The Energy for Cooperation

(POLISH-GERMAN COOPERATION POTENTIAL ANALYSIS IN THE ENERGY SECTOR)

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The report was prepared in cooperation with **Tobiasz Adamczewski** and **Arash Duero**.

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Preface

Ambassador **Janusz Reiter**
Prof. Dr. Friedbert Pflüger 4

Executive Summary

1. Introduction to the German and Polish Energy Sector

1.1 General Overview 10
1.2 Energy Consumption 11
1.3 Price of Electricity 12
1.4 Power Mix 12
1.5 Energy Resources 13
1.5.1 Production 13
1.5.2 Import/Export (2012) 13
1.6 Utilities 14

2. Gas

2.1 Price 15
2.2 Gas Trading and Market Structure 16
2.3 Production and Import Structure 18
2.4 Upstream Potential 18
2.5 Gas Infrastructure 20
2.6 Cooperation Potential - Transmission 21
2.7 Cooperation Potential - Diversification 23

3. Renewable Energy

3.1 General Overview 24
3.1.1 Production by Type 24
3.1.2 Market Development 25
3.2 Market Development Comparison 25
3.2.1 Solar Technologies 25
3.2.2 Wind Technologies 26
3.3 Support Systems 26
3.3.1 Overview 26

3.3.2 Positive Aspects 28

3.3.3 Improvement Needs 29

3.4 Cooperation Potential - Cooperation Projects 32

3.5 Cooperation Potential - Offshore Wind 34

3.6 Cooperation Potential - Energy Storage Technologies 35

4. Electric Grids

4.1 TSO and DSO Structure 36

4.1.1 Room for Improvement 37

4.2 Reasons for Grid Expansion 39

4.3 International Cooperation 40

4.3.1 Import/Export 40

4.3.2 Poland/Germany Transfers 40

4.4 Cooperation Potential - Phase Shifters 41

4.5 Cooperation Potential - Electricity Imports 42

5. Climate Policy

5.1 Kyoto Protocol Targets 43

5.2 Climate and Energy Package: Non-ETS Targets 45

5.3 Analysis of Reasoning Behind Climate Policy 46

5.4 Coal 47

5.4.1 Economic Resources and Output 47

5.4.2 The Role of Coal 48

5.4.3 CCS 49

5.5 Cooperation Potential - Clean Coal Technologies 50

5.6 Cooperation Potential - Emission Budget Transfer 52

Works Cited and Consulted 54

FOREWORD

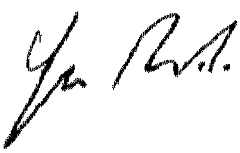
AMBASSADOR JANUSZ REITER

PROF. DR. FRIEDBERT PFLÜGER

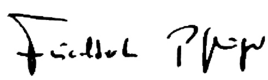
In recent years, there has been a marked trend of intensified dialogue between Poland and Germany regarding bilateral energy issues. Despite diverging approaches regarding the implementation of EU climate policies as well as differing political priorities, both countries have recognized the enormous potential for cooperation in the energy sector. With this study, we seek to highlight the opportunities for cooperation by providing the reader with a detailed overview and analysis of each country's respective energy sector. The particular sectors being analyzed were not selected arbitrarily, but instead were chosen with the intent to elucidate synergies and overlaps where cooperation could realistically take place.

We recognize that international energy cooperation can be a challenging and long-term endeavor. Hence, the purpose of this study is not to find one-all solutions, and indeed, it would be beyond its scope to attempt to do so. Instead, we hope that this analysis will provide added impetus to efforts to enhance dialogue and energy cooperation between Germany and Poland. Moreover, the study is intended to serve as a basis for discussions at the upcoming Polish-German Energy Forum in January 2014.

We would first like to take this opportunity to thank Mr. Tobiasz Adamczewski and Mr. Arash Duero, whose rigorous research and thorough analysis laid the groundwork for this study. Thanks also go to our peer-reviewers Mr. Alexander Jung of Vattenfall, Dr. Henryk Majchrzak of PSE, Mr. Boris Schucht of 50Hertz and Mr. Pawel Smoleń, for their thoughtful input. In addition, we would like to thank the Central Europe Energy Partners (CEEP) for their ongoing efforts to facilitate cooperation between the energy sectors of Central European and other EU member states. Finally, we would also like to thank Ms. Katarzyna Reiter, Director of the Climate and Energy Program at the Center for International Relations in Warsaw, for her support.



Ambassador Janusz Reiter



Prof. Dr. Friedbert Pflüger

EXECUTIVE SUMMARY

The geographical proximity, EU membership and similar development challenges give Germany and Poland an exceptional opportunity for cooperation in the energy sector. Presented in this analysis is the current situation in major energy sectors where such cooperation could take place.

General overview

The general overview introduces the context in which both countries are developing their energy sectors. Through a comparison of macro indicators, including GDP, population, primary energy consumption, and energy prices, it is easier to understand where major differences and similarities lie between the two countries and help to explain discrepancies in the development of their energy sectors.

The contrast between the two countries immediately becomes apparent when looking at their primary energy consumption by fuel type. Whereas Germany exhibits a well-diversified mix between coal, natural gas, oil, and renewables, Poland's mix is dominated by coal, which makes up over half of its consumption.

In Germany, total primary energy consumption is three times greater than in Poland while per capita consumption is about a third higher. Household electricity prices are also higher. German prices have increased significantly over the past few years due to the phase-out of the country's nuclear power plants and the increasing share of renewable energy in power production. Poland's household electricity prices, on the other hand, have actually decreased and are nearly fifty percent lower than Germany's.

Ultimately, divergence seems to best portray the development of each country's energy sector. While Poland has de-facto completed its transition to a market-based economy, there are still elements that give signs that the energy sector is still undergoing transformation. Germany shows more diversification of ownership structure, energy mix and market openness, although, it too, is undergoing a major transition, namely from an energy supply system based on conventional fuels towards one predominantly based on renewable energy.

Despite these differences, however, there are also commonalities. The major identified challenge for both countries is energy security, in the context of growing economies and environmental challenges. The way in which both Germany and Poland will develop their gas, renewable, transmission, and coal sectors in the context of climate policy, will determine both geopolitical and economic stability for decades to come.

Gas

The natural gas sector plays an important role in both countries. Over the past decade, Germany has undertaken efforts to liberalize its gas sector, which has resulted in a well-functioning and liquid gas market with a relatively high degree of import diversification and an extensive infrastructure. Moreover, natural gas has been given precedence over other fossil fuels within the German Federal government's Energy Concept due to its cleaner burning properties as well as its greater compatibility with renewable energy. Despite this, the share of gas in German primary energy consumption has declined in the past couple of years due to the lower price of coal and the greater share of renewable energy.

While Poland's energy consumption is dominated by coal, gas is also perceived to be an important energy source. This is mostly due to its potential as a cleaner alternative to burning coal as well as prospective new supplies from both domestic as well as international sources. Natural gas currently comprises 15% of Poland's primary energy consumption, with the bulk of imports stemming from a single external supplier. One state-controlled company dominates the gas sector, unlike Germany, which has a number of active gas companies in the market. Poland's gas transmission infrastructure is relatively underdeveloped given the country's potential for additional imports as well as prospects for domestic shale gas production. A single system operator runs the transmission grid, which is in stark contrast to Germany's fourteen operators.

Ultimately, Germany's mature gas market with its array of private companies, as well as Poland's emerging market, offer a number of cooperation opportunities. This is particularly important for Poland, given its urgent need to diversify supplies and enhance transmission capacity, but could also prove to be fruitful for German-based companies looking to tap into new markets.

Renewable Energy

Over the years, renewable energy in Germany has received extensive support via the Renewable Energy Sources Act (EEG), which gives priority access to electricity produced from renewables and sets minimal feed-in-tariffs for different renewable energy sources for a specific time period. This has greatly facilitated the expansion of renewable energy in Germany, which comprises nearly a quarter of power production. The EEG has also spurred job creation, investments and even some technological innovation in the sector. So-called co-op projects have provided individuals with an effective instrument to invest in renewable energy. Today, private individuals own one-third of the total installed renewable capacity in Germany. Offshore-wind technology has also received a boost from the EEG. The stable investment framework has prompted energy companies to make substantial investments in offshore wind. This has given German companies the first mover advantage with experience gained from installing technically challenging offshore wind projects. Moreover, financial support is being provided for projects to develop commercially viable and long-term energy storage solutions. However, the feed-in tariff system has also contributed to a drastic rise in the price of electricity. This has prompted German lawmakers to consider reforming the law in order to curb further price increases, which could potentially undermine public acceptance of the country's energy transition (*Energiewende*).

Poland also has a renewable energy support mechanism, albeit one based on a quota system, which creates a market price for certificates of origin issued for each MWh of produced energy. From a macro perspective, the renewables support system in Poland has been working and the annual quotas are being met. Particularly the onshore wind and biomass sub-sectors have been developing dynamically over the past four years with the current system in place. However, the market price for renewables certificates have fallen in the past year due to a number of factors including co-firing as well as holding the renewables target stagnant for three years (2010-2012). There are now proposals for a new system based on tenders, where the company willing to take the smallest feed-in-tariff would win the bid. However, since this proposal is just in its primary legislative phase, the process to its implementation is foreseen to be no shorter than 1.5 years. Until there is legislative stability, many projects will be put on hold, thus hindering the progress that needs to be made by 2020. Hence, Germany's *Energiewende* is a closely looked-at policy from the Polish perspective. Cooperation potential exists in transferring experience from co-op projects. German energy companies can also offer their experience in building offshore wind projects in the Baltic Sea. Energy storage technology is also an important area of potential cooperation between the countries – a project that would revolutionize the energy sector once economically feasible solutions would be found.

Electric Grids

Despite clear differences in the ownership structure of the transmission grids, both Germany and Poland have one major similarity – namely, both countries need to make substantial investments to boost transmission capacity. This is due to a number of differing factors for each country. In Germany, grid expansion is one of the primary conditions for the successful integration of increasing amounts of renewable energy in the electricity market. Currently, a significant share of the electricity generation from renewables (mainly wind) stems from northern Germany, where demand is low relative to the industrial centers in the south. This causes large amounts of energy to flow to the south not only via the German network, but also through the networks of neighbouring countries like Poland, thus raising the risk of grid destabilization. Therefore, new transmission lines from the north to the south have to be built to meet demand, to lessen the detrimental effect on neighboring countries' grids, as well as to compensate for the loss of nuclear generation capacity by 2022, much of which is also located in southern Germany. In addition to the disparity between renewables installation density and demand, the problem of renewable energy market integration and grid stability is also exacerbated by insufficient interconnections between the four supply areas.

Given the current state of Poland's grid infrastructure, it will be very difficult to meet increasing conventional and renewable capacity in the future without significant upgrades and expansions. The country's transmission system operator is vulnerable to losses due to the large distance between its power production and consumption centers. Distribution system operators, too, are vulnerable to loss of efficiency due to old infrastructure. Moreover, Poland will need to increase its capacity in order to accommodate additional renewable sources, especially with more wind projects in the pipeline.

Currently, both countries are planning multi-billion Euro investments. Through enhanced cooperation, Poland and Germany could find solutions through phase-shifters to loop-flows caused by intermittent energy generation. Additional transmission capacity between the countries can also help facilitate the EU's energy market integration policy as well as help fill an impending electricity generation gap in Poland as old power plants are taken offline.

Climate Policy

Both Poland and Germany have reduced their greenhouse gas emissions significantly since their Kyoto Protocol base years. Their approach towards future climate policy differs however. Germany has been pushing for more stringent emission targets over the past years, while Poland prefers to wait for progress on the international arena.

