

# ***The Future of Power Utilities in Central and Eastern Europe***

Disruptive global trends versus regional particularities





# Executive summary

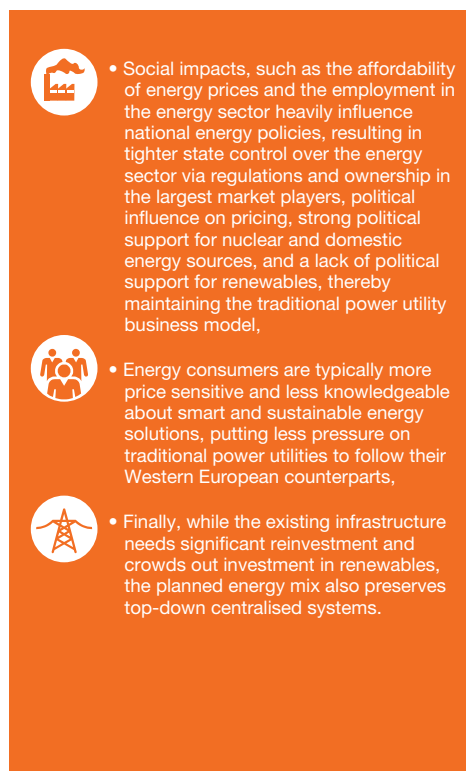
There is a high level of consensus among power and utility companies that an energy transformation is taking place in the wake of five disruptive global trends that have a transformative impact on power markets:

The convergent effects of these trends are undermining the traditional power utility business model, and transforming power from a top-down centralised system to one that is much more competitive, interactive, decentralised and fragmented.

In the same time, market conditions particular to CEE countries<sup>1</sup> go against these disruptive global trends and temporarily preserve the stability of the current energy systems.



- Policy measures and infrastructure development aimed to mitigate climate change concerns and to create unified and connected energy markets with free competition and the protection of consumer rights (e.g. the Renewable Energy Directive in the EU),
- Rapid technological advances in power and digital technologies,
- Changes in customer behaviour, especially the increasing participation in generation and in energy control and management, and the growing need for complex services,
- The growth of distributed generation, and
- New forms of competition expected in areas that at the moment are of limited or only emerging importance to the power sector (smart solutions, local energy systems, e-mobility, distributed generation, and off-grid energy solutions) but will provide opportunities for companies from outside the traditional energy sector, leading to a more open and competitive power market.

