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Energy Union Factsheet Slovak Republic

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Third Report on the State of the Energy Union

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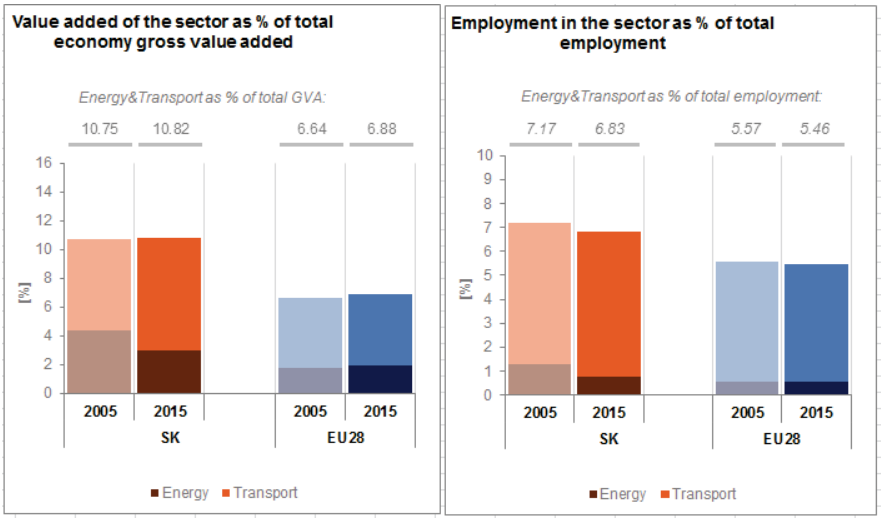
Slovak Republic

Energy Union factsheet[1]

1. Macro-economic implications of energy activities

Energy and transport are key sectors for the overall functioning of the economy as they provide an important input and service to the other sectors of the economy. Together the activity in these two sectors[2] accounted for 10.8 % of the total value added of Slovakia in 2015. Similarly, their share in total employment[3] was 6.8 % in 2015, of which 6.0% in the transport sector and 0.8 % in the energy sector.

The decarbonisation of the energy and transport sectors will require significant investments and economic activity beyond the remit of these sectors themselves. The energy transition implies a structural shift in economic activity. Energy-related investment and jobs will in part migrate from traditional fossil fuel based activities towards construction, equipment manufacturing and other services related to the deployment of low carbon and clean energy technologies. At the moment, the efforts related to the energy transition in other sectors cannot be reliably quantified and are therefore not included.



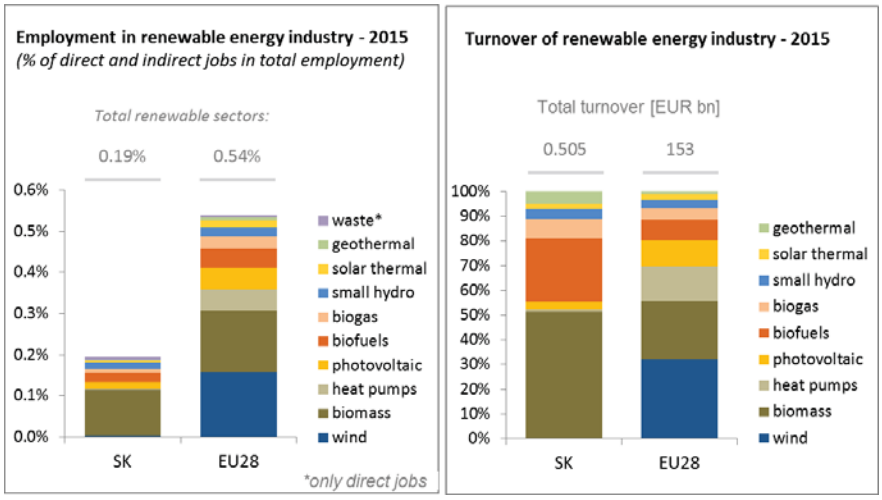
(source: Eurostat)

1 The indicators used in this country factsheet largely build on indicators developed for the Commission Staff Working Document "Monitoring progress towards the Energy Union objectives – key indicators" (SWD(2017) 32 final) https://ec.europa.eu/commission/sites/beta-political/files/swd-energy-union-key-indicators_en.pdf

2 Gross value added and employment in NACE sectors D-Electricity, gas, steam and air conditioning supply and H-Transportation and storage

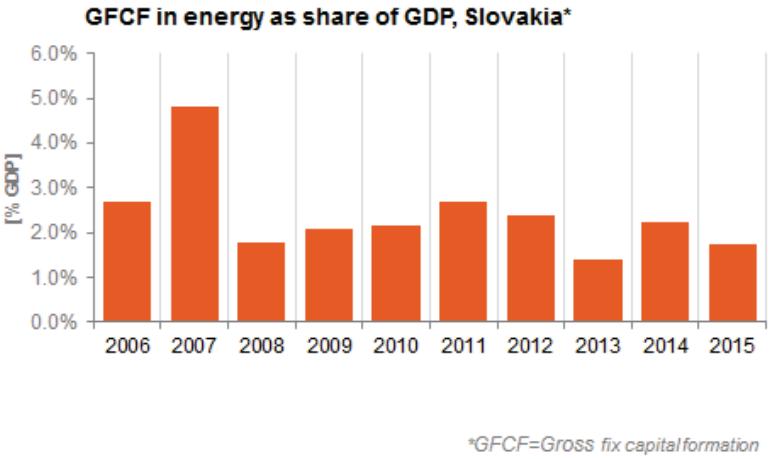
3 National accounts, Eurostat

In the case of renewable energy sector, both the direct as well as the indirect effects on employment are being estimated. According to EurObserv'ER, in 2015, the share of renewable energy related employment in total employment of the economy in Slovakia was at about 0.19 %, well below the EU average of 0.54 %. The turnover of the renewable energy industry in the same year was estimated at around EUR 505 million, the biggest part being attributed to the biomass (EUR 206 million) followed by biofuels (EUR 130 million), and biogas (EUR 40 million) industries.



(Source: EC based on Eurobserv'Er and Eurostat)

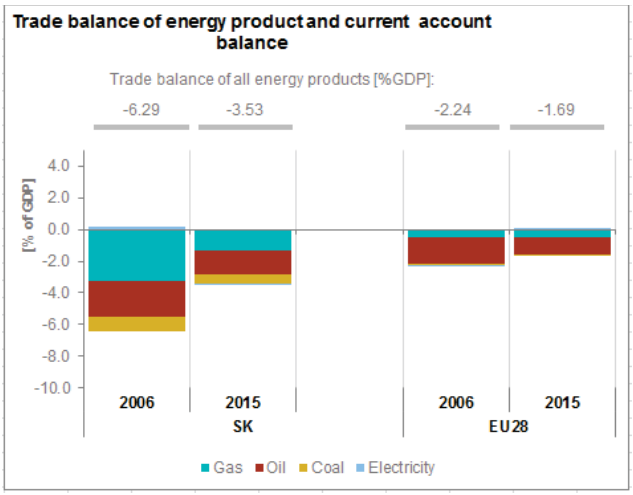
An indication of the level of efforts and challenges encountered by Slovakia in the energy sector is given by the gross fixed capital formation (GFCF)[4]. Investments in the electricity and gas sectors, which are taken as reference sectors, have been fluctuating around 2% since 2008 and stood at 1.7 % in 2015.



(Source: Eurostat)

[4] Gross fixed capital formation consists of resident producers´ acquisitions, less disposals, of fixed tangible or intangible assets. This covers, in particular, machinery and equipment, vehicles, dwellings and other buildings. It also includes foreign direct investment (FDI). Steam and air conditioning supply are also included in the figures mentioned above as Eurostat reports electricity, gas, steam and air conditioning supply together.

In terms of trade, Slovakia is a net importer of fossil fuels and electricity. The trade deficit in energy products has fallen from 6.3 % of GDP in 2006 to 3.5 % in 2015, influenced by improvements in energy efficiency and by a decrease in the prices of energy commodities. The largest decrease is accounted for by gas and the trade deficit of oil and coal has also been decreased whereas a slightly positive balance for electricity in 2006 turned negative in 2015.

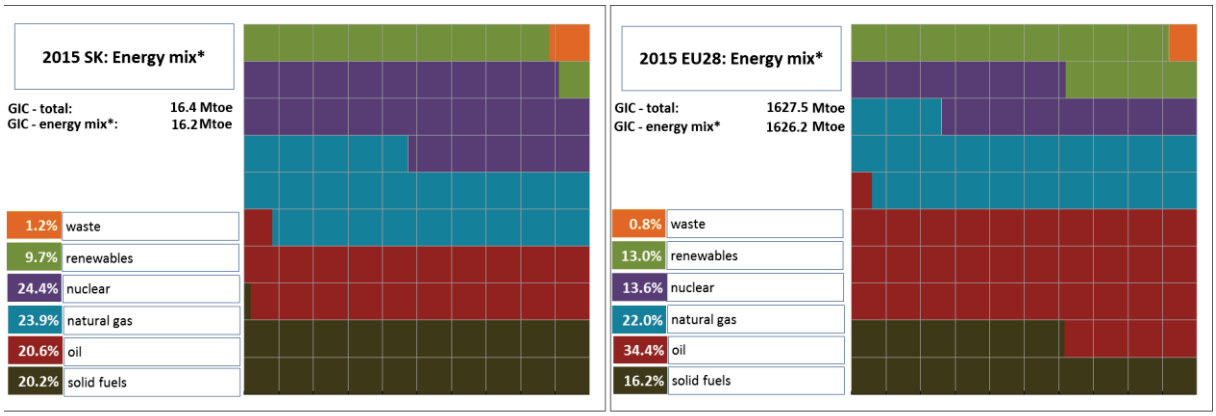


(Source: Eurostat)

2. Energy security, solidarity and trust

2.1. Energy Mix

In comparison to the average energy mix of primary products in the EU, nuclear had a higher share in 2015 in Slovakia's energy mix (24.4 % vs. 13.6 %), similarly to solid fuels (20.2 % vs. 16.2 %). At the same time, oil products had a significantly lower share (20.6 % vs. 34.4 %) and renewables also had lesser importance (9.7 % vs. 13 %). Natural gases had a similar share in Slovakia to the EU average.



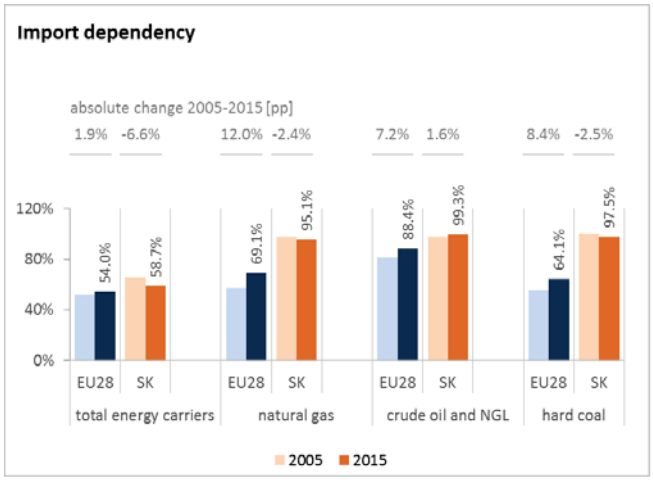
**energy mix as share share in GIC-excluding electricity and derived heat exchanges , GIC=gross inland consumption*

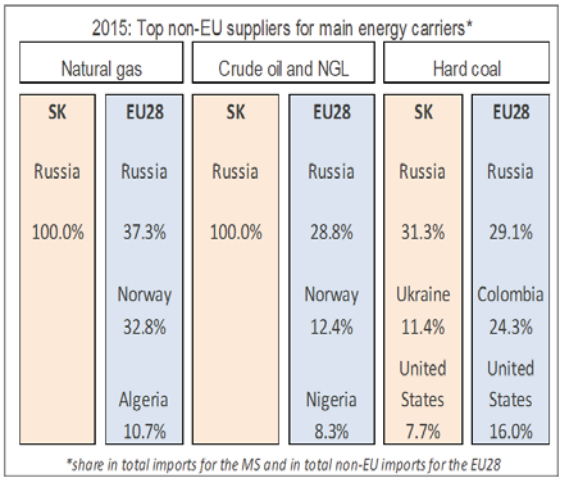
((source: Eurostat)

2.2. Import dependency and security of supply

Slovakia had an overall import dependency for fossil fuels slightly above the EU average, as well as for gas and petroleum and products between 2005 and 2015. In particular, Slovakia imports almost

all of its gas from Russia. Consequently, Slovakia experiences a significant energy trade deficit, expressed in percentage of GDP, being well above EU average.

