracking" fluid public, the integrity of wells more solid, and the storage of used water more secure. Local and national debates about better regulation go on.[12] Even though this debate may resemble that taking place in Europe, there is something specific to the European debate. In Europe, natural resources belong to the state; in the US, they belong to the owners of the ground, which allows them to share in the profits of extracting what is underground.

[11] "Gaz et pétrole de schiste: leçons américaines et australiennes," *Paris Tech Review*, January 27, 2012. Available online: http://www.paristechreview.com/2012/01/27/gaz-petrole-schiste-lecons-americaines-et-australiennes/ (accessed on October 30, 2013).

[12] "Golden rules for a golden age of gas," op. cit.

Empowering the United States

The long-term profitability is yet to be proven, the environmental impact to be further analyzed, and the regulation to be improved, but it is now clear that the extraction of unconventional gas has positive effects on the climate, economy and energy security of the US.

Thanks to the increase in the share of gas in its energy mix, the US recorded in 2012 the lowest level of CO_2 emissions in 20 years.[13] Gas, whose price has decreased, has partially replaced oil and coal in the main consuming sectors – electricity, industry, and housing.[14] Consequently, American coal has been exported to Europe, which has led to lower coal prices and higher consumption in Europe, and, simultaneously, to higher greenhouse gas emissions in Europe.

It is now clear that the extraction of unconventional gas has positive effects on the climate, economy and energy security of the US.

Low prices have reduced the production costs of American industry, both in absolute and relative terms – i.e. as compared with Europe. The rise of competitiveness is most blatant in the chemical industry and in the energy-intensive industries producing electricity and aluminum.[15] According to the consulting firm IHS CERA, the extraction of unconventional hydrocarbons contributed to the creation of 1.7 million jobs up to 2012, and this figure should double by 2035. Its contribution to public revenue at the local, state, and federal levels amounted to 62 billion US dollars up to 2012 and should reach 2,500 billion US dollars by 2035.[16]

Thanks to its vast reserves of unconventional hydrocarbons, the US could replace Russia as the biggest gas producer by 2015 and the biggest

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[13] I. Dreyer, G. Stang, "The shale gas 'revolution': Challenges and implications for the EU," EU ISS, February 18, 2013. Available online: http://www.iss.europa.eu/publications/detail/article/the-shale-gas-revolution-challenges-and-implications-for-the-eu/ (accessed on October 30, 2013).

[14] "Gaz de schiste aux États-Unis: les Européens doivent prendre au sérieux la menace sur leur industrie," *Flash Economie – recherche économique*, No. 637, September 26, 2012. Available online: http://cib.natixis.com/flushdoc.aspx?id=66067 (accessed on October 30, 2013).

[15] Ibid

[16] "America's new energy future," HIS CERA, October 2012. Available online: http://www.ihs.com/info/ecc/a/americas-new-energy-future.aspx (accessed on October 30, 2013).

oil producer by 2017, according to the International Energy Agency. Given the supply surplus on the domestic market, America could become a net exporter of gas by 2020 and of oil by 2030.[17] Indeed, if the shale gas revolution continues, it may transform into a geopolitical revolution. America's dependence vis-à-vis its suppliers in the Middle East is being reduced, a trend which has the potential to change American policy in the Gulf region.[18]

Assessing Europe's underground

The hour of shale gas has not yet come to Europe. But to say that the American revolution has not affected the old continent would be an error. The price of gas in the European spot markets (with short-term contracts) has fallen in the past few years, because the LNG destined for the American market has been redirected towards Europe. If the US allows exports, the European harbors will in future receive LNG that is "made in America." Moreover, in the US shale gas is more competitive than American coal, which is then "dumped" in Europe. As a result, the US burn less coal, while Europe burns more coal, which turns the emission trends on the two continents upside down. Economically speaking, the difference in energy prices widens the competitiveness gap, weakening Brussels at the very moment of negotiations for a free-trade agreement with Washington. Thus, in the current energy, climate, and economic context, questions about the possibility of extracting shale gas in Europe are legitimate.

Shale gas resources in Europe are comparable to those in the US. According to the US Energy Information's report from June 2013, Europe has 13.16 TCM of unproved technically recoverable resources (TRR) against 15.88 TCM of unproved TRR in the US.[19] To put the numbers in perspective, Europe disposes of 4.06 TCM of proved reserves of conventional gas located, for the most part, in Norway (2.04 TCM) and in the Netherlands (1.20 TCM), while the US disposes of an amount double this (8.90 TCM). Europe's commercial gas production, which has not yet tapped into unconventional

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17 *World energy outlook 2012*, Paris: International Energy Agency, 2012.

18 I. Dreyer, G. Stang, "The shale gas 'revolution'," op. cit.

19 "Technically recoverable shale oil and shale gas resources: an assessment of 137 shale formations in 41 countries outside the United States," US Energy Information Administration, June 2013. Available online: http://www.eia.gov/analysis/studies/worldshalegas/ (accessed on October 30, 2013).

Table 1. Estimate of unproved technically recoverable resources of shale gas (in TCM)

Europe	13.16
Bulgaria	0.48
Denmark	0.90
France	3.83
Germany	0.45
Netherlands	0.73
Norway*	0.00
Poland	4.14
Romania	1.43
Spain	0.22
Sweden	0.28
United Kingdom	0.73
United States	15.88

* Norway does not have shale gas. It is, however, the EU's major external supplier thanks to its conventional gas reserves amounting to 2.04 proven TCM.
Source: US Energy Information Administration, June 2013

resources, reached only 0.28 TCM in 2011, well under the production of America (0.67 TCM) and that of its major external supplier, Russia (0.67 TCM).[20] Concerning shale gas, 60 per cent of unproved TRR are possessed by Poland and France together, the 40 per cent remaining being shared (in the order of importance) by Romania, Denmark, the United Kingdom, the Netherlands, Bulgaria, Germany, Sweden, and Spain. Given that Europe consumed 0.44 TCM of gas in 2012, its resources theoretically represent 30 years of consumption.

[20] Europe's production, as recorded by the US Energy Information Administration, includes also Norway's production (0.11 TCM in 2011), which is not an EU member state. As for EU's internal production, it reached 0.16 TCM in 2011 against the US production of 0.65 TCM and Russia's 0.61 TCM, according to BP ("Statistical review of world energy 2013," BP, June 2013. Available online: http://www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013.html (accessed on October 30, 2013).)

Shale gas meets economics

Technical recoverability does not, however, equal economic recoverability.[21] The volumes technically recoverable are determined by current extraction technology, while the volumes economically recoverable depend on drilling costs, well productivity, and gas prices. Although Europe's and America's resources are comparable in terms of volumes technically recoverable, they are not comparable in terms of volumes economically recoverable.

The drilling cost depends on geological and economic factors. Given these factors, an estimate quoted by the French government agency *IFP Énergies nouvelles* speaks of a cost three times higher in Europe than in America.[22] The predictions for Poland based on the first exploration data confirm this gap.[23] The three-fold higher cost in Poland can be attributed, firstly, to geological factors – the depth, temperature, and pressure all being higher. Secondly, economic factors in Poland play a role too: more complicated access to the grounds (owned by individuals with no direct interest in extracting a resource belonging to the state), a higher population density, and the lack of roads and of gas transport and distribution networks.[24] Drilling costs vary from one basin to another due to the limited exploration progress in Europe, and thus every estimate is very approximate. Nevertheless, with the exception of road transport and gas infrastructure, all geological and economic factors affecting the Polish case can be found everywhere in Europe. The attempt

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[21] The US Energy Information Administration defines technical and economic recoverability as follows: "Technically recoverable resources represent the volumes of oil and natural gas that could be produced with current technology, regardless of oil and natural gas prices and production costs. Economically recoverable resources are resources that can be profitably produced under current market conditions." See: "Technically recoverable shale oil and shale gas resources," op. cit.

[22] The French government agency estimates the drilling cost at 3 US dollars per MMBTU in the US against 8 – 11 US dollars per MMBTU in Europe. See R. Vially et al., *Hydrocarbures de roche-m re: État des lieux*, Paris: IFP Énergies nouvelles, January 22, 2013. Available online: http://www.ifpenergiesnouvelles.fr/content/download/73029/1543429/file/IFPEN_Hydrocarbures-de-roche-m%C3%A8re_%C3%89tat-des-lieux.pdf (accessed on October 30, 2013).

[23] "Central and Eastern European shale gas outlook," KPMG, 2012. Available online: http://www.kpmg.com/global/en/issuesandinsights/articlespublications/shale-gas/pages/shale-gas-development-inevitable.aspx (accessed on October 30, 2013).

[24] F. Černoch et al., *Unconventional sources of natural gas: development and possible consequences for the Central Eastern European region,* Brno: International Institute of Political Sciences of Masaryk University, 2012. Available online: http://www.iips.cz/data/files/Unconventional_Sources.pdf (accessed on October 30, 2013).

Figure 1. Gas prices on selected world markets

Source: British Petroleum, June 2013

to transpose the American case becomes all the more complicated when considering the character of the European energy landscape, which lacks small to intermediate oil companies inclined to take commercial risks, as well as important experience in the extraction of unconventional hydrocarbon resources.[25]

In contrast to the estimated drilling costs, the prices – another factor in the economic recoverability of extraction – are rather favorable. They are high, thus beneficial for producers. Indeed, the spot prices are three times higher in Europe than in the US. In America, they slumped down to 3 US dollars per MMBTU under the pressure of a supply surplus of gas. The European market experienced a decrease in prices at the end of the last decade due to the economic crisis and the secondary effects of the American shale gas revolution previously mentioned. Ever since, these prices have been rising because of long-term contracts with traditional suppliers which are indexed at oil prices and continue to dominate the gas supply in Europe. The oil prices

[25] B. Kavalov, N. Pelletier, *Shale gas for Europe – main environmental and social considerations (A literature review)*, Ispra: Joint Research Centre, 2012. Available online: http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/26691/1/lbna25498enn.pdf (accessed on October 30, 2013).

remain high and Europe today pays between 9 and 12 US dollars per MMBTU of gas.[26] Although this is theoretically an advantage, it must be noted that it is difficult to estimate the development of European gas prices and thus to allow for long-term production planning.

The last factor in the economic recoverability of unconventional gas, the productivity of wells, has yet to undergo a serious analysis. At present, European countries know their underground only very imperfectly.

Paris versus Warsaw

In order for the economic recoverability to be determined, exploration needs to be pursued. Yet the European public opinion is not unanimous, the two extremes being represented by France and Poland. On the one hand, Paris has *de facto* forbidden shale gas exploration, worried about the social acceptability of "fracking," and content with its low carbon balance due to its nuclear energy. On the other hand, Warsaw is rigourously pursuing exploration in order to reinforce its energy security, and motivated, moreover, to reduce its dependence on polluting coal. These two countries, possessing together the largest chunk of shale gas resources, represent the two opposed trends related to pontential shale gas extraction in Europe.[27] In fact, beyond the economic recoverability, the European considerations with respect to transposing the American case are dominated by social acceptability and energy security.

In Paris, the debate goes on despite a *de iure* ban on hydraulic fracturing. The ban was achieved by a vast social movement inspired by the American film *Gasland* (2010) showing the alleged negative consequences of shale gas production on the American environment and public health. The French opponents added a local economic issue: impact on tourism-dependent regions. The conflict between the holders of exploration licences and local communities was exarcebated by the absence of public consultation, not

[26] "Statistical review of world energy 2013," BP, June 2013. Available online: http://www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013.html (accessed on October 30, 2013); "East Med gas would help European supply but not prices," *Reuters*, July 8, 2013. Available online: http://uk.reuters.com/article/2013/07/08/energy-gas-mediterranean-idUKL5N0F11XX20130708 (accessed on October 30, 2013).

[27] IFP Énergies nouvelles gives an exhaustive list of factors determining the transposition of the American case in Europe. R. Vially et al., op. cit.

legally required at the exploration phase. “Fracking” was forbidden by law on July 13, 2011. Although the legislation was passed under the center-right presidency of Nicolas Sarkozy, it has been maintained under the new center-left presidency of François Hollande. “As long as I am president, there will be no shale gas exploration,” reiterated Hollande in a TV interview on July 14, 2013. On the legal front, the Constitutional Court confirmed the ban on hydraulic fracturing in October 2013. Yet the political battle is far from over and could lead to the amendment of the legislation in the forseeable future. The industrial lobby, supported by a segment of the political class (across party lines), continues to engage in vigorous debate with the ecological movement, itself supported by certain political forces. Proof of this is that in July 2013, the Minister of Ecology Delphine Batho resigned, saying that she was under pressure of the shale gas lobby.

In fact, beyond the economic recoverability, the European considerations with respect to transposing the American case are dominated by social acceptability and energy security.

The Polish perspective is completely different. Warsaw is the *avantgarde* of European shale gas exploration despite several downward revisions of Polish resources. They are currently estimated at 4,140 BCM of unproved technically recoverable resources by the US Energy Information Administration and at 346–768 BCM of economically recoverable reserves by the Polish Geological Institute.[28] The varying data does not, however, impact the motivation of the Polish government to take control of its underground. It sees, notably, the opportunity to reduce the country’s dependence on Russian gas (90 per cent of gas imports) and the power sector’s dependence on coal (90 per cent of electric production). Developing shale gas is part of the national energy strategy, which features also the construction of an LNG terminal on the Baltic coast in 2014 and of a gas grid in the north of the country.[29] Poland has been party to the “Unconventional gas technical engagement program” ever since it was launched in 2010 by the United States (originally as the Global shale gas initiative) as an instrument

[28] “PAP Biznes: Polish Geological Institute Director on shale gas resources, regulation et al.,” *Natural Gas Europe*, July 13, 2013. Available online: http://www.naturalgaseurope.com/polish-geological-institute-shale-gas (accessed on October 30, 2013).