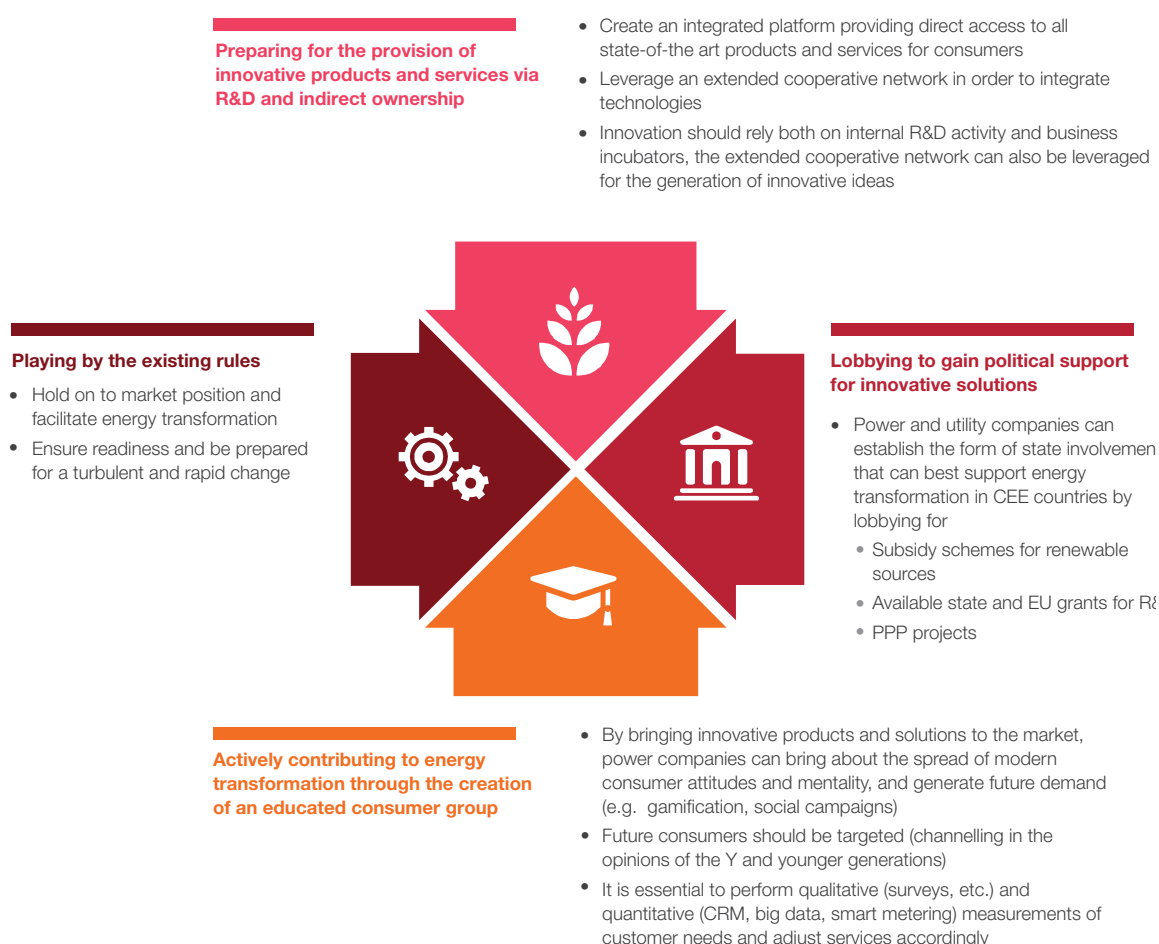


- Social impacts, such as the affordability of energy prices and the employment in the energy sector heavily influence national energy policies, resulting in tighter state control over the energy sector via regulations and ownership in the largest market players, political influence on pricing, strong political support for nuclear and domestic energy sources, and a lack of political support for renewables, thereby maintaining the traditional power utility business model,
- Energy consumers are typically more price sensitive and less knowledgeable about smart and sustainable energy solutions, putting less pressure on traditional power utilities to follow their Western European counterparts,
- Finally, while the existing infrastructure needs significant reinvestment and crowds out investment in renewables, the planned energy mix also preserves top-down centralised systems.

<sup>1</sup> For the purposes of this analysis, the term “CEE countries” refers to the Czech Republic, Hungary, Poland and Slovakia.

While the described disruptive factors are already present and have started to advocate energy transformation in CEE countries, regional particularities temporarily withstand their impact, generating a growing tension in these energy markets. However, due to economic reasons and EU regulations, energy transformation is inevitable, and the change will be more explosive and turbulent compared to Western European countries, characterized by the rapid spread of new consumer behaviour and a quickly changing competitive environment.

Therefore, energy and utility companies operating in CEE countries need to follow a different strategy compared to their Western European counterparts: they need to play by the existing rules on the one hand, while, in the same time, they also need to start both preparing for and also actively facilitating the energy transformation in their markets by



# Five disruptive global trends will have a transformative impact on CEE power markets

## **Policy measures and infrastructure development for sustainable and competitive energy markets**

In an effort to mitigate climate change concerns and to create unified and connected energy markets with free competition and the protection of consumer rights, in many parts of the world there is a growing regulatory pressure on the energy sector which is driving energy transformation.<sup>2</sup> As an example, the Renewable Energy Directive and the Europe 2020 national targets for climate change and energy have a visible impact on the energy mix of European countries.

## **Rapid technological advances in power and digital technologies**

Technological innovation is at the centre of the shifts that are bringing about a very different future power sector world. The most visible examples are:

- The growth of solar and wind generation,
- The spread of distributed and smaller-scale customer-based energy systems and smart grids,

- Energy efficiency solutions, having a major impact on consumed volume,
- Future breakthroughs in the storage of electricity, expected to be a turning point in the spread of renewable energy sources.

Power technology developments are running alongside with the digital revolution, which is creating new opportunities for controlling, managing and trading energy.

## **Changes in customer behaviour: participation in generation, control and management, and growing need for complex services**

The availability of digital communications solutions as well as affordable solutions for the generation and storage of electricity give rise to an active customer participation in self-generation and the procurement of energy, as well as in energy control and management. While energy transformation will have a significant impact on all parts of the value chain, the two areas that are expected to be impacted the most are those that involve active customer participation or interact with customer energy usage: generation and behind-the-meter services to customers.

<sup>2</sup> Source: PwC 14<sup>th</sup> PwC Global Power & Utilities Survey





### ***The growth of distributed generation***

Technological innovation gives rise to the spread of local generation. Already at the moment, in many parts of Germany more than 80% of the local consumption is met from distributed (mostly rooftop solar and landowner wind) sources; with the December 2015 launch of the EU funded Green Homes programme, Slovakia started to offer a support scheme for the installation of renewable energy systems in residential buildings. On average, industry experts expect that 10-20% of total generation will come from distributed sources by 2020, eventually undermining the traditional power utility business model and complicating the task of balancing supply and demand. Power is being transformed from a top-down centralised system to one that is much more interactive, decentralised and fragmented.

### ***Intensifying competition in the wake of unified and connected energy markets, and upon the entry of players coming from outside the traditional energy sector***

Changing and ever more complex customer needs, a more open market due to regulations, and technological advances open up the field to engage customers in novel ways, providing opportunities for companies from outside the traditional energy sector. Further, industry experts expect that a number of areas that

currently are of limited or only emerging importance to the sector will be of major importance in the next decades, providing further opportunities for non-traditional competitors.

As a consequence, and in the wake of unified and connected energy markets, energy transformation is leading to a more open and competitive power market. Sector players can expect competitive threat coming from a number of sectors, including

- Companies with a technology or engineering focus, seizing new opportunities in electromobility, smart metering, smart cities, etc. – e.g. an innovative Slovak SME, involved in R&D related to e-vehicles, battery swap, fast charge technology and Vehicle2Grid and smart grid applications, has launched a countrywide network of chargers across Slovakia;
- Companies from the IT/telecom sector, seizing opportunities in energy control and management, smart city, or even in the traditional energy utility role – e.g. Hungarian and Polish telecom operators launched electricity and gas retail services, but also a number of IT firms are developing smart city and smart home applications;
- Powerful brands from the retail sector or online sectors, and companies with online, digital and data management profiles, seeking media and entertainment, home automation, energy saving and data aggregation opportunities.



