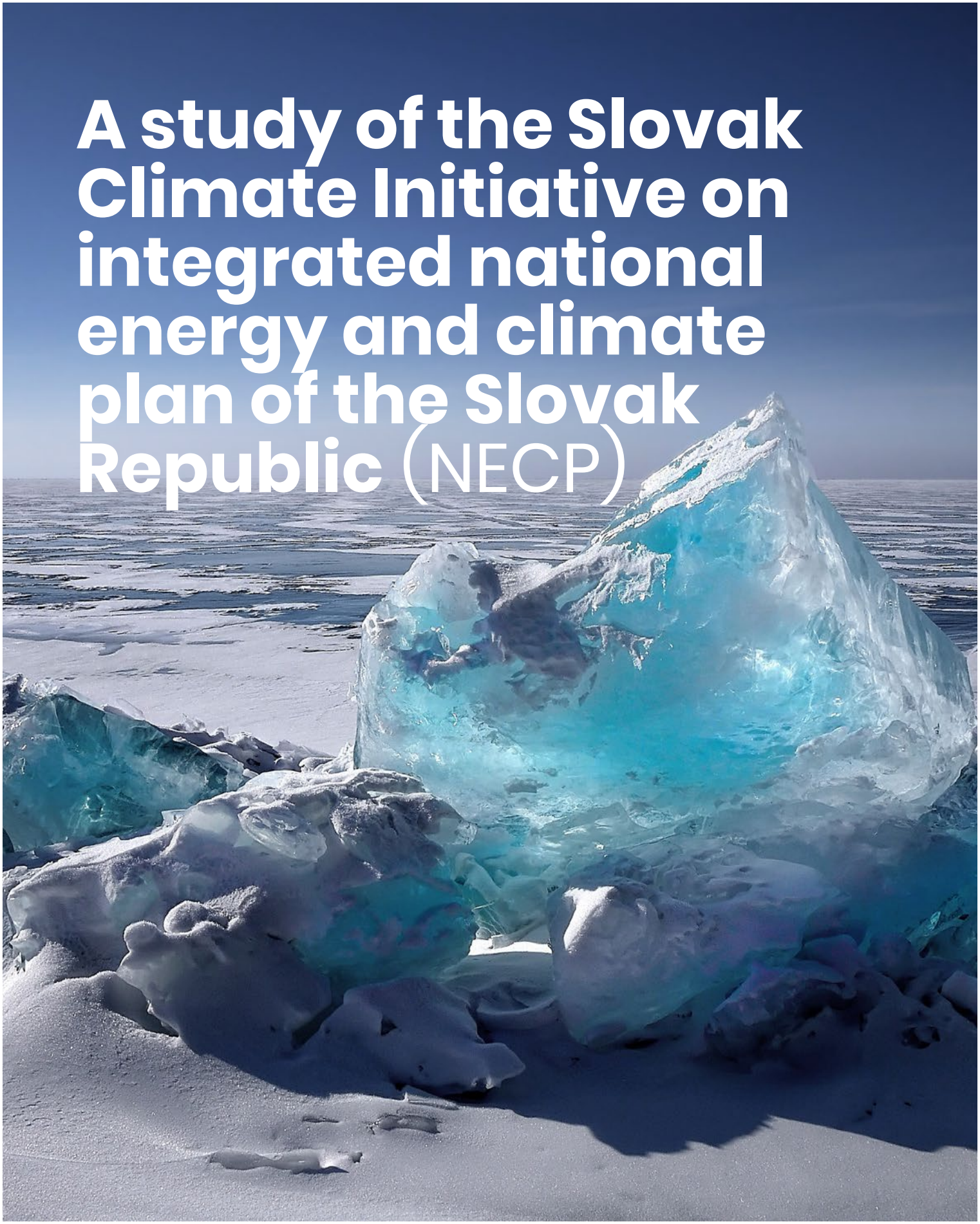
A study of the Slovak Climate Initiative on integrated national energy and climate plan of the Slovak Republic (NECP)



Slovak Climate Initiative

May 2019

Content

I. Summary

Building construction and renovation impacts both, energy and climate part of the Slovak NECP. It is not simply about energy efficiency and increasing the share of RES but also about adapting to climate change and greenhouse gas emission reductions. In a wider sense, it is about reductions in other pollutant emission (particularly in terms of local air pollution), indoor environment quality improvements (with the impact on users' health and productivity, and economic performance of the country), and other aspects. The general national goal in the area of building energy efficiency should include supporting the construction of new nearly zero-energy buildings (NZEB), and preparing possibilities for the construction of the so-called plus energy buildings. And in the area of building renovation, the goal should include supporting renovations in required pace 3% of buildings a year (in terms of maintaining the lifetime of buildings) with a growing share of buildings renovated in energy classes A and/or A1, and A0. To achieve these objectives, it is necessary to monitor fulfilment of partial goals 1.1.–1.5. specified in Part II hereof.