[29] “Central and Eastern European shale gas outlook,” op. cit.

of its commercial diplomacy. By November 2012, the Polish government had handed out 112 exploration licences, a majority of them for five years.[30] Most of them belong to the national gas company PGNiG, while some are held by multinationals such as Chevron, Total, and ENI.[31] The government wants commercial extraction to begin in 2014–2015 and is currently drafting a new law on hydrocarbons which will influence profitability.[32]

But the shale gas development is far from smooth. Poland lacks a portion of the necessary capital, water resources, and networks for gas transport and distribution.[33] The possible threat to the environment is an issue of public debate. Although a government study has claimed that the exploration activities did not pollute air, water or soil, and that the accompanying noise remains under legal limits,[34] inhabitants in some regions (including the Pomeranian Voivodeship) complain about the traffic noise and worry about water pollution and the impact on real estate prices, agriculture, and tourism in this coastal region. What has become a movement is requesting financial compensations and stronger protection.[35] In addition, doubts about the economic recoverability have been highlighted by the departure of the multinationals ExxonMobil and Marathon. Generally speaking, however, the Polish government, as well as the population – concerned by the dependence on Russian gas and the pollution from coal-fired power plants – remain supportive of shale gas. The departure of big oil companies is attributed to relatively better commercial opportunties abroad.

The European dimension

Even though the difference between the French and the Polish cases shows the extent to which the energy mix remains a national responsibility in the

[30] M. Wozniak, "Shale Gas in Poland," presentation of the advisor to government and chief geologist done at Sciences Po Paris on December 6, 2012. Available online: http://www.sciencespo.fr/coesionet/sites/default/files/ppt%20M.%20Wozniak%2006.12.12.pdf (accessed on October 30, 2013).

[31] "Golden rules for a golden age of gas," op. cit.

[32] M. Wozniak op. cit.

[33] "Central and Eastern European shale gas outlook," op. cit.

[34] M. Wozniak op. cit.

[35] "Pomorze: seeds of Polish shale gas counter revolution," *Natural Gas Europe*, November 26, 2012. Available online: http://www.naturalgaseurope.com/opponents-polish-shale-gas-counter-revolution (accessed on October 30, 2013).

Table 2. Policies towards shale gas extraction in the European Union

member state	progress
Bulgaria	moratorium
Czech Republic	
France	
Netherlands	
Denmark	exploration forseen
Hungary	
Romania	
Estonia	exploration ongoing
Germany	
Lithuania	
Poland	
Spain	
Sweden	
United Kingdom	
Italy	no development forseen

Source: Office parlementaire d'évaluation des choix scientifiques et technologiques, ShaleGas-Europe.eu and news sites

European Union, it symbolizes the dilemmas at stake across Europe, where national markets are increasingly interconnected. Thus, it is more than natural that this debate be pursued – with the strong presence of both France and Poland – in Brussels. Indeed, the fate of shale gas is not determined solely at the national level, but also at the European one.

This debate kicks in at the very moment when Europe is searching for new climate and energy policies. In March 2013, the European Commission published a Green Paper entitled "A 2030 framework for climate and energy policies." These discussions should result, in 2015–2016, in a new European strategy, successor to the current 2020 objectives. The latter, aiming to increase the share of renewable energies to 20 per cent of the EU's energy mix, to decrease greenhouse gases by 20 per cent from 1990 levels, and to generate a 20 per cent energy savings, is not a clear-cut success. The construction of new green energy capacities has been revealed as being too expensive, blocking the access of European consumers to low wholesale electricity prices stemming from overcapacities. The economic crisis and cheap coal have paralysed the Emission Trading Scheme, which should have contributed to the reduction of greenhouse gases. The Fukushima accident has, for its part, accelerated the nuclear phase-out in Germany, and added to the skepticism vis-à-vis nuclear energy in other counties, which prefer today to resort to fossil fuels. The situation is aggravated by Europe's dependence on external suppliers, which is a weakness in an accelerating global race for energy resources.[36]

Thus, Europe finds itself faced with a puzzle: How to procure for itself energy that is clean, yet also cheap and secure?

One of the possible responses is to develop European shale gas reserves. The success of this enterprise will be determined – as shown above – by the economic recoverability of the available reserves, by social acceptability, and by the desired level of energy security.

Europe finds itself faced with a puzzle: How to procure for itself energy that is clean, yet also cheap and secure?

European institutions have been trying to get hold of this issue since 2011. The European Council, gathering together the heads of European states and governments, concluded in February 2011 that "in order to further enhance its security of supply, Europe's potential for the sustainable extraction and use of conventional and unconventional (shale gas and oil shale) fossil fuel resources should be addressed" (parentheses included in the original text).[37] Ever since, however, the debate in Brussels has been dominated by considerations of environmental risks, which does reflect the Union's strong competence in the environmental domain, but does not exhaust the plethora of advantages of a possible extraction.

The report contracted by the European Parliament in 2011 analyzed the essentially environmental problems linked to the extraction. It identified gaps in the European legislation concerning extraction. The conclusions of the report are reflected in the "European Parliament resolution of 21 November

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[36] The European debate has been well summarized here: C. Maisonneuve: "Énergie: l'Europe en retard d'une revolution," *Les Échos*, July 24, 2013. Available online: http://www.lesechos.fr/24/07/2013/LesEchos/21485-038-ECH_energie---l-europe-en-retard-d-une-revolution.htm (accessed on October 30, 2013).

[37] "European Council, 4 February 2011, Conclusions," European Council, March 8, 2011. Available online: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/119175.pdf (accessed on October 30, 2013).

2012 on the environmental impacts of shale gas and shale oil extraction activities."[38]

As for the European Commission, it is currently examining the subject and considering future steps. The Commission-contracted "Final report on unconventional gas in Europe" of November 2011, by the law firm Philippe & Partners, observed that the legislative framework is sufficient for the current phase of exploration, but proposed amendments in regard to future commercial development.[39] In 2012, the Commission published three studies which focus on the impact of extraction of unconventional hydrocarbons on (1) the energy markets, (2) the climate, and (3) the environment and public health. The Commission explains:

> The study on energy market impacts … suggests that under a best case scenario, future shale gas production in Europe could help the EU maintain energy import dependency at around 60 per cent. But it also reveals the sometimes considerable uncertainty about recoverable volumes, technological developments, public acceptance, and access to land and markets. The study on climate impacts shows that shale gas produced in the EU causes more GHG emissions than conventional natural gas produced in the EU, but – if well managed – less than imported gas from outside the EU, be it via pipeline or by LNG due to the impacts on emissions from long-distance gas transport. The study on environmental impacts shows that extracting shale gas generally imposes a larger environmental footprint than conventional gas development. Risks of surface and ground water contamination, water resource depletion, air and noise emissions, land take, disturbance to biodiversity, and impacts related to traffic are deemed to be high in the case of cumulative projects.[40]

Finally, between December 2012 and March 2013, the Commission conducted a public consultation on shale gas in Europe. Although the results

[38] "European Parliament resolution of 21 November 2012 on the environmental impacts of shale gas and shale oil extraction activities (2011/2308(INI))," op. cit.

[39] "Final report on unconventional gas in Europe," Philippe & Partners, November 8, 2011. Available online: http://ec.europa.eu/energy/studies/doc/2012_unconventional_gas_in_europe.pdf (accessed on October 30, 2013).

[40] "Midday Express of 2012-09-07," European Commission, September 7, 2012. Available online: http://europa.eu/rapid/midday-express-07-09-2012.htm?locale=en (accessed on October 30, 2013).

published in July 2013 did not indicate a consensus regarding shale gas extraction, the majority of persons and insitutions involved requested a better legislative framework at the European level.[41]

In order to put in place the recommendations of experts and of the public, the Commission is preparing at the moment new measures to bestow environmental integrity on unconventional hydrocarbons production. Commissioner for the Environment Janez Potočnik declared that the measures would aim at filling the current regulatory gaps without being precise about their legal nature. In any case, the Commission is expected to present them by the end of 2013.

What the Union can do

Given the current conditions, Europe will not repeat America's experience and witness a shale gas revolution in the short term. Extracting unconventional gas is economically less interesting, socially less acceptable – France being a typical case – and, in terms of energy security, not motivating enough, beyond countries very dependent on Russian imports such as Poland. Nevertheless, the American experience looms over Europe, with some European capitals wishing to emulate it and others wanting to avoid it. As a consequence, they feed into the European discussion about the advantages and disadvantages of developing the unconventional gas resources. The controversy is part of a larger debate about the European Union's climate-energy strategy until 2030. The European Commission, representing the common European interest, has seized the opportunity. By the end of the year, the Commission wants to present new measures to better regulate the environmental impact of a possible extraction.

By the end of the year, the Commission wants to present new measures to better regulate the environmental impact of a possible extraction.

[41] "Analysis and presentation of the results of the public consultation 'Unconventional fossil fuels (e.g. shale gas) in Europe,'" DG Environment of the European Commission, October 3, 2013. Available online: http://ec.europa.eu/environment/integration/energy/pdf/Shale%20gas%20consultation_report.pdf (accessed on October 30, 2013).

The Union should not stop here: the positive consequences in the US on climate, economy, and energy security on the one hand, and Europe's own troubled climate and energy policy on the other, should make the Union think beyond environmental constraints. The Union should:

- in the short term, finalize the current analysis of gaps in the European legislation and propose new measures beneficial to the environment, but also – thanks to the streamlining of the environmental rules – to potential investors.
- in the short term, seize the opportunity proposed by the 2014 European elections and organize a public debate at the European level, which would take into account not only environmental but also economic and geopolitical aspects of shale gas extraction, in order to determine its role in the Union's climate and energy policies until 2030.
- in the medium term, equip itself with resources allowing it to estimate the shale gas reserves in Europe and determine the profitability of its extraction in European conditions.
- in the long term, observe the best practice of extraction in the US, facilitate the exchange of information between the extracting Member States, and contribute to improving the extraction method towards better environmental standards and economic conditions.

Barbora Schejbalová, Filip Černoch

Atomausstieg: The withdrawal of Germany from nuclear energy and its impact on energy security and the diversification of energy supply

Abstract: *In immediate response to the disaster at Fukushima Daichii, Germany decided to cut off all of its nuclear resources by 2020, and in that manner fully withdraw from using nuclear energy. This study analyzes this decision in the context of the shift in Germany's dependence to imports of raw materials directed for electricity production. The text accordingly places its focus on the analysis and evaluation of how this change of dependence will affect Germany's energy security. The study also examines the impact of these changes in terms of Germany's position in the wider international-political context.*

A certain revival of nuclear energy observable in recent years was markedly influenced by the Fukushima Daiichi nuclear power station accident of March 2011. Germany responded to this accident quite vigorously: a three-month moratorium was ordered, under which the seven oldest nuclear power stations were closed. Thus the law granting an "extension of the longevity of nuclear power stations" – approved by the Black–Yellow Coalition at the end of October 2010 – was suspended. Afterwards, Germany made the decision to eliminate nuclear energy from its energy mix by 2020, and to substitute it with renewable sources. These goals are summarized in a new

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energy concept dated June 6, 2011, entitled "Germany's new energy policy – Heading towards 2050 with secure, affordable and environmentally sound energy." [1]

This decision by Germany began a discussion directed especially toward questions surrounding the security of the electricity supply, its price, and the feasibility of generating electric energy from renewable sources in particular. Attention was also turned to Germany's now-greater dependence on raw energy material imports from abroad – particularly on natural gas, which contributes significantly to the production of electricity.[2]

The authors wish to focus on the possible impacts of the German decision on its dependence on raw energy material imports for producing electricity. Their findings are compared with the presumed development of the volume of imported raw materials according to the original energy concept of 2010, which alternatively had prolonged the operation of nuclear plants until 2042. Additionally, the security aspect of energy dependence on imports of raw materials, and the impact of withdrawal from nuclear energy on the energy security of Germany, are examined.

Research questions

The main research question is: "How will Germany's withdrawal from nuclear energy influence the country's dependence on imports of foreign raw materials for producing electric energy?" In answering this question, we will obtain the basis for a second, logically linked one: "What kind of influence will the above mentioned change of dependence have on Germany's energy security?" The answers will be obtained through an evaluation of the diversification of energy sources for producing electric energy.

1 "Germany's new energy policy Heading towards 2050 with secure, affordable and environmentally sound energy," German Federal Ministry of Economics and Technology, June 2011.

2 In 2010 the share of imported natural gas in its total consumption reached 87 per cent, 39.2 per cent from Russia, 35 per cent from Norway and 21.5 per cent from Holland. Natural gas has a 14 per cent share of electricity production. See "Erdgasimporte," German Federal Ministry of Economics and Technology, 2012. Available online: http://www.bmwi.de/BMWi/Navigation/Energie/Energietraeger/gas,did=292328.html (access on February 19, 2012; "Stromerzeugung nach Energieträgern von 1990 bis 2011 (in TWh)," AG Energiebilanzen e.V., 2011. Available online http://www.ag-energiebilanzen.de/ (accessed on February 26, 2012).

The relationship between energy security and diversification of energy supply is well defined by the energy security concept. Diversification of energy supply is one way of ensuring the improvement of energy security for a given country. Through diversification a country decreases its dependence on a particular energy resource and increases its energy security, and vice versa.

In order to answer the above research questions, already-existing scenarios of future development within the German energy sector will be applied. These will provide us with data concerning the anticipated electro–energy mix, which will subsequently be applied in order to analyze the change in the amount of dependence on imported raw materials and its effect on energy security. A good reason for applying already developed scenarios is the difficulty involved in creating a good quality energy scenario, which exceeds the scope of this text.

The main research question is: "How will Germany's withdrawal from nuclear energy influence the country's dependence on imports of foreign raw materials for producing electric energy?"

The energy scenarios being applied are part of a study carried out in 2011 at the request of the German Federal Ministry of Economy and Technology. Within the framework of that study, four target scenarios were initially elaborated, the purpose of which was to lay a foundation for energy strategy and climate-oriented political decisions about the future shape of Germany's energy sector. After the German government's decision to exclude nuclear energy from the energy mix, the scenario published in the Spring of 2011 was added. This scenario corresponds to the current content of energy policy.

For the purpose of this analysis, therefore, the scenario of 2011 assuming the termination of nuclear power plant operations, and the scenario which extends nuclear power plant operations for 12 years according to the 2010 policy, will both be applied.

Research tools

The present and future dependence of Germany on the import of raw materials will be defined by an indirect application of the Herfindahl–Hirschman Index (HHI), which squares the percentage share of the market – in other words,

it is the sum of subjects and their percentage shares of the existing market. The index is used mainly to estimate existing concentration for the purpose of anti-monopoly measures.[3]
The HHI index is determined by the following formula:

$$\mathrm{HHI} = \sum_{i=1}^{n} S_i^2$$

where S_i^2 = the square of i-company's percentage share of the market, and n = the number of companies in the existing market.

