Renewable Electricity Market Monitoring in the Countries of the Danube Region

PREPARED BY

REKK

NEW SZÉCHENYI PLAN

The market monitoring was commissioned by MVM Plc.

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TABLE OF CONTENTS

LIST OF FIGURES

[1] SWD(2013) 439 final COMMISSION STAFF WORKING DOCUMENT European Commission guidance for the design of renewables support schemes; Accompanying the document: Communication from the Commission, Delivering the internal market in electricity and making the most of public intervention

[2] Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Montenegro, Romania, Serbia, Slovakia, Slovenia, Ukraine

LIST OF TABLES

LIST OF ABBREVIATIONS

AT	Austria
BA	Bosnia-Herzegovina
BiH	Bosnia-Herzegovina (state)
FBiH	Federation of Bosnia and Herzegovina (entity)
BiH - RS	Republic of Srpska (entity)
BG	Bulgaria
CZ	Czech Republic
DE	Germany
HR	Croatia
HU	Hungary
MD	Moldova
ME	Montenegro
RO	Romania
RS	Serbia
SI	Slovenia
SK	Slovakia
UA	Ukraine

BRP	Balance Responsible Party
DR	Danube Region
DSO	distribution system operator
EIA	Environmental Impact Assessment
FIP	feed-in premium
FIT	feed-in tariff
GC	green certificate
GFEC	Gross Final Energy Consumption
NREAP	National Renewable Energy Action Plan
PV	photovoltaic (solar electric)
RES	renewable energy source
RES-E	renewable electricity
TGC	tradable green certificate
TSO	transmission system operator

EXECUTIVE SUMMARY

The 14 countries of the Danube Region provide a complex picture of RES-E development. The past five years of 2008-2012 have seen **tumultuous changes in the region's policy environment.** This, along with the general economic slowdown, has proven to be detrimental for new RES-E investment in some of the countries, while others have yielded unexpectedly high growth rates in the sector.

Despite the continued importance of hydro power to the portfolio of renewable electricity in the majority of the countries, **significant investments have been made into new RES-E technologies.** Photovoltaic appliances have captured surprisingly large shares of new RES-E thanks to the rapid spread and acquisition of technology and slow reactions of policy makers.

Our report highlights the politically sensitive issue of the **burden on electricity end-users caused by RES-E support policies in the Danube Region.** After researching and calculating the burden of support relative to income we identified three groups of countries. In modestly supporting or late starting countries the RES-E support budgets are less than 0.1% of the GDP (Bosnia, Croatia, Moldova, Serbia). In the second group the weight of the national RES-E support budgets are between 0.1% and 0.2% of the GDP, and it contains countries with growing RES-E sector (Austria, Romania, Slovenia, Ukraine) as well as others with a stagnating one (Hungary). In the third group, the GDP related support budgets are greater than in the lowest group by a factor of 10 to 40, being as high as 0.4% to 0.9% of the GDP. The countries in this group are clearly determined to increase RES-E in their portfolio (Bulgaria, Czech Republic, Germany, Slovakia) but differ in the sustainability of their support policies.

Sustainability of support is a major issue in the region. Our report has not only accounted for abrupt changes in the regulation and retroactive measures taken by policy makers in some countries but we identified major risk factors to consider by others. For example, Ukraine is one of the most ambitious newcomers in the group of heavy supporters of RES-E. Its strategy to offer exceptionally high support rates per unit of renewable electricity might be justified with policy targets and entry barriers. But countries with a similar strategy must **avoid cementing support rates in national legislation.** If current pledges are too difficult to modify over time, the country runs the risk of inviting an excessive number of new RES-E investments that will peak at an unsustainably high magnitude, heavily inflating its support budget and making its electricity consumers pay RES-E surcharges that will become politically unacceptable.

The current report is full of new data that details the sector's position in the Danube Region. It is interesting to note that **most of the countries are well on track to meet their RES-E targets in 2020** – at least all but two have completed their objectives for 2012. The two countries (Romania and Hungary) provide useful examples by showing that **accountability and stability are key to successful regulation of RES-E support instruments.** Hungary, for example, was on the fast track to grow its renewable electricity production for many years. Meanwhile, policy debates led to a decision to gradually phase out support for solid biomass co-firing. The argument follows that high efficiency biomass and other new technologies will quickly make up for the gap. As biomass co-firing quotas have been rapidly reduced, policy has been insufficiently slow in replacing the outdated support regulations with new ones. The long anticipated and oft promoted new RES-E support regulation has not emerged in the past four years. It comes as no surprise then that overall RES-E production has declined and investments have halted in Hungary. Romania had been waiting for the EU to approve the reform of its tradable green certificate (TGC) system, which had an impact on their RES-E development. But the final approved system had to be significantly modified this year, which might discourage further investments in the country.

Based on the underlying survey, the current monitoring report concludes that with regard to grid connection and enforcement costs **the majority of the observed countries apply cost sharing regimes that we deemed "non-shallow".** The label draws attention to the fact that, contrary to most European countries, Danube Region countries shun the so-called shallow grid-cost sharing regime in which RES-E projects are required to pay only the cost of their direct connection to the nearest grid facility. With only a few exceptions (Bulgaria, Serbia, Moldova, Germany), Danube countries make RES-E projects also pay for the indirect system development costs claimed to emerge as a consequence of their connection to the grid. It is nonsensical in countries with high support rates: they pay a lot for renewable electricity but a significant amount is absorbed by grid operators, making it very hard to later reduce support rates.

We find that the overwhelming majority **of RES-E policymakers in the Danube Region still prefer to use feed-in tariffs (FIT) as their primary instrument choice.** There are only four countries which apply a coexisting feed-in premium (FIP) scheme (Germany, Czech Republic, Slovenia, Bosnia) and only one single country to run a tradable green certificate system (Romania). On one hand, it is explicable by the wide-spread initial reasoning: renewable electricity is an infant industry, so if new RES-E investments are desired a country must keep a FIT scheme running for several years. On the other hand, RES-E technologies have moved far down their experience curves and many are market ready by now, producing electricity at competitive costs, and making it pointless to provide them with special treatment. It is time to allow for the market to play a larger role, to the detriment of state protection, because consumers deserve renewable electricity as cheaply as possible. This is a typical reformist argument, which has just recently been reinforced by a real heavy-weight supporter: the European Commission (EC).

In the run-up to finalizing this monitoring report, the EC published its best practice guidance on the design of renewables support scheme,[1] in which it clearly takes sides in the RES-E policy reform debate. Its simple advice is the following: **phase out feed in tariffs, replace them with feed-in premiums.** FITs are advised only in a very limited scope: for small scale activities with pre-set capacity caps. FIPs are advised to help expose RES-E producers to more price risks and market flexibility. In the light of this, it is worthy of note that the **Danube Region countries may be on the brink of major policy reforms to switch from FIT regimes to FIP schemes.**

[1] SWD(2013) 439 final COMMISSION STAFF WORKING DOCUMENT European Commission guidance for the design of renewables support schemes; Accompanying the document: Communication from the Commission, Delivering the internal market in electricity and making the most of public intervention

INTRODUCTION

This report was commissioned by MVM Zrt, the state owned Hungarian energy group aiming to support the work of the European Union Strategy for the Danube Region, a macro-regional development and action plan for all the countries in the Danube river basin, including nine EU member states and five neighboring[2]. The sustainability of the energy sectors is of priority focus in the Strategy, so the initiative to monitor the renewable electricity (RES-E) sectors of the region in order to effectively target further development plans was welcomed by the Sustainable Energy Priority Area.

The joint research project was led by the Regional Centre for Energy Policy Research (REKK) at the Corvinus University of Budapest. The research staff included 9 of REKK permanent staff and 17 local experts from the Danube Region, most of them active or former energy regulators.

The monitoring report is primarily based on REKK's own survey questionnaire. Publicly available national and international statistics were drawn upon, as well as publications of national energy regulators.

The paper is structured as follows: Chapter 1 presents a cross-country analysis including the summary statistics related to the RES-E sectors in the region based on the survey data. The chapter also describes the most important characteristics of the countries' renewable policies, and explores possible relationships between those characteristics and RES-E penetration. The analysis also looks at the overall support budgets and compares them across countries, relating them to different variables such as consumed electricity, the number of consumers, or GDP.

Chapters 2-15 include country profiles compiled using information provided by the survey respondents, as well as available public information on the 14 countries of the region. The chapters are built-up similarly to the questionnaire, so that each country profile follows a uniform structure starting with a general description of the RES-E sector; its renewable resource composition and its share in the overall electricity production, followed by an outline of the main features of RES-E policy in each country. The description of RES-E policies cover the market design, the main barriers related to licensing and certification as well as grid integration, the main characteristics of the support scheme in place, and the level of support. The paper does not intend to provide a detailed presentation of national legislations; its aim is to explore the main relationships that might affect the success of different RES-E policies.

[2] Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Montenegro, Romania, Serbia, Slovakia, Slovenia, Ukraine

1. Cross-country analysis of the Danube Region RES-E Monitoring data From the REKK RES-E Survey

In this chapter, we summarize the findings of the REKK Survey of RES-E Monitoring across the countries of the Danube Region.

1.1 General description of the RES-E sector

The 14 countries produced approximately 1250 TWh of electrical energy in 2012 of which about 250 TWhs (cca. 20%) were generated from renewable energy sources. This is an impressive across the board number, but closer examination reveals wide discrepancies in RES-E distribution across countries. More than half was generated in Germany and another 21% in Austria, making the two countries the source of nearly three quarters of RES-E in the Danube Region.

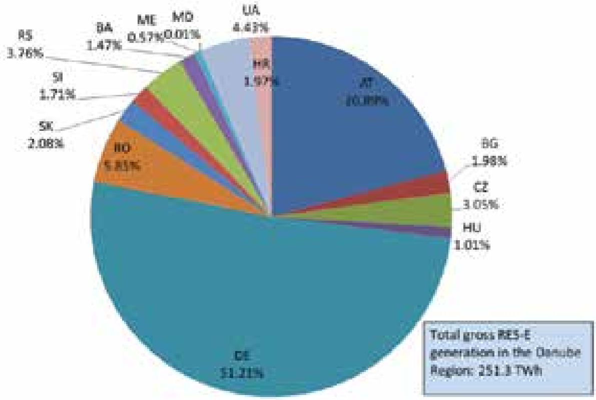

Figure 1.1 Composition of RES-E generation in the Danube Region by country, 2012

Source: REKK RES-E Survey 2013.

Although Germany generates by far the most aggregate renewable electricity in the region, this is also because of the sheer size of its electricity sector compared to other countries in the region. When renewable production is calculated as a share of national output, other countries can be observed to be producing relatively more as illustrated in Figure 1.2. However, countries with the highest share of renewable electricity supply (Austria with 73% followed by Montenegro, Serbia, Croatia and Bosnia and Herzegovina with shares above 30%) are all countries traditionally relying on hydropower.

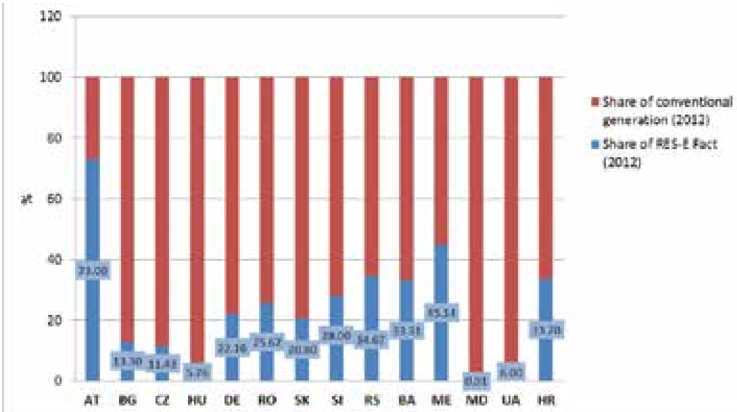

Figure 1.2 Share of RES-E in total generation by country, 2012

Source: REKK RES-E Survey 2013.

Breaking down national RES-E production by technologies (see Figure 1.3) exposes the important bias of the sector: the bias towards hydro, which dominates the RES-E sectors of all but three countries (Germany, the Czech Republic and Hungary). Besides the traditional generation structure, the composition of renewable supply is dependent on the abundance of different renewable sources as well as the (usually somewhat correlated) goals set out by national support policies. The time elapsed since the launch of national support programs might also be a determinant, e.g. the dominance of hydro production in the Balkan countries might decrease as more renewable capacities of other technologies are installed and support policies prove to be successful.

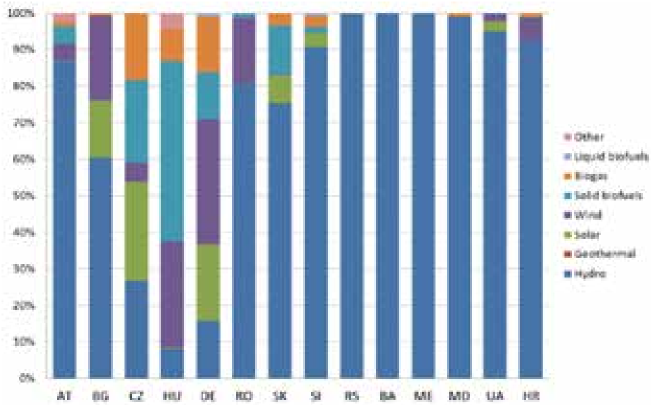

Figure 1.3 Composition of renewable electricity generation by source in the surveyed countries

Source: REKK RES-E Survey 2013.

Figure 1.4 presents the level of installed RES-E capacities in the analyzed countries. It is clear from the figure that Germany again exceeds all other countries with 75.6 GW, followed by Austria with 15.2 GW. In the latter – as we pointed out earlier – large hydro establishments are dominant: they represent over 80 percent of renewable capacity. RES-E generating capacity in the other Danube Region countries vary between 0.016 (Moldova) and 8.5 (Romania) GW, due to the different timing, design, and implementation of support policies.

Figure 1.4 Installed RES-E capacity by country and source

Source: REKK RES-E Survey 2013 and REKK data collection.

In order to see how effective the promotion policies of these countries proved to be in the last 5 years, we calculated yearly capacity growth rates for the period of 2008-2012 by dividing yearly capacity increments with the capacity values of the preceding years, in the following way:

$$CGR_t = \frac{C_t - C_{t-1}}{C_{t-1}}, \quad where$$

CGR_t — *capacity growth rate for year t*

C_t — *capacity level for year t*

The growth rate is an important measure of the effectiveness of support regimes, but it is also important to notice that the state of development (which can be measured by the amount of installed RES-E capacities in our case) can influence the rate of improvement, as the same increment of growth may signal a much higher development in a country with low capacity levels in 2008 than in a country with high initial capacity values. We would expect to receive lower average growth rates for countries with more developed RES-E sectors and high growth rates for countries where promotion policies came into effect recently. Figure 1.5 plots the relationship.

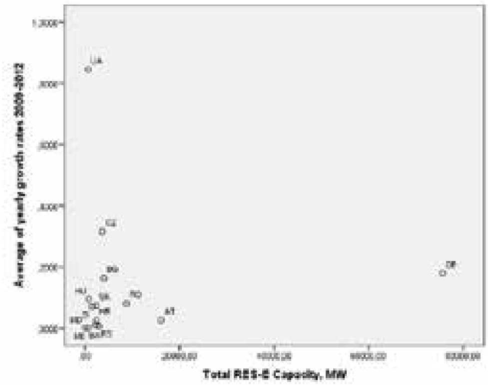

Figure 1.5 Relationship between the 2012 level of RES-E capacity and the average yearly growth rates of RES-E capacity in the last for years (2009-2012)

Source: Own calculation based on REKK RES-E Survey 2013.

As can be seen in the figure, the expected relationship is not true for most of the countries. Many of them are characterized by low initial capacity levels as well as low yearly growth rates, while the growth rate achieved in Germany is above the average of the other countries, probably due to its high its outstanding RES-E target.

In Figure 1.6 we plotted the yearly growth rate values against time for all countries. Our results are depicted on the following figure. Please note that the percentage values depicted on the vertical axes are scaled differently in each graph. This allows the results of the two previous graphs to be taken into account when evaluating the effectiveness of support policies for growth rates over the last 4 years.

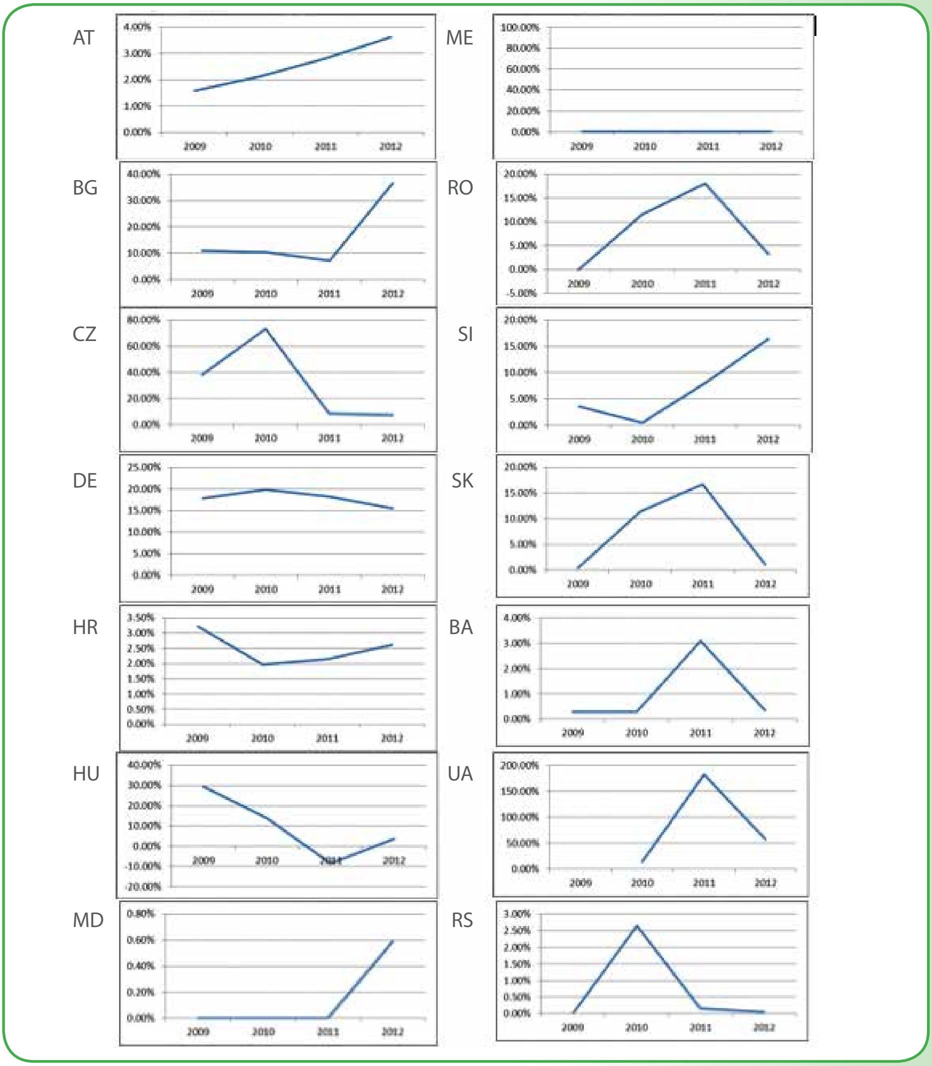

Figure 1.6 Yearly growth rates of installed RES-E capacity by country

Source: Own calculation based on REKK RES-E Survey 2013.

Note: yearly increment over the capacity level of the preceding year, %

According to the graphs Germany and Austria are the countries displaying smooth developments, however the steady increase in the rate of growth slowed somewhat during the last 3 years in Germany, indicating a slow-down of RES-E expansion even in the case of the largest producer. In Bulgaria, Slovenia and Croatia the pace of growth shows a decreasing trend until 2010-2011, and accelerated growth in 2012. Countries characterized by high uptake in first years followed by a sharp slowdown in growth rates are Romania, Czech Republic and Slovakia, where cuts in RES-E support rates were experienced. Similar patterns can be observed in Serbia, Ukraine and Bosnia and Herzegovina, but here the RES-E capacity basis is quite small, meaning that even individual investments could move the growth rates significantly. The growth rates in Ukraine exceed by far those of the other countries, representing the rapid expansion of its RES-e sector in the last three years. The negative value for Hungary shows a decrease in RES-E capacity in 2011 compared to 2010, due to the exclusion of some large-scale power plants from the support scheme that co-fire biomass and coal. The changes in capacity growth rates also reflect the uncertainty about the introduction of the future regulation (METAR) in Hungary.[3] In Montenegro the improvement of RES-E capacities has not started yet.

1.2 RES-E barriers

Licensing and certification

One of the most obvious barriers to new RES-E investments is the complexity of the licensing procedure. One would suspect that the more authorities involved the longer the overall lead time would be and that is exactly what our survey has proved. Only two of the 14 countries (Germany and Montenegro) solve the task with less than 5 authorities and they are rewarded with overall lead times below 9 months. As our cross-tabulation in Table 1.1 illustrates, the 14 countries arrange along the intuitive diagonal of the matrix.

		Overall lead time		
		below 9 months	9-24 months	above 24 months
Authorities involved	0 - 5	DE, ME		
	5 - 15	SK, SI, MD	AT, BG, CZ RO, UA, HR	RS
	above 15			HU, BA

Table 1.1 Cross-tabulation of authorities involved in licensing procedure and overall lead time of licensing

Source: REKK RES-E Survey 2013.

Grid integration

Our survey focused on a number of factors influencing the successful integration of renewable electricity to the grid. First, we inquired about the details of the grid connection. Unexpectedly, the majority of the countries do not grant priority to RES-E production with regard to their grid connection. In Bulgaria, the Czech Republic, Germany, Slovakia and Slovenia renewable plants enjoy priority, and the same is stipulated in the Hungarian Electricity Law, however here in practice the sequence of grid connection happens on a first come first served basis among renewable and conventional plants. It is less of a surprising that authorities do not attempt to allocate scarce grid connection capacities efficiently, rather they simply hand those out to the ad-hoc queue in a rank order. Competitive bidding is prescribed in Hungary for wind plants over 50 kW capacity and Montenegro has not faced the problem of scarce grid connection capacity so far according to the survey.

[3] See the country chapter on Hungary for further information.

As for distribution of grid connection costs, we distinguished direct connection costs from indirect system development costs and tried to identify countries which apply a genuine shallow cost approach - meaning that none of the indirect grid costs are allocated to newly connectable power plants. We found that only four of the fourteen countries (Germany, Bulgaria, Moldova and Serbia) apply a truly shallow cost approach – the rest of the region is best referred to as countries with non-shallow cost sharing regime. The connection charges regime is different from that of the conventional plants only in two out of the fourteen countries: in Hungary and Slovakia RES-E developers are entitled to discounts.[4]

Level of priority granted for RES-E plants when connecting to the grid	***priority***	***non-discriminatory***	***other***
	BG, CZ, DE, SK, SI	AT, RO, RS, BA, ME, MD, UA, HR	HU
Allocation of scarce RES-E connection opportunities in case of scarce grid connection capacity	***first come first served***	***competitive bidding (tender)***	***other***
	AT, BA, BG, CZ, DE, HR, MD, RO, RS, SK, SI, UA	HU	ME
Cost sharing regime of grid connection	***shallow***	***non-shallow***	
	BG, RS, MD, DE	AT, BA, CZ, HR, HU, ME, RO, SK, SI, UA	
Does the connection charges regime for RES-E plants differ	***no***	***yes***	
	AT, BA, BG, CZ, DE, HR, MD, ME RO, RS, SI, UA	HU, SK	

Table 1.2 Issues related to grid connection

Source: REKK RES-E Survey 2013.

Once a RES-E plant is successfully connected to the grid, lack of access rights emerge as the next possible barrier. Danube countries mostly grant priority access to the grid and if the plant dispatchable, priority dispatching is also ensured (except in Bosnia).

priority granted to RES-E plants / **access rights to grid →** / **dispatching to the grid ↓**	*priority*	*guaranteed*	*other*
priority	AT, BG,CZ, HU, SK, SI, MD	RO, ME, UA, HR	RS
non-priority	BA		

Table 1.3 Issues related to grid access

Source: REKK RES-E Survey 2013.

RES-E market design

With the growing share of renewable plants integrated into the electricity system, the increased involvement of RES-E producers in balancing obligations should be observed. In the group of our surveyed countries, however, there are two countries where balancing markets do not exist (Ukraine and Moldova),

[4] In Slovakia RES-E plants receive a 2 % discount compared to conventional plants, while in Hungary RES-E operators might save 30 to 50 % of the grid connection charge depending on the share of renewable source in their fuel mix.

while in Bulgaria and Slovenia RES-E generators are exempted from submitting production schedules.

Gate closure time is 1-12 hours before real time in most countries. In Austria and Germany gate closure happens 15 minutes before real time, while rather long time passes in Bulgaria, Slovenia and Serbia between submitting schedules and delivery.

Gate closure	less than 1 hour before delivery	1-12 hours before delivery	12-36 hours before delivery
Country	AT, DE	CZ, HR, HU, RO, SK, BA, ME	BG, SI, RS

Table 1.4 Distribution of countries according to gate closure time

Source: REKK RES-E Survey 2013.

Intraday markets may provide an opportunity to trade imbalances after gate closure in the intraday market and before real time. We asked our respondents to indicate whether an intraday market exists in their countries. According to the results it is possible to trade imbalances after the gate closure in day ahead markets in Austria, Bulgaria, the Czech Republic, Germany, Hungary, Romania, Slovenia, Serbia and Bosnia, however, there is a need for a further investigation on how exactly those markets operate in some of these countries.

The next table compares the schedule submitting obligations of RES-E and conventional plants. As we indicated earlier, we found that four countries do not require scheduling by RES-E plants. There are four countries in which both RES-E and conventional plant operators are required to prepare their schedules themselves. In Romania and Slovenia it is the balance group operator who is in charge of preparing and submitting the schedule, as is the case with conventional power plants. In Germany and Austria, while conventional plant operators are responsible for their own scheduling, RES-E plant operators are relieved from this duty, and the task is surrendered to either the system operator (Germany) or the balance group operator (Austria). In the Czech Republic the task of schedule preparation was divided between plant operators and system operators depending on whether the plant was connected to the transmission or distribution system. This regulation has changed recently.[5] In Montenegro schedules for RES-E plants are prepared by the market operator.

Country	plant operator	system operator	balance group operator	no schedule required	other
HU, SK, RS, BA, ,	RES-E plant, conventional plant				
AT	conventional plant		RES-E plant		
BG	conventional plant	conventional plant		RES-E plant	
CZ	RES-E plant, conventional plant	RES-E plant, conventional plant			
DE	conventional plant	RES-E plant			
RO, SI			RES-E plant, conventional plant		
ME	conventional plant				RES-E plant
UA,HR, MD	conventional plant			RES-E plant	

Table 1.5 Who is responsible for the production schedule for RES-E and conventional plants?

Note: - RES-E plant – conventional plant

Source: REKK RES-E Survey 2013.

[5] See the country chapter on the Czech Republic for further details.

1.3 Support scheme for RES-E

RES-E support schemes are imposed and justified by national renewable energy strategies and action plans. These documents embody strong legislative power at home and are internationally binding. Once voted for by the majority of the parliament, national renewable energy strategies and action plans give sufficient authority to the national governments to impose various support instruments with the explicit aim to favor and enhance renewable electricity producers. For the countries of the Danube Region, the European Union and/or the Energy Community Treaty provide very important secondary back-up for RES oriented policy.

National renewable energy targets are usually broken down to sub-targets in the electricity, heating and transportation sectors. RES-E support schemes are formally rationalized according to ambitious growth targets for consumption of renewable electricity. Our survey summoned the renewable electricity targets of the Danube Region and compared the actual status to those targets. The next figure presents targeted RES-E shares indicated in the National Renewable Energy Action Plans for 2012 and compares them to the actual values and the targets to be achieved by 2020.

While most of the countries were above or close to their RES-E targets in 2012, some countries, even Member States were lagging behind (RO, HU, SI).

Austria's 2020 targets are below 2012 levels because it expects stronger growth in electricity consumption than in the RES-E share, thus having less ambition developing its RES-E compared to other technologies. Bosnia, Montenegro and Ukraine have not yet prepared their National Renewable Energy Action Plans, therefore we are not able to draw conclusions on their advancement.

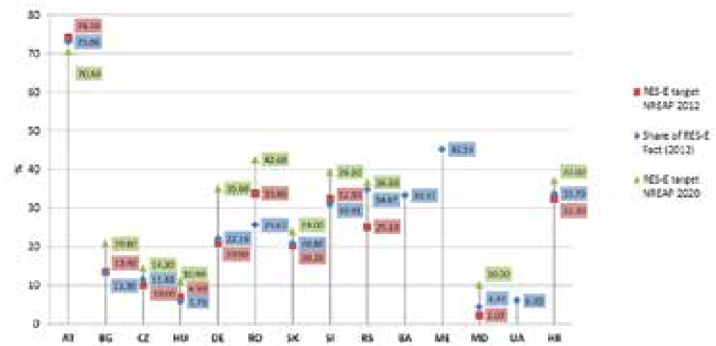

Figure 1.7 Share of RES-E generation in final gross consumption compared to NREAP target values

Source: REKK RES-E survey 2013, NREAPS

Support scheme design

Out of the fourteen surveyed countries, nine employ feed-in tariffs, four use a mixed tariff and premium support design (DE, CZ, SI, BA), and only one makes use of tradable green certificates. Figure 1.8 maps these support scheme designs to indicate the overwhelming popularity of FIT schemes.

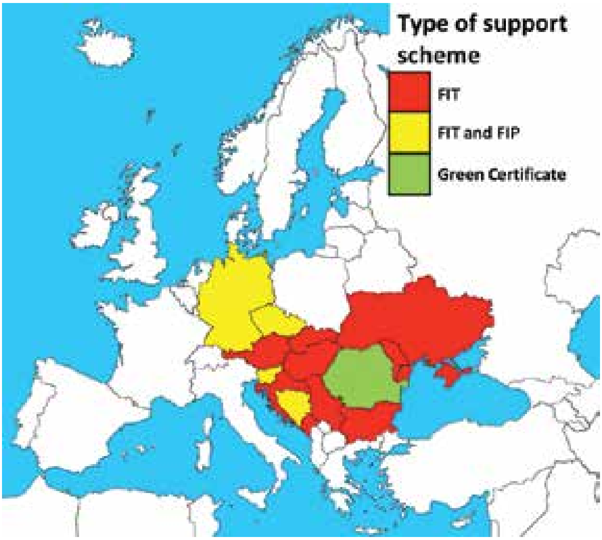

Figure 1.8 Type of support scheme in the DR countries

Source: REKK RES-E Survey 2013.

Rate of support (market premium manifested in FIT or certificate price)

FIT values vary across countries due to deviations in national RES-E support policies. The graphs on the next figure depict FIT levels for some selected technologies and plant sizes, applied to newly established technologies in 2013 for all countries. The vertical axes are of the same range (0-45 eurocent/kWh) to make comparisons easier across technologies. As the charts demonstrate, solar installations receive the highest support with a maximum of 45.52 eurocent in Bosnia and Herzegovina (paid for a kW of 5 kW rooftop PVs), and the variability across countries is also the highest in the case of these technologies. The smallest FIT is also applied in BiH for hydro power plants (1.84 eurocent/kWh). Wind power FITs deviate the least across countries, with an average value of 8.92 eurocent/kWh. In the next figure biogas technology refers to a plant using biomass as a source, while a biomass plant indicates an installation firing solid materials. Biogas and biomass plants receive average remunerations of 13.7 and 12.3 eurocents respectively in the Danube Region, with moderate variability across countries. Geothermal energy as a RES-E source is not supported in all DR countries, but in those countries aiming to foster geothermal improvement the support level is set high (e.g. in Germany and Slovakia geothermal FITs are the highest at the moment).

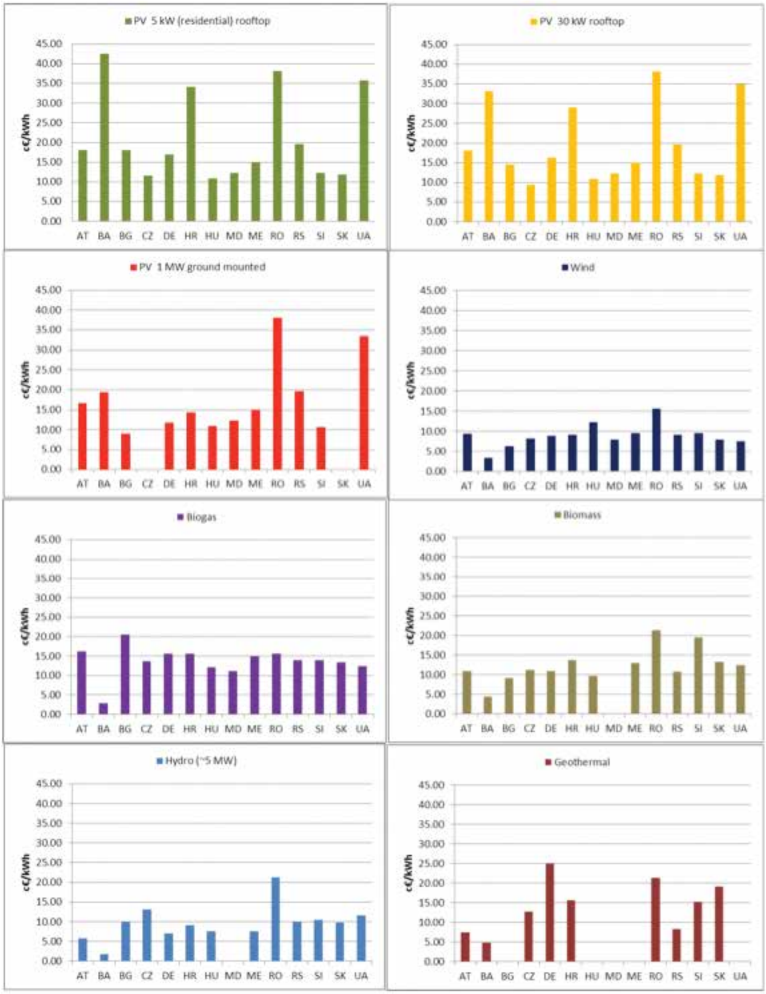

Figure 1.9 RES-E support (FIT) paid for selected technologies in Danube Region countries [6]

Source: REKK RES-E Survey 2013.

