



KEY DRIVERS OF EUROPEAN POWER MARKET

Michal Krepelka

Commercial and Strategy Division
CEZ Group

Hydrogen Days

Prague, 18 March 2015

CEZ GROUP IS AN INTERNATIONAL UTILITY WITH A STRONG POSITION IN CEE

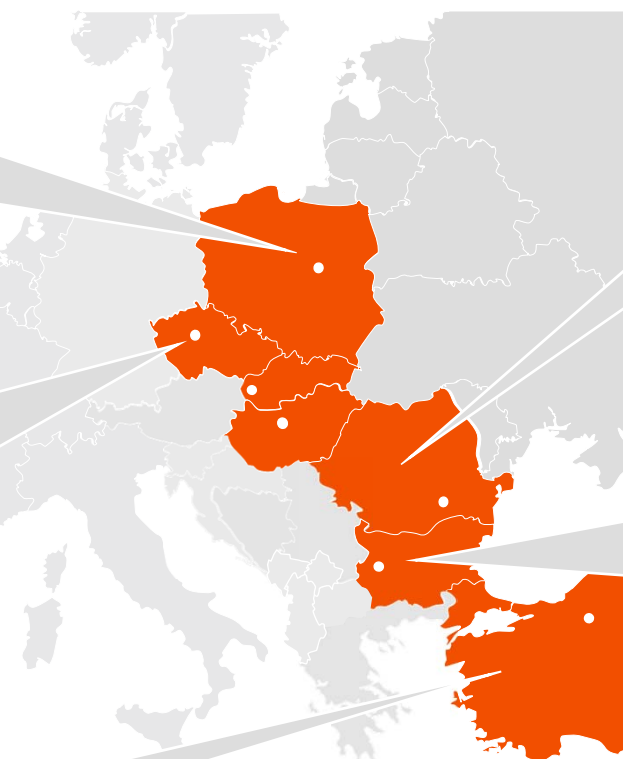


CEZ Group in Poland (100% stake in Skawina, 100% in Elcho)	
Installed capacity (MW)	681
Electricity generation, gross (TWh)	2.6
Generation market share	1.4%*
Number of employees	322
Sales (EUR million)	153

CEZ Group in the Czech Republic	
Installed capacity (MW)	12,631
Electricity generation, gross (TWh)	62.3
Generation market share	72%
Sales of electricity to end customers (TWh)	20.7
Market share	37%*
Number of employees	20,677
Sales (EUR million)	6,680

CEZ Group in Turkey (50% stake in SEDAS through AkCez, 37.36% stake in Akenerji)	
Installed capacity (MW)	640
Electricity generation, gross (TWh)	1.9
Generation market share	1.1%*
El. sales to end customers (TWh)	7.8
Number of connection points (million)	1.4*
Market share	6.5%*

■ Energy Assets ○ Active subsidiary



CEZ Group in Romania (100% stakes in CEZ Distributie, CEZ Vanzare, Tomis Team, Ovidiu Development, TMK Hydroenergy Power)	
Installed capacity	622 MW
Electricity generation, gross (TWh)	1.3
El. sales to end customers (TWh)	3.4
Number of connection points (million)	1.4*
Market share	15%*
Number of employees	1,818
Sales (EUR million)	427

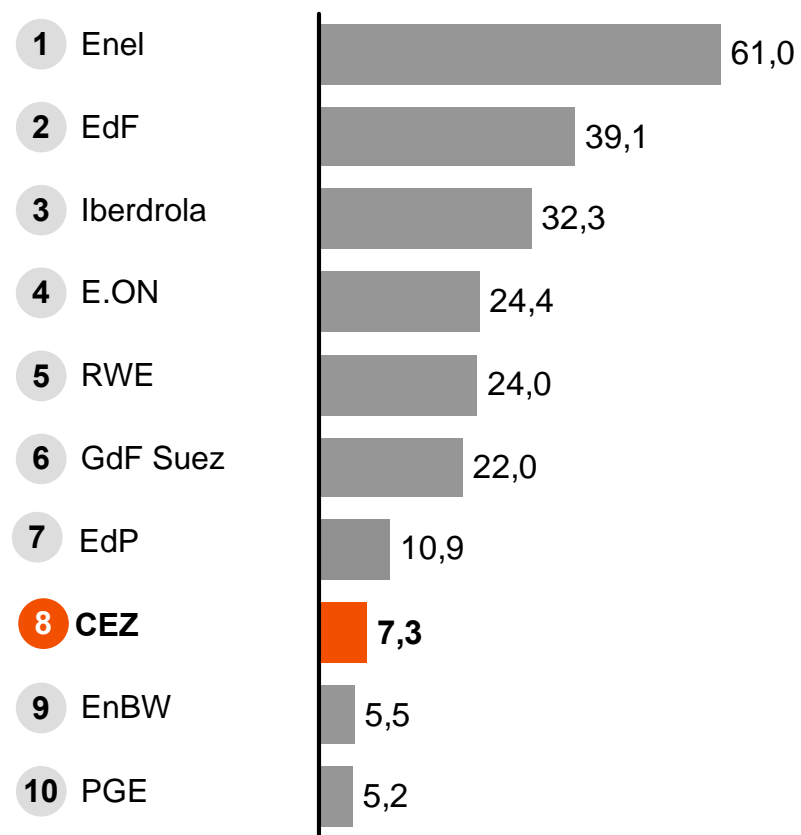
CEZ Group in Bulgaria (67% stake in CEZ Razpredelenie Bulgaria, CEZ Electro Bulgaria, 100% in TPP Varna, 100% in Free Energy Project Oreshets)	
Installed capacity (MW)	1,265
Electricity generation, gross (TWh)	0.6
Market share	11.9%*
El. sales to end customers (TWh)	9.8
Number of connection points (million)	2.1*
Market share	42%*
Number of employees	3,714
Sales (EUR million)	853