While the United Nations Framework Convention on Climate Change is still working towards a global deal, wherein all countries would take on emission reductions, the EU will be looking into options for its post-2020 climate and energy policy.

The use of coal in the energy mix is a significant factor in the context of EU climate policy. Since the EU ETS targets mostly the conventional power sector, more ambition would lead to higher electricity prices. This is especially valid in the Polish context, where coal dominates the

power sector. The changing reality of the global coal sector, which is becoming too competitive for domestic production, has changed Poland's import/export balance over the last five years. While production is slowing down and the import balance is growing, embracing climate policy seems to be a way forward.
The climate and energy package creates a framework towards not only reducing emissions, but also a move towards sustainable development. Compliance with climate policy is a chance for both Germany and Poland to move towards a more resilient energy sector. Being less dependent on imported energy sources, through more renewable energy deployment, could help the economies grow in a more resilient manner. Additional benefits could include healthier societies and innovation. These efforts must, however, be shared and changes need to be made in accordance with each country's predispositions.

Clean coal and quick dispatch technologies, being developed in Germany, could be an area of cooperation between major companies in the German and Polish energy sector. Emission transfer schemes built within the EU ETS could also be explored by policy makers and business to even out emission reduction efforts in a cost-effective way.

The country's transmission system operator is vulnerable to losses due to the large distance between its power production and consumption centers.

INTRODUCTION TO THE GERMAN AND POLISH ENERGY SECTOR

1.1 GENERAL OVERVIEW

Despite their geographical proximity and EU membership, Germany and Poland are two quite different countries. Germany is the fourth largest economy in the world and ranks twenty-ninth in terms of wealth per capita.[1] Poland's economy has been growing dynamically for the past twenty four years, since the regime change in the country. [2 3]

These macro indicators shed light on some reasons behind discrepancies in the development of energy sectors in the two countries. A factor best portraying the sector's development is divergence. Although Poland has de facto completed its transition to a market-based economy, there are still elements that give signs that the energy sector is still undergoing transformation. Germany shows more diversification of ownership structure, energy mix and market openness.

In Germany, the energy mix is more diverse than that in Poland, as are gas supplies. There are four transmission system operators in Germany, while in Poland there is only one. Market trading in both gas and electrical energy has a longer history and more stakeholders in Germany. The ownership structure of major energy companies is also more diverse, which on the one hand makes them more flexible, but on the other hand leaves less control in the hands of government responsible for strategic decisions. Building more power and transmission capacity in Poland by state-owned companies will be a good comparison study to the German need to build north-to-south transmission systems by privately owned transmission system operators (TSOs). The result of effectiveness in which these investments will be convened could provide insight as to whether a more centralised or decentralised system holds more benefits.

Whether diversification, strong push for renewable energy and market openness is a model to be followed by Poland remains to be decided by policy makers. While Germany looks for ways to enhance the efficiency of its *Energiewende* (energy transformation), Poland seems to be reverting to a coal-based system. Creating strong policy, which helps the economy to grow sustainably, will be a challenge both Germany and Poland will be facing for decades to come, which is why decisions taken today are bound to have a lingering effect on the reality of future generations.

In year 2012	Germany	Poland
Population (million)	81.890	38.538
GDP (billion EUR)	2,643.9	376.4
GDP/capita (EUR)	32,285	9,769

Sources: World Bank, Eurostat, Polish Central Statistical Office (2013)

1 | World Bank, *Gross Domestic Product,* 2012.

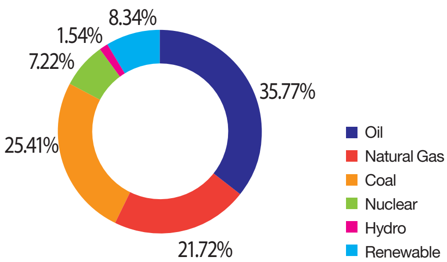
2 | CIA World Factbook, *Country Comparison GDP Per Capita,* 2012.

3 | Poland ranks 24th in the world economy and 69th in wealth per capita.

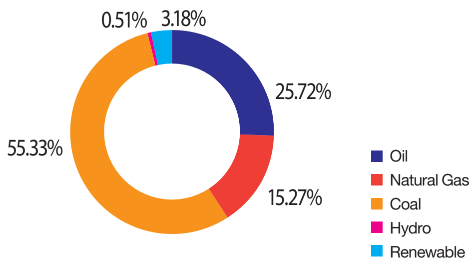
1.2 ENERGY CONSUMPTION

Primary energy consumption by type (2012)

Germany, total 311.7 mtoe



Poland, total: 97.6 mtoe

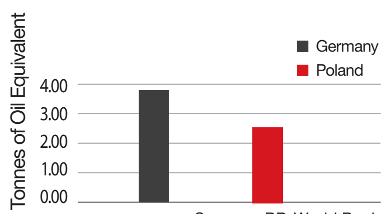


Sources: BP, Statistical Review of World Energy (2013)

Germany

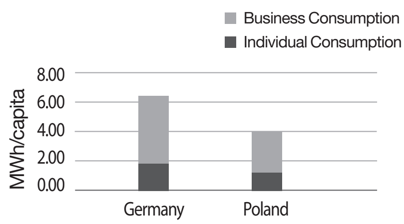
Total energy consumption in Germany in 2012 was 311.7 million tonnes of oil equivalent. Per capita, this amounts to 3.81 tonnes of oil equivalent. The total energy consumption in Germany was 526600 GWh. 74% of that was consumed by business with total electricity consumption per capita at 6.4 MWh.

Primary Energy Consumption per Capita (toe, 2012)



Sources: BP, World Bank

Electricity consumption per capita (2012), use of individuals vs. business



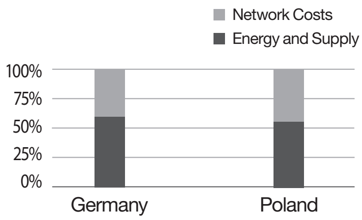
Source: Polish Energy Regulatory Office, Verivox (2013)

Poland

Total energy consumption in Poland in 2012 was 97.6 million tonnes of oil equivalent. Per capita, this means 2.53 tonnes of oil equivalent. The total electrical energy consumption in Poland was 157013 GWh. Most (76%) was consumed by business and total electricity consumed per capita was 4 MWh.

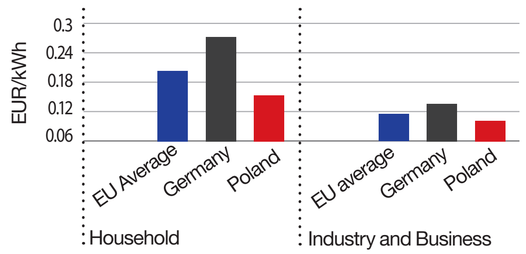
1.3 PRICE OF ELECTRICITY

Share of Networks in the Energy Price



Source: Eurostat, Share of Price Excluding Taxes and Levies (Second half 2011)

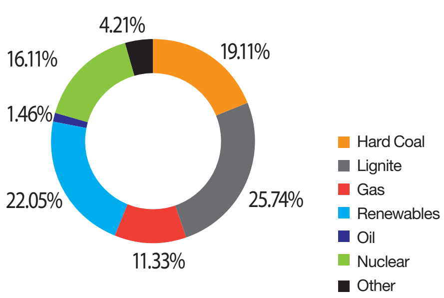
Electricity Prices, Households and Industry (2012)



Source: Eurostat, Half-Year Electricity and Gas Prices (2012)

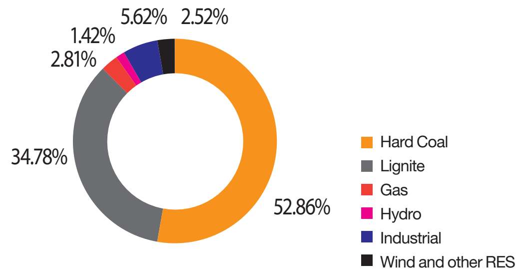
1.4 POWER MIX

Germany, Power Mix (2012), Total Produced: 617 TWh



Source: AG Energiebilanzen (2012)

Poland, Power Mix (2012), Total Produced: 159 TWh



Source: Energy Regulatory Office (2012)

1.5 ENERGY RESOURCES
1.5.1 Production

Germany

Germany has vast coal reserves and is a major producer of lignite. Nevertheless, it remains largely reliant on energy imports, especially oil and natural gas, although renewable energy sources are increasingly contributing to the domestic energy mix.

Domestic production (2012)

Resource	Germany	Poland	Units
hard coal	13,000	79,565	th. tonnes
lignite	177,000	64,206	th. tonnes
oil	2,600	669	th. tonnes
gas	11,200	4,317	mln. m^3

Source: Polish Statistical Office, Energy Regulatory Office, AG Energiebilanzen (2012)

Poland

Despite Poland having vast resources of coal and large potential for gas, by the end of 2012 it remained an importer of both. Oil remains the most imported energy resource in 2012, as domestic production is low.

1.5.2 Import/Export (2012)

Germany

Import, Germany

Resource	amount
hard coal	37,300 th. tonnes
oil	93,600 th. tonnes
gas	81,800 million m^3
electricity	44,200 GWh

Export, Germany

Resource	amount
hard coal	-
oil	-
gas	-
electricity	67,300 GWh

Source: AG Energiebilanzen (2012)

Poland

Import, Poland

Resource	amount
hard coal	9,116 th. tonnes
oil	24,633 th. tonnes
gas	11,265 million m^3
electricity	9,803 GWh

Export, Poland

Resource	amount
hard coal	6642 th. tonnes
oil	-
gas	-
electricity	12,644 GWh

Sources: PwC, Ministry of Economy, Energy Regulatory Office

1.6 UTILITIES

Market Share Germany

Company	Generating Capacity (%)	Production (%)
E.ON	11.49%	29.4%
RWE	17.81%	24.6%
Vattenfall Europe	8.05%	11.1%
EnBW	7.47%	9.4%
Total	44.82%	74.5%

Source: Federal Network Agency (2012)

Market Share Poland

Company	Generating Capacity (%)	Production (%)
PGE	36.89%	39.54%
Tauron	15.64%	13.83%
Enea	8.83%	8.13%
PAK	6.99%	7.32%
Energa	3.27%	2.88%
Total	71.62%	71.69%

Source: Energy Regulatory Office

The difference between installed generating capacity and power production from those sources shows how developed and diverse the renewable energy sector is. In Poland, where most energy comes from large coal-fired plants owned by major energy companies, the proportion between installed generating capacity to produced power is almost 1 to 1. In the case of Germany, this proportion is distorted, as generating capacity installed in renewable energy is much less efficient than typical coal or gas plants. This trend also shows that big market players, although dominant in conventional energy production, are not investing as much in renewable energy as smaller companies would. In terms of daily average market price, Poland's price of electrical energy fell from over PLN 250 per MWh (EUR 63 per MWh) at a peak in 2008, to below PLN 170 per MWh (EUR 43 per MWh).[4] Market prices in Germany are also low, with a daily average of EUR 40[5] in the beginning of November 2013, with a drop of EUR 8 from the same week in 2012. While Germany has seen a year on year increase in overall electricity prices over the past three years, Poland has seen the opposite. Although Poland has gone through the financial crisis without a major hit to its economy, GDP growth remains low (below the 1% mark quarterly)[6]. On the other hand, Germany had five quarters of negative growth rates since 2009, yet the recovery dynamic was much more robust than in Poland. In terms of demand, Poland saw a steady increase in consumption since 2009 from 148 TWh to 156 TWh[7]. In the same time period, Germany's electricity consumption fell from 549 TWh to 544 TWh.[8] In these years, Germany saw a price increase of electricity, which was influenced by increased renewable energy support and recovering gas and coal prices.[9]

4 | Polish Power Exchange, October 2013.