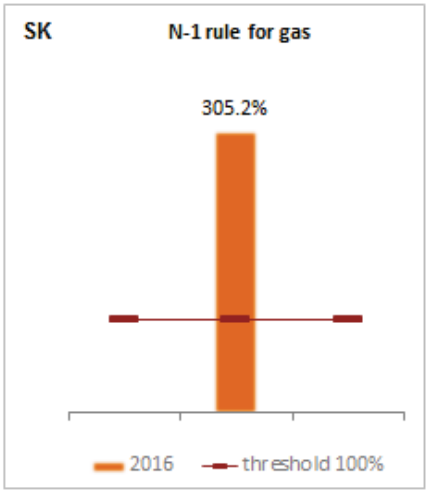




(source: Eurostat)

Slovakia remains one of the most vulnerable EU countries to possible gas disruptions. The establishment of a reverse flow mechanism with Ukraine was an important milestone for energy security in the region.

The security of gas supply regulation requires that, if the single largest gas infrastructure fails in one Member State, the capacity of the remaining infrastructure is able to satisfy the total gas demand during a day of exceptionally high gas demand. Slovakia complies with this rule.

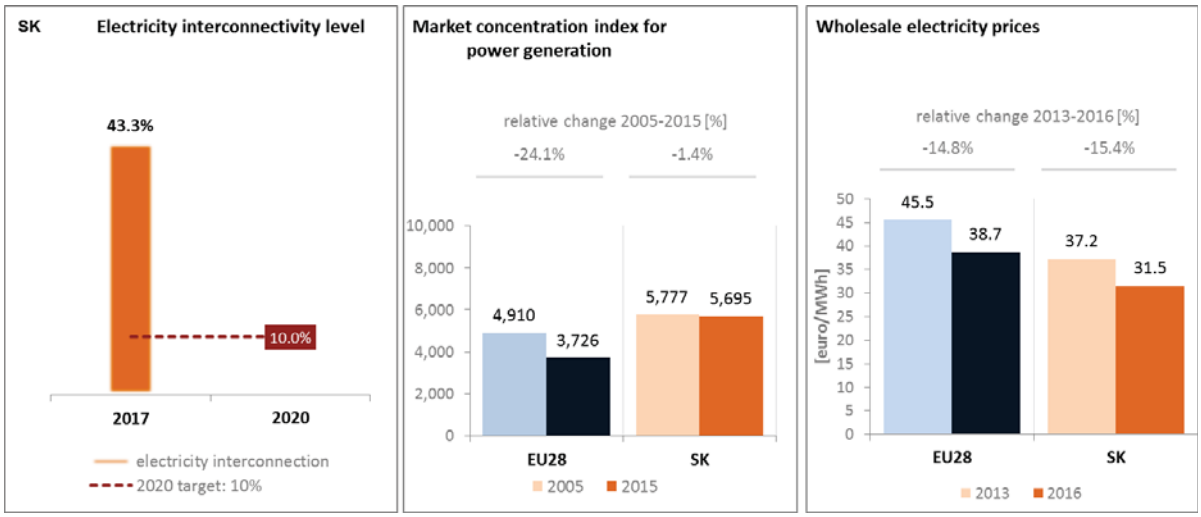


(Source: gas coordination group)

3. Internal market

3.1. Interconnections and wholesale market functioning

3.1.1. Electricity



(source: EC based on ENTSO-E scenario outlook and adequacy forecast 2014) *(sources: EC services based on Eurostat for the left graph and based on Platts and European power exchanges for the right graph)*

The interconnection capacity[5] for electricity was 43.3 % in 2017 for Slovakia, which is well above the 2020 and 2030 EU objectives (respectively 10 % and 15 %). However, the country is impacted by electricity loop flows from Germany, via Poland and the Czech Republic. Significant congestions also occur on the Slovak-Hungarian border where new electricity interconnections are planned (i.e. to be financed under Connecting Europe Facility - CEF). Continuing the modernisation and upgrading the national electricity grid in Slovakia is a key element in improving the functioning of the national and regional electricity markets.

Market concentration of electricity generation remained constantly high in Slovakia between 2005 and 2015, whereas in the EU-28 it decreased slightly.

Wholesale electricity market prices were lower in Slovakia between 2013 and 2016 compared to the EU average and more or less corresponded to wholesale electricity prices in Central and Eastern European markets. In September 2012, the market coupling of the Czech, Slovak and Hungarian day-ahead electricity markets were successfully launched (Romania joined in 2014).

The national arrangements for congestion management and bidding zone definition in Central Europe do not necessarily reflect actual congestion, reducing possibilities to trade electricity across borders. Finding a joint regional solution would be likely to benefit all affected neighbours.

[5] The interconnectivity level is calculated as a ratio between import interconnection and net generation capacities of the country (i.e. the 2017 value is the ratio between simultaneous import interconnection capacity [GW] and net generating capacity [GW] in the country at 11 January 2017, 19:00 pm as resulted from ENTSO-E Winter Outlook 2016/2017)

Electricity Projects of Common Interest

Slovakia has three electricity infrastructure projects in the second Union list of Projects of Common Interest (PCIs):

(i) PCI 3.16.1 Hungary — Slovakia interconnection between Gabčikovo (SK) — Gönyű (HU) and Veľký Ďur (SK): This project is in the permitting phase on both the Slovak and Hungarian sides. It has obtained a Connecting Europe Facility (CEF) grant for studies of 0.7 million EUR and commissioning is foreseen in 2020.

(ii) PCI 3.17. Hungary — Slovakia interconnection between Sajóvánka (HU) and Rimavská Sobota (SK): This project is in the permitting phase on both the Slovak and Hungarian sides. It has obtained a Connecting Europe Facility (CEF) grant for studies of 0.7 million EUR and commissioning is foreseen in 2020.

Slovakia signed with Hungary a construction agreement at Ministerial level for the implementation of the two aforementioned interconnectors (3.16.1 and 3.17) in October 2016.

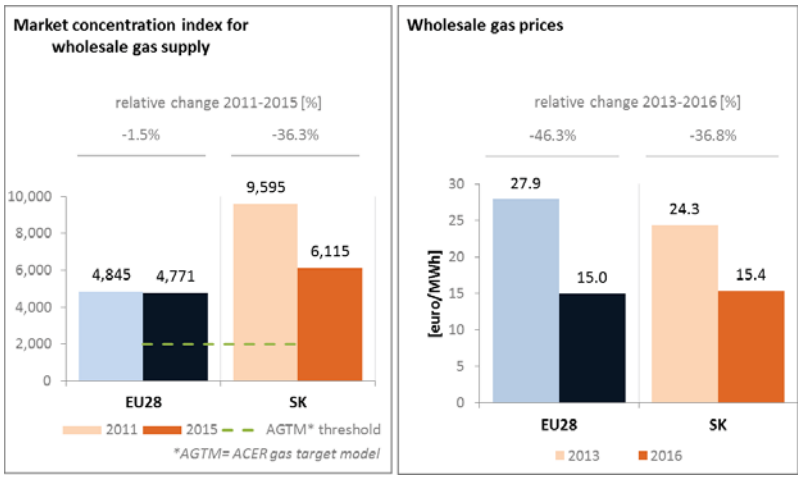
(iii) PCI 3.18 - Interconnection between Kisvárda area (HU) and Velké Kapušany (SK). This is a long term project which is currently under consideration. The estimated commissioning date is 2029.

3.1.2. Gas

Slovakia facilitates greater regional integration of gas markets and aims at further strengthening interconnections with neighbouring countries in gas networks. The important infrastructure projects, helping in diversifying import gas sources, include the new gas interconnector between Poland and Slovakia, one of the projects of the EU energy infrastructure priority corridor North-South gas Interconnections in Central Eastern and South-Eastern Europe (NSI East Gas).

Wholesale gas prices in Slovakia were of comparable with the EU average in 2016.

Market concentration of wholesale gas supply is high, though it decreased measurably between 2011 and 2015. The largest gas supplier still holds a market share of almost 61 % of gas supply to all final customers in Slovakia and it imports gas based mainly on a long-term contract with Gazprom. Slovakia should continue its efforts to diversify gas imports in order to foster security of supply and address the concentration on the wholesale market. New interconnectors will help to diversify gas supply across the Visegrad group countries (Poland, Czech Republic, Slovakia and Hungary).



(source: ACER for the left graph and EC services based on on Platts, gas hubs, Eurostat for the right graph)

Gas Projects of Common Interest

Slovakia has two gas infrastructure projects in the second European Union List of Projects of Common Interest (PCISs):

(i) - Cluster PL-SK interconnection and related internal reinforcements in Eastern Poland which includes:

- The Poland – Slovakia interconnector;

The project consists of a new cross-border pipeline with a length of approximately 164 km and with a maximum daily capacity of 15.6 mcm/day (approx. 5.6 bcm/year) in the direction SK-PL and 12.9 mcm/day (approx. 4.7 bcm/year) in the direction PL-SK. The scope of the project will also cover the construction of the Strachocina compressor station (Poland), the modification of the existing compressor station in Veľké Kapušany (Slovakia) and the construction of metering station near the Slovak-Polish border. The interconnector is currently undergoing the permitting stage on the Slovakian side with permitting having already finished on the Polish side. The project is estimated to be commissioned in 2020.

The project promoters have been awarded CEF financing for works with a value of EUR 107 million (40 % of the eligible costs) in the second 2016 CEF call. The promoters had previously benefited from EU financing for studies of EUR 4.8 million.

- Transmission infrastructure projects between Rembelszczyzna and Strachocina (PL);
- Transmission infrastructure projects between Tworog and Strachocina (PL).

The two internal Polish infrastructure projects are planned for commissioning partially in 2019 and partially in 2023.

(ii) Pipeline system from Bulgaria to Slovakia (Eastring)

Eastring is a project covering Slovakia, Hungary, Bulgaria and Romania, and possibly also third countries, e.g. Turkey and/or Ukraine and intended to serve as an interconnection between Western

EU liquid hubs and the Balkan region (an area with a potential to be a highly liquid region offering new gas sources from Caspian/Eastern Mediterranean/Middle East region). Depending on the results of the feasibility study currently underway, the project capacity will vary between 10 bcm/year and 40 bcm/year. The project is estimated to be finalized by 2021.

The project promoters have recently been awarded CEF financing for studies with a value of EUR 1 million in the second 2016 CEF call.

