CEEP REPORT
Central Europe Energy Partners

www.ceep.be ▪ No. 3 (50) ▪ 2017 (Q3)

CEDE | Central European Day of Energy

11.12.2017

New technologies driving the energy transition in Central Europe

Registration is now open for the second edition of the Central European Day of Energy event (CEDE), with the confirmed participation of Maroš Šefčovič, Vice-President of the European Commission in charge of the Energy Union, Jerzy Buzek, Member of the European Parliament, Chair of ITRE Committee and Dominique Ristori, Director-General in the Directorate General for Energy, the European Commission.

CEDE will take place in Brussels, on 11th December 2017 and is organised by CEEP in co-operation with DG Energy and with the support of the International Visegrad Fund.

This year's event will focus on the sustainable energy, innovation and modern technologies in Central Europe: renewable energy expansion, low emission technologies use, smart grids, energy efficiency projects, development of electromobility that drive the energy transition. Furthermore, the event will address the most cost-effective strategies to develop a sustainable and environmental friendly energy sector in Central Europe.

Among the projects that will be presented, one can find: EFRA Project (Grupa LOTOS, Poland), BALTPOOL (EPSO-G, Lithuania), SINCRO.GRID (HEP/HOPS/ELES, Croatia and Slovenia) and Smart grid demonstration project of SPS and hybrid battery (PSE, Poland).

For further details and the registration link, check the website of the event: www.ceep.be/cede2017/.

In this issue

COMMENT

What Does Digital Mean for the Future of the Energy Sector?

Megan RICHARDS
Director of Energy Policy in the European Commission's DG Energy

Establishing a fully functioning Energy Union and achieving the Digital Single Market are two of the top ten priorities for the European Commission during President Juncker's mandate. Considerable progress has been made on both of these major initiatives and the inter-linkages between the two are significant. In his annual State of the Union address in September 2017, President Juncker underlined the importance of making European industries stronger through innovation, digitalisation and decarbonisation and it is clear that these objectives go hand in hand.

The Commission is keen to ensure that the enormous changes that have begun in the European energy sector are continued and encouraged with the support of new digital technologies which will increase and improve energy efficiency, improve the introduction and use of renewable energy, and help us to meet our greenhouse gas reduction goals while also making life better, healthier and more sustainable for all.

One of the major building blocks to achieve our Energy Union is the Clean Energy for all Europeans package – the European Commission proposals for eight legislative acts and enabling measures adopted last November. When adopted and put into effect, these should provide the stable regulatory framework to facilitate the clean energy transition in the EU, help to stimulate investment in more carbon-neutral initiatives, make the EU energy sector more stable, more competitive and more sustainable – fit for the 21st century and help to deliver on our Paris Agreement commitments.

To achieve our Energy Union goals and to implement the Clean Energy package, the uptake and expansion of digital technologies will be decisive – all along the energy supply chain. This is recognised clearly by EU Member States, industry and other stakeholders in the Tallinn E-energy Declaration, developed under the Estonian Presidency of the Council, and signed (by Member States and other stakeholders) on the 19th and 20th of September 2017.

Without expanded and effective digitalisation across the energy sector we will not achieve our ambitious goals of (i) putting energy efficiency first, (ii) achieving global leadership in renewable energies and (iii) providing a fair deal for consumers – some of the main goals of the Clean Energy package. Rapid rollout of innovative solutions for market operators in all parts of the energy sector will certainly require increasingly digital applications. In particular, digital solutions will facilitate and drive forward effective and improved energy efficiency, enable consumers to participate more actively in both production and management of energy, take advantage of market variations, and improve infrastructure management thus reducing costs, environmental impact and improving quality. In the case of electric grids, smart digital solutions will help to improve and facilitate more rapid and effective introduction and management of renewables and better interconnections.

Digitalisation has the potential to be a critical transformative function for energy markets as it improves grid management, fosters flexible and liquid markets allowing a more efficient matching of supply and demand that lowers generation costs and therefore prices. It leads to better resource management, better integration of renewables and thus helps to lower the need of fossil fuel use in the power generation mix, which in addition to positive cost benefits is beneficial for society as a whole, helping us to better meet our Paris Agreement goals.

In addition, digitalisation allows faster problem detection and resolution of problems: For instance, by using smart grid technologies and automated fault detection, some of our network operators were able to reduce the outage time to less than 1 minute thus improving flow and delivery in the system and reducing costs.

Consumers are at the heart of the energy transition and the Clean Energy package. Technology developments in use and access to renewables, better rollout of smart grids, smart homes, and battery storage solutions make it possible for energy consumers – both at domestic and industrial level - to become active players on the market both as producers and as demand managers. The electricity market proposals should provide consumers with free access to their consumption data and ensure the interoperability of smart metering systems, including through open standards. Consumers will have the right to share their data with third parties under a single harmonised format, which should improve competition and foster the development of new business models. These new technologies will also help to keep our electricity supply competitive and affordable, and maintain high standards of security of supply.

As Europe's energy systems move towards more effective and more efficient decarbonisation, decentralisation and distribution, we need to ensure that the greater role of digitalisation is recognised and encouraged in all areas of the energy sector. As Commissioner Arias Cañete often says, the clean energy transition will be good for the economy (in the form of jobs and growth), good for the environment (in the form of cleaner energy and reducing air pollution) and good for consumers (in the form of potentially cheaper bills and improved quality of life). But we will not achieve these benefits without incorporating new digital opportunities.

To sum up, the Commission objective of attaining of a fully Digital Single Market goes hand in hand with the Energy Union goals - their objectives are not just compatible, but essential for each other – digital transformation and the clean energy transition are the future. ■

INTERVIEW

J. Buzek: 'We must be able to use all the indigenous energy sources available in Europe'

Jerzy BUZEK
Chair of ITRE Committee, European Parliament

From renewables to clean coal technologies, all sources should be used in the most efficient and environmentally sustainable way, to ensure our energy independence and thus security, stresses Jerzy Buzek, Member of the European Parliament, Chair of the ITRE Committee, in its most recent report 'Accelerating Clean Energy Innovation,' published mid-September 2017.

What is the vision you want to underline with the 'Accelerating Clean Energy Innovation' report?

My intention in drafting the report was to strengthen the Commission's communication in three areas: ensuring better coherence of EU actions; focusing incentives, improving legibility of financial instruments and mobilising equity capital; setting in place the right framework for citizens to gradually become the driving force behind energy innovation. I believe these three areas hold the key to accelerating clean energy innovation in the EU, and the concrete proposals I have made focus primarily on these areas.

However, putting in place the right solutions requires a proper understanding of the wider context. In the EU, but also globally, our economies are undergoing a profound transition in the way they produce, transmit, store and use energy. This transition is founded on three elements: the most fundamental is the need for affordable, reliable and secure energy to power our economic growth. Ensuring our economic growth over the long-term requires in turn an ever more sustainable use of available resources. In parallel, we are witnessing a technological revolution, driven in particular by digitalisation and which offers new opportunities to also redesign our entire energy systems.

In short, clean energy innovation has great potential to give European economy as a whole a global economic advantage. It is about economic growth within our internal market, but also worldwide. At the same time, we must be able to use all the indigenous sources available in Europe—from renewables to clean coal technologies—in the most efficient and environmentally sustainable way. This is a crucial factor for our energy independence and thus security.

What kind of incentives can push energy companies to spend more for innovation? What can be the role of the EU in this regard?

First of all, we need to recognise that investments in energy innovation, particularly those of systemic nature, require long-term certainty and stability as regards policy vision, legal framework and targeted incentives, i.e. funding programmes, support schemes, etc. The challenge here is not only to ensure long-term stability of EU energy policy, but moreover having it reflected across all relevant policy strands: research, digital union, transport, regional policy, services, manufacturing, reindustrialisation, etc. In parallel, we need to seek compatibility of this framework with national priorities and programmes supporting energy innovation, so that we avoid duplication but more importantly, divergences that might hamper energy innovation deployment.

Secondly, we need to more effectively coordinate the relevant support programmes and funds at EU and national level to stimulate energy-related innovation. Increasing the R&I resources directed to energy innovation is one thing. In the EP we have already called for an increased budget of €120 billion for research and innovation under the next MFF. In my report, I am suggesting, on top of that, a 50% increase of the share of energy-related innovation financing. This should ensure that we more than double the resources available for investment in energy innovation. However, all these funds can only be complementary to investments from the private sector, which in real terms carries the bulk of investments needed.

Finally, at the level of the EU we can still do a lot to avoid duplication, and improve legibility of the various funds, programmes and financing tools available for in-

> We are witnessing a technological revolution, driven by digitalisation, which offers opportunities to redesign our entire energy systems

novators. We should also improve their compatibility, so that investors can tap to various sources—from EU programmes and investment funds, Structural Funds, EIB, etc.—more easily in financing concrete projects.

What should be the role of the traditional players (big power plants, TSOs etc.) in the energy sector in the new scenario, with the prosumer in the centre?

The citizen-centred approach to EU's energy transition is reflected across the entire Clean Energy Package for All Europeans. Our Energy Union in general should, as its end goal, serve consumers—by ensuring secure ▶

INTERVIEW

CONTINUED

J. Buzek: 'We must be able to use all the indigenous energy sources available in Europe'

Jerzy BUZEK
Chair of ITRE Committee, European Parliament

and affordable access to energy. Our energy generation is becoming ever more dispersed—according to available forecasts by 2050 more than 80% of all EU households could be involved in energy production if storage and demand response are included. Consumer's choices will also gradually become drivers of energy-related innovation.

All this will require the traditional players in the energy sector to adapt to the need for more flexibility—in generation, demand-side response, interconnections and storage. It is about developing smart grid and new energy-related services for end consumers. Our energy enterprises must be prepared to provide clear pricing, comparable tariffs as well as offer dynamic electricity price contracts and easy switching. There is the need to brace for new business models and business opportunities that come with energy-related services, digitalisation and choices that conscious energy consumers make.

Ultimately, innovations—which today are difficult if not impossible to foresee—will be defining the course of changes that will also affect the traditional players. However, certainly in mid-term, they will continue to play the crucial role in balancing the energy systems and ensuring their overall stability.

In conclusion, the energy transition that I described in the beginning poses clear challenges for all stakeholders, including the traditional energy players you refer to. We will only overcome those challenges by embracing innovation across all energy sectors, and perhaps particularly in systemic solutions. This is our best chance for turning this profound energy transformation into a springboard for secure and sustainable growth, EU's global industrial leadership, as well as a key building block of an engaged, knowledge-based society of tomorrow.

WARDYNSKI&PARTNERS

Definition of Innovation from the EU Regulation Point of View

Agnieszka KRAIŃSKA, Radosław WASIAK
Lawyers, Wardynski & Partners

The word 'innovation' is one of the buzzwords in media, political programmes, legal documents and acts. Intuitively, one can understand what the word means, but when checking European programmes, documents or legal acts, things get blurry.