5 | EEX, Phelix average, week 4-8 Nov. 2013 (based on own calculation)

6 | www.tradingeconomics.com, 2013.

7 | PSE

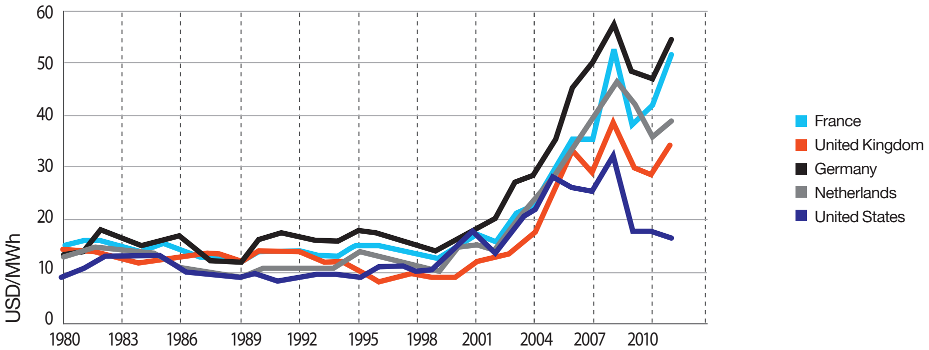
8 | Indexmundi.com

9 | CESifo DICE Report 3/2012

2. GAS

2.1 PRICE

Gas Prices in Germany and in Other Selected IEA Member Countries for Industry



Source: International Energy Agency (2013)

Gas Prices, September 23 and 24, 2013

Country	Price (EUR/MWh)
Polish Power Exchange, Poland	27.59
Henry Hub, US	9.23
NetConnect, Germany	26.65

Sources: Energy Information Administration (2013), Polish Power Exchange (2013), European Energy Exchange (2013)

The gas prices in Poland and Germany are very much dependent on import contracts from Russia and Norway. Since the shale gas revolution has not had a greater impact on EU prices, the variation between the cost of a MWh in North America and Europe vary within the three-fold mark. This trend will remain dominant until more liquefied natural gas (LNG) export terminals are built in Canada on their eastern shores and policy allows for larger export volumes from the US[10]. Demand from rising Asian markets will likely seem more interesting for gas exports, however. Diplomatic efforts may be needed in order to hasten the export of American gas to the EU.

2.2 GAS TRADING AND MARKET STRUCTURE

Germany

Between 2007 and 2012, Germany succeeded in merging 19 regional gas markets, leaving just two: NetConnect and Gaspool. An entry-exit system (EE-system) has been implemented, which includes all customers in just one balancing area, thus fostering competition. Furthermore, the balancing code has been reformed, so that under the new system only one entry and one exit contract is required per market area for the transportation of gas. This two-contract model has facilitated trade, as gas shippers now pay for entering and exiting a zone but not for the actual distance gas travels within the zone. Gas trading at Gaspool and NetConnect has grown continuously over the past five years. Since 2009 alone, the traded volumes have quadrupled. Today, Germany has two dual quality market areas for L-gas and H-gas.[11] Trading in H-gas accounts for approximately 90% of the total volumes traded in Germany. The creation of a market-oriented price signal for L-gas is, generally, more difficult, which is due to its lower quality and the low liquidity of the L-gas market. Therefore, L-gas is not traded on the European Energy Exchange

Poland

Trading gas on the Polish Energy Exchange is a relatively new option for market players (since December 2012).

The process of liberalising the Polish gas market is underway. EU regulations make this transition inevitable. The European Commission launched a court case against Poland for having centrally regulated gas prices (against directive 2003/55/WE). Legislative changes have been implemented through the so-called small tri-pack (amendments to the energy law).

The sector is currently dominated by one company (PGNiG) and until the market is more diverse, the Energy Regulation Office will need to will need to ensure the appropriate price level of high methane gas for end consumers.

The new law stipulates that 55% of the gas is to be sold through the energy exchange (on the free market), which should open up the playing field. However, until infrastructure will allow for more gas to be introduced to the Polish market (currently almost all transmission capacity is reserved by PGNiG), this change will be mostly

11 | High-calorific gas (also called H-gas) is of higher quality because of its greater methane content (between 87% and 99%). Low-calorific gas (L-gas) is natural gas with a lower methane content of between 80% and 87%. Often, L-gas cannot be shipped directly to the end customer without first being upgraded unless it meets the quality standard (11.1 KWh/m^3). See: IEA, *Country Report Germany,* 2013.

Germany

(EEX) in Leipzig.[12] Although, the L-gas and H-gas networks are operated separately, today all customers are incorporated in one large balancing area. Before the creation of the new market areas, shippers could not book entry and exit capacity for their customers, regardless of the gas quality. This is possible today. If H-gas is supplied to customers in the L-gas area or vice-versa, shippers and traders are, however, required to pay a conversion charge.

Although plans for a merger of Gaspool and NetConnect have been discussed since early 2012, it appears unlikely at present. The German TSOs estimated the total investment needs to amount to EUR 3 billion. The financial benefit for the market, by contrast, would only amount to a maximum of EUR 57.3 million annually. In other words, the costs would clearly exceed the expected benefits. An assessment of the Federal Network Agency on the same matter is pending.

Poland

virtual. This is why investments in the physical reverse flow with Germany and LNG terminal are essential.

While PGNiG has distributed 95.43% of gas in 2012, the rest of the market belonged to 14 other companies. It is also Poland's primary upstream and downstream company.

PGNiG is a publicly traded company, but the state has a majority stake of 72.4%. PGNiG became Poland's gas utility in 1982 through integrating local gas producers and distributors. In 2005, it became a publicly traded company.

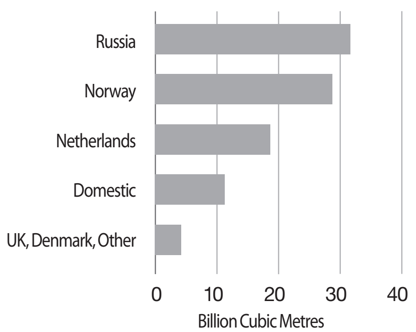
Poland's gas transmission network is operated by Gaz-System S.A., owned in 100% by the government. The process of liberalising the sector is pushing the TSO to put up more transmission capacity up for tenders, so that more players can join the market.

12 | The European Energy Exchange (EEX), based in Leipzig, was founded in 2002 following the merger of power exchanges in Frankfurt and Leipzig. It operates a spot and derivatives market for the German market areas Gaspool and NCG as well as a spot market for the neighbouring Dutch TTF market area. See: IEA, *Country Report Germany,* 2013.

2.3 PRODUCTION AND IMPORT STRUCTURE

Import Structure and Domestic Production (billion cubic metres, 2012)

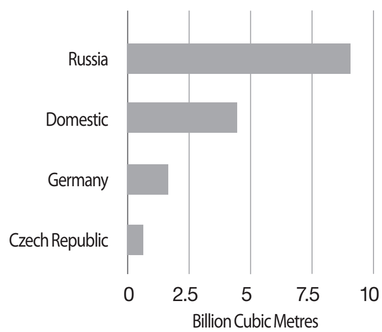
Germany, Natural Gas Source Structure (2012)



Gas Consumption in 2012 (bcm): **93.000**

Source: Federal Ministry of Economics and Technology (2012)

Poland, Natural Gas Source Structure (2012)

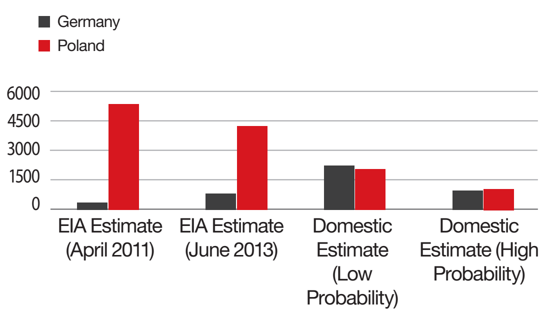


Gas Consumption in 2012 (bcm): **15.317**

Source: Ministry of Economy, Energy Regulatory Office (2012)

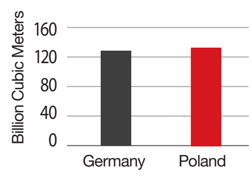
2.4 UPSTREAM POTENTIAL

Shale Gas Potential, Various Estimates



Sources: Polish Geological Institute (2012), Institute for Geosciences and Natural Resources (2012), EIA (2013)

Conventional Natural Gas Potential



Sources: Federal Institute for Geosciences and Natural Resources (2012), Polish Geological Institute (2010)

In 2011, the American EIA assessed Poland's unconventional gas potential to be 5,295 billion cubic metres. Since then, both public and private entities started expensive exploration programmes to prove potential acreage. The price of drilling a single well in Poland is much higher than in the more developed markets in North America.[13] Shale gas exploration and extraction has become one of Poland's flagship energy initiatives for over four years now. Since gas in Poland costs about three times as much as it does in North America and comes from a single foreign source, the possibility of domestic shale gas production is extremely attractive. By mid-2013, only 48 wells have been drilled, which is not enough to better estimate the resource potential nor to begin extraction on a commercial scale.

Shale gas exploitation is publicly accepted in Poland. In a public poll, sponsored by the Ministry of Environment and conducted by TNS Polska, 72% of respondents living on potential shale gas plays, are pro unconventional gas exploration and extraction. 60% of respondents wouldn't mind having wells drilled near their homes.[14]

According to the latest estimations, Germany's technically recoverable shale gas resources amount to 700-2,268 billion cubic metres (two to seven times the currently estimated conventional gas reserves). The German government has not yet taken a final decision on whether shale gas extraction using hydraulic fracturing will be permitted in Germany or not. A study by the Federal Ministry of Environment (Bundesumweltministerium) from September 2012 recommended only a very careful and limited exploration of shale gas under administrative and scientific supervision. A second study by the Federal Ministry of Environment and the Ministry of Economics of North-Rhine Westphalia from the same year recommended a ban on shale gas explorations in Germany until a thorough environmental impact assessment is carried out and its risks can be ruled out. Over the past few years, several citizens' initiatives against shale gas explorations have emerged in Germany (e.g. in North-Rhine Westphalia and Lower Saxony). Nevertheless, about 20 licenses for test drillings have been issued in the meantime. Since the end of 2012, however, the Federal government has engaged in a comprehensive debate with the public on environmental and legal issues related to shale gas explorations. Against this backdrop, the start of shale gas production in Germany cannot be expected anytime soon.

13 | In Poland, drilling an exploration well at an unconventional shale play may cost up to five times as much as in the US or Canada (over EUR 8 million), where thousands of wells are drilled annually.