CEZ GROUP RANKS AMONG THE TOP 10 LARGEST UTILITY COMPANIES IN EUROPE



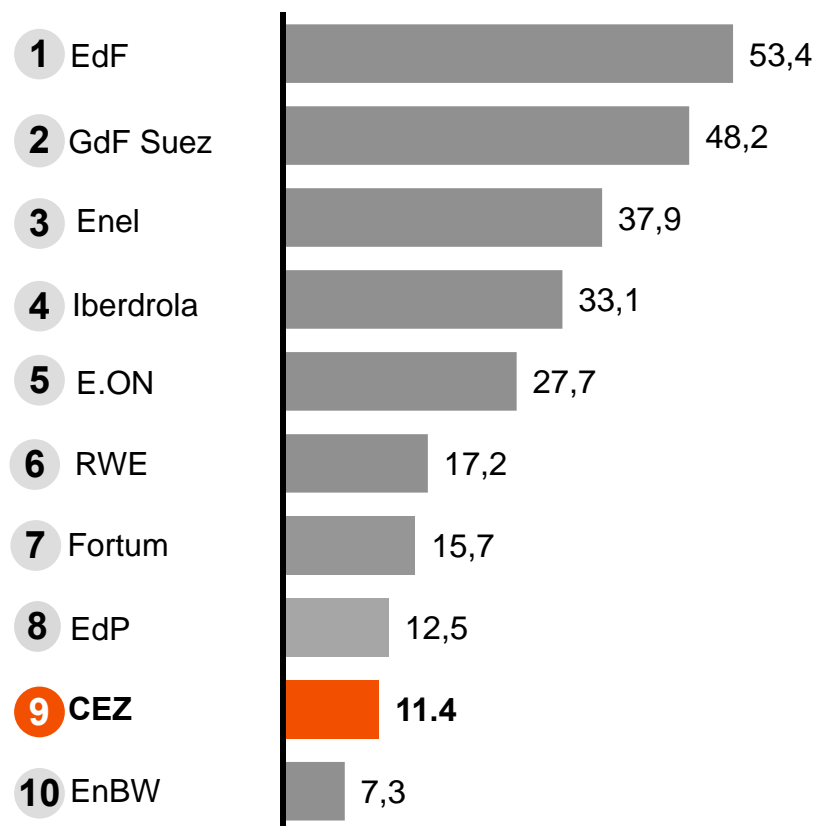
Top 10 European power utilities

Number of customers in 2013, in millions



Top 10 European power utilities

Market capitalization in EUR bn, as of November 21st, 2014

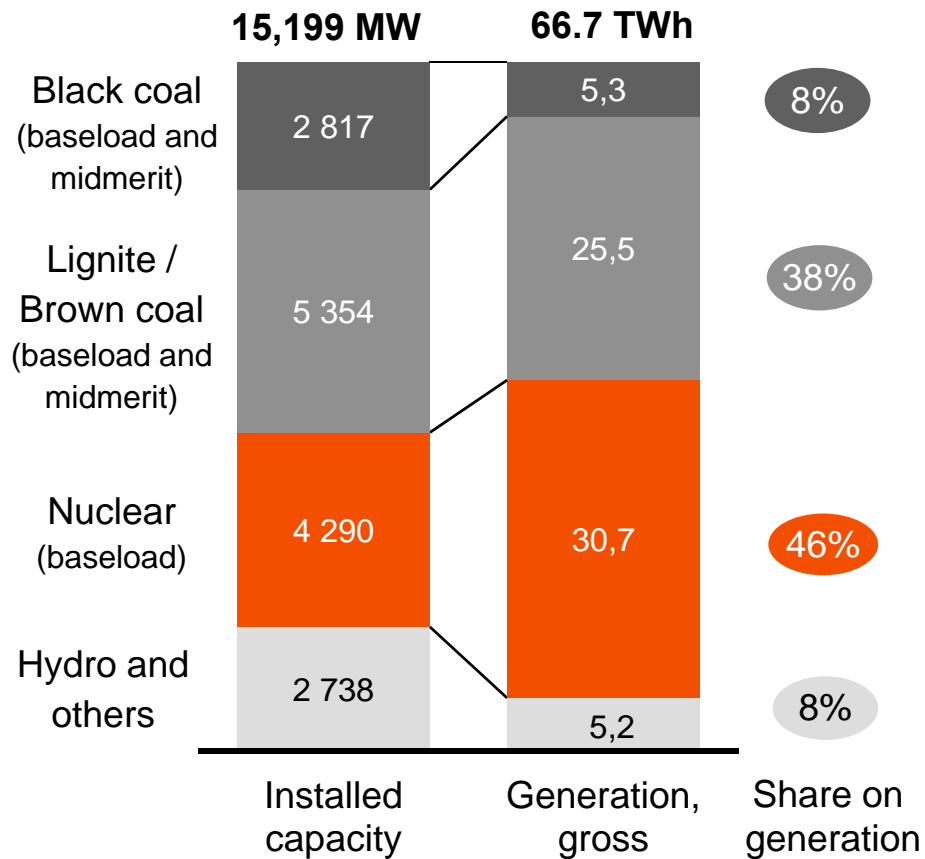


Source: Bloomberg, Annual reports, companies' websites and presentations

CEZ GROUP IS BENEFITING FROM LOW COST GENERATION FLEET



Installed capacity and generation (2013)



- **Coal power plants are using mostly lignite from CEZ's own mine** (73% of lignite needs sourced internally, remaining volume through long term supply contracts)
- **Nuclear plants have very low operational costs**



CEZ has a long-term competitive advantage of low and relatively stable generation costs

CZECH MARKET IS AN INTEGRAL PART OF WIDER EUROPEAN ELECTRICITY MARKET