The OECD's website and its Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition of 2005, presents different types of innovation:

- Product innovation: A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics.
- Process innovation: A new or significantly improved production or delivery method.
- Marketing innovation: A new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
- Organisational innovation: A new organisational method in business practices, workplace organisation or external relations. The 'Innovation Union' is one of the seven flagship initiatives of the Europe 2020 Strategy announced in 2010. It aims to improve conditions and access to finance for research and innovation, to ensure that ideas can be turned into products and services that create growth and jobs.

The Europe 2020 Strategy says: 'As we emerge from crisis in the teeth of fierce global competition, we face an innovation emergency. If we do not transform Europe into an Innovation Union, our economies will wither on the vine while ideas and talent go to waste. Innovation is the key to building sustainable growth and fairer and greener societies. A sea change in Europe's innovation performance is the only way to creating lasting and well-paid jobs that withstand the pressures of globalisation.'

WARDYNSKI&PARTNERS

CONTINUED

Definition of Innovation from the EU Regulation Point of View

Agnieszka KRAIŃSKA, Radosław WASIAK
Lawyers, Wardynski & Partners

According to the Commission, there is no one single definition, but innovation as described in the Innovation Union Plan, broadly means change that speeds up and improves the way we conceive, develop, produce and access new products, industrial processes and services. Changes that create more jobs, improve peoples' lives and build greener and better societies.'

The OECD definition and the Commission's definition complement each other. Therefore, there can be product, process, marketing and organisational innovation which should create more jobs, improve peoples' lives and build greener and better societies.

As regards to the energy sector, innovation is widely present in European initiatives, programmes and policies focusing on those areas. The common aim of such action is to introduce new energy technologies within the European Union that will help to improve energy sustainability as well as to reduce greenhouse gas emissions. This can all be achieved by promoting new energy production technologies such as photovoltaic, wind generation, carbon capture and storage system, as well as highly innovative production of energy in fusion. Further development of such technologies may not only prevent or limit disadvantageous impact of the energy sector on environment, but also increase the level of European energy independence for external sources of fuels and consequently increase security at supply level. In this context, innovation should be recognised as one of the most important elements of the Energy Union. One cannot fail to mention that the Energy Union is built on closely related and mutually reinforcing dimensions. Among others, research, innovation and competitiveness (defined as supporting breakthroughs in low-carbon and clean energy technologies by prioritising research and innovation to drive energy transition and improve competitiveness) play a key role.

High costs of innovation technologies in energy may prevent private companies from such investments, however, that are necessary from a political and social point of view. Therefore, innovation in the energy sector becomes one of the main targets supported in several European initiatives.

As an example, we can specify the European Strategic Energy Technology Plan (SET-Plan) which was established to promote research and innovation efforts for low-carbon technologies across Europe. This goal is achieved, inter alia, by taking the number of actions including coordination of national programmes and securing financing for project development. The new European research and innovation strategy presented by the Commission in 2015 should also be mentioned as an impulse for energy innovation within the EU. Among others, it identifies a number of actions for research and innovation, based on an assessment of the European energy system's needs and on their importance for energy system transformation. It also presents an innovation system starting from research to market uptake, and tackles both financing and the regulatory framework. Also worth mentioning are the European Technology and Innovation Platforms (ETIPs) created within and supporting the implementation of the SET-Plan by bringing together EU countries, industry and researchers in key areas (including wind energy, solar energy, biofuels or even ocean energy).

To summarise, although we did not find any legal definition of innovation in EU legal acts, it is present therein at different levels and influences the future of the European economy, especially including the energy sector. Taking into consideration the aim of the Energy Union, the future of innovation is bright and will be developed within the EU legal framework within the next few years.

PGE

The Innovation Fund in the Framework of the ETS. How Should it Be Designed?

Dominika NIEWIERSKA
Chief Specialist, PGE Polska Grupa Energetyczna S.A.

The legislative proposal to revise the EU ETS Directive sets forth the Innovation Fund (IF), whose aim is to support demonstration projects of innovative renewable energy, environmentally safe carbon capture, storage and use (CCS/CCU), energy storage and low-carbon innovation in energy intensive industry. According to the EC's proposal, at least 400 million allowances should be reserved from 2021 onwards for this purpose. In addition, a further 50 million of the unallocated allowances from 2013–2020 should be set aside, together with remaining funds from the second call of the existing NER 300 Programme, to enable earlier support to eligible projects, i.e. before 2021.

Currently, the EU ETS trialogue is ongoing. European Parliament proposes to increase the amount of allowances available under the Innovation Fund to 600 million. The final form and amount of allowances dedicated to the Innovation Fund will be known after the trialogue has been finalised. As far as we know, the Council does not exclude further discussion about increasing the size of the Fund.

The Innovation Fund is the NER 300 programme's younger brother and based on its experience.

The NER 300 programme:

- established carbon capture and storage (CCS) and innovative renewable energy (RES) projects,
- awarded €2.1 billion to 38 innovative renewable energy projects and one CCS installation.

Energy-intensive industries and the energy sector need to continue to contribute in the next decade and beyond to meet climate and energy targets. It's indisputable that in order to reach these long-term decarbonisation goals, innovation will be a key player.

The Innovation Fund should definitely help the industry and the power sectors to meet the investment challenges by supporting innovative demonstration projects in energy intensive industries, renewable energy, energy storage, and carbon capture, storage and use. The design of the Innovation Fund will have to address the specific market needs and demand for low-carbon innovation, while ensuring effective use of the funds available.

In June 2017, the European Commission completed and published the key recommendations for the Innovation Fund based on experts' opinions from energy intensive industries, renewables, energy storage, and carbon capture and storage sectors. Sector experts identified several key business drivers for low-carbon innovation including:

1. Cost Savings and Competitiveness;
2. Carbon Price;
3. Developing Robust Inter-Industrial Collaboration Models;
4. Reduced Environmental Externalities (delivering Improved Corporate Sustainability Reputation);
5. International Competition for low-carbon products.

But firstly, the fundamental question is 'What is the definition of innovation?' The answer for this question should be the base for designing the Innovation Fund. Innovation do not have to always mean something new, sometimes the improvement of existing technologies brings very good results and the Innovation Fund should not lock in only for dedicated categories. Both existing and emerging technologies could be considered as potentially innovative especially if innovative business models are needed to ensure that a given technology can break through. All technologies, which lead to GHG emissions' reduction should be taken into consideration.

However, the more a technology is at an early stage of its development, the more it is innovative and risky, so it needs more public funding support. For that reason, the Innovation Fund should offer mainly grants.

Secondly, the stability of the regulatory framework for mature and less mature technologies, not only during innovation projects lifetime, but also within next stages of implementation, until commercialisation is very important for investors.

Unquestionably, the Innovation Fund should have clear criteria and requirements for a projects selection process. The decision-making process also should be transparent as much as possible. The more complicated the process will be, the more potential beneficiaries will not participate in it and the chance for the Innovation Fund successful implementation would decrease.

In general, the concept of the Innovation Fund is a good solution for innovation projects development in the context of EU targets, but we have to remember about NER 300 weaknesses. The aim of NER 300 was to establish a demonstration programme comprising the best possi- ▶

The Innovation Fund Value Estimation	According to the European Commission's proposal	According to the European Parliament's proposal
Number of EUAs	EUA 450 m	EUA 600 m
EUAs' value estimation	€11.4 bn	€15.2 bn

PGE

CONTINUED

The Innovation Fund in the Framework of the ETS. How Should it Be Designed?

Dominika NIEWIERSKA
Chief Specialist, PGE Polska Grupa Energetyczna S.A.

ble CCS and RES projects and involve all Member States. The programme intended to support a wide range of CCS technologies (pre-combustion, post-combustion, oxyfuel and industrial applications) and RES technologies (bioenergy, concentrated solar power, photovoltaics, geothermal, wind, ocean, hydropower and smart grids).

Under the first NER 300 call for proposals, the European Commission made funding awards for a total value of €1.1 billion to RES projects only (20 renewable energy projects). None of the CCS projects was awarded. Under the second award decision in July 2014, the European Commission awarded a total of €1 billion in funding to 18 renewable energy projects and one carbon capture and storage project. However, some awarded NER 300 projects may be cancelled. Beyond the complicated character of such technologies and lots of technical problems during its implementation, investors met a bigger problem—money. The NER 300 was not enough to cover the investment costs, and without national programmes dedicated to the above-mentioned projects, which could support NER 300, the financing gap remained uncovered.

It is one of the most important lessons learnt from NER 300 programme—the necessity to give investors the opportunity to build the full money value chain, with one key source—the Innovation Fund supported by the national dedicated funding programmes.

As a company from the energy sector, for which the innovation aspects are an important part of our business, we are looking forward to seeing the final version of the Innovation Fund with its final requirements and criteria, which can be perceived as potential financing sources for our innovative renewables projects, such as the floating photovoltaic power plant, the floating lidar pilot project or photovoltaic power plant integrated with innovative energy storage, but we also cannot forget about existing power generation technologies, which can be developed with the innovation spirit.

Key experts' recommendations how to design the Innovation Fund
Clear list of finance products on offer, with investment grants having a major role
Simple, two-stage application process with multiple competitive calls leading to agile decision making processes supported by adequate resources for the Innovation Fund implementation
Aligning the timing of support with funding needs (through milestones-based disbursement)
Ensure complementarity between the Innovation Fund and other EU and national funds
Enable and incentivize cross-sector collaboration by supporting consortia with cross-sector technologies

EPSO-G

Why Should an Underestimated Biomass Market be Given a Better Chance?

Rolandas ZUKAS
Chief Executive Officer, EPSO-G

The European Union's binding target of a 20% share of renewable energy by 2020 has proved to be a very efficient tool, not only to drive the technology innovation, but also urging them to take a closer look at options available on the local biomass market and beyond. As it often does, it turned out that the innovation in, until recently, a shy biomass market was at hand all this time. If we have a well-functioning spot oil market, why should trading biomass fuel be different?

Tradition based innovation

That was the basic idea behind Lithuania's biofuel spot exchange BALTPOOL, part of the EPSO-G group, which was set up a few years ago. It was designed to offer local market participants a simple yet handy tool to find out biomass market prices and buy wood chips and pellets of a required quality right away.

As it usually goes with each innovation, the fanciest part was to pass the usual suspects—the 'no-sayers,'. But since then, biofuel exchange has showed its stren[illegible] at just a few years apart, the economics of bioma[illegible] have proved very sound, not to mention the enviro[illegible] benefits.

As the exchange trading paved a path to transparent price formation, Lithuania chose to require all regulated heat providers to buy biomass via BALTPOOL, unless they could source biomass cheaper elsewhere.

Lithuania consumes roughly two million tonnes of wood chips a year. The new regulation has helped considerably and regulated companies already trade 90% of their biomass over the exchange. On top of that, almost one third of the 297 registered buyers, that are not regulated and have no obligation to do so, opted to trade on the exchange on their own preference with an increasing number of them coming from neighbouring markets.

How does it work?

A trading auction takes place every Tuesday. Until 10.30 EET, the buyers shall submit their orders. Then sellers submit their orders (until 11.00 EET) and at 11.00 EET the action begins. During the auction only the sellers may reduce their orders prices—buyers cannot change their orders. Every lowering of the price prolongs the trading session by three minutes. The auction can last up to 12.00 EET at the latest.

