1. CZECH REPUBLIC

1.1 INTRODUCTION

1.1.1 OBJECTIVE OF THE CASE STUDY

The present case study is developed as part of the European Environment Agency (EEA) project 'Energy Support and Innovation'. The key objective of this case study is to explore in some depth the relationship between support measures applied to all forms of energy and the innovation process in the renewable energy sector. More specifically, the key research question is: How do energy support measures affect the market conditions for renewable energy technologies and hence innovation in the renewable energy sector?

Within this project, the effect on innovation is mainly measured in terms of the market deployment of renewable energy technologies, although other indicators have been used to describe the state of play concerning other phases of the innovation process such as research and market development. The structure of the case study is as follows:
Sub-sections 1.1.2 and 1.1.3 provide a brief overview on the key features of the country's economy and energy system as well as overall market conditions for renewable energy technologies. Section 1.2 includes a quantitative overview of the energy support measures in place, distinguishing between conventional energy sources and renewable energy sources (RES) and their development over the period 2005 to 2011. Sub-section 1.3.1 discusses progress concerning the deployment of renewable energy technologies and the 2020 outlook. Because a successful innovation process presupposes that effective and efficient policies are in place, an assessment of the effectiveness and efficiency of renewable policies in place is provided in Sub-sections 1.3.2 and 1.3.3. Subsequent sections provide additional insights on the innovation process in the renewable sector (research and development (R&D), employment, etc.). Finally, for a successful innovation process, the economic, innovation and sector-specific policy objectives need to be coherent and reinforce each other. Therefore, a brief analysis of policy coherence is included in Section 1.5. The analysis covers the period from 2005 to 2011. Relevant developments prior to 2005 and more recent ones are reflected as much as possible.

1.1.2 KEY FEATURES OF THE CZECH ECONOMY AND THE ENERGY SYSTEM

Error! Reference source not found. shows several key parameters for the Czech economy. The energy intensity decreased significantly between 2005 and 2011, from 433 to 356 thousand tonnes of oil equivalent (ktoe) per EUR 1 000 of gross domestic product (GDP). GDP per capita has increased from EUR 10 200 in 2005 to EUR 11 600 in 2011. The largest sector in the economy is the service sector (60 %) with a relatively high share of industry (29 %).

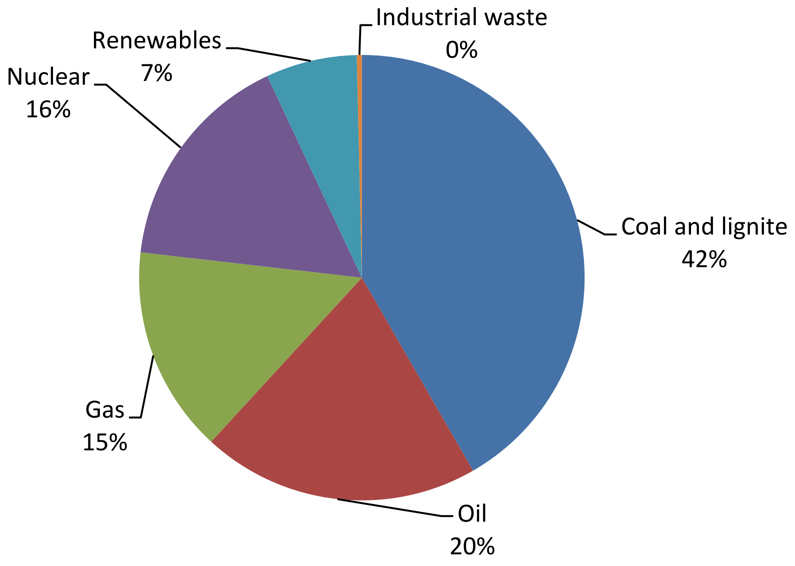
Table 1-1 Key economic indicators

Czech Republic	2005	2006	2007	2008	2009	2010	2011
Energy intensity (gross inland consumption, kg oil equivalent, per €1 000 of GDP)	433	414	391	371	364	375	356
GDP per capita, real (2005 €)	10 200	10 900	11 500	11 700	11 100	11 400	11 600
Unemployment as % labour force	8 %	7 %	5 %	4 %	7 %	7 %	7 %
GDP share agriculture, forestry, fishing, mining (% GVA)	4 %	4 %	4 %	4 %	3 %	3 %	4 %
GDP share industry (% GVA)	30 %	30 %	30 %	30 %	29 %	28 %	29 %
GDP share commercial services (% GVA)	59 %	59 %	59 %	60 %	61 %	62 %	60 %

Source: Eurostat (2013)

The Czech Republic uses mainly coal and lignite as the primary energy source (42 %), followed by oil (20 %), nuclear (16 %) and gas (15 %) (Figure 1-1).

Figure 1-1 Gross inland energy consumption by fuel, 2011



Source: Eurostat, 2013

In the period 2005–2011, the Czech Republic has been the third largest net electricity exporter in the European Union (EU), after France and Germany ([1]). Natural gas is mainly used as complementary fuel in multi-fired units and for peaking purposes. Combined heat and power (CHP) constitutes one third of electricity generation and over 40 % of overall heat production, making the country the third largest in CHP use after Denmark and Finland ([2]).

[1] See http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/database online.
[2] See http://www.reegle.info/policy-and-regulatory-overviews/CZ online.

1.1.3 OVERALL MARKET CONDITIONS FOR RENEWABLE ENERGY TECHNOLOGIES

In 2005, the Czech Republic introduced legislation to stimulate renewable energy production. The Act on the promotion of electricity generation from renewable sources set the legislative framework for the provision of support for renewable electricity generation ([3]). Feed-in tariffs (FITs) and feed-in premiums (FIPs) are two key support measures for promoting electricity from RES (RES-E). The FIT and FIP rates are guaranteed over 20 years, except for hydropower generators (30 years) and sewage gas-fired plants (15 years). Heating from RES is promoted through investment support or provision of a green bonus.

As a result of favourable market conditions in the period 2005–2010, supported by a decline in the prices for solar panels in combination with the slow reaction of law makers, the Czech Republic became the country with the fourth largest newly installed photovoltaic (PV) capacity in 2010 ([4]). However, market conditions deteriorated rapidly afterwards. In response to the increase of installed capacity (and therefore costs), the political and media debate in the Czech Republic has generally become unfavourable to renewable developments. In response to these developments, several changes were introduced that have significantly deteriorated market conditions for the deployment of RES in the Czech Republic.
The main changes are as follows:

- A windfall profit tax of 26 % on FITs and 28 % on FIPs, respectively, was imposed on the PV installations in operation between January 2009 and December 2010 for 3 years until December 2013. The Czech Government and Chamber of Deputies of the Czech Parliament recently approved an extension of a windfall profit tax of 10 % on FITs and 11 % on FIPs, respectively, from January 2014 onwards, for PV installations that entered into operation during 2010 ([5]).
- In summer 2013, the Czech Government and Chamber of Deputies of the Czech Parliament adopted a proposal stating that as of 1 January 2014 public support for new renewable electricity generators being provided through FITs/FIPs will not be provided anymore (with an exemption for wind, geothermal, biomass and hydropower if a building permit is secured before the entry into force of the legislation and in operation by 31 December 2015). This proposal was approved by the Chamber of Deputies of the Czech Parliament and will be discussed in the Senate in 2013.
- CEPS, the Czech transmission system operator (TSO) declared a temporary connection moratorium for variable renewable electricity plants, which was officially terminated at the end of 2011. Although renewable electricity producers are generally entitled to priority connection to the grid, the TSO argued that the grid capacity was not sufficient for additional renewable electricity installations. The TSO has demanded several amendments of the legal framework, including the introduction of advance payments for grid connection and abolition of the priority access for electricity from variable RES-E.

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[3] See http://www.kinstellar.com/publications/article/developments-in-czech-renewable-energy-regulation-825/ online.

[4] See http://www.kinstellar.com/publications/article/developments-in-czech-renewable-energy-regulation-825/ online.

[5] Source: Czech Government (http://www.vlada.cz/cz/media-centrum/aktualne/vlada-omezi-podporu-pro-obnovitelne-zdroje-energie-109181/).

Currently, the power distributors are granting grid connection permits on a case-by-case basis.

The abolishment of the FITs/FIPs will deteriorate market conditions for new renewable energy significantly.

1.2 QUANTITATIVE OVERVIEW OF SUPPORT TO ALL ENERGY FORMS IN THE CZECH REPUBLIC, 2005–2012

1.2.1 DIRECT TRANSFERS

During the observation period, FITs and FIPs were two key support measures for promoting energy from renewable energy sources. The FIT and FIP rates were guaranteed over 20 years for RES-E, except for hydropower generators (30 years) and sewage gas-fired plants (15 years). Electricity plant operators could choose between a guaranteed FIT and a FIP paid on top of the regular electricity price achieved in the market. Every electricity producer may make this choice once a year (§ 8 par. 2 Act No. 165/2012). The FITs and FIPs are differentiated with respect to RES technology, type and installed capacity.

Heat generated from renewable energy was realised through investment support and the provision of FIPs ('green bonus'). The investment in renewable heat can be supported from governmental programmes, financial resources from European Commission programmes or from the selling of European Union Allowances (EUAs). The FIP of CZK 50 per gigajoule (GJ) (about EUR 2/GJ) has been considered to support operational costs of heat generation from biomass, biofuels and geothermal energy in facilities with more than 200 kilowatts (kW) of thermal capacity. Co-firing of renewable energy with non-renewable is not eligible for the support.

The 2012 revision of the Act on promoted energy sources sets strict criteria for the eligibility for FITs for green electricity and the support has been limited to a maximum installed capacity of 100 kW, with an exception for small hydropower generators (up to 10 megawatts (MW)). The support for PV was limited to up to 30 kilowatt-peak (kWp), and only PV panels placed on building roofs or walls are eligible for the FIT support scheme. The FITs are indexed for inflation — the Czech Government uses a fixed indexation of 2 % per year. The revision of the FIT support scheme was mainly driven by an increase in electricity prices for the end user because the promotion of renewable electricity as the FIP/FIT payments were financed via a regulated levy, set as a component of electricity price, on final electricity consumption. All users pay the same levies in the Czech Republic. Although there is pressure from industrial companies to be exempt from this payment, there are no immediate plans to do put this into effect. The component associated with the RES support in the electricity price increased from EUR 1.0 per megawatt-hour (MWh) in 2006 to EUR 6.6/MWh in 2010 and to EUR 23/MWh in 2013. In order to reduce the pressure on the end user, part of the costs for the FIP/FIT support schemes (EUR 0.5 billion yearly), mainly provided to PV installations, is now directly financed from the state budget. The maximal ceiling for the levy to cover the costs involved by RES-E support is fixed at CZK 495/MWh (EUR 19/MWh) in the 2013 amendment of the RES law, which will enter into force as of 1 January 2014.

Between 2005 and 2011, annual expenditure for the support of RES increased from EUR 45 million to EUR 1 240 million (Table 1-2).