Energy poverty is a fundamental problem; taking into account its nature and importance the problem should be solved accurately and as a matter of priority. Despite expectations, submitted NECP of the SR addresses the issue only briefly.

Generally, energy poverty can be defined as households' inability to ensure socially and materially the necessary level of energy services. Despite, however, the issue–how to accurately define and measure energy poverty still presents a complicated challenge for the researchers and policy makers. According to qualified estimates, more than 20% of household income in Slovakia is spent on housing. And energies make a large part of housing costs. While in 2004, energy costs of employed people reached 68%, in 2017 they fell down to 58%. With retired people group the ratio is a bit higher–in 2017, energy costs represented 65%. The fact that people with lower income must sometimes pay more for energy than others with higher income is a paradox of energy poverty. They live in houses with poor insulation, and they are unable to invest in energy saving measures, energy-saving household appliances or more efficient lighting.

Energy poverty issue is no new to Slovakia. Under the Act No. 250 on Regulation (of 2012), the Regulatory Office for Network Industries (RONI) is obliged to prepare a Concept of Protection of Consumers Fulfilling Energy Poverty Conditions. In April 2019, RONI submitted the Concept of Protection of Consumers Fulfilling Energy Poverty Conditions for inter-departmental consultation. The concept introduces a definition of energy poverty and proposes solutions that rely on applied approaches such as housing allowance, detached house insulation allowance or subsidies for the removal of system failures in residential buildings. Measures such as the prohibition of supply disruption due to non-payment during heating period, the concept of a public supplier or the social tariff encountered a strong opposition and the final form of the concept remains an open question.

Draft integrated National Energy and Climate Plan (NECP SR)[1] by no means used the potential for controlled reduction in fossil fuels exploitation and use in 2021–2030, i.e. in key period of climate protection. Several important chapters are incomplete, which prevents public consultation in accordance with Article 10 of the EU Regulation. The data related with the commitments under

1 https://www.economy.gov.sk/energetika/navrh-integrovaneho-narodneho-energetickeho-a-klimatickeho-planu

the Paris Agreement, especially the commitment to make efforts to limit the temperature increase to 1.5°C above pre-industrial levels. Some data are specified only up to 2025. The document fails to include the Government resolution on the transformation of the Upper Nitra region that was passed on 12 December 2018 and has essential impact on subsidising coal and decarbonizing Slovak economy. With regards to fossil fuels, the document fails to mention the need to decrease dependence on their imports hand in hand with systematic measures to increase energy efficiency (EE) and renewable energy sources (RES) fulfilling sustainability criteria. Last but not least, the SR should stop subsiding profits of polluters–especially those burning fossil fuels.

Renewable energy sources (RES) relate to 3 key areas: RES for heat and cold production, RES and electricity production, and RES in transport.

We believe that progressive reduction in CO_2 emissions to the level that will stop or at least largely slowdown climate change that negatively affects flora, fauna, and humankind as such, is the primary goal of these plans. As mentioned in the submitted draft, forecasted greenhouse gas emissions and their removal by sinks will lead to reduction by 12% by 2030 compared to 2005. However, such measure fails to comply with the Paris Agreement. Reduction by 55% compared to 2005 and/or 45% compared to 2010 would be a sufficient measure. Moreover, overall emissions in Slovakia have not been declining at all since 2014. A positive effect of gradual increasing share of organic components in motor fuels is questionable. Even, emission from civil aviation are continually rising.

At this point, we believe it is crucial to stress that the very approach of NECP SR concerning nuclear energy is flawed. Though it is considered a low-emission source, by no way it can be considered a zero-emission source, as also noted by the World Nuclear Association.

Further, we state that draft NECP SR in the initial part of its analysis concerning the share of RES in final energy consumption is not based on an up-to-date data. Therefore, we have proposed a new trajectory (Annex). Moreover, the draft NECP SR itself states that up to 88.8% of current energy mix is dependent on import of primary raw materials. This state by no means reflects energy security and adequate diversification of energy sources.

Further, it must be mentioned that the European Commission Report on Energy Prices specifies that state support to fossil fuels in Slovakia has grown in the period 2008–2016. Stagnating investments to RES and growing overall final consumption of electricity caused that in 2017 the share of RES fell down to 11,49%.

A study by Sandbag and Agora Energiewende think-tanks says that RES is also supported by economy, as wind and sun are on a par with coal and gas (LCOE). Therefore, we strongly recommend that renewable sources are more extensively used, especially from sun and wind. We also recommend a precise finalization of NECP SR, as already now we see market prices in this sector. Based on our analyses, we recommend a more ambitious trajectory aimed at increasing overall combined installed capacity of power stations from RES up to 3.804 MW, which is equivalent to estimated production at 9.662 GWh in 2030 (as compared to 3.259 MW and/or 8.822 GWh proposed by the MoE SR).

