Overview of Czech and German Renewable Energy Policies

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Abstract

This paper provides an overview of the renewable energy policies in Germany and Czech Republic. The description of major renewable policies in both countries is complemented with the description of financial support schemes for these policies. National renewable energy plans in both countries are discussed. The emphasis is on renewable electricity energy.

Keywords: Renewable energy, feed-in tariff, Czech renewables, German Renewables

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1 Introduction

On April 23, 2009 European Commission published so-called the Renewables Directive, official title – Directive 2009/28/EC. This directive mandated all the Member States to achieve certain level of renewable energy sources in final consumption by 2020. Overall share of RES in EU energy consumption must be 20% and 10% in transport consumption. The 2020 target for Germany is 18% and for the Czech Republic is 13%.

The major financial supporting schemes in the Czech Republic and Germany include feed-in tariffs and green bonuses, these schemes are reviewed in Sections 2.1.1 and 2.2.1. Feed-in tariff scheme is widely criticised because of its excessive costs, this critique is reviewed in section 3.1. As a result of this and due to other reasons on April 9, 2014 European Commission approved the shift from all FIT support mechanisms towards auction scheme for RES effective from 2017.

In this paper we summarize support schemes and targets in Germany and the Czech Republic by reviewing National Renewable Energy Action Plans and briefly review other existing policies for promotion of RES.

2 Czech and German policies

2.1 German National Renewable Energy Action Plan

The latest issue of German National Renewable Action Plan (hereinafter German NREAP) was published in July 2010.

RES-E generation increased fivefold from 17 TWh in 1990 to 93 TWh in 2009 (all numerical data in this section is taken from German NREAP, if not stated otherwise). In addition, composition of RES-E changed dramatically, in 1990, 91% of RES-E was generated by hydropower, while in 2009 40% of RES-E was generated by wind power, 33% by biomass and only 20% by hydropower.

RES-H/C generation increased from 32 TWh in 1990 to 115 TWh in 2009, main

portion generated by biomass.

As all NREAPs, the German one has its projections of gross final consumption of energy until 2020.

Table 1: Expected gross final consumption of energy in Germany in the areas of heating and cooling, electricity and transport until 2020, taking into account the impact of energy efficiency and energy saving measures 2015-2020 (ktoe)

	2015	2016	2017	2018	2019	2020
Heating and cooling	103588	101581	99551	97449	95276	93139
Electricity	50588	50229	49799	49346	48844	48317
Transport	51279	50655	50034	49414	48857	48302
Gross final consumption	213122	210089	206984	203760	200463	197178

National Renewable Energy Action Plan of Germany

We can see from the Table 1 that Germany will gradually decrease its gross final consumption. The biggest decline, decrease of 10%, is expected in heating and cooling sector due to increased efficiency.

Directive 2009/28/EC sets the 2020 target level of renewable energy in gross final energy consumption of 18% for Germany. Whereas, German NREAP estimates that by 2020 share of RES in gross final energy consumption will be 19.6%. In the electricity sector RES will account for 38.6%, in the heating/cooling sector RES will account for 15.5% and in the transport sector RES will account for 13.2%. German NREAP has its estimated trajectories of renewable energy in aforementioned sectors. These estimations will be used as a reference in the following assumptions and computations.

Table 2: Estimated trajectory of energy from renewable sources in heating and cooling, electricity and transport 2015-2020 in Germany

	2015	2016	2017	2018	2019	2020
RES-H/C (%)	11.7	12.4	13.1	13.9	14.7	15.5
RES-E (%)	26.8	28.8	31.0	33.3	35.9	38.6
RES-T (%)	7.0	7.1	9.3	9.4	9.7	13.2
Overall RES share (%)	13.5	14.4	15.7	16.7	17.7	19.6

National Renewable Energy Action Plan of Germany

There are a lot of policies and measures for promotion of renewable energy mentioned

and described in German NREAP, we will describe the ones concerning feed-in tariffs and other financial support schemes. The full list of the core measures can be found in Table 5 of German NREAP.