[6] In case of Romania, where a green certificate system is in place 'FITs' were calculated by adding the average 2012 market value of the relevant number of GCs to the average base-load market price in 2012, based on OPCOM data (www.opcom.ro)

Annual support budget: comparing the monetary incentives of the national RES-E support regimes

The 14 countries of the Danube Region apply a wide variety of support instruments to provide feasible returns on renewable electricity investments. In our survey, first of all, we identified the incentive component embedded in each and every support regime. We isolated the incentive component in order to distinguish between the economic wholesale value of renewable electricity and the premium that is paid above it. In a FIT scheme the economic basis of support is not equal to the feed-in tariff that is paid out. Instead, we captured the monetary incentive of the FIT regime by subtracting the market value (or wholesale value) of the supported renewable electricity from the feed-in payout. The economics of this approach is more transparently manifested in a feed-in premium regime, in which RES-E producers sell their production in the electricity markets and the support regime pays out the necessary markup to ensure reasonable payback on investments.

The following charts are designed to analyze the monetary incentives embedded in the region's RES-E support regimes. First of all, we show how much monetary incentive is provided for each unit of renewable electricity produced.

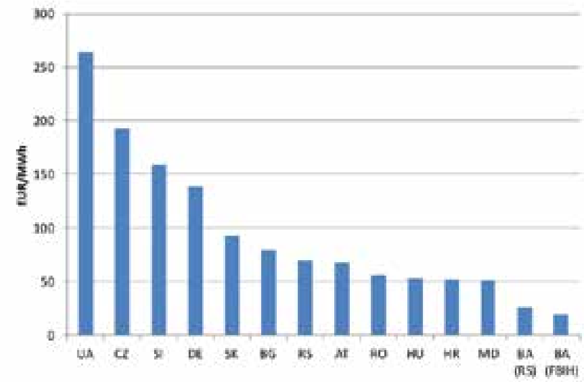

Figure 1.10 Unit support for renewable electricity, 2012, EUR/MWh

Source: Own calculation based on REKK RES-E Survey 2013.

One can see financial incentives varying to a great extent within the region, with median figure below EUR100, but at least four out of the 14 countries paying over EUR100 per MWh. The next chart presents the weight of the same national RES-E budgets but this time by distributing it to each kilowatthour of electricity delivered to end-users in 2012.

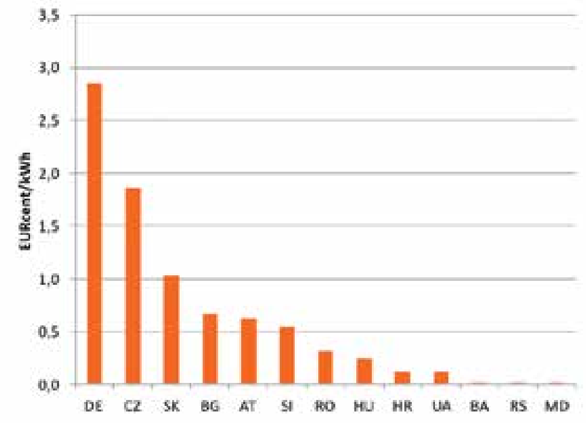

Figure 1.11 End-users' cost of renewable support per kWh of electricity consumed, 2012, EURcent/kWh

Source: Own calculation based on REKK RES-E Survey 2013, IEA Electricity Information 2013., EUROSTAT

Comparing the two graphs we can see that Germany or the Czech Republic are examples of countries which provide financial incentives effectively: their support level is very high and much renewable electricity is generated under their schemes as shown by the relatively high end-user costs of the regime. Ukraine, on the other hand, which offers the highest unit support for renewable electricity, does not actually have to collect much from its end-users to stand up for the support instrument. The reason is that the amount of RES-E produced under its recently introduced support scheme has not reached considerable amounts yet.

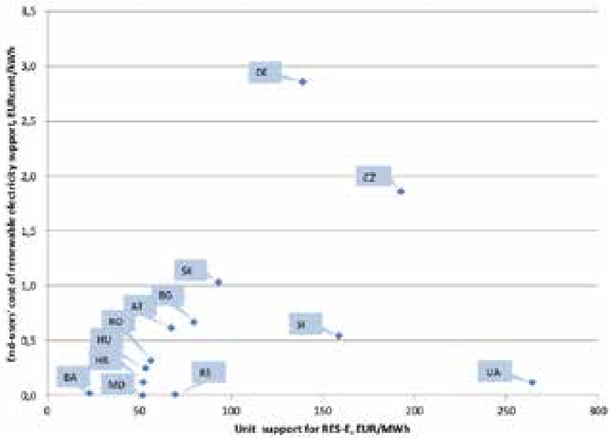

Figure 1.12 Relationship between unit support for RES-E and end-users's cost of RES-E support, 2012

Source: Own calculation based on REKK RES-E Survey 2013, IEA Electricity Information 2013, EUROSTAT

Unit support for RES-E and the support cost incurred by end-users seem to be correlated. Data in the above plot underline that if countries initiate financial support instruments that do make RES-E investments profitable, eventually RES-E investments start to flow and support budgets to grow. Ukraine is a relatively new player with a nascent support scheme that offers significant payments but subsequent RES-E generation has not yet followed and thus end-users do not have to pay much. The Czech Republic has made great strides since its generous PV support budget created a bubble of over investment and measures were taken to redirect RES-E payments to mitigate the cost burden on end-users.

Figure 1.13 aims to illustrate the relative weight of the per-kWh cost for end-users by presenting the same data as % of electricity prices for household and non-household consumers.

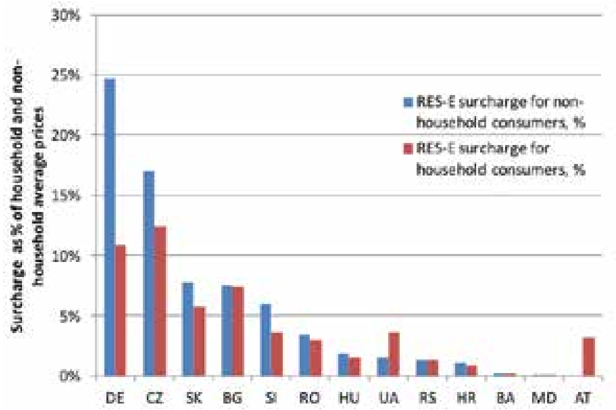

Figure 1.13 Expenditure for renewable electricity support as percentage of end-use prices for household and non-household consumers, % (2012)

Source: Own calculation based on REKK RES-E Survey 2013, IEA Electricity Information 2013, EUROSTAT

Our chart exhibits surprisingly high expenditure rates in many countries which often are not explicit in the national billing systems.

Note that the above illustration is not depicting real expenditures of consumers, the surcharge is recalculated to facilitate cross-country comparisons. Policy does influence the final burden sharing costs. In Germany, for example, non-household consumers are not actually required to spend 25% surcharge on their electricity bills in order to pay their contribution to the RES-E scheme – many of them are entitled for exemptions, like energy intensive industries and companies that export to competitive foreign markets. In return, household consumers are required to spend more than our basic calculations suggest. Hungary is an example of the opposite: from 2013 households were exempted from contribution to the RES-E support budget, so currently the Hungarian RES-E scheme is financed exclusively by the non-household consumers.

Next we explore if the RES-E burdens on end-users are in line with their corresponding economic output across the Danube Region. Therefore, in Figure 1.14 we present the total budget of the operative monetary incentives as percent of the national GDP in 2012.

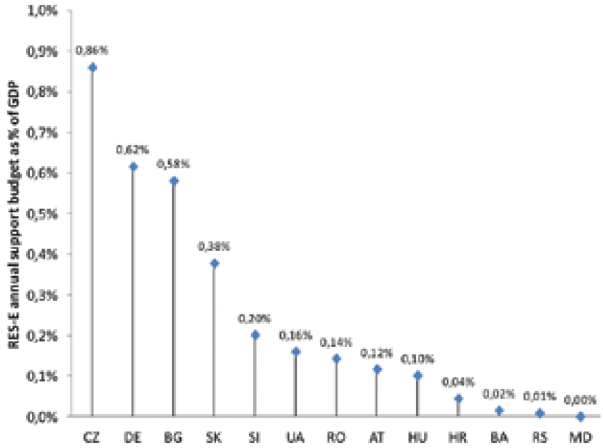

Figure 1.14 Annual RES-E support budget as percent of GDP, 2012, %

Source: Own calculation based on REKK RES-E Survey 2013, EUROSTAT

The values on Figure 1.14 range from modest to quite significant rates. The Czech Republic still features by far the highest relative support budget despite recent cuts in spending. The Czech support budget carries forward the burden of financing RES-E until supported producers are eligible for subsidies, generally for 10-20 years. Note that the figures do not contain monetary incentives other than the FIT/FIP or Green Certificate schemes (i.e. investment grants, tax allowances or support from the state budget are not accounted for). Still, the RES-E budgets relative to GDP are a similar magnitude to their military expenditures (about half as much).

We investigated the relationship between the level of capacity installed and the unit support (EUR/MWh) in order to see whether any relationship can be observed. As the stock of capacity that has been accumulated during different time spans across different countries cannot be related as a dependent variable to the 2012 per unit support expenses, we tried to explore whether countries with larger or smaller installed capacities spend more money on renewable promotion. We created two scatterplots, one with Germany included (Figure 1.15), and one without (Figure 1.16), because Germany is a kind of outlier with respect to RES-E capacity. It can be observed from the first figure that Germany, in spite of its massive RES-E capacity stock, ranks 4th among the Danube Region countries on its per-unit support level. This can be partially explained by the fact that the national policy set out a quite ambitious target (35% by 2020, 50% by 2030 and 80% by 2050) requiring the constant promotion of RES-E development and directing investments toward more expensive technologies as the potential of cheaper sources were being exhausted (on-shore wind, geothermal energy utilization).

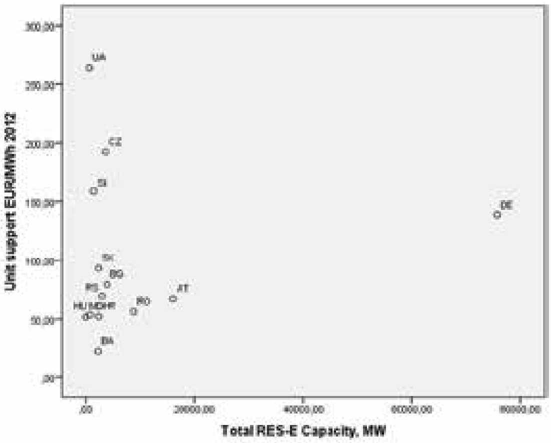

Figure 1.15 The relationship between total RES-E capacity and the unit support in 2012 (Germany included)

Source: Own calculation based on REKK RES-E Survey 2013 and data compiled by REKK.

If we look at the same relationship for all countries except Germany, we can see a kind of inverse relationship between RES-E capacity level and unit support cost suggesting that countries lagging behind spend more on RES-E promotion than those which have already accomplished more investments. There are some countries, however, which are grouped in the segment of low installed capacity and low spending (BA, HR, HU, MD).[7] It will be interesting to see how effective their support policies will turn out to be in the future.

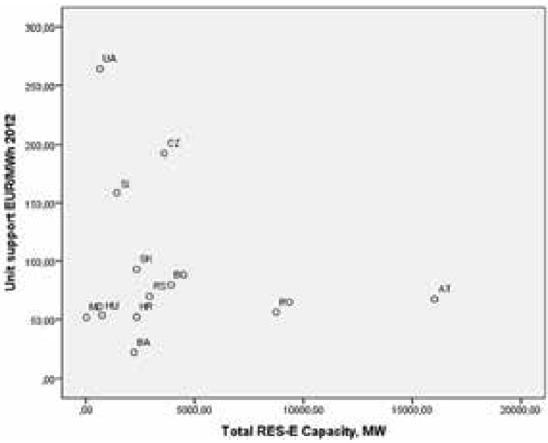

Figure 1.16 The relationship between total RES-E capacity and the unit support in 2012 (Germany excluded)

Source: Own calculation based on REKK RES-E Survey 2013 and data compiled by REKK.

[7] Montenegro is not involved in the analysis because of non-availability of data on support costs.

Figure 1.17 explores the relationship between the unit support for 2012 and the growth in capacity accomplished in 2012. Although the support rate is related to the yearly RES-E generated (EUR/kWh), we compared it to the growth rate of capacity instead of the increase in production because the supply of hydroelectricity can vary considerably from year to year depending on water availability. Yearly growth rate is computed as the increment in year 2012 over the level of capacity in 2011. The next figures demonstrate the relationship.

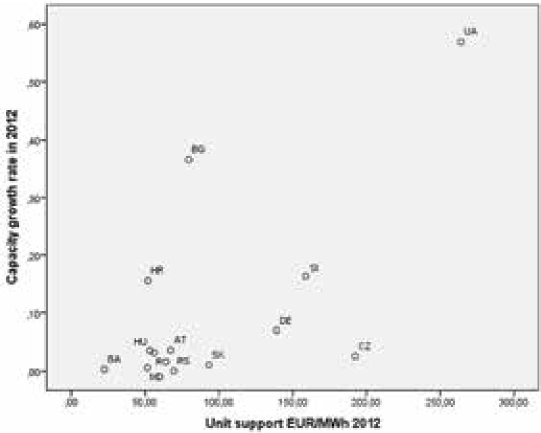

Figure 1.17 The relationship between the support per unit of MW and the yearly growth rate of RES-E capacity in year 2012

Source: Own calculation based on REKK RES-E Survey 2013 and data compiled by REKK.

We can observe a weak correlation between the two variables indicating that higher spending might bring about more investments. Ukraine and Bulgaria were the most successful countries in inducing capacity installations in 2012, while the Czech Republic realized less capacity growth comparatively, in spite of its relatively high support level, probably as a consequence of the retroactive intervention implemented in 2011.

2 RES-E COUNTRY PROFILE - AUSTRIA

2.1 General description of the RES-E sector

In 2012 the total gross electricity generation was 72.4 TWh, dominated by hydro power plants (65.7%). Natural gas-fired power plants (15.9%) and coal-fired power plants (7.1%) are also important pillars of the electricity mix in Austria, while the rest of the energy comes from renewable based power generation. Austria was a net electricity importer: and in 2012 the net import was 2.5 TWh. Total installed capacity exceeds 23 GW, out of which installed capacity of hydro power plants is 13.3 GW and thermal power plants (including biomass based power plants) give one third of the total installed capacity (8.3 GW). The installed capacity of wind generators was 1.3 GW at the end of 2012.

Renewable energy statistics

Total renewable generation was 54.8 TWh in 2012, dominated by hydro generation, which provides 87% of the total RES-E generation. Figure 2.1 depicts the RES-E generation mix in the last decade.

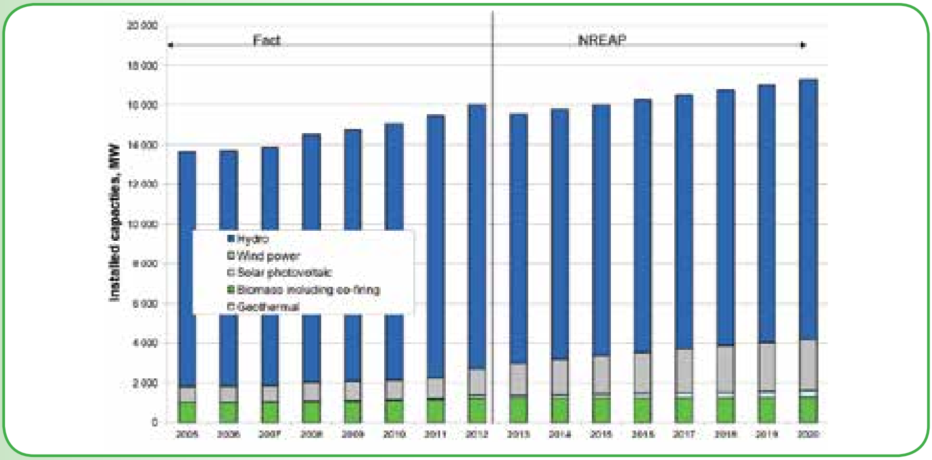

Figure 2.1 Renewable electricity generation capacity in Austria, MW

Source: E-Control, NREAP

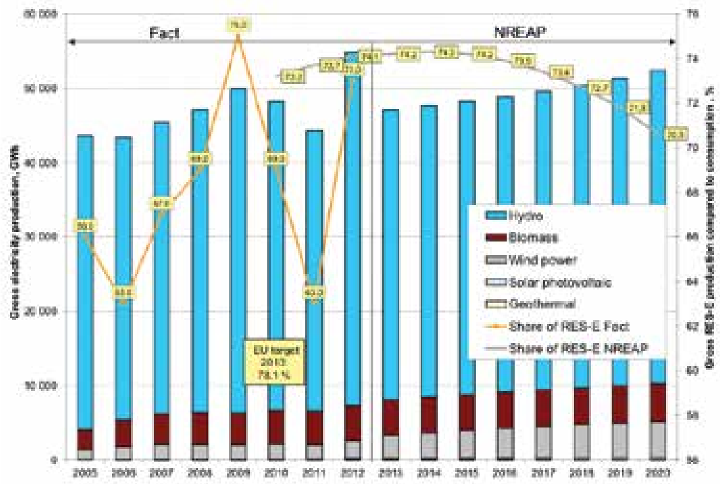

Figure 2.2 Gross renewable electricity generation in Austria, GWh

Source: E-Control, NREAP

Renewable market design

According to the Green Electricity Act eligible renewable producers can sell the produced electricity to the OeMAG, the green electricity balancing group. OeMAG was founded in 2006 by the three Austrian TSOs. Today ownership of OeMAG is comprised of the three TSOs (49.6%) and investment banks. OeMAG takes the energy produced by supported renewables at a fixed price determined annually by a resolution of the Ministry of Economy, Family and Youth. RES-E producers are only responsible to notify OeMAG about major plant revisions, while OeMAG is responsible for preparing production schedules and also must bear the cost of balancing. The revenue of OeMAG comes from four major parts:

i) a surcharge on grid usage and network loss charges (Ökostromförderbeitrag),

ii) a lump sum for each metering point (Ökostrompauschale),

iii) a fee for certificates of origin and

iv) the market price[8] of electricity sold to electricity traders. All these revenues are determined by the regulator (E-Control) or the ministry.

[8] Market price is also determined by the regulator, but it depends only on the EXAA price (EXAA: Austrian power exchange, www.exaa.at)

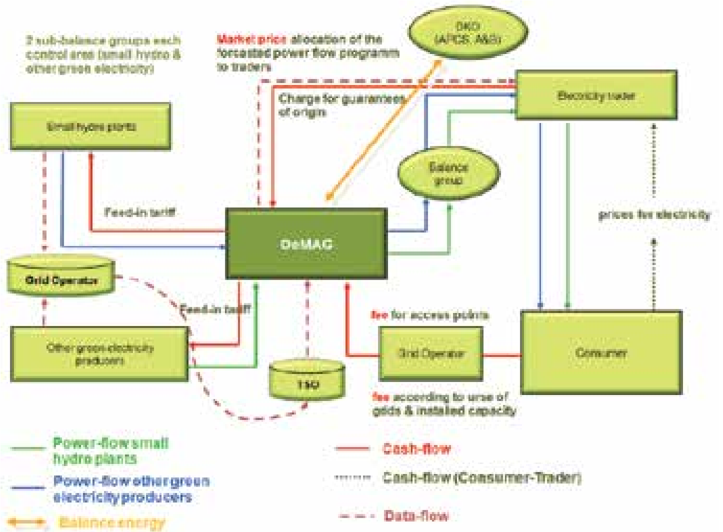

Figure 2.3 RES-E market design in Austria

Source: Brandlmaier (2012)[9]

Estimated RES-E potential

According to the Green-X database the realisable potential of RES-E generation is 68.4 TWh in 2020 and 81.5 TWh in 2030. The present utilization exceeds 54.8 TWh, which is not far from the potential. The largest potential, which is still not utilized, is electricity generation from photovoltaic plants.

	Electricity generation in 2012	Realisable potential by 2020	Realisable potential by 2030	RES-E 2012/Potential in 2030
Geothermal	1	70	1174	0.1%
Biomass	4 649	5674	7279	63.9%
Hydro	47 570	53 082	53 187	89.4%
Photovoltaic	124	2965	11744	1.1%
Wind	2 461	6651	8128	30.3%
Total	54 805	68 442	81 512	67.2%

Table 2.1 RES-E potential and present utilization in Austria, GWh

Source: Green-X database - Re-shaping project[10]

[9] Horst Brandlmaier: OeMAG, balance group responsible for supported green electricity, http://www.energy-community.org/pls/portal/docs/2014187.PDF
[10] http://www.reshaping-res-policy.eu/downloads/RE-Shaping_CP_final_18JAN2012.pdf

2.2 RES-E barriers

Licensing and certification

In Austria one stop-shopping is not available; a new RES-E generator needs 5-15 different licenses. The length of the whole licensing process depends on the size and type of the producer. Large projects (>20 MW wind capacity, >15 MW hydro) are subject to an environmental impact assessment permitting procedure. In this case the average licensing process can take 2 years or even longer. In the case of smaller projects the average lead time for the RES-E authorization procedure is between 9 and 24 months.

Grid

According to the Electricity Economy and Organizational Act (EIWOG) RES-E power plants are not given priority for connection to the grid. While RES-E power producers enjoy the same rights as other types of power plants regarding grid connection, in the case of dispatching and access rights to the grid renewable power generators have priority.

In accordance with the general provisions of energy law, the costs of grid expansion are borne by the final consumer or the grid operator. This interpretation would suggest a "shallow" charging on RES-E project side. Yet in practical terms it has been shown that the cost charging on the RES-E project side is rather "non-shallow" in Austria. In reality grid extensions are based on bilateral contracts between the developers and the grid operator and the method to determine the cost of upstream grid reinforcement is not uniform. In some cases, RES-E project developers pay a lump sum fee and in other cases the calculation is done on a project specific basis.[11]

2.3 Support scheme for RES-E

Renewable targets

According to the 2009/28/EC Directive all Member States have to publish a National Renewable Action Plan (NREAP), which describes how to reach the RES binding-target and also sets indirect RES-E targets. The non-binding RES-E target by 2020 is 70.6%, which is a realistic target, due to the fact that the share of RES-E was 63% in 2011, which increased to 73% by 2012, because of the high utilization of hydro power plants.

In 2012 the new Green Electricity Act (GEA) was approved, which sets more ambitious targets for renewables. Table 2.2 and Table 2.3 demonstrate the present installed capacities and electricity generation by technology, the targets set in the NREAP and the new targets approved by the GEA.

[11] http://www.reshaping-res-policy.eu/downloads/RE-Shaping_CP_final_18JAN2012.pdf, p.:19

	Fact, 2010	Fact, 2012	NREAP - 2015	GEA - 2015	NREAP - 2020	GEA -2020
Hydro	12 919	13 350	12 708	13 619	13 282	13 919
Geothermal	1	1	1	1	1	1
Solar	90	215	179	590	322	1 290
Wind	963	1 337	1 951	1 711	2 578	2 963
Biomass	1 100	1 211	1 228	1 311	1 281	1 300
Total	15 073	16 114	16 067	17 232	17 464	19 473

Table 2.2 Installed capacity; facts and targets in Austria set by NREAP and GEA, MW

Source: GEA (2012)[12], NREAP, E-Control

	Fact, 2010	Fact, 2012	NREAP - 2015	GEA - 2015	NREAP - 2020	GEA -2020
Hydro	41 572	47 570	39 423	45 072	42 112	45 572
Geothermal	1	1	2	1	2	1
Solar	31	124	170	531	306	1 231
Wind	2 063	2 461	3 780	3 563	4 811	6 063
Biomass	4 517	4 044	4 826	5 117	5 147	5 817
Total	48 184	54 200	48 201	54 284	52 378	58 684

Table 2.3 RES-E generation; facts and targets in Austria set by NREAP and GEA, GWh

Source: GEA (2012), NREAP, E-Control

Support scheme design and rate of support

In Austria two types of support regimes exist for RES-E: investment subsidies and FITs.

Investment subsidy

Small PV (<5 kW), photovoltaic installations installed on buildings and small hydro power plants (<10 MW) are eligible for the investment subsidy. In Table 2.4 we summarize the level of investment grants. The total budget was limited and distributed on a first come first served basis.

[12] The Green Electricity Act is available in German at: http://www.e-control.at/portal/page/portal/medienbibliothek/oeko-energie/dokumente/pdfs/%C3%96SG%20 2012_Kundmachung_BGBLA_2011_I_75_29.07.2011.pdf

Technology	Size/type	Investment subsidy	Feed-in tariff
Photovoltaic	roof-top or ground-mounted installations with a maximum capacity of 5 kW.	300 EUR/kWp	no
	Building integrated installations with a maximum capacity of 5 kW	400 EUR/kWp	no
	>5 kW	30% of the investment costs, but no more than 200 EUR per kW	yes
Hydro	<50 kW	1500 EUR/kW + feed in tariff	yes
	50-100 kW	30% of the investment costs, but no more than 1500 EUR per kW	yes
	100-500 kW	30% of the investment costs, but no more than 1500 EUR per kW	yes
	500-2000 kW	20-30% of the investment costs, but no more than 1000-1500 EUR per kW	yes
	2000-10000kW	10-20% of the investment costs but, no more than 400-1000 EUR per kW	no

Table 2.4 Investment subsidy in Austria, EUR/kW

Source: OeM-AG and RES-Legal

All RES-E technologies are eligible for feed-in tariffs with the exception of hydro power plants above 2 MW installed capacity and PV power plants below 5 kWp installed capacity, while in the case of biomass, biogas and geothermal power plants the energy efficiency rate must be at least 60%. The eligibility period for biomass and biogas power plants is 15 years, while for other RES-E technologies this period is 12 years. Feed-in tariffs are determined and annually revised by the regulator. Feed-in tariffs differ by technology, size, energy produced and application date. The budget is distributed on a first-come-first served basis. Table 2.5 summarizes the present feed-in tariffs for selected technologies. The complete feed-in tariff system may be observed in Table 2.7.

Technology	Specification (FIT/FIP)	Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	18.12
PV 30 kW rooftop	FIT	18.12
PV 1 MW ground mounted	FIT	16.59
Biogas (average)	FIT	16.22
Biomass (average)	FIT	10.97
Wind	FIT	9.45
Hydro (average)	FIT	5.75
Geothermal	FIT	7.5

Table 2.5 Support for specific technologies in Austria, EURcent/kWh

Source: E-Control

Annual support budget

The total yearly budget for new installations was 49 million euros in 2013. Overall costs of the incentive component of the FIT regime exceeded 363 million euros in 2012 as Table 2.6 depicts.

	Overall payment for RES-E producers mEUR (A)	Market (wholesale) value of production mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2008	576	324	252	6200	40.6
2009	563	284	280	5500	50.9
2010	599	249	350	5900	59.3
2011	582	274	308	5100	60.4
2012	657	294	363	5400	67.2

Table 2.6 Cost of FIT regime in Austria, mEUR

Source: REKK RES-E Survey 2013

2.4 Cross-border cooperation

Non RES-E (export/import capacities, traded electricity)

Austria has relatively strong interconnections with its neighbours, except Slovakia, where no cross border line exists. However there is a physical limit in the German-Austrian border, due to an agreement between the two countries no commercial congestion is allowed.

RES-E

According to the REKK RES-E Survey we do not know of any initiatives for cross-border cooperation involving RES-E development.

2.5 Appendix

Technology		Feed-in tariffs (EUR/kWh), if application is submitted until the end of 2012	in 2013
Wind energy		9.5	9.45
Solar energy	PV installations on a building or a noise barrier with capacities over 5 kWp. up to 500 kWp:	19.7	18.12
	Other PV installations with capacities over 5 kWp. up to 500 kWp:	18.43	16.59
Geothermal energy		7.5	7.43
Biogas	Biogas plants:	13-19.6, depending on the maximum capacity	12.93-19.5, depending on the maximum capacity
	Sewage gas plants:	6	5.94
	Landfill gas plants:	5	4.95
Hydro-power	New or revitalised hydro-power plants which have increased their efficiency by at least 50%, up to 2 MW	5 – 10.6, depending on the amount of electricity fed into the grid.	4.97-10.55, depending on the amount of electricity fed into the grid.
	Revitalised hydro-power plants which have increased their efficiency by at least 15%, up to 2 MW	3.25 – 8.3, depending on the amount of electricity fed into the grid.	3.23 – 8.26, depending on the amount of electricity fed into the grid.
Biomass	Solid biomass:	According to the maximum capacity: 11-20	According to the maximum capacity: 10.94-20
	Liquid biomass:	5.8	5.74

Table 2.7 Feed-in tariffs in Austria from July 2012 until the end of 2013, EUR/kWh

Source: E-Control[13]

[13] http://www.e-control.at/portal/page/portal/medienbibliothek/recht/dokumente/pdfs/oekostrom-einspeisetarifVO-2012-OESET-VO-2012.pdf

3 RES-E COUNTRY PROFILE - BOSNIA AND HERZEGOVINA

3.1 General description of the RES-E sector

Fuel mix, generation mix

Bosnia and Herzegovina (BiH) is a fairly complex country with regard to its administration. The country itself consists of two autonomous entities, the Federation of Bosnia and Herzegovina (FBiH) and the Republic of Srpska (RS), as well as a smaller administrative region called Brcko District. Although legislation and regulation is shared between the state and the entities, entity-level legislation is more specific and overrides state legislation and regulation.[14] Transmission system and cross-border auctioning is managed by the ISO BiH. The grid itself is owned and developed by the transmission company Elektroprenos BiH. Production, distribution and supply is managed by regional vertically integrated monopolies EPBiH and EP HZHB in FBiH and ERS in RS. Transmission activities are regulated by the state-level authority DERK, while production, distribution and supply are supervised by the entity-level regulatory authorities RERS and FERK.

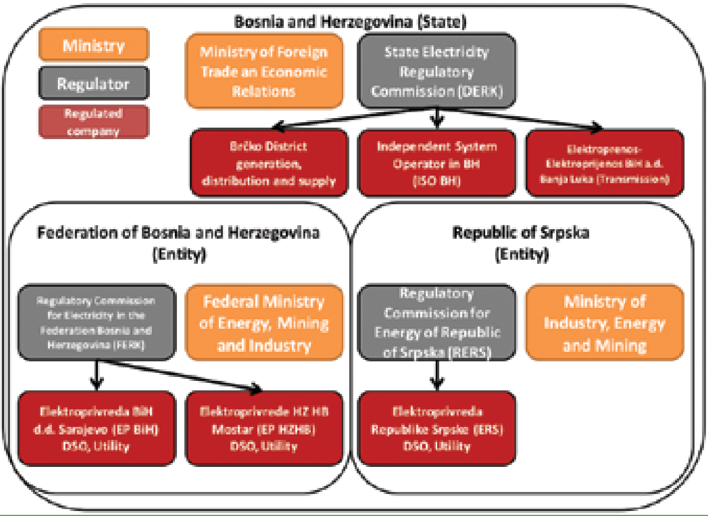

Figure 3.1 Stakeholders of the electricity market in Bosnia and Herzegovina

Source: REKK

The power generation portfolio of the country is not strongly diversified. By the end of 2012, 3973 MW of power plants were connected to the grid. More than half of the generating capacities are hydropower – in late 2012 slightly over 2200 MW – while the remaining capacities are aging coal fired thermal power stations (37 service years on average). Currently no wind power is connected to the grid, but almost 0.5 MWe of solar power has been installed. In the past five years no significant investment in generating capacities occurred apart from the commissioning of some 90 MW of hydropower and negligible (0.43 MWe) PV connections.[15]

[14] In this chapter by "state" we indicate Bosnia and Herzegovina as a whole country; "entity" refers to the autonomous self-governing FBiH and/or RS.
[15] REKK RES-E Survey 2013 and Platts Electricity in Eastern Europe

Share of RES-E in supply and breakdown of built-in capacities

In the past five years hydro production supplied 33 to 65% of the annual power consumption. The country is a net exporter of electricity, although its foreign trade position depends on the hydrological conditions: in 2010 exports amounted to nearly 4000 GWh, while in 2012 less than 350 GWh was exported (DERK 2008-2012[16]). RES-E production in BiH means hydropower, no wind or other type of RES-E has been connected to the grid yet. Only 0.43 MWe of solar PV capacities were installed in 2012.

From 2012 on, the Federal Ministry of Energy, Mining and Industry maintains a register of renewable projects in the BiH, updating project status twice a year. According to the registry, nearly 650 MW of renewable power plants are being constructed currently, most of which is wind power, located in the FBiH. Renewable budget covers the financial support of these renewable capacities.