II. Energy efficiency–buildings

Part A: National plan

1. NATIONAL OBJECTIVES

Building construction and renovation impacts both, energy and climate part of the Slovak NECP. It is not simply about energy efficiency and increasing the share of RES but also about adapting to climate change and greenhouse gas emission reductions. In a wider sense, it is about reductions in other pollutant emission (particularly in terms of local air pollution), indoor environment quality improvements (with the impact on users' health and productivity, and economic performance of the country), and other aspects.

> **The general national goal of NECP SK should therefore include supporting the construction and renovation of buildings that are highly energy efficient, adapted to climate change, and sustainable in terms of quality of used materials and quality of indoor environment. With new buildings, a natural goal is to ensure construction of nearly zero-energy buildings (NZEB) and prepare opportunities for the construction of the so-called plus energy buildings. And in the area of building renovation, the goal is to ensure renovations in required pace 3% of buildings a year (in terms of maintaining the lifetime of buildings) with a growing share of buildings renovated in energy classes A and/or A1, and A0.**

To achieve these objectives, it is necessary to monitor fulfilment of the following **partial goals**:

1.1. Ensure due application of existing generally binding legal regulations in EPBD;
1.2. Support and enhance local self-governments;
1.3. Develop programs that support innovations and use the best available techniques (BAT) in building construction and renovation;
1.4. Create conditions for involvement of private capital into construction and renovation of quality buildings;
1.5. Develop program that will support housing for low-income groups.

2. POLICIES AND MEASURES

2.1. Due application of existing regulations

2.1.1. Allocate budgetary funds of the Ministry of Transport and Construction of the Slovak Republic, launch controls of energy certification in accordance with Article 9, Par. 3 e) of Act No. 555/2005 Coll., and apply respective sanctions.
2.1.2. Implement a unified software for energy efficiency of buildings calculation when issuing energy certificates and thus simplify controls, and limit the opportunities for tampering with the calculation.
2.1.3. Introduce obligation to issue energy certificate during building permit authorisation rather than current practice, i.e. during occupancy permit in order to assess in full whether the designed building fulfils energy efficiency of buildings requirements in time when it is still possible to make necessary adjustments in design documentation/before construction.

2.1.4. Amend the Construction Act and its definition of construction proceedings in a way that energy certificate is required for building permit and building permit can only be issued on condition that energy certificate includes confirmation on a building's classification into required energy class. In the case of alteration of a building before its completion issue occupancy permit only for those buildings which, following the alteration, remain classified in valid energy class.

2.2. Supporting and empowering self-governments

2.2.1. Amend zoning legislation that will empower self-governments to set their own extra requirements for construction works under clear and transparent conditions.

2.2.2. Develop a support program for self-governments to perform functional and energy audits of buildings.

2.2.3. Ensure long-term system of self-governments' education (property management, investment unit, etc.) and provision of technical assistance e.g. by establishing energy management units at district level.

2.2.4. Introduce a stable central subsidy system providing non-repayable subsidy at less than 60% of eligible costs for building renovation.

2.2.5. Ensure availability of low-cost and long-term financing of energy performance projects in renovation of public buildings.

2.2.6. Remove regulatory barriers that are currently impeding feed in of energy from RES and inadequately taking into consideration fixed costs of heating prices from district heat productions.

2.3. Developing programs supporting innovations and use of best available techniques (BAT) in construction and renovation of buildings.

2.3.1. Establish system of subsidies and other support instruments in adequate amount for construction and renovation of buildings, so that Slovakia is able to comply with legislation and construct/renovate buildings that respect 21st Century.

2.3.2. Integrate support to different types of buildings, remove unnecessary administrative burden and dual controls.

2.3.3. Enhance technical assistance for the applicants and invest in communication and promotion of quality buildings and support programs.

2.4. Creating conditions for involvement of private capital into construction and renovation of quality buildings.

2.4.1. Financial instruments, tax relief, as well as removal of regulatory barriers may attract private sector investments into massive development of rental housing or renovation of public buildings through energy performance.

2.4.2. However, the precondition for success is to empower self-governments and provide motivational support for the implementation of innovations and the best available techniques.

2.5. Establishing program to support housing of low-income groups

2.5.1. Enlarge the program (of the Ministry of Transport and Construction of the Slovak Republic) that supports renovation of detached houses, to include a category self-help insulation and window and door replacement in selected regions with higher level of subsidies in dependence on an applicant's income.

2.5.2. Establish jobs positions for professionals to prepare and implement general low-emission energy concepts, prepare projects for aggregate investments into

renovation of detached houses, and provide technical assistance and consulting services, etc.

2.5.3. Support the implementation of measures set out by low-emission energy concepts including the construction of local district heat productions that use local energy source, such as wood waste.

2.5.4. Support the development of any rental housing. The goal is at least double the current pace of rental apartments construction. Support social services for seniors including the construction of new social service centres.