Market share is measured here as the production of the company being measured, divided by the sum of the production of all companies on the existing market.[4] The index's theoretical values are within the range of 0 to 10,000 points. In the event that there is only one subject operating on the market, its market share reaches 100 per cent and the index reaches a value of 10,000. On the contrary, when there is large number of subjects on the market, whose market shares are almost 0 per cent, the index reaches zero.[5]
The HHI index will be used in this text to formulate the level of diversification of energy sources used to produce electricity, thereby referring to the country's level of dependence on a specific energy raw material source, and eventually also to its energy security.

Three alternative versions of the HHI index calculation are generated in the analytic part of the text. The main reason for this is in order to specify Germany's diversification level of electro–energy mix. Another important reason for it is in order to logically link the various calculations of the entire change of dependence analysis. According to the economic theory, the HHI index's upper and lower limits for numerical values are 0 and 10,000. In this text, for the purpose of HHI index interpretation the upper and lower limit numerical values are specified as the numbers $10{,}000_I$ and $10{,}000_D$, but only

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3 See "Modernanalyst.com." Available online: (http://www.modernanalyst.com/Careers/InterviewQuestions/tabid/128/articleType/ArticleView/articleId/1003/What-is-the-Herfindahl-Hirschman-Index-HHI-and-why-would-you-use-it.aspx (accessed on March 7, 2012).

4 A. Zemplinerová, "Antimonopolní politika," Národohospodářský ústav Akademie vied České republiky. Available online: http://nb.vse.cz/~svobodam/Archiv_textu. (accessed on March 12, 2012).

5 "Modernanalyst.com." op. cit.

in cases where what is being considered are only imported (not exported) raw materials, and where only two values are substituted into the HHI index formula. If the country imported raw materials to produce electricity from abroad, the HHI index's numerical value would be $10{,}000_I$ (the lowest index indicates imports). On the other hand, if the production of electricity operated only from domestic energy raw materials, the numerical value would be $10{,}000_D$ (the lowest index indicates domestic raw materials). In this interval, or more precisely with the help of indexes, it will be possible to determine if the dependence on imported raw materials within the analyzed period increased, or on the contrary decreased. The index of the numerical value is determined by the higher percentage quotient of the imported or domestic raw material in the energy mix. This HHI index modification is necessary because, for example, if Germany were to use ten different raw materials to produce electric energy,[6] the maximal diversification which we would be able to achieve is when all raw materials have the same share of the electro-energy mix (thus 10 per cent) and the HHI index value is 100 points. If the above mentioned modification wasn't used, and a situation occurred in which in the share of hard coal and natural gas in the electro-energy mix increased, while simultaneously the share of nuclear energy decreased, this would appear to lead to a strong diversification, but in fact it would increase dependence on the import of energy raw materials. In this respect the modified HHI index will help us to interpret other acquired indexes correctly.

Contemporary expert literature does not offer a widely approved scale of supply dependence rating, according to which it would be possible to evaluate the energy security of a given country based on its dependence level on a particular imported raw material.

The first alternative version of the HHI index calculation takes into account only the energy raw materials source, without differentiating whether it is natural gas, renewable sources, black coal or brown coal. The final number

[6] According to the final scenarios the volume of energy raw materials is taken in into account. At the same time a differentiation between domestic and external raw materials is made. Natural gas and black coal are therefore represented twice, once as a domestic source and once as an external one.

represents the electro–energy mix's diversification level, which indirectly displays the degree of dependence on imported raw materials.

The second alternative version of the HHI index calculation includes all of the energy raw materials used to produce electricity, dividing them into domestic and imported from abroad. The reason for dividing the various raw materials further into imported and domestic is in order to specify the whole diversification level of Germany's electro–energy mix, and also to show how difficult it would be to substitute for a particular quantity of imports in the event of their cut-off. The more that sources are diversified, the easier their substitution and the lower the dependence on each of them.

In the last calculation alternative, the percentage shares of raw materials are outlined also according to their particular countries of origin, with respect to countries importing both natural gas and black coal. This alternative offers the most detailed level of diversification.

Contemporary expert literature does not offer a widely approved scale of supply dependence rating, according to which it would be possible to evaluate the energy security of a given country based on its dependence level on a particular imported raw material. In this study, energy security will be evaluated in connection with Germany's shift to dependence on the import of foreign raw materials, in accordance with the security criteria N-1, which within the context of this study means that in the event of the biggest supplier dropping out, the system must be able to function without further problems. This security criterion is part of the European regulation on natural gas supply security, which came into force in 2010.

The European Commission introduces the formula for security rule N–1 in this form:

$$N-1(\%)=\frac{\mathrm{EPm}+\mathrm{Pm}+\mathrm{Sm}+\mathrm{LNGm}-\mathrm{Im}}{\mathrm{Dmax}}\times 100,\ N-1\geq 100 \text{ per cent}$$

On the side of demand is Dmax, which represents the total daily demand for gas. On the other hand, on the side of demand, are EPm, Pm, Sm, LNGm and Im.

EPm – technical capacity of entry points (in millions m^3/day)

Pm – maximal technical extraction capacity (in millions m^3/day)

Sm – maximal technical storing capability (in millions m^3/day)

LNGm – maximal technical capacity of LNG apparatus (in millions m^3/day)

Im – technical capacity of the biggest gas infrastructure (in millions m^3/day)

For supplies to be defined as secure, the calculated formula must equal at least 100 per cent.[7] Considering the objective of the research, *Im* will be the technical capacity of the biggest gas infrastructure modified to the biggest technical capacity of the entry point.

According to the monitoring report of the Federal Ministry of Economy and Technology, the present German gas infrastructure meets this requirement, especially in regard to the diversification of suppliers and large gas underground storages.[8] The contribution of the present analysis therefore will be to discover how this situation will subsequently change with the displacing of nuclear power plants from operation.

Germany's energy sector today is almost 80 per cent dependent on conventional energy production.

Within the framework of the energy security analysis only one imported raw material to produce electric energy will be taken into account, namely natural gas – although black coal is also imported for its production. The reason for this is, first of all, the different structures of the markets for those commodities. The World Coal Association considers the world market for black coal to be globalized,[9] making coal easy to obtain from wide range of producers. The Massachusetts Institute states that the market for natural gas is still regionalized and therefore still not a single globalized market, as in the case of black coal.[10]

7 "Regulation (EU) No. 994/2010 of the European Parliament and of the Council of 2 October 2010 concerning measures to safeguard security of gas supply and repeating Council Directive 2004/67/EC," European Parliament, 2010. Available online: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:295:0001:0022:EN:PDF (accessed on March 7, 2012).

8 "Monitoring–Bericht nach § EnWG zur Versorgungssicherhet bei Erdgas," German Federal Ministry of Economics and Technology, July 2011, p. 6. Available online: http://www.bmwi.de/Dateien/Energieportal/PDF/monitoring-versorgungssicherheit-erdgas-stand-juli-2011,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf (accessed on February 25, 2012).

9 See World Coal Association website http://www.worldcoal.org/coal/market-amp-transportation/ (accessed on March 28, 2012).

10 E. Mearns, "The oil drum: Europe," *Energy Bulletin,* 2010. Available online: http://www.energybulletin.cz/files/inline/plyn_Evropa_preklad_EBCZ.pdf (accessed on March 25, 2012).

Table 1. Electro–energy mix of Germany in 2011

raw material	% share	raw material	% share
renewable sources	19.9	renewable sources	
black coal	18.7	hydro power	3.1
brown coal	24.6	wind Power	7.6
natural gas	13.7	biomass	5.2
burning oil and other sources	5.4	photovoltaics	3.2
nuclear energy	17.7	domestic waste	0.8

Source: "Stromerzeugung nach Energieträgern von 1990 bis 2011 (in TWh)," op. cit

Energy sector of Germany

Germany's energy sector today is almost 80 per cent dependent on conventional energy production. In the next forty years this sector is expected to be fully reorganized so that at least 80 per cent of produced electricity comes from renewable sources.

Currently Germany obtains its electric energy from fossil fuels, nuclear energy, and renewable sources. Separate data are introduced in Table 1. Apart from certain exceptions, the general tendency to increase the amount of produced electricity is observable.

Concerning the trade of electricity, Germany's trade balance has been in the minus since 2003. Therefore Germany is purely an electricity exporter.[11] The maximal height of the electricity trade balance up to 2011 was -6 TWh.[12]

Energy scenarios

The first scenario applied by the authors corresponds to the current energy concept, thus to the expeditious withdrawal from nuclear energy. The second

[11] The balance value would be -6 TWh in 2011. Whereas the trade balance of electricity trade between 1990 and 2002 was within the -5,3 TWh and +4,8 TWh limits. See "Stromerzeugung nach Energieträgern von 1990 bis 2011 (in TWh)," op. cit.

[12] Germany has been a pure exporter of electricity since 2003. Export increased until its maximum in 2008, when the volume of sold electricity reached 22.4 TWh. In the following years the balance decreased. See "Stromerzeugung nach Energieträgern von 1990 bis 2011 (in TWh)," op. cit.

Table 2. Amount of energy raw materials for producing electric energy, 2010–2030, PJ

		scenario 1			scenario 2		
	2010	**2015**	**2020**	**2030**	**2015**	**2020**	**2030**
nuclear energy	1,533	1,021.0	342,0	0.0	1,527.6	1,316.5	978.9
black coal	992	846.0	507,4	195.6	616.6	308.6	154.2
brown coal	1,367	1,545.7	1317,5	530.0	1,504.0	1,222.0	382.5
natural gas	667	417.9	566,0	595.9	385.1	413.8	361.1
fuel oil	66	0.1	0.0	0.0	0.0	0.0	0.0
pumped – storage power stations	-	31.4	33.6	37.8	37.5	38.1	37.2
others	86	13.6	26.8	53.6	13.4	26.8	53.6
renewable sources	854	815.8	971.2	1,228.4	815.8	971.2	1,228.4
water	-	68.4	72.0	86.4	68.4	72.0	86.4
wind onshore	-	230.1	249.7	278.6	230.1	249.7	278.6
wind offshore	-	32.9	115.2	228.5	32.9	115.2	228.5
biomass	-	320.9	337.8	376.7	320.9	337.8	376.7
photovoltaics	-	94.2	115.2	149.0	94.2	115.2	149.0
geothermal energy	-	7.4	23.1	48.0	7.4	23.1	48.0
other renewable sources	-	61.8	58.2	61.2	61.8	58.2	61.8
total	5,565	4,691.3	3,764.5	2,641.3	4,900.0	4,297.1	3,195.9

Source: Authors based on "Energieszenarien 2011," op. cit.

scenario, on the other hand, is based on an extended period of operation for the newest nuclear plants.[13]

Both energy scenarios presuppose a reduction in emissions by 2020 to 40 per cent of the 1990 level, an enhancement of energy efficiency of 2.3–2.5 per cent per year, and an increase in the share of renewable sources in gross energy consumption.[14] The scenarios include the projection of energy raw materials, and also socioeconomic trends in population and economy growth, as summarized in Table 2. The anticipated future prices of particular

[13] "Energieszenarien 2011," EWI, GWS, Prognos. 2011. Available online: http://www.prognos.com/fileadmin/pdf/publikationsdatenbank/11_08_12_Energieszenarien_2011.pdf (accessed on March 24, 2012).

[14] Ibid

Table 3. Amount of energy raw materials for producing electric energy, 2010–2030, in % according to PJ

		scenario 1			scenario 2		
	2010	**2015**	**2020**	**2030**	**2015**	**2020**	**2030**
nuclear energy	27.6	21.8	9.1	0.0	31.2	30.6	30.6
black coal	17.8	18.0	13.5	7.4	12.6	7.2	4.8
brown coal	24.6	32.9	35.0	20.1	30.7	28.4	12.0
natural gas	12	8.9	15.0	22.6	7.9	9.6	11.3
fuel oil	1.2	0.0	0.0	0.0	0.0	0.0	0.0
pumped – storage power stations	-	0.7	0.9	1.4	0.8	0.9	1.2
others	1.5	0.3	0.7	2.0	0.3	0.6	1.7
renewable sources	15.3	17.4	25.8	46.5	16.6	22.6	38.4
water	-	1.5	1.9	3.3	1.4	1.7	2.7
wind onshore	-	4.9	6.6	10.5	4.7	5.8	8.7
wind offshore	-	0.7	3.1	8.7	0.7	2.7	7.2
biomass	-	6.8	9.0	14.3	6.5	7.9	11.8
photovoltaics	-	2.0	3.1	5.6	1.9	2.7	4.7
geothermal energy	-	0.2	0.6	1.8	0.2	0.5	1.5
other renewable sources	-	1.3	1.5	2.3	1.3	1.4	1.9

Source: Authors based on "Energieszenarien 2011," op. cit.

energy raw materials are summarized in Table 3. In all cases it is predicted that prices will increase, although in the case of natural gas and black coal – which are pivotal for this study – prices between the years 2015 and 2020 initially decline. Afterwards, in the year 2030, they reach values higher than in the initial year 2008.

Power stations and electricity production

Due to the limited capacity of this text it is not possible to depict in detail changes in the shares of particular sources in the energy mix, within the scope of particular scenarios. The data concerned are therefore summarized into the following tables 2 and 3.

Analysis change in rate of dependence

The following is an analysis – using the HHI index – of the change in Germany's rate of dependence on imports of raw materials for producing electricity, after its withdrawal from nuclear energy.

The first calculation option (Option A below) differentiates only between imported and domestic raw materials. The second calculation option (Option B) takes into account the differences between various energy raw materials and further divides them according to their origin, i.e. whether imported or domestic. Only two energy raw materials for producing electricity are imported, natural gas and black coal. Though both of these raw materials are being extracted on German soil, this local production is not meeting domestic needs. According to existing data, in the case of natural gas it is meeting 86 per cent of the need, and in the case of black coal, 78 per cent.[15] Black coal extraction will be stopped in Germany by 2018 for environmental reasons, and Germany will then be fully dependent on imports from abroad.[16] Natural gas and black coal are therefore divided by their volumes, or more precisely into their percentage share according to which part is obtained from domestic product and which part must be imported from abroad.

According to the existing scenarios, as far as natural gas import is concerned, the given shares are not going to change until 2020.