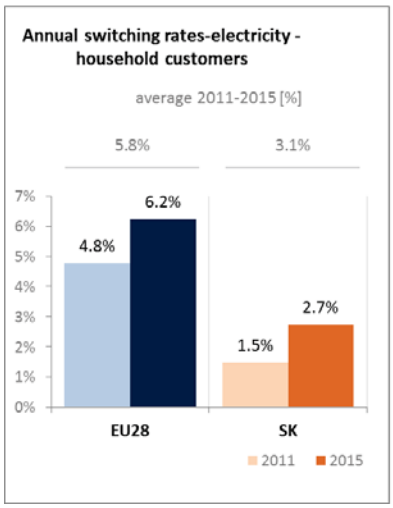
3.2. Retail electricity and gas markets

Retail prices in Slovakia are still regulated through "price caps" for all households and small industrial users. The regulatory cycle in Slovakia is five years, the elaboration phase of which includes a consultation process including all market participants, which represents an additional step to enhance the transparency and predictability of the regulatory framework. The regulatory framework should include measures to further increase the competitiveness of the Slovak energy sector. Retail prices are below the EU average for electricity (all consumers) and for household gas consumers.

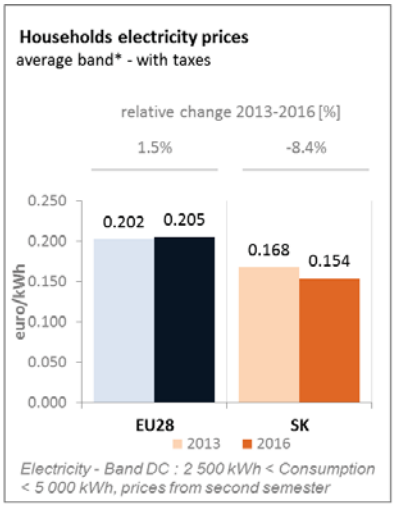
3.2.1. Electricity

The electricity market could be improved and it could facilitate new production and cross-border transmission. The recent adoption of the law on energy regulation extends the framing of the setting of energy prices until 2021. Energy regulation in Slovakia also includes several national policy-induced price components, such as a feed-in-tariff for electricity generation from domestic coal and lignite sources (not favourable for sustainability and environmental aspects). The connection of new decentralised sources to the network is perceived as difficult, and since 2013 a 'status of limited connection' inhibits the connection of new decentralised sources to the grid. The complex, opaque regulatory framework complicates relations between stakeholders in the energy market, hampering the production and distribution of renewable energy and the transition to clean energy technologies.

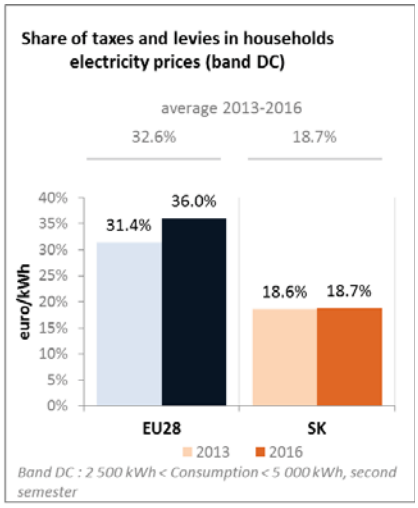
Although retail electricity prices are regulated in Slovakia, over the period 2011 and 2015 switching rates between utilities showed a slight increase (from 1.5 % to 2.7 %); though this was less than the half of the EU average, it indicates a potential for a dynamic and competitive retail electricity market in Slovakia.



(source: ACER)



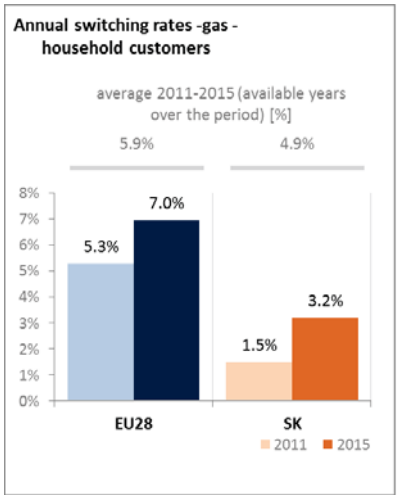
(source: Eurostat)



(source: Eurostat)

3.2.2. Gas

Although retail gas prices are regulated in Slovakia, between 2011 and 2015 switching rates between utilities showed a slight increase (from 1.5 % to 3.2); though this was still well behind the EU average, it indicates a potential for a dynamic and competitive retail gas market.



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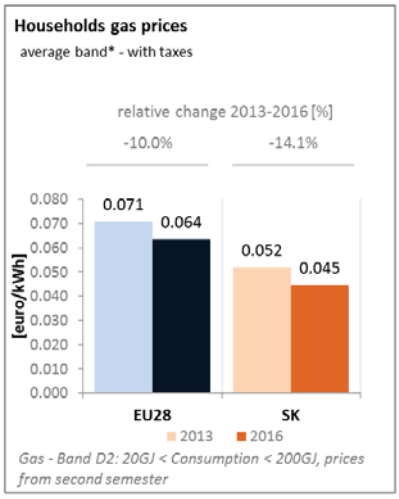

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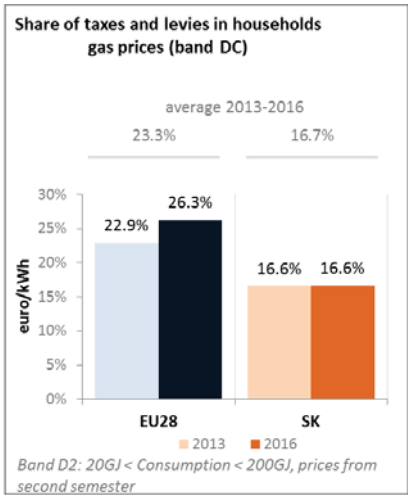
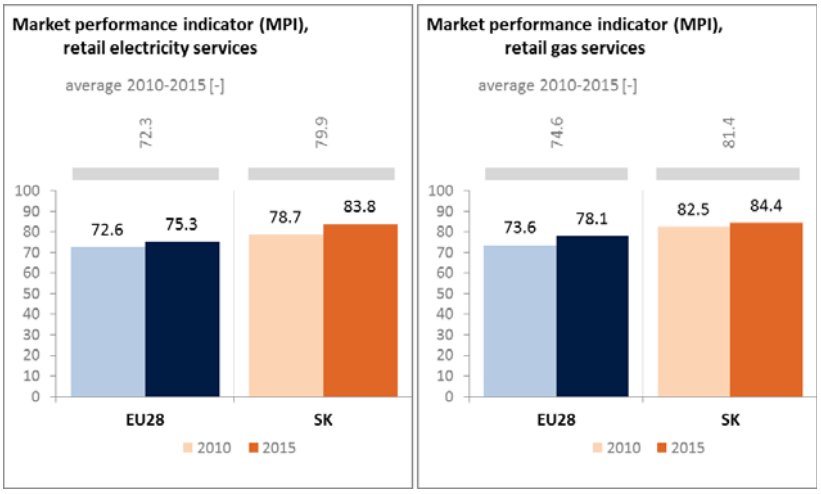


(source: Eurostat)

3.2.3. Market performance indicators

The overall assessment on consumer satisfaction of the retail electricity and gas markets is above the EU average[6].

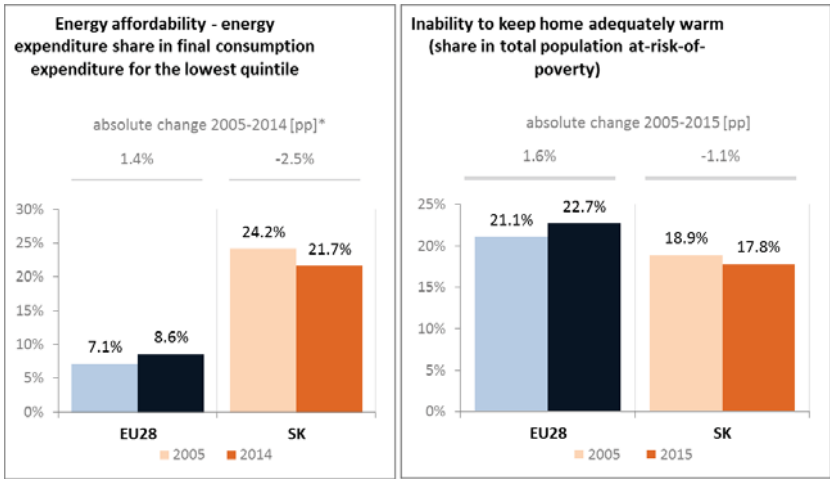


(source: DG JUST survey)

3.3. Energy affordability

6 10th Consumer Markets Scoreboard (June 2014), http://ec.europa.eu/consumers/consumer_evidence/consumer_scoreboards/10_edition/index_en.htm

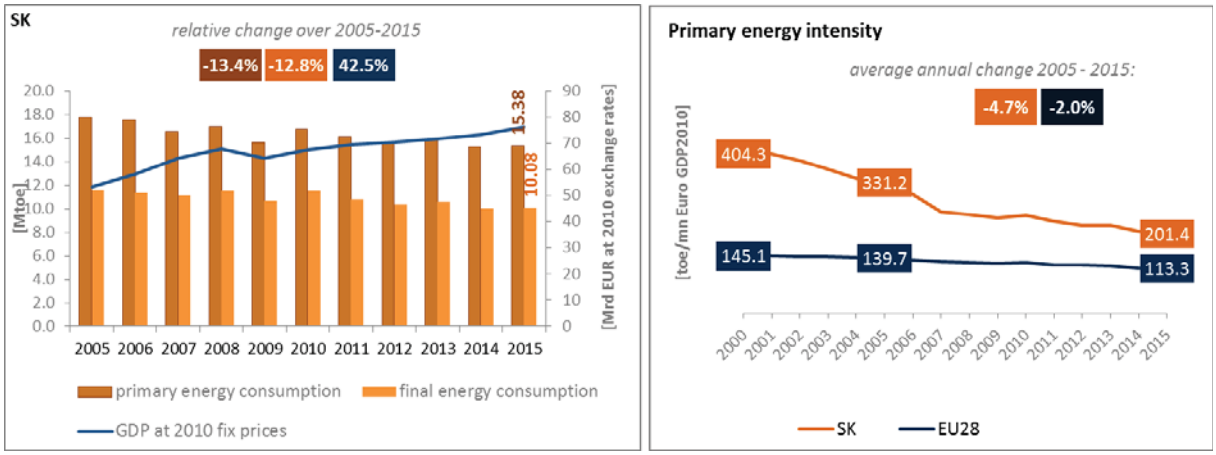
The concept for the protection of consumers fulfilling conditions of energy poverty was adopted in June 2014. It should be updated with each new regulatory period. The Act on Energy Industry defines vulnerable household electricity customers as strongly disabled persons who use electricity or gas for heating, or a person, whose vital functions depend on the offtake of electricity. The DSOs keep records on vulnerable customers and can disrupt electricity distribution only after having directly communicated with these electricity customers.



(source: ad-hoc data collection of DG ENER based on HBS with the support of Eurostat and national statistics)

4. Energy efficiency and moderation of demand

Slovakia is well on track to meet its 2020 targets on energy efficiency. Its primary energy consumption (15.4 Mtoe in 2015) was already under the 2020 target of 16.4 Mtoe. The final energy consumption (10.1 Mtoe in 2015) still shows a remaining gap to the 2020 target of 9 Mtoe. Both numbers marked a slight increase in 2015 compared to the previous year (with 0.8 % and 3 % respectively). The trend over the past ten years was of general decrease (with some 13 % for final energy consumption). However, the limits in decreasing the country's energy consumption were clearly visible in the last two years. Therefore, further efforts are needed for lowering final energy consumption.