Table 1-2 Cost of RES support schemes per technology, 2005-2011 (million eur)

	Hydro	Biomass	Biogas	Wind	Solar	**Sub-total RES**
2005	19.9	17.4	6.1	1.2	0.0	**44.7**
2006	21.9	24.2	9.2	2.7	0.1	**58.1**
2007	24.9	32.1	12.1	5.8	0.8	**75.6**
2008	29.2	42.2	20.0	9.6	5.6	**106.6**
2009	22.1	45.6	33.6	8.7	40.2	**150.1**
2010	54.6	78.3	70.0	13.9	265.3	**482.1**
2011	59.1	94.2	101.9	25.7	959.1	**1 239.9**

Source: Energy Regulatory Office, 2013

In summer 2013, the Czech Government (and consequently the Chamber of Deputies of the Czech Parliament) adopted a proposal that as of 1 January 2014 support for new renewable electricity generators through FITs/FIPs will be abolished ([6]). Furthermore, a windfall profit tax of 26 % on FITs and 28 % on FIPs, respectively, was imposed on the PV installations in operation between January 2009 and December 2010 for 3 years until December 2013. The Czech Government and Chamber of Deputies of the Czech Parliament recently approved an extension of a windfall profit tax of 10 % on FITs and 11 % on FIPs, respectively, from January 2014 onwards, for PV installations that entered into operation during 2010. This 'solar tax' is levied on revenues from selling electricity generated by PV installations, which effectively reduces the FIT rate. The annual revenue from the solar tax is estimated at the level of EUR 210 million during the period 2011–2013.

Green Savings Programme

The Green Savings Programme has been a major energy savings and RES promotion programme for the residential building sector in the Czech Republic. The Programme supported energy savings in heating through thermal insulation, construction of new houses to the passive energy standard, and switch to RES for space and water heating, including combinations of these measures. The Programme was initially financed with the revenues from sold surplus of assigned amount units (AAUs) under the Kyoto Protocol. The Programme was initiated in the late 2000s in agreement with the Japanese Government, a major buyer of Czech AAUs surplus. The Programme started in April 2009 and is administered by the Czech State Environmental Fund. Between 2009 and the second quarter of 2013 financial support worth more than EUR 800 million was awarded to 74 072 projects (SFŽP, 2012). This represents about 6.4 % of the housing stock in the Czech Republic (Máca, 2013).

[6] With an exemption for wind, geothermal, biomass and hydropower if a building permit is secured before the entry into force of the legislation and in operation by 31 December 2015.

By October 2012, under the sub-programme C 'Use of RES for space heating and hot water' more than 34 000 applications for the support of renewable energy use in more than 46 300 flats, which represents 1.1 % of the housing stock, were recorded (Škopková, 2013). By January 2012, EUR 155 million in support allocated to projects was spent. Of the allocated funding, 49 % supported solar heating systems, 28 % and 23 % were given to subsidise biomass use and heat pump installations, respectively. On average, the support amounted to EUR 4 600 per project. Key figures of the sub-programme C are provided in Table 1-3.

Table 1-3 Green Savings Programme - subprogram C, March 2009-January 2012

Type of the measure	Specification of the measure	No Projects	Out of which on apartment houses (> 3 flats)	No Flats	Financial support awarded (*thousand EUR*)	Financial support per project (*thousand EUR*)
Replacement of fossil fuels /electric heater	Biomass	18	0	25	54	3.008
	Biomass (manual, no tank)	1 743	10	2 205	4 422	2.537
	Biomass (manual, tank)	1 660	6	1 973	6 575	3.961
	Biomass (automatic)	5 448	52	6 808	24 448	4.488
	Heat pump (ground-water)	1 954	11	2 430	20 098	10.286
	Heat pump (air-water)	3 329	14	3 839	23 154	6.955
	Heat pump (water-water)	90	0	110	581	6.450
	Heat pump (air-air)	22	0	22	47	2.127
Installation of solar heating system	water	13 418	213	20 875	47 135	3.513
	water, space heating	5 972	37	7 479	28 489	4.770
TOTAL	**Sub-programme C**	**33 654**	**343**	**45 766**	**155 002**	**4.606**

Source: EEA based on Urban and Ščasný (2012), data kindly provided by the State

Environmental Fund of the Czech Republic

As noted by Máca (2013), the Programme had a modest start due to lack of awareness regarding the conditions. However, once the rules had been clarified a steady rise in applications occurred and the total subsidy amount exceeded available funding sources in September 2010, which led to the suspension of the Programme.

A revised second phase of the Green Savings Programme started in 2013. Its level of support will depend on energy savings for heating. The subsidy will amount to 25 %, 35 % and 50 % of eligible costs, if at least 40 %, 50 % or 60 % energy saving, respectively, is achieved. The total funding will depend mainly on revenues from auctioning of EUAs, but other possible budgetary sources are being discussed. Its preliminary budget is estimated to be up to EUR 1.1 billion (Máca, 2013) by 2020. The Czech Ministry of the Environment recently announced that the first part of the support starting in autumn 2013 will be approximately EUR 72 million ([7]).

[7] Source: Czech Ministry of the Environment (http://www.mzp.cz/cz/news_130613_Nova_zelena_usporam_vyhlaseni).

1.2.2 *FISCAL PREFERENCES*

Partial tax refund for diesel or blended diesel

The partial tax refund for diesel or blended diesel (B30) used in crop production was introduced in 2000 as a response to increasing excise tax on mineral oils rates in order to alleviate the tax burden on farmers. The tax refund also benefited some forestry activities, but since 2009 this refund has been cancelled for its incompatibility with EU agricultural state aid guidelines.

The refund amounted to 60 % (85 % for B30) of the full tax for most of the time. As reviewed by Máca (2013), pursuant to the 2012 amendment to the Excise Tax Act the refund rate is lowered to 40 % (diesel) and 57 % (B30) of the tax for 2013, and the tax refund is effectively repealed from 2014 as an austerity measure aimed to reduce the government deficit. The excise tax refund for diesel used in agriculture amounted to between CZK 1 477 (2006) and CZK 1 824 million (2011) (EUR 50 and EUR 74 million) ([8]).

Consumers of mineral oil used for heat production can obtain partial refunds of their energy tax payments. This refund is estimated to be annually between EUR 21 and EUR 27 million during the period 2008–2011. In 2010, the refund was EUR 21 million (lowest value in period 2008–2011); in 2009, the refund was EUR 27 million (highest value in the period 2008–2011).

Reduced excise tax for biofuels

The reduced excise tax rate is set for diesel blended with fatty acid methyl- or ethyl-esters (< 30 %, sometimes denoted as B30). Excise tax exemption for pure biodiesel was reintroduced in 2009, whereas tax refund of ethanol content in ethanol–petrol blends, as originally introduced in 2004, was reintroduced in somehow restricted form — limited to E85 only — in 2009 after its abolishment in 2006. As documented by Máca (2013), the excise tax reductions, exemptions and refunds for biofuels amounted, in 2011, to CZK 1.1 billion (EUR 45 million). Currently there are no plans for changes in tax benefits, but some concerns regarding state budget impact were already raised mainly in conjunction with the growing biofuel use leading to growth in foregone tax revenues.

Exemptions from energy tax on electricity

Taxes on electricity, natural gas and solid fuels are three new taxes introduced as of 1 January 2008, with their rates set at the minimum rates as defined in the Energy Taxation Directive (2003/96/EC). The rates of electricity tax do not differentiate between use for business and non-business. The electricity tax of EUR 1.13/MWh includes numerous exemptions, especially for renewable electricity (solar, wind or geothermal origin, produced in hydroelectric installations, generated from biomass or from products originating from biomass), and for electricity generated from methane emitted by abandoned coal mines or generated in fuel cells; tax exemption is also granted to electricity used for passenger and freight transport by rail, tramway and trolleybuses, for metallurgy and for electrolyses. Considering the fact that about 8.0 terawatt-hours (TWh) were generated in 2012 from RES, the tax exemption from electricity tax for renewables is estimated at the level of EUR 9 million in the year 2012.

[8] Exchange rates in 2006, EUR 1 = CZK 28,3. In 2011, EUR 1 = CZK 24,6. Source: Eurostat (2013).

Energy tax exemption for certain uses of natural gas and solid fuels

Until 2007, a zero tax rate was applied on natural gas, except for use as propellant, as part of an excise tax on mineral oils. Since January 2008, the tax rate on natural gas has been set close to the EU minimum level (EUR 0.34/GJ), with an exemption granted to:

- gas used for electricity production and for high-efficient CHP generation;
- gas used for heating in households;
- natural gas used in certain mineralogical and metallurgical processes. Until 2012, a zero tax rate was also applied to natural gas used as an alternative automotive fuel; the rate will gradually rise until 2020.

Over the period 2008–2011, energy tax exemption for natural gas used by households for heating purposes amounted to between CZK 1 802 million (2008) (EUR 51 to EUR 72 million) and CZK 1 353 million (2009)([9]).

Tax exemptions have been granted for the use of solid fuels in high efficient CHPs if the heat is delivered to households, and to the use of solid fuels in certain chemical, mineralogical and metallurgical processes.

Following a proposal by the European Commission to revise the Energy Taxation Directive, which includes a restructuring of the energy tax to account for carbon dioxide (CO_2) content ([10]), the Czech Government discussed in 2012 the possibility of splitting energy tax into carbon and energy components along with the abolition of tax exemption on natural gas use for households from 2014 onwards. A substantial increase of tax rate reflecting carbon content has been also proposed by the Czech Ministry of Finance in early 2013 (Máca, 2013). All proposals have been discussed at government level in 2013 but have been facing a strong opposition from industry.

Reduced VAT on energy-efficient heating

The reduced value-added tax rate applies to heating (and cooling) delivered through district heating. Its main objective has been to preserve and further promote extensive district heating systems that deliver heat to some 1.5 million households in the Czech Republic (i.e. approximately 38 % of all the households). The reduced VAT rate was originally set at 5 % but then gradually increased to 9 % in 2008, 10 % in 2010, 14 % in 2012 and to 15 % from 2013 onwards, effectively narrowing the gap between reduced and standard VAT rates (19 % in 2004–2009, 20 % in 2010–2012 and 21 % since 2013 onwards). The revenues foregone from the reduced rate amounted to approximately EUR 56 million (Máca, 2013).

Exemption from real estate tax

RES, such as solar and wind technologies, are granted an exemption from real estate tax. Households that transform the heating system of their house from solid fuels to RES are not obliged to pay the real estate tax for five years.

[9] For exchange rates applied, see Annex II.

[10] For an overview of the current state of play on the revision of the Energy Taxation Directive, see the Irish Presidency's note on the subject: Council of the European Union: Energy Taxation Directive – State of play, Brussels, 12/06/2013, 10825/13 (http://register.consilium.europa.eu/pdf/en/13/st10/st10825.en13.pdf).