2.5.5. Create a research grant program for a pilot and demonstration projects, perform targeted information and educational campaign, and provide better monitoring of air pollution and health impacts in particular regions.

Part B: Analytical part

3. CURRENT SITUATION AND FORECASTS OF FUTURE DEVELOPMENT WITH EXISTING POLICIES AND MEASURES

The Slovak Republic has approximately 1 million residential and detached houses (with 1.9 million apartments) and more than 15 thousand public buildings such as schools, hospitals, offices. The number of private non-residential buildings is unknown, but it is estimated that their floor area is about 1/3 of the total building floor space. 2/3 of buildings are in their original state, with prevailing construction period being 1960–1990, and these buildings need renovation also in terms of prolonging their lifetime, not to mention energy efficiency, and other parameters of quality buildings. This need is also confirmed by the results of a survey, under which 1/5 of households have poor housing and they suffer from 1.5 to 2.9 times more frequent health problems. It is estimated that the cost of healthcare due to the use of poor-quality buildings amounts to EUR 410–870 million a year. According to the European Environment Agency, wood heating will cause more than 3 thousand premature deaths a year, where about one-fourth of detached houses use wood heating, and households heating makes up to 70% share in particulate matter. Compared to other EU countries, Slovak households spend the largest share of income for household energy (14.5% on average). The operation of public buildings costs public budgets an estimated EUR 360 million a year.

Buildings in fact represent a country's strategic infrastructure. We spend 90% of our time inside them, they consume 40% of energy, they are responsible for 36% of CO_2 emissions, and have a major impact on air pollution. 11% of newly built detached houses in 2017 fail to meet the statutory minimum requirements for buildings in the area of building energy performance. Studies show that, for example, healthy office buildings increase labour productivity by 8 to 11%. With a very conservative estimate, this would bring potential growth in Slovakia's GDP worth EUR 1.3 billion. The rental housing associated with labour mobility makes only 3% of the housing stock in Slovakia. Without changing attitudes, the share will rise only to 4% by 2050.

In 2017, Slovakia has recorded the most significant growth in energy consumption across the EU. According to Eurostat, primary energy consumption in Slovakia in 2017 increased by 5,1% year-on-year, and final energy consumption increased by 7%. In 2017, Slovakia's economic growth was 3,2%.

The construction, renovation, and use of buildings in Slovakia in the future will be mainly influenced by climate change, demographic development, and urbanization. Demand for housing will grow with

population aging and the advancement of new family models (smaller families, stable population, more apartments). Slovakia already has about a quarter less apartments per capita compared to more advanced EU countries. We also assume that by 2050 the population of Slovak cities will grow by at least 20% only due to migration from the countryside. These people will need housing, just as immigrants–new inhabitants of Slovakia who compensate for the lack of labour. We expect the number of apartments to grow by up to half a million, up to a quarter of the housing stock.

At the same time, household energy consumption will increase. On one hand, due to increasing number of appliances, on the other hand to ensure thermal comfort in new climate conditions. As the increase in average temperature will cause a particular increase in summer peaks, no more substantial decrease in energy consumption for heating can be expected. On the contrary, extremely high temperatures and long periods of heat combined with the increasing purchasing power of the population will (as now) lead to a massive increase in cooling in residential and non-residential buildings.

Risks to the future development whilst maintaining existing policies

- In the vast majority of buildings' renovations cost-optimal level of energy efficiency of buildings is not reached (energy class–primary energy A1, total need of energy A). This preserves a sub-optimal state for the next 30–40 years.
- Newly constructed buildings that fail to fulfil the EPBD requirements due to the definition of building approval procedure–again preserves the state for 30–40 years ahead.
- The pace of renovation is very law, especially in public buildings (about 1% p.a.), in detached houses–quality of renovation is important.
- In general, renovations bring buildings that are not adapted to climate change, its indoor environment is not solved at all and this will bring impact on health and productivity.
- The number of air-conditioned apartments and buildings will grow and this will make pressure on energy consumption, where this type of consumption is ignored when taking into consideration residential buildings and making energy efficiency calculation, and air-conditioning is not an optimal manner of prevention to interiors over-heating.
- Lack of rental housing in cities impedes economic development of the country and reduction of unemployment, keeps people in areas with no economic activities and perspective for improvement, thus aggravates environmental situation (in particular local air pollution).
- Preserves dependence on imports of energy sources and raw materials from one country–Russian Federation.

Forecasts of energy consumption and greenhouse gas emissions (and other pollutants) are currently being prepared.

4. EVALUATING IMPACTS OF PLANNED POLICIES AND MEASURES

Impacts of proposed policies and measures should be evaluated using multiple criteria, the attitude is called Multiple Benefits of Energy Efficiency of the International Energy Agency, of which the Slovak Republic is a member.