	Under construction		Completed	
	Number of projects	Capacity, MW	Number of projects	Capacity, MW
Hydro	35	43.05	30	24.53
Wind	10	489.60	1	0.30
Biomass	4	79.40	0	0.00
Solar PV	170	31.04	14	1.07
Other	0	0.00	1	0.43
Total	219	643.09	46	26.33

Table 3.1 Renewable projects under construction in BiH

Source: Registry of the Federal Ministry of Energy, Mining and Industry[17]

RES-E market design

Renewable production is supported by feed-in tariffs and/or premiums in both of the entities. Feed-in budget is financed by the end users of electricity, who pay a predetermined renewable unit fee for each kWh consumed. This fee is regulated annually by the relevant authorities (RERS and FERK), therefore it differs in the two entities. The fee is set so that it will support a predetermined amount of renewable generation. The regulator sets the feed-in and the fee beforehand, so the budget may not be balanced annually. For instance as for RS in 2012, the fee was 0.0018 BAM/kWh (~0.00092 EUR/kWh).[18] Due to the low hydro production a large amount of the 2012 funding was not spent, so in 2013 the regulator utilized the remaining budget to finance 60% of year's expenses and managed to cut the support fee to 0.0009 BAM/kWh (~0.00046 EUR/kWh).

Estimated RES-E potential

The most recent information regarding RES-E potential was presented at the RIO 20+ conference in 2012. The country is reported to have a potential of 6800 MW hydropower. Technical solar potential is estimated to be 67.2 PWh annually.[19] Since 1998, a number of possible wind power sites have been surveyed, amounting to 720-950 MW capacity. Biomass potential was found to be 33.518 PJ, but this includes heat usage as well as electricity. Geothermal power potential has not been assessed so far.

[16] http://derk.ba/ba/godinji-izvjetaji-derk-a

[17] Renewable project registry of the Federal Ministry of Energy, Mining and Industry http://www.fmeri.gov.ba/registar-projekata-obnovljivih-izvora-energije-i-kogeneracije.aspx

[18] We used the following exchange rate throughout the document: 1 EUR=1.956 BAM

[19] We must note that this requires almost 50% of the country to be covered with PV panels

3.2 RES-E barriers

Licensing and certification

Licensing for renewable power plants takes a long time and involves a number of authorities and permits. Renewable technologies first of all need to obtain an ecological permit from the environmental ministry of the entity. The applicant should provide a detailed feasibility study, an ecological impact assessment, and submit this documentation to the entity level authority (RERS in RS, FERK in FBiH).

As the next step, the power plant shall obtain:

- license for generating electricity;
- license for trading electricity;
- energy consent (approval of the Federal Ministry of Energy, Mining and Industry)

To construct the facility, investors must possess a construction license from RERS or FERK. An urban approval issued by the entity's ministry for spatial planning is needed as well. If the construction license and the urban approval are ready, the ministry may award the power plant with a construction permit.

Natural resources including renewable energies are regarded to be the property of BiH, therefore a concession is needed to exploit wind or hydropower (but no concession is needed for PV). The concession process is long and uncertain, because there is no transparency in the selection. The authority decides if the offer serves the public interest and it might grant the concession without tendering.[20]

The whole licensing procedure may take more than 2 years. Investors should contact more than 15 authorities, both at the federal and the entity level. The procedure therefore is complicated and involves excessive red tape.

Federal legislation requires a certificate of origin system to be in place in both entities. The system has already been implemented in the RS, and is being realized in the FBiH.[21]

Grid integration

State

On state level, renewable projects are not prioritized when connecting to the transmission grid. Queue management regulation does not exist in BiH yet – and the REKK RES-E Survey indicated that this has not yet been an issue of concern. The fact that no scarcity of transmission capacity was observed may be attributed to the fact that (i) investments are so rare that no queue is formed (ii) licensing and regulation takes so long time that ISO can prepare for connecting any new intermittent capacity.

Cost of connecting to the transmission grid is entirely financed by the generator and made up of two parts: a fixed fee depending on capacity connected and a variable fee depending on the cost of additional investment. If additional investment is needed to reinforce the transmission grid due to the connection of new capacities, the generator shall finance that investment. The rulebook on access to the transmission grid applicable in BiH allows renewable producers to receive a 50% discount on the fixed component of the fee.[22]

[20] CMS: Renewables Support Mechanisms Across Europe. http://www.cms-dsb.com/Hubbard.FileSystem/files/Publication/66d448bf-8611-4409-bb4f-4ccee4bbbcf9/Presentation/PublicationAttachment/d2078c0b-4df4-45f2-9e72-359f37f345fb/CMS_Renewable_Energy_Guide_April_2013_b.pdf
Wolff Theiss: The Wolff Theiss Guide to: Generating Electricity from Renewable Sources in Central, Eastern & Southeastern Europe. http://www.wolftheiss.com/tl_files/wolftheiss/CSC/Guides/The_Wolf_Theiss_Guide_to_Generating_Electricity_from_Renewable_Sources_in_CEE_and_SEE_2012.pdf

[21] Based on CMS (2013), Wolfftheiss (2013) and REKK RES-E Survey 2013

[22] Since variable costs are determined for each investment, we cannot indicate the relative share of this support.

In both entities, a feed-in tariff system and obligatory redemption is in place, so renewable producers are granted priority access to the grid.

RS

In case of the RS, renewable producers are granted priority when connecting to the distribution grid.[23]

RES-E up to 0.5 MW do not have to submit a daily schedule and if balancing occurs it only needs to pay 25% of the balancing costs. The remaining balancing costs are paid by the end users via the renewable unit fee.[24]

FBiH

RES-E producers having a capacity below 150 kW are exempted from paying balancing costs.

3.3 Support scheme for RES-E

RES-E utilization target

RES-E utilization target in the state level

No common target exists on the state level. BiH committed to the target of 40% RES in consumption by 2020 in the 10th Ministerial Council of the Energy Community (18.10.2012, Budva), but no target for RES-E was specified. Entity level RES-E target was set in the RS, allowing for meeting the 20% target in line with the EU goals. In the FBiH, currently no RES-E target exists for 2020.

Country-level target is provided by the 10 year development plan prepared by the ISO, synthesizing inputs of the vertically integrated producer-utilities, ministries and entity regulators. The most recent development plan for 2013-2024, approved by the state regulator DERK, foresees expansion of thermal capacities with 1050 MW by 2020 and new hydro with 315 MW. By 2020, the new capacities will produce 5.3 TWh annually, of which 4.6 TWh is thermal and 0.7 is hydro.

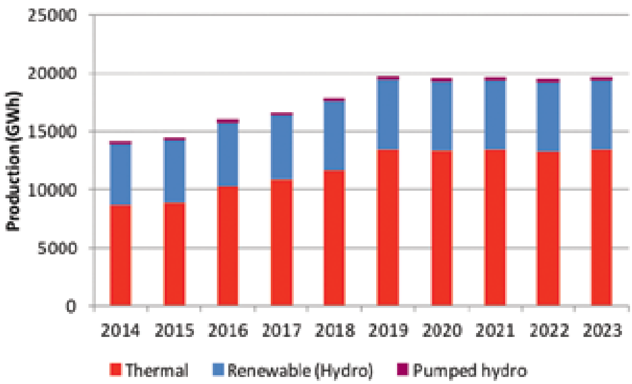

Figure 3.2 Planned cumulated capacity expansion to 2023 in BiH, MW

Source: NOSBIH 2013, Indicative network development plan[25]

[23] RULE BOOK on Incentives for Generation of Electricity from Renewable Sources and in Efficient Co-generation, http://www.reers.ba/sites/default/files/Rule_book_Incentives_RES_25October2011.pdf, Article 7 Paragraph 4

[24] RULE BOOK on Incentives for Generation of Electricity from Renewable Sources and in Efficient Co-generation, http://www.reers.ba/sites/default/files/Rule_book_Incentives_RES_25October2011.pdf, Article 9 Paragraphs 1-4

[25] NOSBIH http://www.nosbih.ba/body.aspx?docid=37&lang=BOS ISO BiH (2013): Indicative network development plan 2014-2023. http://www.derk.ba/DocumentsPDFs/IPRP-2014-2023-v22.pdf

RES-E utilization target in the RS

In the RS, the renewable capacity to be connected to the grid and the produced electricity receiving support is limited. RERS published the maximum amount of renewable power supported on its website. It must be noted that large hydropower with a capacity over 10 MW does not receive any support. Therefore it is not indicated in the figures below and any amount can be connected to the grid without limitation. By 2020, 230 MW of RES-E other than large hydro will be connected to the grid, producing 745 GWh of electricity annually.

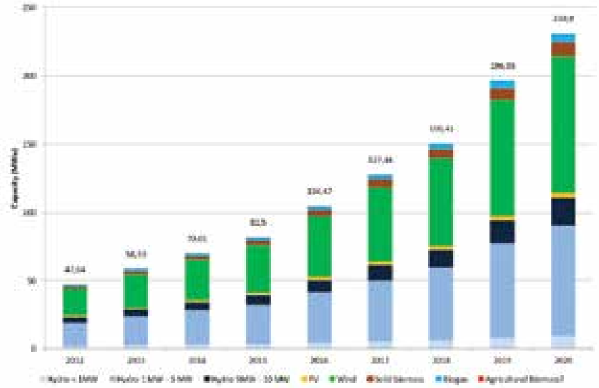

Figure 3.3 Amount of supported renewable capacities in RS, MW

Source: RERS[26]

RES-E utilization target in the FBiH

In the FBiH, no specific target for RES-E integration was applied. However, the Strategic Plan and Program for the Energy Sector Development in the Federation of BiH published in 2009 calculated possible renewable production. Inputs for these calculations were submitted based on data before the economic crisis, so the forecasts of this document are heavily distorted. Even for 2010, projections greatly overestimate the realized capacity and production. According to the document, about one third of electricity production should be satisfied with renewable power. This implies the integration of 600 MW wind, 880 MW additional hydro and 700 MW of additional pumped hydro capacity.

[26] RERS http://www.reers.ba/lat/node/220

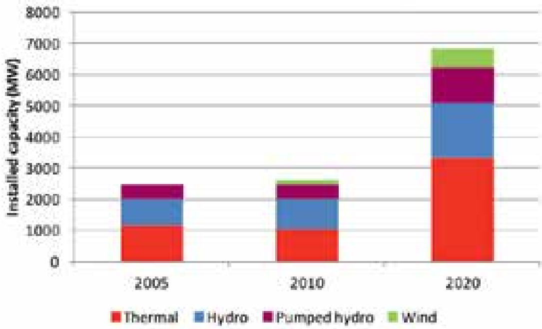

Figure 3.4 Installed capacity projected in FBiH, MW

Source: Strategic Plan of the Energy Sector FBiH (2009)[27]

Support scheme design

RES-E Market design in the RS

In the RS, a feed-in plus premium type system exists. Renewable producers are differentiated by technology and receive support up to a predefined capacity limit. Furthermore, renewable producers receive support not only for the power supplied to the grid but also for their own consumption (however, this support covers only the premium part not the feed-in). Since 2012, feed-in prices have remained constant while the premium has been adjusted causing a slight decrease in the level of total feed-in. Hydropower plants receive a feed-in of 62-77 EUR/MWh, wind is supported with 58-86 EUR/MWh. Support levels for solar PV in 2013 H1 were over 200 EUR/MWh, but the current regulation is gradually cutting down this tariff to a maximum of 180 EUR/MWh.

RES-E Market design in the FBiH

Renewable producers receive a feed-in price but not a premium. Similarly to the RS regulation, level of support is differentiated by technology and by capacity. The FERK sets a reference price and determines a multiplier factor for each renewable technology and for ranges of capacity. Presently, the reference price is 0.1226 BAM/kWh (~0.0627 EUR/kWh) and has not changed since 2012, but the overall support has been adjusted by changing the multipliers. The FBiH system recognizes more technologies and partitions to more capacity levels than the RS regulation, but on the whole, feed-in tariffs are similar to the RS tariffs. The scheme is funded by a unit fee paid by customers amounting to 0.0009 BAM/kWh (~0.00046 EUR/kWh).[28]

Rate of support (market premium manifested in FIT or certificate price)

To calculate the rate of support and annual support budget, we used publicly available statistics published by the state and entity regulators, fees set by regulations, and data submitted in our RES-E Survey. We must stress that our calculations are not precise and should be considered to be estimations.

[27] Federal Ministry of Energy, Mining and Industry in the Federation of Bosnia and Herzegovina (2009): STRATEGIC PLAN AND PROGRAM OF THE ENERGY SECTOR DEVELOPMENT OF FEDERATION OF B&H http://www.fmeri.gov.ba/systems/file_download.ashx?pg=94&ver=1

[28] http://www.ferk.ba/_ba/index.php/dozvole/uputstva

RS

Using RERS annual reports, we considered the average industry price to be the wholesale price. To calculate the rate of support, we simply subtracted the latest available wholesale price (being 38.89 EUR/MWh for RS in 2011)[29] from the feed-in price for each technology. From 2012 on, a slight increase can be observed in hydro, wind and biomass feed-ins while PV feed-ins became more differentiated and considerably lower. Solar support level is over 200-250 EUR/MWh, and the support for wind and small hydro varies between 25-50 EUR/MWh.

FBiH

Solar PV rates seem to be significantly higher than that of the RS support (for some capacities surpassing 400 EUR/MWh), but hydro and wind support levels are somewhat lower in the range of 20-35 EUR/MWh.

Technology	RS Specification (FIT/FIP)	RS Support (EURcent /kWh)	FBiH Specification (FIT/FIP)	FBiH Support (EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	14.71	FIT	42.52
PV 30 kW rooftop	FIT	14.71	FIT	33.12
PV 1 MW ground mounted	FIT	8.15	FIT	19.33
Biogas* (1-10 MW)	FIT	n.a.	FIT	2.85
Biomass* (1-10 MW)	FIT	7.67	FIT	4.48
Wind* (1-10 MW)	FIT	4.56	FIT	3.35
Hydro (to 10 MW)	FIT	2.48	FIT	1.84
Geothermal (1-10 MW)	FIT	n.a.	FIT	4.85

Table 3.2 Support to specific technologies in BiH, EURcent/kWh

Source: RERS and FERK

Annual support budget

RS

The annual support budget level presented in Table 3.3 is also an approximation. First, we established the unit fee paid by consumers and multiplied it by the volume of electricity consumed in RS (2). Unit fee (1) was assumed to be 0.0009 EUR/kWh. Since only small hydro production is operated in the RS, we can use the feed-in for small hydro (5) and the production data (4) published by RERS. Overall support budget (A) can be calculated as (1)*(2)/1000. As for the market value (B), we consulted RERS statistics and used average price each year as a proxy for the market price of electricity (7). Market value equals the market price of electricity multiplied by the renewable power produced (B=(4)*(7)/1000). The cost of the incentive system is the difference of A and B.

It can be concluded that the cost of the scheme is highly dependent upon the annual hydro production. Years with beneficial hydrological conditions translated into considerably higher cost.

RS	Unit fee, EUR/MWh	Consumption, GWh	Revenue, MEUR	Renewable production, GWh	Feed-in tariff, EUR/MWh	Feed-in cost, MEUR	Wholesale price	Wholesale revenue, mEUR	Cost of the incentive components
	1	2	3=1*2/1000	4	5	6=4*5/1000	7	8=4*7/1000	9=6-8
2012	0.9	3684	3.3	43.04	64.62	2.78	38.89	1.67	1.11

Table 3.3 Cost of the renewable scheme in RS, mEUR

Note: These calculations are based on RERS statistics and serve only as an indicative figure, not actual data.

[29] RERS Annual report 2011, RERS http://www.reers.ba/lat/node/220

FBiH

The calculation follows the same logic as the RS calculation.

FBIH	Unit fee, EUR/ MWh	Consumption, GWh	Revenue, MEUR	Renewable production, GWh	Feed-in tariff, EUR/MWh	Feed-in cost, MEUR	Wholesale price	Wholesale revenue, mEUR	Cost of the incentive components
	1	2	3=1*2/1000	4	5	6=4*5/1000	7	8=4*7/1000	9=6-8
2012	0.6	8370	5.0	49.18	63.31	3.15	44.86	2.21	0.95

Table 3.4 Cost of the renewable scheme in FBiH, mEUR

These calculations are based on FERK statistics and serve only as indicative figures, not actual data.

Overall costs calculated for both entities are displayed in Table 3.5.

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component, mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
FBIH	3.15	2.21	0.95	49.18	19.29
RS	2.78	1.67	1.11	43.04	25.73

Table 3.5 Cost of FIT regime in BiH, mEUR

3.4 Cross-border cooperation

Non-RES-E (export/import capacities, traded electricity)

BiH has interconnection with all of its neighbours. Capacities are allocated in a transparent manner, auctions are organized by the ISO NOS BiH. Yearly, monthly and daily auctions are held, and most of the capacity is sold at the monthly auctions.

Overall, the country is a net exporter of electricity. From 2010 on, BiH has been importing power from Serbia and exporting to Montenegro. Flows to Croatia depended on the current year's hydropower production. In dry years (such as 2007, 2011 and 2012) exports were below 1 TWh, but during high hydro production, exports could reach up to 3-4 TWh.

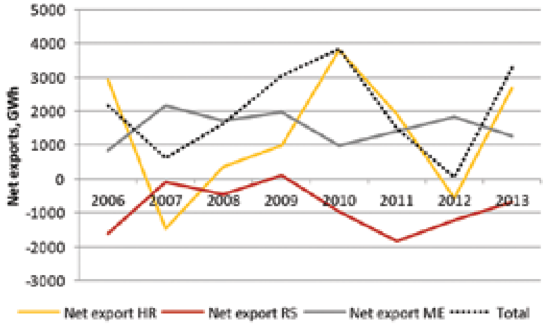

Figure 3.5 Net export physical flows in BiH, GWh

Source: NOSBIH annual and monthly reports.[30] (2013 data up to October)

RES-E

There is no joint implementation of such a project in BiH. In September 2013, the country received a considerable loan of 172 billion EUR from the German development bank KfW. The funds are earmarked for the development of two hydropower plants in FBiH and wind park feasibility studies in RS.

[30] NOSBIH http://www.nosbih.ba/body.aspx?docid=37&lang=BOS

4 RES-E COUNTRY PROFILE - BULGARIA

4.1 General description of the RES-E sector

Capacity and generation mix

The Bulgarian electricity market can be characterised as a transitional market with heavy regulation, dominance of state-owned companies, and an increasing presence of European and other foreign utilities.

The total installed capacity in 2012 was around 13.8 GW. Gross electricity generation was dominated by mostly lignite fired thermal power plants and the Kozloduy Nuclear Power Plant (NPP), while the rest of the electricity production came from hydro and renewable energy. Outside of hydro-based generation, other renewable sources have a rapidly growing presence (12%), while gas-fired power plants play a marginal role in the Bulgarian electricity mix.

Since 2010 in Bulgaria 1249 MW new renewable capacity has been installed, out of which 80% is solar and 15% is wind. As a consequence of this development the original 85% share of hydro in the total renewable electric capacity has declined to about 65%, while the share of solar grew from 2% to 20% in the last three years. Wind has maintained a level close to its 13% share of the total installed capacity due to its moderate growth.

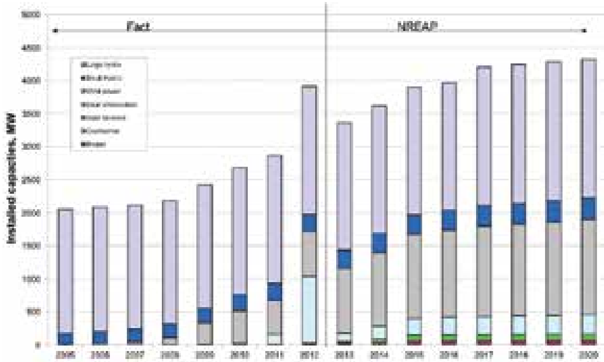

Figure 4.1 Installed RES-E capacities in Bulgaria, MW

Source: NREAP Bulgaria, REKK RES-E Survey 2013

Renewable electricity generation is dominated by huge hydro capacities installed before the liberalization of the Bulgarian electricity sector. Hydro dominance results in high volatility of annual renewable production. The rapid increase of wind and solar capacities in the last few years has added 2 TWhs to the renewable production in 2012. This shift to solar and wind production will smooth fluctuation of annual renewable output. However, renewable generation in Bulgaria is still very much dependent on weather conditions (e.g. precipitation and wind).

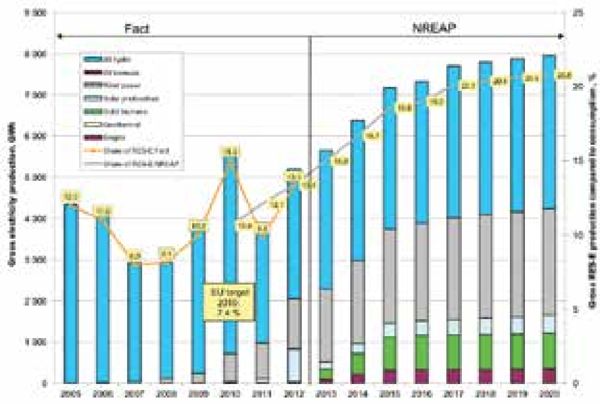

Figure 4.2 Gross renewable electricity production in Bulgaria, GWh

Source: NREAP Bulgaria, REKK RES-E Survey 2013

Note: RES-E share figures up to 2010 are based on the Bulgarian progress Report[31] (2011), 2011 and 2012 figures are based on REKK calculation

RES-E market design

Since 2007 RES-E generation has been subsidized by feed-in tariffs (FIT). The regulation is based on the renewable law beginning in 2007 that created an appealing framework for investors. Promotion of renewables included mandatory purchase of RES electricity at preferential prices, priority connection of RES power to the grid, long-term Power Purchase Agreements (PPAs with duration of 15-25 years) and limited annual FIT adjustments. Due to the attractive regulatory framework and lucrative feed-in tariffs investors showed a massive interest in wind and solar energy developments: by 2010 the proposed investment capacity has reached the total installed capacity of Bulgaria.

This situation resulted in the approval of the new Law on Energy from Renewable Sources (LERS) in May 2011, aiming to curb soaring renewable investment and development. The LERS reduced the term of guaranteed payment (from 15 to 12 years for wind projects and from 25 to 20 years for solar projects), removed the cap on annual FIT adjustments, required investors to pay an upfront connection fee (of 25 EUR/kW) as a guarantee for completion of projects, and tariff setting was conditioned on the completion of projects.

In spite of these measures, renewable investors remained interested: in the first half of 2012 a huge amount of PV capacity has been commissioned, prompting the regulator to intervene. In July 2012 the State Energy and Water Regulatory Commission (SEWRC) announced sharp cuts to the feed-in tariffs (22% for wind producers and around 50% for solar power plants), and froze the award of grid capacity (for the next 12 months) for all renewable projects. In September 2012 the regulator introduced interim grid access fees for renewable energy producers, which were effectively retrospective cuts in feed-in tariffs; by 10% for wind and hydro producers and 5-39% for solar producers depending on the date of commissioning of the project. Currently there is a full ban on renewable electricity investments to prevent further budget increases. Bulgaria is on track to reach the RES-E 2020 target that is 20.8% of gross final electricity consumption. In 2012 13.3% of all generation came from RES-E production, providing a justification for the ban: now only those projects that were permitted before 2013 can enter the FIT regime.

[31] Bulgarian Ministry of Economy, Energy and Tourism: Report on the Achievement of the national indicative targets for consumption of electricity produced from renewable energy sources in 2010, Sofia, March 2011

The main pillars of the present renewable regulation are the following:

- Feed-in Tariffs: renewable tariffs are set annually by the State Energy and Water Regulatory Commission (SEWRC) according to a price formula fixed by law.
- Mandatory purchase: the public provider (NEK) and the public suppliers are obliged to sign long-term contracts with renewable producers (12 years for wind producers, 15 years for small hydro power plants, 20 years for solar, geothermal and biomass plants).
- Network connection: projects below 5 MW of installed capacity apply to the distribution grid operators for connection; above 5 MW the TSO is the contracting party for connection. Network companies are obliged to complete network connections by the declared start-up dates of producers and must allocate money for RES-linked network development in their annual investment plans. It is problematic, however that no meaningful regulatory sanctions are in place when the DSOs/TSO fail to fulfil their obligation for priority connection.

Estimated RES-E potential

The medium term wind potential is estimated to be at around 3 GW[32] and the government is seeking to reach around 1.4 GW by 2020. Numerous wind projects that have final or guaranteed preliminary contracts provide an opportunity for those investors who prefer ready-to-build projects that contain requisite permits, including the final grid connection contract.

Bulgaria is relatively well positioned to take advantage of solar resources; annual mean irradiation is above 1 500 kWh/m^2, with conditions in the strongest resource areas (situated in the Southern part of the country) comparable to those in Northern Spain. The technical solar potential is estimated to be at around 3 GW.[33] A number of large solar PV projects have been proposed, especially in the South, but the government's preference is clearly to shift the development of photovoltaic parks to industrial areas, rooftop and facade wall installations, and reduced sized projects.

Bulgaria is an agricultural country with a large biomass potential, but limited growth is planned for biomass based electricity generating capacity, with around 150 MW of new capacity by 2020.[34] Growth is much more pronounced in the heating sector (about 350 MW of thermal capacity). There is a clear preference for biomass and biogas projects on behalf of the government (increased feed-in tariffs), but until now only few projects have been realised.

Bulgaria's huge hydro potential is already exploited to a large extent. Taking into account the pressing modernization needs of operating hydro power plants, it is not realistic to expect a significant capacity increase. In the NREAP a modest development of around 300 MW of hydro capacity is envisaged between 2010 and 2020. The Bulgarian FIT for small hydro installations (with capacity below 5 MW) is highly preferential.

[32] EBRD (2010) Country Profile Bulgaria, http://www.ebrd.com/downloads/legal/irc/assessment.pdf
[33] Eclareon (2011) RES-Integration Country Report: Bulgaria, http://www.eclareon.eu/sites/default/files/bulgaria_-_res_integration_national_study_nreap.pdf
[34] NREAP Bulgaria

4.2 RES-E barriers

Licensing and certification

The average number of authorities involved directly or indirectly in the RES-E licensing/permitting procedure is 5-15. The average lead time for the overall RES-E authorization procedure including grid connection is 9-24 months. The licensing procedure is differentiated by installed capacity, for rooftop PVs of several kW the procedure lasts for less than 9 months and for installed capacity over 5 MW the lead time of the licensing procedure is over 1 year.[35]

For RES-E production Bulgaria has a certification of origin scheme in place. The Sustainable Energy Development Agency to the Ministry of Economy and Energy[36] is responsible for issuing the certificate.

Grid integration

The main barriers in the connection phase are the following: a) the TSO is reluctant to connect new renewable energy plants to the system, b) there are serious capacity limits for renewable energy, c) developers have to pay an advance payment for connection.

From 2012 the new law introduced a quota system for the grid access of new renewable plants. Previously no cap was set on the amount of renewables to get grid connection. The regulator defines the quotas by region and by voltage level based on the estimated network capacity for a one-year period and this can be allocated to producers of renewable energy. The quota is based on the development plans of DSOs and TSOs, where they estimate the renewable capacity that can be connected to the system. When defining the quotas the regulator considers whether it is in line with the NREAP target. The first quota setting took place in the middle of 2012.

The renewable law guarantees preferential connection of renewable generation to the grid. However, due to the unexpected amount of proposed renewable projects a new element was introduced in the application process. Presently for grid connection application a bank guarantee is required in order to filter out speculative or less serious projects. The process of connection licensing and the operation of the guarantee is described below:

As a first step project developers apply to the DSO for connection right. As a new rule a bank guarantee (advance payment) for participation in the procedure must be deposited. The sum is deposited in favour of the operator of the respective electricity grid to which the plant will be connected. The DSO distributes capacities on a first come first served basis.

If the project is not rejected, then the bank guarantee will become part of the connection fee, in the form of an advance payment to the grid operator once the preliminary contract has been concluded: BGN 50 000 (approx. EUR 25 000) for each megawatt (MW) of installed capacity of the future energy project when the installed capacity is higher than 5 MW, and BGN 25 000 (approx. EUR 12 500) for each megawatt (MW) when the installed capacity is less than or equal to 5 MW. The preliminary contract is valid for 1 year. A grid connection agreement can last for a maximum of 2 years. These deadlines were set to ensure that investments will be realised in time.

The cost sharing rules of direct connection is the same as for conventional plants: the generator pays 100% of the connection cost to the nearest grid point. The system development cost behind this point is paid by the TSO/DSO 100%.

[35] REKK RES-E Survey 2013
[36] http://www.seea.government.bg/index.php?lang=en

The law encourages renewables with guaranteed access to the grid, preferential dispatching of electricity, and guaranteeing the construction of necessary infrastructure. According to the law, the renewable plants can be cut off for a maximum duration of 48 hours (per occasion) in case of "imminent and direct danger to life and health of individuals or the integrity of the grid and power plants". Preferential dispatching and ensuring grid development are debated by investors, as generation of wind turbines were often curtailed by the TSO (by 20-50%, in order to ensure network stability) prior to a major HV-line (High-voltage) replacement project. Further substantial investments into the transmission grid have been announced for 2013.

For RES-E no scheduling is required except for large hydro. Wind, solar and small run-of the river hydro do not pay penalty. Conventional plants do scheduling for themselves, and they also pay balancing penalty in case of deviation from plan (at the end of 2010 27.89 BNG/MWh (14.25 EUR/MWh) upwards, 186.65 BGN/MWh (95.43 EUR/MWh) downward). There is an intraday market to trade imbalances after gate closure and before real time. The TSO is responsible for forecasting renewable production and they can only reduce RES-E only for preserving system security. However, in May 2012 the regulator revived a proposal from 2010 to create a special Renewables Balancing Group, involving green producers in balancing obligations.

4.3 Support scheme for RES-E

RES-E utilization target

The RES-E indicative target for 2020 is 20.8% (% of gross final electricity consumption) according to the National Renewable Energy Action Plan (NREAP).[37] The majority of RES-E production in 2020 (7 600 GWh) will be based on hydro and solar, the rest coming from wind and biomass. The 2012 calculated share was 13.3%. However, several projects are in the process of implementation. According to the Bulgarian authorities, the renewable sector is on track to reach the 2020 target; hence, a cap was set: only those projects that received permits before 2013 can enter the system. This position might however change in the future if the fulfilment of the RES-E target is in jeopardy.

Support scheme design

Bulgaria has a rather sophisticated feed-in tariff system, with 30 different prices for different RES-types. Tariffs and RES types usually differ by technology and size. Since 2011 the regulator (SEWRC) calculates the FIT directly on the basis of a target ROI (Return on Investment) assuming average capital costs, operating costs, and energy resource. In June 2012 SEWRC announced severe cuts in PV feed-in tariffs, resulting in 20-50% price reduction.

Rate of support (market premium manifested in FIT or certificate price)

Feed-in -tariffs are published on the website of the State Energy and Water Regulatory Commission.[38] Table 4.1 indicates the FITs for some selected technologies (in EURcent/kWh). The FIT varies according to the size of the facility. For the exact rate in the local currency see the appendix.

[37] The National Renewable Energy Action Plan: http://www.eneffect.bg/ee-infocenters/Legislation/1-Actual%2006%20Feb%202013/REAP-Sept%202012.pdf
[38] http://www.dker.bg/files/DOWNLOAD/res-c-19-28062013.pdf

Technology	Specification (FIT/FIP)	Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	18.10
PV 30 kW rooftop	FIT	14.53
PV 1 MW ground mounted	FIT	9.01
Biogas (average)	FIT	20.50
Biomass (average)	FIT	9.10
Wind	FIT	6.26
Hydro (average)	FIT	10.00
Geothermal	FIT	

Table 4.1 Support to specific technologies in Bulgaria, EURcent/kWh

** 1 Euro=1.95583 BGN*

Annual support budget

The budget for FIT support was originally financed by the "green energy element" of the final customer price. In 2010 this element amounted to about 2-3% of the average final price; but this percentage is increasing vigorously in line with renewable electricity production. According to the Minister of Economy around 8% of the 13% increase of end user electricity prices in July 2013 was due to new solar capacities commissioned in the first half of 2012.[39] From July 2013 the renewable costs are partly financed at the expense of the income from the sale of EUA. However, the main part of it is paid by all customers in their electricity bills through the Public Service Obligations (PSOs).

Despite recent interventions into the support system there are still mechanisms in place to guarantee stability for the renewable projects in Bulgaria:

- Until June of 2011 the year-on-year reduction of the tariff was limited: annual cuts of the supplemental element, which amounted to 80% of the feed-in tariff, was not allowed to exceed 5%. This regulation made feed-in tariffs rather predictable. This still applies for old investment projects, however these projects were targeted by the very high connection tariffs (see above).
- Actual feed-in tariffs for new entrants are calculated along a formula that is pre-defined for several (10 to 20) years. Revisions occur annually: mainly decrease of feed-in-tariffs for PV and wind (for new entrants); the feed-in tariffs for electricity from biofuels are revised on the basis of raw material prices.

There is no official data available on the annual support budget. In public discussions for 2013 EUR 250 million is mentioned.[40]

The presented data are again estimates based on in-house calculations with serious simplifications due to a lack of detailed data.[41]

[39] Source: Platts Energy in East Europe, Issue 244, July 13, 2012
[40] REKK RES-E Survey 2013
[41] There is only yearly renewable electricity production data available (no monthly data), while tariffs are valid from July to June next year. There is no data for electricity production reported by capacity size while tariffs depend on capacity.