The buyer needs only to enter a maximum price they want to pay for biomass and amount in energy value (tonnes of oil equivalent or MWh). After that, sellers compete for the buyer's order by lowering their prices. Participants may conclude contracts for different periods: week, month, quarter and half-year.

The most popular periods are "week"—about 40% of all contracts are concluded for this period, and the longest available contracts (quarter and half-year) also constitute about 40%.

Immediately after, the auction trading results are sent to participants. Only then do participants see with whom they made contracts—all the trading is anonymous. Only prices and quantities are shown in the trading table. This guarantees transparency and efficient price formation in the market.

What are the benefits?

Since 2015, the value of traded contracts more than tripled with 59,000 trucks full of wood chips (1.8 million tonnes) traded last year.

BALTPOOL, now the number one meeting spot for anyone wanting to buy or sell biomass in Lithuania, has 297 registered members from all three Baltic States and Belarus. Last year, 88% of all biomass produced in Lithuania for regulated heat producers was traded there.

Buyers on the exchange have already saved more than €11 million on biomass since the beginning of operations, which has resulted in lower heating prices for final consumers. Exchange ability to establish a fair market price of biomass ensures that the market will get full benefits from the conversion of gas to biomass in the heating sector. The exchange trading has naturally had an impact on the once astonishing divergence of market prices across the country.

Recently, the difference in prices has shrunk, largely due to the fact that BALTPOOL has become a preferred trading place by the absolute majority of market participants.

On top of low divergence, prices at the exchange remained more or less steady, also serving as a proof of efficiency of trading at the exchange.

How the exchange changed the market:

- Standardised biomass products and biomass supply procedures
- Equal and transparent trading rules to all participants
- Low market barriers for new market participants
- High market liquidity and low systemic risk in the market
- Effective price establishment mechanism—open auction

The popularity of biomass in Lithuania has several reasons—on the one hand, the country is heavily reliant on gas and oil imports and is looking forward at every option to diversify its energy supply. On the other hand, a third of the country´s territory is covered in forests, which makes logging pretty easy. However, the latest trends show that ▶

EPSO-G

CONTINUED

Why Should an Underestimated Biomass Market be Given a Better Chance?

Rolandas ZUKAS
Chief Executive Officer, EPSO-G

biomass fever is spreading to other countries as well. Therefore, we believe that electronic biomass trading centres are really necessary for the market, especially considering all those new projects in Europe which plan to use biomass.

Going ahead

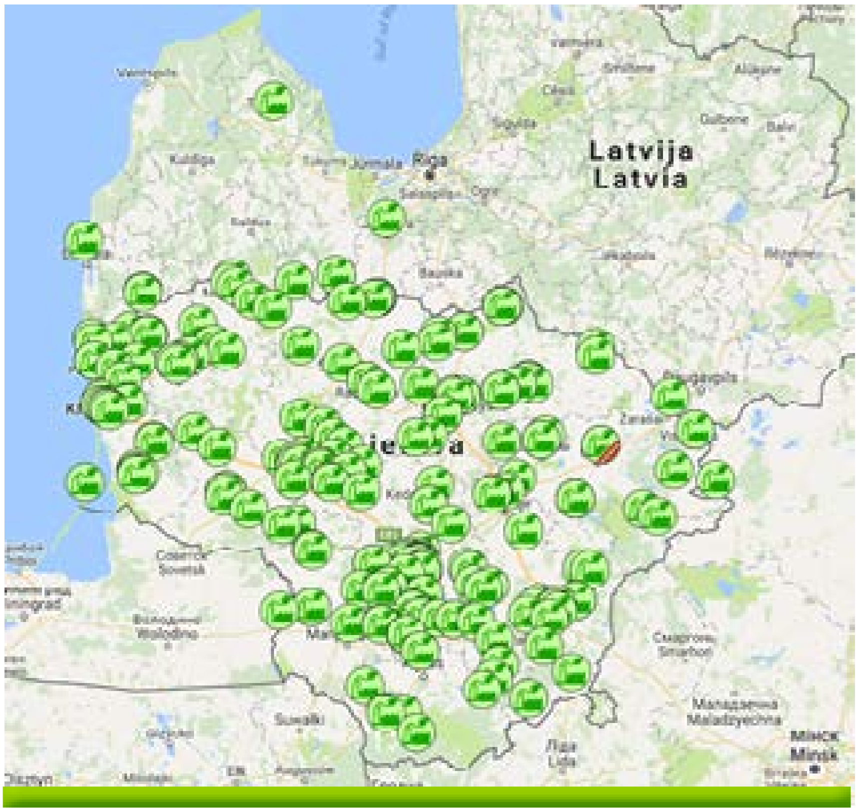
We believe that active cross-border trade may further contribute to a successful biomass market development and fair market price formation.

For this purpose, BALTPOOL made required changes to its trading system and processes in 2016 to be able to accept foreign participants in the exchange. The results are encouraging—today BALTPOOL has 20 foreign participants from neighbouring countries and many more are closely eyeing the new practice.

This sends us a clear indication that elsewhere in Europe there is an obvious need for a convenient place to trade biomass products. Especially when developers of new projects already plan to source biomass not only from local markets, but also from other countries which have more biomass to offer.

And we are ready to share our knowhow—the beauty of the BALTPOOL system is its simplicity—as it does not require the buyers to own their procurement divisions, and they are free from long negotiations with potential suppliers every year. All one needs to do is to put the order in the exchange. This system can be easily adopted by other countries! Shall we?

Rolandas Zukas, chief executive officer of Lithuania's state-run holding EPSO-G in charge of the country's electric energy and natural gas transportation systems and biofuel trading platform, BALTPOOL.



Registered buyers,
BALTPOOL (October 2017)

PSE

The Future of Electricity Transmission. A Challenging Environment for TSOs

Bartosz KWIATKOWSKI
R&D Director, PSE Innowacje
Joanna RYCERZ
Consultant, PSE Innowacje

Electricity markets across Europe have been experiencing a tectonic shift in the last decades due to unprecedented conditions. To a lesser extent, it is a result of regulatory actions initiated by the European Commission, but the main reason are the megatrends of an energy transition affecting the industry. What makes the market different are primarily the technological changes in the field of power generation (supply side), the proliferation of increasingly smart industrial and household devices (demand side), as well as the sheer scale of interconnectivity enabled by evolving IT systems.

In Poland, the share of stochastically operating Renewable Energy Sources (RES) connected at the DSO level, increased by almost 40% in terms of total capacity last year. This substantial shift towards decentralised generation brought new challenges for balancing the electricity system. System operators, responsible for maintaining grid's stability and operational security, are now facing the need to redefine their relations with third parties – to forge close, real-time cooperation.

Instead of central dispatch and a limited number of bilateral interactions with an oligopoly of vertically integrated entities, the market is increasingly influenced by a growing number of market participants, ranging from competing small and medium enterprises (SMEs) investing in RES, to individual prosumers. Usually they are neither prepared nor interested to participate in the electricity market on the same terms with traditional players. Increasing the level of volatile generation and consumption may also lead to higher costs of securing adequate system reserves.

These new energy sector conditions were well defined in the document developed by the Polish Ministry of Energy: "Guidelines for Development of Energy Innovations". There is no alternative way: new business models and services are arising, changing the way TSOs have managed electricity systems in past decades.

A shift in demand

The increasing volume of Renewable Energy Sources connected to the grid is the major trend on the supply side of the market. However, the demand for electricity sees a similarly essential transformation. while the industrial consumption of Energy remains largely flat and is not expected to drop despite the advances in energy efficiency and productivity, SME and households experience a real revolution. The energy consumption profile is changing rapidly. Heat waves observed in recent years triggered growth in the HVAC market in Poland. Households are acquiring small air conditioners which have never been considered a standard equipment for an average apartment. SME sector, tottering in the past on the brink of liquidity, recently shows more ambition, investing in technologies and increasing the consumption of electricity. Small manufacturers are on the rise, particularly in the niche industries. In Poland, like in many other EU countries, peak demand for power in summer months is higher than ever before.

If the ambitious electromobility programme announced by the Polish Government in 2016 turns out to be a success, the highly variable demand generated by car chargers will become yet another factor for consideration. Development of the charging infrastructure is the primary challenge for a successful electric mobility, yet often is omitted. How does the electric car look like from the perspective of the power network? It is literally a moving battery, connecting irregularly to various nodes of the grid and instantly boosting local load. Multiply it by a thousand and the TSO has an essential issue to manage. Multiply it by a hundred thousand, and the TSO needs to implement a tool to mitigate the peaks in power demand. Massive deployment of electric chargers may pave the road for another novelty though – energy storage systems may be a vital companion, as they have the potential to reduce the strain on power system operators.

Trends mentioned above add up to the new energy consumption profile that is different from the one prevalent in recent decades. The emerging profile is characterised by relatively stable total annual energy consumption with increasingly stochastic daily fluctuations and peak demands in summer higher than ever before.

Implications for the grid

Keeping the grid stable and balanced is therefore becoming increasingly more difficult. On the supply side, the Centrally Dispatched Generating Units are deemed to gradually lose prominence and demand for power gets harder to predict. PSE is currently participating in the EU-Sysflex project within the Horizon 2020 programme and, taking the advantage of the real-time Dispatcher Training Simulator, plans to test scenarios for the power grid of the future – far more stochastic and supplied to a large extent by Renewable Energy Sources connected primarily to low or medium voltage network. The final results of such simulations will be available no sooner than 2020, but indications are clear: dispatchers in the decades to come will have a job different from what they are familiar with today, and new instruments will be necessary to secure the stability of the transmission system.

First and foremost, new analytical and forecasting tools

PSE

CONTINUED

The Future of Electricity Transmission. A Challenging Environment for TSOs

Bartosz KWIATKOWSKI
R&D Director, PSE Innowacje
Joanna RYCERZ
Consultant, PSE Innowacje

will be essential. Given the increasingly variable nature of power supply and demand, adoption of stochastic principles seems necessary. Major TSOs in Europe are constantly improving their toolbox in this field and they are gradually introducing new features: from predictive maintenance and short-term generation forecasting to long-term planning of outages and grid development.

Second, quite soon, Artificial Intelligence and machine learning tools may be adopted in various parts of the transmission system to assist the decision-making processes necessary for stable grid operations. Some functions are likely to be delegated (e.g. local balancing on the level of energy clusters), and some automated – one example is the application of a distributed ledger technology for empowering prosumers to join energy trading. In such cases, algorithms may include the primary principle of grid security. The industry of energy transmission and distribution is ripe for disruption.

Addressing the issue

The Polish transmission system operator is well aware of the looming challenges. To address them, PSE is particularly active in developing market incentives. A range of Demand Side Management instruments is considered. The new framework for Demand Side Response (DSR) was implemented in 2017, through two separate programmes –guaranteed load reduction and optional load reduction.