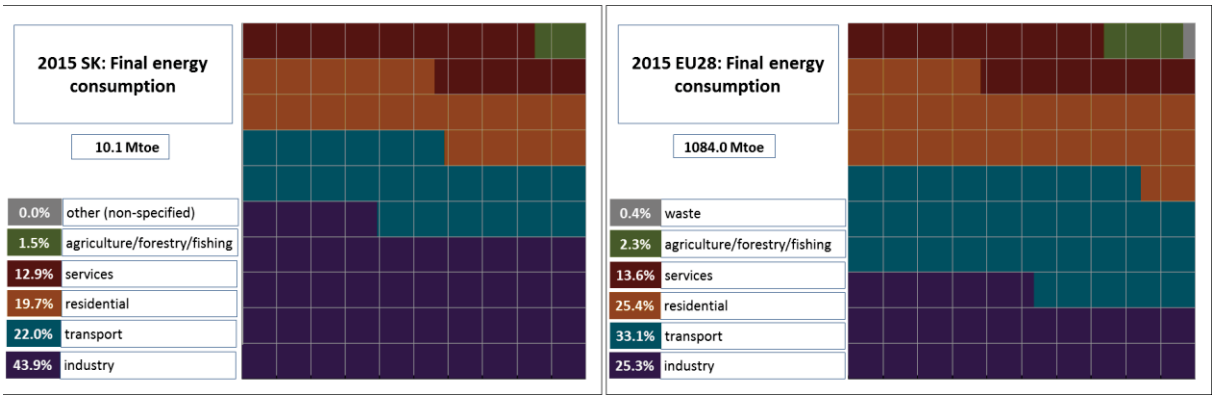


(source: Eurostat)

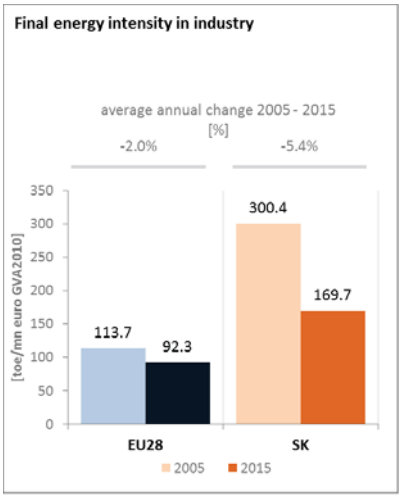
Slovakia's energy intensity is relatively high, given the high energy intensity of the industrial sector and its significant share in the GDP (43.9 % in 2015). The energy intensity of the economy, which

serves as a proxy indicator for overall energy efficiency, improved between 2005 and 2015, but it was approximately 80 % higher than the EU average in 2015, being among the highest in the EU.

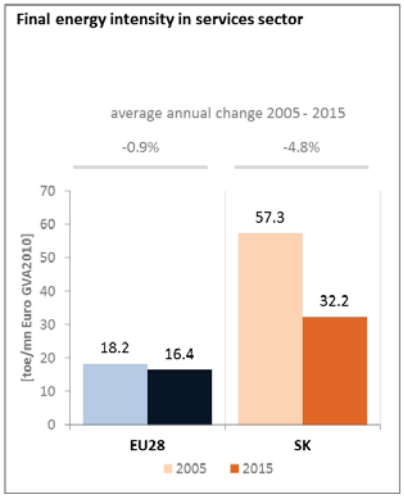
The sectorial breakdown presents a mixed view on energy consumption between 2005 and 2015. Consumption by industry remained more or less constant in the past few years, after undergoing a gradual decrease from 2005 to 2009. The industry has traditionally had the largest chunk in the final energy consumption, with some 44 % of 2015 total compared to an EU average of only 25 %. It is followed by consumption in transport (currently at some 22 %), households, and trade and services. Consumption has decreased by the most in the residential sector (-22 %) followed by the trade and services sector (-13 %).



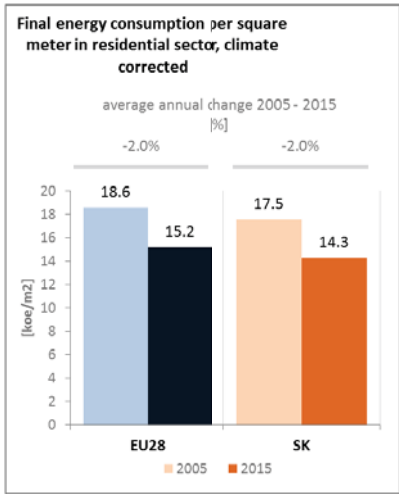
(source: Eurostat)



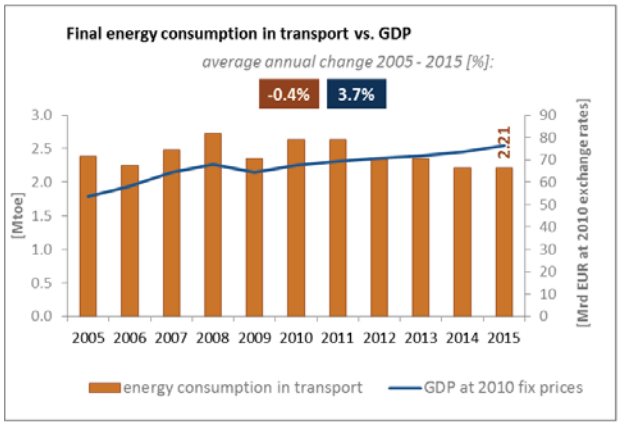
(source: Eurostat)



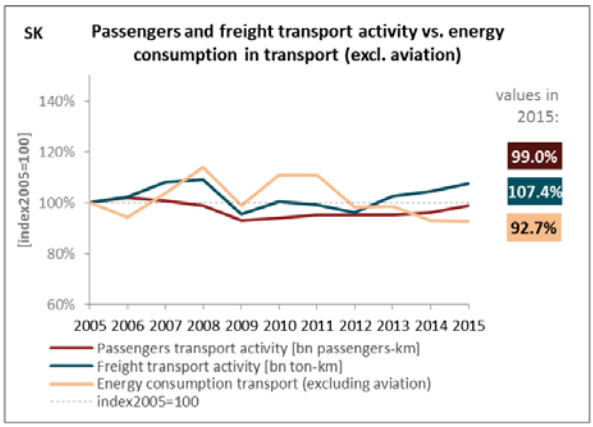
(source: Eurostat)



(source: Odyssee database)

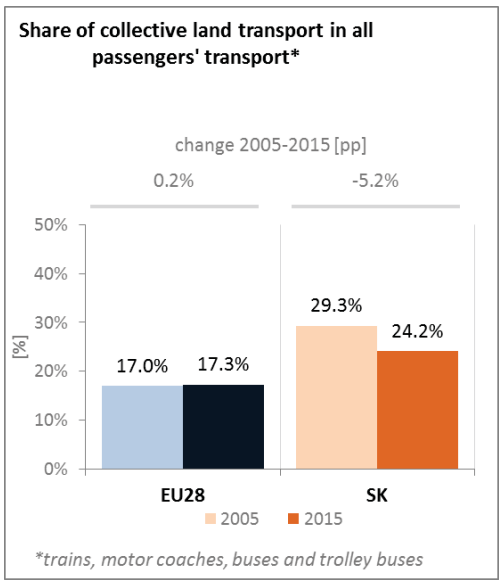


(source: Eurostat)



passengers transport activity=Private cars + bus + rail + tram & metro
freight transport activity=road+rail+inland waterways+pipeline

(source: Eurostat and DG MOVE pocketbook)



(source: Eurostat)

The energy savings achieved by renovating buildings of central government bodies amounted to almost 55 GWh in 2015, meaning that the annual target was met. Over 9 000 square meters of total floor area were renovated in 2015. The total amount of final energy saved in buildings by applying energy efficiency measures was of 550 GWh, similar with the level achieved by measures applied in industry.

As regards Article 7 of the Energy Efficiency Directive (2012/27/EU) on energy efficiency obligation schemes and alternative measures, Slovakia chose to take an alternative approach. The main rationale behind this choice was to try to alleviate potential increases in the pricing of energy (electricity, gas, heat) for final customers. This alternative approach consisting of setting other policy measures is expected to allow Slovakia to reach its cumulative energy savings target for 2014-2020 (of 26 565 GWh) or the annual energy savings target (of 948 GWh).

The alternative approach resulted in final consumer energy savings of 1 150 GWh in 2015, seeing an important increase compared with 2014 when only 837 GWh were achieved (i.e. well below the annual target). However, the combined average for 2014 and 2015 was still missed, therefore the saving targets for 2016-2020 needed to be slightly increased.

In January 2017, the Slovak Government approved the Strategic Development Plan for Transport until 2030 (second phase of the MASTER plan). It sets up the strategic priorities, i.e. measures which have been reviewed and given preference from the perspective of their potential contribution and economic efficiency. As regards infrastructure investments, the Government continued to put priority on the construction of the missing sections of motorways and highways.

Slovakia is facing a challenge in the high renovation and maintenance costs and old rolling stock in their railway network. The national reform programme of 2017[7] underlined the significance of railway transport and the efficiency of the public passenger transport in the area of public transport and investments continue to flow into the modernisation of railway corridors, purchase of new and the restoration of the existing train units. The Government has also stated its intention to optimise the unit cost and to increase revenues in the subsidised public passenger rail transport. Furthermore, with the objective to increase the accessibility, comfort, and hence the attractiveness of the public passenger transport, there is a plan to set up a transport authority for the coordination of passenger trains, suburban buses, and eventually also the city transport.

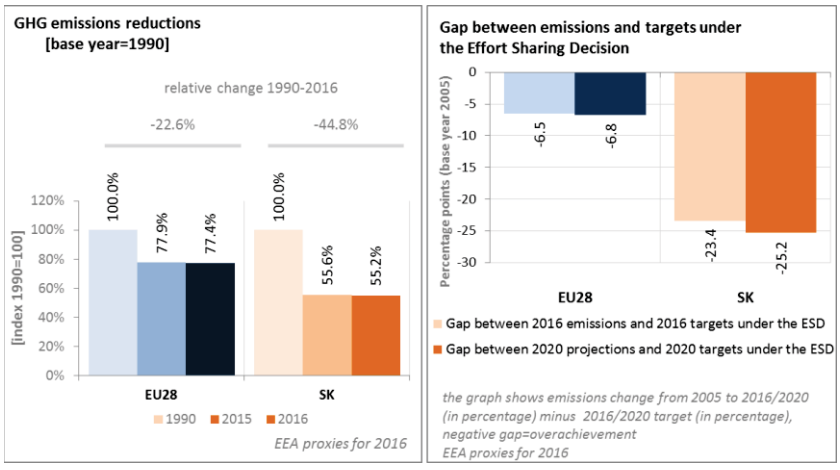
5. Decarbonisation of economy

5.1. GHG emissions

In 2016, Slovakia reported 44.8 % less GHG emissions than in 1990, a decrease twice higher than at the EU average.

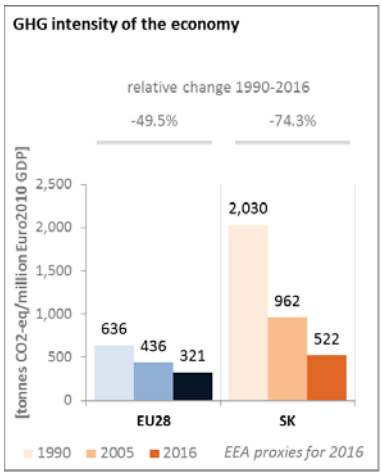
National Greenhouse Gas (GHG) emissions target in 2020 of Slovakia is a maximum 13 % increase in non-ETS sectors as compared to the 2005 base year. According to the latest national projections and taking into account the existing measures, the non-ETS emissions are expected to decrease by 12.2 % in 2020 compared to 2005. Thus, the target will be over-achieved by some 25.2 percentage points.