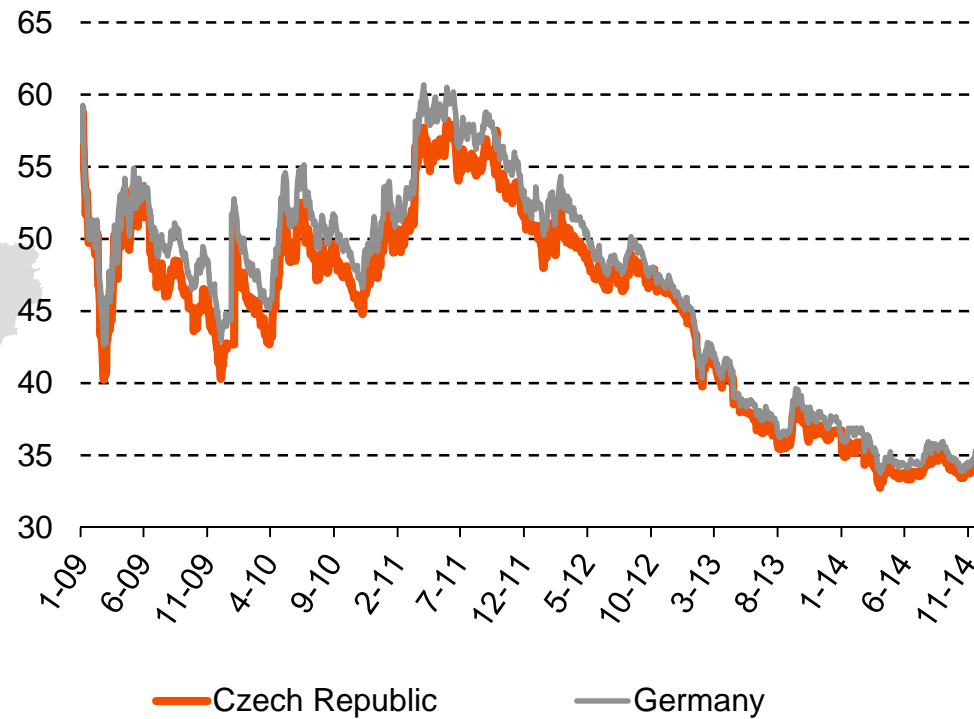


- Czech power prices are fully liberalized and are driven by the same fundamentals as German market
- There are no administrative interventions from the side of the government

European electricity market



Price of electricity (year-ahead baseload, €/MWh)



THE UTILITY SECTOR IS EXPERIENCING REVOLUTIONARY TIMES



Key drivers for the utility sector

EU Political Decisions

- The EU 2030 targets for energy/climate change will lead to new wave of support schemes and investments
- Other regulatory interventions (e.g. market design) will play crucial role in the utility industry developments

Technological Development

- The cost competition of renewable sources is growing substantially with the technological parameters developing as well
- The costs are declining also for energy storage and other technological components to open new business models

