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Policy Paper

State of Innovation in the Czech Energy Sector

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Current state policies and approach to energy innovation

The Czech Republic finds itself facing a number of trends shaping the energy policy landscape of today´s Europe. On the one hand, it is a country that has gone through the transition from a centrally-planned economy with a relative success and has integrated into the European Union, including its Internal Energy Market. On the other hand, despite most of the sectors of the country's economy assuming the new perspective, the energy sector seems to be stuck in the old-fashioned perceptions and planning. Regardless of the growing interconnectivity and the fact that the Czech electricity price is basically determined by the situation on the German market, the state energy policy does not seem to fully recognise the situation.

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Partly as a response to the criticism and also to tackle and reflect the challenges of modern society and modernisation, in spring 2017, the Government of the Czech Republic introduced a comprehensive document titled 'Strategic Framework: Czech Republic 2030' (Government of the Czech Republic, 2017) that sketches a vision of a sustainable development until 2030. The document outlines a comprehensive strategy encompassing a whole lot of state policies, being divided into six chapters, namely: People and Society, Economic Model, Resilient Ecosystems, Communities and Regions, Global Development and Good Governance. It is no wonder that given the country's extensive industrial base, the issue of effective use of energy is to some extent present in the majority of these chapters. The energy sector as such is addressed in sections devoted to industry, housing and transportation. Quite understandably, the energy sector is mentioned also in relation to innovations that are at the core of the aforementioned strategy.

On the bright side, unlike most of the Czech strategic documents of the past, the document gives an extensive list of indicators and ways to measure the progress in individual categories (Government of the Czech Republic, 2017, pp. 125–219). However, as much as the document is specific in what should be achieved and how it is to be measured, unfortunately, it remains silent on the concrete steps towards these goals. Therefore, although the document is much more goal-specific compared to the sectoral policies so far, there is still a danger that the proposed strategy will have little effect, owing to the outline drawback.

It is also worth noting that the sheer complexity of the document has prevented the strategy from formulating solutions to some of the major hindrances present in the Czech energy sector of today. For example, the framework under scrutiny herein stresses that the Czech Republic should focus on transition to the low-carbon technologies and that the share of the energy produced from renewables and nuclear units should be increased along with the efficiency of the power generation (Government of the Czech Republic, 2017, pp. 55–57). At the same time, unfortunately, it does not provide any hint on how this should be achieved in a sustainable way, even though the document openly admits that the interplay between the traditional (base-load) and intermittent energy sources is one of the main cruxes of today's Czech energy policy (Government of the Czech Republic, 2017, pp. 273–274).

The aforementioned issue highlights the utter importance of another topic for the country's future development, which is that its energy mix influences a whole lot of other sub-sectors of the Czech economy. Although, basically all of the versions of the State Energy Policy since 2004, including the latest one (Ministry of Industry and Trade, 2014), put the main emphasis on nuclear energy in the country's future power generation, the economy of nuclear units combined with the future demands on the power generation and grid development question the viability of the construction of new nuclear units at the moment. Nuclear power plant construction is extremely demanding in its initial phase, from economic point of view, i.e. nuclear power plants have enormous initial costs of around €5 billion per unit. It currently poses a very tough hurdle to overcome, despite the fact that the variable costs are low and assume just a fraction of the total lifetime costs of that given unit (Vlcek, Jirusek and Henderson, 2015). At the same time, electricity markets nowadays experience low electricity prices and face rather unpredictable supplies of electricity from renewable sources. Needless to say, it is hard for any new nuclear units to be constructed under such circumstances. Hence, Czechia, who currently boasts a position of an important electricity exporter within the EU, may

be facing a different reality in the foreseeable future, when the older units get decommissioned.

As it has already been mentioned, owing to the modern changes in the patterns in electricity generation and consumption, an adequate development of the grid constitutes another challenge to the Czech energy sector. Moreover, previous ways of managing it are hardly suitable in the emerging environment of renewables, electric cars, etc. That is where innovations to the Czech energy sector in the form of smart grids come to play. Unlike the traditional grid that is basically one-directional, smart grids can flexibly supply electricity in various directions based on the actual demand.