1.2.3 RISK TRANSFER TO GOVERNMENT

Phasing-out of mining activities

The Czech Government committed to finance from the state budget the technical work related to mines' closure, remediation of environmental damage of past mining activities and the social costs of phasing out mining activity, such as health benefits for miners. Overall, since the initiation of the phase-out of mining in 1992 until 2009, a total of EUR 3 billion was released from the state budget. Approximately EUR 1.7 billion was spent on technical work related to the phase-out of mining and on the remediation of environmental damage of mining operations, and a remaining EUR 1.2 billion was spent on social health benefits for miners (MoE, 2010). About 43 % of support was allocated to coal mining. As reported by the Ministry of the Environment, the total amount of money reserved is up to EUR 1.5 billion (that corresponds to about 45 billion CZK). Each year, between CZK 1,56 billion (2009) and CZK 1.89 billion (2005) was spent during 2005–2011 (that is EUR 59 to EUR 63 million) ([11]). During 1992–2009, total support of uranium amounting to CZK 13 billion was spent on technical work and CZK 4.6 billion on social health expenses (Starý et al., 2010).

Elimination of past environmental damages

In 2006, the Ministry of Finance of the Czech Republic decided to use revenues from privatisation to pay for the remediation of past environmental damages from mining activities taking place before the privatisation process. By the end of 2009, three coal mining entities had drawn financial resources from the National Property Fund of the Czech Republic in order to deal with past environmental damages. By December 2009, about CZK 2 .687 billion (EUR102 million) ([12]) was allocated from the National Property Fund of the Czech Republic to coal mines in order to deal with past environmental damages, with an additional EUR 1.0 billion available for future financing. An additional EUR 3.2 billion was guaranteed to uranium mining company DIAMO for the elimination of environmental damages.

Programmes financing remediation of ecological damage

As mining companies in the Czech Republic have been obliged to generate financial reserves for remediation and reclamation of areas affected by mining only since 1994, the state took up the responsibility to finance remediation of those ecological damages that had arisen before the year 1994, particularly in coal mining companies in the Ústí nad Labem, Karlovy Vary and Kladno Region, with eliminating ecological revitalisation upon termination of coal mining in the Moravian–Silesian region, and with eliminating burdens of crude oil and natural gas extraction in the South Moravian region. The total amount for remediation of ecological damage attributable to coal mining was estimated cumulatively to be EUR 1 .361 billion. About EUR 73 million was allocated in the year 2011. As of December 2009, EUR 180 million was spent in total. About EUR 230 million was allocated to ongoing projects and a further EUR 160 million is required to complete ongoing projects.

Nuclear support

Nuclear power enjoys a rather positive public attitude in the Czech Republic. According to Special Eurobarometer 324 from March 2010 on Europeans and nuclear safety, 86 % of the

[11] For exchange rates applied see Annex II.
[12] Exchange rate 2009 see Annex II.

Czech respondents would like to see the share of nuclear energy in the national energy mix maintained or even increased. ČEZ, the main electricity generator in the Czech Republic, is 70 % owned by the Czech Government. In the past, ČEZ has enjoyed strong support from the government for its nuclear activities, ranging from state loan guarantees to state interventions in disputes between the company and its suppliers (Heinrich Böll Stiftung, 2011).
At present, ČEZ seems optimistic concerning the future of nuclear power in the Czech Republic. In November 2012, ČEZ applied to the Czech State Office of Nuclear Safety (SUJB) to build two new units at Temelin. In January 2013, the government gave environmental approval for the two units. According to the World Nuclear Association[13], the nuclear development has been put on hold for now due to the political turmoil in the country:
"The government was planning to legislate for a cost-difference guarantee for electricity from Temelin 3&4 to ensure that investment is viable. This would cover the difference between wholesale electricity prices and price levels needed to cover construction costs. The Ministry of Industry and Trade wants it written into a new long- term Czech energy framework, but this is opposed by the Ministry of Finance. In July 2013 CEZ said that it would delay all decisions for a year or two in order to allow the government to update its national energy strategy and negotiate a power purchase agreement."
While it has been very difficult to find in publicly available literature accurate information on support to the nuclear industry in the Czech Republic (and this has been the case for many other EEA countries, see Introduction in the full report), one report (Heinrich Böll Stiftung, 2011) suggests that there may be instances where the government could decide to support nuclear developments given the strong link between ČEZ and the political elite in the Czech Republic. According to the report, the Czech Government may decide for example to be flexible in using (or not) the dividends from its participation as a majority shareholder in ČEZ to support nuclear developments at the Temelin site.

In addition, in the Czech Republic there are two separate funds, one for decommissioning and one for waste disposal. While the first is an internal (to the company) blocked account, the second is an external fund managed by the Ministry of Finance (SWD(2013)59 final). Under the Atomic Energy Act 2002, ČEZ as a nuclear plant operator is required to put aside funds for waste disposal at the rate of EUR 0.002 per kilowatt-hour (kWh). This compares rather poorly with the rate required, for instance, in France of EUR 0.14/kWh.
In conclusion, publicly available literature does not allow for an accurate account of measures that may apply to the nuclear sector in the Czech Republic, but at minimum we can observe a clear tendency to shift the risk from the nuclear operator to the government or tax payers. This is not happening just in the Czech Republic but is a rather wide-spread phenomenon concerning many support measures identified in this project across Europe (see details in the introduction in the full report).

Table 1-4 Risk transfer to government, Czech Republic (miilion EUR)

	2005	2006	2007	2008	2009	2010	2011
Financing of the technical work related to closing mines and rectifying the consequences of	63	65	63	69	59	62	64

[13] http://www.world-nuclear.org/info/Country-Profiles/Countries-A-F/Czech-Republic/

past mining activity							
Elimination of past environmental damages by coal mines		108					
Compensation of municipalities affected by mining	0.7	0.6	0.6	0.6	0.6	0.6	0.6
Programmes financing remediation of ecological damage attributable to coal mining, petroleum and gas extraction	x	x	x	x	x	X	73

Sources: Stary et al. (2009), Stary et al. (2010) and Stary et al. (2011)

1.2.4 *NON-FISCAL MEASURES*

Biofuel obligation

The biofuel obligation sets the minimum volumes of biofuels to be put on the market and leaves to the distributors various options on how to achieve them. At present, the law prescribes the following minimum quantities of 4.1 % for petrol and 6 % for diesel. The distributors can satisfy this obligation by distributing blended fuels or pure biofuels. From 2014, the volume-based biofuel obligation will be replaced with obligation to reduce greenhouse gas (GHG) emissions from motor fuels (by 2 % in 2014, 4 % by 2017 and 6 % by 2020).

Priority grid access

As far as the grid operator is concerned, plant operators are entitled to a) the priority connection of a renewable energy plant to the grid (§ 4 par. 1 RES Act), b) the expansion of the grid, if the expansion is necessary to satisfy the terms of a connection agreement (§ 45 par. 1 Energy Act), and c) non-discriminatory use of the grid for the transmission or distribution of RES-E.

The grid connection procedure may be an important barrier to the development of RES in the Czech Republic. CEPS, the Czech Transmission System Operator (TSO), declared a temporary connection moratorium for variable RES-E plants, although RES-E producers are generally entitled to priority connection to the grid. This temporary moratorium was officially terminated at the end of 2011. In addition, some studies suggest that the future expansion of the transmission grid is not aimed at supporting the integration of RES-E (Jirous et al., 2011) ([14]).

The connection charges for a RES installation to the grid follow the deep cost approach. This means that the RES-E producer has to ensure the connection of their RES-E plant to the transmission or to the distribution grid at their own expense. As for the distribution grid, the distribution system operator (DSO) bears the costs for grid development in settled areas. In non-settled areas, the DSO obligation is limited to 50 m of low-voltage lines.

According to the Renewable Energy Law, the DSOs and the TSO are obliged to purchase all RES-E eligible for support under the terms and conditions given by the law. This also includes balancing requirements. Hence, there is no balancing responsibility for RES-E producers, no matter which support design they use (Jirous et al., 2011).

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[14] According to Jirous et al. (2011), the role of ČEZ has to be regarded critically. The economic and political power of the dominant generator and largest distribution system operator, ČEZ, should be very far-reaching and also affecting the formally independent TSO. This would hinder the development of RES in the Czech Republic.

1.2.5 *QUANTITATIVE OVERVIEW OF SUPPORT MEASURES TO ALL ENERGY FORMS IN THE CZECH REPUBLIC FOR THE PERIOD 2005–2011*

Table 1-5 provides a summary overview on support measures for all energy sources for the period 2005–2011.

Table 1-5 Quantitative overview of support measures for all energy sources, Czech Republic, 2005-2011 (million EUR)

	2005	2006	2007	2008	2009	2010	2011
Renewable support							
Feed-in-tariff	45	58	76	107	150	482	1.240
Green Savings Programme	n.a.	n.a.	n.a.	n.a.	52*	52*	52*
Exemptions from energy tax on electricity	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Reduced excise tax biofuels	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	45
Tax regulation mechanism (exemption from real estate tax): RES-H	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Biofuel quota	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Priority grid access: connection to the grid	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Fossil fuel support							
Energy tax exemption for certain uses of natural gas	n.a.	n.a.	n.a.	72	51	62	64
Energy tax refund for oil used for heating	n.a.	n.a.	n.a.	24	27	21	23
Excise tax refund for diesel used in agriculture	50	52	54	61	59	66	74
Energy tax exemption for certain uses of solid fuels	n.a.	n.a.	n.a.	35	29	36	36
Energy tax exemption for solid fuels in efficient CHPs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Phasing-out and restructuring of the coal-mining industry	63	65	63	69	59	62	64
Elimination of past environmental damages**	n.a.	25	25	25	25	n.a.	n.a.
Programmes financing remediation of ecological damage caused prior to 1994***	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	73
Compensation of municipalities affected by mining funded from royalties on mining leases	0.7	0.6	0.6	0.6	0.6	0.6	0.6

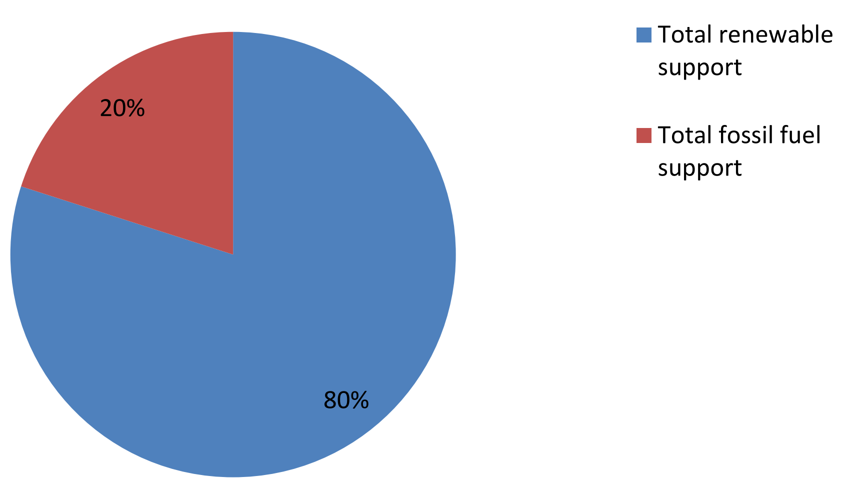
* Total support over the period 2009–2011 has been EUR 155 million. As yearly data are not available, we have averaged the total amount evenly over the years 2009, 2010 and 2011.