THREE OBJECTIVES OF THE EU ENERGY POLICY



REGULATION

- **Competitiveness**
 - Customers across the EU are faced with rising energy bills
 - RES support costs have escalated in some countries with ill designed mechanisms
- **Security of supply**
 - Rising intermittent generation is displacing conventional generation which is needed for generation adequacy but is being forced to shut down (economic factors)
- **Sustainability**
 - The EU is on track to meet its emissions reductions and RES targets up to 2020



THE ENERGY SECTOR WILL BE SUBSTANTIALLY SHAPED BY THE 2030 FRAMEWORK FOR ENERGY AND CLIMATE POLICIES



REGULATION

The member states have approved three 2030 energy and climate targets in line with the European Commission proposal

At least 40 %
greenhouse gas
emission reduction
compared to 1990

- **Binding** on the **pan-European** level
- Partial target for EU ETS: 43% reduction compared to 2005 to 2020

At least 27 %
renewables share of total
final energy
consumption

- **Binding** on the **pan-European** level
- In the power sector this translates to 47% RES share of consumption
- Any contingent support will have higher market exposure (feed-in premium)

At least 27 %
energy savings
compared to 2007 BAU
predictions

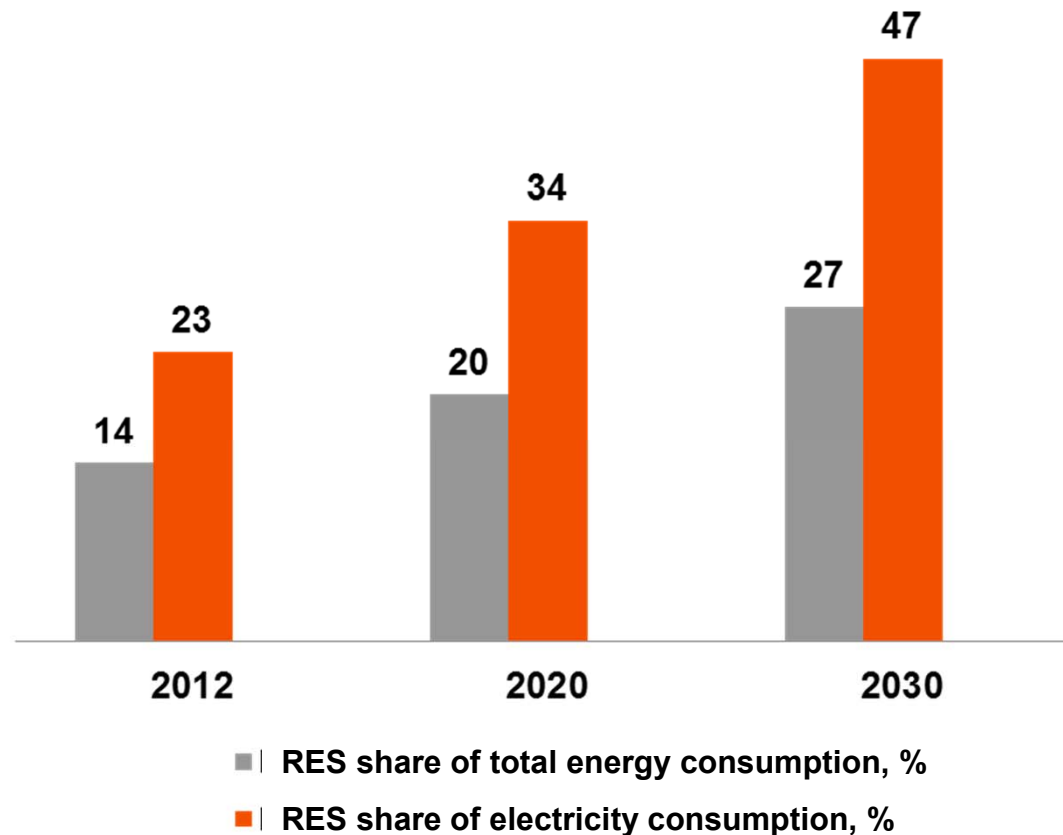
- **Indicative** on the **pan-European** level
- Motivated especially by the effort to reduce import dependency
- EC will propose priority sectors for energy savings

27% RENEWABLES SHARE OF TOTAL CONSUMPTION TRANSLATES TO 47% IN THE EUROPEAN POWER SECTOR IN 2030



REGULATION

Development of RES share of consumption
EU, percentage



- Ambitious RES development target means that the current share has to double
 - In the power sector RES generation should grow by 800 TWh/year by 2030
- ▼
- RES will be a significantly growing part of energy sector
 - Prepare for less room for generation from conventional power plants and improve their generation flexibility
 - More intensive participation on the growing RES market