The Czech government addressed the challenge of the future grid development in a document titled 'National Action Plan for Smart Grids,' which was published in 2015 (Ministry of Industry and Trade, 2015). The plan sets four implementation stages of smart grids in the country with the final date set on 2040. The document envisages that the initial phase will be preparatory and will take place by the end of 2019. Smart meters are currently encouraged at the level of distribution and transmission companies. These undertakings are subsidized through grants from European monetary sources, namely Enterprises and Innovations Operational Fund (Operační program Podnikání a inovace pro konkurenceschopnost, 2017a, 2017b). Only after 2019, smart metering should be implemented widely at the level of customers. The implementation phase should take place in two steps. By 2025, 30% of consumers should be converted to smart metering, while all consumers should have smart meters by 2030. The concluding implementation stage is aimed at the evaluation of the whole undertaking and procuring stability and integrity of the new system's operation (Ministry of Industry and Trade, 2015, pp. 21–28). However, as much as this plan is appealingly ambitious, the timeframe seems to be quite tight. It is safe to say that the original governmental plan is already behind schedule, which is far from being uncommon.

In addition, there are few instances of pilot projects from private entities. Most notably, the company ČEZ started with the implementation of smart grids in a micro-region, Vrchlabí, which serves as a test-bed for technologies that will be implemented in the future (ČEZ, 2017).

Case study of renewable energy sources: Troubled implementation

An important issue related to the country's future energy mix and energy innovation is the development of renewable energy sources (RES). While hydropower and biomass are considered to be traditional RES in the country, they will be left out herein. Regarding wind power, there are few regions in the Czech Republic which qualify as adequate sites for building wind power plants, i.e. Krusnohorsko, Jesenicko and Ceskomoravska vrchovina, while some of the places in these areas cannot be exploited since they qualify as protected areas (Vlček and Černoch, 2013, p. 156).

However, it is reasonable to focus on solar power development in the country in more detail. The state support of renewable energy dates back to 2005. However, a large portion of that support was directed to solar photovoltaic (PV) installation that were considered as an innovative source of energy. Act No. 180/2005 Coll. pioneered the term 'green bonus,' indicating 'the financial amount increasing the market price of electricity that is paid to the producer of electricity from renewable sources' (The Parliament of the Czech Republic, 2005). In addition, RES were granted a preferential access to the grid.

When the EU climate and energy package was adopted, Directive 2009/28/EC of the European Parliament and of the Council of the European Union on 23 April 2009 on the promotion of the use of energy from renewable sources foresaw the RES share of 13% by 2020 in the Czech gross final

consumption (The European Parliament and The Council of the European Union, 2009). This directive has been fully implemented in the National Renewable Energy Action Plan from July 2010, which was even a bit more ambitious, setting up the target of 13.5% (Ministry of Industry and Trade, 2010).

Nevertheless, the implementation process had been flawed, especially when it came to PV power plants. The system of state promotion of renewables was set so generously that, for example, the solar power installed capacity target set for 2020 has been exceeded already in 2010. The cause of this boom lies in a combination of reduction of investment costs in photovoltaic and wind power plants construction on one hand and excessively high preferential treatment through state support on the other hand, which led to a significant development of the renewable sector and proliferation of companies engaged in installation of domestic and industrial power plants (Vlček and Černoch, 2013, p. 162).

The originally well-planned programme was supposed to motivate citizens to accept renewables, to get them to trust in their potential and also to increase renewable energy's share in total production and consumption of electricity in the Czech Republic, in order to meet the required commitments resulting from international agreements. In reality, however, citizens and the industrial sector identified the opportunity and prospect of easily obtainable and guaranteed state money over the course of several years, and photovoltaic plants consequently experienced an incredible expansion. These events, naturally, led to growing risk from problems arising inside the transmission, and mainly inside the distribution, system. The progress predicted by the National Action Plan was supposed to have been at a notably easier pace and would thus have allowed for simultaneous development of infrastructure. (Vlček and Černoch, 2013, p. 162).

The state had to react to such a situation. First, in 2010/11 it passed amendments to the Act of 2005 that limited the types of PV installations to be supported and introduced a retroactive solar tax of 26–28% for all photovoltaic facilities launched in 2009 and 2010 (Vlček and Černoch, 2013, p. 164). The new Act No. 165/2012 Coll. on promoted energy sources was adopted in 2012. Even though Directive 2009/28/EC understood the levels of the National Action Plan as the minimum, the new Act understood them as the maximum. Hence, the cap was calculated every year not only for the entire Czech Republic, but for individual regions as well. In addition, support for PV power plants was limited to a production capacity of less than 30 kWp that is located on the roof or perimeter wall of a building (The Parliament of the Czech Republic, 2012).