In Germany, there is a federal law, the Renewable Energies Heat Act (EEWarmeG), which requires all new buildings to cover heat energy needs of at least 15% by solar thermal energy, 30% by biogas or 50% by liquid or solid biomass, heat pumps or geothermal energy. However, no federal law exists regarding use of RES in existing buildings. Nevertheless, such laws can be implemented by federal states.

Major legislative instrument for promotion RES in Germany is the Renewable Energy Source Act (hereinafter EEG). It came in force on April 1, 2000. The EEG includes many regulations regarding grid connections such as priority grid connection for producers of RES-E and compensation schemes such as feed-in tariffs and etc.

In case of disputes between RES producers and grid operators, there is a neutral body for resolving them – The Clearing House EEG. The costs regarding a grid connection, optimization, expansion and development are borne by the grid operator. Some part of the costs is recovered by grid fees. Moreover, producers of RES-E are not charged transmission and distribution tariffs.

2.1.1 Financial support schemes

There are different financial support schemes:

Feed-in tariff – all RES-E plants with capacity up to 500 kW and in accordance with EEG can be entitled with FITs. Producers of RES-E are guaranteed with FITs for 20 years, with exception of large hydropower plants, they are guaranteed for 15 years, plus the year of putting into operation. FITs are paid by grid operators, who are obliged to buy all electricity from RES-E producer, to producers. However, these additional costs are passed onto end customers via TSOs and DSOs and end customers have them included in their bills. Feed in tariffs are technology specific, they can be found in the Table 3.

There is a cap for PV plants of 52 000 MW which are entitled for FITs. No caps for

Table 3: German feed-in tariffs as of 11.12.2014

Type of RES	Feed-in tariff EURcent/kWh
Hydropower	3.50 - 12.52
Biomass	5.85 - 23.73 minus 0.2 per kWh
Biogas	5.83 - 27.73 minus 0.2 per kWh
Wind power plant	Onshore: 4.95 - 8.90 minus 0.4 per kWh Offshore: 3.9 - 19.4 minus 0.4 per kWh
Geothermal power plant	25.2 minus 0.2 per kWh
Photovoltaic power plant	specific building-mounted systems: 11.49 - 13.15 minus 0.4 per kWh other systems: 9.23 minus 0.4 per kWh up to 10 kW: 12.59 up to 40 kW: 12.25 up to 500 kW: 10.95 up to 10 MW: 8.72

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other technologies have been introduced. Additionally, Germany has introduced degression rates, i.e. FITs will decrease annually for some percentage thus inducing producers to reduce costs. Degression rates can be found in Table 4.

Table 4: Degression rates for German FITs

Type of RES	Degression rate
Hydropower	0.5% every year
Biomass	0.5% every 3 months and if biomass surpasses 100 MW degression rate go up to 1.27%
Biogas	Landfill and sewage gas: 1.5% Other: 0.5% every 3 months and if biogas surpasses 100MW degression rate go up to 1.27%
Wind	Onshore: 0.4% every 3 months and if power surpasses 2600 MW degression rate go up to 1.2%. If power goes below 2400 MW the degression rate decreases and in extreme cases FITs even increased. Offshore: until 1.1.2018 no degression rate imposed, then degression rate will be between 0.5% and 1.0%
Geothermal	5% every year from 2018
Photovoltaic	0.5% every month if power surpasses 2600 MW degression rate go up to 2.8%. If power goes below 2400 MW the degression rate decreases and in extreme cases FITs even increased by up to 1.5%

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The KfW[1] Financing Initiative Energiewende – this scheme provides with low-interest loans for investments in installations of RES-E in accordance with EEG. The loan can cover up to 50% of the project and can be between EUR 25 million and EUR 100 million. The loan is long-term and interest period is up to 20 years, in addition, first 3 years can be repayment-free. Interest rates depend on the situation on capital markets but are fixed for 10 years, for loans exceeding 10 years interest rates are redefined. Energy supply companies cannot get loans under this programme. Only companies with annual turnover between EUR 500 million and EUR 4 billion are eligible for this programme.