** In addition to the amounts presented in the table, EUR 1.0 billion is available for future financing and EUR 3.2 billion was guaranteed to uranium-mining companies for the elimination of environmental damages. However, we have not been able to allocate these amounts for the years 2005–2011.
*** In December 2009, EUR 180 million has been spent in total. However, we have not been able to allocate these amounts over the individual years in the period 2005–2009. Therefore, these amounts are excluded from the table.
Source: Own compilation

Because the dataset is incomplete due to unavailable information, it is difficult to draw with certainty any definite conclusion regarding the trends in allocation of support to various energy sources over the period being considered. While information gaps do exist in relation to all sources, information concerning the support allocated to conventional sources tends to be more difficult to collect. In order to determine the relative share of renewables versus fossil fuel support measures, we have estimated shares for the year 2011 (which is the most complete). Total renewable support sums up to EUR 1.336 million, and total fossil fuel support to EUR 335 million.

Based on the available information, renewable energy receives more support in quantitative terms than fossil fuels. Figure 1-2 shows that total aid for fossil fuels amounted to 20 % in 2011 versus 80 % for renewables. For renewables, FIT/FIP payments have been by far the most important measure representing 93 % of total support for renewables. An important share of the renewable energy support measures are therefore not government-funded but financed by final electricity consumers. Contributions from the state budget to the FIT/FIP system amount to EUR 500 million per year.

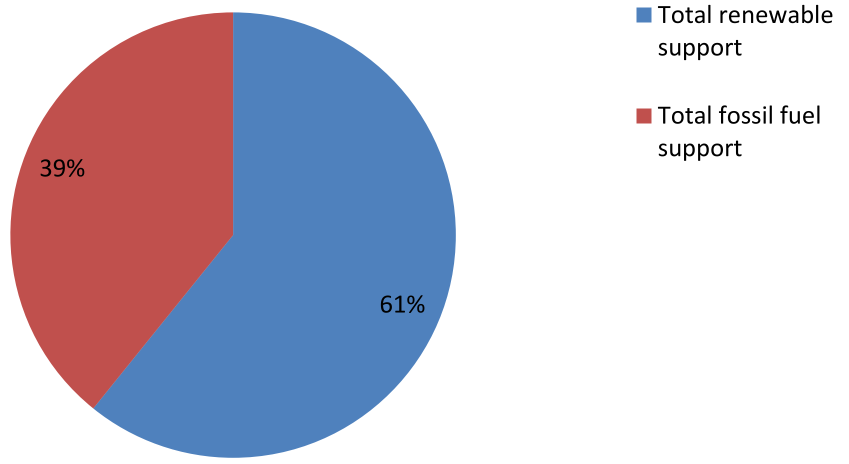
Figure 1-2 Support for RES vs. conventional sources, Czech Republic, 2011 (million EUR)



Source: EEA

The relative share of renewable energy support is lower when taking the period 2005–2011 into consideration. The main reason is that support for renewable energy has increased significantly (FITs in particular). For the period 2005–2011, the share of renewable energy support is 61 %.

Figure 1-3 Support for RES vs. conventional sources, Czech Republic, 2005-2011 (million EUR)



Source: EEA

When comparing support for conventional fossil and nuclear energy sources with the support for renewable technologies, the discussion should also take into account past support for conventional sources. Decades of support for these sources (albeit for political reasons that may have been legitimate at the time) led to an energy system designed based on the characteristics of such sources. In addition, a whole support infrastructure (including institutional) was put in place underpinning this development. Therefore, RES do not only have to compete at the technological level with well-established conventional technologies but also at the level of support infrastructure (including institutional). In this context, support measures such as FIPs for RES are one element to help level the playing field for renewable energy.

As discussed in Sub-sections 1.1.3 and 1.2.1, future support for renewables will decrease significantly. Public support for new renewable electricity generators being provided through FITs/FIPs will not be provided anymore (with an exemption for wind, geothermal, biomass and hydropower if a building permit is secured before entry of the legislation into force and in operation by 31 December 2015). This will have a huge impact on renewable energy support, as FIT/FIP payments make up 93 % of total renewable energy support. In this context, the relative share of support for conventional fossil and nuclear sources versus renewable sources will change significantly.

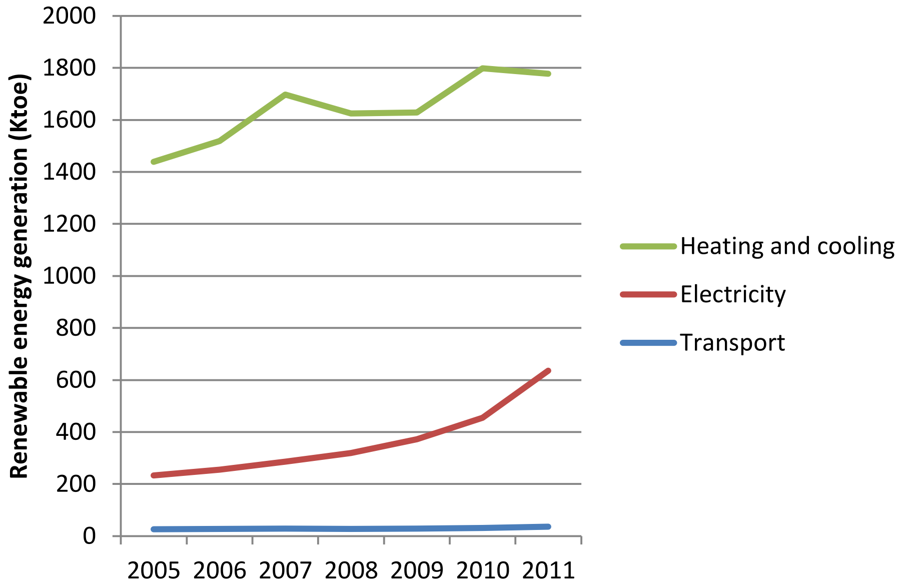
1.3 EFFECTIVENESS AND EFFICIENCY OF NATIONAL SUPPORT SCHEMES FOR RENEWABLE ENERGY

Before analysing the effectiveness and efficiency of the national support schemes for renewable energy, the following sub-section outlines key developments in renewable energy deployment between 2005 and 2011.

1.3.1 *DEVELOPMENTS IN THE DEPLOYMENT OF RENEWABLES*

Renewable heating and cooling had by far the largest share in renewable energy generation, while the share of transport remained small. Renewable electricity generation nearly tripled between 2005 and 2011 (Figure 1-4).

Figure 1-4 Renewable energy generation, Czech Republic, 2005-2011 (ktoe)

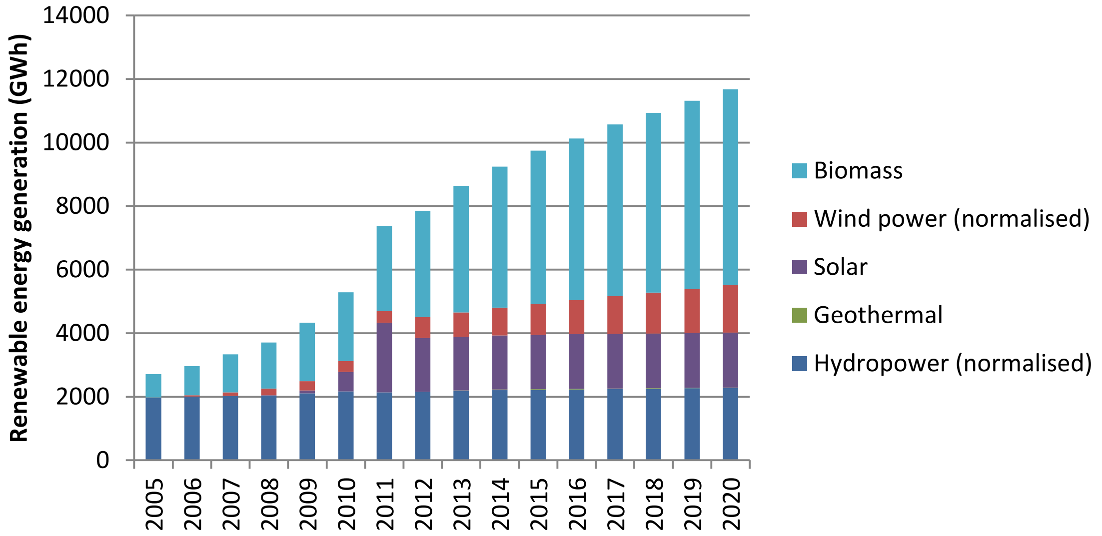


Source: EEA (2013)

Renewable electricity generation was dominated in 2005 by hydropower and biomass (Figure 1-5). In the period 2005–2011 solar electricity generation has increased significantly. Data from the National Renewable Energy Action Plan (NREAP) ([15]) show that until 2020 an increase of wind power and biomass is foreseen. Biomass is in large part used as co-firing in coal power plants. The amount of solar electricity generation in 2011 was higher than foreseen for 2020.

[15] Please note that the Czech Republic had resubmitted a new NREAP in March 2013. This development is not captured in this study. The new plan, however, is unlikely to change the main conclusions for this study.

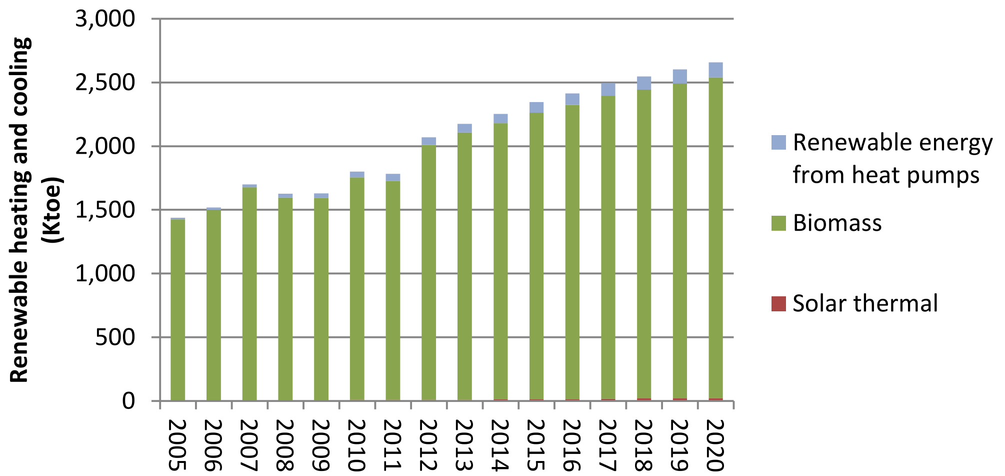
Figure 1-5 Renewable electricity generation (2005-2011) and NREAP projection (2012-2020) (gwh)



Source: Eurostat (2013) and EEA (2013)

In the heating and cooling sector the highest contribution by far comes from solid biomass, which is expected to grow further to reach the 2020 target (Figure 1-6).