THE 2030 FRAMEWORK MUST BE DESIGNED TO INCREASE THE ENERGY SECURITY IN A COST EFFECTIVE WAY



REGULATION

For the future development, three areas are crucial

Market based CO2 reduction

- EU ETS reform like MSR is necessary. It will result in CO2 in transparent end cost effective way

Appropriate mechanism of RES support

- RES Target could increase the energy security but current design leads to the opposite
 - high prices for end customer increasing gas consumption
 - low wholesale prices leading to power plant closures

Efficient way in reaching the energy savings

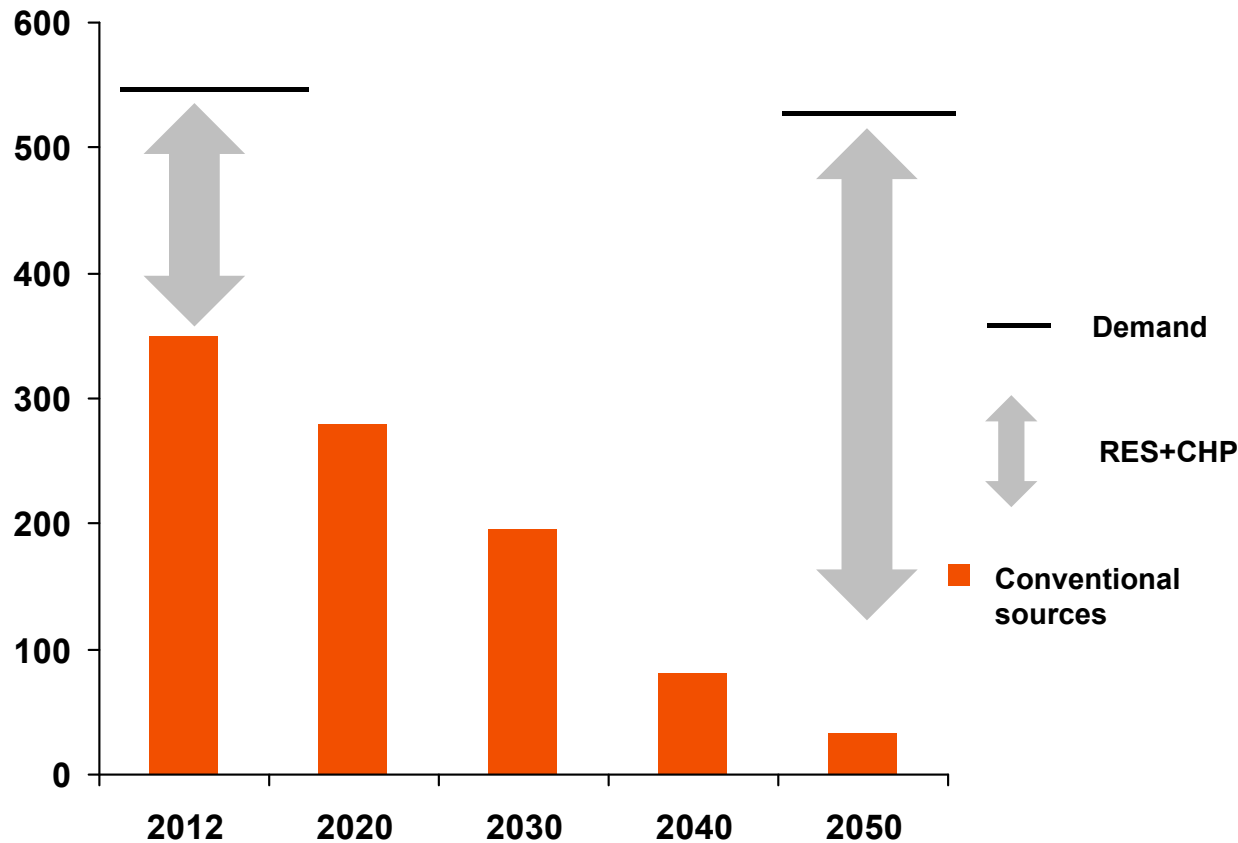
- The chosen way must not increase the dependency on importing fuels (mainly oil and gas)