The KfW Programme Geothermal Exploration Risk – this programme is eligible only for geothermal energy. It covers investments costs of drilling activities, the loan can cover maximum 80% of the costs. There is a cap of EUR 16 million per drilling. The loan is given for 10 years with first 2 repayment-free years.

The KfW Programme offshore wind energy – this programme is eligible only for companies that want to construct wind farms inside 12 nautical-mile zone of the North and Baltic Sea. There are three different forms of financing: (i) direct loans under financing by bank syndicates; (ii) financing package combining a KfW on-lent through a bank loan and a direct loan from KfW; (iii) in addition to (i) and (ii), a direct loan under bank syndicates is granted covering unforeseen costs during construction phase.The loans are long-term and interest period is 20 years with first 3 repayment-free years. Interest rate is redefined after 10 years.

The KfW Renewable Energy Programme Premium – this programme is eligible only for producers of electricity from geothermal energy. Loans cover up to 80% of investment costs. Loans can be given for 5,10 or 20 years with first 1,2 and 3 repayment-free years respectively. Interest rates are fixed for 10 years and then redefined if loan is for 20 years.

The KfW Renewable Energy Programme-Standard – this programme is eligible for investments in any RES technology. Loans can be given to projects even if they are not to

[1]KfW is a German state-owned development bank, which provides financial aid for renewable energy projects

be constructed in Germany but close to German borders and moreover even if project is done abroad but by German company. Loan can cover up to 100% of investment costs, nevertheless there is a cap of EUR 25 million per project. The loan is long-term and low-interest with fixed interest periods of 5 or 10 years including the repayment-free period. Effective interest rates may vary between 1.31% and 7.56% per annum. The fixed interest loan can be granted for 20 years if economic and technical duration of investment is longer than 10 years.

Market premium – all technologies of RES are entitled for market premiums. Market premium is granted usually for 20 years plus the year of putting into operation. Market premiums are paid by grid operators, who are obliged to purchase all generated electricity. However, these costs, identically as in FITs scheme, passed onto end customers and they have these costs in their bills. The amount of market premium is calculated every month by subtracting the monthly electricity value in EURcent/kWh from the reference tariff (which can be found in Table 3). The scheme is identical to FITs with only difference – plants with installed capacity exceeding 500 kW are eligible for this scheme.

Flexibility premium – only biogas plants that are put into operation before August 1, 2014 are eligible for this support. Subsidy is provided only for additional capacity for on-demand use. The amount of the subsidy is EUR 130 per additionally installed kW per year for 10 years. The subsidies will be provided until 1.350 MW of additional capacities will be reached. The additional costs are borne by end customers.

Flexibility surcharge – same plants eligible as for flexibility premium. This subsidy can be combined with market premium or feed-in tariff. Flexibility surcharge amounts for 40 euro per installed kW per year for duration of eligibility of market premium or FIT. Additional costs are borne by end customers.

It is stipulated in the EEG that electricity, which gets feed-in tariff, cannot be marketed as "green electricity". Nonetheless, it is possible for producers of RES-E to get simultaneously FITs and low-interest loans.

In 2009, the use of domestic renewable energy sources prevented 108 million tons of CO2 equivalents of energy related greenhouse gas emissions. EUR 5.7 billion of energy imports were saved. The total turnover from renewable energies was EUR 33.3 billion, EUR 17.6 billion in new construction and development of installations for RES and EUR 15.7 billion in other renewable energy plant operations.

Germany has 300 000 employees in renewable energy industry, this is 75% higher than in 2004. Furthermore, Germany anticipates 400 000 people to be employed in renewable energy sector by 2020. Also, 215 million tones of CO2 emissions to be prevented by 2020 through the use of RES.

2.2 Czech National Renewable Energy Action Plan

Ministry of Industry and Trade of the Czech Republic published the latest issue of Czech National Renewable Energy Action Plan (hereinafter Czech NREAP) in August 2012.

As all NREAPs, the Czech one has its projections of gross final energy consumption until 2020.