According to the existing scenarios, as far as natural gas import is concerned, the given shares are not going to change until 2020. However, as result of the decrease in Germany's own natural gas production, in the first scenario the ratio will be changed to 90.6 per cent in favor of external imports by 2030. Accordingly, domestic production will cover less than 10 per cent of electricity consumption. In the second scenario, the ratio is very similar, namely 89.5 per cent in favor of imports. Within the analyzed period, black coal is only imported from abroad, domestic extraction being already fully

[15] See "Erdgasimporte," op. cit.; "Jahresbericht 2011. Fakten und Trends 2010/2011," Verein der Kohleimporteure, 2011. Available online: http://www.verein-kohlenimporteure.de/download/VDKI-Jahresbericht_2011_WEB.pdf?navid=18 (accessed on March 12, 2012).

[16] See the official website of Germany's Federal Ministry of Economics and Technology, www.bmwi.de.

suppressed. In calculating the third option (Option C), the percentage shares of raw materials according to their country of origin are used. Countries importing both natural gas and black coal are included. For natural gas, the following are the assumed values for the shares of separate countries: Russia 39.2 per cent, Norway 35 per cent, Holland 21.5 per cent, and other countries 4.3 per cent.[17] For black coal, the separate shares are defined as follows: Russia 30 per cent, Colombia 24 per cent, Poland 12 per cent, South Africa 11 per cent, USA 9 per cent, and other countries 14 per cent.[18] These percentages are based on current import shares.

Year 2020

The values contained in Table 4 represent the amounts of imported raw materials in PJ (petajoules) for 2020, as resulting from each of the two scenarios. The difference between the shares of nuclear energy in current electric production is visible.

While in the first scenario only a few final nuclear plants will still be connected to the grid in 2020, and the nuclear share of electricity generation will reach 9.1 per cent, in the second scenario the share of nuclear energy in the electro–energy mix will achieve 30.6 per cent. In the first scenario, nuclear energy is being replaced especially with coal and gas. In terms of predicting future raw material consumption, in certain years in the first scenario black coal will use 64 per cent more and brown coal 7.8 per cent than in the second scenario, where the difference in the shares of coal in the electro–energy mix is 6.3 per cent, or 6.6 per cent respectively. The difference between the amounts of natural gas reaches more than 152.2 PJ, which in the first scenario means a 37 per cent higher consumption of natural gas and a 5.2 per cent higher share in the electro–energy mix. Renewable sources in 2020 have a share in production of 25.8 per cent, or more precisely 22.6 per cent. In the compared scenarios, in the case of nuclear energy the biggest change in the percentage shares of particular raw materials in the energy mix is when the difference reaches 21.5 per cent in its favor.

The resulting HHI index is summarized in Table 5. The initial year 2010 is inserted for easier comparison. Option A indicates obtained values which include energy raw materials according to their origin. Different kinds of raw materials are therefore divided into two groups (domestic and foreign) and subsequently added into the formula. Notice that in the second scenario,

[17] "Erdgasimporte," op. cit.

[18] "Jahresbericht 2011. Fakten und Trends 2010/2011," op .cit.

Table 4. Year 2020, Scenario 1 and 2, PJ

	2010		**scenario 1**		**scenario 2**	
raw material	**volume PJ**	**% quotient**	**volume PJ**	**% quotient**	**volume PJ**	**% quotient**
nuclear energy	1,533	27.6	342.0	9.1	1,316.5	30.6
black coal	992	17.8	507.4	13.5	308.6	7.2
domestic production	218.3	3.9	-	-	-	-
import	773.7	13.9	507.4	13.5	308.6	7.2
brown coal	1,367	24.6	1,317.5	35.0	1,222.0	28.4
pumped – storage power stations	-	-	33.6	0.9	38.1	0.8
other sources	86	1.5	26.8	0.7	26.8	0.6
crude oil	66	1.2	-	-	-	-
renewable sources	854	15.3	971.2	25.8	971.2	22.6
natural gas	667	12	566.0	15.0	413.8	9.8
domestic production	93.4	1.7	79.2	2.1	57.9	1.4
import	573.6	10.3	486.8	12.9	355.9	8.4
Russia	224.9	4.1	190.9	5.1	139.8	3.3
Norway	200.8	3.6	170.5	4.5	124.6	2.9
Holland	123.3	2.2	104.8	2.8	76.6	1.8
others	93.4	0.4	20.6	0.5	15.0	0.4
total	5,565.0	100.0	3,764.6	100.0	4,297.1	100.0

Source: Authors based on "Energieszenarien 2011," op. cit.

domestic raw materials have a much higher share in the electro–energy mix than in the first. Option B, when raw materials are added into the formula according to their origin and kind, exhibits the following results. In scenario 1 the HHI index reaches a value of 2,327.8 points, and in scenario 2 a value of 2,379.0. In the initial year (i.e. 2010) it reaches more than 1,922.2 points. Option C takes into account the shares of separate imported raw materials, but also according to country of origin.[19] The index then reaches a value of

[19] Raw materials are divided according to their kind and subsequently considered according the country of origin.

Table 5. HHI index, 2020

scenarios	**HHID**	**scenarios**	**HHI 2020**	**HHI 2010**
Option A		**Option B**		
scenario 1	6,113.9	scenario 1	2,327.8	1,922.2
		scenario 2	2,379.0	
scenario 2	7,366.7	Option C		
		scenario 1	2,070.4	1706,2
2010	6,352.0	scenario 2	2,289.9	

Source: Authors based on “Energieszenarien 2011,” op. cit.

2,010.4 points in the first scenario and 2,289.9 points in the second. The initial year’s value is 1,706.2 points.

In the first scenario imported raw materials have share of 26.4 per cent, and in the second 15.6 per cent, with domestic sources reaching shares of 73.6 per cent and 84.4 per cent respectively. The difference in the shares of imported raw materials between the two scenarios is 10.8 per cent. When compared with the initial year, in which imported raw material shares reach 24 per cent, the volume of imported energy raw materials increases in the first scenario and decreases in the second. The HHI index results correspond to these data. Based on this it is possible to state that in the first scenario dependence on the import of external raw materials will be higher than in the second. If Germany’s energy concept does not change again, its dependence on energy raw materials will be higher in 2020 than at present, by 238.1 points. On the other hand, if the earlier decision from 2010 was upheld, the importance of domestic raw materials would increase to more than 1,000 points.

The calculated values of the Option B index show that though shares of black coal, brown coal and natural gas are increasing, due to the substitution of electricity for nuclear power, the index in the case of first scenario is lower. The electro–energy mix is therefore more diversified than in the situation arising within the second scenario. The resulting difference between these values is not significant, because it is less than 52 points. It is clear that the comparison of each scenario with the initial year shows a decrease in the diversification of raw materials. In the first scenario it is by 405.6 points, and in the second by 456.8. The index results of Option C, which are distinguished by the inclusion of the countries of origin of particular raw materials, confirm Option B’s results to be true.

The bigger differences between indexes are not, surprisingly, between the different scenarios, but between the scenarios and the initial year. When comparing the first scenario's share of imported raw materials with the same values for the initial year, we can observe a 2.6 per cent increase in the import of natural gas, and contrariwise a slight decrease in that of black coal. In the initial year, the higher level of diversification is caused especially by the higher share of nuclear energy, and conversely by lower shares of consumption of brown coal and renewable sources. Also, when considering the values of the second scenario, the diversification rate is much lower than in the initial year. These results are caused especially by the dominance of nuclear energy, brown coal and renewable sources in the production of electricity, and contrariwise by the lowering shares of natural gas and black coal.

If Germany's energy concept does not change again, its dependence on energy raw materials will be higher in 2020 than at present.

The first scenario makes reference to the planned disconnection of nuclear plants from the grid by 2022. The calculated HHI index values confirm the general assumption that the import of raw materials will increase in this scenario. This increase is observable whether in comparison with the second scenario or with the initial year. On the other hand, in the second scenario there is a lower demand on energy raw materials import than in the initial year.

The indexes also, however, revealed some less apparent facts about the withdrawal of nuclear energy in relation to energy sources. As is apparent in Table 5, according to the HHI index results calculated within Options B and C, the diversification level in Scenario 1 is higher than in Scenario 2. Within the framework of the second scenario, therefore, although the level of imported raw materials is lower, diversification is also lower. In other words, if we compare the two scenarios for 2020, although the reducing of nuclear energy use will lead to an increase of energy raw materials import, it will not lead to a decrease in the diversification of the electro-energy mix. The current energy concept, therefore, will result in a much easier substitutability of particular raw materials, as none of them will have a dominant share in the electro-energy mix. We can thus assume that the sector responsible for the production of electricity would be more secure.

Table 6. Scenario 1 and 2; 2030

	2010		scenario 1		scenario 2	
raw material	**volume PJ**	**% quotient**	**volume PJ**	**% quotient**	**volume PJ**	**% quotient**
nuclear energy	1,533	27.6	0.0	0.0	978.9	30.6
black coal	992	17.8	195.6	7.4	154.2	4.8
domestic production	218.3	3.9	-	-	-	-
import	773.7	13.9	195.6	7.4	154.2	4.8
brown coal	1,367	24.6	530.0	20.1	382.5	12.0
pumped – storage power stations	-	-	37.8	1.4	37.2	1.2
other sources	86	1.5	53.6	2.0	53.6	1.7
crude oil	66	1.2	-	-	-	-
renewable sources	854	15.3	1,228.4	46.5	1,228.4	38.4
natural gas	667	12	595.9	22.6	361.1	11.3
domestic production	93.4	1.7	56.1	2.2	50.6	1.2
import	573.6	10.3	539.8	20.4	310.5	10.1
Russia	224.9	4.1	201.0	8.0	122.0	4.0
Norway	200.8	3.6	179.5	7.2	108.7	3.5
Holland	123.3	2.2	110.3	4.4	66.8	2.2
others	93.4	0.4	21.7	0.8	13.0	0.4
total	5,565	100.0	2,641.3	100.0	3,195.9	100.0

Source: Authors based on "Energieszenarien 2011," op. cit.

Year 2030

The predicted amounts of raw materials for producing electricity in Germany in 2030 are summarized in Table 6. Separate values for raw materials in the initial year can also be seen in this table. A comparison of both scenarios shows that in the first one nuclear energy is completely substituted with other sources, especially with natural gas and brown coal, but also with renewable sources. The share to be replaced is 30.6 per cent (i.e. the predicted share in the second scenario). The share in the electro–energy mix increased mostly for natural gas, namely by 10.3 per cent, and also for brown coal, where the difference between values reaches 8.1 per cent. A similar difference can be found also in the case of renewable sources.

Similarly to the 2020 scenarios, here also we can observe a relatively high difference in the total volume of raw materials for producing electricity. When comparing the two scenarios, the savings amounts to 554.6 PJ. When comparing both scenarios to the initial year, the difference is much higher. With the first scenario it is 2,923.7 PJ, and with the second 2,396.1 PJ.

The initial values of the share of energy raw materials in the electro-energy mix for 2010 differentiate themselves from those presented in the scenarios, especially in the case of renewable sources (which in 2030 have a share more than 20 per cent higher), but also in the case of brown coal (whose share is predicted to be 10 per cent lower).

The percentage values of shares of particular raw materials were added into the HHI index formula and the results are brought together in Table 7. In Option A – which considers only the origin, not the kind, of particular raw materials – the value of the calculated index reaches 5,985.7 points within the first scenario, and 7,464.0 within the second. In Option B – which takes into account not only the kind but also the origin of raw materials – the first scenario has a value of 3,047.9 points, and the second 2,685.7. In Option C, the last option – which reflects both the kind and country of origin of raw materials – the index reached a value of 2,723.9 points in the first scenario and 2,599.3 in the second.

Based on these acquired values, we can state that with the calculations in Option A the level of dependence on the import of raw materials is higher in scenario 1, and lower in scenario 2, than in the initial year. Assuming that we will also compare the acquired HHI index values of the two scenarios within Options B and C with the initial year, a relatively distinctive decrease in the diversification of particular raw materials for producing electricity is noticeable. In the same way we can see a lower diversification in the first scenario than in the second, in the calculations of Options B and C respectively.

According to the initial study that we utilized, the share of imported raw materials in Germany's electro-energy mix comprises 27.8 per cent in the first scenario and 16.1 per cent in the second. For the initial year this value for imported energy raw materials is 24 per cent. In comparing the two scenarios, the volume difference in imported commodities is 11.7 per cent. In the first scenario the volume increases by 3.8 per cent, and in the second it decreases by 7.9 per cent, as compared to the initial year. The HHI index results in Option

Table 7. HHI index, 2030

<table>
<tr><th>scenario</th><th>HHID</th><th>scenario</th><th>HHI 2030</th><th>HHI 2010</th></tr>
<tr><td colspan="2">Option A</td><td colspan="3">Option B</td></tr>
<tr><td rowspan="2">scenario 1</td><td rowspan="2">5,985.7</td><td>scenario 1</td><td>3,047.9</td><td rowspan="2">1,922.2</td></tr>
<tr><td>scenario 2</td><td>2,685.7</td></tr>
<tr><td rowspan="2">scenario 2</td><td rowspan="2">7,464.0</td><td colspan="3">Option C</td></tr>
<tr><td>scenario 1</td><td>2,723.9</td><td>1,706.2</td></tr>
<tr><td>2010</td><td>6,352.0</td><td>scenario 2</td><td>2,599.3</td><td></td></tr>
</table>

Source: Authors based on "Energieszenarien 2011," op. cit.

A correspond to these changes. In comparing the two scenarios, here the situation occurs in which dependence on import of external raw materials for producing electricity increases in favor of the first one. The difference between the two scenarios is 1,478.3 points. As compared with the initial year, the HHI index value in the scenario involving the expedited shutdown of nuclear plants decreases by 366.3 points, while dependence on external import of energy raw materials simultaneously increases. Conversely, in the scenario involving the continued operation of nuclear plants, dependence on imports decreases by 1,112 points as compared with the initial year.

The calculations of the HHI index in Option B take into account the kind and general origin of particular energy raw materials. The index value of the first scenario is higher than that of the second one, while in the case of the extended use of nuclear energy, the electro-energy mix is more diversified. Within the framework of the first scenario, energy from renewable sources, natural gas, and black and brown coals serves to substitute for nuclear energy. Thus the separate shares of energy sources which substitute for nuclear energy are lowering the share distribution of particular energy raw materials within the electro-energy mix. The HHI index calculation under Option C confirms the results from Option B. In general, lower values are produced by including more variables in the index formula. In this case, not only particular raw materials are taken into account, but also their countries of origin.