14 | TNS Polska (2013)

2.5 GAS INFRASTRUCTURE

	Germany	Poland
Length of Pipelines (km)	477,000	10,033
Transmission System Operator (s)	Bayernnets Erdgas Transport Systeme Fluxsys/Tenp Gascade Gasunie GRTgaz Deutschland GTG Nord Jordgas Transport Lubmin-Brandov Gastransport Nowega Ontras Opal Nel Transport Open Grid Europe Terranets BW Thyssengas	Gaz-System
Nominal Gas Power Capacity Installed (MW)	23,900	0,934

Sources: PGNiG, Gaz-System, Ministry of Economy; Federal Ministry of Economics and Technology, Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway (2012)

2.6 COOPERATION POTENTIAL - TRANSMISSION

Recent developments in the German and Polish gas sectors offer both countries opportunities for enhanced cooperation. Here, Poland has three overarching priorities. Firstly, it will need to meet rising demand for gas in power generation, both as a means of diversification and to reduce CO_2 emissions. According to Polish TSO Gaz-System, agreements concluded for the connection of new gas-fired power generation facilities will result in a demand increase of about 5.7 billion cubic metres annually.[15] Existing gas transmission capacities will likely be insufficient to meet this demand. Secondly, the country sees the need to enhance its security of supply, including diversifying its sources as well as transport routes. Currently, Poland's transit-oriented gas infrastructure predominantly transports Russian gas from East to West, which leaves it highly vulnerable to external supply shocks. Thirdly, the country is committed to developing a well-functioning and liquid internal gas market, which could serve as a future gas hub for the region. However, the present landscape is characterised by relatively small markets with a high degree of fragmentation and low interconnectivity levels.

Upgrading existing gas transmission networks and increasing interconnectivity through bilateral cooperation with Germany can help Poland address these challenges and is a precondition for developing its internal market. Initial steps have already been taken in this regard. Cooperation with Germany began in 1996/97 with the Yamal pipeline project. In 2011, virtual reverse flow on the Yamal pipeline was enabled, thus allowing the purchase of gas from German contractors. Furthermore, both Poland's Gaz-System and Germany's Gascade signed an agreement in November 2012 for the expansion of the Mallnow metering station to allow physical reverse flow on the Yamal pipeline. The project is expected to be operational by the second quarter of 2014 and will allow up to 5 billion cubic metres of physical gas to flow from Germany to Poland annually. The Mallnow interconnection point will require agreement documents and coordinated auctions, which are expected to be held in 2014. In addition, an upgrade of the existing Poland-Germany interconnection at Lasow was launched in early 2012 (cooperation with Poland's Gaz-System and Germany's Ontras).[16] Despite these developments, some legal hurdles will have to be overcome and more progress will be required if Poland wants to achieve its stated objectives.

15 | Marzecki, Adam. *Poland-Germany cooperation in terms of regional gas market development,* 2012.

16 | Marzecki, Adam. *Poland-Germany cooperation in terms of regional gas market development,* 2012.

For instance, there are challenges in the Polish legal system, which make it difficult to obtain permission to use peoples' land and drive through their ground pipelines. Sometimes it takes years to get through 100 km and there can be as much as 3000 different landowners on a 100 km strip. The only time when this is easier is when special laws (spec-ustawa) are passed to ensure this is done.

Also, more system integration is needed. This could entail further upgrades to transmission networks and implementing a proposed project to build an additional 1,000 km of pipelines linked to the Czech and German gas transmission systems by 2014. The increased transmission capacity and interconnectivity would significantly boost Poland's ability to meet future incremental demand. Moreover, it would enhance supply security by linking the country to Germany - one of the most liquid gas markets in Europe - as well as contribute to the development of an internal gas market. Connecting to the German market would also be very attractive for Poland given the prospects of purchasing natural gas at spot market prices, thus increasing cross-regional arbitrage opportunities. To underscore this point, it is worth highlighting that in 2012 Poland paid an average gas price of approximately USD 525 per 1000 cubic metres, whereas Germany paid an average price of USD 379 per 1000 cubic metres.[17] Finally, while greater system integration would involve more gas transfer fees, which comprise approximately 7% of the gas bill, it could also lead to lower gas prices and bigger savings in the long-run due to more market competition and investments.

German companies also stand to benefit. The European Gas Target Model recommends that the development of well-functioning wholesale gas markets be based on a series of entry-exit zones, which may be national, or in some cases also cross-border in scope.[18] This may likely facilitate deeper cooperation and interconnectivity with Poland, which would augment Germany's role as a major gas hub by giving companies greater access to a growing market. Moreover, increased German-Polish gas interconnectivity will also help meet Germany's own rising cross-border transportation capacity needs.

17 | Marzecki, Adam. *Poland-Germany cooperation in terms of regional gas market development,* 2012.

18 | European Energy Regulators, *CEER Vision for A European Gas Target Model,* 2011.

2.7 COOPERATION POTENTIAL - DIVERSIFICATION

Diversification of supply is a key component in delivering added gas supplies in the coming decade as well as enhancing energy security. Aside from the aforementioned transmission expenditures, two additional factors can contribute to a more diverse supply of the energy resource: increased domestic production and import from producing countries other than Russia.

Poland's potential for increased domestic production lies primarily in the untapped sources of shale gas. Over the last years, the resource's volume assumptions have been significantly scaled down from the 5,295 billion cubic metres assessed by the EIA in 2011[19], to a high probability range of 346-768 billion cubic metres assessed by the Polish Geological Institute in 2012 (1.9 trillion cubic metres in the low probability scenario)[20]. Considering the country's consumption of about 15 billion cubic metres per year, with a potential to increase above 20 billion cubic metres by 2020[21], even the lower range of up to approximately 20 years supply seems significant. In addition, PGI assesses about 130 bcm[22] of untapped conventional gas, which should be exploited in the near future.

Since Poland has the most advanced exploration programme in the EU, where many countries, including Germany, are still debating the pros and cons of shale gas extraction, there is solid ground for future cooperation between the two countries. Despite slow activity with only 48 exploration wells drilled in Poland as of August 2013[23], northern Poland already looks to have the most potential. With increased domestic production in Poland, both Germany and Poland would benefit from increased supply security.

Moreover, strict environmental regulations could ensure that the production process will come under more scrutiny than from sources exploited outside of the EU. This way, both countries stand to gain a supply of gas which meets higher production standards.

A more diverse supply of gas to Poland and Germany can also be achieved through further expansion of import capacity, such as through LNG terminals. The current Polish investment in the Świnoujście LNG terminal near the Baltic Sea will significantly increase Poland's consumption potential (5 billion cubic metres in its first phase)[24]. But even more importantly, it will serve as an import supply diversification point for the region. Although Germany's gas supply is much more diverse than Poland's, the Świnoujście project will make the Polish market more liquid and open to cooperation with neighbouring countries.

19 | EIA, *World Shale Gas and Shale Oil Resource Assessment,* 2013.

20 | Polish Geological Institute, *Assessment of Shale Gas and Shale Oil Resources of the Lower Paleozoic and Baltic-Podlasie-Lublin Basin in Poland,* 2012.

21 | Based on potential investments in gas power.

22 | Nawrocky, Jerzy. *Bilans zasobów gazu ziemnego w Polsce,* 2010.

23 | Polish Ministry of Environment, 2013.

24 | Gaz System, *LNG Terminal,* 2013.

3. RENEWABLE ENERGY

3.1 GENERAL OVERVIEW

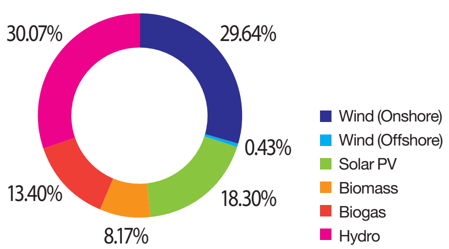
In 2012	Germany	Poland
Installed RES (MW)	76,017	4,414
RES production/capita (MWh)[25]	1.66	0.17

Sources: German Federal Ministry for Environment, Nature Conservation and Nuclear Safety (2013), World Bank, Polish Central Statistical Office (2013), Polish Energy Regulatory Office (2013)

3.1.1 Production by Type

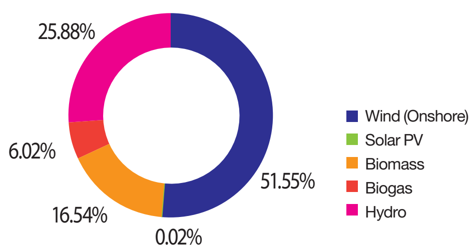
RES production by type (2012)[26]

Germany



Source: German Federal Ministry for Environment, Natural Conservation and Nuclear Safety (2013)

Poland



Source: Polish Energy Regulatory Office (2013), PSE (2013)

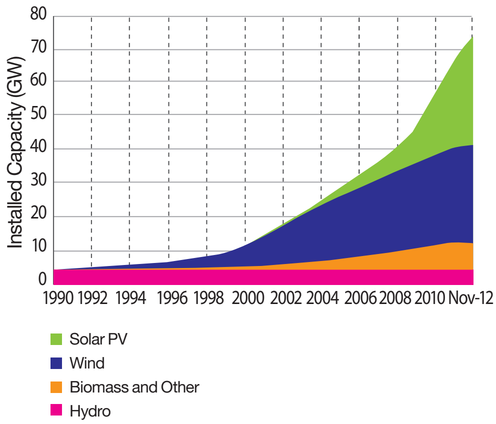
25 | Excluding co-firing.

26 | Excluding co-firing.

3.1.2 Market Development

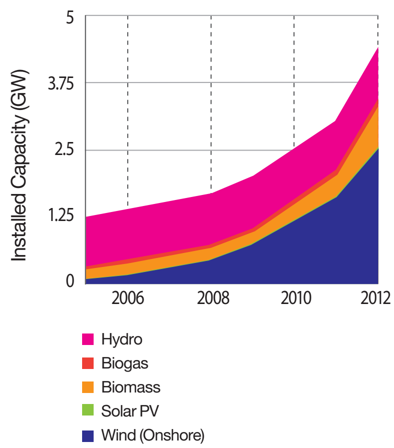
RES Production by Type – Development, End of Year (GW)

Germany



Source: AG Energiebilanzen 2012, BMU (2012), Umweltbundesamt (2012), Bundesnetzganetur (2012), Dong

Poland

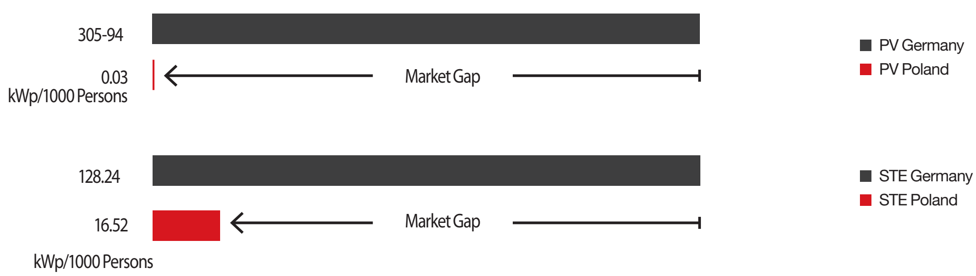


Source: Polish Regulatory Office

3.2 MARKET DEVELOPMENT COMPARISON

3.2.1 Solar Technologies

Market Development – PV and Solar Thermal

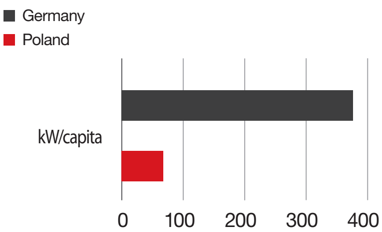


Source: Cleantech Poland, (autumn 2013)

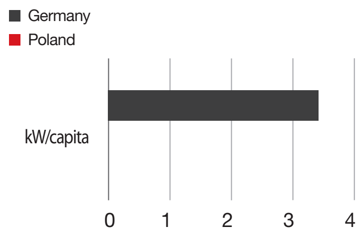
3.2.2 Wind Technologies

Market Development - Wind (onshore and offshore)

Onshore Wind Installed (2012)



Offshore Wind Installed (2012)



Source: European Wind Energy Association 2012, Own calculations

3.3 SUPPORT SYSTEMS

3.3.1 Overview

Germany

The development of RES in Germany's electricity sector can mainly be attributed to the Renewable Energy Sources Act (EEG) of 2000, which on the one hand obliges grid operators to give priority access to electricity produced from RES, and on the other hand, sets minimal feed-in tariffs for different RES sources for a specific time period (generally 20 years). This has created long term stability and guarantees investment returns with a considerable profit margin. The additional costs of the electricity

Poland

The current Polish renewable energy support mechanism is written into the energy law, which uses the quota system to create a market price for certificates of origin issued for each MWh of produced green energy. Regardless of the type of RES used, each MWh equals one certificate of origin, commonly known as the green certificate. The system has been in place since 2005 and, based on existing regulations, will be available until 2021.