The TSO is organising a procurement process based on reverse auctioning model and the bidders offer to reduce temporarily their power usage upon TSO's request by a certain amount; in the latter case they are compensated only for the executed reduction, in the former – also for their readiness to do so. The introduction of the new DSR instrument triggered the need of so-called aggregators: a new business model based on pooling electricity consumers and connecting them by an IT system to ensure that the required load reduction is executed at the lowest possible cost and with the lowest possible interruption of operations. As a result, the DSR mechanism resulted in an accelerated proliferation of smart energy management systems, paving the path for entirely new business opportunities.

Aggregators are well positioned to lead the way to new services on the energy market.

Implementation of the new services comes with a variety of analytical tools. The Polish grid operator embarked in 2016 on the mission to build a unique analytical capability, combining in-depth balancing market know-how with advanced mathematical skills provided by the academic Interdisciplinary Division of Energy Analyses. The initiative just began to bear fruit – PSE is gradually building an extensive set of applications, loop flows and dispatch models as well as other predictive tools to get ready for the future electricity market design. Like in early 2000s in the financial industry, now mathematicians are headhunted by the power system operators – to establish algorithms for adequate reserves, fair burden-sharing, pricing of ancillary services, prediction of RES generation and electricity consumption as well as many others.

Pilot projects as the one being implemented at the local level by a consortium of the Polish TSO, DSO and Japanese NEDO, aim at exploring the possibilities for combining energy storage system and smart grid solutions, to reduce strain on the transmission system. Effectively, investments in localised load balancing may bring saving on reinforcement and maintenance of the transmission infrastructure – a major cost counting in billions of Euros every year. All these projects require integration with the existing IT infrastructure. The effort currently put by the TSOs in upgrading their IT systems to implement new services is truly unprecedented. Advanced solutions, like DSR mechanism or electricity market management system, require an entirely new approach to the IT infrastructure, collecting and managing vast amounts of data and establishing new interfaces to communicate with the service providers.

Over the past few years, consulting companies frequently ranked power sector as lagging in terms of innovation in comparison to other industries operating on more competitive markets. This perspective is now rapidly changing, as the main players strive to adopt solutions to accommodate the future of the energy market. The Industry 4.0 slogan was the trend across Europe, but now it is becoming the reality for the transmission industry.

First published on warsawinstitute.org and republished here with permission

ANALYSIS

Poland on the Road to Electromobility

Michał KURTYKA Ph.D
Undersecretary of State. Ministry of Energy of Poland

Electromobility is one of several strategic directions for Poland's economic development in the near term. On 16th of March, 2017, the Polish government adopted the Electromobility Development Plan, which sets goals and directions for action in this area until 2025.
The energy composition of transport fuels, shaped through history, is a major challenge for both the Polish power industry and its transport sector. In time, it will also increasingly burden Polish cities, where noise and pollution are already a significant discomfort for inhabitants. From this perspective, electromobility is a strategic choice that will not only reduce dependence on energy imports, but also has the chance to become a competitive advantage for the Polish economy.

Global trends

The emerging market's potential is best illustrated by a forecast indicating that around 500 million electric vehicles (out of 2 billion vehicles in total) will be driving on the world's roads in 2040. As a consequence, we can expect the sales of electric vehicles to grow rapidly — today about 500,000 units are sold each year, while in 2040 it could even reach 41 million units. [J. MacDonald, Electric vehicles to be 35% of global new car sales by 2040, www.bnef.com] The expected market growth exceeds the production potential of today's electric car manufacturers many times over.

In the present circumstances, it's difficult to imagine the appearance of a mass-production car company based on the traditional combustion engine. The examples of Tesla, Google and Apple show that in the case of electric vehicles, the barriers to entry are considerably smaller. This applies not only to the construction of entire vehicles, but also to individual components. At the same time, it is a good opportunity for countries like Poland, which have not accumulated enough capital to compete in the traditional vehicle market.

Polish answers

For this reason, one of the objectives of the Electromobility Development Plan is the advancement of the electromobility industry, which can be done both through an appropriate proportion of electric vehicles produced in Poland out of the total number of vehicles and by a suitable degree of saturation of vehicles registered in Poland with Polish components.

Already today, a few Polish companies that bet on electromobility some years ago remain the European market leader in their segments. Solaris is a brand of electric buses not only recognised in Europe, but globally. Many companies that have contributed to Solaris's success by providing the charging infrastructure or components for the production of electric buses offer their own products independently on the European market today. What can be done for these companies to continue to grow? What can be done to add new ones?

Government activities are currently focused on two areas: the creation of future demand and targeting financing towards research in the field of electric vehicles and associated infrastructure. In April, the Ministry of Energy presented a draft law on electromobility, which comprehensively regulates the situation of consumers and manufacturers of electric vehicles. After the entry into law of the act:

- the purchase of an electric car will be cheaper (ex emption from excise tax);
- the driver of an electric car will be able to drive more comfortably (allowed the use of bus lanes) and cheaply (free parking in city centers);
- by 2020, a charging infrastructure for electric vehi cles will be established (over 6,000 points in 32 metropolitan areas);
- local governments will be more eager to choose electric buses (infrastructure construction will be faster and cheaper);
- local authorities will be given a real tool to fight for better air quality in their area (possibility of establishing zero-emission zones).
- The bill is a result of the annual cooperation of the Ministry of Energy with companies and its analysis of the experiences of other countries. The electromobility act will be a constitution for market development — eliminating identified barriers and creating new advantages.

An important aspect of the adoption of the law will be the creation of sufficient demand for electric vehicles. In addition to incentives for businesses and individuals, the electromobility act introduces incentives for local and central administrations to switch to electric transport. We've proposed that by 2025, 50% of cars used by the central administration be powered by electricity.

I am convinced that the law will not only contribute to industry development, but will also lead to a significant increase in the number of electric vehicles on the roads, which is also a goal of the Electromobility Development Plan (1 million electric vehicles by 2025).

Innovative approach to R & D

The biggest challenge, but at the same time the programme's biggest opportunity, is to create a new industry. This will not be possible without concentrating R & D ►

ANALYSIS

CONTINUED

Poland on the Road to Electromobility

Michał KURTYKA Ph.D
Undersecretary of State. Ministry of Energy of Poland

resources, which have the chance to play the role of a springboard for good ideas in electromobility.

As part of the implementation of the Electromobility Development Plan, the first dedicated financial support instruments for both companies and local government units have been launched. The Ministry of Energy is working on the establishment of a Low-Emission Transport Fund, which will generate nearly 5 billion PLN ($1.3 billion) to support the construction of infrastructure, vehicle purchases and electric vehicle manufacturers. The National Fund for Environmental Protection and Water Management is also working on a dedicated programme.

The National Center for Research and Development (NCBiR) is launching the No-Emission Public Transport programme, which aims to develop a next-generation electric bus. It's worth emphasising the programmé's unique formula, where research is started only when there is sufficient demand for an innovative product. NCBiR is currently working with cities to identify their needs in relation to electric buses. In the next phase, NCBiR will launch a research competition which will result in the development of a bus, as defined by local authorities. Buses will then be purchased by cities that were involved in conceptualizing the product. This formula maximises the chances that the effects of R&D will be used commercially.

Another manifestation of the innovative approach to the development of the industry is the activity of Electromobility Poland, which is supposed to lead to the launch of Polish electric cars, but not through building independent production lines, but by supporting existing private entities. The primary tool of Electromobility Poland for achieving this goal is the engagement of entities operating on the Polish market in the field of vehicle or component production, integration of their potential and preparation for the industrialisation stage.

New models in the electromobility market

I am convinced that there is no turning back from electromobility. The question is not if but when electric cars will become a natural element on the landscape of our streets. This demonstrates the activities of auto companies, which are focused not only on the adaptation of gas-powered cars to electric propulsion, but also on finding completely new forms of transport use, for which electric drive is only a means and not an aim. This is quite natural, given the increasing volume of traffic in city centers, problems with access to downtown at peak hours or insufficient parking spaces. An electric vehicle, being quiet and non-polluting, will gradually gain in popularity.

However, it is not yet known what type of cars, including electric, will be used in the cities of the future. U.S. research shows that the average car sits unused 96% of the time. European studies show that statistically we use the car for about an hour a day. This means that cars take up public parking space instead of moving. The better use of vehicles that have arrived in the city center and for some reason must remain, poses a challenge, but also presents a chance to spread alternative ways of using cars. Increasingly popular car sharing and carpooling provide a partial answer, but business models in the electromechanical market provide much food for thought.

In the electromobility act, we introduce the possibility of establishing zero-emission zones in city centers. Such a move, though judged by some to be socially difficult, is necessary to create a space in which new business models can emerge. Gradually, we want to persuade Poles that city centers without gas-powered cars can not only be more appealing, but also more efficient in terms of the mobility options offered.

Change means opportunities

Henry Ford, who introduced the Ford Model T in 1907, a relatively low-priced car that revolutionised transport at the beginning of the 20th century, liked to say that if he asked people what they wanted, it would have been a faster horse. This did not prevent him, however, from selling over 15 million Model Ts in 20 years. In a short period, the internal combustion engine had displaced horse transport from American roads. Technological change had defended itself. The car was simply more reliable, comfortable and faster. I'm convinced that a similar revolution awaits the automotive sector in the coming decades.

A unique opportunity is presenting itself to Poland to enter a growing segment of the world market and to occupy an important place in it. In preparing the Electromobility Development Plan, we have tried to create levers that will enable us to capitalize on our domestic social capital. Polish students win world competitions in the fields of robotics, electrical engineering and computer science. Polish designers and engineers are working successfully for the world's biggest automotive companies. It's time for a project on a scale that matches their ambitions and skills, which will encourage them to join in the construction of Polish, and perhaps eventually global brands in the electromobility market.

ANALYSIS

Electrifying Opportunity. E-mobility in Visegrad Countries

Marcin KOROLEC
President of the Electric Vehicles Promotion Foundation
Krzysztof BOLESTA
Director for Research at Polityka Insight and the vice-president of the Electric Vehicles Promotion Foundation

The volatility of oil prices and recurring geopolitical tensions in some of the most important oil producing countries, growing environmental and climate awareness combined with technological advances have led to a resurgence of the electric car. An important milestone was the launch of the Tesla Roadster in 2008—the first mass-produced electric car, equipped with lithium-ion batteries. From that point, the number of electric vehicles has continued to grow. In 2015, it crossed the barrier of one million registered electric cars. A year later, the 2 million mark was easily passed. This pace of change in the automotive sector will continue to increase.

According to estimates of the International Energy Agency (IEA), by 2030 there will be between 56 to 200 million electric cars worldwide. Bloomberg New Energy Finance predicts that by 2025, electric cars will be as cheap as gasoline vehicles with the global electric fleet hitting 530 million vehicles by 2040. USB, a Swiss bank, is even more bullish pointing towards price parity in Europe by 2018. In the most aggressive projection, ING, a Dutch bank, claims that all new cars sold in Europe will be electric within less than two decades.