The obtained results imply moreover that the generally accepted notions – that the expedited abandonment of nuclear energy will lead to an increase of dependence on the import of external raw materials for producing electricity – are true. The year 2030 is a confirmation of this tendency rather than a deviation from it. At the same time, the change in the diversification level of energy raw materials is explicit. While in 2020 the electro–energy mix is more diversified in the first scenario, in 2030 this changes and the situation anticipated in the second scenario is more diversified. The reason for this, mentioned above, is first of all the high volume of renewable sources, natural gas and brown coal, which should substitute for a third of the share of nuclear energy, as presupposed in the second scenario. In 2030, therefore, the presupposed negative impacts of the expeditious withdrawal of nuclear energy become fully evident. Consequently, energy dependence increases and raw materials diversification decreases.

When summarizing the two scenarios separately according to the share of nuclear energy as it evolves over time, in the first scenario this decreases by 9.1 per cent between 2020 and 2030. The share of consumed black and brown coal also decreases, namely by 6.1 per cent and 14.9 per cent. On the other hand, the supply of renewable sources increases. This difference is the biggest of all and reaches 20.7 per cent. Furthermore, the share of natural gas increases by 7.5 per cent. The total volume of imported energy raw materials therefore increases by 1.4 per cent in the electro–energy mix. This trend is also confirmed by a modified HHI index,[20] which is reduced by 128.24 points. In spite of the decreasing level of the share of imported black coal, the increased share of imported natural gas conceals this drop and raises the total consumption of foreign energy raw materials. In this way also, the diversification of energy raw materials decreases over the course of the analyzed years. Notwithstanding, in 2020 the electro–energy mix is slightly more diversified than in the second scenario, particularly in favor of the share of renewable sources in electricity production and less in favor of natural gas. Simultaneously, the volume of exhausted raw materials for producing electricity is lowered by 42 per cent.

In 2030, the presupposed negative impacts of the expeditious withdrawal of nuclear energy become fully evident.

Within the prognosis of the evolution of the deployment of energy raw materials for producing electricity, in the second scenario a decrease in

[20] The lower index of the modified HHI index is for domestic raw materials. The closer the number is to 10,000, the less energy raw materials are exported from abroad, and the less the country is dependent on them.

the share of black and brown coal occurs, by 2.4 per cent and 16.4 per cent respectively. On the other hand, in the first scenario a relatively gentle decrease in the volume of black coal occurs, although simultaneously there arises a strong decrease in the share of brown coal in electricity production. Also as in the first scenario, an increase occurs in the shares of renewable sources and natural gas, although at a lower rate in both cases – in renewable sources by 15.8 per cent, and in natural gas by 1.7 per cent. Thus the share of imported raw materials in general decreases, inasmuch as the decrease in the share of black coal is greater than the increase in the share of natural gas in the energy mix. This process is verified by a modified HHI index,[21] which over the course of particular years increased by 97.3 points. The diversification of particular energy raw materials increased equally, whilst the difference in the obtained values between 2020 and 2030 is 306.7 points. In the second scenario, therefore, the diversification of raw materials increased over time, while at the same time dependence on imports of raw materials for producing electricity decreased. The volume of consumed raw materials decreases by 34 per cent. In all calculation options, the difference value between scenarios in particular years increases, and this growing gap between the two scenarios (i.e. in terms of dependence on foreign raw materials and diversification) opens unsustainably over the years.

A precipitated withdrawal of nuclear energy will lead to a lowering of the diversification of energy sources, and to an increase of dependence on the import foreign raw materials, especially natural gas.

Summary of analysis of dependence change

The HHI index final values, with the help of the verification method, confirm that the anticipated increase of dependence on the import of energy raw materials for producing electricity is connected with the expeditious withdrawal of nuclear energy. However, the indexes also reveal a less expected reality: the higher level of raw materials diversification in 2020 within the first scenario as compared with the second one. Such a process is caused by the decrease in the share of nuclear energy, and conversely by an increase in the use of

[21] The lower index is for domestic raw materials.

natural gas and renewable sources. As a result, electricity production is not dependent on one major source, and the sources in use are more easily replaceable in case of supply failure. Accordingly, the whole system is more secure. In scenario 1, however, diversification decreases between the years 2020 and 2030. On the basis of the obtained indexes, we can make the claim that a precipitated withdrawal of nuclear energy will lead to a lowering of the diversification of energy sources, and to an increase of dependence on the import foreign raw materials, especially natural gas. Contrariwise, if the energy concept extending nuclear power usage until 2042 were to remain in place, in long–run it would lead to the higher diversification of energy raw materials, and to a lower amount of imported raw materials.

An interesting fact arising from the two scenarios themselves is the increased volume of natural gas import in both of them.

Natural gas imports security analysis

The purpose of this analysis section is to evaluate whether the change, examined above, in the level of dependence on energy raw materials imports for producing electricity, will influence Germany's energy security, with respect to the security formula N–1. As already mentioned above, for the purpose of analysis in this section only natural gas will be taken into account. Above all, the reason for doing this is the different nature of international trade when it comes to imported raw materials for producing electricity.

In order to implement this analysis, it will be necessary to slightly modify the tool used, so as to make it correspond with the text specification. Particular variables must be modified in order to mirror the infrastructure of natural gas used solely for producing electric energy, and at the same time to employ the data used in previous scenarios.

$$N-1(\%)=\frac{\mathrm{EPm}+\mathrm{Pm}+\mathrm{Sm}+\mathrm{LNGm}-\mathrm{Im}}{\mathrm{Dmax}}\times 100\text{, N} - 1 \geq 100 \text{ per cent}$$

The first variable is the technical capacity of entry points, EPm. Only the volume of natural gas used to produce electricity is taken into account,[22] which

[22] Although it would be possible to redirect natural gas from other industry sectors, this situation will not be considered. The result values of the security formula can therefore be considered as the condition for an extreme situation of energy security being endangered.

is equal to predicted gas imports in particular years and scenarios. The total volume of imported gas is assigned to particular entry points according to the percentage key – i.e. a particular entry point's share of the total capacity, which is the sum of all entry points. Therefore, the technical capacity will be determined by the predicted consumption level according to the particular scenarios, the years analyzed, and particular pipelines' volume share in the total technical capacity of entry points. Such modification is utilized in order to obtain the maximal technical capacity, which will be replaced by the anticipated production of natural gas in Germany, marked as *Pm*. For the maximal technical storage capability *Sm* – which corresponds to volume in the original formula – the amount of stored gas in 2010 will be used. In the applied scenarios there aren't any data about the future construction of storage capacities, hence current conditions are used also for predicted years. Part "-1" of the security rule represents the biggest gas structure, but in the modified version reflects the biggest entry point. Thus the Russian pipeline Jamal is pivotal for security evaluation, because it has the biggest capacity of all entry points in the territory of Germany, in concrete terms 120 milliard m^3 per year. At the same time, if we count up the volumes of particular pipelines according to their country of origin, pipelines from Russian Federation will have the biggest volume due to its being the most important supplier of natural gas in Germany. In terms of the security formula calculation, two situations will be considered: the cut off of the Jamal pipeline, and the cut off of all Russian supplies. The Jamal pipeline or the whole Russian Federation is therefore the biggest entry point for natural gas supplies (marked as *Im* in the formula). The other variable in the security formula is the maximal technical capacity of *LNG* machinery – because in Germany today there is no terminal station under construction for producing liquefied natural gas, nor in future years is this source counted on, although it is very probable that these terminal stations will be constructed in the future. The last variable in the formula is the total daily demand of natural gas (D_{max}), which will be replaced by the presumed volume of needed electricity production for particular years and scenarios. In the security formula N–1, particular natural gas sources are presented in cubic meters (m^3). Because all data up to now were set in PJ, and the result of the existing formula is a percentage value, calculations are made in PJ.[23] Particular values, in the formula as well, are recalculated to represent one day.

[23] Only in the case of Maximal Technical Storage Capacity are values for natural gas specified in billions m^3. Units are converted into PJ. When in a situation in which the standard temperature and pressure solid measurement of natural gas is 31.7 MJ, then in the case

Table 8. Values according to security formula N – 1, 2020

natural gas PJ/day		**2010**	**2020 scenario 1**	**2020 scenario 2**
technical capacity of entry points		1.77	1.31	0.97
maximal technical storage capability		2.10	2.10	2.10
technical extractive capacity		0.26	0.20	0.16
technical capacity of the biggest entry point	Jamal	0.36	0.30	0.22
	Russia	0.62	0.51	0.38
total daily demand		1.82	1.55	1.13

Source: Authors based on "Energieszenarien 2011," op. cit.

Table 9. Resultant values of security formula N–1, 2020

	2010		**scenario 1 2020**		**scenario 2 2020**	
	Jamal	**Russia**	**Jamal**	**Russia**	**Jamal**	**Russia**
final capacity	226 %	192 %	213 %	206 %	266 %	252 %

Source: Authors based on "Energieszenarien 2011," op. cit.

The following table 8 summarizes the values of particular variables in the security formula N–1, resulting from the above mentioned study.

The calculated values of security formula N–1 are recorded in Table 9. According to this principle, a system supplied with particular energy raw materials will be secure if the final value is more than 100 per cent. The percentage values obtained – which result from the scenarios and also take into consideration a cut off of both sources (the Russian pipeline Jamal passing through Ukraine, and a cut off of the whole Russian supply) – show a number higher than 100 per cent in all cases. We claim therefore that in both the first and second scenarios, energy security does not decrease to under its threshold limit value, i.e. under the value of 100 per cent. The energy security of Germany is therefore guaranteed by a network of particular import routes.

of conversion these standard conditions are considered. See V. Quaschning, "Conversion factors for units of energy," 2003. Available online: http://www.volker-quaschning.de/datserv/faktoren/index_e.php (accessed on March 26, 2012).

Table 10 further shows the particular values which will be added into security formula N–1. Distinct differences in total daily demand are notable, which decreases as seen in the table. The main reason is a presupposed decrease in electric energy consumption, which results in a lower amount of expounded raw materials being brought to its production, and also results in an increase in the share of renewable sources, which reaches up to 50 per cent. While in the case of the first scenario natural gas consumption is lowered slightly, in the case of the second it drops twofold.

Table 11 shows again the final values of security formula N–1. As with the results calculated for 2020, in 2030 Germany's energy security is not considerably endangered either. But particular scenarios now exhibit a greater difference in values. Nuclear energy, which in the case of the first scenario is already fully excluded from the electro–energy mix, is substituted with renewable sources and natural gas, which however are used much more in the second scenario.

Table 10. Values according to security formula N–1, 2030

natural gas PJ/day		**2010**	**2030 scenario 1**	**2030 scenario 2**
technical capacity of entry points		1.77	1.41	0.85
maximal technical storage capability		2.10	2.10	2.10
technical extractive capacity		0.26	0.15	0.14
technical capacity of the biggest entry point	Jamal	0.36	0.32	0.19
	Russia	0.62	0.56	0.33
total daily demand		1.82	1.63	0.99

Source: Authors based on "Energieszenarien 2011," op. cit.

Table 11. Final values according to the security formula N–1, 2030

	2010		**scenario 1 2030**		**scenario 2 2030**	
	Jamal	**Russia**	**Jamal**	**Russia**	**Jamal**	**Russia**
final capacity	226 %	192 %	204 %	190 %	312 %	278 %

Source: Authors based on "Energieszenarien 2011," op. cit.

Although the Jamal pipeline possesses the highest technical capacity, supplies cut off from this transport route will not endanger Germany's security. It would be the same in the event of a Russian refusal or inability to supply the demanded volumes of natural gas by any of its pipelines. In the first scenario, energy security acquires, in 2030, values very similar to those in the initial year 2010. On the other hand, if the operation of nuclear plants were to be extended, energy security in 2030 would be almost 100 per cent higher than in 2010.

If we focus on particular years in the comparison of scenarios, we will find out that the way in which security changes differs between scenarios. Within the scope of the first scenario's prediction, a temporary solution may be to produce most of the electricity from renewable sources and from natural gas. Over the years the share of natural gas in the electro–energy mix gradually increases, although percentage value of the natural gas supply formula never approaches the 100 per cent limit. Over the years, however, we can observe a lowering of energy security. In the case of supply cut off, from the Jamal pipeline explicitly, the percentage value of the security formula N–1 decreases from 213 per cent to 204 per cent. If Russia stops its entire natural gas supply, the decrease over the years will be from 206 per cent to 190 per cent. Although energy security is probably not endangered, the obtained results indicate that a certain dependence on the natural gas supply from the Russian Federation is in fact a reality.

In the second scenario, the security of the natural gas supply increases over the years, due to the decrease in energy consumption and especially due to the increasing share of renewable sources, and possibility to a reduced use of natural gas for producing electricity, as nuclear energy still serves as a a temporary (bridge) technology.

Conclusion

This analysis testifies of the anticipated impacts of an expedited withdrawal of nuclear energy, and thus of an increase in dependence on imports of energy raw materials for producing electricity. According to Angela Merkel's initial plan, i.e. to extend the operation of nuclear plants, a general increase in the import of raw materials would never occur.

HHI index utilization also revealed a less expected reality. In the first scenario (in which there is a withdrawal from nuclear energy), the final index values, somewhat surprisingly, display a higher level of diversification in 2020. This is due to a limiting of the amount of electricity produced from nuclear power, and an increase in its production from natural gas, brown coal and renewable sources. The current energy concept, therefore, can lead to a higher diversification of the electro–energy mix, thanks to the relatively equalizing share of particular raw materials in the mix. The second year analyzed, however, confirms the generally accepted premise that nuclear plants being cut off from the grid would lower the diversification of energy raw materials for producing electricity and simultaneously increase dependence on imported raw materials. This process is caused mainly by the full withdrawal of nuclear energy and also by the increase in the share of brown coal, natural gas, and especially renewable sources. In the case of the second scenario, the completely opposite process is anticipated.

An interesting fact which arises from the study is that natural gas imports will increase in both the first and second scenarios. Considering this fact, we can make the claim that natural gas will have a very important role in the future.

Within the framework of the analysis of the change in Germany's energy security, only natural gas was taken into account. Despite the fact that the volume of imported natural gas will increase in the case of both scenarios, energy security in terms of supply will stay intact. Although the security formula N–1 indicates lower values for dependence on the required volume of natural gas for producing electricity, it does not approach the security limit of 100 per cent in any of the analyzed cases. A substantial benefit in this respect are the big underground storages, which in the case of a supply cut off are able to provide a volume of natural gas sufficient for a few weeks.