GERMAN ENERGY POLICY ENERGIEWENDE IS EVEN MORE AMBITIOUS THAN EU TARGETS



REGULATION

Generation from conventional sources in Germany
TWh



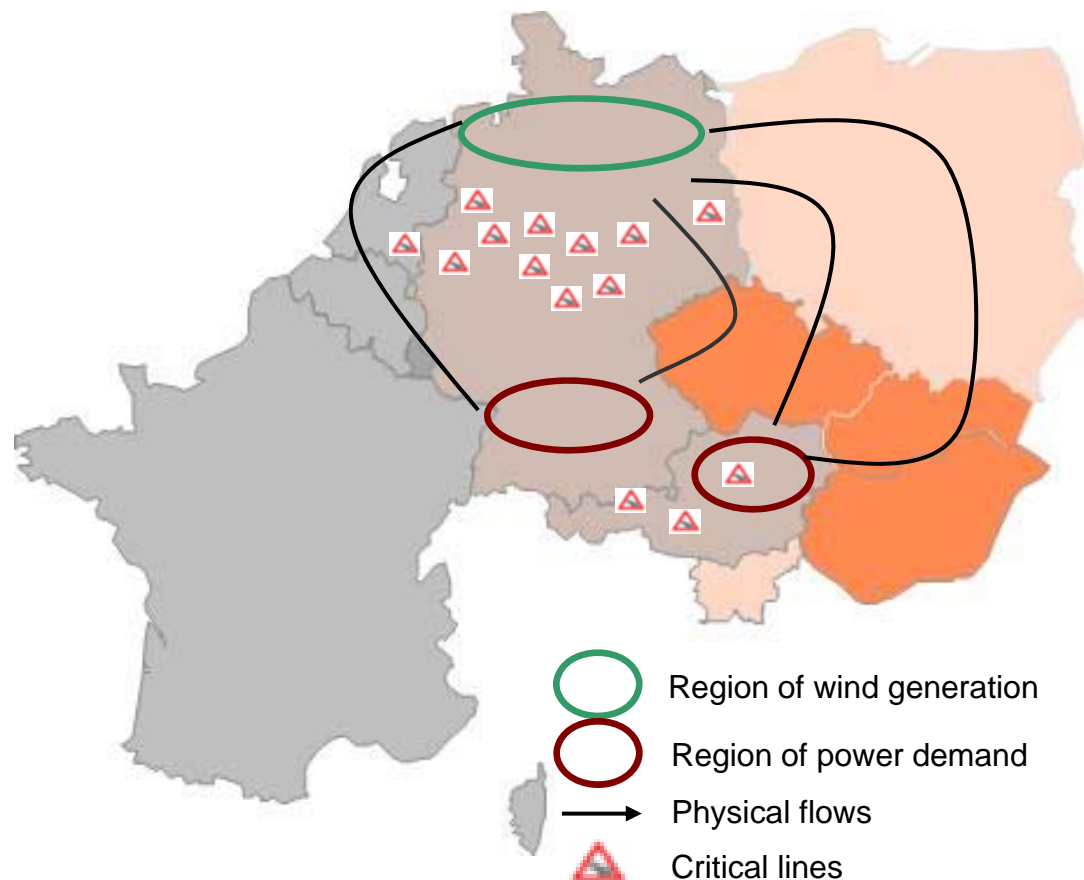
- The aim of Energiewende is to abolish coal and fossil-fuelled sources and replace them by
 - renewable energy
 - energy efficiency
 - sustainable development
- The conventional sources will be accepted only until the renewable generation and energy storage become competitive

THE PRESSURE ON THE TRANSMISSION GRID RISES AS THE PACE OF THE INFRASTRUCTURE DEVELOPMENT IS MUCH SLOWER THAN THE INCREASE IN THE RES GENERATION