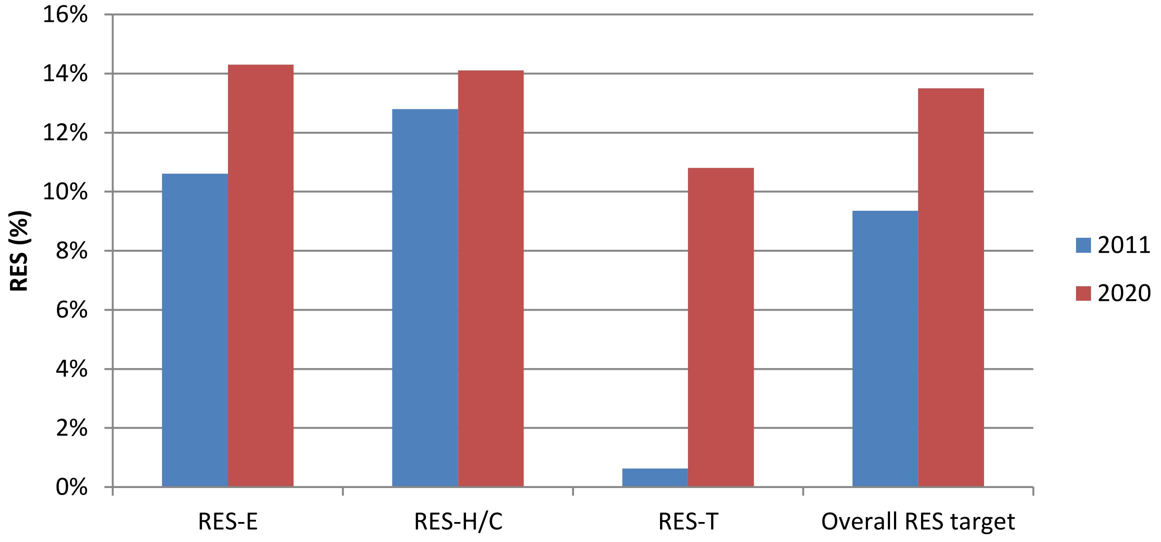
Figure 1-6 Renewable heating and cooling generation (2005-2011) and NREAP projection (2012-2020) (ktoe)



Source: Eurostat (2013) and EEA (2013)

In 2011, the share of RES in gross final energy consumption was around 9 %. Renewable electricity had a share of 11 %, renewable heating and cooling of 13 %, and renewable transport of around 1 % (Eurostat, 2013). With these developments, the Czech Republic overachieved the interim target for the period 2011–2012 of 7.5 % under the Renewable Energy Directive (EEA, 2013). Among the 3 sectoral targets for 2020 (14.3 % for renewable electricity, 14 % for renewable heating and cooling, and 10.8 % for transport), the target on transport seems the most daunting to achieve (Figure 1-7).

Figure 1-7 Share of renewable energy in gross final energy consumption by sector (2011 vs. 2020 target)



Source: Eurostat (2013) ([16])

The figures in this section were provided to present an overall picture of developments related to renewable energy in the Czech Republic. The effectiveness and efficiency of the Czech Republic's support schemes for RES are analysed in more detail in the following sub-sections.

1.3.2 RES POLICY EFFECTIVENESS

The Policy Impact Indicator (PII) shows to what extent the remaining gaps to a future target for RES have been reached per year. It is defined as follows:

Policy Impact Indicator = additional generation in a given year divided by the difference between the generation in 2005 and the potential defined by the policy target.

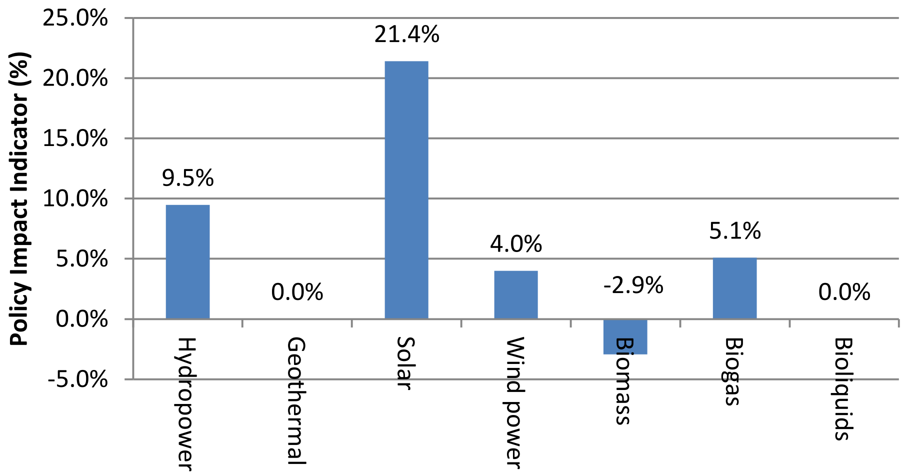
As the generation in 2005 is used as a basis to calculate the remaining gap against the target set for 2020, an average yearly policy impact of over 6.5 % during the 15 years between 2005 and 2020 would be required to meet the 2020 target.

For the Czech Republic, the policy impact is measured against the 2020 renewable energy targets for each technology as specified in the Czech Republic's NREAP under the Renewable Energy Directive.

[16] This figure does not include the most recent (small) adoptions to the NREAP of August 2012.

For renewable electricity, the average PII between 2006 and 2011 shows that the highest impact in terms of additional electricity generation per year was achieved for solar and hydropower. Solar and hydropower were those technologies that advanced most in closing the gap between actual electricity generation in 2005 and the technology-specific 2020 target as set out in the NREAP. On average, the remaining gap was reduced, respectively, by 21.4 % (solar) and 9.5 % (hydropower) in each year between 2006 and 2011. If these growth rates were to be continued, solar and hydropower would overachieve their 2020 technology-specific targets. These results indicate that the policy in place for these technologies has been very effective. The same cannot be said for other technologies. Biomass and wind power are of particular concern because they are expected to grow significantly until 2020 (Figure 1-8).

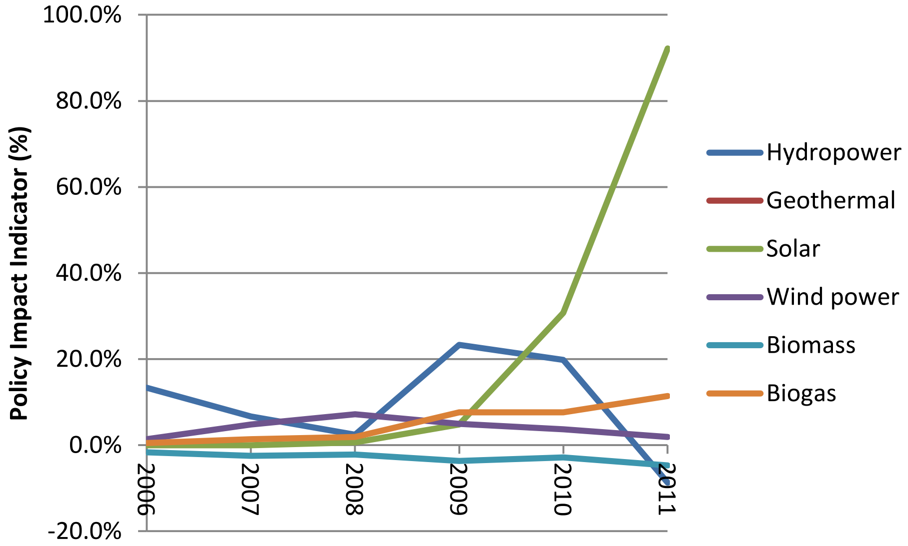
Figure 1-8 Average Policy Impact Indicator for Renewable Energy Technologies, 2006-2011



Source: EEA

The PII varies quite strongly on a yearly basis during the time period analysed. Figure 1-9 shows the PII in the time period 2006–2011 for each single year.

Figure 1-9 Yearly PII for renewable energy technologies, 2006-2011

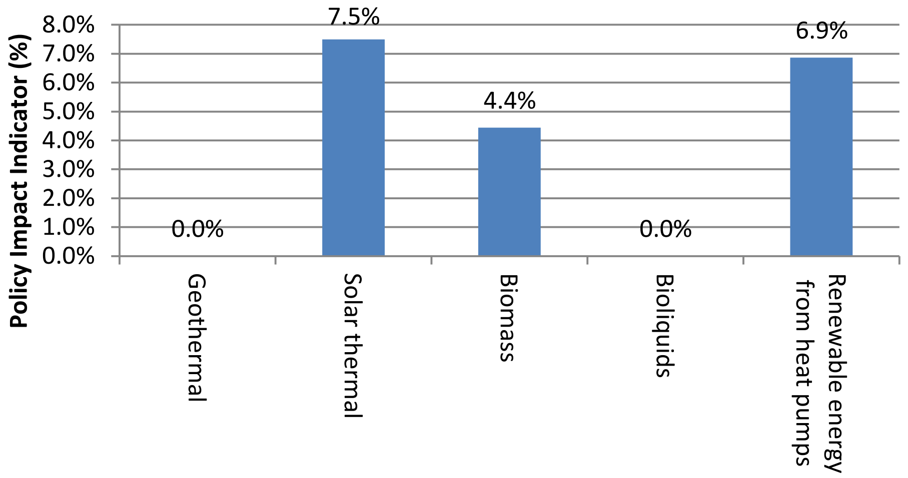


Source: EEA

The figure shows a large increase for solar energy in 2011. The additional solar energy generation in 2011 covered more than 80 % of the difference in generation between 2005 and 2020. This increase has been a result of favourable market conditions, which have deteriorated significantly since then (see Sub-section 1.1.3). Yearly fluctuations were relatively large for hydropower, peaking from + 23 % in 2009 to – 9 % in 2011. In general, electricity production from hydropower varies significantly over the years due to the hydrologic situation. The negative values for hydropower in 2011 and biomass (including bioliquids) imply that renewable energy generation in these years was lower than in the previous year.

For the heating and cooling sector, the average PII between 2006 and 2011 was around 7.5 % for solar thermal, 4.4 % for biomass and 6.9 % for renewable energy from heat pumps. No progress was made to increase the share of bioliquids and geothermal in the period 2006–2011. These calculations show that while there is good progress in the heating and cooling sector, it is not sufficient to meet the set targets for this sector. The improvement of the policy effectiveness is of particular relevance to biomass as this technology is expected to contribute by far the most to the renewable heating and cooling target in 2020 (Figure 1-10).

Figure 1-10 Average PII for renewable heating and cooling technologies, 2006-2011



Source: EEA

The yearly PII for renewable heating and cooling shows an increase in policy effectiveness for solar thermal in 2010 albeit the decrease in 2011. The yearly PII for biomass varied very strongly (Figure 1-11).