Germany does not perceive dependence on Russian gas, which will probably even increase in the future, as primarily negative. First and foremost, this is because Germany is approaching their mutual relations as interdependent, considering the symmetrical positions of both countries. Therefore Germany is anticipating only positive outcomes in terms of the stability of their mutual trade relations. This policy method is not new to Germany and is thus accepted by the general public. The maintenance of good relations with Russia is also one of long–term objectives of Germany's foreign policy. Germany is convinced that its payments for energy raw materials, together with its innovation and technical potential, are enough to counterbalance the Russian store of raw materials, and that relations established in this way are sustainable in the long term on the part of all involved parties.

András Deák

Contest for corporate survival. A new era for CEE oil markets?

Abstract: *Oil supply security is not the foremost challenge for V4 oil policies. These four countries belong to the biggest oil supply disruption response mechanism on the globe, have relatively high density networks, and enough mobility to manage potential problems. Local companies and governments have to face a more complex and longer-lasting negative trend: the end of the regional oil consumption boom, and the rapidly worsening global – and more particularly regional – business environment. This is a challenge primarily for the local oil companies, and for the sustainability of their profitability. The future of these corporate strategies – their adaptation to changing global sectoral patterns – will be a much more important factor in future outcomes.*

Central European states have the privilege of being members of the best oil supply security management mechanism on the globe. By joining the OECD and the International Energy Agency, they have also become members of its collective oil supply disruption response policy. This policy has been developing since WWII, when the US had to organize vast supplies of petroleum to its Allies. Every other ton shipped out of the New World within the framework of the lend-lease program was oil or oil product. The US had to establish strong coordination in the whole vertical chain, from the oil fields through refining to transport. These practices remained alive and proved useful during the Middle East oil crises, which occurred so often between 1951 and 1973. In 1974 this mechanism was put on an institutional footing and became one of the first tasks and instruments of the newly created International Energy Agency.

According to the IEA emergency response mechanism, member states must prepare strategic stocks of crude and oil products, equal to no less

Deák, A., “Contest for corporate survival. A new era for CEE oil markets?,” *International Issues & Slovak Foreign Policy Affairs* Vol. XXII, No. 3, 2013, pp. 100–112.

than 90 days of their respective imports.[1] These stocks can be accessed only collectively, in emergency situations, and according to common rules of utilization. Moreover, the mechanism provides a large set of various measures including demand management, OECD supply response and transport optimization solutions, in order to enhance adequate responses in all segments of the market. All in all the Western Hemisphere has a robust oil security policy, potentially capable of coping with oil supply crises comparable to the worst on record. OECD countries constitute half of the global oil demand, and its strategic stocks contain more than 9 per cent of the annual global production. Coupled with other public reserves, the IEA has enough oil to weather (for example) an Iranian halt in exports of several years. This is not a short-term response mechanism as it's often characterized, but a flexible mid-term security guarantee for any major oil disruption lasting several months.

V4 countries have never had to face major oil supply emergency situations.

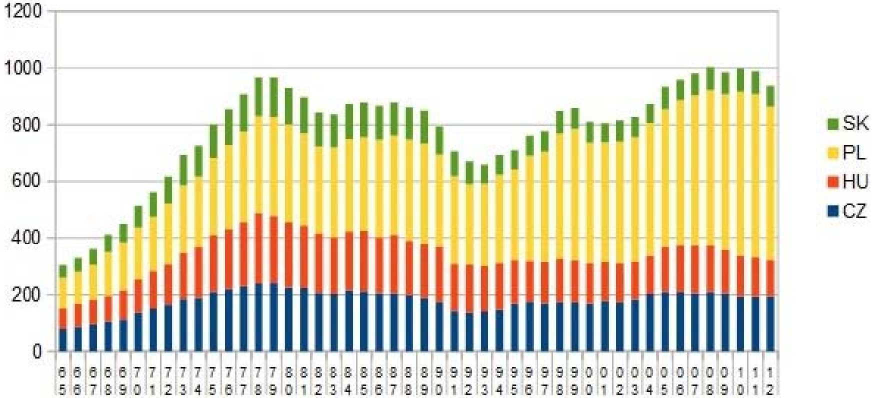
V4 countries have always had enhanced oil security guarantees. Even if they had a low level of internal production, and humble capabilities to influence producers and global oil politics, V4 countries have never had to face major oil supply emergency situations. This is due to the fact that they have participated in efficient international coalitions and response regimes during the respective periods. They weathered the Middle East oil crises while under the Soviet umbrella, receiving uninterrupted physical supplies at affordable, less volatile prices in the critical years. After regaining independence, they joined the above mentioned OECD mechanism, practically solving their physical oil security challenges at an extremely effective level. Due to these factors, oil is proportionally less represented in energy security thinking within V4 countries than in other major industrial regions.

The Golden Age is over

V4 oil consumption trends have followed the general European pattern with the usual development lag for the region. The Western oil consumption boom

1 For current data see "Closing oil stock levels in days of net imports," International Energy Agency, July 2013. Available online: http://www.iea.org/netimports.asp (accessed on September 30, 2013).

Figure 1. Oil consumption trends in V4 countries, 1965–2012, bpd



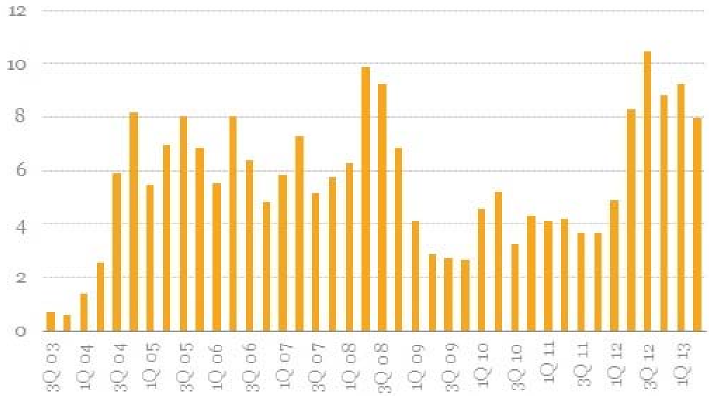
Source: BP Historical Statistical Review of World Energy. Available online: http://www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013.html (accessed on October 30, 2013).

and mass motorization of the 1950s–1960s arrived to this region a decade later, while expensive oil products for heating and electricity generation were replaced with gas and nuclear mainly during the 1980s. These trends were interrupted by the fall of the Communist system and the accompanying economic crisis. While Western OECD oil markets reached their "maturity" by the mid-1990s, for V4 countries the second wave of motorization came only at the end of the decade, increasing oil demand by 50 per cent (see Figure 1). Today this second "Golden Age" of Central European oil seems to be over. In 2010 the V4 had an average of 433 vehicles per thousand people, compared to 572 in Germany or 271 in Russia.[2] At their current development stage and income levels these markets can be characterized as mature, with very limited growth potential if any.

The period between the mid-1990s and 2008 was a successful era for the sector in all respects. The market had been flourishing due to an increase both in truck traffic and the number of personal cars. The growth in demand was fairly certain due to the catch up to mature Western consumer societies, and returns of investments were easy to calculate. The effects of the promising

[2] See the World Bank data. Available online: http://data.worldbank.org/indicator/IS.VEH.NVEH.P3 (accessed on September 30, 2013).

Figure 2. MOL refinery margins, 2003Q3–2013Q1, USD/barrel



Source: Portfolio.hu. Available online: http://www.portfolio.hu/vallalatok/energia/mitol_eros_a_magyar_olajmulti.185110.html (accessed on September 30, 2013).

market situation were magnified in most of these countries by sectoral privatization, democratic and market transformation, and EU accession. The sector provided a low risk, high return perspective, opening up relatively cheap funds and credits for the development and refurbishment of infrastructure. On these solid foundations, two Central European companies would rise to the lower medium ranks of the industry, namely MOL and PKN Orlen.

These regional companies also had a good deal of luck in other respects. Due to high oil prices since the early 2000s and the rapid growth in global oil consumption, refinery margins were relatively high worldwide. Coupled with a growing market this factor secured high profitability – both in mid and down stream segments – and increased the autonomy of these companies. Good economic results were further strengthened by Russian oil export fundamentals. Russian exports had an astonishing comeback in the early 2000s, initiating a tsunami of Urals crude oil to European markets, to Northwest Europe in particular. Due to these shifts the Urals–Brent spread rose drastically. Regional refineries, usually optimized on Russian crude, had a considerable advantage in using these spreads as compared with other continental refineries with other base-load crudes.

It was unlikely that these conditions would last forever. Nevertheless, the sector had a hard landing after 2008. Oil demand growth froze in most of

Figure 3. Brent–Urals spread, 2003Q4–2013Q1, USD/barrel

Source: Portfolio.hu. Available online: http://www.portfolio.hu/vallalatok/miert_nem_hat_a_molra_az_emelkedo_olajar.188668.html (accessed on September 30, 2013).

the regional and neighboring markets, turning into decline in some particular countries such as Hungary. Refinery margins collapsed, and due to the changing production–consumption patterns a good deal of refinery capacities became unprofitable, particularly in Europe.[3] It will take some years and some mid-stream shutdowns to rebalance the continent's refining segment. Nonetheless, the changing Russian oil export fundamentals has had by far the biggest impact on the financial performance of companies in the region. Moscow has launched a variety of sectoral initiatives, all of them negatively affecting the situation and the longer-term outlook. As a result, the Russian Urals blend has lost its price advantage. The main source of financial benefits has turned into a headache for most of the regional players.

The multifold Russian oil challenge

The origins of the changes in Russian oil export policy mostly lie beyond CEE–Russia, or even EU–Russia, relations. Russia pursues a sovereign oil

[3] G. Hureau, S. Serbutoviez, C. Silva, G. Maisonnier, "Investment in exploration-production and refining," IFP Énergies nouvelles, October 2012, p. 45. Available online: http://www.ifpenergiesnouvelles.com/publications/etudes-disponibles (accessed on September 30, 2013).

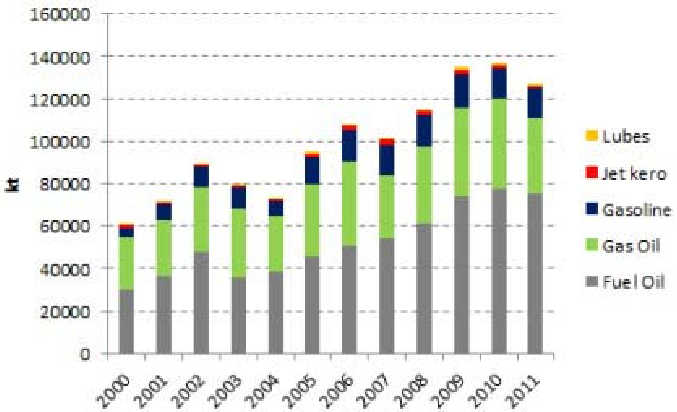
and oil export policy, which is underpinned primarily by economic and internal policy factors. External actors and considerations about targeted markets are differentiated primarily by anticipated net export revenues. In this regard what is happening today in the Russian oil sector is very much rooted in industrial patterns. This is a unilateral strategy, and consumers do not have significant leverage on these trends. Russia's oil exports used to be, and likely still remain, an external matter for the region.

Among the major factors, inertia plays a significant role. Russia has been producing around 10 million bpd oil for a couple of years now, a level roughly equal to the Saudi level. Moscow does not want to – and in the light of constrained reserves really cannot – go significantly above this level. No official or corporate documents imply considerably higher production levels.[4] Keeping in mind the growing domestic demand, unchanged production will mean fewer exports. Russian internal consumption has been growing steadily, primarily due to the society's late motorization. Russia is the second biggest market for new car sales in Europe (after Germany), with more than 2.5 million vehicles annually. This process is far from being finished. Today 30 per cent of oil production remains in Russia and this share is likely to grow in the years to come.

China and the Far East is another important factor. Due to booming imports in the Far East, producers can sell their crude at premium prices in these markets. For Russia, turning to the Far East was a difficult and costly challenge, due to its vast distances and land-locked production sites. Large scale exports to China or to the Far East involve not only a gigantic investment into pipeline capacity (ESPO pipeline), but also the development of the Eastern Siberian fields. However the benefits are also enormous. Europe offers bleak prospects with its economic slowdown and a market oversupplied by the Urals. The start of exports to China and the Far East, diversified away from European consumers, had the biggest input into the narrowing Brent–Urals spread, as demonstrated above. Russian exports to China began less than a decade ago, but in 2013 it is expected that deliveries will reach 1 million bpd and (according to contractual arrangements) this level is set to grow steeply. Coupled with other Far Eastern exports, the region is becoming an important competitor for Europe.

[4] For 2020, projections range from 7.8 to 11 bpd. See J. Henderson, "Tight oil developments in Russia," The Oxford Institute for Energy Studies, WPM 52, October 2013. p. 2–3. Available online: http://www.oxfordenergy.org/2013/10/tight-oil-developments-in-russia/ (accessed on October 20, 2013).

Figure 4. Russian oil product exports, 2000–2011



Source: B. Fattouh, J. Henderson, "The impact of Russia's oil refinery upgrade plans on global fuel oil markets," The Oxford Institute of Energy Studies, WPM 48, July 2012, p. 6. Available online: http://www.oxfordenergy.org/2012/07/the-impact-of-russias-refinery-upgrade-plans-on-global-fuel-oil-markets/ (accessed on October 20, 2013).

Lastly, the Russian refinery modernization program puts an additional squeeze on crude oil exports. Moscow has been striving to persuade the oil companies to develop the relatively low efficiency refinery sector for more than a decade. These efforts brought only limited results, until recently. Russian companies were opposed, and modernization was ultimately a response only to the imperatives of the growing demand in the domestic petrol market. Despite the government's development of oil product export pipelines and infrastructure, the bulk of exports consisted of fuel oil with little added value. Finally, the government changed the export duty regime in 2012 and started to force companies into more activity. Consequently (according to company data), the Russian refinery capacity is set to increase by 10 per cent in the next three years alone. This trend suggests not only less fuel oil exports, but also less crude exports and more high quality oil product exports in the European markets, putting considerable pressure on CEE refinery margins in the years to come.

Russia is not an exception. Most producers are following the same path, offering worsening competitivity conditions in the oil product segment. In the Middle East, refinery capacity is set to increase by nearly 60 per cent between 2010–2018, in some cases in strong coordination with Asia Pacific upgrade projects.[5] Physical diversification of imports is not a remedy for these structural shifts. What CEE countries perceive as a Russian supply challenge is just the CEE's reading of a global turn in the sector. For CEE oil companies, diversification can be only a small part of their accommodation to the changing patterns of the global oil industry.[6] Supply security is only the tip of the iceberg, hence it would be very misguided to limit our policies to addressing this particular problem.