REGULATION

Physical Flows of Wind Power in Central Europe



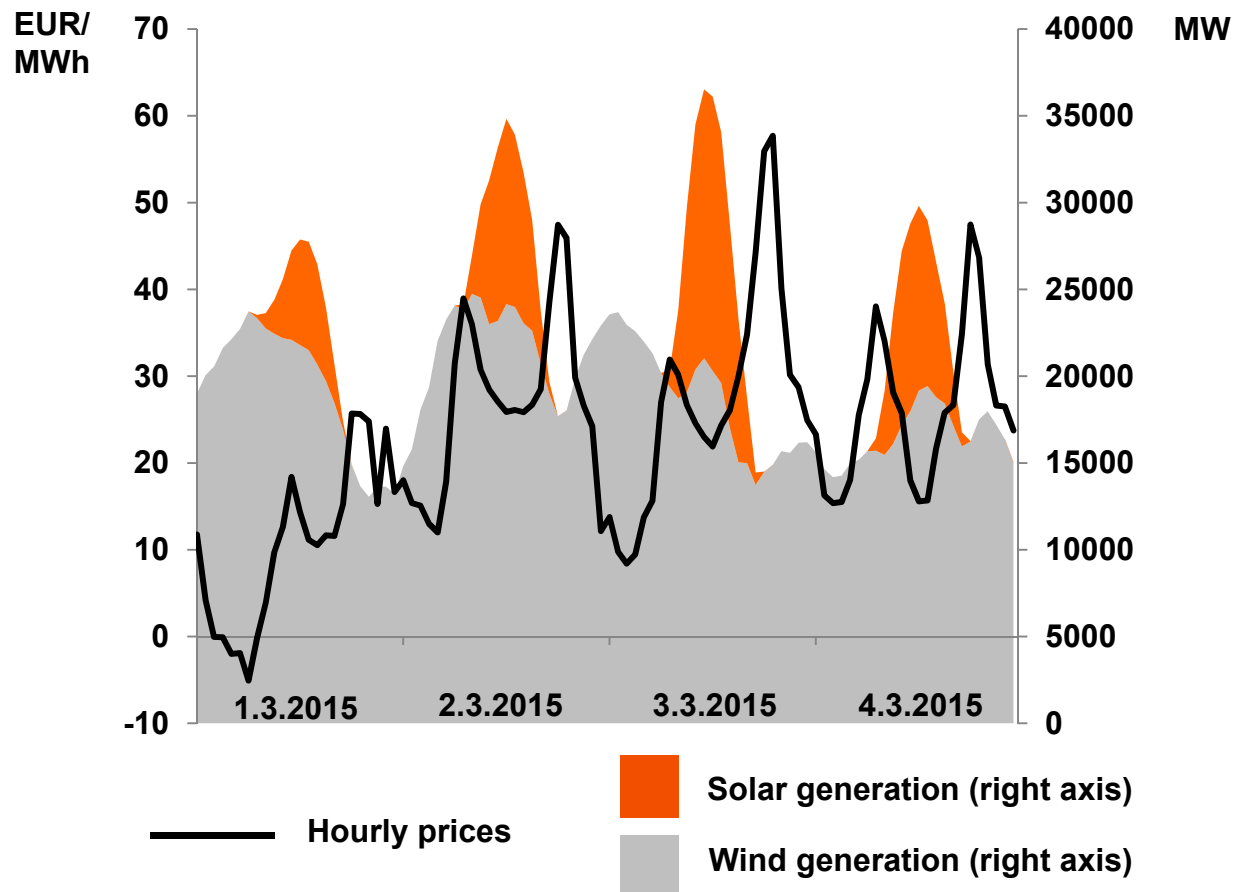
- RES electricity from the Northern Germany flows to the demand centers in the South which, together with large volatility of RES generation, creates pressure on the transmission grid
- Management of flows has become increasingly difficult after the first phase-out wave of nuclear units
- Majority of subsidies is allocated directly to the RES and not to the development of infrastructures

DUE TO UNSTABLE RENEWABLE GENERATION THE POWER PRICES BECOME MORE VOLATILE



Hourly prices and hourly generation from wind solar in Germany

1.-4. March 2015



- The volatility of RES generation is a challenge for grid operators as well as power generators
- The prices can decline to negative figures under certain conditions
- The remaining portfolio has to adapt to RES fluctuation in generation
- The RES generation increase the needs for back-up capacities and ancillary services

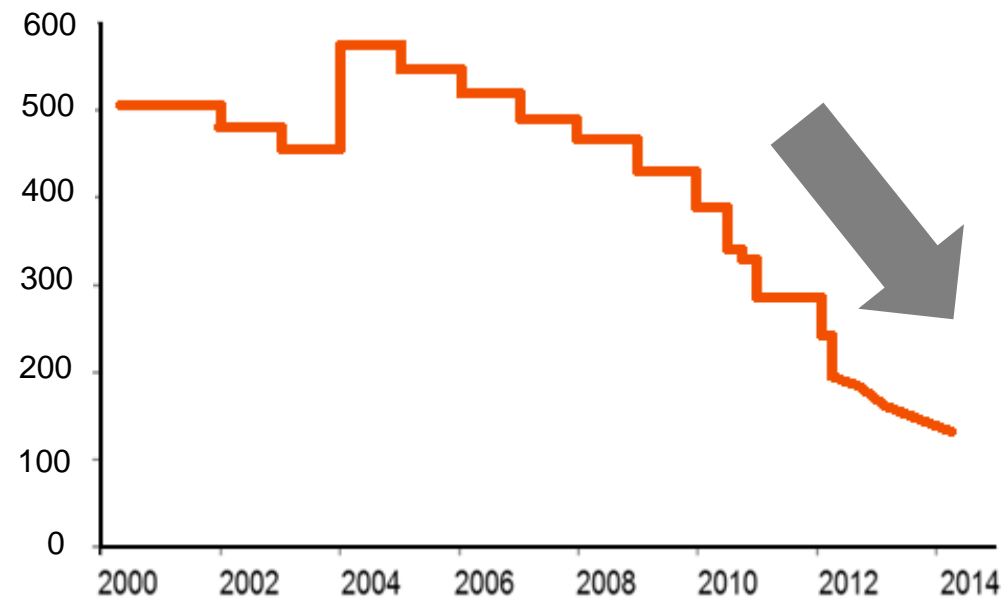
THE COST COMPETITIVENESS OF RENEWABLE GENERATION IS GROWING SUBSTANTIALLY



TECHNOLOGIES

Development of feed-in tariffs for power generated from PV plants in Germany

Support for plants up to 40 KWp
(Feed in tariff, EUR/MWh)