Figure 1-11 Yearly PII for selected renewable energy technologies, 2006-2011

Source: EEA

Overall, the Czech Republic's renewable energy policy can be considered as effective for the analysed period. The growth rate for key technologies such as solar and hydropower in the electricity sector was on average higher or close to the rate needed to reach the 2020 targets. However, strong yearly fluctuations point to a lack of policy consistency over time. The drastic changes recently introduced to the Czech Republic's FIT/FIP support scheme are a response to the escalating costs of the support scheme.

The next sub-section will analyse the cost efficiency of the Czech FIT/FIP support scheme.

1.3.3 RES POLICY EFFICIENCY

To measure policy efficiency, the Total Cost Indicator (TCI) has been used. The TCI shows the cost for a specific renewable energy support scheme. For this purpose, the amount of annual FIT/FIP payments is compared to the wholesale value of the total annual electricity generation ([17]).

The yearly average wholesale price in the Czech Republic varied quite strongly between 2005 and 2012 (Table 1-6). This affects the calculations of the TCI with respect to the value of total annual electricity generation.

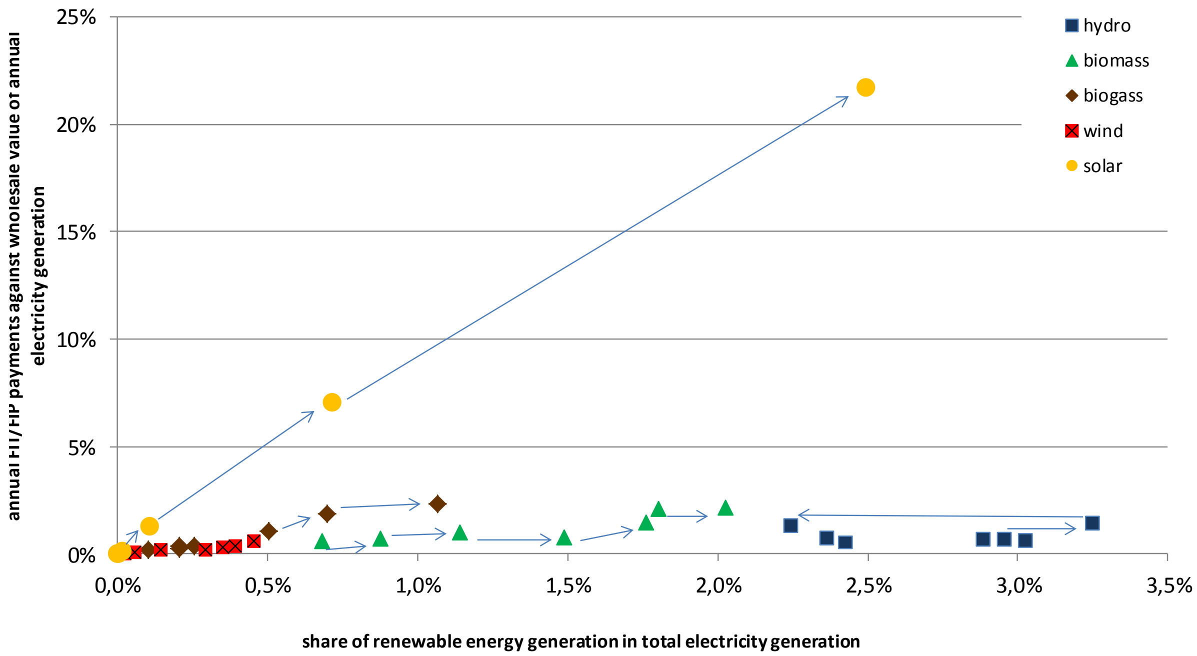
Table 1-6 Average wholesale electricity price (EUR/MWh)

2005	2006	2007	2008	2009	2010	2011	2012
34,02	40,59	36,99	64,41	37,8	43,65	50,56	42,38

Source: EMOS (DG ENER, 2013)

The TCI for the year 2012 in the Czech Republic is illustrated in Figure 1-12. It shows that the costs for solar energy increased to 22 % of the wholesale value of total electricity production in the Czech Republic in that year, while the share of solar electricity generation was less than 2.5 %. For the other technologies, the costs relative to their share in total electricity generation have been considerably lower. The arrows show the change from 2005 to 2011.

Figure 1-12 TCI for renewable electricity, 2005-2011



[17] As the concept of the TCI focuses on renewable electricity generation (IEA, 2011), heating and cooling are not included in this analysis.

Source: EEA

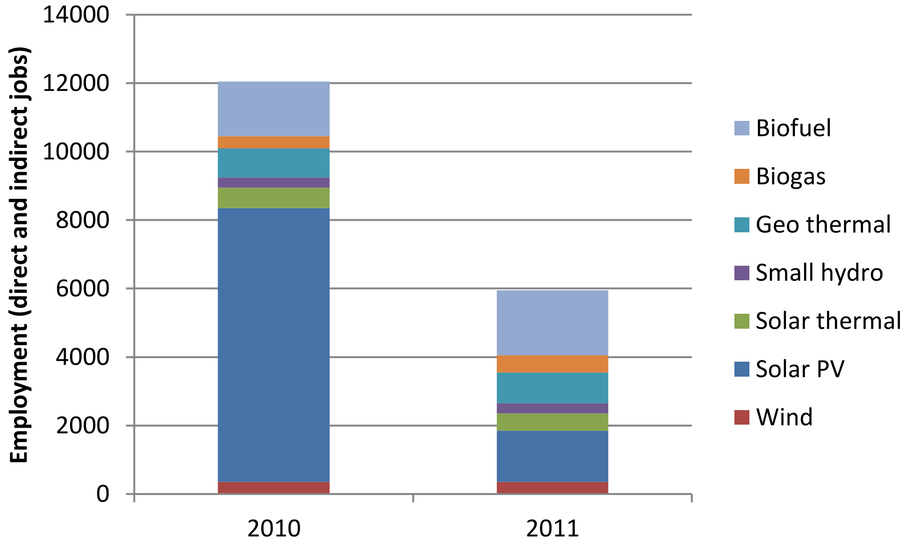
The differences in TCI for each technology reflect the different technology costs. Given the higher costs for solar PV as compared to the other technologies, it is not surprising that it requires more financial resources to add the same amount of electricity output from solar PV as compared to onshore wind. At the same time, the analysis for the period 2005–2011 indicates that the policy in place became too costly compared to the achieved output in solar energy.

It is important to note that the calculation of the TCI does not specifically show the lowering of wholesale prices that occurs due to the higher penetration of renewable electricity, also known as the 'merit order effect'. This is a weakness of the TCI (IEA, 2011) since the merit order effect can have a significant impact on wholesale electricity prices (e.g. Würzburg et al., 2013). A further investigation of the merit order effect is, however, outside the scope of this report.

1.3.4 Economic impact of renewable energy sector

The increase in solar energy output is also reflected in the employment and production statistics of the renewable energy sector. Employment in the renewable energy sector in the Czech Republic was dominated by solar PV in 2010. More than 8 000 people were employed in the solar PV sector in 2010, decreasing to 1 500 jobs in 2011. Overall employment in the renewable sector decreased from roughly 12 000 jobs in 2010 to less than 6 000 in 2011, mainly due to the decrease in solar PV-related jobs.
Jobs in the other categories remained more or less constant (Figure 1-13). In 2010, 66 % of total employment in the renewable energy sector was generated by solar PV, decreasing to 25 % in 2011. A large part of the jobs appear not to be structural and could be more related to installation of renewable energy technologies, but some jobs were also created in production/manufacturing.

Figure 1-13 Employment in RES sector (fte[18]**)**



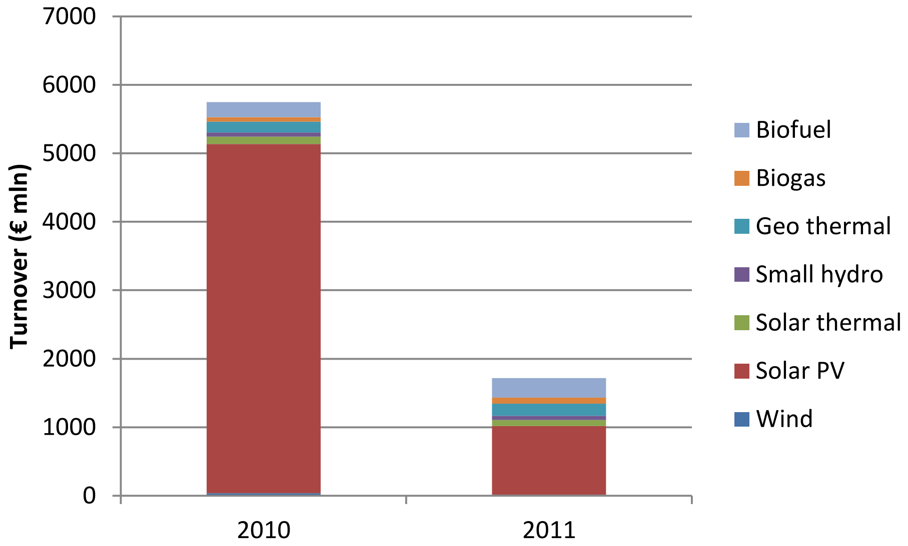
[18] Full-time employment

Source: EurObserv'ER (2012)

Annual turnover figures show comparable trends. There is a large domination in 2010 by solar PV (more than EUR 5 billion decreasing to EUR 1 billion in 2011). In 2010, solar PV contributed 91 % to total turnover of all renewable technologies. This share dropped to 63 % in 2011, which is still considerably higher than the share in employment in 2011 (25 %). This may be due to the fact that solar industry is less labour-intensive, but further analysis is needed to completely understand the situation (in fact, across all four target countries, the solar industry seems to have failed in creating sticky employment despite generous support; see more discussion in the full report). Total turnover decreased from EUR 5.6 billion in 2010 to EUR 1.6 billion in 2011 (

Figure 1-14).

Figure 1-14 Annual turnover in RES sector in 2010 and 2011 (million EUR)



Source: EurObserv'ER (2012)

1.4 Assessment of innovation processes in the renewable energy sector

The analysis in the previous section showed how effective and efficient the FIT/FIP scheme was in stimulating the deployment of renewable energy technologies and establishing as sizeable renewable energy sector. This section looks beyond the deployment phase and assesses to what extent earlier stages in the innovation cycle such as R&D and demonstration have been important in this process.

1.4.1 Rationale and objectives of innovation policies in Czech Republic

Innovation policies in the Czech Republic have been formulated in various documents. At present, the overarching policy plan has been the National Research, Development and Innovation Policy 2009–2015 (NRDIP). The plan sets out nine goals on how to accelerate research, development and innovation (RDI) in the Czech Republic. The second objective states:

'Focus State aid for RDI on the needs of sustainable development – priorities for applied research, development and innovation will be determined in accordance with the objectives to be achieved in relation to the needs of sustainable development in the Czech Republic in all its three pillars (economic, social and environmental development).'

One of the priorities listed in this document has been the focus on energy sources. Related objectives include the handling of issues related to more efficient and more environmentally friendly use of fossil fuels, reduced CO2 emissions, expanded use of RES and advances in environmentally friendly biofuels. The specifics of this programme show that quite a lot of attention will be given to RDI activities in the nuclear industry, along with energy savings and renewable energy.