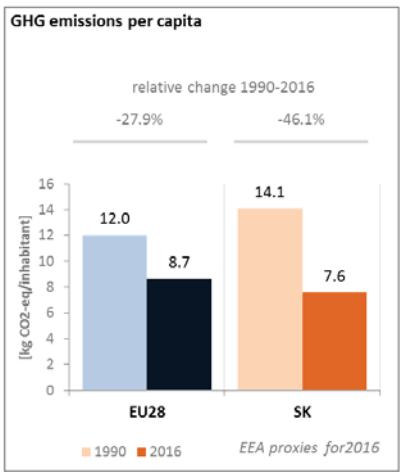
For 2016 the interim target was an increase of no more than 9 % compared to 2005, while the preliminary figures show that the non-ETS emissions actually decreased by 14 %.



(source: EC and EEA)

[7] National Reform Programme of the Slovak Republic 2017 (http://www.finance.gov.sk/Components/CategoryDocuments/s_LoadDocument.aspx?categoryId=8046&documentId=15607)



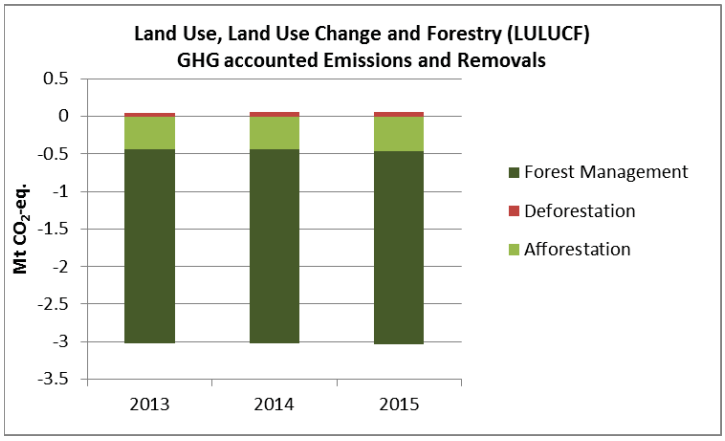


Largest Sectors of GHG Emissions in 2015	SK	EU28
Energy/power industry	22.4%	30.9%
Transport	16.2%	21.0%
Industry	38.9%	19.9%
Agriculture (incl. forestry & fishery)	8.0%	12.0%
Residential & Commercial	10.7%	12.8%
Waste	3.7%	3.2%
Other	0.1%	0.2%

(source: EC and EEA)

Preliminary accounts under the Kyoto Protocol for Slovakia show overall removals of -3.0 Mt CO_2-eq. as an annual average in the period 2013-2015. For comparison, the annual average of the EU-28 accounted for removals of -119.0 Mt. CO_2-eq. It should be noted that in this preliminary simulated accounting exercise, removals from Forest Management were capped to -2.6 Mt CO_2-eq per year, due to significantly exceeding the limit of the difference between the reported sink and the accounting forest management reference level.

Removals by Afforestation are notably higher than very limited emissions by Deforestation; however, removals by Forest Management are by far much higher in all years. Overall, there is no trend in removals; in fact all activities show no particular trend over the course of the three-year period.

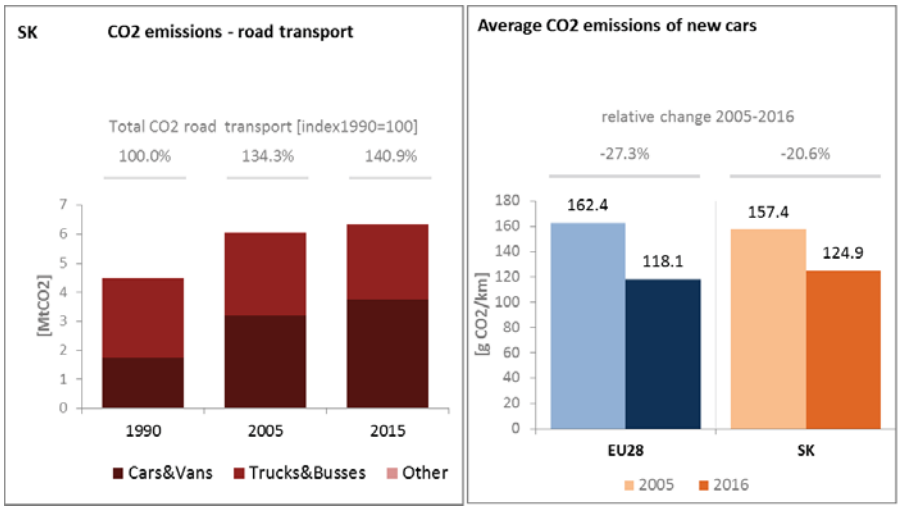


Note: Forest Management credits are capped and presented as yearly averages when the total Forest Management credits of the considered period exceed the simulated cap over the same period.

(source: EC and EEA)

CO_2 emissions in transport and alternative vehicles

The average CO_2 emission of new passenger cars in Slovakia is slightly above the EU average (124.9 g CO_2/km vs 118.1 g CO_2/km in 2016).



(source: European Environment Agency)

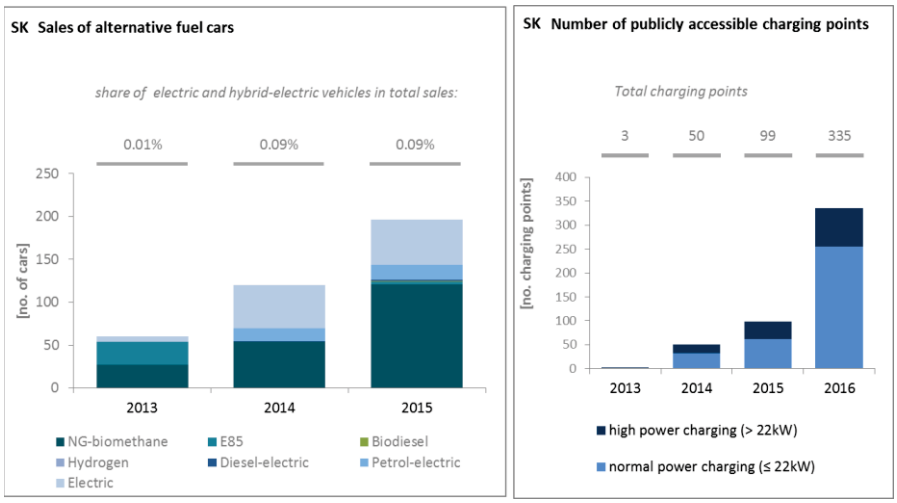
New, innovative technologies, such as electro-mobility, are indispensable for EU's growth, jobs and competitiveness. The boost to alternative energy sources for transport may imply an important development of the Slovak industrial sector: currently 1 of the 3 plants located in Slovakia is producing vehicles running on alternative energies.

Electro-mobility is on the rise in terms of the numbers of electric vehicles that have been registered and the current charging infrastructure. Despite the relatively low absolute numbers of registered electric vehicles, there were palpable year-on-year increases in electric vehicles and plug-in hybrids between 2011 and 2016.

Slovakia has been building up a core network of rapid recharging points. This network seamlessly connects the cities of Bratislava and Košice along the main roads –the D1 motorway and the R1 expressway. Since 2015, this network has also incorporated multiple charging standards, considerably improving recharging conditions for the end user.

Alternative fuel vehicles sales have been increasing over the recent years. The Government introduced environment-friendly elements in the car registration fee, taking into account the age of the car and the engine power. The fee is lower for cars powered by alternative fuels.

Over the last three years, the number of electric charging points in Slovakia has increased from 50 units in 2014 to 335 units in 2016.



(European Environment Agency) *(European Alternative Fuels Observatory)*

National Policy Frameworks under Directive 2014/94/EU on alternative fuels infrastructure have to establish targets, objective and measures for the development of the market of alternative fuels in the transport sector and the deployment of the relevant infrastructure. Slovakia has submitted its National Policy Framework as requested under article 3 of the Directive 2014/94/EU.

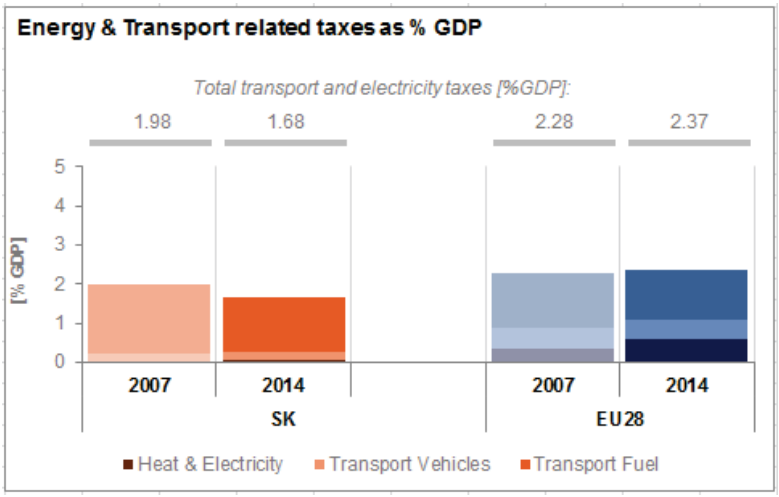
A detailed assessment of the Slovak National Policy Framework in terms of its compliance with the requirements of Directive 2014/94/EU on alternative fuels infrastructure, its contribution to achievement of long-term energy and climate objectives of the Union and coherence of its targets and objectives in terms of cross-border continuity has been published as part of the Communication on Alternative Fuels Action Plans (COM(2017)652) and the related staff working document SWD(2017)365.

5.2. Adaptation to climate change

Slovakia adopted its National Adaptation Strategy (NAS) in 2014. An update is foreseen in 2018. To date, no specific national adaptation plan has been adopted, though some adaptation actions are included into existing sectorial strategies and plans for water management, agriculture and forestry. Some adaptations plans have been adopted on local level. Consequently, no Monitoring and Reporting Framework has been developed. The NAS proposes a set of adaptation measures in the following sectors: geological environment, water management, biodiversity, urban environment, health, agriculture, forest management, transport, energy, tourism, and disaster risk management. Adaptation measures with positive impacts on public health are considered to be a top priority.

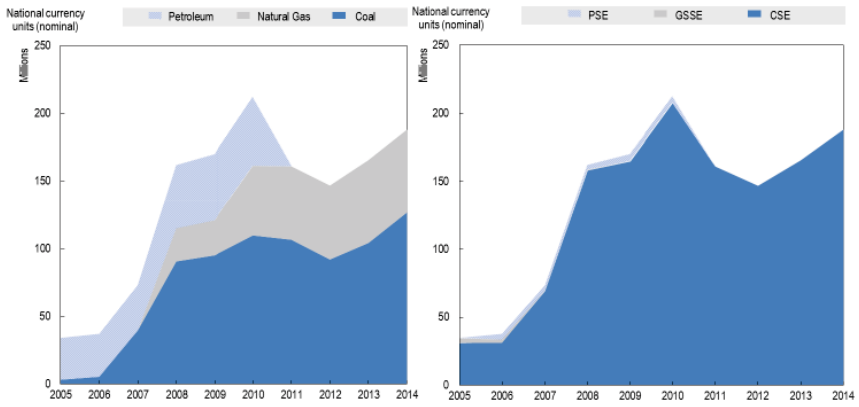
5.3. Taxes on energy and transport and fossil fuel subsidies

The overall tax burden on energy and transport in Slovakia amounts to 1.7 % of GDP, i.e. 0.7 % below the EU average. The taxes on transport fuel are with 1.4% of GDP slightly above EU average but have decreased by 0.4 % since 2007, whereas the tax burden on transport vehicles did not change compared to 2007 and is with 0.2 % of GDP less than half of the EU average. Taxes on heat and electricity are at 0.1 % of GDP very low compared to an EU average of 0.6 % of GDP. The tax burden on energy and transport has fallen compared to 2007, which mainly reflects falling fuel tax revenues. Slovakia has no CO_2 component in the tax frameworks for vehicles or energy products.