- Proposed measures and policies do not impose additional legislative requirements for constructing companies.
- They will bring additional energy savings.
- Adaptation of buildings and quality indoor environment will impact health and productivity. According to the estimates, the current state of buildings brings health care costs at EUR 410–870

million a year and potential GDP growth in Slovakia at EUR 1.3 billion as a result of improved quality of indoor environment in office buildings.

- Impact on public finance has to be seen through generated investments in private sector, where in the conditions of the SR each EUR 100 million invested in buildings renovation generates about EUR 30 million of additional income or reduced public expenditure.

5. INVESTMENT NEEDS TO ACHIEVE GOALS 2030

(EUR mil. a year)	Investment need	Necessary public expenditure
Public buildings	200	120
Detached houses	400–600	65
Residential buildings	150	65
Private non-residential buildings	???	???
Other measures and policies	50	50
In total	800–1 000	300

Note: Public finance currently spent to support energy efficiency of buildings is approximately EUR 250 million a year (mainly from structural and investment funds, State Housing Development Fund and Ministry of Transport and Construction of the Slovak Republic).

Sources: Buildings for the Future: Program Buildings 2050. Bratislava, 2017.

III. Fossil fuels phase out, especially coal

COMMON REASONINGS OF SEVERAL PROPOSED CHANGES:

(Reasoning A: Coal phase out)

inating coal mining and burning as soon as possible (820 gCO2eq/kWh[2] of life cycle emissions) is a necessary step for meeting the Paris Agreement commitments.[3]

A large number of European countries have endorsed the binding coal phase out in France (by 2021), Sweden (2022), Italy, Great Britain, Ireland and Austria (2025–Austria considering 2020), the Netherlands and Finland (2029), Denmark and Portugal 2030, Germany (2038–considering 2035).[4] No coal energy sectors can be found in the following countries: Albania, Belgium, Cyprus, Estonia, Iceland, Latvia, Lithuania, Norway, and Switzerland.

The Intergovernmental Panel on Climate Change (IPCC) states that mankind has only twelve years (up to 2030) to reverse catastrophic climate change, and that it is necessary to reduce coal production to 0% worldwide and average annual low carbon technology and EE investments need to increase five times by 2050 compared to 2015.[5] The low-carbon study of the SR counts with the decommissioning of the power plant in Nováky by 2023 and in Vojany by 2025.[6] If local coal mining was phased out by 2023, then the SR's savings on electricity prices would be EUR 388 million in 7 years, and EUR 160 million on healthcare, and the SR's greenhouse gas emissions would be reduced by 6 percent at minimum.[7] Another hundreds million euro can be saved by even earlier phase of local coal mining.[8] Moreover, the European Pollutant Register points to a total of 53 pollutants by which coal power plants contaminate air, water and soil.[9]

(Reasoning B: Systematic reduction in fossil fuels consumption)

Dependence on the import of fossil fuels needs to be solved first and foremost by reducing them systematically in terms of preferring the European EE principle (Energy Efficiency First).[10] IPCC (2014) reports 490 gCO2eq/kWh emissions for combined gas combustion facilities, which emit more emissions than most RES technologies with 11–230 gCO2eq/kWh.[11] The European Bank for

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2 Schlömer S., T. Bruckner, L. Fulton, E. Hertwich, A. McKinnon, D. Perczyk, J. Roy, R. Schaeffer, R. Sims, P. Smith, and R. Wiser, 2014: Annex III: Technology-specific cost and performance parameters. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, s.1335.

3 Stratégie environmentálnej politiky SR, 2019, https://rokovania.gov.sk/RVL/Material/23592/1

4 https://beyond-coal.eu/data/

5 https://www.ipcc.ch/report/sr15/

6 Štúdia nízkouhlíkového rastu pre Slovensko: Implementácia rámca klimatickej a energetickej politiky EÚ 2030, Ministerstvo životného prostredia, Svetová banka, 2019.

7 https://ec.europa.eu/jrc/sites/jrcsh/files/coal_regions_report_jrc_pilot-slovakia.pdf

8 https://euractiv.sk/section/klima/opinion/ak-prestaneme-dotovat-uhlie-do-roku-2021-usetrime-ludom-345-milionov-eur/