The NRDIP analyses that current RDI budgets in the Czech Republic for energy sources are below those of other countries in Europe. The document states that funding from public sources needs to be increased by at least 150 % to provide enough incentive to increase private and own resources by 400 %. The main mechanism of financing these plans will be a greater appeal on EU Cohesion and Structural Funds.

According to the Innovation Union Scoreboard (IUS), the performance of the Czech Republic was below that of the EU-27 average in 2012. Ranking 18th out of 27 EU countries, the Czech Republic is categorised as a moderate innovator ([19]). The IUS provides a comparative assessment of the performance of the EU-27 Member States based on 25 different indicators, such as scientific publications, venture capital and sales of innovations (EU, 2013) ([20]). Research intensity measured by gross domestic expenditures on R&D (GERD) increased from 1.35 % of GDP in 2005 to 1.85 % in 2011. GERD per capita was (in current USD at purchasing power parity (PPP)) increased from 288 in 2005 to 485 in 2011 (OECD, 2012).

1.4.2 Drivers for innovation in the RES sector

The most important drivers for innovation in the RES sector seem to be funding for R&D through targeted funding for a pre-authorised purpose.

There is no direct evidence that FIT/FIP stimulation of renewable energy has been an important driver for innovation in this sector in the Czech Republic. Public funding is generated by the relevant institutions (Grant Agency of the Czech Republic and Technology Agency of the Czech Republic and Ministries), which carry out tendering and procurement functions and grant titles. Another form of support is institutional funding, which is used to cover the costs of specific research institutions on their research activities. This support aims to serve for the long-term development of research organisations. The supported institutions include the Academy of Sciences of the Czech Republic and its institutions, the Ministry of Education of the Czech Republic and other research organisations, with support distributed according to the research results achieved. All these institutions use targeted funding and support. Other funding opportunities for RDI are the resources provided by EU funds through various operational programmes.

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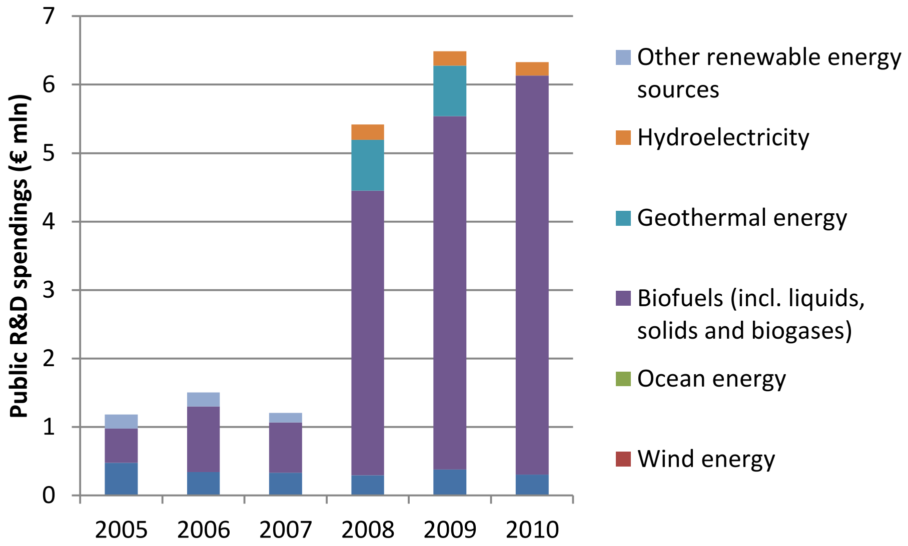
[19] Together with Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain.
[20] The Innovation Union Scoreboard report, annexes and the indicators' database are available at http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/index_en.htm online.

The Czech Republic's total R&D budget for renewable energy technologies has increased from EUR 1.2 million in 2005 to EUR 6.3 million in 2010 (Figure 1-15). By far, most of the R&D budget is spent on biofuels. In 2010, 92 % of the total R&D budget was allocated to biofuels.

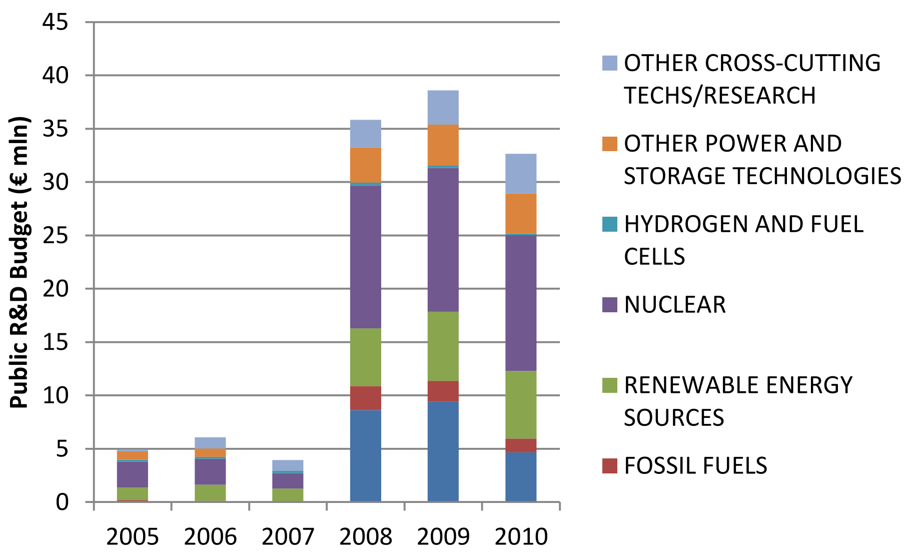
Figure 1-15 Public R&D spending per RES technology (million EUR)



Source: IEA (2013)

Comparing the total R&D budget for RES to the total R&D budget for other energy areas shows that since 2005 renewable energy technologies had a large share (ranging between 15 % and 31 %) among all energy technologies (see Figure 16). However, most of the public R&D spending (between 35 % and 49 %) was allocated to nuclear energy.

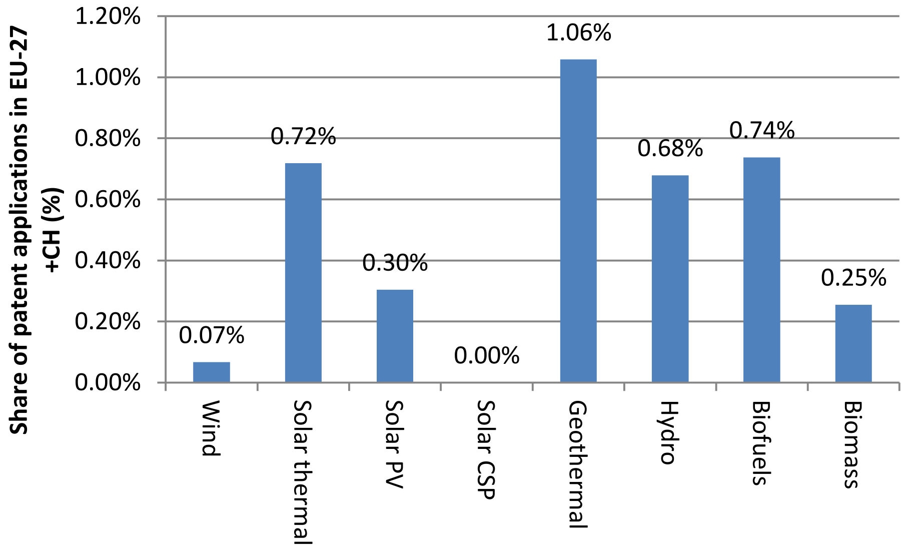
Figure 1-16 Public R&D spending for energy technologies, 2005-2011 (million EUR)



Source: IEA (2013)

The Czech Republic has a low share in the EU-27's patent applications, with the highest share in geothermal technologies, biofuels and solar thermal (Figure 1-17). These numbers indicate that there is no correlation between domestic deployment and R&D activities. Patent applications for solar PV were very low while deployment rates were very high for solar PV in the Czech Republic.

Figure 1-17 Czech Republic share of RES patent application in total EU-27+Switzerland (average 2006-2010), in % ([21])



Source: OECD stat (2013)

1.5 Coherence of renewable energy policies with other relevant policies

In this section we discuss the coherence of energy policies with other relevant policies. Coherence is assessed in terms of the degree to which there is an absence of major conflicts between policy areas concerning objectives/targets and the degree to which policies reinforce their effects (i.e. synergies) and minimise negative trade-offs.

1.5.1 Energy and renewable energy policy objectives

The Czech National Reform Programme (NRP) submitted in the framework of the European Semester in 2013 (NRP-CZ, 2013) refers to safety, competitiveness and sustainability. The Czech Republic has a target of achieving a 13 % share of the gross energy consumption under the Renewable Energy Directive (2009/28/EC). Furthermore, a Government Energy Policy 2010–2030 is currently under

[21] Patent applications filed under the Patent Cooperation Treaty (PCT). 2010 is the latest year for which data were available.

preparation. RDI will be one of five key priorities and the support for renewables should be focused on more efficient use of biomass, development of next-generation biofuels, new types of PV systems and highly efficient geothermal sources.
The objectives of the Czech Government are to reduce energy costs, completion of the EU energy market and proper implementation of the liberalisation package in all Member States. Stable and sustainable conditions for supporting RES-generated energy in the long term should be maintained while limiting operational support provided to RES. In relation to the latter aspect, the Czech Government announced it will take legal action to revise and stabilise financial support policies applicable to RES, including PV power plants. In 2013, the Czech Government has approved to cancel, from 1 January 2014, operational support for new renewable electricity generators (with an exemption for wind and hydropower if a building permit is secured before 31 December 2014) ([22]).
Furthermore, over recent years the Czech transmission system has faced significant overflows of RES-E from neighbouring states (particularly from Germany). There is a need to effectively reduce this overload and to increase grid flexibility.

1.5.2 Coherence with economic policy objectives

The NRP of the Czech Republic submitted in the framework of the European Semester 2013 (NRP-CZ, 2013) sets out that the Czech Government aims to create and improve conditions for business and to provide quality transport, energy and digital infrastructure in the following six key areas:

1. Improvement of business environment, development of business services;
2. Sustainable industrial sector;
3. Development of transport infrastructure;
4. Development of energy and environmental infrastructure;
5. Development of digital infrastructure and a digital strategy for the Czech Republic;
6. Space activities of the Czech Republic.

Overall, there is no major incoherence between economic policy objectives, and energy and renewable energy policy objectives. Objectives such as the development of energy and environmental infrastructure point to support schemes that would favour infrastructure development in these areas, without however supporting RES in particular.