The amendments and the new act have contributed to the stabilization of the renewables sector, beneficial mainly for PV power plants. The abrupt suspension of the sector and a significant change in terms led to the bankruptcy of about 10 companies trading in photovoltaic technologies, while the state is financially burdened with support for decentralized production and renewables for the coming decades, renewables have been discredited in the public eye to a great extent. If we compare the renewables sector of the Czech Republic with neighbouring Germany, we can conclude that, while the discourse in Germany has already gone through the phases of 'if' and 'how' and is currently in the phase of 'when,' we in the Czech Republic still oscillate somewhere at the frontier of the phase 'if' and 'how' (Vlček and Černoch, 2013, p. 164, 169).

Case study of electric mobility: Fuzzy interplay between the actors

At this point, it is reasonable to pay more attention to the actual projects and fields of energy innovation in the Czech Republic, which seem to be driven primarily by the private sector.

Development of electric vehicles and implementation of electric mobility constitutes an illustrative example. Despite some changes that are taking place, it seems there is yet much to do, and the public sector could and, effectively, should play a far more active role in promoting electric vehicles than it does today.

It can be said that the times when automobile industry and public administrations were sceptical of electric cars are over. The global electric car stock surpassed 2 million vehicles in 2016 after crossing the 1 million threshold in 2015 (International Energy Agency, 2017, p. 5). Both car companies and governments have changed their attitude towards the technology, causing a rapid growth of the new market. And the Czech Republic seems to be following suit, being one of the leading countries in Central Europe when it comes to e-mobility. For example, in 2015, a year-to-year increase in the number of new electric vehicles in the country equalled 51.3% (European Automobile Manufacturers Association, 2016). Overall, the country is home to more than 1,000 electric vehicles and the government plan is for this number to exceed 95,000 regularly driven electric vehicles within the next 10 years (Cities Digest, 2017) along with some 1,200 charging stations by 2020 (Prague TV, 2017a).

First of all, a positive impact of the European Union on the developments in the field cannot be overlooked. Since the EU is promoting electric cars to improve the environment, it financially supports some initiatives in the field. For example, the Czech Republic plans to expand the electric charging infrastructure include the building of another 40 stations thanks to a grant provided under the Connecting Europe Facility (CEF), an EU facility used by the European Commission to support the construction of charging stations along the TEN-T network of major roads that interconnect Europe (Cities Digest, 2017). The lack of the latter is often called one of the major challenges for the growth of the electric cars attractiveness for customers, along with battery life and price.

Secondly, as the examples of Norway, Denmark or China show, public sector support is crucial for boosting the spread of electric cars. And that is what the Czech Republic is missing—consistent and rigorous support for electric cars from the state. In its turn, it explains quite a slow pace of the sector take-off in the country (even though it is the best in the region). The stumbling block at present is the failure of the government and car makers to agree on significant subsidies which would boost the sales of electric cars (Radio Praha, 2017b), which is the key measure that is capable of making the difference. The government is also considering some sort of incentive for people to buy electric cars, such as not having to pay value-added tax. However, the Czech Prime Minister Sobotka says that the issue still needs to be examined and currently, since electric cars are so expensive, it would mainly be a subsidy for wealthy people (Prague TV, 2017a).

However, this does not mean that the Czech government is trying to obstruct the ongoing developments. The problem is that it is quite reactive instead of being proactive. Yet there are some positive measures being adopted. For example, the Czech Industry Ministry is already subsidizing the purchase of electric cars for firms, government offices and municipalities, which reportedly supported the purchase of 190 electric cars last year (Radio Praha, 2017b).

Thirdly, the corporate level matters and affects the developments in the field. The analysis of the market shows that Czech companies are favourable towards the electric cars and count on it to become a significant market in the future. For example, the two largest Czech companies, car producer Škoda Auto and energy giant ČEZ, plan to work together to develop electric cars and infrastructure: Škoda will make electric cars while ČEZ will develop and build charging stations (Prague TV, 2017b).

ČEZ has been active on the e-mobility segment of the market since 2009, when it first announced plans to buy dozens of electric cars by 2012 and test them in the streets of Prague and Ostrava (Aktuálně.cz, 2009). Since then, the company has developed a network of some 70 charging stations in the Czech Republic with 40 more to come, which is claimed to be 'the largest network of its kind in the CEE region' by the company's CEO D. Beneš (Prague TV, 2017b). It can be said that ČEZ is pushing ahead with a programme to have the required infrastructure in place when the brakes on electric car sales finally come off (Radio Praha, 2017a).

In its turn, car producer Škoda has only recently switched its attention to the growing market of electric vehicles. Accordingly, it plans to have hybrid electric cars in mass production by 2019, and a purely electric car that would be able to run 550 km without recharging—by the end of 2020 (iDNES.cz, 2017). Škoda board member Bohdan Wojnar recently told Hospodářské noviny that by 2025, electric cars could make up some 20% to 25% of Škoda car sales (Prague TV, 2017b).