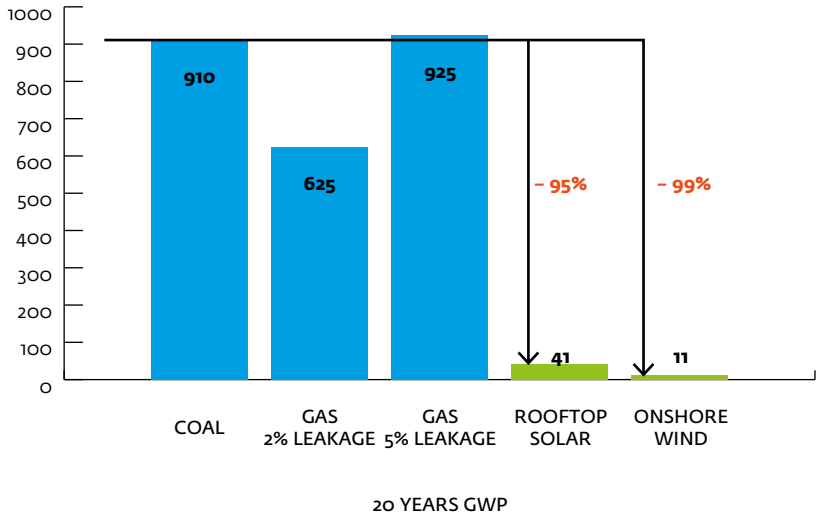
9 http://www.atlasuhli.cz/clanky/zdravi.html

10 https://ec.europa.eu/energy/en/topics/energy-efficiency

11 Schlömer S., T. Bruckner, L. Fulton, E. Hertwich, A. McKinnon, D. Perczyk, J. Roy, R. Schaeffer, R. Sims, P. Smith, and R. Wiser, 2014: Annex III: Technology-specific cost and performance parameters. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate

Reconstruction and Development (EBRD) uses data from a more recent study,[12] which also takes into consideration natural gas leaks–emissions thus range from 500-625 gCO2eq / kWh at 2% leakage up to 625–925 gCO2eq / kWh at 5% leakage. In addition, a higher number indicates a 20-year global warming potential and a lower number indicates a 100-year global warming potential. Even more worrying is the fact that the IPCC states that mankind has only twelve years until 2030 to reverse catastrophic climate change. And so, the strong short-term impact of natural gas is highly problematic. The transition from coal to gas can even be counterproductive in the short-term horizon. On the other hand, the transition from coal to renewable energy sources that meet sustainability criteria can lead to savings of up to 99% of greenhouse gas emissions.

Lifecycle GHG emissions kgCO2eq/MWh



Source: CEE Bankwatch Network, 2019 based on the data (EBRD 2018[13]) and (IPCC 2014[14])

Prof. Broderick and Dr. Anderson from the University of Manchester report that additional reserves of fossil fuels, including natural gas, clearly have a zero role in energy production after 2035, while respecting the objectives of the Paris Agreement.[15] They further state that long-distance [gas] pipes, e.g. from Russia, may have higher emissions compared to average supply piping systems, but these are

Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, s.1335. https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_annex-iii.pdf

12 Energy Transitions Commission, Copenhagen Economics analysis based on Farquharson et al (2016); Lazarus et al (2015), Sumarizované na s.42 na internete: https://www.ebrd.com/power-and-energy/ebrd-energy-sector-strategy.pdf

13 Energy Transitions Commission, Copenhagen Economics analysis based on Farquharson et al (2016); Lazarus et al (2015), Sumarizované na s.42 na internete: https://www.ebrd.com/power-and-energy/ebrd-energy-sector-strategy.pdf

14 Schlömer S., T. Bruckner, L. Fulton, E. Hertwich, A. McKinnon, D. Perczyk, J. Roy, R. Schaeffer, R. Sims, P. Smith, and R. Wiser, 2014: Annex III: Technology-specific cost and performance parameters. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, s.1335.

15 Anderson, K. A Broderick, J. (2017) Natural gas and climate change, Manchester: University. https://www.research.manchester.ac.uk/portal/en/publications/natural-gas-and-climate-change(c82adf1f-17fd-4842-abeb-f16c4ab83605).html

currently poorly characterized.[16] The IPCC further claims that electricity supplies from RES needs to be increased up to 70–85% worldwide by 2050.[17]

The Netherlands states in its National Energy and Climate Plan that it will ensure that new houses do not use natural gas, a significant percentage of buildings will not be gas-fired, and will reduce gas mining in the Groningen field after 2022.[18]

PROPOSED AMENDMENTS:

We propose that page 6, part "Decarbonisation (RES)" is amended to include the following: *"in order to achieve a low-carbon economy the SR considers essential a systematic reduction in energy and fuel consumption, increasing energy efficiency, and optimum use of renewable energy sources and nuclear energy". ... "Reducing overall coal consumption and its share in heating in favour of renewable energy sources, fulfilling sustainability criteria, will improve sustainability and security of heat supplies."*

Reasoning: the EU prioritises EE–"Energy Efficiency First."[19] The most ecological and secure energy is that we do not need at all, and thus we propose that the following three basic priorities are respected, respectively:[20]

1. Reduce energy and fuel consumption;
2. Increase energy efficiency;
3. Sensitive use of local renewable sources for local consumption.

We propose that page 17, part "h) Economic policy strategy of the Slovak Republic by 2030" is amended to include the following: The goal of global environmental policies is to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, which significantly reduces the risks and impacts of climate change and holds global warming well below 2°C, which is still taken as solvable in terms of the impacts on environment and man.