Germany

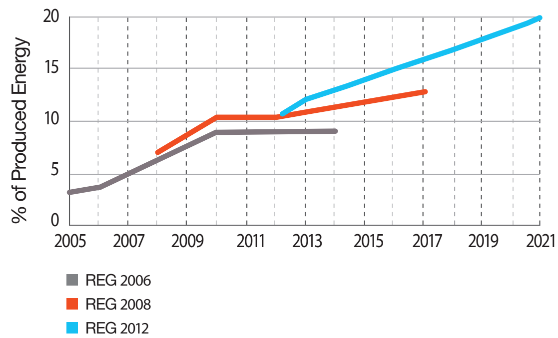
production from RES are covered by the final consumers through an EEG surcharge (feed-in-tariff minus revenues from sale). Here, lowered surcharges or exceptions for energy-intensive industries (approximately 2,000 out of 42,865 actors consuming 53% of the electricity used in industry) as well as rail-using companies exist in order to prevent any adverse effects on their international competitiveness.[27] The tariffs for new plants are regularly reduced according to technological progress and market developments ('degression').

Since 2012, an optional market premium model was introduced, particularly for wind farms. Operators can sell their electricity directly to the market, not to the grid operator. Moreover, the operator receives a premium payment depending on the market price that it achieves (calculated on a monthly basis as the difference between the average wind market price and the feed-in tariff level). Photovoltaic producers receive feed-in tariffs only for 90% of the electricity generated. The rest needs to be self-consumed or sold on the market.

Poland

According to the climate and energy package, Poland's RES target for final energy consumption by 2020 is 15%. The government's goal is that 19% of gross national electrical energy production should come from renewables. Looking at 2012, the target seems far away, because although the 10.4% electricity production quota was basically met, approximately 50% of RES power comes from co-firing. When conducting studies on possible legislative amendments, the Polish Ministry of Economy has deemed co-firing as an inefficient technology seen more often than not as an outcome of a perverse incentive created by the RES support system.[28]

RES Quota Targets, Years 2006-2021



Source: Ministry of Economy, renewable energy regulations from the years 2005, 2008 and 2012; Energy Regulatory Office annual reports

27 | BDEW, *Erneuerbare Energien und das EEG: Zahlen, Fakten, Grafiken*, 2013.

28 | Ministry of Economy of the Republic of Poland, 2013.

3.3 SUPPORT SYSTEMS
3.3.2 Positive Aspects

Germany

From a macro perspective, Germany's renewables support system has thus far been considered a success. It has met, and even exceeded, its targets.

RES also play a respectable role in the German economy. The sales of facilities and components of manufacturers producing in Germany totaled EUR 21.9 billion in 2012.

The gross employment in the economic sphere connected with RES was 368,400. The total amount of companies working in the RES sector was 31,425 in 2012. Additionally, 9,400 persons were working in publicly funded research and development as well as in the public administration associated with RES. The most significant number of jobs are in wind (117,900), photovoltaic (87,800), and bio-energy (59,400). RES plays an especially important role in the labour market of the economically weaker eastern German federal states. On average, 9.9 out of 1,000 German employees work in the RES sector, the average in eastern Germany is 14.3 against 9.0 in the west. Sachsen-Anhalt (26.3), Brandenburg (21.4) and Mecklenburg-Vorpommern (19.2) top the rankings.[29]

Poland

From a macro perspective, the RES support system in Poland has been working. The annual quotas are being met. The wind and biomass sub-sectors have been developing dynamically over the past four years with the current system in place. The year on year increase of RES installed in Poland seems to be dynamic. Wind and biomass are gaining the most momentum. As of October 2013, approximately 3.08 GW of wind power has been installed. Despite many problems the sector faces, planned investments have gone forward and contributed to this outcome. The Eurobserver reported that in the year 2010, Poland had 28,450 people employed across all renewable markets through direct and indirect employment, the most significant of which are wind (7,000), biomass (7,500) and biofuels (9,600).

The support system, which was introduced eight years ago helped to create supply chains for many RES types. Poland has a well developed solar-thermal sector, which can serve as an example of how a properly adjusted support system can have a positive effect on the development of a specific technology. Generally, however, the RES sector is waiting for legislative reform, which could reinvigorate the market.

29 | O´Sullivan, Marlene; Edler, Dietmar;Peter, Bickel; Lehr, Ulrike;Peter, Frank; Sakowski, Fabian. *Bruttobeschäftigung durch erneuerbare Energien in Deutschland im Jahr 2012,* 2013; www.unendlich-viel-energie.de, Erneuerbare-Energien-Arbeitsplätze in den Bundesländern, 2012; www.statista.de, *Anzahl der Unternehmen der Erneuerbaren-Energien-Branche nach Bundesland im Jahr 2012,* 2012.

3.3.3 Improvement Needs

Germany

Despite the generally positive role the Renewable Energy Sources Act (EEG) has played in expanding the deployment of RES in Germany, it has also brought with it a number of pressing issues that need to be addressed.

Firstly, there is growing consensus in Germany that the EEG in its current form needs to be amended in order to tackle rapidly rising energy costs stemming from the green energy surcharge, as well as to better accommodate the integration of renewables into the energy system.

Secondly, conventional power plants are becoming economically unviable due to the price drop of electricity in the wholesale market as a result of the increased production of subsidised renewable energy. This is happening despite the vital role they play in guaranteeing supply security. As the share of fluctuating renewable energy increases in the coming years, so too will the need for flexible backup capacity become more important as long as no long-term power storage solutions have been developed.

Poland

The current RES support system is flawed in many ways. The market-based price of the green certificate system has fallen in the past year.

Due to oversupply, the market prices of green certificates started falling by the end of 2012, reaching an all-time low of PLN 100.48 per MWh (EUR 25.12 per MWh) on February 14, 2013. However, it is important to note that the volume of certificates being sold on the commodities exchange also dropped significantly as the price dipped. The price of green certificates traded over the counter still remained above the PLN 200 per MWh mark (EUR 50 per MWh). The oversupply is due to a few factors. First of all, co-firing produced a significant amount of renewable energy throughout the past years, which kept the RES quota target basically in line with production. Moreover, instead of remitting the certificates to the regulator, power distributors preferred to pay a substitute fee. Also, the ministry of economy held the RES target stagnant for three years (10.4% in 2010-2012), while more and more RES installations came online. The massive oversupply, despite the quota increase in 2013, will remain in the system for a number of years, unless support is cut for co-firing and old hydro

Germany

Thirdly, the lack of investment certainty and insufficient grid infrastructure has resulted in a number of companies involved in offshore wind power development to defer investments, lay off workers or even declare bankruptcy. This development risks turning Germany's offshore wind projects into a stranded investment.

Fourthly, the Energiewende is a project of such magnitude that it inevitably has an impact beyond its borders. The surplus electricity produced in northern coastal wind parks, for instance, has difficulty finding its way to the southern industrial centres because of insufficient grid infrastructure. As a result, Germany is using neighbouring countries' grids during peak times to transfer surplus renewable energy from the north to the south, which risks destabilising their grids.

Poland

plants. This would create space for wind, solar, biomass, biogas and new hydro plants.

With the introduction of an improved support system, perverse incentives could be removed and the RES sector as a whole could potentially help contribute to economic growth through innovation, environmental and health benefits, as well as strengthened energy security and job creation.

Dedicated RES legislation has been drafted many times throughout the past years, with introduction of feed-in tariffs for small installations and diversified coefficients for larger types (draft RES law from October 2012[30]). However, there is a lack of political will to push through such changes, which are deemed to be costly and inefficient by some. These proposals, which were already publicly consulted and drafted into law, were replaced with yet another proposal from September 2013.

This new system would support renewable energy investments through a tender, where the company willing to take the smallest feed-in tariff would win the bid.

30 | Ministry of Economy of the Republic of Poland, 2012.

Germany

Finally, consumers who produce their own energy do not have to pay for the costs of maintaining the grids. As more and more consumers become energy self-sufficient by producing their own renewable electricity, the maintenance costs have to be borne by ever fewer people, thus resulting in considerable price increases for those who do not have the means to produce their own energy. This development is especially urgent in light of the fact that electricity prices in Germany are already at all-time highs and third highest in the EU.

Poland

The aim of the new proposal is to make the system as cost-effective as possible, but at the same time, it does not differentiate between technologies and sizes beyond 1 MW. Thus, rather than being a tool for implementing best available technologies, it will spur investment in the cheapest means of reaching the RES goal.[31] Some other major elements include: a phase-out for support for co-firing, no support for small and micro-installations (and prosumers) and two support areas: for installations above 1 MW and 40kW-1MW. Since the proposed solutions are just in their primary legislative phase, the process to its implementation is foreseen to be no shorter than 1.5 years.

Until there is legislative stability, many projects will be put on hold, thus hindering the progress which needs to be made by 2020. Out of all RES technologies, solar PV has not developed due to low support. Although the RES support system was established in 2005, it has not changed the energy mix significantly. RES power (excluding co-firing) accounts for only about 5% of produced power in Poland.

31 | Ministry of Economy of the Republic of Poland, 2013.

3.4 COOPERATION POTENTIAL - COOPERATION PROJECTS

Poland aims to facilitate the expansion of RES through a quota system, which requires utilities to produce more renewable energy. This policy, which is enforced by a central regulatory authority, sets specific renewable energy targets for distributors, and penalises those that do not meet the targets. The focus here is largely on cost, with the assumption being that utilities will choose the least costly source of renewable energy.[32] The quota system has proven to be moderately successful in Poland, but it has also come under criticism for disproportionately expanding the use of biomass for co-firing relative to other forms of RES such as PV, biogas or wind power, which only makes up about 2% of power production despite favorable wind conditions.

Moreover, while the de-centralised and distributed nature of RES can offer citizens and local communities an opportunity to participate in renewable energy production, this opportunity has to date largely been missed in Poland. The Polish parliament did amend its Energy Law in mid-2013 to exempt owners of micro-installations producing renewable electricity from paying a grid connection fee and other charges.[33] While this can` help encourage more participation from private citizens, it is not likely due to the lack of a feed-in tariff. In order to diversify its renewable energy mix and encourage greater participation from private citizens, Poland may stand to benefit from the effective German energy cooperatives model, which is based on community ownership of renewables projects and a feed-in tariff rather than a quota system.