Visegrad countries are slowly waking up to this new electrification trend. The Polish government's strategic document setting objectives for the whole economy—Responsible Development Plan—provides a platform for e-mobility development. A number of implementing documents have been proposed. The country has the ambition to become one of the pacesetters in the global value chain of e-cars and e-buses manufacturing, and is already sporting a leading electric bus manufacturer in Europe—Solaris. It supports the European Commission in pushing for a joint European answer to American and Chinese lithium-ion battery gigafactories. Hungary also sees e-mobility development as a way to boost economic growth. It tries to establish a supplier industry inter alia through spurring internal demand. In 2016, around €6.5 million were spent for subsidising sales of e-cars. Slovakia also features an electric vehicle subsidy scheme where all-electric vehicle buyers are eligible for a €5,000 bonus from the state. Slovakia is also home for GreenWay, an uncontested leader in the region in fast charging infrastructure development. In the Czech Republic, the two largest companies, carmaker Škoda Auto and energy giant ČEZ, are keen on the idea. They work together to develop both electric cars and infrastructure. Global battery producers recognise the region as a suitable place for investment. V4 countries already host Samsung (Hungary), LG Chem (Poland) and A123Systems (the Czech Republic) and more investment decisions are expected soon.

Electrification of transport is certainly an idea that some politicians from Central and Eastern Europe see as an opportunity. The region has a strong manufacturing base and a well-developed automotive industry value chain. E-mobility constitutes a disruption that could help V4 in climbing a ladder towards a more lucrative end of the market. However, it is also a threat to established companies cooperating around the internal combustion engine. Diminishing the role of petrol and diesel cars could simply drag these companies down or even wipe them out.

The global electric vehicle market is small enough and so V4 countries could still catch European leaders including the UK, the Netherlands or even Norway. What is needed however is an extensive strategy, which must be implemented by central and local governments, energy companies, the automotive industry and the ICT sector. Cooperation within the group would also help. It is very clear that e-mobility is a crossroad. V4 countries must now determine whether they want to be in the avant-garde of the automotive sector changes or they would rather become the custodian of the internal combustion engine.

The Polish case

The Polish government approached the issue of e-mobility in a structured manner. A document called 'Package for Clean Transport' was tabled, which is in fact a set of three separate papers constituting the e-mobility development strategy. These cover broad measures to speed up electrification of transport until 2025 with an aspiration in mind to have a million e-vehicles on Polish roads by that date. This also includes buses that have a dedicated and binding target imposed on local authorities and their public transportation fleets. The strategy also describes how a charging network will be deployed consisting of 6,400 public charging points and also contain a detailed list of planned legislative measures. An important component of the strategy is a new fund for low-emission transport that should be established to finance e-mobility projects.

Developing e-mobility in Poland will help in delivering a number of important policy objectives. It will reduce dependence on imported oil, assist in the modernisation of the electricity sector and improve air quality in cities. Investing in e-mobility, if done properly, can also push Poland up in the automotive industry value chain and create new suppliers including ICT companies and designers. But the development of the policy so far has already some lessons for the region and beyond. Innovation and new industries are the notions widely supported by both administration and business. On the other hand, one cannot work with disruptive technology keeping existing incumbents untouched. Moreover, individual transport is very closely associated with freedom. Any changes and new regulations in this respect are difficult to implement. Poland and its neighbours have to learn fast how to tackle these issues and move forward as the benefits of e-mobility are much greater than its costs. The competition is already on the move.

SFPA

The Perspectives of the Development of Electromobility in Slovakia

Tomáš Madleňák
Research Fellow, Slovak Foreign Policy Association (SFPA)

Slovakia is one of the countries of Central Europe with economy based on the construction industry, with the automotive industry playing a leading role. It is the largest producer of cars per capita in the world since 2007.[1] In 2016, the automotive industry produced approx. 1.04 million cars.[2] The automotive sector holds a share of 12% of the GDP, which accounts for 44% of the total industrial production in the country.[3] It also creates 35% of the country's industrial export and creates over 80,000 jobs directly, with the number of jobs created indirectly reaching over 200,000.[4]

For Slovakia, the future of the automotive industry faces the challenge of the alternative–fuelled, especially electrical vehicles (EV). It is in the vital economical interest of Slovakia that EVs are increasingly made within the production capacities of the factories that are already established in the country (and within those that are being currently built).

The producers: limited interest

The most notable interest from the producers established in Slovakia is the case of Volkswagen. In its Bratislava-based factory, it is building the hybrid model of Touareg since 2010.[5] Moreover, it is about to launch the production of the Q8 hybrid SUV starting next year.[6] Most notable is the current production of the e-Up! EV model. As the image of the brand has suffered notably because of the 'dieselgate' scandal, the brand is now trying to use these vehicles to improve its public perception, also by supporting several smaller projects as the first car-sharing initiative in Bratislava 'up! city'[7] or lending the e-Up to the Slovak police for testing.[8]

Other car producers, however, do not seem interested in establishing or redirecting their construction capacities to the future technologies. Peugeot-Citroen reacted to enquiries by citing their La Rochelle (FR) city project and stating they are offering two models of EVs in Slovakia—neither of which is however produced in Slovakia. They refused to comment on the future plans.[9]

Kia commented they are selling plug-in hybrid and hybrid versions of the Nira and Optima models as well as the Soul EV model. None of the models or electric motors or hybrid aggregates are produced in Slovakia.[10]

The state: limited effectiveness

The government approved the Strategy for the Development of Electromobility in Slovakia[11] in 2015. It recognised the potential of Slovak industry for the development of the innovative EV technologies and some strategies to promote electromobility have been introduced.

The pure EVs pay the lowest amount for the registration tax, €33. That is the same amount as traditional gas or diesel vehicles of the lowest power range. They are as well exempt from the annual circulation tax. Hybrid owners are paying circulation tax reduced by 50%.[12]

The most notable incentive from the government is the provision of subsidies to the sales of electric vehicles (€5,000) and hybrids (€3,000). The plan started in January 2017, for one year, with the goal of promoting the sale and registration of 1,000 EVs.

The result so far is that the number of EVs on Slovak roads has doubled. However, it is seriously underperforming in relation to the original goal—this year, only 370 EVs were registered in Slovakia. Slovak Electric Vehicles association is asking for an extension of the plan nonetheless,[13] and the government is considering it.

The government strategies so far show little success and most of the drive for EV introduction in SR derives from pure economical interest of the brand that tries to associate itself with 'clean' technologies after the 'dirty' affair. What is furthermore important is that according to a Peugeot-Citroën representative, the subsidy from the government is relatively small and only finance-oriented. More benefits in the fields of tax deductions, free parking etc., would be beneficial.[14] Another issue of its own is the development of the charging stations infrastructure.

1 http://www.industryweek.com/global-economy/slovak-car-industry-production-almost-doubled-2007
2 https://spectator.sme.sk/c/20436752/slovakia-again-breaks-car-production-record.html
3 Data for 2015, http://slovakia.speedchain.eu/files/uploaded/UserFiles/2016%20SK/prezentace/zap.pdf
4 Data for 2015, http://www.teraz.sk/ekonomika/na-slovensku-sa-vlani-vyrobilo-viac-ako/175550-clanok.html
5 https://byznys.ihned.cz/c1-42367580-seznamte-se-touareg-hybrid-made-in-bratislava
6 http://eautoportal.sk/audi-q8-vyroba-bratislava/
7 https://auto.sme.sk/c/20575090/v-bratislave-sa-rozbieha-car-sharing-mozete-si-pozicat-elektricky-up.html
8 http://www.teraz.sk/slovensko/policia-vw-sluzobne-auto-vymena/81882-clanok.html
9 E-mail communication with PSA Peugeot Citroen spokesperson in Slovakia Ivana Orvinska, 17.10.2017
10 E-mail communication with KIA Motors Slovakia spokesperson Jozef Bačé, 17.10.2017
11 http://www.rokovania.sk/Rokovanie.aspx/BodRokovaniaDetail?idMaterial=24933
12 https://www.acea.be/uploads/publications/EV_incentives_overview_2017.pdf
13 http://www.seva.sk/images/SEVA_Podpora%20EV_otvoreny%20list.pdf
14 E-mail communication with PSA Peugeot Citroen spokesperson in Slovakia Ivana Orvinska, 17.10.2017

REKK

Energy Transition in Hungary: Large Energy Storage Project Launched to Test Optimisation Algorithms

Ákos BEÖTHY
Senior research associate, REKK

ALTEO Group, a Hungarian power producer that focuses on renewable energy and smart energy management services, has launched a €3.5 million R&D project to create an intelligent power storage system based on battery technology. The project, co-financed by Hungary's National Research Development and Innovation Agency, will aim at integrating wind turbines with a storage facility at the company's dispatching centre, which controls production from its small units of combined heat and power. The development will not only allow for optimising production and supply at the company's level, but will also have positive system-wide effects.

Energy storage in Europe is gaining more attention in conjunction with the climate objectives of the European Union. Storage can play an important role in the decarbonisation of the electricity sector by improving the integration of intermittent, weather dependent renewable sources and better aligning production with consumption. Moreover, the total capacity of the electricity system does not have to match peak consumption or be adapted to the peak generation of renewables. This allows for savings in the expansion of generating capacities as well as the development of the transport and distribution infrastructure. Storage also has the potential to be commercially viable since it enables the sale of electricity during periods of high demand, and thus high prices.

Under the decarbonisation scenarios of the European Commission, the share of renewables within the electricity generation will rise to between 59% and 85% by 2050. With the expansion of weather dependent renewable, the electricity networks need to prepare for a number of changes. The gap between demand for electricity and renewable production, the so called residual load, can be met with electricity from conventional power plants or from storage. Power generation in the short run may increasingly deviate from forecasted values, while system inertia—mitigating frequency fluctuations—declines. The existing transmission and distribution network capacities serve increasingly as limitations when they are unable to cope with growing renewable production. The flexibility of electricity systems—traditionally designed to handle changes in demand—increasingly has to serve the fluctuations of supply.

The need for more flexible storage may open the way for technologies that are used less widely today. Pumped storage power plants, which account for 95% of grid connected storage capacity in Europe, can only be constructed in locations that contain certain geological features and society's willingness to accept them can be low on environmental grounds. In Hungary, for instance, according to the Ministry of National Development, the suitable locations are all nature protected areas, therefore this solution is out of the question.

Moreover, while pumped storage systems can also quickly react to imbalances within the electricity network, the integration of renewable energy sources is better facilitated by a larger number of smaller, decentralised storage facilities, such as the one planned by ALTEO Group. The central element of the project will be a Li-Br battery of approx. 2 MW, with an energy content of 2 MWh. The battery will be integrated into a dispatching centre that will be able to not only efficiently regulate the production of two connected wind power plants, but also to offer ancillary services to the transmission system operator (TSO). Later, power-based heat production will also be integrated into the system.

R&D activities to be carried out in the framework of the investment will seek answers to questions related to the deployment, system integration and operation of battery-based power-storage. The company promises to share its experience with potential future investors and the Hungarian TSO. Based on all the information and data to be gained from the project, future installations may be designed to operate much closer to their technical optimum, which means greater efficiency and a contribution to maintaining stable, well-balanced electricity systems capable to integrate more and more renewable production.