# Market conditions temporarily preserve the stability of the current energy systems in CEE countries

The energy transformation pathway in CEE countries is most likely to take a different shape than in more developed Western Europe. According to PwC, CEE specific market conditions – the conservative attitude of energy market players and the existing infrastructural landscape and energy mix – will temporarily preserve the stability of the current energy systems.

## ***The political environment is focused on security of supply, energy prices and employment***

Political environment is defined as the local political agenda that defines governments' energy priorities in the given country over the long term. According to PwC, the political environment counteracts with energy transformation in CEE countries in two aspects.

**1.** Ensuring the security of supply is a particularly sensitive task in this region, burdened with long term gas contracts with Russia and eventual gas disputes. In this context, governments look for opportunities to reduce their countries' energy dependence.

**2.** As the regional standard of living is below the Western European average and energy bills take up a relatively larger chunk of people's income<sup>3</sup>, governments need to take into account the social impacts of the national energy policy, such as the affordability of energy prices and the employment in the energy sector.

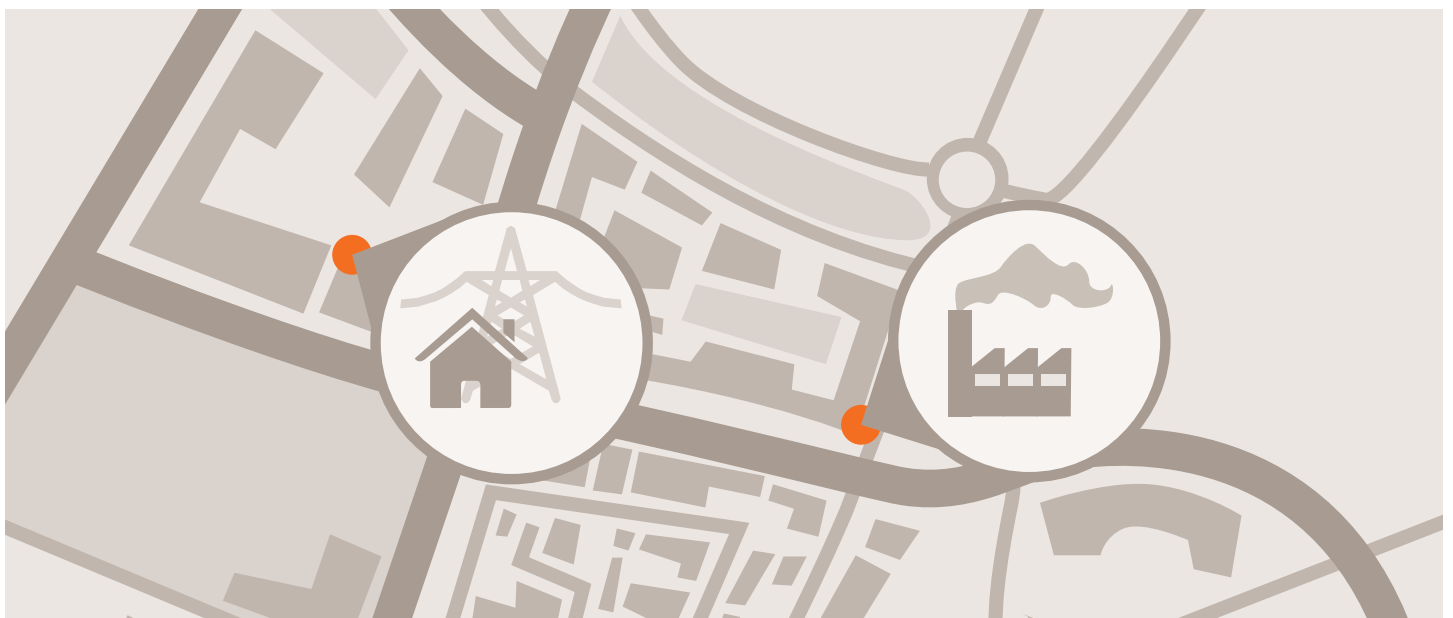
As a result, governments in CEE countries are typically less committed towards renewables that drive up energy prices, and typically try to have a tighter control over the energy sector via regulations and ownership in the largest market players in order to influence pricing and support domestic energy sources.

## ***Price sensitive CEE consumers are slower to adopt renewables***

The attitude of energy consumers is related to energy transformation based on two aspects.

**1.** According to PwC, consumer attitudes related to the consumption and sources of energy, and the general importance of affordability,

<sup>3</sup> According to EUROSTAT, in 2010 the mean expenditure on electricity and other fuels was 8% of the mean equivalised income in the Eurozone and 9% in the EU, as opposed to 15% in the Czech Republic, 26% in Hungary, 19% in Poland and 22% in Slovakia (1,2).





sustainability, and smart technologies hinder energy transformation in CEE countries. As a result of the lower relative living standard, CEE consumers tend to be more price sensitive and slower in the adoption of, and less willing to invest in, new technologies.

2. In the same time, the presence of innovative market players that offer a portfolio of innovative products on the market may facilitate energy transformation by the education of future consumers.