Reasoning: *the Paris Agreement signed by the Slovak Republic in 2016 sets forth obligation: "to hold increase in global average temperature well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels that would significantly reduce the risks and impacts of climate change;"*[21]

We propose that page 25, part "d) Taxation of energy products and electricity" is amended to include the following: *"Finally, support to electricity production from coal and lignite should be stopped as well as electricity and heat production in CHP installations using fossil fuels."*

Reasoning: (Reasoning A: Coal phase out)

We propose that page 25, part "d) Taxation of energy products and electricity" is amended to include the following: *"Instead, tax on electricity consumption could be increased, and tax exemption for households' electricity consumption could be lifted in order to motivate households for more efficient use of electricity. Lower income households could be compensated by the Government by means of tax measures or*

16 Anderson, K. A Broderick, J. (2017) Natural gas and climate change, Manchester: University. https://www.research.manchester.ac.uk/portal/en/publications/natural-gas-and-climate-change(c82adf1f-17fd-4842-abeb-f16c4ab83605).html

17 https://www.ipcc.ch/sr15/

18 https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans

19 https://ec.europa.eu/energy/en/topics/energy-efficiency

20 http://www.energoportal.org/inteligentna-energetika/priority

21 Parížska dohoda, https://eur-lex.europa.eu/legal-content/SK/TXT/?uri=CELEX:22016A1019(01)

additional measures. Further, support measures for industrial polluters could be reduced, especially if they burn fossil fuels and they are profitable."

Reasoning: The principle "polluter pays" is an essential element of European environmental legislation; it means that an entity that causes environmental damage shall be responsible for such damage, and it must adopt necessary preventive or corrective measures and bear all related costs.[22]

We propose that page 28, part "g) Action plan for the transition of coal region–the Upper Nitra" is amended to include the following: *"in its Resolution No. ~~47/2010~~ 580/2018 the Government of the SR approved, under SGEI, volumes of electricity and heat supplies and production from local coal during the period in which the blocks 1 and 2 A of the heat power plant in Nováky fulfil the conditions of valid legal regulations for protection of environment no later than by 2023, where specific conditions in the SGEI shall be imposed to individual market actors by the Ministry–in its decisions. Slovakia will adopt a binding deadline for the closure of coal production no later than 2023 and closure of coal burning all over Slovakia by 2025." ~~This measure ensures by 2020 and/or 2035, an optimum level of coal mining, higher security of electricity supplies and lower energy dependence of the SR. Such support had also a significant social aspect, i.e. keeping employment rate in the Upper Nitra, Veľký Krtíš, and Záhorie region~~.*

Reasoning: This data is non-up-to-date. Draft transition of the Upper Nitra region in relation to draft general economic interest–ensure security of electricity supplies, was approved on 12 December 2018.[23] (Reasoning A: Coal phase out)

We propose that page 31, part "iii. Key issues with cross-border relevancy" is amended to include the following: "the Slovak Republic is highly dependent on the import of primary energy sources. So, it is necessary to decrease high dependency on the import of fossil fuels through systematic measures in the area of energy efficiency and RES fulfilling sustainability criteria." ~~Taking into account the location of the SR (in Central Europe), diversification of transport routes is necessary, especially in the case of natural gas and crude oil. It is necessary that particularly North–South routes are supported.~~

Reasoning: (Reasoning B: Systematic reduction in fossil fuels consumption)

We propose that page 50, part "Natural gas" is amended to include the following: *"the SR is an important transit country, especially for natural gas, direction: East–West and West–East. Further, the SR shows the highest degree of dependency on the import of natural gas of all the EU countries. It is necessary to reduce systematically dependency on natural gas consumption, and thus reduce its import as such. ~~complete also connections North–South to preserve the position of the SR. Develop underground gas storage facilities~~.*

Reasoning: the SR shows the highest degree of dependency on the imports of natural gas of all the EUR countries.[24]
(Reasoning B: Systematic reduction in fossil fuels consumption)

We propose that page 52, part "iv. National objectives with regards to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand control, and energy storage" is amended to include the following: *"District heat productions with cogeneration of electricity and heat will be preferred to the electricity production from fossil fuels ~~using no heat~~ and ensure their operation so that they can be maximally used in provision of balancing energy. It is necessary to use the infrastructure of heat power plants when building energy efficient facilities for RES that fulfil sustainability criteria. ~~energy recovery of municipal waste~~."*

22 https://eur-lex.europa.eu/legal-content/SK/TXT/HTML/?uri=LEGISSUM:l28120c-from=CS

23 http://www.rokovania.sk/Rokovanie.aspx/BodRokovaniaDetail?idMaterial=28001

24 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Provisional_natural_gas_balance_sheet_by_country_-_table_2.png

Reasoning: Financing of facilities that use any fossil fuels would significantly undermine performance of the Paris Agreement commitments, as well as energy and climate goals of the SR by 2030[25].[26] Support to the facilities for energy recovery of municipal waste violates the binding hierarchy of waste management[27] adopted by the Ministry of Environment of the SR.[28] It would largely undermine the efforts of the SR to fulfil its recycling goals and get of the group of the EU countries showing the worst results in this area.[29] (Reasoning B: Systematic reduction in fossil fuels consumption)
We propose that page 60, part "Where applicable, national objectives and measures with regards to ensuring consumers' participation in energy system and the benefits of self-generation and new technologies including smart meters" is amended to include the following: "It is presumed that a detailed knowledge of the course of consumption will lead to changed behaviour ~~breeding~~ of consumers."