(Source: Eurostat, provisional data)

Total support for fossil fuels in the Slovak Republic by fuel type (left) and support indicator (right)



Note: CSE=Consumer Support Estimate: PSE=Producer Support Estimate: GSSE=General Services Support Estimate.

(source: OECD Inventory of Support Measures for Fossil Fuels 2015)

After peaking in 2010, total support for fossil fuels saw a moderate decline until 2014, reaching then EUR 165 million, majority of which (95 million) comes as energy tax reductions and exemptions, and the remaining EUR 70 million is a budgetary transfer to coal production.

What appears as a decline in support since 2011, can be attributed to the removal of direct grants for exploiting the country's lignite deposits, which were provided by the state between 2006 and 2010. Besides coal, natural gas is also fully exempt from taxation for a number of purposes, such as the processing of minerals and in combined-heat-and-power plants.

In 2014 and 2015, state aid has been granted to ensure the orderly closure of the Baňa Dolina and Cigeľ lignite and coal mines. This was based on the Council Decision 2010/787/EU which requires that mines receiving such aid must be wound down by the end of 2018 at the latest.

The aid to cover exceptional costs of the closure of the Baňa Dolina lignite mining field amounted to a total budget of EUR 200 318, granted under a plan ending in 2015[8].

The aid to cover exceptional costs in the closure of mining field Cigeľ amounted to a total of EUR 6 081 515. It takes the form of a direct grant, which will be disbursed in tranches covering the period 2015-2017[9].

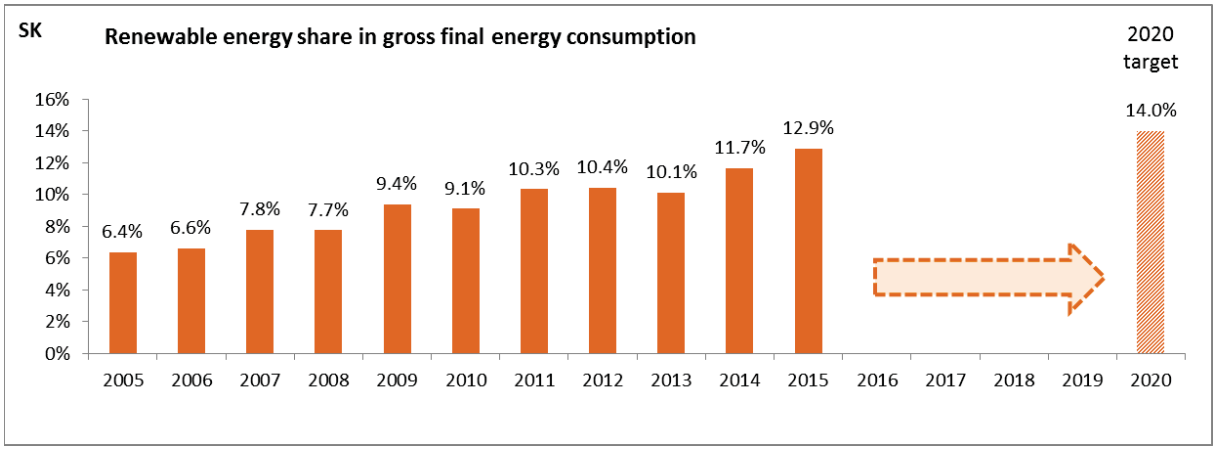
5.4. Renewable energy

In 2015 the share of renewables in the gross final energy consumption of Slovakia was 12.9 %, meaning that Slovakia not only outperformed the interim target for 2015/16 (10 %), but the 2017/2018 target (11.4 %) as well, and it is right on track to meet its 2020 target (14 %).

Nevertheless, there is an issue of public acceptance of renewables due to overgenerous support schemes in the past and a clear nuclear option made by the Slovak government, making the environment for renewables unfavorable. The distribution system operators (DSOs) have declared a connection moratorium for new renewable energy plants with a generating capacity of more than 10 kW, arguing with problems of capacity and the stability of the grid.

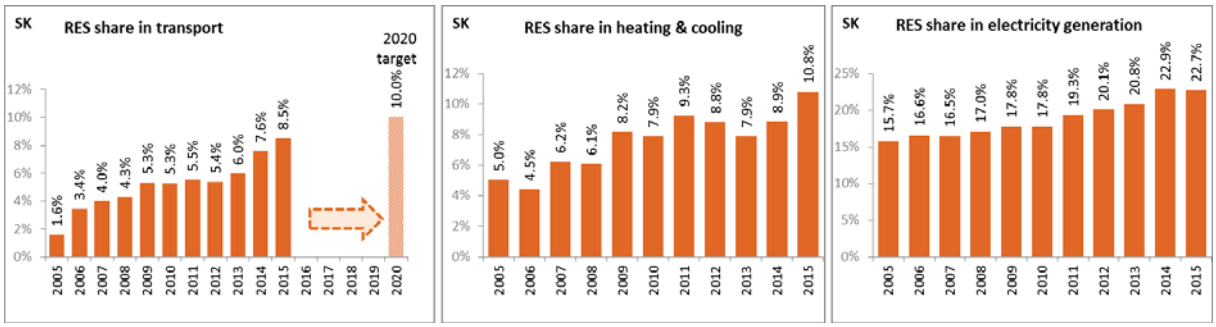
Slovakia applies a technology-specific feed-in tariff as the main support instrument for renewable electricity generation. Since July 2011, the Slovak government has introduced several sudden and unplanned changes in the PV feed-in schemes and additional reporting obligations, resulting in an uncertain investment environment for RES-E in the country.

Lifting the moratorium on new renewable installations would facilitate the attainment of the 2020 RES target (14 %) and it might contribute to the future 27 % RES EU target for 2030.

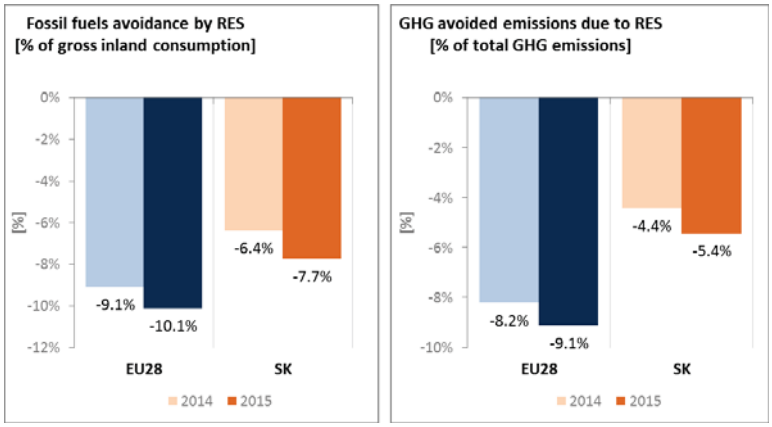


(source: Eurostat-SHARES)

[8] http://ec.europa.eu/competition/state_aid/cases/254370/254370_1600282_76_2.pdf
[9] http://ec.europa.eu/competition/state_aid/cases/253688/253688_1616638_114_5.pdf



(source: Eurostat-SHARES)



(source: EEA[10])

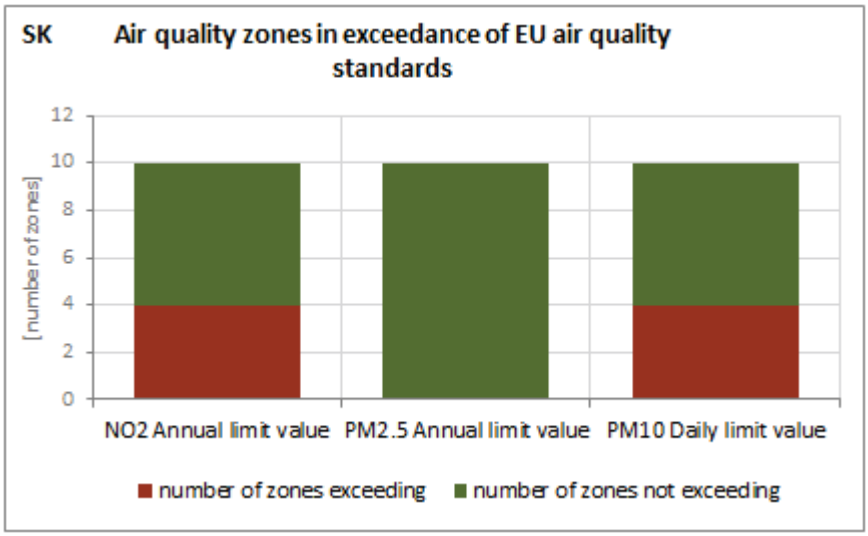
5.5. Contribution of the Energy Union to better air quality

Air quality in Slovakia continues to give cause for concern. For the year 2013, the European Environment Agency estimated that about 5,620 premature deaths were attributable to fine particulate matter ($PM_{2.5}$) concentrations[11].

For PM and for nitrogen dioxide (NO_2) Slovakia reported exceedances of the binding EU air quality standards[12]. For the year 2015, Slovakia reported exceedances of the limit value for PM_{10} and of the limit value for NO_2 in 4 of the 10 air quality zones in Slovakia[13].

[10] Avoided GHG emissions mentioned here have a theoretical character as these contributions do not necessarily represent 'net GHG savings per se' nor are they based on life-cycle assessment or full carbon accounting.

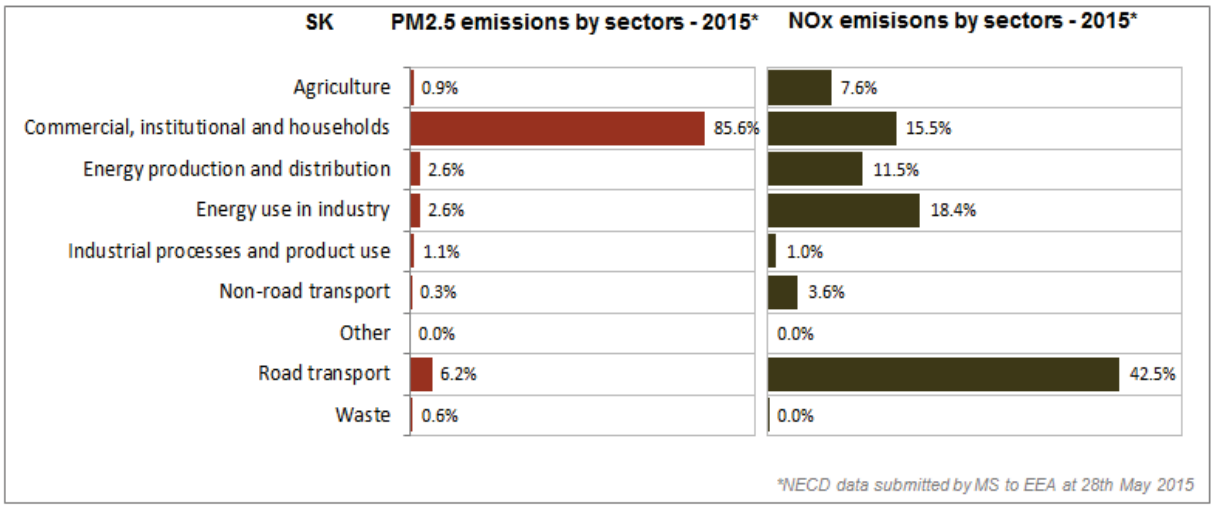
[11] European Environment Agency, 2016, Air Quality in Europe – 2016 Report, table 10.2. The report also includes details as regards the underpinning methodology for calculating premature deaths.