Table 5: Expected gross final energy consumption of the Czech Republic in heating and cooling, electricity and transport up to 2020 taking into account the effects of energy efficiency and energy saving measures 2015 - 2020 (ktoe)

	2015	2016	2017	2018	2019	2020
Heating and cooling	16 812	16 739	16 667	16 638	16 600	16 586
Electricity	6 328	6 425	6 520	6 616	6 712	6 810
Transport	6 436	6 453	6 470	6 453	6 437	6 407
Gross final consumption	29 576	29 617	29 657	29 708	29 748	29 803

National Renewable Energy Action Plan of the Czech Republic

From the Table 5 it is seen that unlike Germany, Czech Republic does not expect a decline in gross final energy consumption. Only a little decrease is anticipated in heating and cooling sector.

Directive 2009/28/EC sets the 2020 target level of renewable energy in gross final consumption of 13% for the Czech Republic. Whereas Czech NREAP targets 14% of

gross final consumption to come from renewable energy sources by 2020. Czech NREAP has its estimated trajectories of renewable energy in heating and cooling, electricity and transport.

Table 6: Estimated trajectory of energy from renewable sources in heating and cooling, electricity and transport 2015–2020 in the Czech Republic

	2015	2016	2017	2018	2019	2020
RES-H/C (%)	13.6	14.0	14.5	14.8	15.2	15.5
RES-E (%)	12.8	13.0	13.2	13.4	13.5	13.5
RES-T (%)	7.1	7.7	8.3	9.6	10.2	10.8
Overall RES share (%)	12.0	12.4	12.8	13.3	13.7	14.0

National Renewable Energy Action Plan of the Czech Republic

There are a lot of policies and measures for promotion of renewable energy mentioned and described in Czech NREAP, we will only describe the ones regarding feed-in tariffs and feed-in premiums (so called green bonuses). The full list of all policies and measures for promotion of renewable energy mentioned in Czech NREAP can be found in Table 5 of Czech NREAP.

It is highlighted that the Czech Republic has "Complex legislation (one of the most complex in the EU)" regarding authorization and other permissions prior to the construction of renewable energy plants. The preparation and implementation phase takes between 122 and 196 months.

According to the Act No. 165/2012 TSOs and DSOs are required to connect producer of RES to the grid if producer requests and complies with the connection conditions.

2.2.1 Financial support schemes

In the Czech republic there are three types of financial support for RES:

Investment support from subsidy schemes for the promotion of renewable energy and heat production

Feed-in tariffs and feed-in premiums - this type will be discussed later

Tax exemptions and tax refunds

Tax exemptions and tax refunds, pursuant to the Act No. 586/1992 on income tax, are attributable to:

- Small water power plants up to the capacity of 1 MW,
- Wind power plants,
- Heat pumps,
- Solar installations,
- Installations generating and using biogas and woodgas,
- Biomass energy or heat generating installations,
- Installations generating biologically degradable substances as specified in a special legal regulation.

Tax exemptions last for first five years of operation plus the year of putting into operation.

Feed-in tariffs and green bonuses are part of so-called operational support. These two schemes of support cannot be combined, however producers may switch from one to another once a year.

The Energy Regulatory Office taking into account the industrial producer price index recalculates feed-in tariffs annually. Feed-in tariffs are guaranteed for a lifecycle of a renewable energy plant, which is usually 20 years.

Green bonuses are guaranteed only for one year, and then reassessment by the Energy Regulatory Office is done.

The amount of green bonuses is determined by the Energy Regulatory Office basing on the market price of electricity. Producers can sell the generated electricity to the market and get a green bonus, likewise, producers can consume the generated electricity and get a green bonus for consumption of RES-E. From this perspective, green bonuses

scheme is hedging producers from market prices fluctuations, since a green bonus is a markup to a market price of electricity.

Under feed-in tariff scheme, producers of RES-E can sell generated electricity to the mandatory purchaser who is obliged to pay the feed-in tariff and then the market operator pays the difference between the feed-in tariff and the market electricity price. In case of green bonuses, the market operator pays them to producers of RES-E.