A corporate challenge, rather than a security one

All of these developments – the slowdown in European demand, the refinery overcapacity on the continent, and particularly the changing picture of Russian exports – have forced regional companies and policy makers to rethink existing strategies. The high concentration of changes in the market environment makes conventional business models less efficient and, perhaps even unsustainable. Many uncertainties have emerged in less than five years, turning the sectoral outlook rather bleak.

The potential implications vary widely. The most security-related problem is the potential drop in accessible Russian crude oil through the former export channels, namely the Druzhba pipeline. This question is part of the broader Post Soviet transit issue. These relations are traditionally non-transparent, loaded with a good deal of Belarusian–Russian and Ukrainian–Russian geopolitical content. The past record is contradictory, especially in the gas sector. The respective parties were capable of managing these relations amid growing frustration and regular (although short-term) disruptions. Russia also pursues a transit diversification policy, building up new bypass pipelines (BTS-2) along with the gradually growing credibility of their future utilization. All these steps point to the real risk of a growing Russian unwillingness to supply these CEE countries under existing conditions.

As shown on Map 1, a potential supply disruption would not cause a major halt of supplies to the regional refineries. Both Polish and Hungarian

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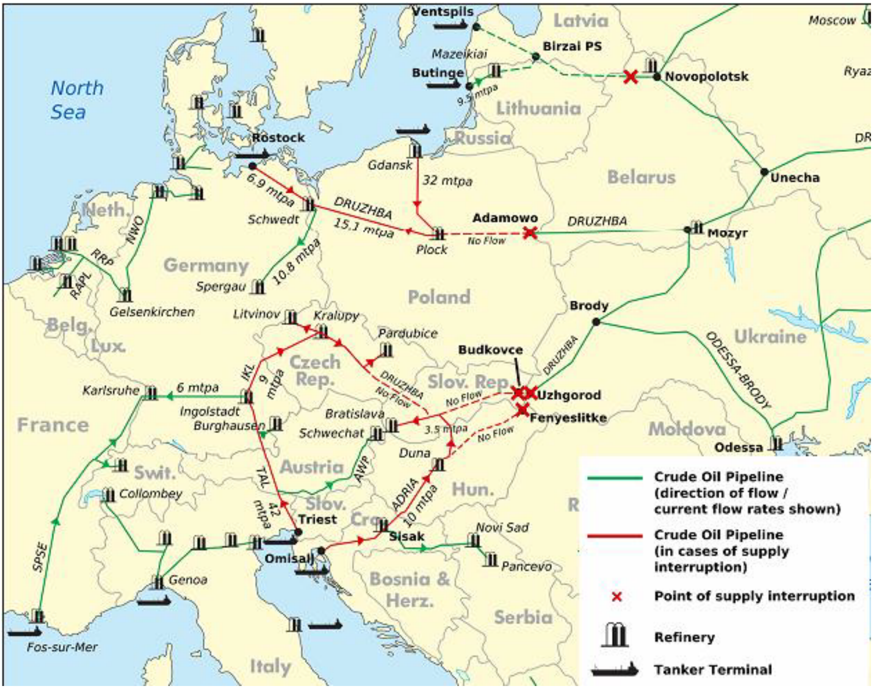
[5] B. Tippee, "Middle East set to eclipse Asia in refining capacity growth," *Oil&Gas Journal*, October 21, 2011. Available online: http://www.ogj.com/articles/2011/10/middle-east-set-to-eclipse-asia-in-refining-capacity-growth.html (accessed on September 30, 2013).

[6] "Refining 2021: who will be in the game?," ATKearney, 2012. Available online: http://www.atkearney.de/documents/856314/1214684/BIP_Refining_2021.pdf/0409afab-852d-4081-972c-27f99215b043 (accessed on September 30, 2013).

Map 1. Possible CEE supply setup without Druzhba pipeline



Source: "Study on the technical aspects of variable use of oil pipelines coming into the EU from third countries. Overall report," 2010. Directorate-General for Energy of the European Commission, D142-ILFM-AD-0016/REV. 0., 2010, p. 22. Available online: http://ec.europa.eu/energy/oil/studies/doc/2010_reporting_technical_aspects.pdf (accessed on September 30, 2013).

refineries would be able to fully substitute imports through other pipelines. Only the Slovak and Czech capacities would face some problems at full capacity utilization, but even these negative consequences can be easily offset by coordinated measures or commercial instruments. The same is true for some German inland capacities. All these alternatives are more complex and have a potentially higher cost due to a longer route or the inclusion of tankers and sea routes, and in some cases rail transport. But unlike gas networks, the regional oil supply infrastructure meets the N–1 requirement and can be fully supplied by oil products in case of a disruption.

The complexity of the problem comes from the resolute Russian unwillingness to further use the Druzhba pipeline. The range of future implications stretches from some tariff increases to a potential long-term Russian supply stop on the pipeline. For some refineries this would cause a serious economic disadvantage, even if in most cases this cannot be fully characterized as a disruption in physical supplies. The potential threat here and its implications are in the “grey zone” of oil security policies. In some cases these challenges can be responded to easily at the corporate level. For example, MOL initiated the reconstruction of the Százhalombatta–Šahy pipeline, enhancing the full physical supply of the Bratislava refinery from the Adriatic Sea. This was a relatively easy decision, since it had to be made only by a single actor, namely the MOL Group. The expansion of potential pipeline capacity is more difficult in the case of the TAL pipeline, where Unipetrol must persuade many different shareholders about the benefits of this investment. These difficulties likely played an important role in the PKN Orlen decision to arrange longer-term commitments: it secured its Czech supplies through Druzhba until 2016 by signing a 7 billion US dollar contract with Rosneft in June 2013.

The complexity of the problem comes from the resolute Russian unwillingness to further use the Druzhba pipeline.

Uncertainty has a damaging effect on regional investment into local infrastructure. As far as pipelines or other alternative import capacity is concerned, it is very difficult to calculate potential utilization and return rates as long as a final decision about the Druzhba pipeline has not been taken. Commercially these alternatives are not attractive. On the other hand, these investments cannot be funded from the EU TEN-E program, since oil projects are not eligible. But this problem is only a part of the bigger picture. The challenge is replicated on a much larger scale in refinery modernization programs, where the uncertainty comes not only from the unclear future of Russian supplies, but from global changes in general. The relative costs of Urals substitutes, and the accessible margins of sour, high sulphur crudes, are both at risk due to shifts in Middle East oil policies.[7] This is an unwelcome uncertainty in a situation in which further

[7] In 2007 MOL purchased the Mantova refinery optimized for heavy-crude, since future margins seemed to be attractive. Due to unfavorable changes in the composition of global oil supplies, this refinery is set to be decommissioned and transformed into a simple deposit today.

investments into capacities and hydrocracking is the key to survival in the continental refinery business.

Independent of the highly visible Druzhba pipeline issue, the consequences of the worsening commercial environment may have a more far-reaching effect on the region's oil situation. During the last couple of years the value chain of the oil industry has changed remarkably: profits moved to the upstream segments. It is unlikely that this situation will soon change very much. All companies strive for production assets in order to sustain and survive. In 2012, 79 per cent of OMV's profits and 73 per cent of MOL's came from their upstream sector, even though these companies have a relatively low level of reserves by international standards.[8] This also means that these Central European companies have to fight for survival downstream with their home assets, and simultaneously to find additional investment opportunities in the highly competitive, risky and closed upstream segments, primarily outside the region. Whether these companies have the necessary funds and expertise to do both is still questionable. The former option would mean bigger investments into refineries and hydrocracking, securing their core activities. This provides a short-term positive effect for CEE national governments but puts the medium-term outlook at risk at the corporate level. The latter option usually assumes leaving the region and being dependent on external production in the Middle East, the North Sea, or Canada. If successful, this provides high profitability for the commercial actors, but also represents a gradual distancing from the national markets and their local needs.

Until now, most companies could synchronize these attempts. OMV had a promising investment in Romania and it has good results in the off-shore sector.[9] MOL bought the Croatian INA primarily because of its upstream potential, while PKN Orlen still has a considerable chance to find a way out of this dilemma through the Polish shale gas formations. These outlooks would represent a win-win situation for CEE national governments and companies, and ease not only the regional oil supply situation but also the much more important situation in natural gas. Nevertheless, the regional potential and reliability of these outlooks (with the possible exception of OMV's Romanian success) are uncertain due to limited reserves, as well as to policy and political handicaps.

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8 Company data.

9 The Romanian deep-water Neptun-block alone has the potential to offset much of its decline from existing fields.

Instead of conclusions

The global oil industry is in flux again. We have been witnessing a significant transformation in the sector, similar to those of the 1980's. A shift in the value chain, the expansion of producer companies, uncertainty about the growth of the oil market (particularly in Europe), and a changing credit environment, all point to a harsher future than was anticipated during the previous two decades. In the longer run this may likely bring a new wave of concentration to the sector, in which many smaller companies will have to give up their autonomy or even merge into bigger conglomerates.

In the light of these trends, the current situation in the CEE regional oil market is much more than a conventional supply security challenge. The sheer existence of the regional companies – OMV, Mol and PKN Orlen – is called into question. The subsistence of the CEE Oil Corporate Trinity in its current form is not guaranteed at all. All three entities were at the critical size, with only minor upstream assets, and barely qualified for international attention. Smaller companies in the region were sold out to them or to other outsiders, mainly Russians. Understandably, local political support may save the autonomy of these entities for a while. But politics is not a long-term, ultimate guarantee. If the current negative environment persists, the current corporate setup will likely evolve to something else. The nature of these property shifts will be of crucial importance. They may happen among regional players only or also involving external actors. They can lead to the emergence of stronger regional corporate alliances or, on the contrary, destroy existing synergies and result in the further fragmentation of the local landscape. These future developments may depoliticize regional oil markets or increase the influence of politics. Given the liberalized nature of the oil sector, these shifts will have a much bigger significance here than in the electricity or natural gas sectors. Conventional development paths are the least likely possibilities for the oil sector in the years to come.

The global oil industry is in flux again.

The potential restructuring of the sectoral (and in particular ownership) relations within the regional oil industry is a major issue for local governments – and not because of supply security considerations. The OECD oil disruption response mechanism is independent from ownership relations, and is a well-established international benchmark. Nevertheless, the oil industry being unregulated, national governments have much less influence in the sector than in the gas or electricity segments. Income levels and corporate size are much bigger – oil companies are often the biggest tax payers and have the biggest income levels in these countries. The CEE region also has a special political sensitivity in regard to these questions. Neither the corporate ability to accommodate global sectoral changes nor the potential reshaping of regional balances can be fully separated from politics. V4 governments will likely have to take a more active role in influencing favorable sectoral outcomes in the future. Whether they do it together or separately – in what form, for which goals, and by what kind of instruments – remains the most important question in the years to come.

Energetická politika Evropské unie [Energy policy of the European Union]

By Filip Černoch, Veronika Zapletalová, Brno: Muni Press, 2012. 155 p.
ISBN: 978-80-210-6073-9

For several years now, energy policy has been one of the main topics for policymakers. After two problem-free decades, an increase in demand and prices during the 2000s, “energy weapon” challenges, problems with supply and similar issues, have brought about a change in the views of decision-makers on energy. At the EU level, energy has become of key importance, especially since the 2009 gas crisis. However, this crucial position of energy within the national economy was only partially reflected within the academic literature, and apart from a number of books published in 1990s and 2000s the subject did not receive great attention before the gas crisis. The situation is even more complicated in the case of the Czech Republic and (especially) Slovakia, where academic interest in energy policy issues at the EU level (and also at the national level) is only in its nascent phase. This book by Filip Černoch and Veronika Zaplatalová, *Energy policy of the European Union*, is trying to shed some light on the energy policy at the EU level and thus contribute to our understanding of the topic.

It must be stated first of all that the book represents one of the very first complex publications in the Czech Republic or Slovakia (to the best knowledge of the reviewer) exclusively dealing with the energy policy of the EU. Previous publications dealing with energy were focused only partially on the EU level, and were concerned also with energy at the level of member states or global energy issues. Thus, in spite of several shortcomings mentioned in this review, the book represents a very important step in discussions in both countries on energy policy within the EU. This is one of the principal reasons for the book’s being worth reading.

The book is also a very good introduction to the energy policy of the EU. It touches upon the main energy related issues, but on the other hand does not aspire to provide an exhaustive treatment of the topic. As stated by the authors in several places, it is a textbook intended for students and those members of the “public interested in the topic” (p. 139). This is also a limitation of the book; in this reviewer’s opinion, however, this fact does not decrease its value.

The authors have divided the book into an Introduction and four subsequent chapters. Each of the subsequent chapters deals with one aspect of EU energy policy. The first chapter analyzes the development of EU energy policy since the beginning of European integration. The second deals with internal energy policy, the third with environmental issues, and the fourth with external energy policy. This division – between internal and external energy policy and environmental issues – is made on the basis of a strategic document of the European Commission (p. 35). On the one hand, the division reflects the way the Commission views the issue; on the other hand, the document does not create a common energy policy, and it is not quite clear how environmental issues fit into this framework. This is not to say that the division is inaccurate, rather that more explanation is needed to improve the argument. One of the shortcomings of the book is that there are only very brief conclusions to every section or chapter, and the authors do not summarize the main points or arguments that would help readers (students) remember the main issues. Moreover, the book lacks a final Conclusion at the end.

The authors do not address one of the main issues in the area of energy at the EU level: whether there is common, harmonized EU energy policy or not. The Lisbon treaty uses the term "EU policy on energy" – and not "EU energy policy" – which is probably meant to stress the current state of affairs, in which there is no harmonized policy at the EU level comparable to a common agricultural policy or other similar common policy. The authors may have a different opinion on this issue, however they did not articulated it in their book.

There is a discussion in the academic literature over whether there is such a policy at the EU level, but the book does not engage in this discussion. The authors assume that there is an energy policy at the EU level, but as they do not analyze the issue in more detail, it is not quite clear whether they mean harmonized policy or just a policy in development. On the other hand, in the fourth chapter of the book (p. 106) the authors claim that the member states have different opinions on the development of the external dimension of the EU energy policy. This indicates that they consider the external part of the EU policy on energy to be much less developed than the internal one, however they do not make this distinction very clear.