### ***Fossils and nuclear will continue to dominate the electricity mix in CEE countries***

The infrastructural landscape and energy mix includes the existing and planned production structure as well as planned investments and related commitments. According to PwC, the infrastructural landscape is a hindering factor for energy transformation in CEE countries for two reasons:

1. The ageing infrastructure needs significant reinvestment, crowding out investment in renewables.
2. The planned energy mix (maintaining high share of coal and the dominance of nuclear with little increase in renewable sources) preserves the traditional power utility business model.
  - a. CEE countries typically identify nuclear energy as the main source of low carbon electricity in order to meet Europe 2020 national emissions targets.
  - b. Strong political support for cheap domestic coal preserves a relatively high share of fossils and contributes to an unfavourable electricity mix.



# Overview of disruptive trends and counteracting conditions in CEE countries

**Czech Republic: nuclear will dominate the electricity mix besides coal, while political support for renewables lost momentum**

- Successful renewable subsidy scheme was suspended and the country's commitment to green energy was scaled down in 2013 as high electricity prices hampered the country's regional competitiveness, and there were issues with the integration of renewable influx into the grid
- Coal and nuclear energy dominate the electricity mix; ageing capacities coming offline in the coming two decades are planned to be replaced by nuclear
- Consumers support nuclear and have ambivalent attitudes towards renewable energy



**Czech Republic**

## Market conditions counteracting energy transformation



### Political environment

- Successful renewable subsidy scheme was suspended and the country's commitment to green energy was scaled down in 2013



### Infrastructural landscape & energy mix

- In 2012, the Czech Republic completed 81% of its RES 2020 electricity target (11.6% of 14.3%), however, further increase is threatened by suspended subsidy scheme and taxation
- Coal and nuclear energy dominate the electricity mix
- Ageing capacities coming offline in the coming two decades are planned to be replaced by nuclear
- There were issues with the integration of renewable influx into the grid



### Consumer attitude

- Consumers support nuclear energy, often distrust suppliers (uncertainty about actually receiving green energy) and have negative attitudes against building large solar parks with large government subsidies
- Environmentally responsible behavior is more associated with saving energy than with renewables

## Global trends facilitating energy transformation



### Policy measures

- EU regulations press the country to curb its reliance on coal
- One of the biggest net exporters of electricity in the EU – secure electricity supply position
- Fully liberalised pricing



### Growth of distributed generation

- CEZ started offering home solar electricity generators for households in October 2015



### Technological advances

- Robust increase in solar generation in recent years



### Changing customer behaviour and needs

- Presence of players providing electromobility, smart metering, energy storage solutions to consumers
- Consolidation is expected in fragmented market to provide better solution in combination with subsidies + financing



### New forms of competition

- IBM supported Pilzen in smart city initiative
- Siemens built a network control system for Prague's power grid





Hungary

***Hungary: strong political influence on the energy sector, including price cuts and the nationalisation of foreign-owned companies***

- Strong political influence on pricing: the government has cut households' energy prices in recent years by an aggregate of ~25%
- Ongoing nationalisation of foreign-owned privatised companies: newly established state-owned First National Utilities Company is responsible for unified public utility services
- Strong political support for nuclear energy (Paks II): nuclear is expected to continue to dominate the electricity mix
- While there has been a lack of political support for renewables, a new feed-in tariff subsidy scheme is being prepared in order to incentivise investments
- High price sensitivity among customers and low willingness to invest in renewable self-generation

**Market conditions counteracting energy transformation**



**Political environment**

- Strong political influence on pricing: the government has cut households' energy prices several times in recent years by an aggregate of ~25%
- Ongoing nationalisation of foreign-owned privatised companies: newly established state-owned First National Utilities Company is responsible for unified public utility services
- Long-term power purchasing contracts prevent further market opening and thus limit scope for sector modernisation, as producers of electricity have no spare capacity to offer potential buyers
- While there has been a lack of political support for renewables (feed-in tariffs below regulated price are failing to stimulate spread of renewables), a new feed-in tariff subsidy scheme is being prepared
- High electricity import dependency: the country is a significant importer of electricity



**Infrastructural landscape & energy mix**

- Nuclear and natural gas dominate the electricity mix; the government is committed to build new nuclear capacity in Paks (Paks II plant)
- In 2012, Hungary completed only 56% of its RES 2020 electricity target (6.16% of 10.9%) – necessary ambitious increase will require adequate and sustainable investments to achieve binding targets



**Consumer attitude**

- High price sensitivity and low willingness to invest in renewable self-generation
- Low penetration of renewables and knowledge about smart metering among households

**Global trends facilitating energy transformation**



**Policy measures**

- EU regulations press the country to increase share of renewables
- A planned EU project targets a new interconnection between Slovenia and Hungary



**Growth of distributed generation**

- German utilities EON and RWE offer the installation of solar generators for households, RWE even offers financial assistance
- MVM Partner offers utility scale power plants for SMEs



**Technological advances**

- Recent uptake in solar and wind generation



**Changing customer behaviour and needs**

- Presence of players providing smart city, electromobility and smart home solutions



**New forms of competition**

- Telecom company Magyar Telekom launched electricity and gas retail services
- Telekom subsidiary T-Systems supports Szolnok in smart city initiative
- GE and Tungsram are involved in smart city, smart lightning solutions

**Poland: heavy dependence on cheap domestic coal makes Poland's energy mix one of the least diversified in the EU**

- Strong political support for cheap domestic coal – coal is expected to continue to dominate the electricity mix
  - Supports struggling domestic mining sector
  - Helps keep prices low
  - Prevents need for import gas, enhancing energy security
- Lack of political support for renewables: long anticipated feed-in tariff solutions introduced but suspended in 2015, final decision expected in 2016