In Germany, no central authority has the task of deciding the scope of a renewables project – this responsibility lies solely with local governments and actors. This particular type of RES investment framework, coupled with a feed-in tariff scheme, has spurred private and localised ownership in RES in the form of energy cooperatives, resulting in a diversified renewable energy mix as well as a broad portfolio of investors ranging from local citizens and businesses to major corporations. The energy cooperatives in Germany also provide private citizens and others with the opportunity to make investments in many projects irrespective of their scope. For instance, more than 90% of Germany's cooperatives have set up solar arrays; in two-thirds of the cooperatives, a single share costs less than EUR 500 – with the minimum investment amount being less than EUR 100 in some cases.[34] This dispels the notion that investments in RES are only reserved for homeowners or higher income households. Such investment incentives have rapidly increased the number of energy cooperatives in the German renewable energy sector from 66 in 2001 to 586 in 2011.[35] In 2012, private individuals alone owned 35% of the 76 GW of total installed renewable energy capacity, compared to 12% owned by the "Big Four" power suppliers and regional utilities.[36] Overall, it is estimated that community-owned energy cooperatives have leveraged EUR 800 million in investments from more than 80,000 private citizens.[37]

Ultimately, energy cooperatives have not only infused a greater degree of participation in Germany's energy transition, but they have also significantly contributed to a greater public acceptance of renewable energy in general. Poland's recent amendment to its Energy Law may be a step in this direction. However, the absence of a feed-in tariff system could prevent it from duplicating Germany's experience. If the aim is to diversify the Polish renewables mix and increase citizen participation, a closer examination of the German experience - while taking the generally higher cost impact of feed-in tariffs vis-a-vis quota systems into consideration - may be helpful in this regard. Moreover, while Poland is currently considering a newly proposed tender-based support scheme, it could stand to benefit from looking into ways to support small-scale projects.

32 | Morris, Craig and Pehnt, Martin. *Heinrich Böll Stiftung, Energy Transition-The German Energiewende,* 2012.

33 | Platts, *Polish Parliament Approves Measures to Implement EU Energy Rules,* July 26, 2013.

34 | Morris, Craig and Pehnt, Martin. *Heinrich Böll Stiftung, Energy Transition-The German Energiewende,* 2012.

35 | German Renewables Agency Information Platform, Energy Cooperatives, 2013.

36 | German Renewables Agency Information Platform, *Renewable Energies in the Hands of the People,* 2013.

37 | Morris, Craig and Pehnt, Martin. *Heinrich Böll Stiftung, Energy Transition-The German Energiewende,* 2012.

3.5 COOPERATION POTENTIAL - OFFSHORE WIND PROJECTS

With current legislative instability in the Polish RES sector, Baltic-based offshore wind projects are not being developed. On the other hand, in the past few years, Germany has seen an increasing interest in offshore wind projects. EnBW's investment in their Baltic 1 (48.3 MW)[38] and Baltic 2 (288 MW) projects[39][40] has, in essence, paved the road to building German offshore wind projects. This gives German companies the first-mover advantage with experience gained from installing offshore wind projects from the shore, on this side of the Baltic Sea.

The European Wind Energy Association assessed that the German offshore wind sector had 3 GW of construction projects commenced by 2013 and a further 3.5 GW in the financial pipeline.[41] In Poland, no offshore construction projects have begun yet. However, by the end of March 2013, 59 applications were submitted to the Ministry of Transport for permits to raise islands on the sea for the purpose of installing offshore wind farms.[42] By 2013, PGE and Kulczyk Investments received connection permits for 1,045.5 GW and 1,200 MW[43], respectively.

The offshore wind sector in both Poland and Germany has high development potential, as long as legislative solutions support its development and issues with transmission systems do not stand in the way. In a special report for the Polish Wind Energy Association, Ernst and Young concluded that by 2025 there could be as much as 6 GW of wind power installed on the Polish side of the Baltic Sea, which could bring in PLN 73.8 billion of investment (EUR 18.4 billion) into the country, create 30,000 jobs and add PLN 14.9 billion (EUR 3.7 billion) to the national and regional budgets through taxes.[44]

38 | www.enbw.com
39 | www.enbw.com
40 | European Wind Energy Association, The European offshore wind industry-key trends and statistics 2012, 2013.
41 | Baca-Pogorzelska, Karolina. Opóźnione „tak" dla morskich wiatraków, March 03, 2012.
42 | Clean Tech, Volume 4, Spring 2013.
43 | Ernst and Young, Raport EY: Morskie farmy wiatrowe mogą dać miliardy polskiej gospodarce, 2013.
44 | Ernst and Young, Raport EY: Morskie farmy wiatrowe mogą dać miliardy polskiej gospodarce, 2013.

3.6 COOPERATION POTENTIAL ENERGY STORAGE TECHNOLOGIES

A safe, scalable and economically viable energy storage solution is one of the most sought after technologies of the 21st century. Reliable energy storage would solve the biggest downside of RES technologies based on wind and the sun: intermittency.

In May 2011, three German Federal Ministries (Economics and Technology, for the Environment, Nature Conservation and Nuclear Safety, and of Education and Research) launched the Energy Storage Funding Initiative, which will disburse EUR 200 million by 2014 towards R&D in the field of energy storage. This is a tactical decision, which goes hand in hand with the ambition to produce 80% of energy from RES by 2050[45].

The need for efficient energy storage seems to be one of the more interesting challenges for the research and development sector. Moreover, it is an untapped economic potential with global implementation capacity. The German Energy Storage Association already has 76 members, some of which are the large global energy companies such as Hochtief, Mitsubishi, NEC, Samsung and others.[46]

The race for a reliable and cheap energy storage solution is something that is happening between companies and countries right now. Present demand for such solutions will only be growing as RES is deployed on a larger scale. Both Poland and Germany stand to gain from close cooperation in R&D projects covering this subject matter.

45 | Ministry of Economics and Technology
46 | German Energy Storage Association website

4. ELECTRIC GRIDS

4.1 TSO AND DSO STRUCTURE

Germany, TSO Structure

Name	Ownership
Amprion GmbH	74.9% consortium of mainly German institutional financial investors, 25.1% RWE
Tennet TSO GmbH	TenneT TSO (Dutch grid operator)
TransnetBW GmbH	EnBW
50 Hertz GmbH	60% Elia System Operator (Belgian grid operator), 40% Industry Funds Management (Australian investor)

Sources: company websites

Poland, TSO+DSO Structure

Name	Government Ownership (%)
PSE S.A.	100%
PGE S.A.	61.89%
Tauron S.A.	30.06%
Energa S.A.	84.18%

Sources: company websites

Germany

Due to historical factors, the German transmission grid is split into four parts, called control areas (Regelzonen). The transmission lines with a total length of more than 34,000 km are operated by four TSOs – Tennet TSO, 50Hertz, Amprion, Transnet BW, which are unbundled from generation companies and regulated by the Federal Network Agency. Previously, each TSO used to be owned by one of the big four power utilities. However, three of them divested their transmission assets, partly due to regulatory pressures following the incentives of the European Commission and the Federal Cartel Office as well as the need to strengthen company balance sheets.

Poland

Polskie Sieci Elektroenergetyczne (PSE S.A.) is Poland's transmission system operator (TSO). PSE is 100% owned and controlled by the Polish government via the Ministry of Economy to ensure fulfillment of long term energy strategies. The TSO operates the transmission lines from 220 kV- 750 kV and works closely with the energy regulator as well as the distribution companies to ensure the proper balancing of the country's energy system.
The Distribution System Operator (DSO) operates distribution grid up to 110 kV. The DSOs structure is basically divided between four major energy companies, which are also the main energy producers in Poland. Investment plans and tariffs

Germany

The regional and local distribution networks with an approximate length of 1.9 million km are operated by 883 DSOs. In most cases, these are vertically integrated companies that own generation assets as well as supply and distribution businesses. The big four generators also hold shares in many of these companies.

Poland

need to be consulted with the Energy Regulatory Office (URE), so that they comply with the country's long term energy strategy. Ultimately, it is URE that approves the transmission and distribution tariffs for end-users. For individuals, URE also approves the electricity tariff, while prices of energy for industry are market-based.

4.1.1. Room for Improvement

Germany

Grid expansion is one of the primary conditions for the successful integration of RES in the electricity market - especially the planned big offshore wind capacities - and therefore a central pillar to the success of Germany's Energiewende. According to the IEA, the German grid thus far has not acted as a significant bottleneck to RES deployment, but with respect to the growing amount of installed wind and solar capacities, the challenges are continuously increasing; a timely connection for offshore plants is already proving difficult. The amount of cutoffs of RES operators from the grids for network stability reasons is small but rising. This is largely caused by overloads at medium-voltage level lines and substations.[47]

Poland

Major investment needs and expenditures are planned up to the year 2025. Poland's energy infrastructure is undergoing a major overhaul and transmission/ distribution systems need investments as well. While the TSO is vulnerable to losses due to large distance between power production and its consumption, DSOs are especially vulnerable to loss of efficiency due to old infrastructure. They need to create more space for new renewable sources, especially with more wind projects in the pipeline. In 2011, there was a reported loss of 7.3% of electrical energy due to transfer efficiency problems. This resulted in a loss of PLN 2.1 billion, or approximately EUR 500 million. 10,774 GWh have been lost, out of which 84.5%

47 | EUR 33,5 million was paid for electricity from cutoff RES installations. See: Bundesnetzagentur, *Monitoring Bericht 2012,* 2013.

Germany

A significant share of the electricity generation from RES (mainly wind) stems from northern Germany, where demand is low relative to the industrial centres in the south. This causes large amounts of energy flows to the south, and not only via the German network, but also via the networks of neighbouring systems (Poland, Czech Republic, Netherlands, and Belgium).[48 49] Therefore, new transmission lines from north to south have to be built to meet demand as well as to compensate for the loss of nuclear generation capacity by 2022, much of which is also located in southern Germany.

In addition to the disparity between RES installation density and demand, the problem of RES market integration and grid stability is exacerbated by insufficient integration between the four supply areas. Although the network companies are by law obliged to optimise and expand their grids to accommodate electricity from RES, the rapid capacity increase in renewables has posed significant challenges to them. Another problem is that the federal structure of Germany prolongs and complicates the planning and implementation of interregional projects falling under the

Poland

was lost in distribution networks.
PSE calculates that the cost of installing one km of a 400kV transmission line is approximately PLN 3 million (EUR 750.000) and PLN 100 million (EUR 25 million) per electrical substation. Thus, investment expenditures over time are divided in the following manner:

By 2015 - PLN 8.546 billion (EUR 2.13 billion)
(Transmission lines: PLN 5.3525 billion or EUR 1.33 billion)
(electrical substations: PLN 3.1935 billion or EUR 799 million)
By 2020 - PLN 7.5305 billion (EUR 1.88 billion)
By 2025 - PLN 2.225 billion (EUR 556 million)

This means that the upcoming six years might see the most intensive investments in the TSO's infrastructure.

Additionally, by 2015, DSOs will be seeing expenditures of approximately PLN 28 billion (EUR 7 billion).[51]

48 | *Loop Flows – Final Advice,* Thema, October 2013, the study prepared for European Commission
49 | Unplanned Flows in the CEE Region in Relation to the Common Market Area Germany – Austria, CEPS, MAVIR,PSE, SEPS, January 2013
50 | German Energy Agency, *"Ausbau-und Innovationsbedarf in den Stromverteilnetzen in Deutschland bis 2030,"* 2012.
51 | Ministry of Economy

Germany

jurisdiction of more than one state (Bundesland). Couple this with strong local public and environmental group resistance to aboveground projects, and Germany's record in realising grid projects thus far has not been very successful.
Expenditure projects by 2030 are estimated between 27.5 and 42.5 billion EUR[50]

4.2 REASONS FOR GRID EXPANSION

Type	DE	PL
Accommodate increasing generation capacity of wind power	x	x
Accommodate increasing generation capacity of solar PV	x	
Accommodate increasing generation capacity of biomass	x	
Accommodate increasing generation capacity of conventional combined heat and power (CHP) production	x	x
New nuclear power		x
Structural changes in powering certain regions	x	x
Making use of installed power for intervention when power shortages could occur due to grid instability from efficiency problems and RES intermittency		x
Accommodate increased international exchange	x	x
Accommodate increasing generation capacity of conventional power		x

Sources: PSE (2013), German Energy Agency (2012)

4.3 INTERNATIONAL COOPERATION
4.3.1 IMPORT/EXPORT

Import/Export of electricity (2012)	Germany	Poland
Import Total (TWh)	44.2	9.8
Export Total (TWh)	67.3	12.6

Source: PSE (2013), German Energy Agency (2012)

4.4.2 Poland/Germany Transfers

Transfer Between Poland and Germany, Physical Flows (2012, MWh)

PL-DE	171,928
DE-PL	6,048,067

Source: PSE (2013)

4.4 COOPERATION POTENTIAL - PHASE SHIFTERS

Both Polish and German transmission and distribution grids require significant investments. An increasing amount of nominal RES power installed year-on-year in both countries is already a challenge for TSOs in balancing the network. Since the German Energiewende helped rapidly develop wind and solar power over the past decade, the challenges faced there are much bigger than in Poland. The problem is, however, by no means local. For a number of years, a temporary increase in power production from sudden weather changes caused problems for Germany's neighbour. Since the German transmission system is not developed enough to distribute sudden surges in power produced by north-based wind turbines to the demanding south, the power finds its way across the borders through Poland, Czech Republic and the Netherlands.