The last player on the market worth mentioning is Tesla. While the company has only entered the Czech market in 2016, it seems that it has certain expansion plans in mind. Tesla's first project (in cooperation with the energy group E.ON) in the Czech Republic was the Supercharger in Humpolec, but since then the company has opened another one in Vestec U Prahy, while the third charging station is coming soon in Olomouc (Tesla Europe, 2017). When the necessary infrastructure is in place, the company is most likely to open a Czech branch to sell its electric cars on the Czech market, which would go in line with its global strategy.

Based on the aforementioned, it can be concluded that the industry has a positive view of the sector's perspectives in the Czech Republic and takes an active role in the developments, despite the public sector lagging behind. However, they also have raised some concerns that cannot be ignored. As the head of ČEZ's e-mobility programme T. Chmelík expressed it: 'It could be the same situation as the problem we have with renewables. Even if there will be a consumption pattern in e-mobility, by nature the e-mobility consumption is difficult to predict because it depends on behaviour of people who can change their minds' (Radio Praha, 2017a). Hence, the spread of electric cars might become a real challenge for the electricity distribution companies that are tasked with keeping the grid stable.

Case study of energy efficiency: An apparent focus on the public sector

Another potential driver of energy innovation in the Czech Republic is energy efficiency. The development of new technologies in this case is motivated by the goal of decreased energy consumption. Interestingly enough, the analysis of the developments in the field is two-fold: on the one hand, some of those are similar to the ones derived from the case of electric mobility; on the other hand, the outlook is less promising.

Czech efficiency policies are mainly driven by the European Union and its legislation. The EU has decided to move forward with the 'Energy Union,' and its key driving principle in building up that Union is 'efficiency first' (The European Commission, 2015). The focus is reflected also in the European Commission's 'Winter Package' introduced in November 2016 (The European Commission, 2016). The current Energy Efficiency Directive (2012/27/EU) was based on the target of a 20% decrease of energy consumption across the EU (The European Commission, 2016), which was later increased to 27% in 2030. Now, a 30% goal in 2030 is being debated.

Taking into account the development in the EU, the Czech Republic is directing large amounts of

financial resources to the achievement of energy saving goals that were set at the national level in 2014 (Ministry of Industry and Trade, 2016). Most of the current programmes are funded by resources from the European Structural and Investment Funds, namely the Cohesion Fund and European Regional Development Fund. Apart from that, the country uses funds available through the Kyoto-provisioned emission allowance trade as well as some limited resources from the national budget.

Financial resources are used mostly to finance efficiency measures using financial subsidies, provided through various grant schemes. EU resources are disbursed through the so-called operational programmes. Companies and industry may ask for grants through the Operational Programme Enterprise and Innovations, and the public sector through Operational Programme Environment. While finances for the public sector are mainly targeting building retrofitting, companies and industry can implement any efficiency measures deemed useful—improving both efficiency of production (in the widest possible sense) and efficiency of their building stock (Borshchevska and Lehotský, 2015). Some parts of the EU Operational Programmes along with domestic resources are targeting private housing. Here, most of the financial sources come from the sale of unused emission allowances. Money is used to finance housing refits, both in individual houses as well as housing blocks. This scheme is called Green Savings (Karásek and Pavlica, 2016; Duleba et al., 2017, pp. 59–60). In addition, Operational Programme Environment finances the replacement of old inefficient heating places for new ones.

A common trait of all programmes is that innovation happens in the form of replacement of old technologies for the new ones. Almost all cases of support take a form of subsidy, which co-finances a proposed set of measures. There is a little diversification in ways of financing efficiency measures, with only small portions of overall energy efficiency budget provided through financial instruments other than grants (such as low-interest loans, etc.). Moreover, funds are used primarily to implement measures, but not to fund research and development of energy-savings measures (see for example Operační program Podnikání a inovace pro konkurenceschopnost, 2015). On top of that, the existing R&D is mostly directed at support of measures' implementation instead of the development of the new technologies.

From the perspective of implementation, grants are awarded usually on the basis of detailed project documentation and expected savings' calculations. Certification process is overseen by the Ministry of Industry and Trade. Firstly, this is envisaged to ensure certain quality of refit measures. Secondly, public bodies are believed to ensure that there are real savings achieved as a result of any project at stake. Only certified project bureaus are allowed to develop projects, and in many cases, only certified energy-saving technologies or products are allowed to be installed.