- Fast development leads to declining CAPEX and improvement in the parameters of RES, small CHP units as well as energy storage facilities
- The PV costs have undergone revolutionary development declining by more than 60 % in the last 5 years
- The feed in tariffs in Germany have declined for larger installations to 90 EUR/MWh from 400 EUR/MWh in 2010
- Additional PV cost decline by tens of percent is expected by 2020
- **PV is becoming a standard part of the generation mix**

THE ROLE OF DECENTRALIZED GENERATION IS GROWING



- Germany
 - Already **28%** industrial companies runs their own energy source
 - Since 2010 over 20 thousand small CHP units installed (capacity less than 1 MW)
 - The roof-top panels consist over **60%** of overall solar generation capacity (38 GW)
- USA
 - The capacity of solar generation should **double till 2016** (today 20 GW)
 - The market with roof-top PV installation should grow by 30% per year till 2020
- China
 - This year **8 GW roof-top PV panels** will be installed

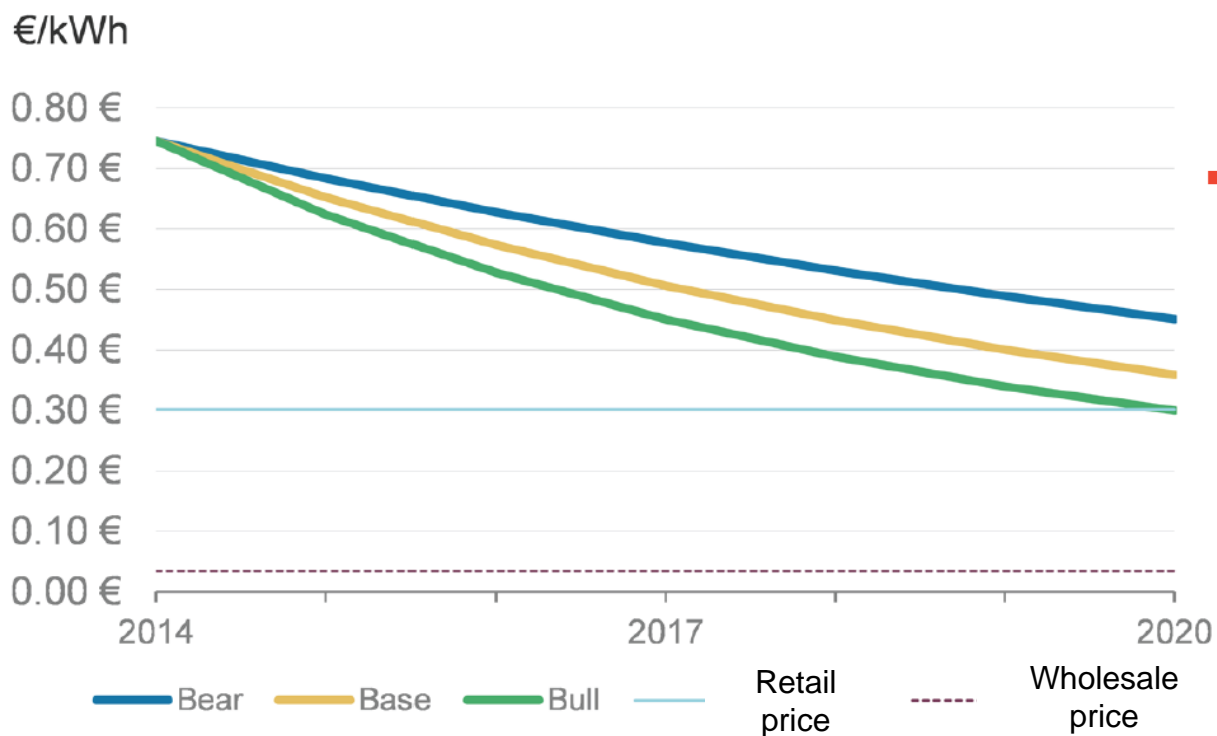


**The expansion of decentralized generation will be supported
by cost competitiveness and not subsidies**

BASED ON THE ANALYSTS FORECAST THE OFF-GRID PV+BATTERY POWER SYSTEM COULD BE COMPETITIVE ALREADY IN 2020



The expected development of full costs – PV+battery



- The forecast includes the expected decline of battery costs by 60% till 2020 and PV panels by 4% p.a.
- The drivers for battery price decline
 - The industrial expansion of lithium-ion cells due to electromobility needs in the U.S. (Tesla)
 - Off-grid solutions remain attractive in many regions in the U.S.

THE IN-HOUSE ENERGY STORAGE WILL BRING REVOLUTION TO THE WHOLE POWER SECTOR



TECHNOLOGIES



- The energy storage remains uneconomic despite the technological progress
- In Germany almost 20% of roof-top PV panels installations is delivered with energy storage – this increases the own consumption from PV panels from 40 to 65%