The Polish transmission system is not prepared to accept large amounts of unpredictable transit flows, as this is disruptive to the grid and has the potential to lead to serious problems if the system voltage is disrupted. Although the issue of unscheduled loopflows and transit flows have caused tension between German and Polish TSOs, by the end of 2012, 50Hertz and PSE managed to come out with an agreement to use virtual phase shifters (vPST) in the short term to better coordinate unplanned energy flows.[52] vPST is a special cross-border re-dispatch regime aimed at limiting unplanned cross border power flows between Germany and Poland, to ensure secure interconnected system operation and to provide commercial transfer capacities on the Polish import profile strengthening cross border power trade. vPST complements the measures of the existing System Operation Agreement between 50Hertz and PSE. Additionally, 50Hertz and PSE signed a Letter of Intent, indicating the willingness of the companies to cooperate in constructing phase shifter transformers in the interconnection lines between Germany and Poland: Mikulowa (PL) - Hagenwerder (DE) and Krajnik (PL) - Vierraden (DE). Currently, there are ongoing talks between the concerned parties on rules of coordinated operation of the PSTs in order to secure operation of the interconnection lines and increase exchange capacities. The foreseen agreement defines also defines cost sharing agreements for remedial measures necessary to maintain system security.

By 2015, PLN 2.4735 billion (EUR 618 million) will be spent by the Polish TSO on international cooperation and connectivity projects. These include investments in the phase shifters, which should come online in 2015.

52 | 50 Hertz, *Press Release,* December 22, 2012.

4.5 COOPERATION POTENTIAL - ELECTRICITY IMPORTS

The Polish Ministry of Economy reports that by 2020, 6.4 GW of installed coal-based power will be shut down because the power units won't meet efficiency and pollution standards set by the Industrial Emissions Directive from 2011. Close to 12 GW will have to be decommissioned by 2030. The pace of replacing these old installations with new ones will determine how much power Poland will need to import in order to meet demand and balance the grid. According to the Ministry of Economy, by 2017, there will be a deficit of 1.1 GW of generating capacity[53]. The Ministry's forecast assumes that planned coal-fired installations will be commissioned as scheduled, but that has been put in question by real-life developments.

Over the past years, major investments in new coal power have been stalled or put on hold due to economic challenges the sector faces today. With a levelised cost of energy (LCOE) higher than the current price of a MWh, building new units has come under question by major energy companies in Poland. New investments are also coming under scrutiny in the context of the recently transposed but not necessarily implemented CCS directive at certain sites. Local communities also fear that they will be displaced due to the plans for new lignite mines.

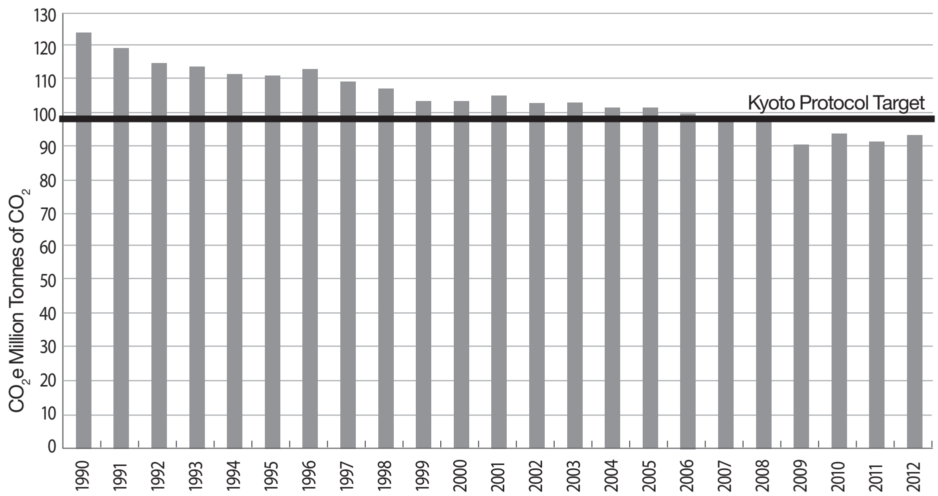
In addition to the lack of new investments in conventional power, the lack of legislative stability is also preventing renewables from coming online. Considering that the time to complete small-scale RES investments is much shorter than building new coal-fired power plants, this could have been one of the solutions to the upcoming problem. The other is the inevitable need to import more energy, especially from Germany. Depending on how quickly generating capacity will grow in Germany and how big of an impact the phasing-out of nuclear power power will have in the near future, there is real potential in further cross-boundary cooperation.

53 | Polish Ministry of Economy (2013)

5. CLIMATE POLICY

5.1 KYOTO PROTOCOL TARGETS

Germany



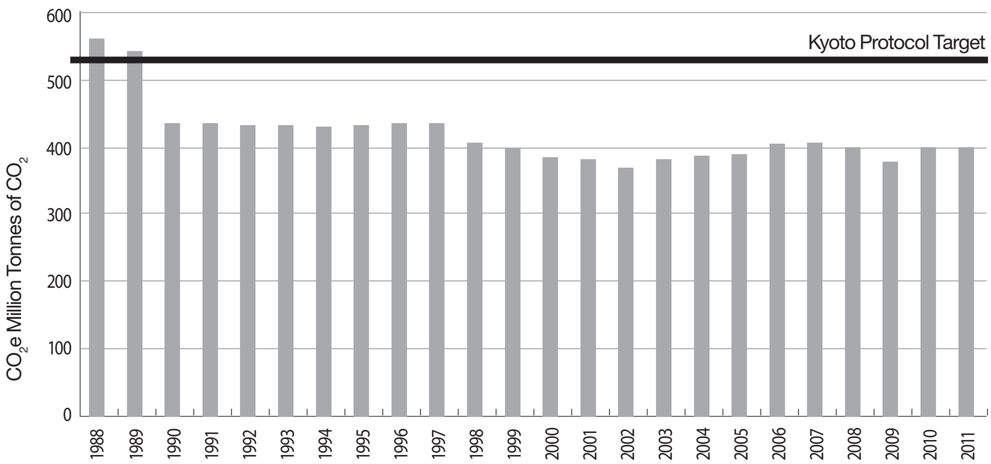
Source: Umweltbundesamt (2013), BMU (2013)

Kyoto Target

Base year	1990
Target Below Base Year (%)	21%
% Reduction	25.6%
2011 Inventory (million tonnes of CO_2)	916.2
GHG/Capita (tonne)	11.19

Source: EEA, 2013

Poland



Source: KOBIZE (2013)

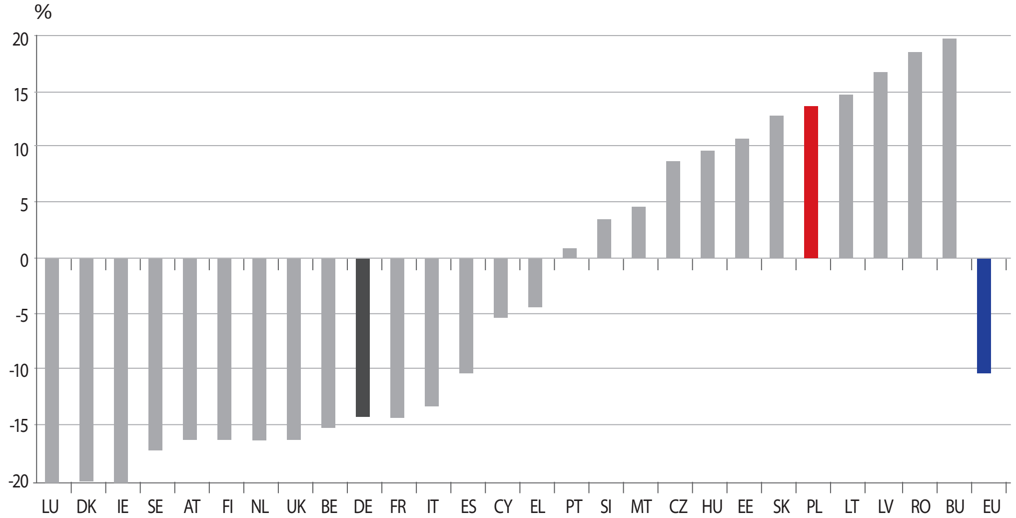
Kyoto Target

Base year	1988
Target Below Base year (%)	6%
% Reduction	29.1%
2011 Inventory (million tonnes of CO2)	399.4
GHG/capita (tonne)	10.38

Source: KOBIZE (2013), GUS (2013)

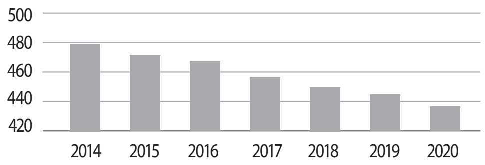
5.2 CLIMATE AND ENERGY PACKAGE: NON-ETS TARGETS

CO_2 Budget (Non-ETS)
Effort Sharing Targets in Non-ETS Sectors

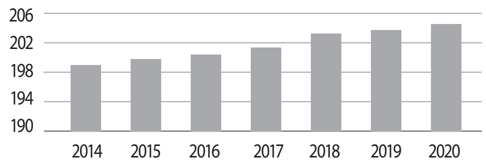


Source: European Commission (2012)

German Non-ETS Annual Emissions Allocation



Polish Non-ETS Annual Emissions Allocation



Source: European Commission (2013)

5.3 ANALYSIS OF REASONING BEHIND CLIMATE POLICY

Germany

Climate action plays a key role in German politics, regardless of party affiliation. The Energy Concept of the German government adopted in September 2010 and revised in June 2011 after the Fukushima Daiichi accident (acceleration of the phase-out of nuclear energy) stipulates an entirely new set of targets until 2050, which should lead to a complete change in the German energy system. According to this, the greenhouse gases (GHG) emission reduction target for the year 2020 is a decrease of 40% compared to the 1990 level and 80%, possibly up to 95%, by 2050. This goes hand in hand with changes in the electricity, heating and transport sectors connected with energy efficiency goals, which are perceived as an important pillar to reach the targets. Moreover, primary energy consumption by 2020 is to be reduced by 20% and by 50% in 2050 compared to 2008 levels. Here are some major arguments used as to why emission targets should be stringent:

1. The German Energiewende is perceived as an important means to mitigate environmental degradation and climate change.

Poland

Poland has not been in favour of tightening GHG emission targets in the EU over the past years. This includes not accepting a 30% target for 2020, rejecting the 2050 roadmap and its 80-95% long term target, as well as strong objections to backloading of excess European Union Allowances (EUAs) in the third phase of the European Union Emissions Trading System (EU-ETS). Here are some of the major arguments used as to why higher emission targets shouldn't be considered:

1. The EU alone will not be able to impact climate change because its global emissions account for only 12% globally. Without a legally binding global agreement hiking the target will not be possible.