However, the tighter oversight of energy savings implementation as well as the sole responsibility of the government for achieving the goal are creating a significant strain over the public bodies. There is a collusion between the period over which the energy efficiency target is supposed to be met and the EU budgetary period. Thus, any delay in one affects the other, which is exactly the case of the Czech Republic. Here, the late opening of the Operational Programmes is very likely to result in an underperformance of the energy efficiency implementation (Sochor, 2017). Hence, it can be argued that this will incentivize Czech public bodies to spend available resources on some easy-to-achieve projects with short implementation times and decent savings instead of opting for some more challenging projects (Borshchevska and Lehotský, 2015), further encouraging spending on implementation instead of R&D projects.

Alternative to state-run programmes, which focus on disbursement of available resources, is the provision of energy services, driven by the private sector. When providing energy services, there is no involvement of the public bodies at all, with energy efficiency measures implemented based on market feasibility. Energy service companies (ESCOs) invest their own resources and implement new technologies at the beginning of a project, while consumers repay the investment by means of their energy bills over the following period of time. ESCOs guarantee a certain level of energy savings. What generates profit for the ESCO is the positive difference between the guaranteed savings and the real ones. Energy services are not a supported or endorsed way of achieving energy savings. Hence, companies are becoming stakeholders in savings' achievement.

The main obstacle in the public sector is that energy services are deemed to cumulate public debt. This goes against the stringent budgetary rules mandated by EU. The effect on the Czech Republic is that any organization, which is directly financed from the state budget, is not allowed to enter into the energy service contract (European Energy Services Initiative 2020, 2016). Therefore, only organizations financially independent from the central government may implement energy services provided by the ESCOs. These are mostly schools, municipalities and hospitals (Siemens, 2014).

Energy services are utilized in the private sector to some extent, but owing to the pressure on shorter return-on-investment, companies are usually implementing only partial measures. Interestingly, energy services are not implemented in the housing sector (Labanca et al., 2015). No big energy suppliers on the Czech market provide energy services as an option for households, due to long return-on-investment periods (Siemens, 2014).

Concluding remarks

There is an established consensus on the importance and desirability of energy innovation in the Czech Republic among the main stakeholders in the field, which is often being voiced. Yet, the practical implementation of the measures is, unfortunately, lagging behind, which questions the extent the actors actually share the aforementioned positive stance on energy innovation.

The point is that the traditional management and vision of the country's energy sector is still quite persistent. The Czech government as well as the big energy companies are hesitant to change what has proved to be working: huge power generation sources, long-term planning, conventional technology, etc. That is why the predominant approach can be coined the following way: 'It is worth to preserve the existing practices that work fine. However, it is also necessary to adapt to the changing reality and the advent of the new technologies'. Hence, the actors are not always proactive rather than cautious. They follow the developments in the field and try to catch up with those that are becoming mainstream.

However, as the analysis shows, there are some exceptions and it is essential to differentiate between the stakeholders. First of all, the positive influence of the European Union is obvious. Quite often it is the European framework/discourse as well as funding that push some initiatives and measures forward and make them happen. For example, albeit the country ranked 16th in terms of financing provided by the European Commission through the Horizon 2020 scheme, in absolute terms it received €177.3 million, which is a considerable amount of money. A tangible share of projects was related to energy: among the featured ones those related to climate change, nuclear fuel supply, smart vehicles, energy efficiency of the buildings, alternative bio-fuels and market integration of RES can be mentioned. Moreover, it is noteworthy that €33.85 million

went to small and medium-sized enterprises, supporting their innovations. (The European Commission, 2017)

Secondly, the public sector is pronouncedly in favour of energy innovation. However, the government sometimes lacks the resources and conviction to elaborate and consistently follow some robust strategy that would encompass particular steps towards the goals. Moreover, due to various reasons ranging from budgetary restrictions to the lack of expertise, some of the governmental initiatives are limited in scope.

Thirdly, the private sector and major energy companies are trying to catch up with the innovative trends. However, as the case of electric mobility shows, in the Czech context those are far from being the front-runners. Furthermore, due to return-on-investments they are also quite limited in the measures/undertakings they support, which is one of the reasons why there is little innovation stemming from energy efficiency implementation.

Nevertheless, it is always the matter of perspective. Even though the Czech Republic might be lagging behind the Western European countries in terms of energy innovation, the country is doing fairly good in the regional context, showing one of the best performances as the case of electric vehicles shows. Moreover, it is quite likely that the expressed support for energy innovation on the side of the Czech government will eventually turn into a set of practical measures that would be meant for their implementation. After all, some signs of the active policy-making in that direction can already be seen.

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