- Cost concerns and ambivalent political support cast doubts on newly adopted nuclear power programme
- Consumers support nuclear energy and shale gas, and often distrust suppliers (uncertainty about actually receiving green energy)



**Poland**

**Market conditions counteracting energy transformation**



**Political environment**

- Strong political support for cheap domestic coal
- Lack of political support for renewables
- Regulated prices
- Net exporter of electricity – secure electricity supply builds on fossils



**Infrastructural landscape & energy mix**

- Coal and lignite dominate the electricity mix, and many large coal-fired and gas-fired power projects are under development
- Inefficient and overexploited infrastructure – transmission & distribution losses higher than regional average
- Cost concerns and ambivalent political support cast doubts on newly adopted nuclear power programme
- In 2012, Poland completed 56% of its RES 2020 electricity target (10.7% of 19.1%) – necessary ambitious increase will require adequate and sustainable investments to achieve binding targets



**Consumer attitude**

- Price is the most important factor
- Consumers support nuclear energy and shale gas, and often distrust suppliers (uncertainty about actually receiving green energy)
- Environmentally responsible behavior is more associated with saving energy than with renewables

**Global trends facilitating energy transformation**



**Policy measures**

- EU regulations press the country to curb its reliance on coal and increase share of renewables
- LitPol (Lithuania-Poland) electricity interconnection is under development
- Further interconnections are planned with Germany



**Growth of distributed generation**

- Feed-in tariff solutions (introduced and suspended in 2015) are considered. Final decision should be taken in 2016



**Technological advances**

- Wind and biomass increased in recent years
- Advances in drilling technology have made vast resources of shale gas accessible



**Changing customer behaviour and needs**

- Presence of players providing electromobility, smart city and smart metering solutions



**New forms of competition**

- IKEA acquired a Polish wind farm
- IBM supported Katowice and Łódź in smart city initiative
- Polish IT firm Comarch developed smart city app



***Slovakia: strong political support for nuclear, resistance against EU intention to change Slovak energy mix***

- Strong political support for nuclear, resistance against EU intention to change Slovak energy mix (reduce share of nuclear and increase share of renewables)
- Political intention to influence pricing via regulation and state ownership
- The country's grid is not ready to support new distributed sources

- Consumers have less positive attitudes towards renewables than in other EU countries

**Market conditions counteracting energy transformation**



**Political environment**

- Vulnerability of electricity supply set to improve soon by new nuclear reactors coming online in 2017 and 2018
- Resistance against EU intention to change energy mix (reduce share of nuclear – Slovakia identifies nuclear energy as the main source of low carbon electricity)
- Formal adherence to EU rules, interventionist role in practice (strong political influence on pricing)
- The government aims to reduce household prices via regulation and state ownership by 10% in the next two years
- Political support for domestic brown coal<sup>4</sup>



**Infrastructural landscape & energy mix**

- Nuclear dominates the electricity mix, coal and renewables also significant
- In 2012, Slovakia completed 84% of its RES 2020 electricity target (20.5% of 24%), however, the transmission and distribution infrastructure is not ready to support new distributed sources



**Consumer attitude**

- Consumers have considerably more positive attitudes to nuclear energy and fossil fuels than in other European countries, and considerably less positive attitudes towards renewables

<sup>4</sup> For the period 2011-2020, General Economic Interest is imposed on the generation of electricity from domestic brown coal: Slovak transmission system operator SEPS is obliged to purchase ancillary services from generators of electricity from domestic brown coal in some parts of Slovakia

**Global trends facilitating energy transformation**



**Policy measures**

- EU regulations press the country to curb its reliance on nuclear
- Customers with a consumption of more than 4MWh per year should have smart meters by 2020
- Further interconnections are planned with Hungary



**Growth of distributed generation**

- Green Homes programme: support scheme for the installation of renewable energy systems in residential buildings (EU funded programme launched in December 2015)



**Technological advances**

- Significant hydropower capacity
- Focus on biomass and geothermal energy
- Focus on secondary energy sources



**Changing customer behaviour and needs**

- Presence of players providing electromobility, smart metering, smart lighting solutions



**New forms of competition**

- Innovative Slovak SME Greenway is involved in R&D related to e-vehicles, battery swap, fast charge technology and Vehicle2Grid and smart grid applications, and has launched a countrywide network of chargers

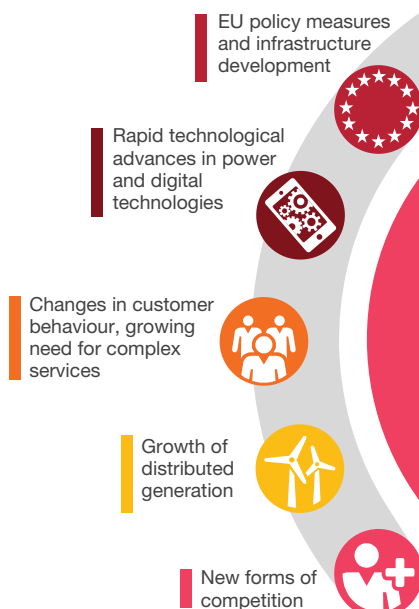
# Energy companies play a pivotal role in facilitating the energy transformation in CEE countries

The temporary stability of the described energy markets is bound to be disrupted. The five disruptive global trends and market conditions have counteracting impacts on the energy markets in CEE countries, generating a growing tension that is, due to economic reasons and EU regulations, bound to lead to the sudden and

explosive transformation of the energy markets and market models at some point. As PwC envisages, the change will be much steeper and more turbulent compared to Western European countries, characterized by the rapid spread of new consumer behaviour and a quickly changing competitive environment.