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2008	37.68	18.52	19.16	649	29.52
2009	54.37	20.89	33.48	846	39.57
2010	111.97	39.57	72.40	1496	48.40
2011	151.21	46.58	104.63	1758	59.52
2012	312.87	82.47	230.40	2898	79.50

Table 4.2 Cost structure of RES support in Bulgaria, mEUR

** The market value is defined by the State Electricity and Water Regulatory Commission as an average market price at the regulated market, and is as follows:*

Year	2012	2011	2010	2009	2008
Average market price of generation mix at the regulated market (excluding must run and long term PPA plants) Euro/MWh	28.70	26.50	26.45	24.70	28.53

4.4 Cross-border cooperation

Non RES-E (export/import capacities, traded electricity)

Bulgaria has sufficient electricity interconnections with its neighbours, and with its huge excess capacities, the country is the powerhouse of the region. In 2012 the net electricity export was above 8 TWh, reaching 17% of net electricity production. However, internal congestion and inefficient allocation of existing capacities, as well as the lack of an efficient plan for the upgrade of interconnection capacities are perceived as a barrier by several market players.

RES-E

Cross-border cooperation is only of secondary priority after meeting the national RES-E target. Although potential is high, and Bulgaria is on the right track to meet the RES-E target, the political support for any further RES integration is lacking. Bulgaria does not seem to have initiatives for cross-border cooperation involving RES-E development.

4.5 Appendix

Feed-in tariffs (based on Art. 32 of the Renewable Energy Sources Act (SG No. 35 of May 3, 2011), VAT excluded, are published on the website of the State Energy and Water Regulatory Commission:[42]

The State Energy and Water Regulatory Commission sets preferential purchase prices from 1 July 2013 for electricity produced by renewable sources and by hydroelectric plants with installed capacity up-to 10 MW, VAT excluded, as follows:

Renewable plant type	Installed capacity	Preferential price, BGN/MWh
1. Micro hydro power plants (HPP)	< 200 kW	197.34
2. Low-head HPP, derivation HPP, operating storage HPP and derivation HPP with annual storage reservoir with net head up-to 30 m	> 200 kW - ≤ 10000 kW	193.38
3. Low head run of river HPP, head < 15 m, no derivation canal	> 200 kW - ≤ 10000 kW	242.30
4. Medium head derivation HPP, operating storage and derivation HPP with annual storage and net head 30 - 100 m	> 200 kW - ≤ 10000 kW	162.71
5. High head derivation HPP, operating storage and derivation HPP with annual storage with net head > 100 m	> 200 kW - ≤ 10000 kW	156.04
6. Tunnel derivations with upper annual storage reservoir	≤ 10000 kW	229.35
7. Micro HPP with pumps	-	98.15
8. Wind farms (WF)	≤ 30 kW	175.86
9. WF	≤ 200 kW	162.33
10. WF	≤ 1 MW	151.39
11. WF	> 1 MW	122.50
12. WF, squirrel cage induction generator	-	105.16
13. Photovoltaic (PV) on roofs and facades in urban areas	≤ 5 kW	353.97
14. PV on roofs and facades in urban areas	≤ 30 kW	284.18
15. PV on roofs and facades in urban areas	> 30 kW - ≤ 200 kW	211.40
16. PV on roofs and facades in urban areas	> 200 kW - ≤ 1000 kW	196.58
17. PV	≤ 30 kW	195.44
18. PV	> 30 kW - ≤ 200 kW	191.13
19. PV	> 200 kW - ≤ 10000 kW	176.29
20. PV	> 10000 kW	160.20
21. Thermal power plants (TPP) on indirect energy use of household waste	≤ 150 kW	225.27
22. TPP on indirect energy use of household waste	> 150 kW - ≤ 500 kW	213.90
23. TPP on indirect energy use of household waste	> 500 kW - ≤ 5 MW	206.32
24. TPP on indirect energy use of sewerage waste	≤ 150 kW	125.94
25. TPP on indirect energy use of sewerage waste	> 150 kW - ≤ 1 MW	105.15
26. TPP on indirect energy use of household sewerage waste	> 1 MW - ≤ 5 MW	89.16

[42] There is only yearly renewable electricity production data available (no monthly data), while tariffs are valid from July to June next year. There is no data for electricity production reported by capacity size while tariffs depend on capacity.

27. TPP on direct biomass combustion of wood waste, forest clearing etc.	≤ 5 MW	249.66
28. TPP on direct biomass combustion of wood waste, forest clearing etc. with combined electricity and heat production	≤ 5 MW	277.71
29. TPP on direct biomass combustion of wood waste, forest clearing etc.	> 5 MW	221.71
30. TPP on direct biomass combustion of agricultural waste	≤ 5 MW	176.96
31. TPP on direct biomass combustion of energy cultures	≤ 5 MW	164.48
32. TPP on indirect use of biomass from plant and animal waste	≤ 500 kW	453.12
33. TPP on indirect use of biomass from plant and animal waste	> 500 kW - ≤ 1.5 MW	434.13
34. TPP on indirect use of biomass from plant and animal waste	> 1.5 MW - ≤ 5 MW	387.53
35. TPP on indirect use of biomass from plant and animal waste with combined heat and electricity	> 500 kW - ≤ 1.5 MW	447.43
36. TPP on thermal gasification of forest waste, without combined production	≤ 5 MW	349.32
37. TPP on thermal gasification of forest waste, with combined production	≤ 5 MW	387.04
38. TPP on thermal gasification of forest waste, without combined production	> 5 MW	337.44
39. TPP on thermal gasification of forest waste, with combined production	> 5 MW	373.76

5 RES-E COUNTRY PROFILE - CROATIA

5.1 General description of the RES-E sector

Renewable energy – including large hydro power plants – plays an important role in Croatian electricity supply. Hydro power plants make up more than half of installed capacity, and depending on weather conditions had more or less the same share in total generated electric power over the last 5 years. Other renewable technologies are very minimal, meaning that the remaining electricity production is mostly from fossil fuelled power plants.

The most promising trend in installed capacity is in wind power. In 2012 the share of non-hydro renewable energy production in total electricity generation amounted to 4%, most of which (3.32%) was wind.[43] On Figure 5.1 we can see the growth of installed renewable capacities during 2008-2012. Not only wind, but the first "biofuelled" (biogas (7.1 MW) and biomass (6.7 MW)) and solar power plants (3.9 MW) were connected to the grid.

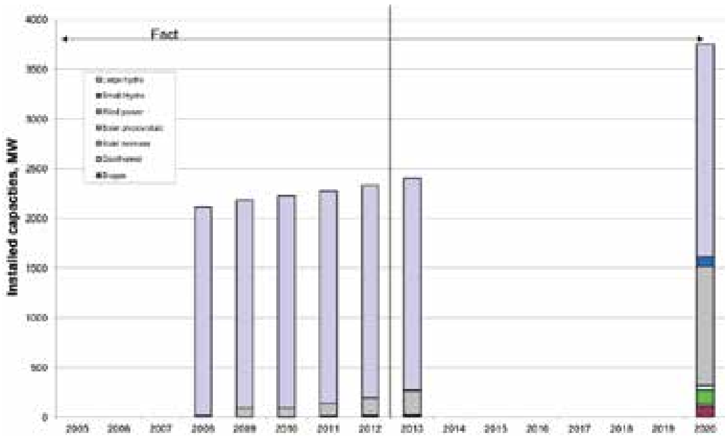

Figure 5.1 Net renewable electricity generation capacity in Croatia, MW

Source: REKK RES-E Survey 2013, compared with ENTSO-E data, and data of Croatian Professional Association for Solar Energy[44]

[43] REKK RES-E Survey 2013 and ENTSO-E

[44] The figure does not involve the data of the Croatian NREAP, because it was adopted by the government in late October, and is not yet available. http://www.eufores.org/fileadmin/eufores/Projects/Keep_on_track/Ljubomir_Majdandzic_Workshop_in_Croatia_11072013.pdf

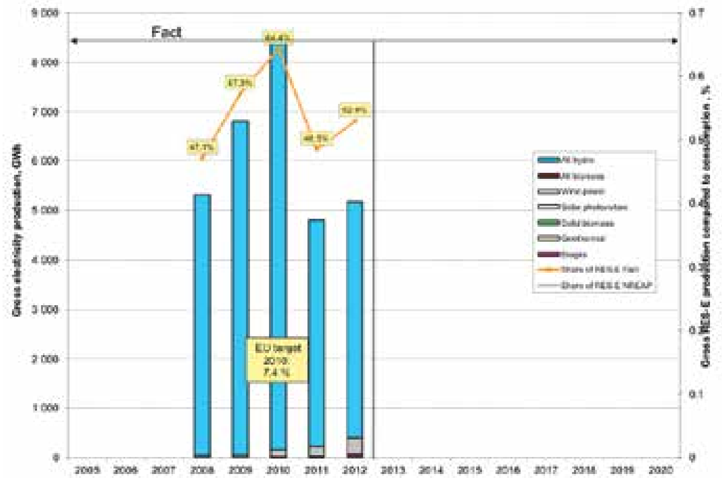

Figure 5.2 Gross renewable electricity production in Croatia, GWh

Source: REKK RES-E Survey 2013, compared with entso-e data[45]

The latest potential estimation was conducted by the Croatian government in 1997 through five national energy programs: BIOEN (biomass and waste), SUNEN (solar energy), ENWIND (wind energy), MAHE (small hydro) and GEOEN (geothermal energy). Most of the above mentioned 2020 targets are in line with these estimations. As regards biogas a report from 2009 published by Big East[46] estimated the volume of agricultural feedstock, the usual source of biogas. According to the study, 1% of yearly electricity production (around 100 GWh) can be produced from biogas.[47] The already realized potential from geothermal energy is 47.9 MW in the case of electricity and 839 MW of thermal energy. The technical potential of small hydro plants is 177 MW, but taking into account commercial viability and environmental issues probably only 100 MW will be available. Wind potential estimations did not cover the whole country, 400 MW of possible capacity could be installed in the examined 29 locations with around 800 GWh/year production. Connecting intermittent wind generation to the grid has not affected the amount of system reserves so far, so this 400 MW may be considered the technical limit. Due to high PV installation costs at the end of the '90s in the above mentioned estimations no potential is given for solar energy. The Croatian Professional Association for Solar Energy argues, that the 45 MW PV target for 2020 is too low, and it is a consequence of foregone price revisions.

Renewable generators are guaranteed grid access, enjoy a priority in dispatching, and are not required to prepare production schedules (except for wind power plants above 5 MW); only the TSO forecasts generation for its own purposes. In case of conventional electricity producers plant operators are obliged to make schedules, and though deviation is calculated (as net of total deviation within the balancing group) no penalty has to be paid.[48]

[45] The figure does not include nuclear production, although the Krško power plant is jointly owned with Slovenia and the generation is split among the countries. The power plant's output is included in the Slovenian generation data.
[46] http://www.big-east.eu/downloads/IR-reports/ANNEX%202-10_WP2_D2.2_Summary-Croatia-EN.pdf
[47] Provided that feedstock includes energy crops, food processing industry and kitchen waste, expired foodstuff, and slaughterhouse waste in the amount of around 2 PJ/year (555 GWh/year) as a source for energy production from biogas.
[48] REKK RES-E Survey 2013

5.2 RES-E barriers

A few barriers have already been mentioned in the previous section, such as the lack of secondary reserves for wind power plants. Another important barrier is that the grid operator is not obliged to expand the grid in order to create the possibility of connection for further renewable power plants. Further, RES plants are not given priority at grid connections[49] and they pay the same connection charge as conventional generators. The cost allocation method can slow down the installation process of renewable power plants because both the cost of direct connection and the required system development are borne by the generator, which makes the connection quite expensive.

The licensing and certification conditions are not bad though, with the average lead-time for the overall RES-E authorization process between 9 and 24 months including grid connection. However, there are variations: for example in the case of building-integrated (rooftop) PVs there is a simplified procedure that normally only takes 1 month, while wind power plants have a special procedure that can take 24 months or more.[50]

5.3 Support scheme for RES-E[51]

Renewable producers may receive preferential loans from two sources. One of them is a loan given by the 100% state-owned Croatian Bank for Reconstruction and Development (HBOR) in cooperation with the Environmental Protection Fund and some commercial banks whereby all costs are borne by HBOR and only projects focused on environmental protection can access the low interest rate (around 4%) loan. The minimum loan amounts to HRK 100 000 (around EUR 13 000), and there is no upper limit, although the amount depends on the specific investment program and the creditworthiness of the borrowers.

The other potential source is through the Environmental Fund Loan. This is an interest-free loan (the total budget in 2013 is 10 000 000 HRK = 1 300 000 EUR[52]) offered by the Fund for Environmental Protection and Energy Efficiency intended to promote renewable energy sources. It is financed not only by the national budget but through voluntary donations as well.

Besides preferential loans, a feed-in tariff is in force. Croatia applies a fairly detailed system, in which all renewable technologies (wind, solar, geothermal, biogas, biomass and hydro power) are eligible for support, but with different rules and restrictions. The tariff is not only differentiated along energy source and plant capacity, but the share of domestic/non-domestic components of the investment is also considered.

Applying for the tariff is not complicated: qualified producers have to sign a contract with the Croatian Energy Market Operator (HROTE), and to file a formal request to the Croatian Energy Regulatory Agency (HERA). Contracts have a duration of 14 years, and prices are revised yearly or biannually (without an exact given formula). Above the feed-in tariff all plant operators are eligible for a maximum +15% extra bonus based on contribution of the plant to the whole economy and society (including the local community, employment, economic growth, development of public services and its general influence on the improvement of the quality of life).

Table 5.1 shows the different feed-in tariffs for some selected technologies based on the tariff table presented in the Appendix to this chapter.

[49] res-legal.eu
[50] REKK RES-E Survey 2013
[51] REKK RES-E Survey 2013
[52] http://narodne-novine.nn.hr/clanci/sluzbeni/2013_06_67_1339.html

	Support (in Eurocent/kWh)
PV 5 kW (residential) rooftop	34.18
PV 30 kW rooftop	29.03
PV <1 MW ground mounted	14.30
Biogas* (1 MW)	15.60
Biomass* (5-10 MW)	13.65
Wind* (>1 MW)	9.20
Hydro (1-10 MW, 5-15 GWh/a)	9.10
Geothermal	15.60

Table 5.1 Support for specific technologies in Croatia, EURcent/kWh

The support scheme is financed through a specific Public Service Obligation (similar to non-tax levies) paid by the consumers in their electricity bills, which is currently HRK 0.005 (EURcent 0.065) per kWh. The feed-in tariffs are determined with cost plus (or rate of return) mechanism and, as it was mentioned above, a price revision is made in every 1 or 2 years. This can help to guarantee the sustainability of the support scheme.

Another method for this is setting capacity caps. For wind power plants the capacity limit is 400 MW, while for solar electricity 15 MW is the cap for building-integrated PVs, and another 10 MW is eligible for other PV technologies. The exact quantified amount of support is shown in Table 5.2:

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2008	3.63	2.51	1.12	38	29.47
2009	4.96	3.56	1.40	47	29.79
2010	9.63	4.46	5.17	84	61.55
2011	24.49	13.08	11.41	225	50.71
2012	44.18	24.40	19.78	381	51.92

Table 5.2 Cost structure of RES-E support in Croatia, mEUR

Source: REKK RES-E Survey 2013

5.4 Cross-border cooperation

In Croatia the organization responsible for cross-border capacity allocation is the TSO HEP-OPS. It organizes yearly, monthly, daily and intraday auctions for allocating cross-border capacity to Bosnia and Herzegovina and yearly, monthly and daily auctions to allocate cross-border capacity to Serbia. Slovenian TSO ELES is responsible for the intraday allocation in both directions between Slovenia and Croatia, while CEE CAO (Central Allocation Office) carries out the yearly, monthly and daily auctions between Hungary, Slovenia and Croatia.[53]

According to the Croatian regulator RES-E cross-border cooperation is only of secondary priority after

[53] http://www.hep.hr/ops/en/services/ncapacities.aspx

meeting the national targets.

5.5 Appendix

Type	Capacity	Tariff (HRK/kWh)	Tariff (EURcent /kWh)
wind	Up to 1 MW	0.72	9.30
	Above 1 MW	0.71	9.20
solar*	non-ground-mounted up to 1000 kW	1.10	14.30
	ground-mounted up to 10 kW	2.00	26.03
geothermal	no restrictions	1.20	15.60
biogas	from agricultural waste		
	Up to 300 kW	1.42	18.46
	300 kW < and < 2000 kW	1.20	15.60
	2 MW< and < 5 MW	1.12	14.50
	landfill biogas		
	The price is based on the average electricity price		
hydro	Up to 1 MW and up to 500 MWh/year	1.20	15.60
	Up to 1 MW and 500-1000 MWh/year	0.80	10.40
	Up to 1 MW and more than 1000 MWh/year	0.60	7.80
	Above 1 MW and up to 5000 MWh/year	1.00	13.00
	Above 1 MW and 5000-15000 MWh/year	0.70	9.10
	Above 1 MW and more than 15000 MWh/year	0.57	7.41
biomass	solid biomass		
	Up to 300 kW	1.30	16.90
	300 kW < and < 2000 kW	1.20	15.60
	2 MW < and < 5 MW	1.15	14.95
	5 MW < and < 10 MW	1.05	13.65
	Above 10 MW	0.90	11.70
	liquid biomass		
	The price is based on the average electricity price		

Table 5.3 Support for specific renewable technologies in Croatia, EURcent/kWh

Source: res-legal.eu, the exchange rate we used was 0.13 HRK/EUR

** For PV plants with capacity above 1 MW, the feed-in tariff is equal to the average Croatian electricity production costs. In the case of solar power plants there is a basic tariff for all non-ground-mounted installations, and there are two coefficients with which the tariff is multiplied: k1 for building integrated (roof-top) photovoltaic installations, and k2 for plants that can be used to generate heat or hot water. Table 5.4 shows these coefficients according to installed capacity:*

non-ground-mounted PV	building-integrated-coeff. (k1)	heat/hot water coeff. (k2)
Up to 10 kW	2.39	1.2
10 kW < and < 30 kW	2.03	1.1
30 kW < and < 300 kW	1.5	1.03
300 kW < and < 1000 kW	1	1

Table 5.4 Specific support for PVs in Croatia

Source: res-legal.eu

6 RES-E COUNTRY PROFILE - CZECH REPUBLIC

6.1 General description of the RES-E sector

Capacity and generation mix

In the Czech Republic renewable power capacities are highly concentrated in hydro and solar technologies, providing 85% of RES-E capacity in 2012. While the level of hydro investments stagnated in 2009-2010, solar investments showed a very dynamic growth pattern before their development was curtailed due to regulatory intervention (see section 6.3 for details). Generation is broadly characterised by a more evenly distributed portfolio: both biogas and solid biofuels contribute with significant shares (15% and 20% respectively) and wind has a 5% share, while geothermal electricity production is absent. The overall growth in capacity and generation is driven by solid and gaseous biomass technology.

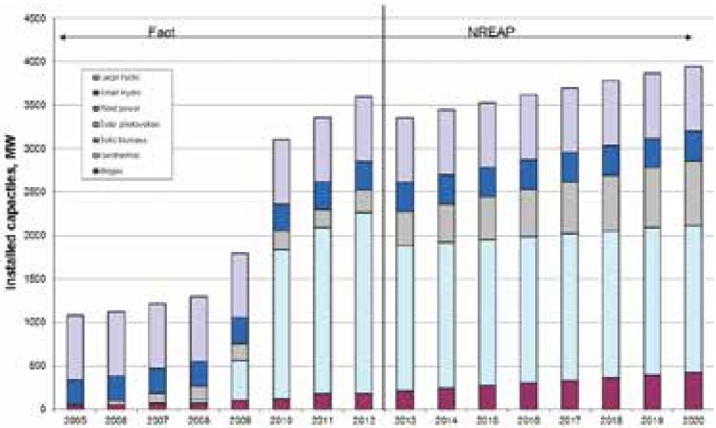

Figure 6.1 Net generation capacity in the Czech Republic, MW

Source: NREAP, ERU statistical database

As Figure 6.1 illustrates, the Czech Republic has already reached a higher level of PV capacity than it was planned in its NREAP for 2012

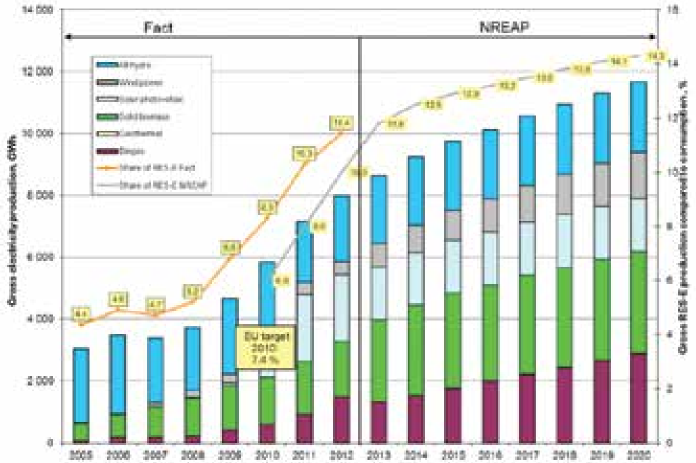

Figure 6.2 Gross renewable electricity production in the Czech Republic, GWh

Source: NREAP, ERU statistical database

As Figure 6.2 indicates, the Czech Republis is on track to reach its 14.3% renewable target for 2020 due to the steep increase in PV capacity in years 2009-2010. In the PV technology segment, 2 GW of capacity was installed within 2 years due to the generous feed-in tariffs offered to developers. However, because of the financial burden this development required, support for PV was abandoned (above 30 kW, see details later). Moving forward, significant growth is only expected in the biomass segment (regarding both biogas and solid biomass technology) and to some extent in wind based generation.

RES-E market design

In the Czech Republic two kinds of RES-E support instruments are in place simultaneously: a feed-in tariff and a "Green Bonus" system. In case of the former, renewable electricity producers sell their electricity to the so called "mandatory buyers" and receive feed-in tariff in exchange. Under the green bonus scheme they sell their electricity directly in the electricity market and are entitled to a fixed premium paid on top of the market price (the "green bonus"). RES-E plants installed before 1 January 2013 can switch back and forth between these two systems annually. According to the new law on the Promotion of Renewable Electricity (Act No. 165/2012) valid from 1 January 2013, operators of newly established installations can choose the FIT system only if the capacity of the plant is below 100 kW (10 MW in case of hydro), all other projects fall under the green bonus system.

The "mandatory buyers" of electricity are responsible for the unscheduled deviations of RES-E producers under the FIT scheme, while under the green bonus scheme the "settlement entity" is responsible for the unscheduled deviations.[54] The settlement entity is responsible for balancing, and is in most cases the market operator itself.

Concerning priority access rules, transmission/distribution grid operators have the right to restrict RES-E production in case the safe operation of the system is jeopardized.

[54] Entities obliged to purchase renewable electricity from producers, appointed by the Ministry of Industry and Trade, are currently three final supplier companies, while the settlement entity in the green bonus system is the OTE, the market operator.

Estimated RES-E potential

The future deployment options for renewable energy/electricity production are often framed with various ”potential” labels such as theoretical, technological, realisable and/or economic. It is therefore difficult to provide consistent estimates at the country level that are a) comparable across countries and b) constitute effective limitation on the 2020 horizon. Concerning wind and solar radiation, the Czech Republic is amongst the countries with lower potential. Consequently, the utilisation rates of the existing plants built on these technologies are amongst the lowest in Europe as the studies in the field indicate.[55] In the case of the Czech Republic the NREAP provides an estimate on the domestic biomass supply which is summarised in Table 6.1 below.

ktoe	2006	2015	2020	2020/2006
Direct supply of wood	975	1223	1405	1.44
Indirect supply of wood	561	1316	1311	2.33
Agricultural by-product	32	286	358	11.1
Biomass from waste	76	113	203	2.67
Biogas	83	n.a.	n.a	-
Sum (without biogas)	1644	2938	3277	1.99

Table 6.1 Estimated biomass supply in the Czech Republic, ktoe

Source: NREAP 2010

As Table 6.1 shows, the Czech NREAP foresees the doubling of domestic biomass supply in the given period. This indicates that there is a potential for further expansion of RES-E biomass, however it cannot be judged according to its ability to increase electricity generation, since it can be used in many other sectors as well (transport, heat and RES-E).

6.2 RES-E barriers

Licensing and certification

According to various assessments the licensing procedure requires significant number of permits. There is no possibility of ”one stop-shopping” with average lead time between 3-12 months, whereas wind technology licensing might require even more time.[56] The number of permits to acquire varies between 5 and 7 but further permits are required with regard to spatial planning when applicable. For smaller installations, total fees are around EUR 8000 but in the case of larger plants the fee and the cost of the feasibility study might reach EUR 50 000-120 000 per installation.[57] The license is issued by the Energy Regulatory Office (ERU), but since August 2011 an authorization process was also introduced in order to ensure compliance with the energy policy of the government. For installations with capacity above 100kW, the authorization is given by the Ministry of Industry and Trade.

Grid integration

In the Czech Republic priority access is given to all RES-E operators but operators have to pay the full cost for connection, estimated to be around EUR 20 000 per installation.[58] In February 2010 CEPS, the

[55] Photovoltaic Geographical Information System, Geographical Assessment of Solar Resource and Performance of Photovoltaic Technology, http://re.jrc.ec.europa.eu/pvgis; EEA (2009): EEA Technical report: Europe's onshore and offshore wind energy potential, 2009/6, http://www.eea.europa.eu/publications/europes-onshore-and-off-shore-wind-energy-potential

[56] Ecorys: Assessment of non-cost barriers to renewable energy growth in EU Member States, 2010, http://ec.europa.eu/energy/renewables/studies/doc/renewables/2010_non_cost_barriers.pdf; Wind energy in the Czech Republic, legal framework vs. praxis, by the Czech Wind Energy Association 2010, http://proceedings.ewea.org/ewec2010/posters/PO.19_EWEC2010presentation.pdf

[57] Ecorys: Non-cost barriers to renewables: Czech Republic, 2010

[58] Eclareon for DG Energy: Integration of electricity from renewables to the electricity grid and to the electricity market, RES-INTEGRATION National report: Czech Republic, 2011, http://www.eclareon.eu/sites/default/files/czech_republic_-_res_integration_national_study_nreap.pdf

transmission system operator, prevented the DSOs from connecting any new PV and wind plants on the grounds that it endangered system reliability. This served as an effective barrier for these technologies until CEPS abolished this limitation at the end of 2011. However, the connection of PV installations above 30 kW is no longer supported in the Czech electricity grid.

6.3 Support scheme for RES-E

RES-E utilization target

As Figure 6.2 indicates, the NREAP sets a 14.3% target for renewable electricity production for 2020. Concerning technology distribution, PV technology already exceeds the planned share of 2020, and consequently regulatory changes excluded PVs from the support scheme in 2011. During the five years between 2008 and 2012, the Czech electricity system accommodated more than 6% additional RES-E generation (from 5.19% to 11.43%). Even though the RES-E penetration levels from 2005 to 2010 stagnated, the country can still achieve its 2020 RES-E target.

Support scheme design

A non-obligatory FIT scheme was introduced in early 2002 to prepare the country for the tasks prescribed by the EU legislation (Directive 2001/77/EC). However before 2004 the Czech RES-E system had been characterised by low RES-E penetration. Act 180/2005 on Renewable Energy Support introduced a mixed system of a feed-in tariff and a green bonus (sometimes called green premium) scheme. In this system (still valid for plants built before the end of 2012) the RES-E operator could choose between the following two parallel regimes:

- The operator could either opt for a FIT connected to an obligatory purchase by the TSO. In this case the FIT was based on a 15 years payback period with inflation adjustments.
- The operator could opt for a green premium that was paid above the market price and then sell its power on the market. Priority grid connection of RES-E by the DSO was also ensured. This option does not have a long term price guarantee.

RES-E operators had the option to decide which system they wanted to participate in each year. Since the new RES-E Promotion Act (in effect from 2013), new installations have been only eligible for green premium. Only smaller installations (under 100 kW and hydro under 10 MW) are still eligible for FIT. Plants built before December 2012 are still regulated and supported under the old regime, but they can choose to switch to the new regime. All technologies, except PV capacities above 30 kW are eligible for support.

Rate of support (market premium manifested in FIT or certificate price)

Tariffs and premiums are set for one year in advance by the energy regulator (ERU), adjusted according to a predetermined methodology which aims to provide a reasonable return to investors in a 15-year time period. The formula also includes a factor connected to the producer price index. Additionally, there is a limit on the possible reduction of the support level: the regulator is not allowed to reduce the FIT/bonus by more than 5% in any year. This regulation aims at defending investors from unexpected cutbacks. However, this 5% limit does not apply to investments with a return period less than 11 years i.e. PV technology. The determined FIT levels also depend on the date of commissioning: plants starting operations in different years are eligible for different tariffs/bonuses. Small hydro production is differentiated according to peak/valley production as well, so the relevant regulatory decision (4/2012 ERU) contains more than a 100 FIT/

FIP levels according to the various specifications/vintages.

Table 6.2 gives the FIT/FIP levels for some selected technologies.

Technology	FIT Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	11.60
PV 30 kW rooftop	9.40
PV 1 MW ground mounted	Not supported
Biogas (up to 550kW capacity)	13.70
Biomass	11.20

Table 6.2 Support for specific technologies in the Czech Republic, EURcent/kWh

Source: RES-legal.eu, REKK RES-E Survey 2013

In addition, the FIT paid for PV producers over 30 kW is taxed. The original 26% tax rate has been reduced to 10% from 2013 for installations that were built in 2010 and this tax rate is maintained during the entire support payment period.

Annual support budget

In 2013, renewable power plants are expected to get subsidies of around EUR 1.7 Bn (CZK 44 Bn), or roughly 1.1% of this year's estimated GDP, paid by consumers and partly by the state budget. This shows the significant impact of the subsidies paid to RES-E production (including supported co-generation) in the Czech economy. In household electricity price composition, RES-E subsidies (including supported cogeneration) amounted to almost 13% in 2012 which would have been even higher (by one third in 2013) without direct government payments to the scheme (financed partly through the tax payments of producers on PV generation). Table 6.3 summarises the cost structure of RES-E for the year 2008-2013.

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2008	269	165	104	2656	39.16
2009	388	233	155	3240	47.90
2010	750	273	477	4325	110.26
2011	1447	254	1193	6169	193.36
2012	1586	276	1310	6811	192.41

Table 6.3 Cost structure of RES support in the Czech Republic, mEUR

Source: REKK RES-E Survey, 2013

Table 6.3 illustrates the steep increase of RES-E support level in years 2010-2013, mainly due to PV capacities installed during the boom of 2009-2010.

[59] http://www.reuters.com/article/2013/08/16/czech-renewables-idUSL6N0GH16A20130816. This number includes the total cost, not only the share of support.
[60] ERU Annual Report 2012, http://www.eru.cz/user_data/files/vyrocni%20zpravy/anglicky/ERU%202012_ENG.pdf

6.4 Cross-border cooperation

Non-RES-E (export/import capacities, traded electricity)

The Czech Republic is one of the biggest exporters in the region, due to the significant level of cheap coal and nuclear generation in its electricity portfolio. Its electricity export totalled 17 GWh in 2012 pewhich is over 20% of its production. In the last five years exports have been increasing and even in 2008, its lowest export level, exports were more than 13% of the total production.

The country is also negatively affected by the German loop-flows generated by the intermittent wind-based RES-E producers. The Czech Republic would like to resolve this problem before engaging in the market coupling process with the West-European Region.

RES-E

According to the NREAP, the Czech Republic does not plan to use the flexibility mechanism on either the seller or the buyer side. It is an interesting case in the sense that the main state owned utility (CEZ) is an active participant in foreign RES-E markets. CEZ is the owner and operator of the biggest wind farm in Romania which operates under the Romanian support scheme.

6.5 Appendix

Technology	FIP support (in EURcent/kWh)	FIT Support (in EURcent /kWh)
PV 5 kW (residential) rooftop	9.4 (CZK 2.44)	11.6 (CZK 2.99)
PV 30 kW rooftop	7.3 (CZK 1.88)	9.4 (CZK 2.43)
PV 1 MW ground mounted	Not supported	Not supported
Biogas	9.6 (CZK 2.49)	13.7 (CZK 3.55) up to 550kW capacity
Biomass	3.9-10.3 (CZK 1.0-2.67)	8.0-14.4 (CZK 2.06-3.73)
Wind	6.1 (CZK 1.57)	8.2 (CZK 2.12)
Hydro (under 10 MW)	8.3-9.2 (CZK 2.15-2.39)	11.4-14.7 (CZK 2.9-3.2)
Geothermal	8.8 (CZK 2.29)	12.7 (CZK 3.29)

Table 6.4 Support for specific technologies in the Czech Republic, EURcent/kWh

Source: RES-legal.eu, REKK RES-E Survey 2013

7 RES-E COUNTRY PROFILE - GERMANY

According to the REN21 Renewables 2013 Global Status Report, Germany ranked first in the world in terms of per capita amount of non-hydro RES-E capacity at the end of year 2012.[61] The rapid development of renewable electricity generation in Germany is attributable to its comprehensive support policy started with the Act on Supplying Energy from Renewables, enacted in 1991, and continued by its successor, the Renewable Energy Sources Act (EEG) that came into force in 2000.[62] The EEG (last time amended in 2012) and its accompanying legislation are aligned with the energy policy approach of the German government, called Energiewende (transition of the energy sector), which aims at progressively transforming the economy into a sustainable system relying basically on renewable energy.