1.5.3 Coherence with innovation policy objectives

Growth based on innovation and research (NRP-CZ, 2013) is one of the priorities of the Government of the Czech Republic for reform efforts, in line with the Europe 2020 strategy. Public expenses on RDI should reach 1 % of GDP by 2020 while the private sector is expected to contribute beyond this objective. An objective is to focus state aid for RDI on sustainable development. Priorities for applied RDI will be determined in accordance with the objectives to

[22] Source: Czech Government (http://www.vlada.cz/cz/media-centrum/aktualne/vlada-omezi-podporu-pro-obnovitelne-zdroje-energie-109181/).

be achieved in relation to the needs of sustainable development in the Czech Republic in all its three pillars (economic, social and environmental development).
In relation to this objective, two actions are defined (Rada pro výzkum, vývoj a inovace, 2013: 17 et seqq.):

1. Review the priorities of applied RDI in relation to the needs for sustainable development in the Czech Republic;
2. As a matter of priority, channel state aid for RDI into priorities corresponding to the needs of society and the knowledge economy in the Czech Republic.

Moreover, there are six priority areas of relevance defined in the NRDIP of the Czech Republic:

1. competitive economy based on knowledge;
2. sustainable energy and material resources;
3. environment for quality of life;
4. social and cultural challenges;
5. healthy population;
6. a safe society.

In the area of sustainable energy and material resources, the main objectives are to achieve a sustainable energy mix based mainly on all available domestic energy resources, and to increase energy independence and energy security of the Czech Republic. The NRP-CZ also specifies that support is granted to RDIs aimed at increasing the efficiency of energy resources' utilisation and reduction of pollutants in the atmosphere.
There is no incoherence between innovation policy objectives, and energy and renewable energy policy objectives of the Czech Republic. Objectives such as focus state aid on RDI for sustainable development point towards potential support of innovation policies for renewable energy technologies. In addition, supporting measures such as knowledge transfer indicate a broader scope of potential support for innovation policies related to a variety of energy technologies in order to meet other objectives of the Czech energy policy, such as achieving a sustainable energy mix based mainly on all available domestic energy resources, and increasing energy independence and energy security of the Czech Republic.

1.5.4 ISSUES TO BE CONSIDERED CONCERNING POLICY COHERENCE

While energy, renewable energy, economic and innovation policy objectives are by and large coherent, potential incoherence needs to be further investigated at the level of policy instruments in three areas:

- the implementation of the objective to lower energy costs: cancel from 2014 operational support for new renewable electricity generators (with an exemption for wind and hydropower approved for building by 31 December 2014) and replace it with targeted investment support for cost-effective installations;
- the boundary conditions for limiting operational support to RES;
- a potential limitation of the access of renewables from third countries to the Czech electricity transmission system.

While lower energy costs may potentially affect energy security by leading to an increased demand for energy, possibly also with negative consequences for sustainability, lower energy costs may increase the competitiveness in economic sectors that are heavily dependent on energy use and subject to a very competitive economic environment. Whether there are real-world effects on energy security and sustainability depends significantly on the price elasticity of energy demand, the type of measures taken to achieve this objective, the sectors covered by such measures and the implementation of these measures.

Moreover, the objective to limit ‘operational support’ to RES could be contradicting the objective to create ‘stable and sustainable conditions for supporting RES-generated energy’ if such limitation takes place suddenly without market players having the possibility to adjust their expectations and investment decisions. Like in the case of the objective to reduce energy costs, however, the way this objective is implemented will determine whether there actually is a contradiction.

Finally, the aim to reduce the overload of RES-E from certain neighbouring states and to increase the Czech electricity transmission system’s flexibility needs to be carefully monitored, as the implementation of this objective could potentially lead to a limitation of the access of renewables from third countries connected to the grid.
Annex I presents a detailed inventory of energy, renewable energy, economic and innovation policy objectives.

1.6 Conclusions

In 2011, the share of RES in gross final energy consumption was around 9 %. Renewable electricity had a share of 11 %, renewable heating and cooling of 13 %, and renewable transport of around 1 %. The Czech Republic overachieved the interim target for the period 2011–2012 of 7.5 % under the Renewable Energy Directive.

Due to more recent changes in the renewable policy in the country, it is unclear whether such a development will be sustained over the coming years. Over the period 2005–2011, the Czech Republic spent 62 % of the total support allocated to energy on renewables compared to 38 % for conventional fossil and nuclear sources. This share is lower than in 2011 (79 % renewable energy support), mainly because of an increase of FITs/FIPs between 2005 and 2011. FIT/FIP payments make up 93 % of total renewable energy support in 2011. Unlike other countries where there seems to be a shift from the public budget to tax payers to support the deployment of renewable technologies, in the Czech Republic the reverse is happening where part of the payments for FITs/FIPs are now directly financed from the state budget to reduce the pressure on the end consumer.

Concerning the renewable technologies for electricity production, the Czech policy was particularly effective for solar PV and hydropower. For these technologies, the PII was well above the average needed to meet the 2020 targets. For wind and biomass, however, further improvements are needed to remain on track with technology-specific 2020 targets. The Czech Republic compares well with Spain and the Netherlands concerning the PII for most technologies for electricity production except biomass (for details, see the full report).

Concerning heating and cooling, Czech policies were particularly effective for solar thermal and heat pumps where the PII was above the average needed to meet the 2020 targets, but the same cannot be said for biomass, bioliquids and geothermal technologies. For the heating and cooling sector, the PII for the Czech Republic matches reasonably well those for Spain and the Netherlands for heat pumps and biomass. Interestingly, despite a rather high effectiveness of the policy for solar thermal, the PII is far below that of the Netherlands (see full report for details).

Concerning the policy efficiency measured using the TCI, policies seem to have been rather efficient in the Czech Republic for biomass, wind, biogas and hydro technologies. The TCI for solar PV stands out, reflecting the fact that strong deployment for this technology came at a very high cost. When compared to other target countries, the support for solar PV was clearly less efficient than in Spain, for example, as it achieved almost the same share of electricity generation but at a higher cost than in Spain (see full report for details). For biomass and hydro, the TCI compares well with the one for Spain. For wind, however, policies were far more efficient in Spain and the Netherlands compared to the Czech Republic where the indicator has a rather low value.

Because of a favourable overall market conditions, the Czech Republic's renewable energy sector has developed very strongly, employing 12 000 people in 2010, although employment decreased by 50 % in 2011. A large part of the jobs appear not to be structural and could be more related to installation of renewable technologies. Despite the existence of a strong industrial sector in the Czech Republic, renewable energy support did not produce a sizeable renewable energy sector.

The data available do not indicate that domestic deployment had a significant impact on R&D activities. At the same time, the Czech R&D budget for renewable energy is relatively low and most of it is spent on nuclear energy. More attention is paid to heavy machinery for conventional energy technologies (e.g. big hydro turbines), which may explain the low budget in R&D for renewables.

While energy, renewable energy, economic and innovation policy objectives are by and large coherent, potential incoherence needs to be further investigated at the level of policy instruments in three areas:

- the implementation of the objective to lower energy costs: cancel from 2014 operational support for new renewable electricity generators (with an exemption for wind and hydropower approved for building by 31 December 2014) and replace it with targeted investment support for cost-effective installations;
- the boundary conditions for limiting operational support to RES;
- a potential limitation of transit volumes of renewable electricity from neighbouring countries.

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Annex I Inventory of energy, renewable energy, economic and innovation policy objectives

<table>
<tr><th>Thematic area</th><th>Policy objective</th><th>Coherence between policy objectives</th><th>Source</th></tr>
<tr><td colspan="4">‘internal’ coherence between different energy policy objectives</td></tr>
<tr><td rowspan="4">Energy</td><td>‘Safety – Competitiveness – Sustainability’;</td><td rowspan="4">O</td><td rowspan="4">NRP-CZ, 2013</td></tr>
<tr><td>‘energy savings’;</td></tr>
<tr><td>Energy efficiency, in particular ‘to contribute to a speedy, energy-efficient modernization of buildings’;</td></tr>
<tr><td>In relation to EU energy policy:
‘achiev[ing] … that energy policies adopted by the EU will lead to the reduction of the energy costs’
‘completion of the EU energy market and proper implementation of the liberalization package in all member states.’</td></tr>
<tr><td colspan="4">coherence with energy policy objectives</td></tr>
<tr><td rowspan="5">Renewable Energy</td><td>‘establish… stable and sustainable conditions for supporting RES-generated energy in the long-term’;</td><td>+</td><td rowspan="5">NRP-CZ, 2013</td></tr>
<tr><td>Limiting ‘operational support provided to RES’;
‘revis[ing] … and stabili[sing] … financial support policies applicable to RES, including photo-voltaic power plants’ to ‘reduce … [the] impact on the competitiveness of the industry and the economy as a whole’;</td><td>O
O</td></tr>
<tr><td>‘efficient and expedient use of biomass energy potential’;</td><td>+</td></tr>
<tr><td>‘building sufficient capacity facilities for energy recovery of municipal waste (especially for biodegradable waste)’;</td><td>+</td></tr>
<tr><td>‘Over recent years the Czech transmission system has faced the onslaught of major overflow of electricity from renewable sources from certain neighbouring states. … there is a need effectively to reduce this overload and to increase its flexibility.’</td><td>O</td></tr>
<tr><td colspan="4">coherence with energy and renewable energy policy objectives</td></tr>
<tr><td rowspan="4">Economic policy</td><td>Long term: ‘need for structural reforms and internal consolidation’;</td><td>O</td><td rowspan="4">NRP-CZ, 2013</td></tr>
<tr><td>Short term: ‘the renewal of economic growth, which needs to be considered when designing … consolidation measures’;</td><td>O</td></tr>
<tr><td>‘creating and improving conditions for business and provide quality transport, energy and digital infrastructure’, also in the areas of a sustainable industrial sector, the development of transport infrastructure, the development of energy and environmental infrastructure;</td><td>+</td></tr>
<tr><td>‘Growth based on innovation and research’</td><td>+</td></tr>
<tr><td colspan="4">coherence with energy and renewable energy policy objectives</td></tr>
<tr><td>Innovation</td><td>Public expenses on RDI should reach 1 % of GDP by 2020 while the private sector is expected to contribute beyond this objective;</td><td>O</td><td>NRP-CZ, 2013</td></tr>
</table>

	'Focus State aid for RDI on the needs of sustainable development – priorities for applied research, development and innovation will be determined in accordance with the objectives to be achieved in relation to the needs of sustainable development in the Czech Republic in all its three pillars (economic, social and environmental development)';	+	Rada pro výzkum, vývoj a inovace, 2013
	'Apply R&D results in innovations and improve public-private cooperation in RDI - to ensure … the establishment of mechanisms for the quick and easy transfer of this knowledge to practical applications, and the use of new R&D knowledge in innovations';	+	
	'Improve the Czech Republic's involvement in international cooperation in RDI';	O	
	'Ensure effective links to policies in other areas – to coordinate the activities of various government agencies, implementing agencies and other providers of State aid for RDI so that the various measures are complementary and synergistically contribute to the growth of the Czech economy's competitiveness and the quality of life in the Czech Republic';	+	
	In the area of sustainable energy and material resources, the main objectives are: to achieve a sustainable energy mix based mainly on all available domestic energy resources; to increase energy independence and energy security of the Czech Republic	+	Information by the Ministry of the Environment of the Czech Republic to the EEA