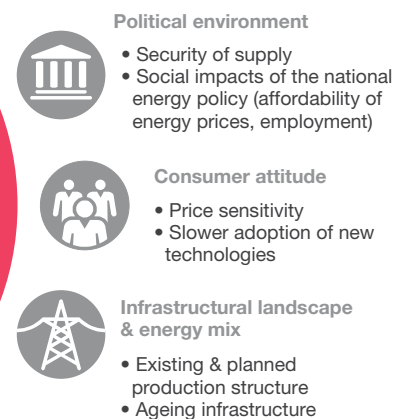
The five disruptive global trends and market conditions have counteracting impacts on the energy markets in CEE countries

## Global trends are having a transformative impact on power markets



Although market conditions particular to CEE countries go against the spread of disruptive global trends, in the medium term, as a result of economic rationality and regulatory changes, market transformation will be inevitable.

## Market conditions temporarily preserve the stability of the current energy systems in CEE countries



Operating in this particular market landscape, energy and utility companies need to follow a different strategy compared to their Western European counterparts: while being required to play by the existing rules, in the same time, they need to participate in, and to actively facilitate, the energy transformation in their markets, and to start preparing themselves to operate in a radically different future market model. In the particular market situation, leadership is possible only if the company's strategy responds both to (1) the challenges of the upcoming new market model, and (2) those factors in the market that are currently inhibiting the spread of the new market model.

According to PwC, power and utility companies operating in CEE countries need to follow a strategic framework comprising four pillars that complement each other:

***Preparing for the provision of innovative products and services via R&D and indirect ownership in order to offer complex solutions for consumers covering all parts of the value chain***

- Create an integrated platform providing direct access to all state-of-the art products and services for consumers
- Leverage an extended cooperative network in order to integrate technologies
- Innovation should rely both on internal R&D activity and business incubators, the extended cooperative network can also be leveraged for the generation of innovative ideas

***Lobbying activity in order to gain political support for innovative solutions***

- Power and utility companies can establish the form of state involvement that can best support energy transformation in CEE countries by lobbying for
  - Subsidy schemes for renewable sources
  - Available state and EU grants for R&D
  - PPP projects

***Actively contributing to energy transformation through the creation of an educated consumer group by bringing innovative solutions to the market***

- By bringing innovative products and solutions to the market, power and utility companies can bring about the spread of modern consumer attitudes and mentality, and generate positive future demand (e.g. gamification, social campaigns)
- Future consumers should be targeted (channelling in the opinions of the Y and younger generations)
- It is essential to perform qualitative (surveys, etc.) and quantitative (CRM, big data, smart metering) measurements of customer needs and adjust services accordingly

***Playing by the existing rules***

- Hold on to market position and facilitate energy transformation
- Ensure readiness and be prepared for a turbulent and rapid change.







# Appendix – Market conditions counteracting or facilitating energy transformation in CEE countries

Market conditions counteracting energy transformation	KPI category	KPI subcategory	KPI	Czech Republic
	Political environment	Security of supply	Long-term gas contracts with Russia	yes
			Energy dependence (2010, % of total consumption)	26%***
			Electricity dependence (imports % of final consumption)	one of the biggest net exporters of electricity in the EU
		Social agenda	Mean consumption expenditure on electricity and other fuels, in PPS, 2010	1 645
			Mean equivalised net income, PPS, 2010	10 923
			Mean consumption expenditure on electricity and other fuels as % of mean net income, 2010 (Eurozone: 8%; EU: 9%)*	15%
		Further local elements and determinants of energy policies	Further local elements and determinants of energy policies	<p>Political support for renewables lost momentum:</p> <ul style="list-style-type: none"> <li>• in 2005 the government launched a generous renewable subsidy program (Feed-in Tariffs (FiTs) and 'green bonuses')</li> <li>• the program was successful (significant uptake in renewables), however, high electricity prices hampered the country's regional competitiveness, and also there were grid limitations</li> <li>• the subsidy program was suspended in 2013 and now solar power facilities are taxed</li> <li>• the government scaled down the country's commitment to green energy</li> </ul>
	Infrastructural landscape & energy mix	Electricity mix	Share of fossil fuels in electricity generation (% of total generation, 2015)	55.4%
			Share of nuclear energy in electricity generation (% of total generation, 2015)	34.7%
			Share of renewable sources in electricity generation (% of total generation, 2015)	9.9%
		Grid system	Condition and flexibility of grid system	Grid limitations: the national grid was unable to handle the huge influx of renewable electricity generation (2005-2013) Investments are expected in the country's power grid in the coming years
		Planned electricity mix	Planned investments and related commitments	<p>Although there are doubts on feasibility, the government plans to build new nuclear capacity due to:</p> <ul style="list-style-type: none"> <li>• Ageing capacities coming offline in the coming two decades;</li> <li>• Coal being the dominant power industry fuel (54% in 2015), contributing to a high level of CO2 emissions;</li> <li>• And EU regulations pressing the country to curb its reliance on coal</li> </ul>