7.1 General description of the RES-E sector

Capacity and generation mix

Figure 7.1 and Figure 7.2 present the evolution of installed capacity and generation related to renewable electricity production.[63] The graphs include both the realized and planned figures, so that we can see how the development plan set out in Germany's NREAP compares to the actual data. First of all we can see that the amount of installed capacity as well as the deployment of renewable energy sources has been growing at an accelerated rate since 1990. Secondly, Germany is presently above the growth path set out in the NREAP, suggesting that there is a good chance to achieve its targets. In 2012 gross electricity production totalled 628.7 TWh, the majority of which (44%) was based on lignite and coal (161.1 TWh and 116.1 TWh, respectively). Power made of renewable sources accounted for 23 percent of total generation (142.4 TWh), followed by nuclear energy (16%) and natural gas (12%).[64] Although Germany set the political target to further improve electricity generation from renewable resources while phasing out nuclear power, instead there is a growing share of lignite and coal in the power mix, mainly at the expense of natural gas. Industry experts attribute this trend to the relatively lower price of coal combined with the stagnation of the EU allowance price and the merit order effect caused by increased RES-E production.[65]

[61] REN 21: Renewables 2013 Global Status Report, p. 21. http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf
[62] Bechberger, Reiche: Renewable Energy Policy in Germany: Pioneering and Exemplary Regulations, Energy for Sustainable Development, Volume 8, issue 1, March, pp. 47-57, http://www.aub.edu.lb/fas/pspa/politics-sports/Documents/germany.pdf
[63] Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), http://www.erneuerbare-energien.de/unser-service/mediathek/downloads/detailansicht/artikel/zeitreihen-zur-entwicklung-der-erneuerbaren-energien-in-deutschland/?tx_ttnews%5BbackPid%5D=223&cHash=bcd312cd2fc8f982ef41d3b-7c5f4bd15
[64] The source of the figures is the Federal Statistical Office of Germany, https://www.destatis.de/EN/FactsFigures/EconomicSectors/Energy/Production/Tables/GrossElectricityProduction.html;jsessionid=E25B313B17A5E57286515A5B13DB7D9B.cae3
[65] Platts analysis: German coal extends dominance in power mix as gas wanes 9 Oct 2013, http://www.platts.com/latest-news/coal/london/analysis-german-coal-extends-dominance-in-power-26352497

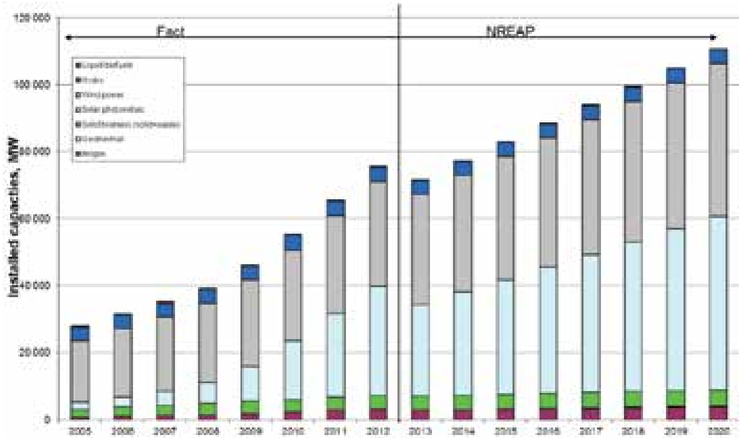

Figure 7.1 Net renewable electricity generation capacity in Germany, MW

Source: BMU and the NREAP of Germany

Share of RES-E in end-use

The majority of RES-E is generated using wind and biomass as a source, with 33.8 and 30.02 percentage shares in total production, respectively. PV installations provided 20.58 percent of RES-E in 2012, followed by hydroelectricity with 15.58 percent. As for installed capacity, PV installations overtook wind turbines with 32 643 MW (42.94 percent) last year. Wind capacity accounts for 41.19 percent of RES-E capacity, followed by biomass plants. Due to the intermittent nature of wind and solar, biomass provides relatively more electricity on a yearly basis per unit of MW. The utilization of geothermal energy for electricity generation purposes is still in its initial stage in Germany with 12 MW installed capacity and 25 GWh power production.

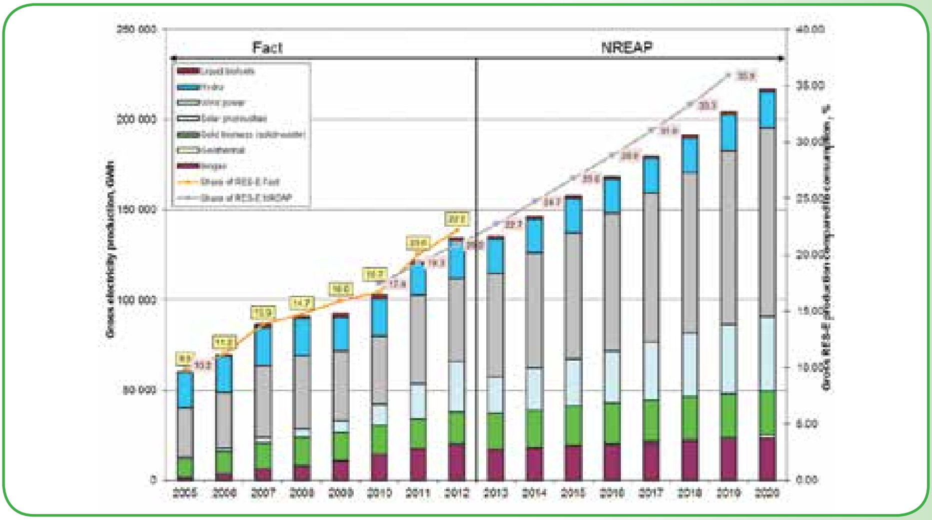

Figure 7.2 Gross renewable electricity production in Germany, GWh

Source: BMU, NREAP

Note: There is a slight discrepancy between the values published by the BMU and our calculations depicted in the figure, because the NREAP (such as our consistent calculation) does not take into account electricity made of sewage, mine and landfill gases.

RES-E market design

In Germany energy contracts connected to physical delivery can be traded on the day-ahead market, either using the trading platform of EPEX Spot or the OTC market. The day-ahead gate closure time is 12 p.m., after which trading can continue on the intraday market. Intraday trading for the next day starts at 3 p.m., and traders can settle hourly as well as 15 minute contracts.[66] In Germany TSOs have the sole responsibility to balance the variable production of renewable plants using the OTC or intraday market and the reserves acquired in the balancing market. The cost of balancing RES-E is met through the socialised transmission tariff. TSOs prepare their own RES-E production forecasts based on meteorological data. RES-E generators commissioned after 30 March 2011 are required to have technical and operational facilities that enable TSOs to reduce their output by remote means in the event of grid overload as a precondition for receiving FIT.[67]

Estimated RES-E potential

The estimated hydroelectricity potential that could be realized in Germany is 40 TWh/year, which is twice as much as generated in 2012. The technical potential of on-shore wind energy is between 175 and 240 TWh as opposed to 46 TWh produced in 2012. Experts estimate that both on-shore and off-shore capacity could still be increased by as much as 70 000 MW. PV potential is estimated to be 150 TWh yearly, utilizing 165 GW capacity, which is five times the capacity installed today. The realizable potential of geothermal electricity is around 90 TWh/year, while generation based on biomass is already nearly at its full potential

[66] Hagemann, Weber: „An Empirical Analysis of Liquidity and its Determinants in the German Intraday Market for Electrcitiy", EWL Working Paper No. 17/13, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2349565

[67] Renewable Energy and Distributed generation: International Case Studies on Technical and Economic Considerations, ICER Report, 21 February 2012, p.45. http://www.icer-regulators.net/portal/pls/portal/docs/26552829.PDF

(almost 50 TWh). The overall RES-E generation potential is somewhere between 500 and 1,000 TWh/year according to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).[68]

7.2 RES-E barriers

Licensing and certification

In Germany RES-E generators have to apply for environmental licences and a building permit from the local authority. Environmental licensing has to be coordinated by the local environmental authority, which is responsible for the issuance of all permits related to the project. The duration of such a licensing process is 3 to 7 months. Small installations (small biomass/biogas units, wind turbines under 50 m, thermal solar installations) do not fall under the obligation of environmental licensing. The time limit for issuing the building permit by the local building authority is 10 weeks, but in practice it takes 4 weeks in most cases.[69] Recently, technical and financial difficulties associated with the expensive and complex subsea grid construction have caused delays in permitting and grid connection that has led to considerable losses for investors. With the amendment of the German Energy Act the financial damage caused by the delayed connection to the grid can be passed on to electricity consumers under special circumstances, providing protection for the TSOs and investors in case of unforeseen circumstances delaying the connection of off-shore wind farms. Furthermore, grid development plans have to be prepared jointly by the maritime agency and the TSOs. The TSO must inform investors about the expected date of grid connection, which becomes binding 30 months before the deadline.[70]

Grid integration

According to the EEG the operator of the RES-E plant has to bear the costs of extending the network from the nearest grid connection point to the installation, as well as the cost of the electricity meter used to record power flow exchange from and to the installation. Renewable plants enjoy priority in purchasing, transmitting and distributing their electricity provided by grid system operators.[71] The modification of the EEG in 2011 introduced an 8 week timeframe for connecting plants to the grid, as well as other measures to improve the information exchange between grid and plant operators. To expedite the expansion of off-shore parks, the above mentioned amendment of the German Energy Law specifies that establishing the grid connection of off-shore wind parks has to happen simultaneously with the construction of the turbines.

7.3 Support scheme for RES-E

RES-E utilization target

Table 7.1 presents the targeted shares of renewable energy sources in electricity supply as specified in the Renewable Energy Sources Act.[72] The target values reflect the aim of the German energy policy to almost fully decarbonise its electricity sector by 2050.

[68] The source of all figures related to RES-E potential: BMU: „Erneuerbare Energien, Innovationen für eine nachhaltige Energiezukunft", October, 2011, pp. 45-46. http://www.bmu.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/ee_innovationen_energiezukunft_bf.pdf
[69] Kaderják P.: Principles of Regulation to Promote the Development of Renewable Energy in the Black See, USAID Working Draft, 2012 April http://www.naruc.org/international/Documents/Principles_Kiev.pdf
[70] Annual Report 2012 of BnetzA and www.germanenergyblog.de/?p=11581
[71] RES-Legal, http://www.res-legal.eu
[72] The English version of Renewable Energy Sources act (EEG) in English can be found at: http://www.erneuerbare-energien.de/fileadmin/Daten_EE/Dokumente__PDFs_/eeg_2013_bf.pdf

Year	2020	2030	2040	2050
% share of RES-E in electricity supply	35%	50%	65%	80%

Table 7.1 RES-E utilization targets in Germany, %

Source: EEG

As Figure 7.2 demonstrated, with the current rate of RES-E development these targets are realistically within reach.

Support scheme design

The EEG mandates priority access for RES-E plants to connect to the grid and entitlement to sell all their electricity to the grid operators who pay feed in tariffs. The duration of FIT payment is 20 years. RES-E investments are also promoted by low interest loan programs.[73] From 2009 the rapid decline in the investment cost of solar PV modules induced policy makers to adjust digression rates more frequently in order to manage the integration of the increased capacity into the system. Since May 2012 monthly digression applied to PV installations, while tariffs are lowered on a yearly basis for all other RES-E types depending on the date of their commissioning. Moreover, PV systems with a capacity between 0.1 and 1 MW are entitled to receive FIT only for the 90% of their generation from 1 January 2014; the rest must be either consumed on-site or sold in the market. Larger PV plants receive FIT only up to the amount generated with a capacity threshold of 10 MW. An overall limit on FIT eligible PV was also set: after 52 GW of installed capacity is reached, owners of newly installed capacities no longer receive feed-in tariff although their priority access to the grid remains intact.

A new instrument called „market premium" was also introduced with the amendment of the EEG in 2012 in order to direct RES-E producers towards a more market-oriented attitude. Plant operators might choose to directly sell their electricity to the market and receive a supplement to their sales income, which is the difference between the FIT and a „reference price". The reference price is calculated as the difference of the average monthly wholesale electricity prices and the „management premium" – a proxy for the transaction costs of participating in the market – declining over time as marketers gain experience.[74] This instrument creates incentive for RES-E producers to optimize their production and marketing strategies in order to maximize their income.[75] It is possible to switch back and forth between the FIT and the market premium system on a monthly basis. Biogas plant operators who participate in the stock market and offer a portion of their installed capacity during periods of peak demand for flexibility purposes can also claim a „flexibility premium" on top of their market premium for a period of 10 years.[76]

Rate of support (market premium manifested in FIT or certificate price)

The FIT system of Germany is differentiated according to the source of energy, plant capacity, plant location and technology. For tariff setting purposes plants located in direct spatial proximity using the same technology and commissioned within a one year period are considered to be one installation, irrespective of their ownership. This rule is applied in order to avoid splitting the generating systems into smaller units to benefit from higher tariffs. Table 7.2 shows the FIT rates valid for a number of plant types commissioned in January 2013. A more detailed list of feed-in-tariff rates is included in the Appendix.

[73] RES-Legal, http://www.res-legal.eu/search-by-country/germany/tools-list/c/germany/s/res-e/t/promotion/sum/136/lpid/135/
[74] Reference prices are published by a common platform of TSOs regularly at http://www.eeg-kwk.net/de/Referenzmarktwerte.htm
[75] German Feed-in-Tariffs: Recent Policy Changes, DB Research, September, 2012 http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000294376/The+German+Feed-in+Tariff%3A+Recent+Policy+Changes.PDF
[76] RES-Legal, http://www.res-legal.eu/search-by-country/germany/single/s/res-e/t/promotion/aid/premium-tariff-ii-flexibility-premium/lastp/135/

Technology	Specification (FIT/FIP)	Support* (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	17.02
PV 30 kW rooftop	FIT	16.28
PV 1 MW ground mounted	FIT	11.78
Biogas (biomass fermentation up to 500 kW)	FIT	15.68
Biomass (5 MW)	FIT	10.97
Wind (onshore, first 5 years of operation)	FIT	8.80
Hydro (5 MW)	FIT	7.07
Geothermal	FIT	25.00

Table 7.2 Support for specific technologies commissioned in January 2013, Germany, EURcent/kWh

**Tariffs are calculated adding up tariff rates applicable for each consecutive capacity interval as specified by the EEG. See Appendix for capacity thresholds.*

Premium tariffs offered to those plants who choose to sell their electricity directly is calculated each month, as it depends on the average monthly stock market price determined ex post. The amount of management premium for wind and solar installations is 0.65 EURcent/kWh, while it is 0.75 EURcent/kWh for plants that can be remote-controlled. Its value also decreases with time as stipulated in the relevant ordinance.[77]

Annual support budget

In Germany the costs of the FIT system are not financed from the state budget, but are almost entirely absorbed by the final consumers of electricity. Grid operators buy electricity from RES-E producers and pay the FIT in return, which then passes the entitlement of the product as well as the payment obligation to transmission operators. TSOs exchange RES-E among themselves according to a federal equalization system, and sell their portion of renewable electricity on the spot market. Utility companies compensate TSOs for their loss (the difference of FIT and the market price), and this cost burden is then passed on to the final consumers.[78] Firms exposed to global market competition and operating in energy-intensive industries are exempted from this „EEG surcharge". Its total amount in 2013 is estimated to be EUR 20.36 billion in total, requiring 5.277 Eurocents/kWh contribution from final consumers, 47 percent more than in 2012.[79] The growing rate of the surcharge initiated debates over alternative methods of financing the energy transition in Germany.[80] Nevertheless, the monthly share of extra cost attributable to the EEG surcharge amounts to only 5% of total energy expenditures and 0.5% of the total disposable income of an average German household.[81]

Table 7.3 includes an estimate for the specific support value per unit of supported electricity. Although these numbers are only an approximation of the official calculations (see note and the link to the official numbers under Table 7.3) the increasing trend is similar to that observable in the value of EEG surcharge over years.

[77] The ordinance can be accessed in German at: http://www.erneuerbare-energien.de/fileadmin/ee-import/files/pdfs/allgemein/application/pdf/entwurf_management-praemienverordnung_bf.pdf
[78] RES-Legal, http://www.res-legal.eu/search-by-country/germany/single/s/res-e/t/promotion/aid/feed-in-tariff-eeg-feed-in-tariff/lastp/135/
[79] EEG surcharge for 2013: 5.277 cents per kilowatt-hour, http://www.50hertz.com/en/file/20121015_PM_EEG-Umlage_EN.pdf
[80] The yearly values and the method of computation for the EEG surcharge are available at: http://www.erneuerbare-energien.de/unser-service/mediathek/downloads/detailansicht/artikel/zeitreihen-zur-entwicklung-der-erneuerbaren-energien-in-deutschland/?tx_ttnews%5BbackPid%5D=223&cHash=bcd312cd2fc8f982ef41d3b-7c5f4bd15
[81] Lecture of Magdolna Prantner on German Support Schemes, ERRA Training course on Renewable electricity regulation, 6.11.2013, Budapest

	Overall payment for RES-E producers,	Market (wholesale) value of production,	Incentive component	Supported quantity	Unit Support
	mEUR	mEUR	mEUR	GWh	EUR/MWh
	(A)	(B)	(C)=(A)-(B)	(D)	(C/D)
2008	9016	4055	4960	71148	69.72
2009	10780	5164	5616	75053	74.83
2010	13182	3462	9720	80699	120.44
2011	16763	4439	12324	91227	135.09
2012	21125	4832	16293	117185	139.04

Table 7.3 Cost structure of RES-E support in Germany, mEUR

Source: BMU[82]

Note: Results in the table differ from the official calculation, because additional surcharge increasing items (e.g. liquidity reserve) are not accounted for.

7.4 Cross-border cooperation

Non RES-E (export/import capacities, traded electricity)

Germany has 4 TSOs and is well connected to the surrounding countries with transmission lines, which are under the process of expansion and reinforcement in order to facilitate the integration of increased RES-E production and avoid unintended cross-border electricity flows.[83] Presently the surplus of wind and solar power generated in sunny or windy periods of the day can overload the transmission networks of neighbouring countries, causing security problems and limiting cross-border capacities available for trading with other countries.[84] The average day-ahead base-load prices for electricity traded on the EPEX SPOT fell from EUR 51.12 in 2011 to EUR 42.60 per MWh in 2012, as a result of increased intermittent renewable electricity supply, having a substantial effect on exports: the country imported 43.8 TWh and exported 66.6 TWh electricity in 2012 leading to a net export surplus of 22.5 TWh in 2012[85] as opposed to the 6.3 TWh surplus in 2011.

RES-E

Currently Germany does not plan to get involved in international cooperation agreements, neither to meet its national RES-E target nor to provide assistance to other countries.[86]

[82] BMU, status of October 2013, http://www.erneuerbare-energien.de/unser-service/mediathek/downloads/detailansicht/artikel/zeitreihen-zur-entwicklung-der-erneuerbaren-energien-in-deutschland/
[83] The German Parliament passed the Act on Accelerating Grid Expansion (NABEG) in 2011. http://energytransition.de/2012/10/act-on-accelerating-grid-expansion/
[84] See http://www.ceps.cz/CZE/Media/Tiskove-zpravy/Documents/German-AustriaMA_Study.pdf
[85] Press release 125 / 2013-04-02 of the German Federal Statistical Office, https://www.destatis.de/EN/PressServices/Press/pr/2013/04/PE13_125_51.html
[86] http://www.reuters.com/article/2013/03/14/europe-renewables-cooperation-idUSL5N0BDDXU20130314

7.5 Appendix: FIT rates valid in Germany for installations commissioned in January 2013

Note: Additional provisions might apply for different specifications related to installations, which we do not itemize here. [87]

Hydropower (§ 23 EEG) determined for the shares of capacity as follows:	EURcent/kWh
For the share of capacity up to 500 kW	12.57
500 kW - 2 MW	8.22
2 - 5 MW	6.24
5 - 10 MW	5.45
10 - 20 MW	5.25
20 - 50 MW	4.16
Over 50 MW	3.37
Yearly degression	*1.00%*
Geothermal (§ 28 EEG)	
Basic tariff	25.00
Increase due to utilisation of petrothermal technology	5.00
Yearly degression	*from 2018 ownwards: 5.00%*
Landfill gas, sewage gas and mine gas	
Landfill gas (§ 24 EEG)	
For the share of capacity up to 500 kW	8.47
500kW to 5 MW	5.80
Sewage gas (§ 25 EEG)	
For the share of capacity up to 500 kW	6.69
500kW to 5 MW	5.80
Mine gas (§ 26 EEG)	
For the share of capacity up to 1 MW	6.74
1 - 5 MW	4.86
Over 5 MW	3.92
Bonuses for landfill and sewage gas	
maximum rated output 700Nm³/hour	2.94
maximum rated output 1,000Nm³/hour	1.96
maximum rated output 1,400Nm³/hour	0.98
Yearly degression	*1.50%*

[87] The sources of data are: EEG, BMU, RES-Legal

Biomass (§ 27 EEG)	EURcent/kWh
For the share of capacity up to 150 kW	14.01
150 - 500 kW	12.05
500 kW - 5 MW	10.78
5 MW - 20 MW	5.88
Biowaste fermentation up to 500 kW	15.68
Biowaste fermentation 500 kW - 20 MW	13.72
Manure biogas upt to 75 kW	24.5
Yearly degression	*2.00%*
Onshore wind (§§ 29, 30 EEG)	
Initial fee (for the first 5 years + extention formula time pursuant to Section 29(2) EEG)	8.8
Base fee	4.8
Small-scale up to 50 kW	8.8
Bonuses:	
System service bonus	0.47
Repowering bonus	0.49
Yearly degression	*0.015*
Offshore wind (§ 31 EEG)	
Basic fees	
Initial fee (first 12 years of operation; extension for remote/deep water installations)	15
Initial tarif in acceleration model	19
Basic tariff	3.5
Yearly degression	*from 2018 ownwards: 7.00%*
Solar Energy (§§ 32, 33 EEG)	
Start of Operations: from 01.01.2013	
§ 32 (2) EEG (Roofs) payments for the shares of capacity in the following ranges:	
up to 10 KW	17.02
10 - 40 kW	16.14
41 kW - 1 MW	14.40
1- 10 MW	11.78
§ 32 (1) EEG - other	
up to 10 MW	11.78
Monthly degression	*1.00% + a flexible degression rate dependent on newly installed capacity*

8 RES-E COUNTRY PROFILE - HUNGARY

8.1 General description of the RES-E sector

Capacity and generation mix

The Hungarian electricity market can be characterised as a mature market with an increasing role in trade with its neighbouring countries. For the last decade gross electricity consumption of Hungary has been fluctuating – in line with the economic growth – at around 40 TWh per year, in 2012 it was 39.95 TWh.[88] In 2012 the total gross electricity generation was 34.41 TWh dominated by the Paks Nuclear Power Plant (NPP) (45.9%) and gas-fired power plants (25.6%). Coal-fired power plants are also an important part of the electricity mix in Hungary (19.84%), while the share of renewable-based power generation was 6.3% in 2012.

The total installed capacity in 2012 was around 10 GW including 777 MW (7.6%) RES-E capacities, in which wind (42%) and solid biomass (41%) play significant roles.[89] The distribution of RES-E capacities and RES-E generation and their projected level according to the NREAP are shown in Figure 8.1 and Figure 8.2.

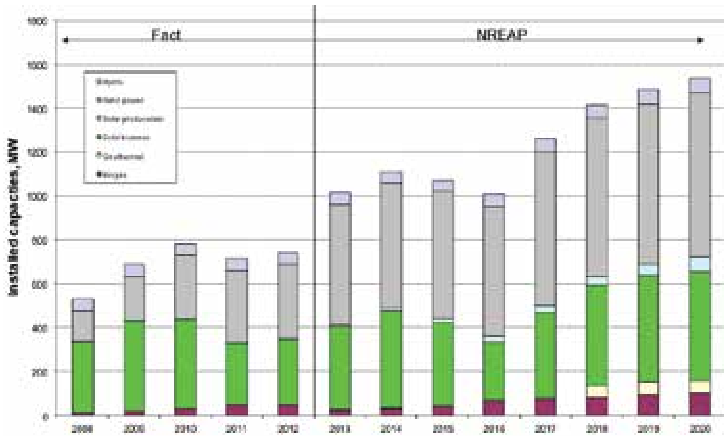

Figure 8.1 Installed RES-E capacities between 2008-2020 in Hungary, MW

Source: REKK RES-E Survey 2013, NREAP

[88] Source: Statistical Data of the Hungarian Power System 2012, MEKH-MAVIR (2013)
[89] Source: Hungarian Energy and Public Utility Regulatory Authority, Annual Report on RES-E and feed-in tariff system (2012)

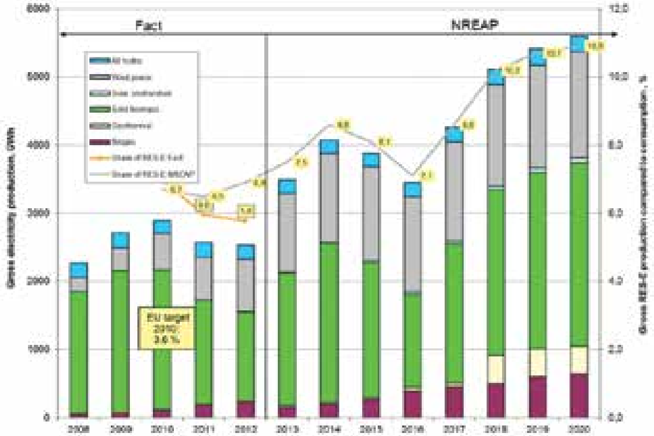

Figure 8.2 Gross renewable electricity production in Hungary, GWh

Source: REKK RES-E Survey, NREAP

Hungary has implemented the RES Directives (2001/77/EC and 2009/28/EC). According to the NREAP, the RES-E indicative target by 2020 is 10.9% of gross final electricity consumption. The majority of RES-E production in 2020 will be based on biomass and wind. The small drop from 2014 to 2016 is due to the anticipated decommissioning of old large biomass-fired power plants. However, according to the NREAP around 300-400 MW new biomass-fired power capacities will be built in the second half of the decade. Although the wind potential in Hungary is estimated to be several thousand MW, according to the present plans, the Hungarian Government does not allow issuing wind licences for more than 740 MW because of system security reasons. This implies that only 410 MW of new wind power generation capacity can be built until the end of the decade. Although Hungary has a relatively good potential for PV generation, large capacities are not expected by the NREAP. While the geological conditions of the country are also favourable for utilizing geothermal energy, with the presently available technology it can economically be used only for heat production and not for electricity generation. The potential for hydro based power generation is very small due to lack of suitable locations. Regarding biogas-based generation, stable growth is expected, with a total installed capacity of 100 MW by 2020. The biogas potential, however, is particularly limited from sewage or in landfill facilities.

RES-E market design

RES-E generators sell their produced electricity at a regulated price (FIT) – set by a government decree – to MAVIR which operates a RES-E balancing group. MAVIR allocates the RES-E generation among the ”KÁT receivers”[90] at a regulated price that is calculated on the basis of the average feed in tariffs and the expenses associated with the settlement of the KÁT balance circle. ”KÁT receivers” get the electricity according to a schedule determined by MAVIR.

Although renewable producers are also responsible for balancing their energy requirements from the system, more favourable rules are granted to them than to conventional producers when there are

[90] ”KÁT receivers” are market participants delivering electricity to final consumers (except universal service providers and other traders) with the quantities which are sold to consumers entitled to universal services at a price not above universal service charges.

deviations from their schedule. RES-E generators are obliged to forecast their production and give a production schedule to the system operator, which can be done in groups with aggregated schedules. The schedules can be modified by 10.00 a.m. on the delivery day for the time period after 12.00 on the day in question without any penalty. RES producers have to pay a 5 HUF (1.6 EURcent) imbalance fee for each kWh that exceeds or falls under a specified threshold. This threshold is ±50% for wind plants, small hydro plants (<5 MW) and PV, ±20% for small biogas power plants (< 5MW) and ±5% for all other installations. So for intermittent capacities a very high deviation range (±50%) is exempted from the penalty payments. Up to the first six months following their connection to the grid, wind and biogas plants (smaller than 5 MW) can also be exempted from their balancing responsibility.[91] In Hungary no intraday market is in operation where imbalances after gate closure can be traded.

8.2 RES-E barriers

Licensing and certification

The RES-E licensing process usually involves several authorities (3-6 main authorities) and requires more than 24 months. Eight specialised authorities can be involved in the environmental protection permission procedure, while the Hungarian Trade Licensing Office (MKEH) may call in as many as 23 specialised authorities and utility providers for the construction permit procedure. The licensing procedure is differentiated by technology and the level of installed capacity.

Currently RES-E certificates do not exist, but a guarantees of origin scheme is expected to operate beginning 1st January 2014 which will be under the authority of the energy regulator.[92]

Grid integration

Grid operators are not allowed to refuse connection of a plant which fulfils the necessary technical and financial requirements even in the case of capacity shortages when additional system reinforcement costs are incurred due to the RES-E development. Even though RES producers should be given priority connection according to the Electricity Law, in practice grid connection applications are handled on a first come first served basis. The development of wind power is restricted systematically in order to prevent grid operation problems. Wind power plants with more than 50 kW installed capacity must be authorized in a tendering procedure developed and implemented by the Energy Office.

Two quota allocation processes were held in Hungary up until 2013. During the first allocation process in 2005 the capacity allocation method was based on a pro-rata allocation which led to a non-transparent secondary market of quotas enabling rent-seeking behaviour. Although the tendering process was more transparent and objective in the case of the 2009 wind tender, political interests conflicted with the goal of the regulator and the process was finally cancelled. Since then the tendering process has been postponed. In the case of other RES-E technologies, a similar situation in which demand highly exceeds the targeted application level has not arisen and queue management processes are thus not in place.

Grid users pay a connection fee to the grid operator once when they are connected to the grid. The grid connection fee consists of the basic tariff for grid connection, a construction tariff for the connection line (a charge for the extension of the grid from the connection point to the plant) and a grid enforcement tariff (a charge for extension works beyond the connection point) if necessary. These fees are not regulated, the relevant decree only requires the application of the common least cost principle, requiring that the connection's place and the cost division are determined by an agreement between the grid and plant operators.

[91] Government Decree 389/2007, MAVIR Commercial Code

[92] Energiaklub (2010): Licensing procedure for renewable energy producing devices in Hungary http://energiaklub.hu/sites/default/files/energia_klub_megujulo__energia_engedelyeztetes_1.pdf

There is a mixed form of shallow and deep cost approach in place in Hungary. In general, plant operators have to pay the basic tariff for grid connection and the line's construction tariff. The cost of grid reinforcement with regard to certain grid connections must be borne by the grid operator to a length of up to 50 m in case of aerial, and 25 m in case of underground power lines for the low voltage grid, and to a length of up to 250 m in case of aerial power line and 125 m in case of underground power line for the medium voltage grid. However, if the necessary grid enforcement operations exceed the aforementioned length, the power plant operator is obliged to pay the grid enforcement tariff. The system operator is responsible for the necessary grid enforcement, although it can ask for a contribution from the power plant developers. They have to agree on connection fees which cannot exceed the cost of the investment needed for the connection. Renewable generators have the possibility to ask for a reduction of the connection fees in the following cases: if at least 70% of the generated electricity comes from renewable sources the plant operator can get a 30% discount from the connection fee; and if at least 90% of the generated electricity comes from renewable sources, the plant operator can get a 50% discount. Power plant developers often do not take advantages of these discounts because DSOs are more active (the connection process usually requires less time) if full connection costs are paid, while these costs can be recovered during the FIT payment period; if the connection costs are higher, the developer receives the FIT for a longer period to compensate for full investment costs.

8.3 Support scheme for RES-E

Since 2003 RES-E generation has been subsidized through feed-in tariffs (FIT) and obligatory purchase. Since the feed-in tariffs are set in a government decree, the Energy Office could determine the level of subsidy by stipulating the plant-by-plant length of the support period and the supported amount based on the calculated payback period. According to the present regulation, feed-in tariffs differ by size of installed capacity, intra-day time period (i.e. peak vs. off-peak hours), the year of commissioning (before or after 1st January 2008) and by technology. For those renewable generators which were commissioned before the 1st January 2008, the feed-in tariff is adjusted with the rate of Hungarian Consumer Price Index of the previous year. For waste-to-energy producers and those renewable producers who were commissioned after the 1st of January 2008, the price also contains an efficiency factor so that the adjustment factor in every year is equal to the value of the consumer price index of the previous year reduced by one percentage point.

Technology	Specification (FIT/FIP)	Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	10.90
PV 30 kW rooftop	FIT	10.90
PV 1 MW ground mounted	FIT	10.90
Biogas (average)	FIT	12.20
Biomass (average)	FIT	9.70
Wind	FIT	12.20
Hydro (average)	FIT	7.60
Geothermal	FIT	

Table 8.1 Support for specific technologies in Hungary, EURcent/kWh

Source: Hungarian Energy Office [93]

Assumed exchange rate: 295 HUF/EUR

[93] http://www.mekh.hu/en/regulated-prices/electricity.html

Annual support budget

Table 8.2 shows the costs of supporting RES-E.

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2008	178.64	105.55	73.09	1770	41.29
2009	201.94	118.92	83.02	2130	38.98
2010	238.34	137.28	101.06	2320	43.56
2011	195.09	104.37	90.72	1840	49.30
2012	195.56	96.54	99.02	1860	53.24

Table 8.2 Cost structure of RES-E support in Hungary, mEUR

Source: REKK RES-E Survey

The Ministry of National Development is preparing a new support scheme and tariff design, called METÁR, which was scheduled to enter into force in the beginning of 2013 but has not been introduced yet.