(Source: EEA)

The health-related external costs from air pollution in Slovakia have been estimated to be more than EUR 3 billion/year (income adjusted, 2010), which includes the intrinsic value of living a healthy life without premature death as well as the direct costs to the economy such as healthcare costs and lost working days due to sickness caused by air pollution[14].

The Energy Union can substantially contribute to addressing these air quality problems through measures reducing emissions of both GHG and air pollutants such as PM and nitrogen oxides (NO_x) from major contributing sectors such as (road) transport, energy production, industry and residential heating (e.g. stoves and boilers)[15].



[12] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, OJ L 152, 11.6.2008, p.1-44

[13] Compliance data as reported by the Member States as part of their official annual air quality report for the calender year 2015 (available on the European Environment Agency's (EEA) Eionet/Central Data Repository), http://cdr.eionet.europa.eu/sk/eu/aqd

[14] See also the EU Environmental Implementation Review Country Report for Slovakia, SWD(2017)58 final of 3.2.2017

[15] National emission data as reported by the Member States to the EEA (available on the EEA's Eionet/Central Data Repository), http://cdr.eionet.europa.eu/sk/eu/nec_revised

(Source: EEA. This table reflects only sources of primary $PM_{2,5}$ emissions.)

6. Research, innovation and competitiveness

6.1. Research and innovation policy

The energy R&I priorities in the Slovak Republic are based on the objectives of its national energy policy: increasing efficiency in power generation and energy end use, reducing energy intensity, reducing dependence on energy imports, expanding the use of nuclear power, increasing the share of renewable energy sources, and supporting alternative fuels for transport.

The R&I strategy up to 2020 includes the following priorities linked to energy: (a) Production and transmission of electricity - increasing the transmission capacity and safety of the electricity system in Slovakia; (b) Nuclear power, including R&D projects on the fast reactor ALLEGRO, increasing the safety and efficiency of nuclear power plants, decommissioning and waste from nuclear power plants at the end of their life-cycle, and improving the safety of operating and built nuclear power plants; (c) Smart-grid technologies – e.g., self-sufficient region and micro grids, renewable energy, electro mobility, Smart Metering; (d) Materials for energy - construction materials, functional materials, technological processes of materials; (e) Heat in industry (e.g., co-generation, opportunities for cost-reductions, methodologies for the combined production of electricity, heat and cooling, material and energy recovery from waste).

Slovakia is not a very active contributor to the ongoing work of the Strategic Energy Technology (SET) Plan. It only participates in two (out of fifteen) temporary working groups for the implementation of the integrated SET Plan, the ones dedicated to energy efficiency in industry and nuclear safety.

Regarding the Horizon 2020 programme, Slovakia has received so far 0.2% of the EU contribution devoted to the 'secure, clean and efficient energy' part of the programme. As of September 2017, 30 participations from Slovak organisations have been awarded EUR 3.3 million in Horizon 2020 energy projects. This includes a grant of EUR 0.6 million to Bavenir for its participation in project SHAR-Q (energy storage).

6.2. Investments and patents in the Energy Union R&I priorities

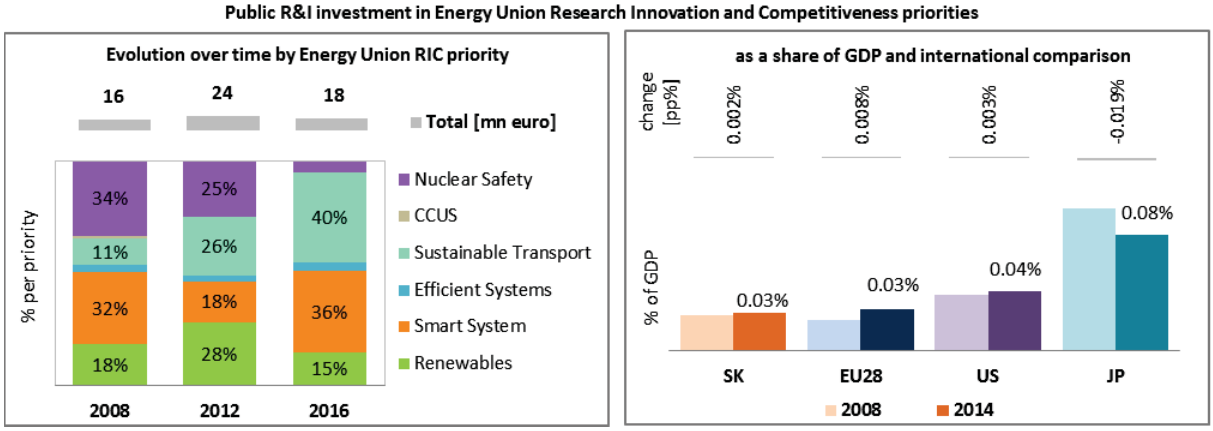
In 2016, public (national) investments in the Energy Union R&I priorities reached EUR 18 million[16]. The highest share of these investments (40%) was attracted by the Sustainable Transport priority of the Energy Union, followed by the Smart Systems and Renewables priorities (36 % and 15 % respectively). In the period 2007-2016, the maximum annual public investment was EUR 25 million, reported in 2013. In 2014, the most recent year for which data for most Member States are available, public investment per GDP in the Slovak Republic was similar to the EU average.

[16] This figure is six times the amount reported in 2015 but in line with reports for previous years e.g. EUR 20 million in 2014 and EUR 25 million in 2013.

Private investment in the Energy Union R&I priorities in 2012 was estimated at EUR 25 million (0.15% of the private R&I investment in Energy Union R&I priorities in the EU). The focus was on the Smart System priority, which received 36 % of these investments, followed by Sustainable Transport with a share of 29%.

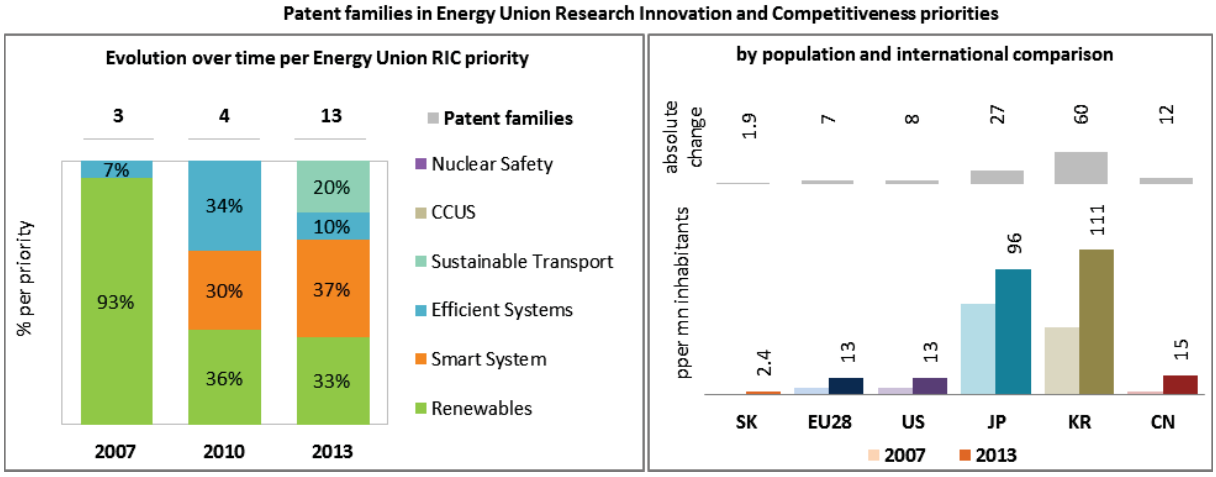
In 2013, the most recent year for which complete patent[17] statistics are available, 12 companies and research organisations based in the Slovak Republic filed 13 patents in low-carbon energy technologies (0.2 % of the EU total). The focus was on Smart System (37 %), followed by Renewables (33 %) and Sustainable Transport (20 %).

In 2013, private R&I investments and patents in Energy Union R&I priorities were lower than the EU average when normalised by GDP and by population respectively. In the period 2007-2013, both private R&I investment and the number of patents in Energy Union R&I priorities have increased on average by 15 % and 31 % per year, rates of increase which are higher than those for the same indicators at EU level (6 % and 15 % respectively).



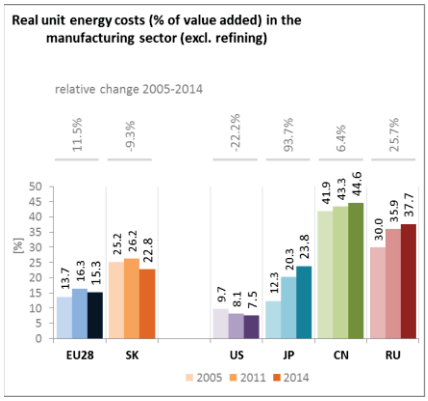
Note: Data only available from 2008 onwards. The international comparison (right) is shown for 2014 (Slovakia had reported EUR 20 million). Reporting at EU level is not as complete for 2015, and very few countries have reported for 2016.

[17] In the context of this document, the term 'patent' refers to patent families, rather than applications, as a measure of innovative activity. Patent families include all documents relevant to a distinct invention (e.g. applications to multiple authorities), thus preventing multiple counting. A fraction of the family is allocated to each applicant and relevant technology.

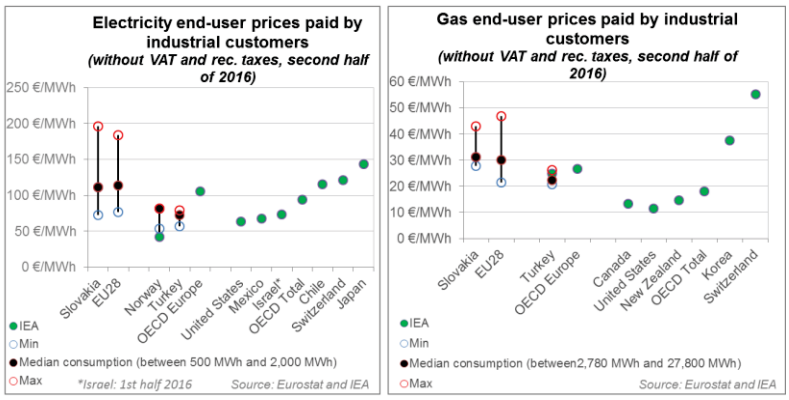


(Data sources: Public investment as available in the International Energy Agency RD&D Statistics database[18] for codes relevant to Energy Union RIC priorities. Patent data based on the European Patent Office PATSTAT database[19]. Private investment as estimated by JRC SETIS. Detailed methodology available from the JRC[20];

6.3. Competitiveness



(source: ECFIN)



(source: Eurostat and IEA)

Regarding the competitiveness in the wind and solar energy sector, Slovakia is performing well in the wind sector as expressed in the high revealed comparative advantage indicator[21] well above 1 and twice the European average. The comparative advantage is concentrated in the industries producing towers, generators and gearboxes for the wind energy sector. As indicated by the revealed comparative advantage below 1, the Slovakian economy is not specialised in solar energy