Hungary	Poland	Slovakia
yes	yes	yes
58%	32%***	63%
significant importer of electricity; (2010: net imports 15% of final consumption of electricity)	net exporter of electricity (1% of its consumption)	Good electricity interconnections and adequate domestic infrastructure capacity are important to shelter the country from supply shocks and to enable a proper absorption of renewables
1 876	1 666	2 048
7 324	8 800	9 273
26%	19%	22%
<ul style="list-style-type: none"> <li>The government has cut the household's energy prices several times in recent years by an aggregate of around 25%</li> <li>Nationalisation of foreign-owned assets</li> <li>Strong political support for nuclear</li> <li>While there has been a lack of political support for renewables (feed-in tariffs below regulated price fail to stimulate spread of renewables), a new feed-in tariff subsidy scheme is being prepared in order to incentivise investments</li> <li>Long-term power purchasing contracts prevent further market opening and thus limit scope for sector modernisation, as producers of electricity have no spare capacity</li> </ul>	<p>Strong political support for coal</p> <ul style="list-style-type: none"> <li>supports struggling domestic mining sector</li> <li>helps keep prices low</li> <li>prevents need for importing gas – enhancing energy security</li> </ul> <p>Lack of political support for renewables</p> <ul style="list-style-type: none"> <li>long delayed renewable energy law adopted in 2015 – the law being redrafted several times damaged investor sentiment</li> <li>new PiS government even stronger opponent of renewables (much of their political support comes from coal mining territories) and determined to 'fight the dogma of decarbonisation' long anticipated feed-in tariff solutions introduced but suspended in 2015, final decision expected in 2016</li> </ul>	<ul style="list-style-type: none"> <li>Increasing share of renewable sources expected to drive up prices</li> <li>Formal adherence to EU rules, interventionist role in practice</li> <li>The government aims to reduce household prices via regulation and state ownership by 10% in the next two years</li> <li>Resistance against EU intention to change Slovak energy mix (reduction of carbon emissions and reliance on nuclear, increase share of renewables)</li> </ul>
23.9%	84.3%	46.1%
56.1%	0.0%	45.6%
20.0%	15.7%	8.3%
<ul style="list-style-type: none"> <li>Ongoing grid developments aimed to reduce high loss ratio (10,81% of output)</li> <li>large number of off-grid solar power panels; delays in connecting wind farms to the grid</li> </ul>	<p>Grid limitations: continued investment is needed to</p> <ul style="list-style-type: none"> <li>Boost inefficient and overexploited infrastructure (transmission and distribution losses in the country are higher than the regional average) and</li> <li>Better incorporate intermittent renewables capacity into the electricity grid</li> </ul>	<p>Developed transmission and distribution infrastructure – no significant losses, however, limitations in terms of supporting new distributed sources: boosting the supply of renewable energy is complicated by limitations in the grid: a study by the Slovak Technical University concluded that the country's transmission system was not ready to support the introduction of new renewable energy sources</p>
<ul style="list-style-type: none"> <li>Ongoing nationalisation of foreign-owned privatised companies: state-owned First National Utilities Company being responsible for unified public utility services</li> <li>The government is committed to build new nuclear capacity in Paks (Paks II)</li> </ul>	<ul style="list-style-type: none"> <li>Many large coal-fired and gas-fired power projects are under development</li> <li>In January 2014 Poland adopted a nuclear power programme, however, there are cost concerns and ambivalent political support</li> </ul>	<ul style="list-style-type: none"> <li>Short-term growth in generation capacity: Mochovce 3 and 4 (both 471MW) nuclear reactors set to come online in 2017 and 2018</li> <li>Plans to use biomass (instead of gas) in remote and mountainous areas</li> <li>Large share of water plants in renewable energy production</li> <li>New energy policy also identifies highly efficient CHP as one of the key areas</li> </ul>

	KPI category	KPI subcategory	KPI	Czech Republic
Market conditions counteracting energy transformation	Consumer attitude	General attitudes towards sustainability and smart & sustainable solutions	General attitudes towards sustainability and smart & sustainable solutions	<ul style="list-style-type: none"> <li>• Consumers support nuclear energy, considered the greenest electricity</li> <li>• Some oppose windmills and PV for destruction of farmland or landscape</li> <li>• There are negative attitudes against building large solar parks with large government subsidies</li> <li>• Environmentally responsible behavior is more associated with saving energy than with renewables</li> <li>• Skepticism stems from distrust towards suppliers (uncertainty about actually receiving green energy)</li> </ul>
Market conditions facilitating energy transformation	EU policy measures and infrastructure development	EU2020 RES commitments	2012 electricity consumption from RES	11.6%
			2020 target electricity consumption from RES**	14.3%
			% of 2020 electricity consumption target completed in 2012**	81.4%
	Electricity interconnections	Electricity interconnections	Existing electricity interconnections	Existing electricity interconnection with networks in AT, DE, PL, SK
			Electricity interconnections under development	-
	Changing customer behaviour and needs	Presence of innovative market players that offer innovative products	Presence of innovative market players that offer innovative products	<ul style="list-style-type: none"> <li>• Presence of players providing electromobility, smart metering, energy storage solutions</li> <li>• CEZ' FUTUR/E/MOTION initiative</li> <li>• Consolidation is expected in fragmented market to provide better solution in combination with subsidies + financing</li> </ul>
	Technological advances	Recent uptakes in the given country	Recent uptakes in the given country	<ul style="list-style-type: none"> <li>• Robust increase in solar generation in recent years</li> </ul>
	Growth of distributed generation	Market players start offering distributed generation solutions OR policy measures giving incentives to do so	Market players start offering distributed generation solutions OR policy measures giving incentives to do so	CEZ started offering home solar electricity generators for households in October 2015
	New forms of competition	Non-traditional energy market player starts offering energy related products/services	Non-traditional energy market player starts offering energy related products/services	<ul style="list-style-type: none"> <li>• IBM supported Pilzen in smart city initiative</li> <li>• Siemens built a network control system for Prague's power grid</li> </ul>