8.4 Cross-border cooperation

Hungary has been a net importer since the 1950s. In 2012 the net electricity import was 7.97 TWh, supplying 23.15% of the gross electricity consumption that year. Hungary has strong electricity interconnections with its neighbours, the capacity allocations are transparent, and the auction quantities are mostly predictable. Since 11 September 2012 when Hungary joined the market coupling between Slovakia and the Czech Republic, at the Hungarian-Slovakian border day-ahead transmission capacities are sold via implicit auctions. Longer-term capacities are still allocated by the Central Allocation Office (CAO), which allocates all available capacities at the Hungarian-Austrian border via coordinated auctions. At its other borders common auctions with the neighbouring TSOs are also organized with the exception of Ukrainian where unilateral auctions are held. Otherwise, on the Slovakian, Serbian and Romanian border intraday capacity auctions are in function. After a year of operation the launch of market coupling brought positive developments to the Hungarian electricity market: in addition to more efficient utilisation of cross-border capacities, price convergence and a decline in price volatility can be observed, while Hungarian prices approach the Czech, Slovakian and Western-European prices.

No initiative for cross-border cooperation exists with neighbouring countries for the purpose of enhancing RES-E generation. According to Hungarian Energy and the Public Utility Regulatory Authority, cross-border cooperation is only of secondary priority after meeting the national RES-E target.

8.5 Appendix: Feed-in tariffs in Hungary from 1st January 2013 (HUF/kWh)

Power category			From 1st January 2013		
			Peak[2]	Valley[2]	Deep valley[2]
Produced from renewable energy sources	Based on resolution of Hungarian Energy Office (HEO) if it was adopted or the application was received before 01. 01. 2008. [except hydro power station units (PSU) >5 MW] *[GD 4. § (1)]*	Solar, Wind *[GD Suppl. Nr. 1. pt.1. b)]*	33.76	33.76	33.76
		Other than Solar and Wind *[GD Suppl. Nr. 1. pt. 1. a)]*	37.72	33.76	13.78
	Based on resolution of HEO[1] adopted after 01. 01. 2008. (except hydro PSU >5 MW, other PSU > 50 MW) *[GD 4. § (2)-(3), (6)]*	Solar *[GD Suppl. Nr. 1. pt. 2. b)]*	32.18	32.18	32.18
		Produced by PSU of 20 MW or less (except Solar) *[GD Suppl. Nr. 1. pt. 2. a)]*	35.96	32.18	13.13
		Produced by PSU of >20 MW - max. 50 MW (except Wind from 30th Nov. 2008, Solar) *[GD Suppl. Nr. 1. pt. 3. a)]*	28.76	25.75	10.50
		Produced by Wind PSU of >20 MW - max. 50 MW from 30th Nov. 2008 *[GD Suppl. Nr. 1. pt. 3. b)]*	35.96	32.18	13.13
		Produced by PSU comprising used equipment[3] *[GD Suppl. Nr. 1. pt. 4]*	22.36	14.31	14.31
	Produced by hydro PSU > 5 MW, other PSU >50 MW *[GD 4. § (4). Suppl. Nr.1. pt. 4]*		22.36	14.31	14.31
Produced from waste	*[GD 4. § (5). Suppl. Nr.1. pt. 5]*		33.73	23.24	12.13

Source: MEKH [94]

[94] Hungarian Energy Office: http://www.mekh.hu/en/regulated-prices/electricity.html

9 RES-E COUNTRY PROFILE - MOLDOVA

9.1 General description of the RES-E sector

Moldova is highly dependent on energy imports, not only natural gas imports for electricity generation but also electricity. Local production relies heavily on the gas/oil fired plant Kuchurgan (2520 MW), that is located in the Moldovan region of Transnistria and is owned by a Russian company INTER RAO UES. There are also several gas-fired CHP plants with a total installed capacity of 380 MW.[95]

The renewable energy market in Moldova is quite young and limited, with total installed RES-E capacity in 2012 only 17 MW. Hydro plants have a total capacity of 16 MW, and a little bit of solar (0.095 MW) and biogas (0.085 MW) complete the picture. In 2013, support for 1.1 MW wind, 0.011 MW solar and 0.32 MW (landfill) biogas capacity was approved.

As for the share of generated electricity, solar energy production remained non-existent, and only the electricity generated from biogas was measurable in 2012 (0.3 GWh). Hydro generation – as usual – was quite volatile in the period from 2008 to 2012, as can be seen on Figure 9.1.

In the last few years, total electricity production amounted to 800-850 GWh/year, while total consumption was around 4 times higher: 3-3.5 TWh. So the share of renewable electricity in both total production (depending on hydro production 4-9%) and especially in total consumption (1-2%) is quite low.

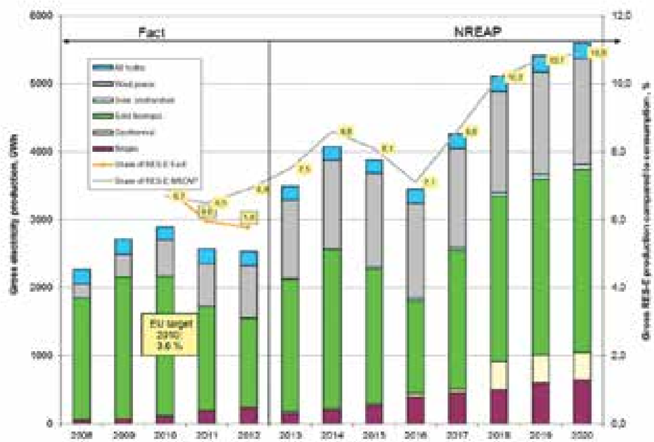

Figure 9.1 Gross renewable electricity production in Moldova, GWh

Source: REKK RES-E Survey 2013

Renewable power plants enjoy priority access to the grid and dispatching. Plant operators are obliged to carry out production forecasting and scheduling, and deviation from production schedule is calculated plant by plant. However, no penalty is levied as they are to conventional power plants. In Moldova there is no balancing market.

[95] Energy Community Annual Implementation Report 2013, http://www.energy-community.org/pls/portal/docs/2304177.PDF

We found a few estimations on Moldovan renewable potentials, although they are not always consistent. The country plans for 400 MW of total renewable capacity to be installed by 2020, mostly via wind power plants[96]. This might be a lower limit of the potential. ccording to a study of University of St. Thomas[97] there are four types of energy sources from which Moldova can benefit: wind, solar power, biomass (including wood combustion, agricultural and wood-wastes and also biogas) and hydro power. Solar PV potential is estimated to be 6.3 MW, while hydro power is around 60 MW. As for wind, the study only gives an estimation for the capacity of plants that can be built by 2010; this number is 26-34 MW, but no investment has been realized yet. In 2010 the European Bank for Reconstruction and Development (EBRD) estimated a 1000 MW wind power potential for Moldova.[98] According to the Energy Community[99] the technical potentials of the different renewable technologies are the following: 14 000 GWh solar power, 8 200 GWh wind power, 3 400 GWh hydro power and 5 400 GWh from biomass (including wood, agricultural waste and biogas).

9.2 RES-E barriers

The lack of accurate information on both the technical potential and geographic distribution of possible projects make project developments more difficult to be realized. Although it is promising that this summer the Ministry of Economy prepared the draft version of the NREAP for the period of 2013-2022, which can help to envisage more developments in the field of renewable energy.

The licensing and connection procedure is relatively fast, which helps the integration of new renewable plants. Around 5-15 authorities are involved in the licensing procedure, and the whole process lasts less than 9 months (including grid connection).[100] There is a guarantee of origin certificate issued by the TSO or DSO – depending on which system the plant operator connects to.

At the connection points no priority is given to renewable plants, and the access rights are allocated on a first come first served basis. The cost allocation method is a typical example for a shallow cost regime. The cost of direct connection is borne by the plant operator, while the TSO/DSO pays the total of indirect costs – upgrades or system development.

9.3 Support scheme for RES-E[101]

As we have already mentioned, the Ministry of Economy prepared a draft version of NREAP that includes a target of 17% share of energy from renewable sources in the gross final energy consumption in 2020. Otherwise, a draft version of a new Law on the promotion and use of renewable energy sources is currently under development. This new Law will transpose the provisions of EU Directive 2009/28/EC, and a new support scheme will replace the existing one.

[96] http://renewables.seenews.com/news/moldova-eyes-400-mw-of-new-capacity-in-bid-to-get-20-of-energy-from-renewables-by-2020-371016
[97] http://courseweb.stthomas.edu/moldova/energy_appendix.htm
[98] http://www.evwind.es/2010/09/04/moldova-a-potential-1000-mw-of-installed-capacity-in-wind-energy
[99] http://www.energy-community.org/pls/portal/docs/324190.PDF
[100] REKK RES-E Survey 2013
[101] REKK RES-E Survey 2013

Moldova applies feed-in tariff to support renewable electricity production. RES-E generators with an installed capacity of more than 10 kW must calculate RES-E tariffs according to a methodology (Methodology for the calculation of tariffs for electricity and biofuels produced from renewable energy sources) approved by the National Agency of Energy Regulation (ANRE) and submit their calculations and relevant documentation to the Agency for approval. Approved tariffs for RES-E are calculated for a payback period of up to 15 years, revised each year. When approving tariffs for RES-E, prices for similar products on international markets shall be taken into consideration.

In tariff calculation a higher rate of return is taken into consideration in case of renewable projects than the rate applied for conventional energy: 1.5 times higher for the first 5 years, 1.3 times higher for the next 5 years and 1.1 for the last 5 years. Table 9.1 shows the FIT rates for some selected technologies based on the latest ANRE decisions (decisions are listed in appendix):

Technology	Specification (FIT/FIP)	Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	12.34
PV 30 kW rooftop	FIT	12.34
PV 1 MW ground mounted	FIT	12.34
Biogas (average)	FIT	11.12
Biomass (average)	FIT	
Wind	FIT	7.97
Hydro (average)	FIT	
Geothermal	FIT	

Table 9.1 Applied supports for renewable projects in Moldova, MDL/kWh

Source: REKK RES-E Survey 2013, calculation were made using the exchange rate 15.56 EUR/MDL

The system is being financed by the end-users through the regulated tariffs that are approved by ANRE. In 2012 there was only one generator producing renewable electricity which was entitled for support (a biogas plant with 85kW installed capacity), producing 314 MWh. According to Moldovan regulation principles, only new hydro plants should benefit from the RES-E support mechanism, so feed-in tariffs for older hydro power plants are not calculated according to the above mentioned Methodology. The cost structure in the last five years was the following:

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2012	0.035	0.019	0.016	0.31	51.61

Table 9.2 Cost structure of RES-E support in Moldova, mEUR

Source: REKK RES-E Survey 2013

9.4 Cross-border cooperation

According to the regulator RES-E cross-border cooperation is only of secondary priority after meeting the national targets.

9.5 Appendix

ANRE Decision approving RES-E tariff	RES type	Installed Capacity of the plant, kW	Tariff, MDL/kWh	Tariff, EUR/kWh
ANRE Resolution No 389 of 11.11.2010	Biogas	85	1.73	0.11
ANRE Resolution No 493 of 30.11.2012	Solar PV	95	1.92	0.12
ANRE Resolution No 511 of 27.02.2013	Wind	1100	1.24	0.08
ANRE Resolution No 510 of 27.02.2013	Solar PV	11	1.92	0.12
ANRE Resolution No 519 of 30.05.2013	Biogas (landfill)	320	1.73	0.11

Table 9.3 Applied supports for renewable projects in Moldova, MDL/kWh

Source: REKK RES-E Survey 2013, calculation were made using the exchange rate 15.56 EUR/MDL

10 RES-E COUNTRY PROFILE - MONTENEGRO

10.1 General description of the RES-E sector[102]

The key players in the electricity market of Montenegro are the transmission system operator, Crnogorski elektroprenosni sistem (CGES), the vertical integrated company Elektroprivreda Crne Gore (EPCG) that performs generation, distribution and supply activities,[103] and the market operator Crnogorski operator trzista (COTE) – which are all state owned. The latter was established in 2010, and is responsible for the organization and management of the market along with the implementation of activities that encourage renewable energy production.[104]

Montenegro has only two sources of generating electricity. One of them is hydro – mostly harnessed by storage facilities with some run-of-river installations – and the other is lignite. The capacity of power plants did not change much over the last 5 years. Total installed hydro capacity has been 658 MW since 2008, while the capacity of fossil fuelled power plants increased from 210 to 218.5 MW in 2009 and has not changed since then.

Around half of the production comes from hydro plants, but this rate highly depends on weather conditions. Total production is around 2700 GWh/year, from which hydro production is usually around 1500-2000 GWh/year. The country is a net importer. The renewable production between 2008 and 2012 and its share from total generation are shown on Figure 10.1:

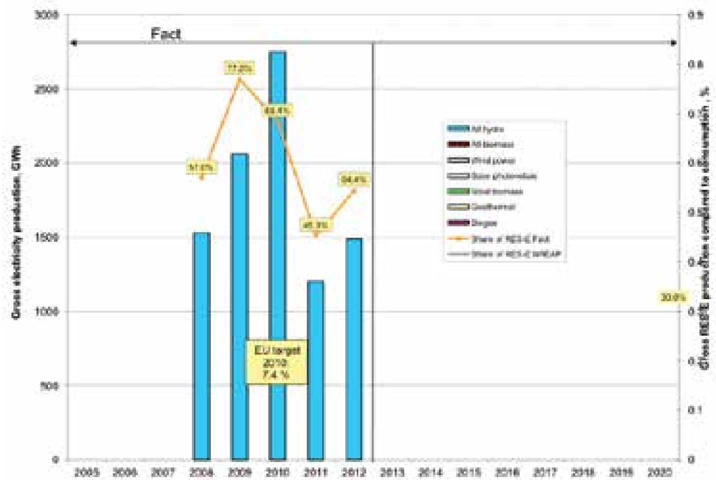

Figure 10.1 Gross renewable electricity production in Montenegro, GWh

Source: REKK RES-E Survey 2013

There is a separate renewable balancing group operating under separate rules different from those responsible for conventional plants. Renewables are not obliged to prepare production schedules, rather

[102] hThe whole study is mainly based on data from the REKK RES-E Survey 2013
[103] Energy Community: Annual report on the implementation of the acquis under the treaty establishing the Energy Community
[104] www.cotee.me

it is in the responsibility of the market operator Crnogorski operator trzista (COTE), while operators of fossil fuelled power plants are required to prepare their own schedules. Deviation is calculated with the same method for every operator within its own balancing group. No penalty is charged in the case of deviation and there is no intraday market to trade imbalances after gate closure. Access rights to the grid are guaranteed for RES-E producers, and they also enjoy priority in dispatch. According to the 2007 estimation of the Ministry for Economic Development[105] the potential for large hydro plants is around 10000 GWh/year, while for small hydro plants this number is between 800 and 1000 GWh, from which only around 400 GWh can be realistically utilised. The wind energy potential is around 400 MW in the whole country, but in the most attractive regions only 100 MW can be established. Solar energy estimations were made with the help of satellite data, according to which the yearly potential of solar energy in Podgorica is 1602 kWh/m2. As for biomass, the potential from forestry and wood industry is around 5-10 MW. No successful exploration of geothermal energy has been realized so far. As regards solid utility waste, only the construction of one power plant with 10 MW capacity is predicted until 2025. The 2020 target for the share of renewable energy is 33%.[106]

10.2 RES-E barriers

Although there is a well-crafted support scheme design in force, the business environment does not look favourable at the moment for RES-E investments – as evidenced by the complete lack of any type of renewable power plant in the country other than remaining hydro plants.

The procedure of grid connection is not complicated, with less than 5 authorities involved in the licensing procedure depending on technology and installed capacity and a process that takes less than 9 months. However, this is an "estimated" length. There is no historical data on the duration of procedures because no renewable plant has been connected to the grid so far based on these rules.

The connection to the grid is non-discriminatory by law, so there is no priority given to renewable plants. The connection capacity allocation is handled on a first come first served basis, but plant operators can build connection capacities on their own and that way can be connected sooner. The cost of direct connection is borne by the plant operator, while the cost of system development is shared between investors and the TSO.

10.3 Support scheme for RES-E

The target set for 2020 in Montenegro rely mainly on generation coming from new hydro capacities[107]. The total targeted capacity is 1221 MW from hydro, 96 MW from wind, 3 MW from biomass, and 10 MW from waste.

Montenegro applies a feed-in tariff support scheme. There have been no support payment yet, but theoretically it will be financed by the end users through an additional cost. There is also a planned annual budget calculated with a formula that will help the system achieve sustainability. Actual feed-in tariffs are also determined along a formula that is pre-defined for several years. The method for setting the tariff is the cost plus (or rate of return) mechanism. Tariffs are differentiated according to technology and size. Table 10.1 lists the FITs applicable for some selected renewable technologies, while he details are shown in Table 10.2 of the appendix to this chapter.

[105] http://iet.jrc.ec.europa.eu/remea/sites/remea/files/files/documents/events/montenegro.pdf
[106] Energy Community
[107] http://www.energy-community.org/pls/portal/docs/1284180.PDF

Technology	Specification (FIT/FIP)	Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	15.00
PV 30 kW rooftop	FIT	15.00
PV 1 MW ground mounted	FIT	15.00
Biogas	FIT	15.00
Biomass (5 MW)	FIT	13.01
Wind	FIT	9.60
Hydro (average)	FIT	7.64
Geothermal	FIT	n/a

Table 10.1 Support for specific technologies in Montenegro, EURcent/kWh

Source: REKK RES-E Survey 2013

10.4 Cross-border cooperation

Cross border cooperation is not in the priority interest of Montenegro, although any investment is welcome by the government.

10.5 Appendix

Power category		From 4th November 2013 EURcent/kWh
Wind		9.60
Solar		15.00
Biomass	From forestry and agriculture	13.71
	From wood - processing industry	12.31
Biogas		15.00
Waste	Solid landfill waste	9.00
	Waste gas	8.00
Hydro	Annual electricity production < 3 GWh	10.44
	Annual electricity production >3 GWh – max. 15 GWh	7.44
	Annual electricity production > 15 GWh	5.04

Table 10.2 Support for specific technologies in Montenegro, EURcent/kWh

Source: table from REKK RES-E Survey 2013, submitted by the regulator

11 RES-E COUNTRY PROFILE - ROMANIA

11.1 General description of the RES-E sector

Almost half of the Romanian electricity capacity runs on renewable sources, and most of this is from hydro plants. Wind capacities have started to grow dynamically since 2010, and – together with PV plants – they are the main drivers of capacity development. This RES-E capacity share translated into a 26% share in production in 2012.

Capacity and generation mix

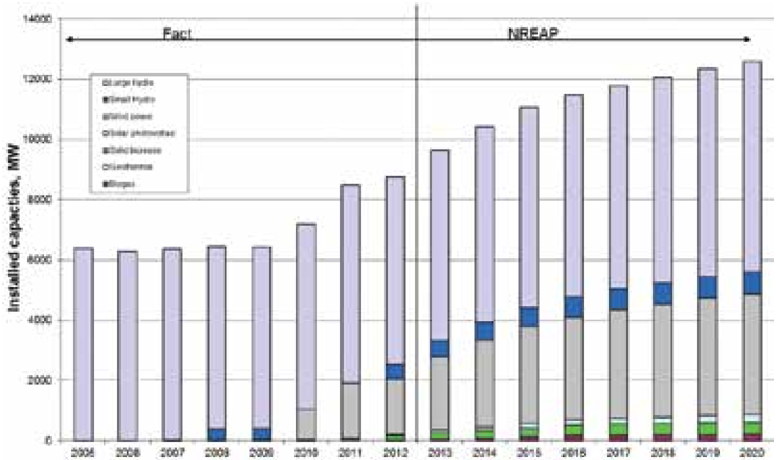

Figure 11.1 Net renewable electricity generation capacity in Romania, MW

Source: ANRE, REKK RES-E Survey 2013, NREAP

Note: The large hydro figures for 2011 and 2012 contain all hydro capacities

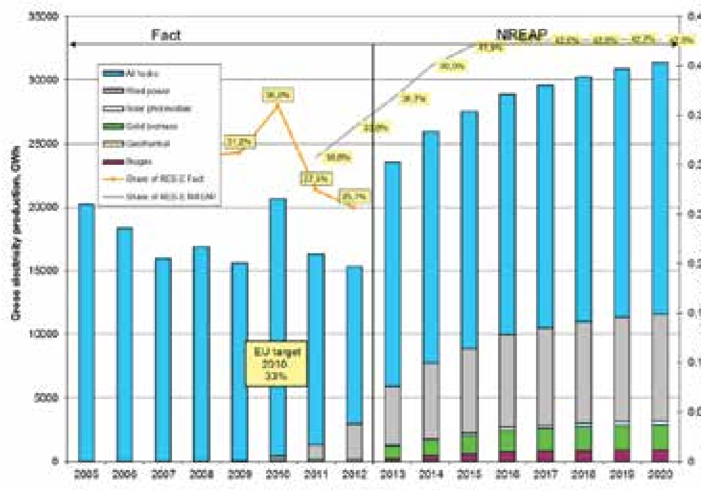

Figure 11.2 Gross renewable electricity production in Romania, GWh

Source: ANRE, REKK RES-E Survey 2013, NREAP

The generation of RES-E fluctuates due to the large share of hydro based production. The NREAP was planned on the basis of 2005 generation that was an exceptional year and consequently the planned and realised RES-E production levels in 2011 and 2012 deviate considerably.

RES-E market design

Since the passage of the new Energy Act in 2012 which banned privately negotiated bilateral contracts, electricity trading in the competitive wholesale market has been limited to the organised market operated by OPCOM. OPCOM operates an intra-day market that provides opportunity for participants to adjust their contracting portfolio on the day of delivery.[108]

There is no special regulation concerning balancing for RES-E producers as compared to other technologies. According to the Commercial Code the TSO is responsible for balancing and also acts as Balancing Market Operator. Balancing energy is provided via pay-as-bid auctions. All producers and suppliers (customers) who have dispatchable units are obliged to participate in the balancing market (BM) cooperating either within their own rights or transferring the responsibility to another party. This means that each participant is obliged to act as a Balance Responsible Party (BRP) or be included in the balancing area of a BRP to which it has transferred its balancing responsibility.

Producers and consumers may form a balancing group if their annual production forecast does not exceed the 30% of total net injected electricity of the previous year and/or if their annual consumption forecast does not exceed the 30% of total net consumption in the previous year. These limits are set in order to prevent anticompetitive behaviour. The penalty paid for 1 MWh deviation at the end of 2010 was 40.25 RON (approx. 9 EUR) for upward and 237.41 RON (approx. 53 EUR) for downward deviation.

[108] ANRE Order No. 73/10. 10. 2013, and ANRE Recommendations No. 1 to 4/10.01.2014.

Green certificates are traded independent of electricity. Trading takes place within two types of markets, the centralised market and the bilateral market, both of which are operated by the OPCOM.[109] In the bilateral market parties agree on a price freely, but have to register the transaction with OPCOM in order to avoid double counting. The price of the certificate is a result of the supply and demand conditions, but regulation for the period of 2008-2025 sets both a price floor (27 EUR/MWh) to protect RES generators and a price cap (55 EUR/MWh) to protect consumers from excessive prices. Because actual RES-E generation has remained lower than the annual quota, the market price for GCs equalled the price cap of 55 EUR that was set in 2008 and is indexed to annual inflation.

Estimated RES-E potential

Romania has a good PV potential, more so than any other country in the South-Eastern region. The 2020 PV target of the NREAP (260 MW) is quite conservative, especially considering the generous support PV has been granted under the current green certificate regime. The very same region (including the Dobrogea, Moldova and Banat regions) has above average wind potential as well that is already attracting a large volume of investment. The hydro potential of Romania is similarly significant but already exhausted by large scale installations. The small scale technical potential is estimated to be 6000 GWh annually (NREAP). The assessment of biomass and geothermal RES-E potential is not a real issue, as the NREAP forecasts mostly heat production using these resources.

11.2 RES-E barriers

Licensing and certification

Licensing is a complex and lengthy process in Romania. The average number of authorities to be contacted in the licensing procedure is between 5 and 15. The lead time of project development can be as long as 2 years. Licensing is differentiated by the size of the proposed generation unit: below 1 MW capacity the documentation required for a production licence is simplified and the duration is only 1 month regardless of the technology. A large share of Dobrogea and Banat regions – the most important areas for wind projects – fall under the Natura 2000 scheme and as such developments in these areas often require additional environmental impact assessment.[110] Developers of generation projects over 125 MW need to submit the proposal for assessment and approval to the European Commission before applying for GC eligibility from ANRE.

Grid integration

The main barrier to the continuous development of RES-E in Romania, especially wind, is the limited capacity of the grid. According to Transelectrica (TSO) in its current state the grid can integrate 2.5-3 GW of wind capacity. In contrast, by September 2013 8.8 GW technical connection permits have been signed in addition to connection contracts for 14 GW capacity.[111] Connection opportunities are allocated on a "first come, first served" basis in the case of scarce grid capacity, and RES-E plants do not enjoy positive discrimination when competing with conventional producers in the connection process. Access may be denied when there is insufficient capacity, however provisions of the connection cost regime imply that this does not mean the project will be abandoned.

Romania, by default, applies a connection cost regime that is more deep than shallow. The cost of network upgrade requirement beyond the point of connection is executed by the network operator, but its cost

[109] OPCOM is the Romanian electricity market operator.
[110] EWEA, 2013
[111] EWEA, 2013

is shared between the network operator and the RES-E developer via the connection tariff, established in accordance with the methodology for setting tariffs for connection and approved by the regulatory authority.

If the network operator is not able to execute the necessary network upgrade by the date requested by the applicant for initiating the operation of the power plant, it is obliged to inform the applicant about the reasons for the delay and possible deadlines for completion of works. Once the DSO/TSO has delayed, the applicant can decide to wait until the network operator can carry out the upgrade (for which a preliminary date has to be given) or can pre-finance the network operator's share. In reality, the RES-E operator often pays the full cost of network upgrade in advance[112] and the network operator is obliged to repay this sum according to the bilateral agreement.

11.3 Support scheme for RES-E

RES-E utilization target

Romania has its national RES-E target set as a percentage of gross final electricity consumption, similarly to other EU countries. Figure 11.2 above shows that in 2011 and 2012 RES-E production lags behind the target, but this does not necessary indicate a slowdown in the deployment process because the majority of RES-E production depends on intermittent large hydro plants. The Strategy of Using Renewable Energy Sources in 2003 set the RES-E targets of 30.0% for 2010 and 30.4% for 2015. These targets have been subsequently changed upwards to 33% (2010), 35% (2015) and 38% (2020).[113] According to the Romanian NREAP, the RES-E indicative target by 2020 is 42.62% mostly due to shrinking consumption following the economic crisis.

Support scheme design

Romania introduced a system of green certificates in 2005 which is still in place, but with major changes effectuated in 2010 and 2013 that had implications for the RES-E market. In 2010 regulatory reform of the promotion system left the framework intact, but several important elements have been modified.

1. The quota obligation has been upgraded to match EU ambitions even though actual green certificate (GC) eligible RES-E generation lagged behind the previously set (lower) target quotas ending 2012. The price of green certificates have decoupled from the price ceiling since April 2013 which possibly indicates a turn in the GC market.

2. The universal rule of 1 GC for each MWh has been differentiated according to technology favouring the more expensive solar (6 GC) and wind investments (2 GCs until 2018, decreased to 1 GC later). In addition, the system differentiates among small hydro plants according to implicit efficiency.

3. The original price range of 24-42 EUR/GC (until 2008) has been increased to 27-55 EUR/GC, yearly adjusted by ANRE according to the Eurozone inflation rate.

4. The penalty increased from 63 EUR/GC (2005-2007) and 84 EUR/GC (2008-2010) to the current 110 EUR/GC.

The Romanian government and ANRE passed a legislation that coordinates investment subsidies and support via green certificates to ensure that investors are not receiving excessive support. (EGO 88/2011).

[112] EWEA, 2013

[113] Act 220/2008 as amended in 2010

Accordingly, ANRE monitors the costs and revenues of producers along with investment costs on a yearly basis and compares these cost figures to the reference values used for the authorisation of the support scheme by the EC. If the resulting internal rate of return (IRR) exceeds the IRR approved by the EC by more than 10%, then ANRE will propose that government reduces the number of green certificates earmarked for the given technology.

RES type	Type of electric unit/plant	Number of GC/MWh	Support period (years)
Hydro energy below 10 MW	new (commissioned after January 1st, 2004	3	15
	upgraded/refurbished	2	10
	commissioned before January 1st, 2004 and not upgraded	0.5	3
Wind	new until 2017	2	15
	new from 2018	1	
	second hand until 2017	2	7
	second hand from 2018	1	
Biogas, biomass, bio liquid, geothermal	new	2	15
	new – energy crop biomass	3	15
	high efficiency cogeneration (additional to GC above)	+1	15
Solar	new	6	15

Table 11.1 Eligibility rules, periods and awarded green certificates per technology in Romania

Source: ANRE

In 2013 ANRE changed the support scheme considerably: its generous terms have been cut back.[114] The reasoning was the increasingly heavy price effect of RES-E production resulting from the influx of new RES-E applications, especially wind and PV projects, and the falling cost of technology. ANRE– based on its 2012 analysis – came to the conclusion that wind, PV and small hydro projects were over-subsidised, but law No. 134/2012 prohibited the reduction of green certificates before Jan. 1, 2014 for PV and Jan. 1, 2015 for other technologies.

The main changes implemented were the followings:

- For new plants, the regulation defers the allocation of 1 GC for wind, 2 for PV and 1 for hydro. The deferred GCs can be recovered in steps (decided later by the regulator) from January 2017 in case of PV and hydro under 10 MW, and from January 2018 for wind.
- PV (or any other) plants erected on land that has the status of "agricultural" land as of 1 July 2014 will not benefit from the GC support scheme.
- RES plants with installed capacity above 10 MW and PV plants above 5 MW will not be granted GCs for the electricity that generated positive imbalances in the system.
- There is an annual cap on the accreditation of RES power plants by the regulator (ANRE) based on the updated data in NREAP. If the cap is reached during any calendar year, the regulator will deny the accreditation of the exceeding capacities until the following year (units can queue for next year's quota).
- Similarly to the measure taken mid-July 2012 with regard to the power sector, GC trading will only be allowed on the centralized market operated by the power market operator OPCOM. The

[114] Governmental Emergency Ordinance No. 57/2013

main consequence of this measure is that producers may not enter into forward GC contracts and hence may not secure the project cash flow for project finance purposes.

Rate of support (market premium manifested in FIT or certificate price)

The rate of support is manifested in the price of green certificates. As the number of awarded GCs is technology specific, the rate of support for each technology can be deducted from the GC price and the number of GCs per 1 MWh. The price of GC seems to decouple from the price ceiling since April 2012 as can be seen in the next figure.

Figure 11.3 Green certificate price in Romania (Jan. 2012 – Sept. 2013), EUR

Source: OPCOM

Annual support budget

The cost of supporting renewable based electricity generation basically doubled every year since 2008, and by 2012 it reached 188 mEUR. The cost of support ("cost of the incentive component") is calculated by multiplying the number of GCs purchased to fulfil the annual quota with the average GC price.

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2008	10.82	4.74	6.08	132	46.05
2009	20.81	7.52	13.28	242	54.89
2010	58.43	21.21	37.21	677	54.97
2011	140.83	56.06	84.78	1510	56.14
2012	338.12	149.41	188.71	3365	56.08

Table 11.2 Cost structure of RES-E support in Romania, mEUR

Source: REKK RES-E Survey 2013

11.4 Cross-border cooperation

Non RES-E (export/import capacities, traded electricity)

Romania was a net exporter in 2010 and 2011 but became a net importer in 2012. The share of net export in total electricity supplied decreased from 5.1% to -0.4% between 2010 and 2012.

	2010	2011	2012	January-April 2013
Export	3.85	2.94	1.15	0.44
Import	0.94	1.04	1.40	0.22
Net export	2.91	1.90	-0.25	0.22
Share of net export in total electricity supplied	5.1%	3.3%	-0.4%	n.a.

Table 11.3 Export and import of electricity in Romania, TWh

Source: ANRE reports

RES-E

Romania is not involved in any RES-E cross-border cooperation projects envisaged by the EU RES-E Directive, and its priority is to meet national RES-E targets via domestic deployment.

12 RES-E COUNTRY PROFILE - SERBIA

12.1 General description of the RES-E sector

In its National Renewable Energy Action Plan (2013) the Republic of Serbia set the ambitious binding target of 36,6% of RES-E share in Gross Final Electricity Consumption to be reached by 2020. The target is set based on the forecast of energy needs, economic capabilities and the international commitments of the country.

The largest electricity company in Serbia is the state-owned, vertically integrated public enterprise Elektroprivreda Srbije (EPS), active in generation, coal-mining, distribution and supply entities (13 in total). Another public enterprise Elekromreza Srbije (EMS) is the transmission system operator, which is responsible for organizing the electricity market and the balancing market.[115] The net electric capacity was 7130.5 MW in 2012, out of which 3936 MW was coal-fired, 353 MW gas-fired, 2835 MW hydro, (including 44 MW small hydro and 614 MW pumped storage capacity) while other renewable capacities added up to 6.5 MW.[116] Table 12.1 shows the amount of electricity generated in Serbia in 2012 according to technology. Total electricity supply amounted to 34 509 GWh, excluding the plants in Kosovo and Metohija.[117] According to the figures, 70.3 percent of generation came from coal-based thermal power plants, 1.13% was produced by cogeneration plants, and 28.53 % of the electricity was delivered by hydro power plants in 2012. The 2012 Annual Report of EPS[118] mentions 37 so called "privileged producers", which supplied an additional 36.184 GWh, to which solar plants contributed with 81, wind generators 207 MWh and biogas plants with 6335 MWh. The rest are reported to be fossil-fuel and hydro based generators. The share of renewable generation in 2012 is, therefore was very small, being under 0.1% of total net generation.