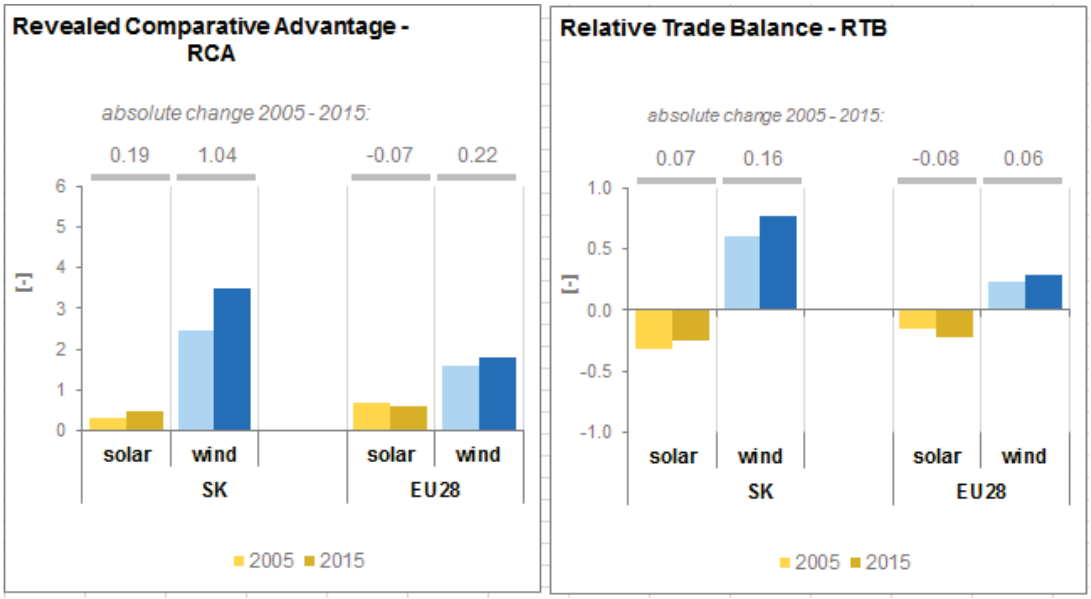
[18] http://www.iea.org/statistics/RDDonlinedataservice/

[19] https://www.epo.org/searching-for-patents/business/patstat.html#tab1

[20] https://setis.ec.europa.eu/related-jrc-activities/jrc-setis-reports/monitoring-ri-low-carbon-energy-technologies

[21] The RCA index for product "i" is defined as follows: $RCA_i = \frac{\frac{X_{j,i}}{\sum_i X_{j,i}}}{\frac{X_{w,i}}{\sum_i X_{w,i}}}$ where X is the value of exports, and j is the country and w is the reference group, the World economy. 2005 refers in the text to the indicator average over the 2000-2009 period, while 2015 represents the average over the 2010-2016 period. The same applies for the RTB indicator - see below.

components, except in power electronics. The relative trade balance[22] for wind components is positive and well above EU average which is in line with the comparative advantage in wind energy industries. For solar energy components, the relative trade balance is negative and at the level of the EU average.



(Source: UN comtrade)

7. Regional and local cooperation

Slovakia is actively participating in various regional cooperation groups, with key focus on the development of infrastructure and security of supply.

- Regional High level Group CESEC, together with Austria, Bulgaria, Croatia, Greece, Hungary, Italy, Romania, and Slovenia, and five Energy Community contracting parties Albania, the Former Yugoslav Republic of Macedonia, Moldova, Serbia and Ukraine. Other Energy Community contracting parties can be invited on an ad hoc basis.

On 9 September 2016 the CESEC High-Level Group agreed on a updated CESEC Action Plan 2.0 that includes i) a Member State-specific list of regulatory actions, ii) actions for the Energy Community Contracting Parties, and iii) further regional work to improve the functioning of gas markets by improving trading arrangements, enabling market entry and – where appropriate – optimizing cross-border transmission tariffs.

It also reached agreement regarding the widening of the scope of cooperation to electricity markets and infrastructure, renewables as well as energy efficiency. This will benefit those three dimensions of the Energy Union. It is to be expected that enhanced regional cooperation in the CESEC region, which takes into account the Western Balkan six initiatives in the electricity market, will benefit

[22] The RTB indicator for product "i" is defined as follows: $RTB_i = \frac{X_i - M_i}{X_i + M_i}$ where X_i is the value of product's "i" exports and M_i imports.

regional cross-border electricity trade and further prioritize PCI projects and also accelerate the implementation of PCI's.

The EU macro-regional strategy for the Danube Region in which Slovakia takes part can be used as a basis for regional cooperation on energy. European Territorial Cooperation – 'Interreg' – under EU cohesion policy also provides further opportunities for cross-border, transnational and interregional cooperation, including in the Energy Union areas.

Cities and urban areas have a key role in the energy and climate challenge. The Urban Agenda for the EU, established by the Pact of Amsterdam in May 2016, better involves cities in the design and implementation of policies, including those related to the Energy Union. It is implemented through Partnerships, in which the Commission, Member States, cities and stakeholders work together on a number of important areas, including on Energy Transition, Urban Mobility, Air Quality, Climate Adaptation and Housing. Slovakia is participating in the partnership on Housing, as co-coordinator.

	No. of SEAPs submitted	Population covered by SEAPs [million]	Average GHG emissions [t CO2-eq/capita*year]		Relative GHG savings by 2020
Slovak Republic	4	0.53	Baseline emissions 5.11	by 2020 4.08	GHG -20.1%
European Union	5332	160.06	5.50	4.00	-27.2%

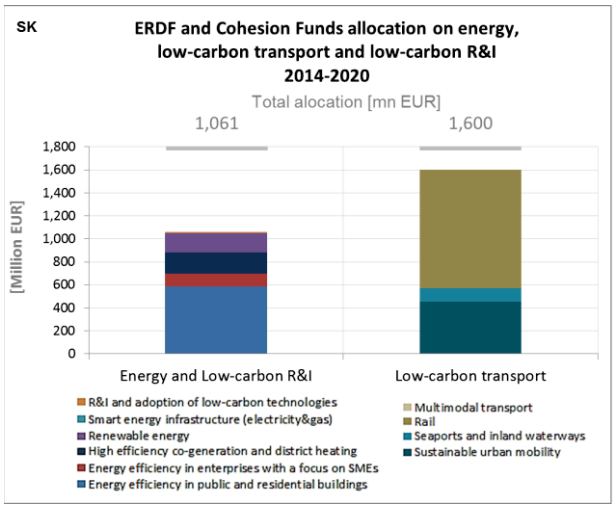
(source: JRC 2016. Notes: SEAP=sustainable energy action plan, GHG=greenhouse gas emissions)

In Slovakia, by September 2016, 4 cities (covering 0.53 million inhabitants) have committed to conduct vulnerability and risk assessment and develop and implement adaptation plans in the framework of the Covenant of Mayors for Climate and Energy.

8. Cohesion policy and EU clean energy investments

EU cohesion policy makes a key contribution to delivering the Energy Union objectives on the ground, including important investment possibilities to implement energy policy objectives in Slovakia, which are complemented by national public and private co-financing, aiming at optimal leverage. It also ensures integrated territorial solutions to energy and climate challenges, supports capacity building and provides technical assistance.

Over 2014-2020, cohesion policy is investing some EUR 1,061 million in energy efficiency improvements in public and residential buildings and in enterprises, as well as in high-efficiency cogeneration, district heating and renewable energy in Slovakia. Cohesion policy is also investing significantly in R&I and in SME competitiveness, based on the national strategy for smart specialisation. For Slovakia, the strategy includes a focus on sustainable energy and automotive and mechanical engineering. At this stage, at least EUR 8 million are foreseen for investments in R&I and adoption of low-carbon technologies, but this might increase further in line with the evolving content of the smart specialisation strategy. A further estimated EUR 1,600 million is invested in supporting the move towards an energy-efficient, decarbonised transport sector.



(source: DG REGIO)

These investments are expected to contribute to around 38,000 households with improved energy consumption classification, a decrease of around 278,900 MWh per year of primary energy consumption of public buildings, 620 MW of additional capacity of renewable energy production, as well as to around 130 km of reconstructed or upgraded railway lines and 30 km of new or improved tram and metro lines. Overall, the EU cohesion policy investments in Slovakia over 2014-2020 are expected to contribute to an estimated annual decrease of GHG emissions of around 739,000 tonnes of CO2eq.

For example, the national pilot project Green to households, running from 2015 to 2018, entails support for installation of small equipment to use renewable energy in households. Households can obtain a financial contribution in the form of vouchers for installation of photovoltaic panels, solar collectors, biomass boilers and heat pumps. More than 14,000 facilities will be supported from the overall budget of EUR 45 million. The main goal of this project is to increase the share of use renewable energy sources by households by 55 MW and to reduce greenhouse gas emissions. The contribution from the European Regional Development Fund (ERDF) amounts to EUR 37,320,252.

As another example, the reconstruction of the boiler plant in Brezová pod Bradlom in 2010-2011 involved the reconstruction of two boilers for wood biomass combustion with a total power output of 5.2 MW (2 x 2.6 MW). The investment also entailed the replacement of distributors and reconstruction of heat exchange stations. Implementation of the project enabled to reduce emissions from heat production and to increase the use of renewable sources. It also resulted in reducing the losses of distribution. The Brezová pod Bradlom boiler plant was put into operation in 2011 and supplies heat to 90% of the population of the city. The contribution from the European Regional Development Fund (ERDF) was EUR 1,078,134.

As a further example, in Bratislava the Cohesion Fund in the 2007-2013 period supported the purchase of 120 electric trolleybuses, with energy recovery (recuperation). The new buses are environmentally friendly and low-floor, which makes them more accessible for citizens with reduced mobility. The new buses are equipped with modern travel information and climate-control systems, improving travel comfort and service quality for all users. Furthermore, these new vehicles make it possible to extend existing trolleybus lines. The project contributes to the achievement of a modal shift from private cars to public transport, thus improving the urban environment and the quality of life. The contribution from the Cohesion Fund was EUR 49,199,408.

To increase the chances of receiving funding backed by the European Fund for Strategic Investments (EFSI), project promoters both private and public are encouraged to contact the European

Investment Advisory Hub for technical support to help them get their projects off the ground. This advice is free of charge for public promoters.

Through its support to sustainable transport systems, the Connecting Europe Facility (CEF) also contributes to the goals of the Energy Union. Following the Slovak participation in the CEF – Transport 2014-2015 Calls, the Slovak action portfolio comprises 18 signed grant agreements, allocating EUR 552.3 million of actual CEF Transport Funding to Slovak beneficiaries (state-of-play February 2017)[23]. The transport mode which receives the highest share of funding is rail (52.2 % of actual funding). The development of railway infrastructure absorbs most of the CEF funding in Slovakia. The rail actions fall into two main groups, where the first group of actions aims to upgrade the rail infrastructure in order to eliminate the existing capacity bottlenecks, reduce travel time and enhance safety along the three Core Network Corridors crossing the country. The second group includes actions addressing interoperability requirements for telematics applications, as well as the implementation of Rail Freight Corridors.

A large share of the Slovak portfolio includes both national and multinational inland waterways (IWW) actions and covers various types of activities contributing to the modal shift of freight from road to inland waterways. The Slovak road actions concern the establishment of the key cross-border road connection on the Baltic-Adriatic Corridor, innovation focused on fast charging stations, including electric vehicle charging, and a pilot deployment of mono-fuelled LNG buses.[24]

[23] Note that European Economic Interest Groups and International Organisations are excluded from the analysis.
[24] Source: INEA