2. Poland needs room (CO_2) to grow and catch up with the wealthier EU Member States.

3. Poland already reduced its emissions by close to 30% from the Kyoto base year (1988) and it is other countries' turn to do the same.

Germany

2. It is, to an extent, also expected that the move towards a more sustainable energy system - should it succeed - will offer German companies a competitive edge.

3. Moreover, domestically produced energy is also perceived to be an opportunity to enhance energy security by lessening the country's dependence on energy imports.

Poland

4. Poland's energy mix, which is based on coal, cannot compete or produce energy cheaply in a high CO_2 cost environment.

5. Higher energy prices from CO_2 prices would hamper industrial competitiveness, especially relative to surrounding non-EU countries.

5.4 COAL

5.4.1 Economic Resources and Output

National economic coal resources and output, in millions of tonnes

	DE Resources	DE Output (2012)	PL Resources	PL Output (2012)
Lignite	40,500	177	22,584	64
Hard Coal	48*	13	48,225	71

Sources: German Federal Institute for Geosciences and Natural Resources (2012), Polish Geological Institute (2012)
* German hard coal resources are much higher (82,961 million tonnes), but they are not considered to be economically exploitable given current conditions.

5.4.2 The Role of Coal

Germany

Coal plays an important role in meeting German energy demand. Some 25% of the total primary energy consumption is sourced from coal and some 44,8% of the electricity generation. Germany has considerable resources of hard coal, but its production is not internationally competitive and the government has committed to the phase-out of subsidies for production by 2018.[54] On the other hand, lignite, where the reserves are even larger and no subsidies are needed, will continue to play an important role in the German energy supply for the foreseeable future. In the period 2013-2015, the Federal Network Agency expects a net growth of conventional power capacity of 5 GW, of which 4 GW will come from coal-fired power plants.[55]

Poland

Coal is Poland's major energy resource. There is a strong coal mining sector, which employs 121,883 people[56]. Moreover, it supplies the energy sector with fuel, hence creating a fundamental cycle of energy security. This is why government policy is aimed at maintaining an energy mix based on coal, which is seen as a secure and cheap power source for decades to come.

Over the past years, major investments in new coal power have been stalled or put on hold due to economic challenges the sector faces today. With a levelised cost of energy (LCOE) higher than the current price of energy, building new units has come under question by major energy companies in Poland. Despite doubt about their economic viability, some of the country's more important investments, such as PGE's two 900 MW units in Opole, might still be financed. Big investment plans in coal are seen as needed through the perspective of energy supply security. As mentioned in section 4.5, much of Poland's installed generating capacity will be decommissioned in the next few years.

54 | German Ministry of Economics and Technology, 2013.

55 | German Ministry of Economics and Technology, 2013.

56 | Ministry of Economy of the Republic of Poland - OSR ustawa OZE, 2010.

5.4.3 CCS

Germany

The Energy Concept explicitly recognises the role of Carbon Capture and Storage (CCS) in the power sector as well as in energy-intensive, high-emitting industrial sectors as a tool to meet the 2050 GHG emission targets. Moreover, it also considers CCS a technology that presents opportunity for export. According to the concept, the government should support pilot projects in Germany and intends to build two out of 12 demonstration projects eligible for EU funding by 2020. Another pilot storage project is planned for capturing industrial emissions. Based on the project evaluation, a decision about potential commercial use should be taken. Also, according to the concept, research on the possible use of CO_2 as a raw material should be undertaken, preferably in conjunction with RES (synthetic methane, algae reactors).

However, there are significant obstacles to developing a legal framework for CCS in Germany. The CCS Act adopted in 2012 only allows for CCS on a test basis and limits the amount of CO_2 stored to 1,3 million tonnes per year per storage site up to a nationwide maximum of 4 million tonnes per year. Additionally, it gives the federal states the right to exclude parts of their territory from CO_2 storage, if objective reasons exist.

Poland

In late August 2013, Poland transposed the Directive 2009/31/EC, which foresees preparing a CCS Readiness report for newly planned power units over 300 MW of generating capacity.

According to the newly amended mining law, where the CCS directive has been transposed, only demonstration projects may implement CCS and only after receiving permits from the Ministry of Environment. The investor will be liable for monitoring the storage site for 20 years after shutting it down, and the government will continue to monitor the site for 30 years.

Poland did prepare documentation for potential CCS locations. Bełchatów, PGE's power plant, was to have a CCS project installed at the 858 MW unit. The project qualified for EUR 180 million from the European Energy Programme for Recovery and was the top two project to receive funding from the NER300 project. However, without the will to sponsor the second half of needed expenditures, the Polish government has made the project obsolete. In late 2012, the minister of environment confirmed that CCS seems to be too expensive and the EUR 600 million project will not be supported.

Germany

Actually, the CCS Act allows a maximum of two to three medium-sized demonstration projects to be realised.

There are no plans for demonstration projects at present. A strong public resistance and great reservation in those areas deemed suitable for CO_2 storage sites represent major barriers for entering the demonstration phase. Germany's CCS Act regulates that a permit for a storage site can be granted only after a planning approval procedure has been carried out, requiring *inter alia* that the storage site is safe in the long term, that dangers to human health and the environment are ruled out and that precautionary measures are taken in accordance with the state of science and technology. In addition, the public has extended opportunities for participation and the operator has to provide financial security to cover all relevant risks. This seems to make storage projects very risky for potential investors.

Poland

CCS activities have been looked into by Tauron, where in April of 2013 tests began on the 200 MW unit in Laziska. The technology, based on a chemical process where amine is used to retrieve CO_2, is a mobile solution which will be tested until Arpli 2014. The cost of the installation was PLN 8.8 million (EUR 2.2 million).[57] More clean coal R&D activities are on their way.

57 | Tauron company website

5.5 COOPERATION POTENTIAL - CLEAN COAL TECHNOLOGIES

In its 2009 draft document 'Poland's Energy Policy by 2030,' the Polish government made the reduction of the energy industry's impact on the environment and increasing energy efficiency a national priority. Yet, approximately 90% of Poland's electricity today is still sourced from carbon-intensive coal and about two-thirds of the installed coal generation capacity is more than 30 years old. Given the country's considerable indigenous coal resources, a significant reduction in coal's share of the country's power generation is not expected over at least the next decade. Hence, the import of cleaner coal technologies from Germany – currently one of the world's frontrunners in constructing highly efficient coal power plants - can play a pivotal role in helping the government achieve its stated climate policy objectives. Today, Germany's new generation of coal power plants can achieve an efficiency rating of up to 46% and require 20% less coal. This is primarily attained by utilising T24 steel in boilers, which, due to its greater quality, allows for higher efficiency ratings. What is more, a number of German energy companies are planning to develop turbines that would allow an efficiency rating of 50%, four percentage points over any coal plant currently in operation. This would require 288g of coal per kWh, compared to 480g on average worldwide – the most advanced technology to date requires 320g.[58] A substantial reduction in carbon emissions would thus be possible, largely achieved by employing new alloys made of chrome and nickel with very little steel, which can withstand much higher temperatures. Though very efficient, this technology is also up to ten times more expensive than the metals currently used in turbines.[59] Advancements in research and development, however, will likely drive costs down over time.

In addition to allowing a more efficient use of finite resources and reducing GHG emissions, newer coal plants use dry coal dust stored in silos to significantly lower start-up and drive-down times, though they still lie about one-third over those of the newest gas-fired power stations.[60] A new coal power plant built by RWE in 2012 near Cologne is a case in point. It has dual 1100-megawatt steam turbines that can ramp generation up or down by 500 MW in less than 15 minutes, making it about twice as fast as the best times achieved by some recent gas-fired plants and more than six times as fast as the average coal-fired plant running today.[61] This is particularly important in the increased shift towards fluctuating renewable energy, where coal plants will continue to be an important backup force: being able to ramp generation up or down flexibly and rapidly will be vital.

58 | VGB PowerTech, Facts and Figures 2012|2013, 2013.
59 | VGB PowerTech, Facts and Figures 2012|2013, 2013.
60 | Fairley, Peter. *Quicker Coal Power,* January 23, 2013.
61 | Fairley, Peter. *Quicker Coal Power,* January 23, 2013.

The transfer of German cleaner coal technologies to Poland has obvious benefits for both countries. For German companies, this would present an opportunity to expand into a growing market with clear first-mover advantages. Poland, on the other hand, could make a significant contribution towards achieving its climate policy aims by substantially reducing the environmental impact of its ageing coal fleet, take further steps towards accommodating the increased use of RES and use its coal resources more efficiently.

5.6 COOPERATION POTENTIAL - EMISSION BUDGET TRANSFER

(Art. 24a of the ETS and article 3 of the Effort Sharing Decision- non-ETS)

The EU climate and energy package has two major areas of quantified emission accounting: the ETS and the non-ETS sectors. Although the aim for overall lowering net emissions from the year 2005 is the main goal of the legislation, there are special areas where countries could work together to balance each others emissions. This special case is valid for Poland and Germany, since Poland has received emission space to increase CO_2 in the non-ETS sector and Germany needs to further reduce CO_2 emissions. While Germany needs to reduce emissions by 14% in the non-ETS sector by 2020 compared to 2005, Poland can increase its by 14%.[62] Because the two economies are not the same size, even all of Poland’s buffer wouldn’t cover that of Germany's demand. Yet space for cooperation still exists, even if the traded volumes aren't sufficient.

Poland’s emissions from the agricultural and land transport sector are expected to grow as its economy grows. But providing additional incentives, such as price value on non-ETS CO_2, could prove to be an added incentive for Poland to develop more sustainably. Article 24a, in the ETS directive (2009/29/EC) allows for implementing projects in the non-ETS sectors, whereby carbon credits could be gained. This could supply a significant amount of offsets for the German economy. Since the Directive stresses that double-counting of emission reductions needs to be avoided, this leaves countries with the ability to increase their emissions in a more favorable position for project hosting.

In addition, Art. 3.4 of the effort sharing decision (406/2009/EC)[63] allows for countries to trade their emissions. Poland could potentially sell Germany up to 5% of its annual emissions allocation in the non-ETS sector each year. This would help Germany to reach its targets and could potentially curb Poland's increase in emissions in the transport sector through a de facto increased target.

The abovementioned methods of possible cooperation have been analysed by the European Commission in the context of increased targets by 2020.[64] The higher the target, the bigger the demand for offsets from countries with no room to grow their emissions. This drives the market price of possible offsets and gives greater possibilities of transferring funds to less developed member states of the EU. A method of 'greening' transferred funds could also contribute to further net emission reductions in countries selling the units.

Until the Council of the European Union agrees on a method of implementing Art. 24a, Member States will have to come up with trading schemes through bilateral agreements. The financial crisis, along with the slow economic growth in the EU, was a significant factor in lowering emissions across the EU in the past years, which also will have an impact on the carbon market until 2020. Increased reduction targets would contribute to the recovery of allowance values and create room for projects under Art. 24a and transfers under Art. 3.4. However, the target would have to include both ETS and non-ETS sectors, and not only be based on backloading or higher targets in the allowance based system.

62 | Decision Number 406/2009/EC

63 | Decision Number 406/2009/EC

64 | EU Commission, *Commission Staff Working Paper-Analysis of Options Beyond 20% GHG Emission Reductions: Member State Results,* February 1, 2012

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