Thermal PP	Cogenerated	Hydro PP	TOTAL (GWh)
24 275	390	9 844	**34 509**

Table 12.1 The electricity generation mix of Serbia in 2012, GWh

Source: Technical Report of EPS, 2012

Share of RES-E in supply, breakdown of built-in capacities

As stated earlier, the main renewable energy resource in Serbia is hydropower and the majority of both total RES-E capacity and RES-E generation is related to hydro power. Only a miniscule amount of renewable production was produced from biomass, solar or wind power. In 2012, 44 MW of small hydro, 2 MW of biogas, 0.5 MW of wind and 2.4 MW of solar power capacity operated in the country.

[115] EPS Technical Report, 2012, http://www.eps.rs/Eng/Tehnicki%20Izvestaji/TEH_Godisnjak2012_en_sajt.pdf, and Energy Community Secretariat: Annual Implementation Report, 2013, http://www.energy-community.org/pls/portal/docs/2304177.PDF, p. 67.
[116] EPS Technical Report, 2012 and Energy Community Secretariat: Annual Implementation Report, 2013, p. 67.
[117] As of June 1999, EPS does not operate their plants on the territory of Kosovo and Metohija.
[118] EPS Annual Report on the Electric Power Industry of Serbia, 2012, http://www.eps.rs/Eng/Godisnji%20Izvestaji/Annual%20Report_PE%20EPS_2012_web.pdf

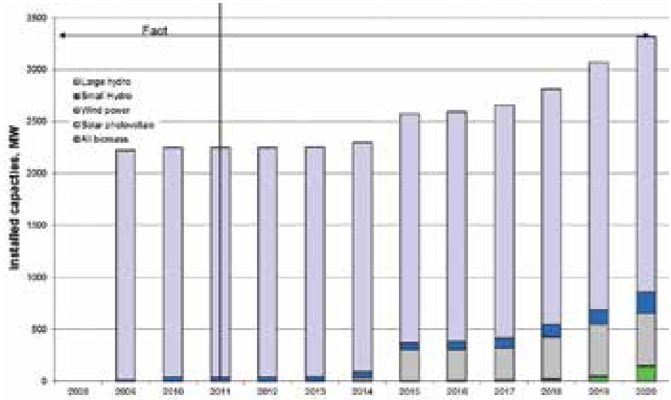

Figure 12.1 Installed RES-E capacities of Serbia between 2009 and 2020, MW

Source: NREAP, 2013

Note: 2009-2011 data is factual, 2012-2020 are estimates. Small HPP are up to 30MW of capacity. Currently there is no operational SHPP in Serbia larger than 10 MW, as only smaller installations are eligible for FiT. Source: Energy Agency Report (2012)

RES-E market design

The coordination mechanisms that integrate supported RES-E into the electricity market is detailed in the Serbian National RES Strategy.[119] As part of the incentive measures, the state owned electricity wholesaler – EPS – is obliged to purchase the whole quantity from privileged producers.

Estimated RES-E potential

The goal of 27% of RES in GFEC by 2020 requires better utilization of unused RES potential. It is estimated that there is a technically usable RES potential of about 5.6 Mtoe per annum, the composition of which is shown in Figure 12.1. Serbia currently uses 35% of its technical RES potential.

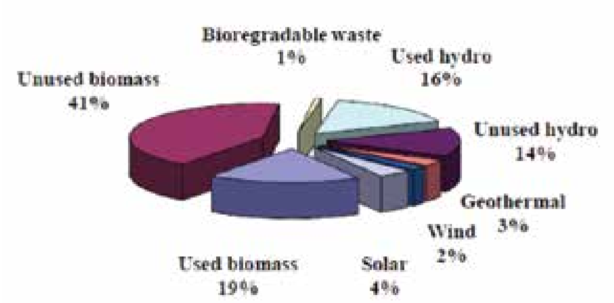

Figure 12.2 Structure of RES in the Republic of Serbia

Source: NREAP (2013), p. 7

[119] NREAP, 2013, p. 81, http://www.energy-community.org/pls/portal/docs/2144185.PDF

With regards to renewable electricity potential, the Energy Community[120] provides an estimate of 4.6 GW for small and medium-sized hydro capacity, 2.3 TWh/year for wind, 50 MW for geothermal electricity and 33 MW for solar energy while biomass could generate up to 19 TWh electricity per annum.

According to the forecast scenario, in the electricity sector it will be necessary to achieve an increase of generation from RES by increasing renewable sources used from 884 ktoe to 1151 ktoe, corresponding to a 30% increase by 2020. Expressed in terms of gross final energy consumption this corresponds to a 2.4% increase (from 9.7% RES electricity in 2009 to 12.1% in 2020). Table 12.2 details the planned installation of the additional 1092 MW expected to be put in operation in order to achieve Serbia's targets in the electric power sector.

Type of RES	(MW)	Utilisation (h)	(GWh)	(ktoe)	Share (%)
HPP (over 10 MW)	250	4430	1108	95	30.3
SHPP (up to 10 MW)	188	3150	592	51	16.2
Wind energy	500	2000	1000	86	27.4
Solar energy	10	1300	13	1	0.4
Biomass - CHP plants	100	6400	640	55	17.5
Biogas (manure) - CHP plants	30	7500	225	19	6.2
Geothermal energy	1	7000	7	1	0.2
Waste	3	6000	18	2	0.5
Landfill gas	10	5000	50	4	1.4
TOTAL planned capacity	1092	n/a	3653	314	100

Table 12.2 Capacity and the electricity production of new plants in Serbia in 2020

Source: NREAP 2013, p. 18

12.2 RES-E barriers

Licensing and certification

Although a licence has to be acquired only for installations over 1 MW, potential investors may face lengthy procedures when applying for a RES-E generation license. The permit is issued by the national energy regulator (AERS) in one month, but other authorities are also involved in the permitting procedure (ministries, municipalities, etc.) which might considerably delay the process. According to the detailed guidance published by the Serbian Ministry of Energy, Development and Environmental Protection the average number of authorities involved directly or indirectly in the RES-E licensing procedure is between 5 and 15.

The procedure for a license to engage in energy-related activities is defined by the Energy Law (2012) and the Rulebook on Requirements Regarding Professional Staff and Terms of Issuing and Revoking of Energy Licenses. However, in order to obtain an Energy License investors must first collect a separate set of documents just to be eligible to apply to the Ministry. These include a valid generation plan, a location permit, the list of owners, various technical permits, water permits etc.[121] These documents must be gathered from the municipal and the state level, from local courts to the Ministry of Energy and back, with the result that potential investors will normally need at least 2 years to obtain all of the documentation. The licensing procedure in Serbia is also differentiated by technology and installed capacity, in particular when it comes to the project's impact on the environment. Depending on the type of RES-E project different permits are required.

[120] Energy Community Secretariat: Annual Implementation Report, 1 September 2013, p. 156. http://www.energy-community.org/pls/portal/docs/2304177.PDF
[121] „Ministry of Energy, Development and Environmental Protection of Republic of Serbia." Ministry | Ministry of Energy, Development and Environmental Protection of Republic of Serbia. N.p., n.d. Web. 13 Nov. 2013. <http://www.merz.gov.rs/en>.

The Environmental Impact Assessment (EIA) procedure, as defined in the Law on Environmental Impact Assessment (2004), is required for projects which are planned to be located in protected areas, regardless of the type and capacity of the project. In addition, EIA might be required for hydro projects with capacities greater than 2MW or wind projects with capacities greater than 10MW.

The lead time is the shortest for roof-top solar PV equipment because there is no need for construction permit, but if there is a visual impact on the landscape than an EIA is required. The procedure related to onshore wind projects on the other hand takes around 36 months.[122]

A guarantee of origin scheme for RES-E production is not yet in place in Serbia. The responsible authority for issuing RES-E certificates is "Elektromreža Srbije" – the Serbian Transmission System Operator (TSO). Article 53 of the existing Energy Law (2012) stipulates that the Guarantee of Origin is to be issued by the TSO for 1 MW of generated electricity, but relevant by-laws which would further explain this mechanism are still missing, and therefore the actual implementation of the system has not started yet.

Grid integration

In Serbia there is no priority network connection ensured for renewable operators. In the case of multiple competing RES-E developers, connection capacity is allocated on a first come first served basis.

Similarly, connection charges do not differ for RES-E plants from those of any other conventional plants. The cost of direct connection is to be paid fully by the generator, while the cost of system development is covered by the TSO. Scheduling and forecasting of RES-E production is the responsibility of the TSO or DSO, depending on whether the producer is connected to the transmission or the distribution grid.

RES-E plant operators do not have priority access to the grid, but they have priority in dispatching except for instances when the TSO can mitigate them for system security reasons.

It is worth noting that Grid access is negotiated with the transmission or distribution network operator during the construction phase. Only after the installation becomes operational and connected to the grid can the investor submit a request for FIT and become a "privileged power producer."[123] Besides generators using renewable sources or waste as a fuel, small-sized power plants (below 10 MW) and cogeneration producers fulfilling a given efficiency criteria might also become privileged and enjoy special rights and benefits.

The privileged producer status lasts for 12 years, after which period renewable electricity producers have equal balancing regimes and obligations to those of conventional plants. During the eligibility period, RES-E producers are not obliged to cover the balancing costs. The public supplier is responsible for balancing and covering the cost of imbalances, which is later passed on to final consumers on a pro rata basis, together with the cost of feed-in tariffs.

The RES-E plant operator is responsible for preparing the production schedule, whereas the deviation from schedule is calculated plant by plant. The deadline for finalizing the generation schedules is 12-36 hours before delivery, after gate-closure positions can be improved only at cross-border capacity auctions.

[122] REKK Survey, 2013

[123] The Energy Law, 2012. „Official Gazette of the Republic of Serbia" No. 57/11, 80/11-amendment, 93/12 and 124/12), Article 60

12.3 Support scheme for RES-E

RES-E utilization target

In order to reach the ambitious target of a 36.6% share of electricity generated from renewable energy sources in gross final energy consumption by 2020, the relevant Serbian authorities have developed yearly utilization targets, as well as a set of support mechanisms.

Figure 12.3 below details the envisaged yearly utilization targets for 2020 as a percentage of GFEC, as presented in the National Renewable Energy Action Plan.

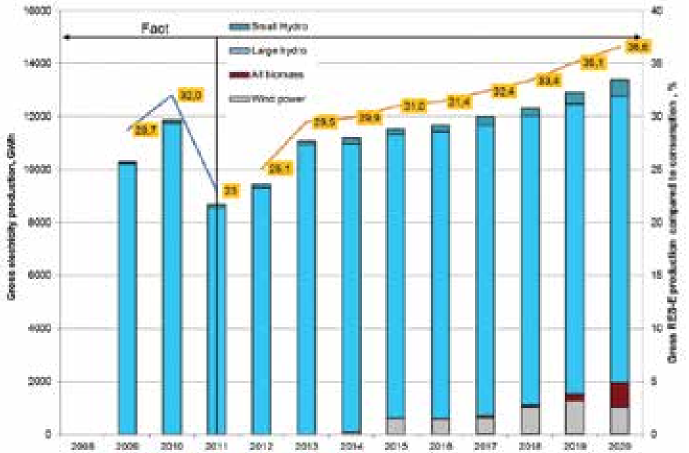

Figure 12.3 RES-E generation in Serbia between 2008 and 2020 (GWh) and the utilisation targets (%)

Source: NREAP, 2013

Support scheme design

In 2009 Serbia introduced its FIT scheme for RES-E development. The support is financed through specific non- tax levies which are paid by all customers in their electricity bills. For each kWh consumed customers must pay 0.044 RSD (0.000386 EUR). FITs are predefined for several years, with annual correction determined by the inflation rate of the EURO zone. However, subsidies for energy generated from PVs were lowered in 2013 because of improving technology, which was common across the region.[124]

Table 12.3 shows FITs for some selected technologies. For a detailed overview please check the Annex 1. The most important facts on FITs in Serbia are the following:

- Feed-in tariffs are expressed as incentive purchase prices which do not depend on the time of a day or a year when the electricity is produced
- Different feed-in tariffs are defined for each RES technology as well as for highly efficient CHP facilities
- Feed-in tariffs are fixed values i.e. they do not depend on the price at the power market

[124] „Solarni paneli." Analiza stanja u Srbiji u oblasti solarnih investicija. N.p., n.d. Web. 13 Nov. 2013. <http://www.solarnipaneli.org/2013/10/analiza-stanja-u-srbi-ji-u-oblasti-solarnih-investicija-deo-i/#more-1588>.

- RES-E producers from RES are entitled to receive feed-in tariffs for 12 years
- All feed-in tariffs are expressed in EURcent/kWh (not in the domestic currency)
- There is an automatic annual indexation of feed-in tariffs in place, based on the inflation rate in the EURO zone
- For some RES technologies (hydro, biomass, and biogas) different feed-in tariffs are defined for different installed capacities
- There are caps on the total installed capacities of facilities that can obtain feed in tariffs for solar (10 MW) and wind technologies (500 MW). No transparent regulations exist for distributing these limited capacities. Current practice is first-come-first-serve.
- For building-integrated roof-top solar electricity, a financial framework is applicable: the total amount of electricity produced is delivered to the network and is entitled to FIT, while total electricity consumption is invoiced monthly by the regular price of electricity. Therefore, separate meters are used to register the electricity supplied by the installation and consumed by the household.

Technology	Specification (FIT/FIP)	Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	18.12
PV 30 kW rooftop	FIT	18.12
PV 1 MW ground mounted	FIT	16.59
Biogas (average)	FIT	16.22
Biomass (average)	FIT	10.97
Wind	FIT	9.45
Hydro (average)	FIT	5.75
Geothermal	FIT	7.5

Table 12.3 Support for specific technologies in Serbia, EURcent/kWh

Source: REKK RES-E Survey 2013

Rate of support (market premium manifested in FIT or certificate price)

It is clear that the total support budget for RES-E increased significantly over the last two years. The comparative analysis of the last three years shows that the support costs have tripled. As a consequence, the support budget grew by a factor of over 10 while the quantity of supported RES electricity grew by a factor of over 8. In 2012 alone, the average incentive payouts to RES-E increased by 36% (from about 51 EUR/MWh to almost 70 EUR/MWh) while the electricity wholesale price dropped by about 7% (from about 55 EUR/MWh to 51 EUR/MWh).

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2010	0.45	0.21	0.24	4.25	56.47
2011	1.46	0.75	0.70	13.76	50.94
2012	4.37	1.86	2.51	36.20	69.36

Table 12.4 Cost Structure of RES-E support in Serbia, mEUR

Source: REKK RES-E Survey 2013.

12.4 Cross-border cooperation

Non RES – E (export/import capacities, traded electricity)

The Republic of Serbia has eight borders and eleven interconnection lines (400kV and 220kV). Elektromreza Srbije (EMS), the country's electricity transmission operator, allocates the rights to use transmission capacity across the segments of interconnection lines. EMS and the neighboring transmission system operators share cross-border transmission capacities in a 50/50 agreement, with the exception of the Serbian-Hungarian border where common explicit auctions have been organized since 2011 for the allocation of 100% of available capacity.

The Republic of Serbia has a fairly balanced export/import ratio of electricity, yet this balance is highly dependent on the hydrological conditions of a given year. In 2011 and 2012 for instance, due to a very dry summer Serbia had to import much more electricity than estimated. The net electricity import amounted to +264 GWh in 2011 and -440 GWh in 2012.

RES-E

The Republic of Serbia is involved in cross-border cooperation in order to enhance RES-E generation jointly with its neighbors. However, this sort of cooperation comes only as a second priority, i.e. after the national RES-E target is met.

The biggest yet established joint agreement in the field of cross-border cooperation is the one between EPS and Seci Energia, of the Maccafferi Group based in Italy.

The idea of cooperation arose after Serbia, as one of the signatories of the Energy Community Treaty, committed to implement the EU RES Directive 2009/28/EC and promote the use of statistical transfer. The related legal framework was incorporated in 2012 (Decision of the Ministerial Council of the Energy Community, 2012)[125], but the Ibar River project was agreed before this.

In 2010, Serbia and Italy signed an intergovernmental agreement on the cooperation in the field of energy in which they envisioned would establish a new joint company based on the principles of Public-Private Partnership. The latter was confirmed in 2011 through the adoption of a law which defines the scope of cooperation.[126]

[125] The procedure for statistical transfer now includes the approval of the transfer by the Ministerial Council of the Energy Community. The authorization is granted subject to the condition that the transferring country is on the right path for the achievement of its 2020 national target.

[126] *Zakon o potvrđivanju sporazuma između vlade Republike Srbije i vlade Republike Italije o saradnji u oblasti energetike* (The Law on defining the cooperation between the governments of the Republic of Serbia and the Republic of Italy in the Energy sector), Official Gazette of the Republic of Serbia",2012.

The joint company was established and the agreement stipulated that the total annual income would be distributed in the following ratio between the parties: 51% to the Seci Energia and 49% to EPS. Seci Energia announced an investment of EUR 285 million into the construction of ten small HPPs on the Ibar River in Central Serbia, and it is expected that these HPPs would have a total capacity of 103 MW and annual production of 450 GW/hour.

The entire production from the Ibar river project will be statistically transferred to Italy. Physical delivery is to be carried out via Montenegro and through an undersea transmission cable which is still to be constructed. The undersea cable is part of a wider transmission grid development project organized primarily by Italy and Montenegro. The Serbian contribution to the project is a grid extension to the border with Montenegro.

Both sides expect to achieve a higher usage of energy from RES, improve the infrastructure and gain financial profit.

12.5 Appendix – Feed-in tariffs in Serbia (from 1st February 2013)

Item	Power Plant type	P - Installed Power (MW)	Feed-in tariff (EURcent/kWh)
1	Hydro power plant		
1.1		P ≤ 0.2	12.40
1.2		0.2 < P ≤ 0.5	13.727-6.633*P
1.3		0.5 < P ≤ 1	10.41
1.4		1 < P ≤ 10	10.747-0.337*P
1.5		10 < P ≤ 30	7.38
1.6	On the existing infrastructure (existing dams, accumulations etc.)	2 < P ≤ 10	5.9
2	Biomass power plant		
2.1		P ≤ 1	13.26
2.2		1 < P ≤ 10	13.82 – 0.56*P
2.3		P > 10	8.22
3.	Biogas power plant		
3.1		P ≤ 0.2	15.66
3.2		0.2 < P ≤ 1	16.498 – 4.188*P
3.3		P > 1	12.31
3.3	Biogas power plants from animal residues (slaughterhouse waste)	All installed capacities	12.31
4.	Landfill and sewage gas power plant	All installed capacities	6.91
5.	Wind power plant (Cap of 300 MW of total installed wind capacities until 2015, and additional 200 MW of wind capacities in the period 2015-2020; total cap – 500 MW of wind capacities until 2020)	All installed capacities	9.20
6.	Solar PV power plants (Cap on total installed capacity until 2020 – 10 MW)		
6.1	Solar PV power plants (Cap on total installed capacity until 2020 – 2 MW)	Roof-top installed P ≤ 0.03	20.66
6.2	Solar PV power plants (Cap on total installed capacity until 2020 – 2 MW)	Roof-top installation 0.03 < P ≤ 0.5	20.941-9.383*P
6.3	Solar PV power plants (Cap on total installed capacity until 2020 – 6 MW)	Ground installation All capacities	16.25
7.	Geothermal power plant		
7.1		P ≤ 1	9.67
7.2		1 < P ≤ 5	10.358-0.688*P
7.3		P > 5	6.92

13 RES-E COUNTRY PROFILE - SLOVAKIA

13.1 General description of the RES-E sector

The Slovakian electricity market has been liberalized since 2007. Electricity consumption in 2012 was 28 786 GWh and total gross electricity generation was 28 393 GWh. The mix was dominated by nuclear power plants (54.57%), while fossil fuels also had a significant role (18.38%). The share of the renewable based power generation was 27.05%, the majority of which can be attributed to hydro power plants.[127]

Capacity and generation mix

The total installed capacity in 2012 was around 8431 MW including 2296 MW (39.15%) RES-E capacity, within which hydro (76.8%), PV (15.9%) and solid biomass (5.1%) play significant roles.[128] The distribution of RES-E capacities, RES-E generation and their projected level according to NREAP are shown in Figure 13.1 and Figure 13.2.

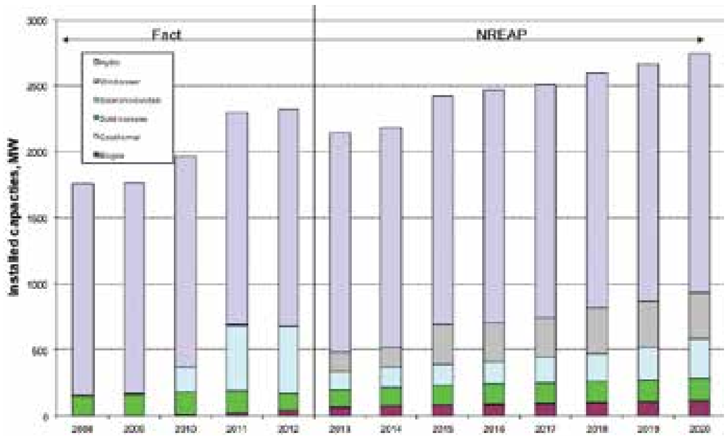

Figure 13.1 Installed RES-E capacities between 2008-2020 in Slovakia, MW

Source: REKK RES-E Survey 2013

[127] National Control Centre of Slovakia, Annual Report 2012, www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2012.pdf
[128] REKK RES-E Survey 2013 and National Control Centre of Slovakia, Annual Report 2012, www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2012.pdf

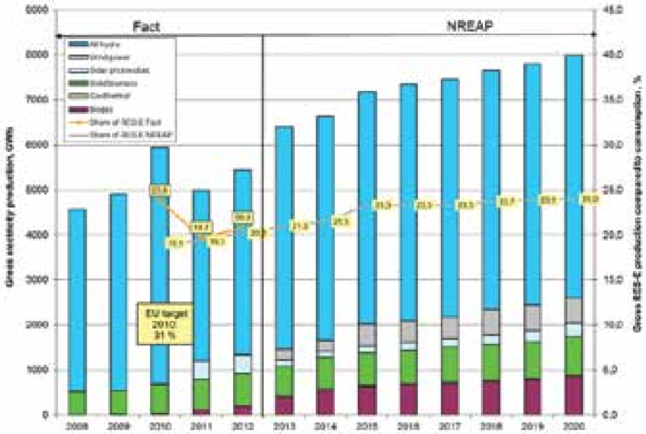

Figure 13.2 Gross renewable electricity production in Slovakia, GWh

Source: REKK RES-E Survey 2013, NREAP

Slovakia has implemented the RES Directives (2001/77/EC and 2009/28/EC). According to the NREAP, the indicative target for RES-E generation by 2020 is 8000 GWh, which is 24% of gross final electricity consumption. The majority of RES-E production in 2020 will still be based on hydro power plants, but biogas and wind power are also expected to have a growing share. Yet the support for solar and wind projects is continuously decreasing, while the most promoted renewable energy source will be biomass.

Slovakia has a large renewable energy potential. Hydro power production, including pumped storage stations, could be increased considerably. There are also significant additional wind, biomass and geothermal resources available.[129] The realizable potential of different sources for 2020 are shown in Table 13.1.

	Geothermal	Hydro large-scale	Hydro small-scale	Photovoltaic	Wind	Biogas	Solid biomass
Realizable potential for 2020 (GWh)	23	4698	500	1360	1093	1186	2326

Table 13.1 Realizable potential for different renewable sources in Slovakia, GWh

Source: http://www.reshaping-res-policy.eu/downloads/RE-Shaping_CP_final_18JAN2012.pdf

RES-E market design

Due to the minor share of intermittent generation in total RES-E production, balancing responsibility is not a major issue in Slovakia. The three distribution system operators are required to take all electricity generated from renewable energy sources, to cover their losses, and pay the price of electricity for the losses. If the electricity from RES-E exceeds the amount needed to cover losses in the distribution system, the distribution system operator is entitled to sell the electricity at the market price.

[129] RES-Integration – Country Report, Slovakia http://www.eclareon.eu/sites/default/files/slovakia_-_res_integration_national_study_nreap.pdf

According to our understanding, in Slovakia there is no intraday market in operation. The deviation of schedules is calculated as the net of total deviation within the group of renewable plants. Since 2011 the responsibility for deviations in RES-E facilities of up to 1 MW has been transferred to the distribution system operator (in 2009-2010 it was up to 4 MW).[130]

13.2 RES-E barriers

Licensing and certification

New renewable energy power plants with an installed capacity of more than 1 MW (for solar power plants above 100 kW) can be constructed only if they receive a certificate of compliance with the Slovak Energy Policy Concept. The issuing authority for the electricity production licence is the Energy Regulator. The licence has to be accompanied by a confirmation that the project has been approved by the transmission or distribution grid operator to which the plant will be connected.[131] The RES-E licensing process usually involves several (5-15) authorities.

The Regulatory Office for Network Industries upon the request of an RES-E producer then issues a guarantee of origin for the preceding year.

The authorities stopped granting approvals for wind farms in 2009 arguing that they threaten the stability of the grid.[132]

Grid integration

In Slovakia, renewable electricity generators are entitled to priority connection to the transmission or distribution grid on a first come first served basis regardless of their installed capacities. Renewable generators are also granted priority dispatch on the transmission grid.

A RES plant is connected to the distribution grid after meeting three conditions: the distribution grid has the technical capacity for the connection, the distribution grid is in close proximity to the electricity generating installation, and economically and technically superior grid-connecting options are non-available.

The cost of connection and grid extension of the distribution system shall be borne jointly by the electricity producer and the distribution grid operator. In practice however, the cost is paid according to the deep cost approach, and a larger amount (according to our expert 98%) is paid by the RES plant operator in the form of a grid connection fee. Connection fees are calculated according to rules presented in the business conditions of the TSO or DSO that determined them whereas the regulatory office gives final approval.[133]

13.3 Support scheme for RES-E

In Slovakia, renewable energy sources are promoted through a purchase obligation for electricity generated in RES-E facilities and the payment of a feed-in tariff. The regional distribution grid operator, to which the renewable energy power plant is connected, is obliged to off-take all such produced electricity. The guaranteed off-take of electricity applies to power plants with an overall installed capacity up to 1 MW for its entire operating life, and 15 years for above 1 MW from the year of commission or significant

[130] REKK RES-E Survey 2013
[131] Renewables Support Mechanism Across Europe: A Comparative Study, CMS Legal Services publication, 2013, http://www.cms-dsb.com/Hubbard.FileSystem/files/Publication/66d448bf-8611-4409-bb4f-4ccee4bbbcf9/Presentation/PublicationAttachment/d2078c0b-4df4-45f2-9e72-359f37f345fb/CMS_Renewable_Energy_Guide_April_2013_b.pdf
[132] http://www.ewea.org/fileadmin/files/library/publications/reports/Eastern_Winds_emerging_markets.pdf
[133] GreenNet-Incentives, http://www.greennet-europe.org

reconstruction/modernization. The feed-in tariff consists of the price of electricity to cover grid losses (market price)[134] and an additional payment of the difference between the price and the fixed feed-in tariff. Only systems whose total installed capacity do not exceed 10 MW (15 MW in the case of wind power plants) are eligible for the additional payment. In the case of PV, the right to a supplementary payment applies only to solar power plants with a capacity below 30 kW located on the roof or sides of a building. Power plants exceeding the above mentioned capacities receive an additional payment up to a proportional ratio of the installed capacity. The support scheme guarantees the payment for 15 years after the commencement of operation or following a significant reconstruction or modernization of a power plant, no matter which technology it uses. The tariff is calculated by the regulatory authority, and depends on the type of RES, the technology used, the size of the installation and the date of starting operation.[135]

The right for off-take of electricity and additional payment only relates to power plants with an overall installed capacity up to 125 MW, increasing to 200 MW if the electricity is produced in high efficiency cogeneration plants and the share of renewable energy sources in the fuel is higher than 20%.[136]

However, each year the regulator may increase or decrease the feed-in tariff in accordance with the core inflation index and the previous year's price of raw materials. Regulated prices (total remuneration level) for some selected technologies put into operation after 1 January 2013 are shown in Table 13.2.

Technology	Specification (FIT/FIP)	Support (in EURcent/kWh)
PV 5 kW (residential) rooftop	FIT	11.90
PV 30 kW rooftop	FIT	11.90
PV 1 MW ground mounted	FIT	
Biogas (average)	FIT	13.40
Biomass (average)	FIT	13.30
Wind	FIT	7.90
Hydro (average)	FIT	9.80
Geothermal	FIT	19.05

Table 13.2 Support for specific technologies in Slovakia, EURcent/kWh

Source: Renewables Support Mechanism Accross Europe: A Comparative Study

**Based on fuel used*

Note: Detailed values can be found in the Appendix.

In Slovakia electricity is subject to a consumption tax. Electricity produced from renewable sources, provided it is supplied directly to end consumers or consumed by a legal entity or an individual who produced it, is exempted from the electricity excise tax.

[134] It is calculated as the arithmetic average of the prices of electricity for covering the grid losses of all regional distribution system operators and is determined by the Regulatory Authority

[135] Renewables Support Mechanism Across Europe: A Comparative Study, CMS Legal Services publication, 2013, http://www.cms-dsb.com/Hubbard.FileSystem/files/Publication/66d448bf-8611-4409-bb4f-4ccee4bbbcf9/Presentation/PublicationAttachment/d2078c0b-4df4-45f2-9e72-359f37f345fb/CMS_Renewable_Energy_Guide_April_2013_b.pdf

[136] Wolff Thesis Guide to: RES-Electricity in Slovak Republic, http://www.wolftheiss.com/tl_files/wolftheiss/CSC/Guides/The_Wolf_Theiss_Guide_to_Generating_Electricity_from_Renewable_Sources_in_CEE_and_SEE_2013.pdf

Annual support budget

Table 13.3 shows the costs of supporting RES-E.

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2010	143	105	38	1900	20.00
2011	332	140	192	2550	75.29
2012	415	145	270	2900	93.10

Table 13.3 Cost structure of RES-E support in Slovakia, mEUR

Source: REKK RES-E Survey

The costs of support scheme are borne by the consumers, through their electricity bill.

13.4 Cross-border cooperation

Slovakia is a moderate net importer of electricity. In 2012 the net electricity import was 392 GWh, supplying 1.5% of the gross electricity consumption that year.[137] There are significant exchanges with the Czech Republic and Hungary, whereas exchanges with Poland and Ukraine are modest and there is no interconnection with Austria. Grid development will be necessary to integrate the increasing intermittent generation which will require the improvement of interconnections.

Since 2009, daily cross-border capacity between Slovakia and the Czech Republic has been allocated via implicit auction as a result of the coupling of spot markets in the Slovak Republic and the Czech Republic. Moreover, since 2011 there has been an intraday capacity allocation system functioning on this border which is free of charge provided the cross-border transmission requirements were accepted, under the "first come, first served" principle. On 11 September 2012 the coupling of the day-ahead electricity markets in the Czech Republic, Slovakia and Hungary was launched. As part of the project the systems in use have already been developed for the EU Target Model of Electricity Markets.

We are unaware of additional initiatives for cross-border cooperation with neighbouring countries meant to enhance RES-E generation. According to our expert, cross-border cooperation is only of secondary priority after meeting the national RES-E target.

[137] Source: ENTSO-E

13.5 Appendix: Feed-in tariffs for energy produced from renewable energy plants put into operation after 1 January 2013

Type of renewable energy source	Price of electricity in EUR / MWh
Hydro power plant with installed capacity	— up to 1 MW – 109,08 — 1 MW–5 MW – 97,98 — above 5 MW – 61,72[1]
Solar power plant with installed capacity up to 100 kW placed on the building	119,11
Wind power plants	79,79
Geothermal energy power plant	190,51
Incineration or co-incineration of biomass by combined production	— intentionally cultivated biomass (excluding cereal straw) – 112,74 — other waste biomass (excluding cereal straw) – 122,64 — cereal straw – 154,27 — bioliquids – 115
Co-Incineration of biodegradable parts of municipal waste with fossil fuels by combined production, if the determined share of biodegradable part in the municipal waste is reached	123,27
Incineration of biogas	— landfill gas or sewage treatment gas plant – 84,69 — biogas produced with anaerobic fermentation technology with a total installation power of - up to 1 MW incl. – 134,08 - above 1 MW – 118,13 — gas produced by thermo-chemical incineration of biomass in an incineration generator – 149,87 — fermented mixture produced by aerobic fermentation of biodegradable waste – 144,88

Source: Renewables Support Mechanism Across Europe: A Comparative Study, (CMS, 2013)

14 RES-E COUNTRY PROFILE - SLOVENIA

14.1 General description of the RES-E sector

The structure of electricity generation in Slovenia remained somewhat unchanged over the last 10-15 years. The three most important sources of electricity production are the nuclear power plant in Krško, which is the largest electricity generator providing around 35% of total generation,[138] the thermal power plants possessing a 32% share, and the hydro power plants with a 26% share of total electricity generated in 2012. The remaining portion of the generation was supplied by small plants connected to the transmission and distribution system.[139] Although power plants running on renewable sources – excluding large hydro plants – still cannot play a major role in electricity generation, they are becoming more and more important. According to the NREAP,[140] in 2005 there was no electricity generated from solar power and in 2012 more than 120 GWh was produced. The most significant improvement in RES generation can be seen in this segment, where the installed capacity of solar power plants doubled both in 2011 and in 2012. According to the Slovenian Energy Agency this is a direct result of the favourable support scheme in the country. In the following figures, the evolution of RES-E installed capacities and generation are shown together with the projections from the NREAP of Slovenia. As we can see, the target for solar energy has already been exceeded (the fact is 240 MW as opposed to the target of 139 MW) and the large hydro power plant's installed capacity is also close to the NREAP 2020 target. In the case of biogas, the actual growth rate is smaller than envisaged in the NREAP (36 MW for 2011 and 44 MW for 2012), but with 29 MW installed in 2012 the 2020 target does not seem unattainable. While for solar power plant developers the support scheme system to provide an adequate incentive, until now it does not seem to be the case for investors of wind and biomass generation.