Apart from the wind power plants and the battery, the upgraded dispatching centre will also contain 7 gas-fired small power plants. Such a design will allow for an accurate and fast regulation of production, making the centre a good candidate to earn revenues on the primary reserve market. Another pillar of the future business model will be the smoothing out of renewable production: as the wind power plants do not enjoy priority access to the grid, the minimisation of the cost of balancing energy is an important consideration.

Special attention will be given to the effects that the developed business model and its optimal operating strategy have on the life-cycle of the technology. Currently, there is a great variety of often contradictory information of how the level and change of different indicators such as state of charge, depth of discharge or external temperature affect the life-cycle of batteries.

Working out the optimisation algorithm of the business model is key, and finding the right balance between the revenues from the primary reserve services and the revenues from the dispatching centre activity will be a continuous challenge. Success, however, may encourage other market players to find market based revenues from their renewable production instead of, or parallel to, RES subsidies.

MASARYK UNIVERSITY

The Future of Nuclear Energy in the Czech Republic: A Twisty Road to Uncertainty?

Mgr. Martin JIRUŠEK, Ph.D
Faculty of Social Studies, Masaryk University

One of the main topics of the discussion on the future of the Czech energy sector is the issue of nuclear energy. The rather prominent position of nuclear energy in the Czech Republic and, to a large extent, also expert discourse, is further strengthened by the fact that basically all versions of the State Energy Policy of the Czech Republic since 2004 count nuclear energy as a cornerstone of the Czech power generation (Ministerstvo průmyslu a obchodu, 2014).

However, there are several issues that need to be addressed. On the broader level, the Czech discussion on the future of power generation often runs into the wall of inability to comprehend the fact that the country´s electricity grid can no longer be isolated from what is happening abroad. Although this issue is mostly related to the sector of power generation, it is an epitome of the main flaw of the Czech energy policy in general—the inability or unwillingness to recognise that energy policy has become an issue that needs to be addressed at least on the regional level and in cooperation with neighbouring countries. Additionally, the story and content of the State Energy Policy itself is an illustration of the unwillingness to take bold actions and provide clear visions beyond a single governmental term.

Energy policy is an issue that needs to be addressed at least on the regional level and in cooperation with neighbouring countries

In line with the main problem sketched above, the most heated debate revolves around the nuclear energy and its future in the country's energy-mix. Moreover, even though the need for a robust base load supply will probably decrease as the grid will become more flexible, there will still be a need for some baseload sources serving as stabilizers of the grid and also backup. The debate on the future of nuclear energy in the Czech Republic is amplified even more by the fact that the old coal-fired power plants, as well as the oldest nuclear power plant (Dukovany), are nearing the end of their lifespan. Regardless of the country´s internal issues related to the power generation and current energy sources, there are a couple of over-arching issues complicating the future of nuclear energy in general that need to be addressed.

First, it is the issue of path dependence. The path dependence of nuclear energy is the sector´s tendency to stick to a specific technological solution for decades once the supplier is selected and the technology implemented. Given the enormous complexity of nuclear power plants, that are said to be the most complex facilities ever created by a man, there is only a handful of contractors that can deliver the technological solution. Simultaneously, the complexity of the endeavour has far-reaching and deep consequences influencing the economy of the state where the nuclear unit is planned. Usually, a number of sub-sectors ranging from education to machinery production and staff training are adjusted to a certain technological solution or design that is used in the nuclear facility. Hence, once a contractor is selected for delivering a certain technological solution, it is very hard to change that path. That is why states tend to employ the same or similar design of nuclear units for many years.

In the Czech reality, and also in the broader discourse within a number of post-communist countries, this feature of nuclear industry becomes an issue in relation to Russia, which has been the major supplier of technologies for the so-called Eastern Bloc. Particularly in the recent decade or so, when worsening relations between Russia and the West started what has been labelled as the Second Cold War, the decision on who should deliver the technology for the new Czech nuclear units has become highly politicised. For most of the time, the discussion that surrounded the project aiming at the construction of two new units in the Temelin Nuclear Power Plant, where also Russian-Czech consortium MIR 1200 was involved, was mostly focused on who will be the principal technology supplier and what might be the political consequences of that move.

Ironically, the Temelin expansion tender was cancelled because of more prosaic reason—the lack of financing or, specifically, lack of economic predictability and viability. The project simply ran into what is currently the biggest obstacle that the nuclear industry has been

MASARYK UNIVERSITY

CONTINUED

The Future of Nuclear Energy in the Czech Republic: A Twisty Road to Uncertainty?

Mgr. Martin JIRUŠEK, Ph.D
Faculty of Social Studies, Masaryk University

facing recently—enormous fixed (initial) costs and uncertain economic viability that possess the biggest hindrance to the industry´s development. Provided that construction costs for a single nuclear bloc are around €five billion, the issue of initial costs needs to be properly addressed. Naturally, to make the whole endeavour viable, these initial costs need to be repaid within a reasonable time and definitely before the end of the unit´s lifespan. However, as the current electricity price is generally too low to secure repaying the initial costs in the reasonable time, it is hard for any project to be procured without either strong financial backing provided by the contractor itself or another type of guarantee, typically provided by the government as in the case of Hinkley Point C in the UK (Černoch & Zapletalová, 2015).

Here, given the extensive governmental involvement in the sector, Russian companies (i.e. the state itself through state-owned companies) active within the sector can offer an individually-tailored solution including financial support in form of loans or other forms of financing. However, such, rather specific, solutions may be burdened with non-transparency as was shown in the case of the expansion of the Hungarian NPP PAKS (Radio Free Europe - Radio Liberty, 2017).

In fact, the transparency and careful and detailed procurement is the key to any successful project in this field. Given the enormous complexity and financial costs, it is of critical importance to have a sufficient 'expert counterbalance' in terms of skilled experts that would oversee the process. The stricter and more thorough the controlling mechanisms are, the less likely are cost overruns, technical problems and, eventually also, delays. Here, the Czech Republic may serve as a contrast to the above-mentioned case of Hungary. While the Temelin tender took almost five years within which extensive documentation from three bidders addressing thousands of conditions enumerated by the Czech side was assessed by a group of experts, in the Hungarian case, the decision was made by a circle of close collaborators around Viktor Orbán with very little details disclosed. As much as it is obvious that such decision is rather politically motivated (especially regarding the international context and mutual relations between both states at that time), such conduct may backfire negatively in the future.

On a general level, there is one more issue that the sector has to face. Mainly due to the complexity discussed above, most of the projects worldwide face delays ranging from months to years. As these issues are not limited to certain designs, contractors or countries, it seems that they are endemic to the sector as such. The fact that in January 2017, 35 of the 55 reactors under construction worldwide were delayed (The Economist, 2017) combined with financial loses that such delays may cause strengthens the distrust in the sector even more than the track record of nuclear incidents that, despite their extensive psychological impact, are, luckily, very rare.

As it was shown above, the sector of nuclear energy in general faces number of obstacles to further development. However, as much as every country possess different features affecting the energy sector, the hindrances the sector faces in the Czech Republic basically reflect the main issues also on the global level. The greatest of them—financing and economic viability—is the main culprit for the slowed sectoral development on the global scale. This finding only highlights the fact that the Czech energy sector can no more be developed regardless of the situation abroad.

Sources

Černoch, F., & Zapletalová, V. (2015, April). Hinkley point C: A new chance for nuclear power plant construction in central Europe? Energy Policy(83), pp. 165 - 168.
Ministerstvo průmyslu a obchodu. (2014, December). Ministerstvo průmyslu a obchodu. Retrieved October 15, 2017, from Státní energetická koncepce: https://www.mpo.cz/assets/dokumenty/52841/60959/636207/priloha006.pdf
Radio Free Europe - Radio Liberty. (2017, August 29). Putin Tells Hungary's Orban Nuclear Plant Expansion To Start Next Year. Retrieved October 15, 2017, from Radio Free Europe - Radio Liberty: https://www.rferl.org/a/putin-hungary-orban-judo/28700669.html
The Economist. (2017, January 30). Construction of most nuclear-power reactors is behind schedule. Retrieved October 15, 2017, from The Economist: https://www.economist.com/blogs/graphicdetail/2017/01/daily-chart-22

KTU

Energy Transition Processes in Lithuania

Prof. dr. Saulius GUDŽIUS, dr. Audrius JONAITIS, Dovilė ŽEMAITYTĖ
Kaunas University of Technology, Lithuania

Important changes in the EU policies and directives that mark the demand for innovation in energy security, consumption efficiency, smart grid development, or energy market integration and digitalisation, determine the need for change in our country.

The need to meet the demands of Lithuanian citizens and businesses asked to consider a National Energy Independence Strategy (hereinafter—Strategy). This strategy establishes the main aims for 2020 and 2030 and provides the vision for 2050. The Strategy is based on competition, supply reliability, reduction of environmental impact, and local business involvement in developing energy technologies. These provisions comply entirely with the demands of the country and the latest international requirements.

The term COMPETITION in the Strategy shall enable the effective use of local energy infrastructure and attract investments that will prevent from overpassing the EU average of the final energy price. The Strategy also strongly supports generation from renewable energy sources.

National security and competition depend on reliably supplied energy, therefore, the reliability provisions involve the aim of becoming a part of the EU energy systems, energy market and infrastructure.

The Lithuanian energy infrastructure conditions a secure energy supply and generation, however, the development of the local generation should be based on the development of energy technologies. The goal is to promote business involvement in the design and instalment of advanced energy technologies, that way enabling the experimental development of energy technologies, creating distributed generation technologies that include smart home energy systems, developing informational technologies (IT) for the optimisation of the energy sector and organising the experimental development of perspective technologies or environmentally-friendly innovation incubators and science centres of digital solutions.

The vision of the Lithuanian energy sector includes advanced energy that provides added value to the country and the consumer by supplying the environmentally-friendly energy at a competitive price. This vision conditions the occurrence of additional initiatives, such as the Strategy for Smart Specialisation 2014–2020 (hereinafter—Specialisation) that established the priorities of research and development (R&D) and innovation. The selected areas have the following potential: transform the entire country's economy, strengthen its international competitiveness and contribute to the growth of EU economy and competition. The most potential area in transforming the Lithuanian economy is 'Energy and Sustainable Environment,' which is categorised as follows:

1. Smart systems for energy efficiency, diagnostic, monitoring, metering and management of generators, grids and consumers;
2. Energy and fuel production using biomass/waste and waste treatment, storage and disposal;
3. Technology for the development and use of smart low-energy buildings—digital construc tion;
4. Solar energy equipment and technologies for its use for the production of electricity, heat and cooling.

The following part contains short descriptions of a few energy projects with added value that offer real products.

Smart system of efficiency evaluation, accounting and control of energy consumption

In response to the consumers' attempts to reduce the energy consumption and increase the productivity of energy consumption and with correspondence to the development tendencies of central heating technologies, a smart system of efficiency evaluation, accounting and control of energy consumption will be introduced. It will enable the consumers to use the thermal energy supplied centrally in a rational and efficient manner and use more energy from alternative or renewable (solar, geothermal, etc.) energy sources to heat spaces and water.

Smart energy accounting systems

The project is dedicated to designing a high-accuracy industrial electric power meter, a prototype of a smart metering and accounting device for the instalment of smart energy accounting systems and smart grids. The meter will enable the realisation of smart metering solutions and performing grid analysis, that way increasing the reliability and efficiency of a smart grid.