There is a state subsidy to cover the costs of market operators associated with feed-in tariffs. This subsidy covers all support costs of heat and the remaining part covers support costs of electricity. If not all support costs of electricity are covered by the subsidy, then they are borne by end customers. The Energy Regulatory Office determines the nationwide uniform fee for end customers and the amount of the subsidy is determined by Ministry of Industry and Trade.

For feed-in tariffs not to be volatile, it is restricted to lower them more than by 5% per year and increase them more than by 15%. In addition, there is a cap on the amount of support for all forms of 4500 CZK per MWh.

Feed-in tariffs and green bonuses are technology-specific. Furthermore, feed-in tariffs and green bonuses are different for plants with different vintage (the year of putting into operation). Tariffs in the Table 7 are excluding VAT.

Table 7: Czech feed-in tariffs and green bonuses for 2014

Type of RES	Feed-in tariff	Green bonus
Reconstructed hydro from 1/1–31/12/2014	9.10	6.1
Hydro at new locations from 1/1–31/12/2014	11.80	8.8
Biomass	4.8-12.1	1.7-9.0
Biogas	12.9	9.8
Landfill, fermentation and mine gas	7.10	4.1
Wind	7.3	5.6
Geothermal	12	8.9
Photovoltaic	up to 5 kW: 11.10 up to 30 kW: 9.00	up to 5 kW: 8.9 up to 30 kW: 6.8

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In the feed-in tariff scheme there is a cap on installed capacity, the following plants are entitled to the feed-in tariffs

- Photovoltaic power plants up to 30 kWp[2],
- RES other than photovoltaic power plants up to 100 kW,
- Wind power plants up to 10 MW.

In the green bonuses scheme there are no caps on installed capacity.

As a result of these support schemes prices for end customers increase, since additional costs of promotion of RES are borne by them.

Nonetheless, producers of RES-E cannot combine feed-in tariffs and green bonuses, but they can get different types of financial support simultaneously, e.g. obtain green bonuses and income tax exemptions. Also, producers of RES-E and RES-H/C get loans with lower interest rates.

As of renewable sources in heating and cooling, there are the following support schemes:

Investment support from the European Union Structural Funds (Operational Programmes in Environment, Business and Innovation and the 2007–2013 Rural Development Plan),

Exemption from property tax (pursuant to Regulation No. 12/1993),

Direct operational support of generation of heat from RES by means of annual green bonuses resulting from Act No. 165/2012,

Indirect support by means of a support of RES-H/C

2.3 Other existing policies

Quota obligations is a quantity based approach, whereas feed-in tariff scheme is a price based approach. In quota scheme, some fixed amount of sold electricity in the market has to be generated from RES. The amount of electricity from RES is determined

[2]kilowatt peak

for the whole state. After that, the amount is allocated among all operators. Thus, operators have to buy so-called green certificates or buy energy directly from producers of RES. Certificates are issued by RES-E generator and then RES-E producers can sell electricity at market prices plus separately sell green certificates. If produced electricity is sold without green certificate, it cannot be accounted by the buyer as green energy. So even if in fact electricity is generated from RES, it is not counted as green without the certificate, this fact may cause a free-rider problem, which will be discussed later.

Tradable certificates system induces suppliers of electricity invest more efficiently. For example, there is a fixed amount of RES-E to be sold q for supplier A and B, but supplier A is unable to generate required amount q by itself, it generates amount a, whereas supplier B can generate more than q, it generates amount b. So we have $a < q < b$. With existing tradable certificates market, supplier B can sell certificates for surplus electricity $(= b - q)$ and supplier A can buy certificates for missing amount of RES-E $(= q - a)$.

Therefore, suppliers choose by themselves whether to invest into RES-E installations or buy certificates in the market. Certificates system also induces technological innovation and competition between RES-E producers. Under quota system, investors will be more careful about their investments, i.e. they will examine the site of installation more as well as the selection of technology to use. So no PV installations will be made in areas where sun barely shines and so forth. However, this may hinder development of immature but promising technologies.