#### Social considerations taken into account in energy policies

\* According to EUROSTAT, in 2010 the mean expenditure on electricity and other fuels was 8% of the mean equivalised income in the Eurozone and 9% in the EU, as opposed to 15% in the Czech Republic, 26% in Hungary, 19% in Poland and 22% in Slovakia (1,2).

\*\* Gross final consumption of electricity from renewable sources for electricity

\*\*\* It counts among the lowest ones in the EU

Hungary	Poland	Slovakia
<ul style="list-style-type: none"> <li>• Strong acceptance of solar and wind energy (well above nuclear and fossils), however, high price sensitivity and low willingness to invest in renewable self-generation</li> <li>• Extremely low penetration of renewables and knowledge about smart metering among households</li> <li>• There is a visible willingness from Hungarian cities to become smart cities and improve the standard of living (e.g. EON Smart City development in Győr)</li> </ul>	<ul style="list-style-type: none"> <li>• Price is the most important factor</li> <li>• Consumers support nuclear energy, considered to be environmentally friendly</li> <li>• Consumers support domestic shale gas</li> <li>• Environmentally responsible behavior is more associated with saving energy than with renewables</li> <li>• Skepticism stems from distrust towards suppliers (uncertainty about actually receiving green energy)</li> </ul>	<ul style="list-style-type: none"> <li>• Consumers have considerably more positive attitudes to nuclear energy and fossil-fuels and considerably less positive attitudes to renewables than in other European countries</li> </ul>
6.1%	10.7%	20.5%
10.9%	19.1%	24.0%
56.0%	55.8%	85.4%
Existing electricity interconnection with networks in AT, SK, RO, UA	Existing electricity interconnection with SE, DE, CZ, SK (UA, BY)	Existing electricity interconnection with networks in CZ, HU, PL and UA
<ul style="list-style-type: none"> <li>• SLO-HU interconnection under development</li> <li>• Further interconnections with SK are planned</li> </ul>	<ul style="list-style-type: none"> <li>• LitPol (LT-PL) under development</li> <li>• Further DE-PL interconnections planned</li> </ul>	Further interconnections with HU are planned
Presence of players providing Smart City, electromobility and smart home solutions	Presence of players providing electromobility, smart metering solutions	Presence of players providing electromobility, smart metering, smart lighting solutions
Recent uptake in solar and wind generation	<ul style="list-style-type: none"> <li>• Wind and biomass increased in recent years</li> <li>• Advances in drilling technology have made vast resources of shale gas accessible in Poland</li> </ul>	<ul style="list-style-type: none"> <li>• Significant hydropower capacity</li> <li>• Focus on biomass and geothermal energy</li> <li>• Focus on secondary energy sources</li> </ul>
<ul style="list-style-type: none"> <li>• German utility RWE offers prepaid installation of solar generators for households with favorable loans</li> <li>• German utility EON offers the installation of solar generators for households</li> <li>• MVM partner offers small power plants for SMEs</li> </ul>	Feed-in tariff solutions (introduced and suspended in 2015) are considered. Final decision should be taken in 2016	Green Homes programme: support scheme for the installation of renewable energy systems in residential buildings (EU funded programme launched in December 2015)
<ul style="list-style-type: none"> <li>• Telecom company Magyar Telekom launched electricity and gas retail services;</li> <li>• Telekom subsidiary T-Systems supports Szolnok in smart city initiative</li> <li>• GE is involved in Smart City</li> </ul>	<ul style="list-style-type: none"> <li>• IKEA acquired a Polish wind farm</li> <li>• IBM supported Katowice and Łódź in smart city initiative</li> <li>• Polish IT firm Comarch developed smart city app</li> </ul>	<ul style="list-style-type: none"> <li>• Innovative Slovak SME Greenway is involved in R&amp;D related to e-vehicles, battery swap, fast charge technology and Vehicle2Grid and smart grid applications, and has launched a countrywide network of chargers</li> </ul>

## Sources:

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# Contact



**Ádám Osztovits**

Partner, CEE Power and  
Utilities Advisory Leader  
PwC Magyarország  
+36 1 461 9585  
[adam.osztovits@hu.pwc.com](mailto:adam.osztovits@hu.pwc.com)



**Péter Gyenes**

Senior Manager  
[peter.gyenes@hu.pwc.com](mailto:peter.gyenes@hu.pwc.com)



**Eszter Szabó**

Consultant  
[eszter.szabo@hu.pwc.com](mailto:eszter.szabo@hu.pwc.com)



**Péter Káplár**

Consultant  
[peter.kaplar@hu.pwc.com](mailto:peter.kaplar@hu.pwc.com)