Design of the new technology of diagnosing and auditing construction state by using a 3D thermovision integrated system

This project involves R&D activities and the design and commercialisation of the technology of monitoring, diagnosing and auditing the state of existing constructions (thermal characteristics, physical state of the envelope and geometric building indicators) by using the 3D thermovision integrated system to create efficient energy consumption solutions.

Implementation of R&D for development of microgrid control systems

The aim of this project is to design a smart optimisation system of the microgrid control systems that would enable the integration of various energy generation and accumulation systems, assurance of energy balance in the microgrid and the lowest price for consumers. ▶

KTU

CONTINUED

Energy Transition Processes in Lithuania

Prof. dr. Saulius GUDŽIUS, dr. Audrius JONAITIS, Dovilė ŽEMAITYTĖ
Kaunas University of Technology, Lithuania

Design of smart HVS and LVS systems

For the first time in the world, a new and adaptive function shall be presented that enables an automatic control of the change in equipment reliability based on the recorded electrical network parameters and assessment of equipment state in real time based on the type of stochastically changing activity. This innovative system would monitor and analyse the dynamics of network parameters and ensure an optimal control of effective flows of power transmission system with high amounts of distributed generation sources.

Research and design of technologies to increase efficiency in biofuel use and pollution reduction

This project involves designing new, eco-innovative prototypes of products for the use of biofuel. The created new, high-quality products that comply with the requirements of environment, economic efficiency and sustainability will be prepared for commercialisation.

Design of new innovative product for transport

The project is intended to invest in R&D in designing innovative control methods for the six-phase asynchronous motor and expanding collaboration with the Lithuanian research and education institutions in carrying out common scientific research of six-phase motors and controllers. The designed technologies will be used in creating electric cars.

Changes in the world energy sector are also reflected in Lithuania. The Lithuanian research institutions and innovative companies seek to design products that could improve the competitiveness and technological development in Lithuania. The designed innovations represent making a big step towards implementing the energy trilemma by ensuring energy security, equity and sustainability.

INSTYTUT SOBIESKIEGO

Polish Consumers for Energy Innovation

Aleksandra LIS, Ph.D
Assistant Professor, Adam Mickiewicz University in Poznań, Poland

After having adopted the EU Climate Change and Energy Package in 2009, which for the first time made the CEE countries realise that energy transition is needed not only in Western Europe, but also in CEE, Polish governments embraced several projects to reduce GHG emissions. Carbon capture and storage (CCS) and a nuclear power plant can serve as two examples, both of which turned out to be costly: the former too costly to operate and the latter still with no reasonable financing plan. The recently called off shale gas revolution of 2011–2016 promised huge budget revenues and a transition to low carbon economy—from coal through gas to renewables. The latest ambitious project is the government's programme for electromobility, which includes several components: an e-car, an e-bus, development of charging infrastructure and other necessary components of an e-industry.

However, even though these big infrastructural projects could change the landscape of Polish power production radically and generate some more innovation, there is also a great potential for reducing GHG emissions and invoking innovation in a more dispersed and small-scale way. In 2016, the European Commission published a package of measures called 'Clean Energy for All Europeans'. The Commission set three main goals in this document: putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers. The European consumer comes here as an active participant in energy markets, not only by making best choices in selecting energy products and services, but also as the one who can shape this market by producing and selling energy. The Commission wants to ensure transparency of information and tools that a consumer could rely on in order to get a reliable comparison of energy prices. On top of that, the poorest and the ▶

INSTYTUT SOBIESKIEGO

CONTINUED

Polish Consumers for Energy Innovation

Aleksandra LIS, Ph.D
Assistant Professor, Adam Mickiewicz University in Poznań, Poland

most vulnerable energy consumers should be protected by a number of special measures.

The report 'How to make the consumer improve security of the energy system and benefit from it at the same time?' [Jak sprawić, aby konsument poprawiał bezpieczeństwo systemu energetycznego i jednocześnie na tym skorzystał?] issued by the Energy Forum (Forum Energii) in December 2016, points out that in the situation of capacity shortages faced by Poland, households grow in importance in the energy system. The report names three areas in which an active role of consumers will be vital: dispersed energy sources, electromobility and electrification of the heating systems. Polish consumers have been relatively passive when it comes to changing electricity providers. Over the last three years, only 3% of them took this decision. However, retail consumers adjust their household activities to the changing price tariffs. According to the report, higher power consumption between 1 pm and 3 pm, and in the evening, indicates that a large group of household consumers correctly read price signals. At the same time, the consumer has the right to change a tariff plan only once a year. It makes it difficult to experiment and understand one's domestic habits. Household consumers have to bear consequences of a wrong choice for a whole year. According to the Energy Forum, some more transparency and incentive for changing consumer's behaviour could be provided by an hourly account of energy consumption on clients' bills.

The Polish state has started to shape conditions for consumers' involvement in energy innovation more strongly over the last couple of years. A good example of such a programme is the Prosument. The programme runs between 2014 and 2022 with a budget of 800 million Polish Zloty (€ 200 million). It is addressed to small energy consumers who want to produce energy for their own needs, but are also able to sell it to the national power grid in case of surplus. The programme offered low-rate loans for buying and installing energy and heat sources with a possibility of partial remission of a loan (up to 40%). Three types of institutions could directly benefit from loans: territorial communities (gminy), the Voivodship Environmental Protection and Water Management Fund (WFOŚiGW) and banks (e.g. Environmental Protection Bank, BOŚ). Different Voivodship Funds had different rules, but most frequently they targeted housing communities or cooperatives.

One of the outcomes of the Prosument programme is a relatively large number of small-scale investments in PV installations. The best year for photovoltaics in Poland was 2017. Today, the installed power of PV in Poland is over 150 MWp, while five years ago it was only 2 MWp. There are around 11.2 thousand of domestic installations with a total capacity of over 62 MW. Most of them were installed in the first half of 2016 and the trend may be stable due to low prices of PV technologies, a growing environmental consciousness, new systems for energy storage and a more stable system of regulations and accounting for the installations below 40kWp. Banks handled the largest number of applications submitted to the Prosument programme and PV made around 90% of all applications.

In the meantime, the new Renewable Energy Law, which entered into force on 1st July 2016, set a definition of the Prosument which makes it possible to offer more measures addressed to this type of energy system participants. A Prosument is defined as the final consumer purchasing electric energy based on a comprehensive agreement and producing electric energy exclusively from renewable energy sources in micro-installations for one's own needs and not for economic purpose as regulated by the law on the freedom of economic activity. This should be noted as a positive move on the side of the legislator, despite the fact that some questions remain, for example as to whether this definition is not too narrow.

However, some challenges still remain. House heating is still mostly operated by single-house, old-type installations, which heavily pollute Polish cities in the winter season. The Ministry for Energy assesses that over five million old and inefficient heat sources still exist in Poland, which are responsible for around 50% of air pollution. Very often, the old installations and bad heating habits (burning trash) takes place in the domain of the poorest energy consumers. A 2016 report by the IBS (Instytut Badań Strategicznych) on energy poverty in Poland, assessed that around 44% of Polish citizens (over 17 million Poles) are affected by energy poverty, defined as an over 10% share of energy expenses in a household budget. The government's response in this area is a programme supporting heat production in cogeneration. This infrastructural change will last for many years, but it will surely mark a great progress in the Polish heating system.

CLEAN COAL

Clean Coal Technologies Centre

Aleksander SOBOLEWSKI
Director of the Institute for Chemical Processing of Coal

The return to the extensive use of coal—the world's most abundant primary energy resource, both in broadly understood power economy, but also in the chemical industry—is related to the development of clean coal technologies. They provide an opportunity to achieve a greater energy efficiency, as well as to improve the economic efficiency. The European Commission's policy is aimed at reducing the use of coal in power generation because of the impact of carbon dioxide emissions on climate change.

The Clean Coal Technologies Centre (CCTW) was erected in 2012 at the Institute for Chemical Processing of Coal (IChPW) in Zabrze, Poland (Fig. 1). The Centre opening was a great success for whole mining and power industries. A modern research infrastructure has been established in the CCTW, which has technological plants of various scales. The new plants are used for testing the gasification and solid fuels pressurized oxy-combustion, CO2 capture using the amine method, studying the gas combustion in a microturbine, chemical looping, as well as selective coal grinding, screening and drying.

The Centre's modern infrastructure satisfies the technical and technological needs of experimental and test plants. At the Institute for Chemical Processing of Coal, we are already using the infrastructure which has been built to obtain financing for research work from European funds. I think that the technology park, which has been created, should be a part of a roadmap of special research infrastructure elements made by Poland available to European research centres. I believe that the developed processing of coal is an opportunity for the national and global economy growth, especially now. However, the portfolio of technologies used should be increased, which will be the Centre's role.

The future of Polish coal industry requires today a full agreement, to play a significant role tomorrow. I think that the atmosphere around these modern plants at the Centre is so creative that it is easier to create a com¬mon front for the development of power generation and chemical industries based on coal.

This research infrastructure has at its disposal research departments of different sizes: from the small laboratory scale, via bench scale up to pilot scale testing. Research infrastructure of the Clean Coal Technologies Centre makes it possible to perform research and development on energy-chemical processing of coal. The technological poten¬tial of CCTW stands in the nine new technological departments as well as 11 departments that were retrofitted. The key research departments at the Zabrze CCTW, which do not have their counterparts in Poland, are referred to as:

- Plant for coal gasification in a pressurized reactor with the circulating fluidized bed and application of the CO2 gas as the gasifying medium. The plant is connected with the system of process gas cleaning and cooling together with its utilisation in a gas turbine (Fig. 2).
- Plant for oxy-combustion of coal—scale 0.5 MW.
- Plant for CO2, capture from the flue gas by the amine absorption method. The capacity of the plant is up to 100 m3/h. The plant fits into the European policy to reduce emissions of greenhouse gases.

The research and development on the CCTW plants are supported by the modern Accredited Laboratory. Operation of the installations is conducted via the operator panels equipped with the touch-in screens from the plant level (technological hall) as well as via stands furnished in the control room. The techno¬logical works performed at the plants do not worsen environmental quality standards with regard to the emis¬sion of particulates and gases to the environment. At the area of CCTW, the monitoring Airpointer® station has been installed for continuous measurement of the air pollutants emission. Prototype CCTW plants were created as a result of the original engineering knowhow of the IChPW researchers, based on multi-year research on coal conversion. Comprehensive conduct¬ing of the research along with the unique and priceless experimental database creates knowledge indispensable to develop new products and consequently industrial implementations. Research and development at the Centre will make it possible to develop knowledge and competences within clean coal technologies.