Under certificate system, free-rider problem may occur. For example, there are two suppliers N and S in the country. Supplier N operates in the northern region of the country and supplier S in the southern region. Supplier N produces energy solely from RES and supplier S uses only fossil fuels. Thus, supplier S meets quota obligation entirely by buying certificates from supplier N. Customers of supplier S will have to cover additional costs associated with purchase of these certificates, whereas customers of supplier N will not have these additional costs. Nonetheless, customers of supplier N will enjoy cleaner air and other benefits associated with RES at the expense of customers of supplier S.

While customers of supplier S will not enjoy same (if any) portion of benefits associated with RES, since located in another region. This problem can be resolved by introducing a cap on purchasing of certificates from other regions. However, this can impede the liquidity of tradable certificates market.

Under such system, prices for certificates will be determined by the market itself. In order to avoid extreme prices price ceiling and price floor can be defined. Furthermore, in order to decrease volatility of certificate prices market for futures can be created. Menanteau et al. (2003) suggests to redistribute money collected from ones who was unable to meet the quota by reverse bidding system to producers-sellers of RES-E.

Renewable energy auctions is a hybrid of quantity-based and price-based approaches. Governments set the target of RES-E and producers of RES-E or project developers act as bidders. Thus, bidders bid a price per unit of electricity at which they will generate it. Then government assesses the bids on the basis of price and other criteria and signs a power purchasing agreement with the winner of the auction.

Auction scheme allows governments to design an auction according to their needs, thus governments can have more control over the sector and its development. Also, with the use of well-designed auctions the real price will be discovered. Since, it is a competitive process and bidders are induced not to inflate prices for the product, so they bid the real prices or at least close to real. Thus, excessive costs associated with support of RES should decrease, since more competition will induce producers to reduce their costs.

First auctions held in Germany revealed that FITs for PV plants are lower than actual costs faced by producers. The auction took place in April 2015 and the total capacity to be auctioned was 156.97 MW[3] of solar PV. Average price of successful bids was 91.7 EUR/MWh[4] which is higher than FIT at that time by 1.5 EUR/MWh. This fact may explain a sharp decline of PV installations in Germany, from about 7604 MW in 2012 to about 3304 MW in 2013 and 2006 MW in 2014.

[3]IRENA and CEM (2015)

[4]See prev. note

In addition, auction scheme is more precise about quantities to be produced than price-based approaches, since the amount of produced RES-E is stipulated in the contract, and more precise about prices than quantity-based approaches, since the contract also stipulates the prices. Consequently, auction scheme exclude some flaws of price and quantity based approaches.

However, auction scheme will work best if competitive environment is assured, so small players should not be discouraged to participate. Consequently, transaction costs must be minimised. Also, the process must be as transparent as possible in order to exclude room for corruption. A very good guide for designing renewable energy auctions was published by IRENA and CEM in 2015, titled: "Renewable Energy Auctions – A Guide to Design."

This policy is gaining acceptance worldwide, with less than 10 countries with such mechanism in 2005 to some 60 countries in early 2015. In 2014, European Commission released guidelines by which Member States had to switch from FITs to auction mechanism starting from 2017.

3 Conclusion

The main purpose of this paper was to provide an overview of the renewable energy policies in Germany and Czech Republic. After reviewing German and Czech NREAPs we ascertained that support for renewable energy is mainly covered by end-customers. End-customers of both countries have additional costs related to support of RES included in their bills. Additional costs related to RES include: feed-in tariffs and other financial types of support, grid development costs and grid balancing costs. All these costs are firstly borne by TSOs and DSOs but then they are passed onto end-customers. However, not all additional costs are borne by end-customers, in the Czech Republic, there is a subsidy, which covers the costs of market operators associated with FITs. In addition, RES producers have some tax benefits. This support resulted in significant increase of

installed capacities in all types of RES excluding hydro, since it has already been very developed. However, since feed-in tariff scheme is regarded as a very costly method and moreover, European Commission has approved the removal of all feed-in tariff schemes from 2017, Germany has already started to shift towards auction scheme.

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