A very interesting claim presented in the book is that the Lisbon Treaty has not brought significant changes to the EU policy on energy. However, most of the literature is in agreement that the importance of the treaty was in establishing a legal framework for energy at the EU level. Thus, while the authors' scepticism towards this issue is an interesting point, more elaboration is required in order to present convincing argument.

One very interesting part of the book is a section in the first chapter that analyzes the development of EU energy policy from a theoretical perspective. This is one of the most innovative parts of the book and one of its main contributions to our understanding of the development of EU energy policy. It is pity, therefore, that the authors did not devote more space to this matter. In the literature there have been only a few efforts to explain energy policy at the EU level in all its complexity using theories of European integration, and this book is offering only a very rudimentary introduction to the issue. The theory could have been dealt with in the chapter on the development of energy policy at the EU level, not only in one short section. Such a structure for the chapter would have enabled the authors to better support their claims with evidence from history – evidence which was in fact mentioned in the chapter, but only marginally connected to the theoretical discussion.

From the current structure of the book it is not entirely clear why the authors chose to first introduce the development of energy policy at the EU level, and then deal with very similar issues in the other three chapters (especially the chapters on internal and external energy). The arguments in these chapters are presented mostly in chronological order, sometimes even repeating issues mentioned in the first chapter. Thus it is not entirely clear why there is a need for the first chapter at all.

The third chapter on climate change is another very useful part of the book, given the fact that this issue is extremely prominent in current debate on energy and its impact on the environment. From this point of view it seems strange that its sub-chapter on renewables comprises only 5 pages. This issue would seem to deserve much more space, given that the EU's support for renewables translates in many countries into feed-in tariffs that are heavily criticized from many points of view. In spite of this shortcoming, this part of the book offers an interesting summary of the issue, as well as being very well written and understandable for anyone interested in the topic.

In spite of the few above-mentioned shortcomings, the book has several important strengths. It is unquestionably a very good source for the literature on energy within the EU, as the authors have utilized a whole range of various sources of literature, as well as primary documents in areas where secondary literature is lacking (this is especially the case with the EU external energy policy). The authors cite their previous texts quite extensively, which is understandable given the lack of literature in this area. The text is very easy to read for anyone interested in the topic, sometimes explaining very complicated details of energy policy (such as the third energy liberalization package) in a very understandable way. The book contains several boxes with explanations of the main issues dealt with in the respective sections. On a more critical note: the authors claim in several places that they had to omit some details due to the limited size of the book. This is of course true to some extent; however, in many instances more detail would increase the usefulness of the publication for its main audience – students.

The main disadvantage of the book from the reviewer's point of view is its inaccessibility. It is not intended for sale (it was published as part of a project at the Masaryk University financed by the structural funds of the EU), and neither is it available on any webpage (at least the reviewer was not able to find it). This is a typical challenge with publications supported by structural funds; if the rules would allow it, however, I would strongly recommend that the authors put the book on a webpage and enable a free download.

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The future of natural gas security in the V4 countries.
A scenario analysis and the EU dimension

By Filip Černoch, Břetislav Dančák, Jana Kováčovská, Petr Ocelík, Jan Osička, Tomáš Vlček, Veronika Zapletalová. Brno: Muni Press, International Institute of Political Science of Masaryk University, 2011, 312 p. ISBN 978-80-210-5650-3.

Since 2009, energy security – the issue of gas especially – has been the sexiest topic discussed in the area of political science and international relations, particularly in Central Europe. Gas supplies have been flowing to the post-Soviet countries of the Eastern block for a long time now without any interruptions. Eventually, however, new sources (such as LNG and shale gas) as well as new routings and projects, may really change the gas pipeline map of Central Europe and the rest of Europe. At the same time, it is important for these countries to be aware both of their own energy demands and of the politics of Russia's dominant supplier – the company Gazprom.

The above mentioned team of authors has brought a new publication to the expert market, a collection of studies compiled over eight months which is unique in its narrow focus – gas and V4 – and includes a wide range of descriptive components of the topic. It also includes an unusual applied mathematical–analytical model, loaded with data, and last but not least a SWOT analysis which ends with some recommendations. In the introductory section the authors have identified precisely the research questions they were seeking to answer (p.19). For example: How could particular gas pipelines and LNG terminals influence an economically rational distribution of gas flow within the V4 countries? They have also clearly described the goals of the study (p. 21): e.g., "to facilitate the comparison of projects according to selected criteria," supported by a large pool of data from various credible sources. They identified the mathematical model MEOS as the key feature of the research, which includes a system of four indexes. An important piece of information for the reader is their explanation that the book is intended as an assignment for the Czech Foreign Ministry.

The second chapter explains the principle and structure of the SWOT analysis, which comprises eight evaluation frameworks and basic data covered by the reference framework for 2008. These data are further developed in more detail in the individual subchapters on V4 countries. In the first of these the Czech Republic is introduced and basic information provided on the gas sector, including characteristics of the suppliers and information regarding the conditions of the gas sector within the country (individual companies, gas storage, the position of the country within the EU's gas transit system, and a description of any individual infrastructural projects, whether under construction or still in the planning stage). This is followed by a description of state policy in this area (regulatory framework), in the form of an analysis – whether of a document called the "State Energy Policy," or of energy legislation focused on gas. The country case study finishes with a forecast of demand up to 2020, together with a conclusion which includes a global evaluation of the country's gas sector. The SWOT analysis is provided at the end in short table form.

Each of the V4 countries is introduced in this way. These chapters bring together for the reader an incredible amount of available information, as provided by various representatives of the public and private sectors.

However, as 2008 is the reference data year and the book was published in 2012, it must be stated at the outset that many changes have occurred in the meantime that need to be taken into consideration, which the authors were not able analyze because of the editorial schedule.

The situation in the gas market, infrastructure scenarios and trends, together with perspectives for regions other than the main suppliers of LNG and PNG (Russia , North Africa or Central Asia), are described in the first part of the third chapter. MEOS methodology and its results come next in the subchapter. It is clearly explained, even to a reader unskilled in the quantitative comparison of scenarios of supply and transit or in energy security. Also described are the MEOS system of four indexes (Hirschman–Hefindahl Index; Substitutability, Reliability, and Cost Indexes – p.154), the application of infrastructure scenario and MEOS simulation to different pipelines like Nabucco, Nord Stream or South Stream and its combination, comparison and regional infrastructures and their explanation and visualization. These in-depth description scenarios – some of which, as mentioned above, may no longer apply (e.g. the Nabucco pipeline postponement/cancellation) – are a unique description of the market status of gas pipelines and infrastructure projects, but especially of individual production regions within the scenario system and combination of indexes. Not a usual working paper, not a memo, but rather a well-done analysis supported by quantitative research. The third chapter closes with a MEOS mathematical simulation and analysis of different reference scenarios (supply and demand) and their impact on the V4 countries. The goal of the MEOS model is to identify the economically optimal utilization of resources and transport routes, and to reveal economic motives for natural gas allocation in a given network. This is when the reader clearly understands the wording of the book and its title. The authors come to the conclusion that the LNG and N-S corridor plus Nabucco scenario brings the maximum in all four scenario indexes for V4 countries, and that thus the countries' support should be expected.

Chapter four ("The EU and representation of the Czech energy interest") summarizes and provides a mathematical analysis of the contextual development of all the information described and presented in the previous chapters. An added value of this section is a description of what the EU calls its European Energy Policy (EEP), its various dimensions and present development. In section 4.2 there is a lengthy description of the latest development in the legislative area of the EEP, the so called Third Liberalization Package, the biggest and latest achievement of the EU energy consensus. In this chapter there is also a section entitled "Criticism" on each described topic (common energy market, EU external policy, environmental policy). Following the next subchapter, the reader comes to the main topic of the book, i.e. the "Czech energy interests" and its "representation." This subchapter contains information about the priorities, economy, and public sphere of energy topics, and the way of communication among responsible partners, which is always important to know. However the chapter is missing a clear recommendation on what should be done to improve institutional communication between the permanent representative and the foreign ministry, in order to clarify opinions as well as Czech interests in the field. The authors have proposed working on new analysis of that issue. This work is not an effort to give a clear and definite opinion, as this task does not fall within the original assignment of the Foreign Ministry; it is rather an "outline for further research," offering basic guidelines and a source of information.. As in the previous chapter, there are descriptions of financial costs, partners and perspectives, from both the Czech and EU standpoints.

In their general findings and final recommendations in the fifth chapter, the authors explain related geopolitical and business issues, arguing in particular against five "myths" (e.g. "Russian gas is cheap," "Russian gas is a political instrument," and "Energy security equals security of supplies," p. 273–80). Why exactly these five? In the book's conclusion the reader can find a summary of outcomes and recommendations, as well as answers to the basic questions set out at the beginning. As the authors very truly say, "the study presented here is not a manual offering one ideal way forward . . . given the ever-changing political and economic situation in Europe. It is a detailed description of the playing area." Among the many other recommendations for V4 countries and the Czech Republic, the most important would be state support for the construction of critical infrastructure in the event of the failure of economic stimuli (LNG or N-S interconnection). Another interesting recommendation is that the level of efficiency of interest representation be upgraded to that of the EU. Are these not all dependent on politics?

The assignment that the authors were given by the Foreign Ministry on this topic was fulfilled via this study. It is full of descriptive information – as mentioned above, however, some of this may no longer be useful. Examples of such information are the individual case studies of V4 countries, but the descriptions of methodology in these sections are not consistent, and a they lack a comparison of the individual regulation systems. This results in the reader being confused, as the same kind of information is not presented in each section. In the discussions of V4 countries, the political context is rarely mentioned and the non-politically skilled reader must search for additional information or a context in which to understand the message of the text (p. 47–9). For example, in the Czech analysis, the authors refer to "one of the players," but without having mentioned anything about who the "other actors in the Czech business and political discourse" are. Similarly, in the case of Slovakia, nothing is mentioned in the book about the fact that the most important gas business player (the company SPP) changed their shareholders in 2012, which pretty much also changed the political discourse concerning energy security in the country. The same goes for the goals of the Slovak government within the energy sector – it is never mentioned that Radičová's government is no longer in power, or that the new one has expressed a different attitude towards the described possible interconnection between V4 countries. In the Polish case study, Poland's position towards gas projections are explained via statements by "the Polish government" and "Polish elites" (p. 90), but without any more detailed explanation as to who exactly is meant by this. The most visible example of this non-standardized approach was found in the Hungarian study, which highlights interesting differences among countries in their perception of regulation. The whole description of this case study is structured differently than the others, which may be seen in the description of the key player on the gas chessboard – the company MOL – and its role within the other V4 countries (p. 112).

The political and general context, as well as transparent information on individual V4 governments and political representation, is missing. Because of this, however, the book may serve more in the role of institutional memory than as an analytical source.

In order to compare certain statements in regard to gas policy, the authors cite various experts in the energy field, such as Karel Hirman (p. 67) or Vladimir Socor (p. 146). However, this sharp divergence of opinion is not further explained – the authors apparently expect that the publication will be read by those fairly well experienced and skilled in energy matters themselves, or by the relevant experts.

It is not only the V4 chapters that are lacking in political context. When explaining the EU's or Russia's intentions (e.g., on p. 130: Turkey vs. Russia), the authors also fail to convey the political position of these global players (p. 136–7). Why do they choose to describe the positions of only some of the countries? Similarly there are other statements which should be defined more exactly – for example (on p. 228), they say that the Czech political elites decided to take part in the Nord Stream project. Which elites, and what exactly did they hope to achieve by that decision?

Other crucial insights which might have been included would be, for example, a comparison of similar information on the pipelines throughout all the various chapters. Nabucco is included in all the descriptions, however, and a generally broad characterization and analysis of this project can be found on p. 168, as well as in the Hungarian case study and in chapter four on Czech interests. As there is much superfluous information throughout the whole book, the reader may be confused as to whether this is new information, or whether it has changed since a certain time.

In general, the gas crisis of 2009 is mentioned rather often in the book. This crisis was a decisive factor, in relation not only to certain activities of gas companies, but also to the geopolitical decisions of governments, e.g. as reflected in signed contracts. It would have been useful if the authors had written a short chapter of just a few pages on the core of this crisis and its current impacts. The special envoy for Energy Security is mentioned in the chapter devoted to Czech interests. However, as this is an analysis of all the V4 countries, it might also have been mentioned somewhere that the Slovak Republic – unlike the other V4 members – has no such special envoy, no one who can speak on behalf of the energy issues of the country.

With all the wide range of information that this book brings together, it could serve as an aid for political representatives in V4 countries in deciding the right course of energy policy for them – i.e. the infrastructure projects to be chosen and scenarios to be preferred. Although the study was commissioned by the Czech MFA, it is valuable tool for all EU countries, and in particular should serve V4 countries as they analytically process information regarding their current policies and try to speak with one voice within the EU. Because energy is too important to be left to politics.

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Articles should be original and deliver the data that are accurate, meaningful and timely. It should not be under consideration elsewhere. The text should be submitted to editors in the simple Word document format with and abstract summarizing the main points. The length of contributions should not exceed 6,000 words.

Quotation should be clearly gathered in a manageable proportion as footnotes. Footnotes should be presented as follows:

Books

P.J. Katzenstein, *Tamed power Germany in Europe*, Ithaca and London: Cornell University Press, 1997, pp. 195–6.

Articles in journals

I. Samson, "The Visegrad Four: from loose geographic group to security internationalization?," *International Issues & Slovak Foreign Policy Affairs* Vol. XVIII, No. 4, 2009, pp. 57–73.

Articles in Volumes

T. Butko, "Unity through opposition. Islam as an instrument of radical political change," in B. Rubin, ed., *Political Islam. Critical concepts in Islamic studies*, London: Routledge, 2007, p. 26.

Articles in newspapers:

"David Cameron deploys 10,000 more police to stop London riots," *The Washington Post*, August 9, 2011.

Articles available online:

"David Cameron deploys 10,000 more police to stop London riots," *The Washington Post*, August 9, 2011. Available online: http://www.washingtonpost.com/world/cameron-deploys-10000-more-police-to-stop-london-riots/2011/08/09/gIQAqz2B4I_story.html (accessed on August 9, 2011).

Documents

"Joint communication to the European Council, the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Region. A partnership for democracy and shared prosperity with the Southern Mediterranean," COM(2011) 200 final, European Commission/High Representative of the Union for Foreign Affairs and Security Policy, March 8, 2011.

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