Fig. Clean Coal Technologies Centre
Experimental mine Barbara - Hall D - Technological part

ARCELOR MITTAL

Carbon Capture and Utilisation –Economic and Environmental Aspects and Regulatory Challenges

Mirosław MOTYKA
ArcelorMittal Poland S.A.
Łukasz BONDARUK
Ernst & Young

Currently, the exhaust gases, being side-effects of industrial production or thermal conversion of fossil fuels, are subject to intensive scientific researches. The main goal of these researches is to develop a method of continuing of the usage of these gases, especially with regard to capturing of the carbon dioxide (being an exhaust gas / byproduct in industrial or electricity generation installations) and its further usage in production of other substations or materials. Finding a proper method of utilisation of the exhaust (waste) gases may not only contribute to the appropriate management of these substations, but it may also be a remedy to the adverse impacts of climate changes resulting from the intensified CO_2 emission. This might be particularly attractive for those countries, the energy economies of which are mainly based on fossil fuels.

CO_2 management methods

Over the last decades, vast technological progress regarding CO_2 utilisation methods is observed. Currently, one of the developed ways of CO_2 "neutralisation" is its storage with the use of Carbon Capture and Storage technology (CCS). CCS consists in sequestration[1] (separation) of CO_2 from exhaust fumes and then its storage as a pure gas. It is the method of final and lasting removal of carbon dioxide from circulation. As a result, CCS merges technologies of capturing, transportation and storage of CO_2[1].

Another method for CO_2 management is Carbon Capture and Utilisation technology (CCU). This method establishes resignation from the storage of CO_2, thanks to which the gas might be further used. This results in reduction of its negative impact on the environment and ensures effective utilisation of carbon dioxide. Therefore, application of the CCU technology means further usage of CO_2 leading to a kind of "closing the cycle of its usage in the economy".

Among methods of CO_2 utilisation (by its simultaneous usage) within the scope of CCU technology, the following ones should be listed:

1. Direct utilisation of CO_2 – where pure CO_2 is separated from exhaust gases and it is further used as a product in conversion processes or production of chemicals and food;
2. Enhanced oil and coal-bed methane recovery – this method is aimed at optimisation of extraction of a crude oil from an oil field or methane from coal-seams (especially from the ones which – from geological point of view – are difficult to explore).
3. Conversion of CO_2 into chemicals and fuels – this are processes of CO_2 utilisation where liquid fuels are produced; this method covers sequestration of the CO_2 to different products and enables production of methanol, formic acid, dimethyl ether, ethanol and other hydrocarbon-based products[2].
4. Mineral carbonation - in this process CO_2 reacts with minerals which contain metal oxide and then forms insoluble carbonates and at the end solid byproduct;
5. Production of biofuels from microalgae.

As far as the scope of this article is concerned, the most interesting CO_2 utilisation method seems to be the usage of this gas for further production of biofuels from microalgae (see point 5 above). It enables to (i) manage the streams of waste gases in the industrial installations or installations aimed at production of the energy, (ii) cut down emissions of harmful gases into the atmosphere, (iii) produce 3rd generation biofuels used in transport as alternative of component of the fossil fuels, (iv) create economic benefits for both - emitters and final users of the produced biofuels.

Legal aspects of CCU development

For the time being, Polish legal acts do not provide specific legal measures ensuring support in using the CCU technology. Recognition of economic and environmental benefits inextricably linked to discussed carbon dioxide management methods leads to the conclusion that is necessary to provide the regulations which would be responsive to the expectations of entrepreneurs, but – at the same time – would reflect the economic interests of the State and enable investments in development of the CCU technology. Therefore, the starting point for implementation of the regulations concerning further usage of CCU technology in Poland should be the EU legislation, which recognises the necessity of regulating this crucial area.

According to the Directive 2009/28/EC on the promotion of the use of energy from renewable sources (RES Directive), each Member State shall adopt a national renewable energy action plan. This plan shall set out Member States' national targets for the share of energy from renewable sources consumed in transport, electricity and heating and cooling in 2020. According to the RES Directive, by definition "energy from renewable sources" should be understood energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. In that scope there is no differentiation between, for instance, ▶

1 For a better understanding of this method, it needs to be clarified that sequestration shall mean each and every undertaking with regard to limit CO_2 emissions. Sequestration requires earlier separation of CO_2 and then its capture.

ARCELOR MITTAL

CONTINUED

Carbon Capture and Utilisation –Economic and Environmental Aspects and Regulatory Challenges

Mirosław MOTYKA
ArcelorMittal Poland S.A.
Łukasz BONDARUK
Ernst & Young

energy generated by wind turbine generators and the one produced by the sewage treatment plant or biofuels, which are generally described as renewable energy.

RES Directive also provides for a mandatory 10 % minimum target to be achieved by all Member States for the share of biofuels in transport petrol and diesel consumption. This shall be introduced in a cost-effective way and finally achieved by 2020. In order to ensure the economic viability of production and using of biofuels, their significance should be increased on the basis the national legislation of the Member States. For this purpose, the EU regulations should provide for an explicit obligation for the Member States to create appropriate regulations in this respect.

As mentioned above, the CCU technology enables to effectively produce biofuels with the use of CO_2 emitted in the sequestration process – which at the same time solves the environmental problems connected with the CO_2 utilisation. In this context, the possibility of qualification of the final product of sequestration as one of the methods of realisation by the Member States of the national action plans concerning the use of energy from renewable sources, appears to be of a crucial importance. Bearing the above in mind, at the end of 2016 the European Commission presented its proposal for amendments to RES Directive (on the basis of the "Clean Energy for All Europeans" package). The proposed amendments include, among others, the implementation of the new definitions of the "waste based fossil fuels" and "advanced biofuels". However, in order to achieve a maximum level of effectiveness of the CCU technology, these definitions require clarification.

As far as waste based fossil fuels are concerned, the Commission indicated that this shall mean "liquid and gaseous fuels produced from waste streams of non-renewable origin, including waste processing gases and exhaust gases".

> The CCU technology enables to effectively produce biofuels with the use of CO_2 emitted in the sequestration process

Additionally, on the basis of the proposed wording of the act: "With effect from 1 January 2021, Member States shall require fuel suppliers to include a minimum share of energy from advanced biofuels and other biofuels and biogas produced from feedstock listed in Annex IX, from renewable liquid and gaseous transport fuels of non-biological origin, from waste-based fossil fuels and from renewable electricity in the total amount of transport fuels they supply for consumption or use on the market in the course of a calendar year"[2].

However, the proposed definition makes the term "waste-based fossil fuels" vague. Even its further supplementation is not sufficient for the proper interpretation of the term in question. The use of the wording "fossil fuels" may suggest that the Commission's intention is to cover by this definition only those waste-based fuels which are produced from stream gases being a kind of side-effect of energy generation from fossil fuels. From the point of view of the producers of goods (excluding the electricity), this provision seems to be unfavorable, especially from the perspective of using the waste gases for production of biofuels. The technological processes taking place in the industries are often connected with generation of heat and other emissions treated as byproducts. In such case, arguing that waste-based streams are directly connected with fossil fuels does not appear justified.

Moreover, such an operation may lead to unjustified exclusion of certain entities from the benefits or opportunities of using waste-based fuels.

Another example of lack of clarity in the proposed wording of RES Directive is using the word "fossil" in the definition of waste based fossil fuels. Interpretation of the word in question in the context of the whole regulation might lead to exclusion from the waste based fossil fuels of these substations, which are effect of the technological processes using the gaseous waste created in the technical processes using the energy created from the sources other than fossil, i.e. renewable sources. Such interpretation would again lead to an unjustified exclusion of industrial installations using energy from renewable sources. This issue ▶

2 Article 25(1) of RES Directive proposal.

ARCELOR MITTAL

CONTINUED

Carbon Capture and Utilisation –Economic and Environmental Aspects and Regulatory Challenges

Mirosław MOTYKA
ArcelorMittal Poland S.A.
Łukasz BONDARUK
Ernst & Young

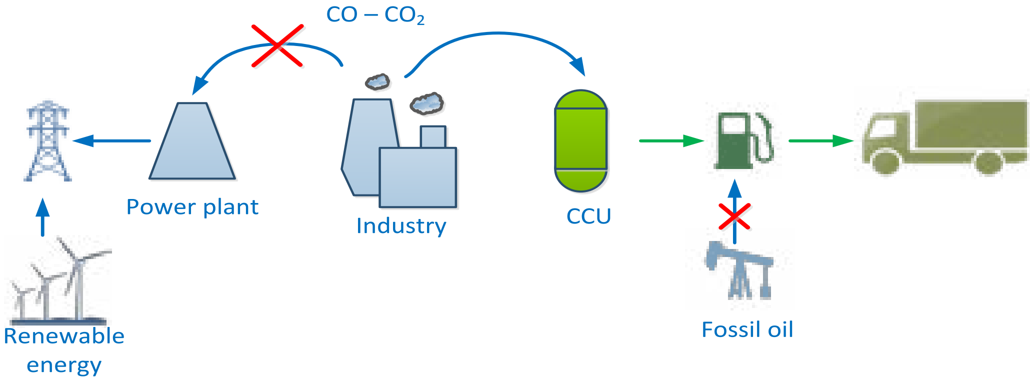
may be much more complicated taking into consideration autoproducers using electricity from the grid and at the same time energy generated by their renewable sources.

As far as the environmental protection is concerned, it is crucial that the EU regulations promote only such usage of liquid and gaseous fuels, which – in the case of the fuels generated from gaseous effluents – are an unavoidable and unintentional product of manufacturing of goods. Therefore, a change in the wording of "waste-based fossil fuels" should be considered. As an example, this may be substituted by "gaseous waste-based fuels" and further explanation that the definition in question would refer only to "liquid and gaseous fuels produced from gaseous waste streams, being gaseous effluents which the holder is required to discard and which are generated as an unavoidable and not intentional consequence of the manufacturing or production of products whose intended purpose is commercial use and/or sale". Abovementioned definition is only an exemplification of possible way of further works related to RES Directive proposal.

The EU's tendency to increase the usage of renewable energy in the electricity sector expressly indicates the direction, which both EU as well as domestic provisions should follow, in order to boost investment in emerging technologies such as CCU. The nature and potential of the CCU technology appears to properly fit in the dynamic economic reality, especially bearing in mind the increased demand for alternative fuels. Therefore, it should be considered, how the EU legislation as well as domestic regulations of the Member States should adapt to the potential and development of the energy market.

1. Majchrzak-Kucęba, I., Co to jest CCS?, Częstochowa 2016, s.13.

2. Czardybon A., Więcław-Solny L., Ściążko M., Technologiczne perspektywy wykorzystania ditlenku węgla, „Energetyka", nr 1 (715), 2014, s.27.



Transparency Register No. 8773856374594

Central Europe Energy Partners (CEEP) represents energy and energy-intensive companies and organisations from four Central European countries, employing over 200,000 workers, with a total annual revenue of more than EUR 30 billion. CEEP is the first major body to represent the energy sector companies from the region at the EU level. The aim of CEEP is to strengthen the region’s energy security within the framework of EU's energy and energy security policy. CEEP is an international non-profit association with its headquarters in Brussels.

Central Europe Energy Partners, AISBL
Rue Froissart 123–133, 1040 Brussels
Phone: +32 2 880 72 97
E-mail: brussels@ceep.be
www.ceep.be

@CEEP_energy

www.linkedin.com/company/
central-europe-energy-partners