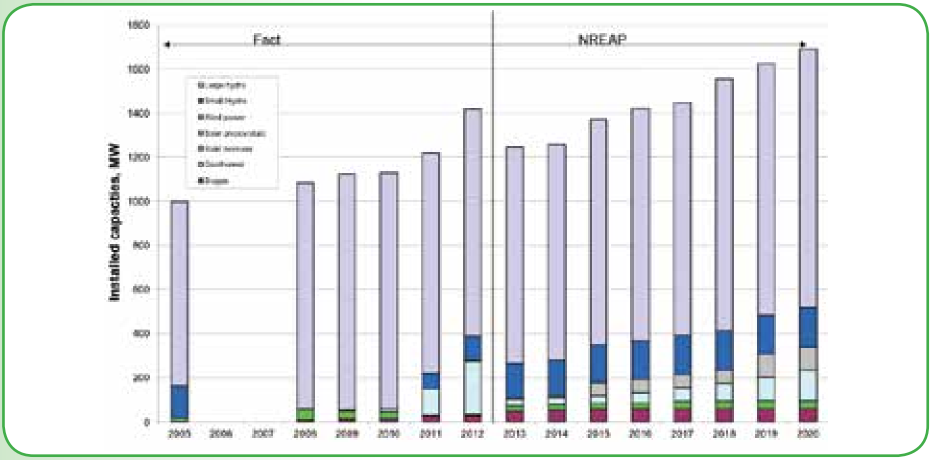

Figure 14.1 Net renewable electricity generation capacity in Slovenia, MW

Source: IEA Statistics, Renewables Information 2012 and NREAP

[138] Since the plant is owned jointly with Croatia, half of this belongs to the Croatian system operator, in accordance with the bilateral agreement between countries.
[139] 2012 annual report of the Energy Agency of the Republic of Slovenia, http://www.agen-rs.si/dokumenti/36/2/2013/PorociloANG2012_1921.pdf
[140] http://ec.europa.eu/energy/renewables/action_plan_en.htm

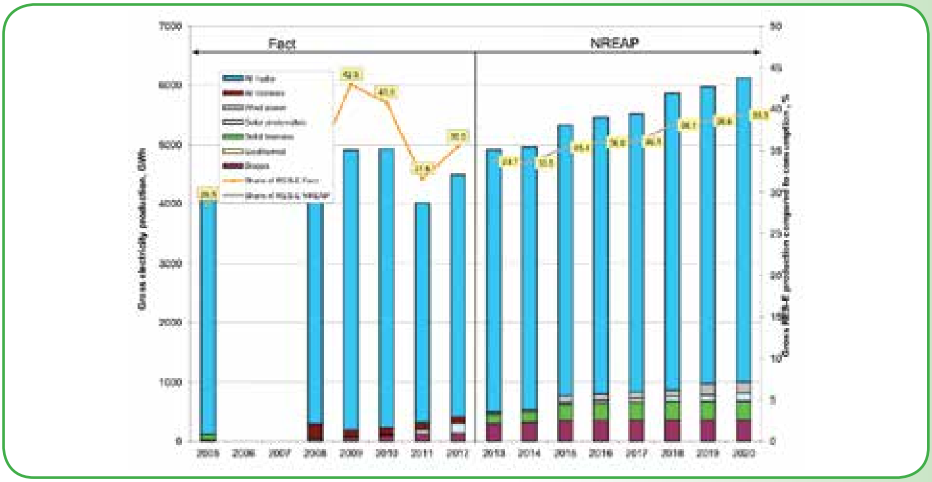

Figure 14.2 Gross renewable electricity production in Slovenia, GWh

Source: IEA Statistics, Renewables Information 2012, REKK RES-E Survey 2013, Statistical Office of Republic of Slovenia and NREAP.

In Slovenia there are two specific balancing groups for the plants receiving support, including RES-E plants and CHP (cogeneration) plants. One is dedicated to those receiving FIT and the other for those selling electricity in the market and receiving a premium. Renewable electricity generators have priority access and also enjoy priority dispatching. In the case of generators receiving guaranteed purchase support, the Centre for RES/CHP is responsible for forecasting and scheduling with the help of the balance group operator (in the case of conventional production it is only the responsibility of the latter). In Slovenia there is also an intraday market in operation to trade imbalances which also increases security of supply.

Potential estimations for Slovenian RES-E plants were provided by M. Obrecht and M. Denac in an article published in 2013.[141] Though the work is recent, it is not completely up-to-date; for example their solar power potential estimation has already been exceeded and they are not always in line with the targets set in NREAP. The study estimated the potential of four energy sources: for biogas the estimated potential is 50 MW and for small hydro plants it is 180 MW. With regard to wind power, Elektro Primorska, one of the five distribution operators in Slovenia, identified three possible wind fields and came up with a potential of 180 MW. However, taking into consideration the strict rules concerning the potential impact of wind farms on the landscape, the authors concluded that only about 90 MW of wind power plants could be commissioned in the country. Although here we can add that the 2020 target in the NREAP is 106 MW, while the National RES industry roadmap projects 500 MW.[142]

RES-E barriers

The average lead time of the authorization procedure for RES-E plants, including the connection is not more than 9 months, and for solar plants it is only 3 months.[143] RES-E plants are given priority in the grid connection and available capacities are allocated amongst them on a first come first served basis. From the generator to the nearest grid connection point all the costs are borne by the plant operator, but the

[141] M. Obrecht and M. Denac: A sustainable energy policy for Slovenia: Considering the potential of renewables and investment costs, Journal of Renewable and Sustainable Energy Volume 5, Issue 3 http://scitation.aip.org/content/aip/journal/jrse/5/3/10.1063/1.4811283

[142] European Renewable Energy Council: Mapping Renewable Energy Pathways towards 2020 – published: March 2011, http://www.erec.org/media/publications/eu-roadmap.html

[143] REKK RES-E Survey 2013

cost of further grid development – if needed – is split between the plant operator and the system operator. Any additional costs to reinforce the grid are usually borne by the TSO, who passes it on to the end users as part of the electricity bill.[144] We should mention here, that according to the European Commission[145] in Slovenia administrative procedures, long lead times and enforcement of RES-E producer rights are the main barriers for RES-E developers in the connection phase.

Support scheme for RES-E

In Slovenia there is an extensive renewable support system. Plant operators can apply for a feed-in tariff or a premium tariff, while special "renewable" loans and subsidies are also available. The Environmental Fund of the Republic of Slovenia – financed by the national budget and voluntary donations – awards low-interest loans to renewable energy, made available through tendering. Slovenia provides funding for the national subsidy scheme as well, which is awarded by the Ministry for Infrastructure and Spatial Planning through a tendering process that is held on a regular basis. Tender documents outline the technologies eligible for support and enumerate how the subsidy is paid.

Feed-in tariffs and premium tariffs are also available for renewable plant operators with a capacity under 5 MW. They can choose between getting a guaranteed price (FIT), or selling their electricity on the market and getting an additional premium above that price (FIP). Above the 5 MW threshold, only the premium tariff scheme is accessible. A plant operator must make a declaration as to which of the two support systems it seeks to participate in, and the declaration is issued by the Slovenian Energy Agency (only for a period of up to 5 years). After that, the market operator BORZEN and the plant operator sign a contract. The guaranteed price in the FIT system will be paid for maximum of 15 years depending on the agreement of the contracting parties, while in the FIT scheme there is no particular time limit for receiving the premium. The premium is defined as the difference between a given reference cost and a reference market price multiplied with a "B-factor." All three elements are set in advance, and the reference market price is the anticipated market price forecasted by the Energy Agency; for 2013 it was 5.066 EURcent/kWh. Table 14.1 shows the feed-in tariffs for some selected technologies. The amount of support relevant to the different categories can be seen in Table 14.3 and Table 14.4. The updated April 2013 tariffs are subject to digression, meaning a 2% reduction in every consecutive month for both guaranteed and premium tariffs.

Technology	Specification (FIT/FIP)	Support (in Eurocent/kWh)
PV 5 kW (residential) rooftop	FIT	12.26
PV 30 kW rooftop	FIT	12.26
PV 1 MW ground mounted	FIT	10.61
Biogas (< 5 MW, average)	FIT	13.90
Biomass (< 5 MW, average)	FIT	19.59
Wind (< 5 MW)	FIT	9.54
Hydro (< 5 MW, average)	FIT	10.55
Geothermal (< 5 MW)	FIT	15.25

Table 14.1 Support for specific technologies in Slovenia, EURcent/kWh

Source:REKK RES-E Survey 2013

[144] res-legal.eu and REKK RES-E Survey 2013

[145] European Commission guidance for the design of renewables support schemes - published in 2013, November, http://ec.europa.eu/energy/gas_electricity/doc/com_2013_public_intervention_swd04_en.pdf

Both systems are being financed by consumers through a surcharge paid in their electricity bill, depending on the power voltage and consumption levels. To assist with the sustainability of the support system, tariffs are revised annually, and the above mentioned digression is in place for solar power plants. Also a cap is set each year, and only 5 MW of newly installed capacity of ground-mounted PV plants is supported.[146] The exact amount of incentives paid in the last 5 years are the following:

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component FIT mEUR (C1)=(A)-(B)	Incentive component FIP mEUR (C2)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh ((C1+C2)/D)
2009*	n.a.	n.a.	2	21	930	24.41
2010*	n.a.	n.a.	23	26	1000	48.60
2011	n.a.	n.a.	17	36	650	81.85
2012	n.a.	n.a.	20	51	450	158.67

Table 14.2 Cost structure of RES-E support in Slovenia, mEUR

Source: REKK RES-E Survey 2013 and 2011, 2012 yearly report of Slovenian Energy Agency

*Including CHP plants

14.2 Cross border cooperation

Cross-border transfer capacities are allocated through explicit and implicit auctions. On the Austrian and the Croatian border the Central Allocation Office (CAO) organizes explicit auctions, while on the Italian border yearly, monthly and intraday explicit auctions are held for both directions by the auction office CASC.EU[147] due to the market coupling.

RES-E cross-border cooperation is not likely to be a priority for the country.

[146] REKK RES-E Survey 2013
[147] eles.si

14.3 Appendix

Type	Capacity	Operating support (EURcent/kWh)	B-factor
wind	Up to 10 MW	4.34	0.8
	10 MW < and < 125 MW	3.08	0.86
hydro	Up to 50 KW	4.96	0.86
	50 kW < and < 1 MW	3.67	0.86
	1 MW < and < 10 MW	2.38	0.9
	10 MW < and < 125 MW	1.8	0.9
solar	building-mounted		
	Up to 50 KW	35.82	0.88
	50 kW < and < 1 MW	32.28	0.88
	1 MW < and < 10 MW	25.62	0.91
	10 MW < and < 125 MW	21.57	1
	other PV installations		
	Up to 50 KW	33.32	0.88
	50 kW < and < 1 MW	30.25	0.88
	1 MW < and 5 MW	23.08	0.91
	10 MW < and < 125 MW	20.42	1
geotherm	Up to 1 MW	determined individually	0.92
	1 MW < and 5 MW	9.27	0.92
	10 MW < and < 125 MW	determined individually	0.92
biogas	from biomass		
	Up to 50 KW	10.29	0.88
	50 kW < and < 1 MW	9.66	0.91
	1 MW < and 5 MW	8.1	0.92
	10 MW < and < 125 MW	-	1.00
	from biodegradable waste		
	Up to 50 KW	-	0.88
	50 kW < and < 1 MW	8	0.91
	1 MW < and 5 MW	6.9	0.92
	10 MW < and < 125 MW	-	1.00
	gas derived from sludge from wastewater treatment plants		
	Up to 50 KW	2.6	0.92
	50 kW < and < 1 MW	1.46	0.92
	1 MW < and 5 MW	6.9	0.92
	10 MW < and < 125 MW	-	1.00
	landfill gas		
	Up to 50 KW	3.95	0.92
	50 kW < and < 1 MW	0.76	0.92
	1 MW < and 5 MW	0.25	0.92
	10 MW < and < 125 MW	-	1.00
biodegradable waste	Up to 50 KW	-	0.92
	50 kW < and < 1 MW	1.76	0.92
	1 MW < and 5 MW	1.45	0.92
	10 MW < and < 125 MW	-	0.92
biomass	90%+ is wood		
	Up to 50 KW	determined individually	0.88
	50 kW < and < 1 MW	16.52	0.91
	1 MW < and 5 MW	10.76	0.92
	10 MW < and < 125 MW	determined individually	0.92
	wood+fossil fuel (5%+ from biomass)		
	Up to 50 KW	4.27	0.88
	50 kW < and < 1 MW	4.27	0.91
	1 MW < and 5 MW	4.27	0.92
	10 MW < and < 125 MW	determined individually	0.92
	wood+fossil fuel (5%- from biomass)		
	Up to 50 KW	2.64	0.88
	50 kW < and < 1 MW	2.64	0.91
	1 MW < and 5 MW	2.64	0.92
	10 MW < and < 125 MW	2.64	0.92

Table 14.3 Support for different technologies in Slovenia– FiT

Source: res-legal.eu, Decree on Support for Electricity Generated from Renewable Energy Sources[148]

Building mounted PVs are heavily supported: installations up to 5 kW are entitled to an additional 5% of the reference costs if they are connected behind the end user's meter.

[148] http://www.mzip.gov.si/fileadmin/mzip.gov.si/pageuploads/Energetika/Sprejeti_predpisi/RES_ENG.pdf

Type	Capacity	Operating support (EURcent/kWh)	B-factor
wind	Up to 10 MW	4.34	0.8
	10 MW < and < 125 MW	3.08	0.86
hydro	Up to 50 KW	4.96	0.86
	50 kW < and < 1 MW	3.67	0.86
	1 MW < and < 10 MW	2.38	0.9
	10 MW < and < 125 MW	1.8	0.9
solar	building-mounted		
	Up to 50 KW	35.82	0.88
	50 kW < and < 1 MW	32.28	0.88
	1 MW < and < 10 MW	25.62	0.91
	10 MW < and < 125 MW	21.57	1
	other PV installations		
	Up to 50 KW	33.32	0.88
	50 kW < and < 1 MW	30.25	0.88
	1 MW < and 5 MW	23.08	0.91
	10 MW < and < 125 MW	20.42	1
geotherm	Up to 1 MW	determined individually	0.92
	1 MW < and 5 MW	9.27	0.92
	10 MW < and < 125 MW	determined individually	0.92
biogas	from biomass		
	Up to 50 KW	10.29	0.88
	50 kW < and < 1 MW	9.66	0.91
	1 MW < and 5 MW	8.1	0.92
	10 MW < and < 125 MW	-	1.00
	from biodegradable waste		
	Up to 50 KW	-	0.88
	50 kW < and < 1 MW	8	0.91
	1 MW < and 5 MW	6.9	0.92
	10 MW < and < 125 MW	-	1.00
	gas derived from sludge from wastewater treatment plants		
	Up to 50 KW	2.6	0.92
	50 kW < and < 1 MW	1.46	0.92
	1 MW < and 5 MW	6.9	0.92
	10 MW < and < 125 MW	-	1.00
	landfill gas		
	Up to 50 KW	3.95	0.92
	50 kW < and < 1 MW	0.76	0.92
	1 MW < and 5 MW	0.25	0.92
	10 MW < and < 125 MW	-	1.00
biodegradable waste	Up to 50 KW	-	0.92
	50 kW < and < 1 MW	1.76	0.92
	1 MW < and 5 MW	1.45	0.92
	10 MW < and < 125 MW	-	0.92
biomass	90%+ is wood		
	Up to 50 KW	determined individually	0.88
	50 kW < and < 1 MW	16.52	0.91
	1 MW < and 5 MW	10.76	0.92
	10 MW < and < 125 MW	determined individually	0.92
	wood+fossil fuel (5%+ from biomass)		
	Up to 50 KW	4.27	0.88
	50 kW < and < 1 MW	4.27	0.91
	1 MW < and 5 MW	4.27	0.92
	10 MW < and < 125 MW	determined individually	0.92
	wood+fossil fuel (5%- from biomass)		
	Up to 50 KW	2.64	0.88
	50 kW < and < 1 MW	2.64	0.91
	1 MW < and 5 MW	2.64	0.92
	10 MW < and < 125 MW	2.64	0.92

Table 14.4 Support for different technologies in Slovenia – FiP

Source: Decree on Support for Electricity Generated from Renewable Energy Sources[149]

[149] http://www.mzip.gov.si/fileadmin/mzip.gov.si/pageuploads/Energetika/Sprejeti_predpisi/RES_ENG.pdf

15 RES-E COUNTRY PROFILE - UKRAINE

15.1 Electricity production and RES-E in Ukraine

Capacity and electricity generation mix of Ukraine

In 2012 electricity generation was dominated by nuclear power, and 45% (90.1 TWh) of total output was produced by Energoatom, a large state-owned company comprising four plants with 13.8 GW capacity. Coal-based plants, having a total of 27.4 GW installed capacity, provided 40% of gross electricity output (78.9 TWh)[150] while 6.5 GW of co-generating plants contributed about 9% of electricity generation, followed by hydro units that generated 11 TWh from 5.5 GW capacity. All other technologies, including renewables (without hydro) contributed only a small proportion: 0.32% of all generation.[151]

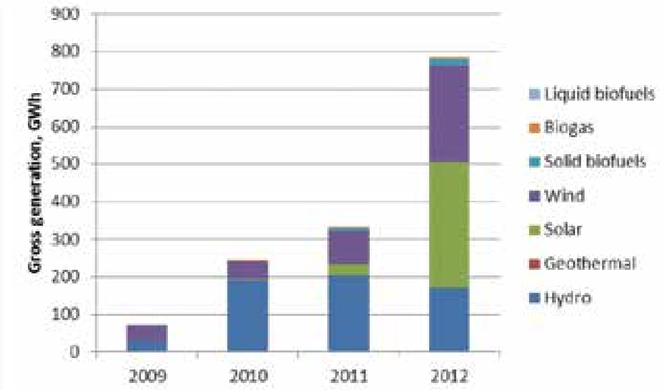

Figure 15.1 RES-E production in Ukraine (without large hydro output), GWh

Source: REKK RES-E Survey 2013 and CISSTAT (2013)

Figure 15.1 shows Ukraine's RES-E production between 2009-2012, excluding the output of already existing large HPPs. We can see that non-hydro renewables gradually increased their production, with a more rapid uptake in 2012. If we also take large hydro generation into account, we find that the RES-E share in total production has varied between 5.7% and 7.0% in the last four years, close to the EU's 2010 target of 7.4% share.[152]

[150] The available capacity of coal plants fell behind installed capacity considerably, due to the age and state of the power plants commissioned mostly in the period of 1965-1970.
[151] Sources: REKK RES-E survey 2013 and IMEPOWER: http://imepower.wordpress.com/sector-overview/
[152] CISSTAT. 2013. "Production of the Electric Power". Database. Official Statistics of the Countries of the CIS. http://www.cisstat.com/0base/index-en.htm

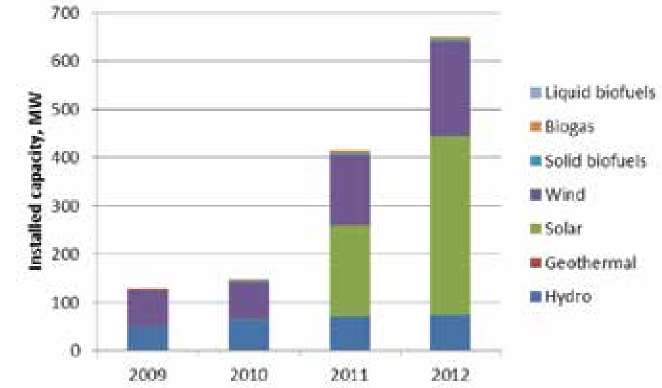

Figure 15.2 RES-E installed capacities in Ukraine (with only small hydro included), MW

Source: REKK RES-E Survey 2013

Figure 15.2 shows RES-E installed capacities, excluding large hydro power plants. The main conclusions which can be drawn from the two figures above are the visible and accelerating uptake of solar PVs from 2011 (the growth in solar production is even more pronounced); the growth and subsequent stagnation of small hydro production from 2010; the growth of wind generation in 2012 in spite of capacities developing relatively slowly; and the stagnation and low share of all other technologies.

15.2 Share of RES-E in supply, breakdown of built-in capacities

RES-E market design

Ukraine introduced a support mechanism to encourage renewable energy generation in 2009. With the codification of Article 17-1 in Ukraine's Electricity Law, the so-called "green tariff" (feed-in tariff) was introduced to support electricity production using alternative energy sources. Secondary legislation was adopted by the end of 2009. According to the Electricity Law, not only newly-built but all existing hydropower plants are entitled to green tariff unless their installed capacity exceeds 10 MW.[153]

The hydropower produced by Ukrhydroenergo's large hydropower plants are not supported by FIT.[154] All the electricity produced by large hydro power plants is sold at the wholesale electricity market at regulated rates: these rates are cost-based and set by Regulator.[155] Apart from large hydro power plants, the Law guarantees that all renewable electricity generated under the green tariff system will be purchased. Renewable electricity may be sold to Energorynok (the state enterprise that operates the wholesale electricity market), directly to consumers (in case the RES-E generator has an energy supplier licence), or to energy supplier companies.[156] In order to sell all of the electricity to Enegorynok at green tariff rates, the producer must join the wholesale electricity market, obtain a license for electricity generation or for co-generation, establish a contract with Energorynok, and apply to the National Energy Regulatory Commission of Ukraine for a green tariff.

[153] OECD (2013) Attracting Investment in Renewable Energy in Ukraine, Private Sector Development Policy Handbook, November 2012 http://www.oecd.org/countries/ukraine/UkraineRenewableEnergy.pdf
[154] Ukrhydroenergo is the state-owned public company encompassing Ukraine's large hydro power stations.
[155] REKK RES-E Survey 2013
[156] The Wolf-Theiss Guide to: Generating Electricity from Renewable Sources in Central, Eastern and Southeastern Europe, 2013 Edition,http://www.wolftheiss.com/tl_files/wolftheiss/CSC/Guides/The_Wolf_Theiss_Guide_to_Generating_Electricity_from_Renewable_Sources_in_CEE_and_SEE_2013.pdf

Estimated RES-E potential

In general, the total potential of electricity generation based on renewable energy is estimated at 25 TWh in the draft National Energy Strategy of Ukraine. The total capacity target of alternative and renewable energy in Ukraine for 2030 is estimated to be at least 10% of the total installed capacity, or 5.7 GW (10-12 GW including large hydro power plants), and the volume of production is estimated at 11-16 TWh per year excluding large hydro (and 23-28 TWh including it).[157]

	2010	2015	2020	2025	2030
Wind	0.1	0.6	1.9	3.8	**7.4**
Solar	<0.1	0.3	0.8	1.4	**2.6**
Small hydro	0.2	0.4	0.7	1.3	**2.1**
Biomass	<0.1	<0.1	0.2	0.2	**0.3**
Generation from other RES	<0.1	<0.1	<0.1	0.1	**0.2**
Total	**<0.4**	**<1.4**	**3.6**	**6.8**	**12.6**

Table 15.1 Dynamics of production of electricity from renewable energy sources (RES-E) between 2010-2030, TWh

Source: Ukrainian Energy Strategy until 2030, Government of Ukraine, 2012

15.3 Barriers for RES-E development

Licensing and certification

The average number of authorities involved directly or indirectly in the RES-E licensing/permitting procedure is 5-15. The energy regulator is involved in two procedures: licensing of electricity production and submission/approval of feed-in tariffs. Other permits have to be acquired directly with the relevant authorities (e.g. environment permit, building permit, energy efficiency assessment).[158] The average lead time for the overall RES-E authorization procedure including grid connection is 9-24 months. The time depends on the developer's activity, meaning that some projects can theoretically be authorized in less than 9 months. The licensing procedure is neither differentiated by technology nor by installed capacity.

There has been a certification of origin for RES-E production in place since November 2012 under the Energy Efficiency Agency, a division of the Ministry of Economy, which is responsible for issuing guarantees of origin. According to a planned amendment to the Electricity Law, the issuing body would be the wholesale energy market operator Energorynok in the future.[159]

Grid integration

With regard to grid connection, RES-E plants do not have priority compared to conventional power plants. In the case of scarce grid connection capacity, the RES-E connection opportunities among competing RES-E developers are allocated on a first come first served basis. The costs of direct connection to the nearest grid point and indirect grid costs such as system development are shared as follows: the RES-E generator has to pay 50% of all costs as a debit, which will be paid back by the TSO/DSO during the next 10 years. Transmission companies are responsible for the necessary upgrades and extension of their systems. The connection charge for RES-E plants does not differ from the one for conventional plants. For RES-E generators there is guaranteed grid access.[160] According to the REKK RES-E Survey filled out by the regulator, at the moment there are no differences between balancing regimes of renewable and conventional electricity producers. Since installed capacity of RES generators is growing, the development

[157] Ukrainian Energy Strategy until 2030, Government of Ukraine, 2012, http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505
[158] REKK RES-E Survey 2013
[159] REKK RES-E Survey 2013
[160] REKK RES-E Survey 2013

of a special regime for renewable energy is planned. Both in the case of RES-E production and conventional electricity production, the plant operators are responsible for preparing the production schedule and deviation from the production schedule is calculated plant to plant.[161]

Energorynok calculates the payments for overproduction and underproduction one day after the end of supply. The payments compensate the additional costs of generation companies incurred from deviation from the schedule by order of the dispatcher. RES-E producers are responsible for scheduling their supplies but not for deviations from planned schedules.[162]

15.4 RES-E support scheme

RES-E utilization target

The only target for RES generation that was set under the conditions of Ukraine's accession to the Treaty establishing the Energy Community is an 11% share of renewable energy in gross final consumption of electricity by 2020. As we have shown earlier in this chapter, Ukraine is on track to achieve its target.

Ukraine chose feed-in tariffs (FIT) as a support mechanism for the RES-E sector, under the so-called "green tariff" system. The costs of the national RES-E electricity support scheme borne by the generator and/or supplier are passed on to consumers in the wholesale electricity price without a specific surcharge appearing in electricity bills.[163]

The tariff is applied to electricity generated from wind, solar PV, small hydropower plants and solid biomass and is differentiated by technology and size. The Electricity Law also makes sure that large hydropower plants are excluded from the FIT support mechanism.[164] Furthermore, the Law puts the obligation on RES-E producers to use a particular share of local Ukrainian content for all power plant construction projects that started after January 1, 2012 ("local content requirement").[165]

In addition to the FIT, RES-E developers have access for significant tax benefits and additional sources of funding provided by the European Bank for Reconstruction and Development (EBRD). The EBRD launched the Ukraine Renewable Energy Direct Lending Facility (UREDLF), with the aim of partial financing of small and medium-sized renewable energy projects (solar, wind, small hydro, biomass and biogas). It comprises an amount of up to EUR 50 million for financing projects together with Technical Assistance funded from a grant of USD 8.45 million from the Global Environment Facility.[166]

Feed-in tariff rates

Table 15.2 shows support tariffs in Ukraine (for all supported technologies FITs apply) for some selected technologies (A more detailed FIT table is included in the Appendix to this chapter). We can see that solar power receives a much higher per-kWh support than other technologies, which is likely the most important factor behind the relatively strong growth of PV compared to other RES-E technologies.

[161] REKK RES-E Survey 2013
[162] Electricity Balancing Models in the Energy Community, An Assessment Report of the Energy Community Regulatory Board March 2012, http://www.energy-community.org/pls/portal/docs/1496181.PDF
[163] REKK RES-E Survey 2013
[164] Parliament of Ukraine 2009 and 2013; Article 17–1 Верховна Рада України. 2009. Про Внесення Змін До Закону України „Про Електроенергетику... | Від 01.04.2009 № 1220-VI. http://zakon4.rada.gov.ua/laws/show/1220-17.
———. 2013. Про Електроенергетику. http://zakon4.rada.gov.ua/laws/show/575/97-%D0%B2%D1%80/page.
[165] Parliament of Ukraine 2013 (see former footnote), Article 17–3
[166] EBRD. 2013. "Ukraine Sustainable Energy Lending Facility: Strategic Environmental Review.", http://www.ebrd.com/pages/project/eia/39850.shtml.

Technology	Specification (FIT/FIP)	Support (in Eurocent/kWh)
PV 5 kW (residential) rooftop	FIT	35.80
PV 30 kW rooftop	FIT	34.90
PV 1 MW ground mounted	FIT	33.40
Biogas	FIT	12.40
Biomass	FIT	12.40
Wind (average)	FIT	7.54
Hydro (average)	FIT	11.63
Geothermal	n.a.	n.a.

Table 15.2 Support for specific technologies in Ukraine, EURcent/kWh

From the beginning of April 2013, the levels of FITs defined by the Law were lowered in accordance with the dampening effect of technological improvements on the costs of electricity production. The appendix includes the level of feed-in tariffs valid at the end of 2012. As can be seen from the table, Ukraine has a unique FIT policy applied for wind power which rewards generation facilities with larger capacities, despite their lower per-unit costs, favouring larger scale deployment of wind source.

There is a digression coefficient for new or significantly upgraded generation facilities fixed in the law: 10%, 20% and 30% in 2014, 2019 and 2024, respectively. The green tariff is provided on an ex-post basis, if an investor can demonstrate – among other requirements – that it has reached the prescribed share of locally supplied content after the project has been constructed.[167]

Annual support budget

The overall annual costs of the support scheme are shown in Table 15.3 below, based on the estimates provided by the Ukrainian energy regulator. We can see the significant increase of per-kWh support over the 2008-2012 period, reflecting the rapidly growing deployment of PV plants from 2011 as the only technology receiving FIT levels exceeding 30 Eurocent/kWh. This attributed to their predominant share among RES-E technologies which resulted in a support of close to 31 Eurocent/kWh by 2012.

	Overall payment for RES-E producers, mEUR (A)	Market (wholesale) value of production, mEUR (B)	Incentive component mEUR (C)=(A)-(B)	Supported quantity GWh (D)	Unit Support EUR/MWh (C/D)
2008	2.05	1.44	0.61	43.65	13.97
2009	6.87	1.82	5.05	71.12	71.01
2010	31.04	9.40	21.64	297.25	72.80
2011	53.87	14.72	39.15	386.35	101.33
2012	258.18	38.08	220.10	833.28	264.14

Table 15.3 Annual support budget in Ukraine, mEUR

Source: REKK RES-E Survey 2013

[167] EBRD. 2013. "Ukraine Sustainable Energy Lending Facility: Strategic Environmental Review." , http://www.ebrd.com/pages/project/eia/39850.s

15.5 Cross-border cooperation

Electricity exports and imports of Ukraine

Ukraine has cross-border electricity interconnectors with Moldova, Belarus, Russia, Slovakia, Romania, Hungary and Poland. Cross-border transmission capacities are presented in the following table.

Cross-border intersection/direction of electric power transmission	Cross-border transmission capacity, MW
Unified Energy System, Ukraine (UES) > UES Russia	2000
UES Ukraine > UES Belarus	500
UES Ukraine > UES Moldova	550
"Directed transmission" Dobrotvor TPP (Ukraine) > Zamosc (Poland)	215
Burshtyn TPP Island (Ukraine) > ESs of Slovakia, Hungary and Romania	495

Table 15.4 Cross-border capacities in Ukraine 2010, MW

Source: NARUC 2010[168]

The main trading partners of electricity are ENTSO-E countries (Slovakia, Romania, Hungary, Poland) and Belorussia. Ukraine is a net exporter of electricity, with imports being used only for covering emergency needs. With regard to capacity allocation, Ukraine's interconnection capacities with the Russian system are at the exclusive disposal of Ukrenergo and are not available to other market participants.[169] There is no intraday market in Ukraine to trade imbalances after gate closure and before real time, nor is there a requirement for finalization of generation schedules for RES-E plants.[170]

International cooperation in RES-E

Explicit cross-border cooperation measures such as statistical transfers, joint projects, or joint support schemes are currently not implemented in Ukraine. The obligation to use a certain share of local content in developing RES-E capacities might actually hinder potential cross-border cooperation.

[168] Naruc. 2010. "Ukraine: Country and Regulatory Profile Template". National Association of Regulatory Utility Commissioners. http://www.naruc.org/International/Documents/Ukraine_Country%20Profile_eng.pdf
[169] Energy Community Secretariat "Annual Implementation Report on the Acquis Under the Treaty Establishing the Energy Community, 2013."
[170] REKK RES-E Survey 2013

15.6 Appendix

Technology	Specification (FIT/FIP)	Support (in Eurocent/kWh)
PV 5 kW (residential) rooftop	FIT	36,63
PV 30 kW rooftop	FIT	36,63
PV 1 MW ground mounted	FIT	34,65
Biogas	FIT	12,65
Biomass	FIT	12,65
Wind (under 600 kW)	FIT	6,60
Wind (600-2000 kW)	FIT	7,70
Wind (over 2000 kW)	FIT	11,55
Hydro (under 200 kW)	FIT	19,80
Hydro (200-1000 kW)	FIT	15,84
Hydro (1-10 MW)	FIT	11,88
Geothermal	n.a.	n.a.

Table 15.5 Support for specific technologies (on December 31, 2012)

Soure: REKK RES-E Survey 2013

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