Reasoning: The meaning of the original word "breeding" in Slovak is more frequently used for animal breeding rather than behaviour of consumers of energy services.[30] **We propose that page 80, part "c) State aid scheme for entities in sectors and sub-sectors, where a significant risk of carbon leakage is anticipated in relation to internalisation of EU ETS emission allowance costs to electricity prices" is amended to include the following:** *"The purpose of this aid is to avoid a significant risk of carbon leakage in transferring greenhouse gas emission allowance costs to electricity prices borne by the beneficiary of the aid if its third country competitors do not have to include similar CO2 costs in their electricity prices and the aid recipient is not able to transfer these costs to product prices without losing a significant market share. Such assistance will be revised on the basis of profitability of these enterprises and a realistic assessment of the risk of exit to third countries. Financing projects to reduce greenhouse gas emissions and environmental pollution overall is a priority."*

Reasoning: The principle "polluter pays" is an essential element of European environmental legislation; it means that an entity that causes an environmental damage shall be responsible for such damage, and it must adopt necessary preventive or corrective measures and bear all related costs.[31] None of the specified entities need compensation for electricity price increase in order to be profitable and to prevent its exit from the EU.

25 https://www.ipcc.ch/sr15/

26 http://www.foeeurope.org/NoRoomForGas

27 http://www.minzp.sk/files/sekcia-enviromentalneho-hodnotenia-riadenia/odpady-a-obaly/registre-a-zoznamy/poh-sr-2016-2020_vestnik.pdf

28 http://www.minzp.sk/files/sekcia-enviromentalneho-hodnotenia-riadenia/odpady-a-obaly/registre-a-zoznamy/poh-sr-2016-2020_vestnik.pdf

29 http://www.minzp.sk/iep/publikacie/ekonomicke-analyzy/tri-vyzvy-slovenskeho-zivotneho-prostredia.html

30 http://slovnik.juls.savba.sk/?w=chov&s=exact&c=dc1e&d=kssj4&d=pspc&d=sssj&d=scs&d=sss&d=peciar&d=ma&d=hssjV&d=bernolak&d=obce&d=priezviska&d=un&d=locutio&d=pskcs&d=psken&d=noundb&ie=utf-8&oe=utf-8#

31 https://eur-lex.europa.eu/legal-content/SK/TXT/HTML/?uri=LEGISSUM:l28120&from=CS

Figure 1. Compensations and profits of firms with alleged risk of carbon leakage for 2017

Name of entity	Approved compensation	Profit	Profit with no compensation
Metsa Tissue Slovakia s.r.o.	219 718	5 623 527	5 403 809
Železiarne Podbrezová a.s.	333 632	4 048 232	3 714 600
U. S. Steel Košice, s.r.o.	372 114	449 921 000	449 548 886
Mondi SCP, a.s.	1 097 931	72 267 000	71 169 069
SLOVNAFT, a.s.	1 456 736	146 724 000	145 267 264
OFZ, a.s.	1 133 684	14 253 224	13 119 540
Slovalco, a.s.	5 386 185	36 114 000	30 727 815
Total	**10 000 000**	**728 950 983**	**718 950 983**

Source: Own data, processed with the use of data from envirofond.sk and finstat.sk

We propose that page 84, part *"iv. Where applicable, national policies, time-lines and measures planned to phase out energy subsidies, in particular for fossil fuels"* **is amended to include the following:** *"~~Will be supplemented according to current state in the final version of the National Energy and Climate Plan~~. Slovakia will adopt a binding deadline for closure of coal mining no later than by 2023 and closure of coal burning all over Slovakia by 2025."*

Reasoning: (Reasoning A: Coal phase out)
We propose that page 129, part "Parameters and PaO used in energy sector–fugitive emissions" is amended to include the following: tieto formulácie: *"~~With regards to solving the issue of mining and energy sector in the Upper Nitra region, it is expected, in the coming weeks, that the Government of the SR will reconsider support to electricity and heat production and supplies from local coal, in the context of the general economic interest, and such support will be stopped~~ no later than ~~by 2023~~. Slovakia will adopt binding deadline for the closure of coal mining no later than by 2023 and closure of coal burning all over Slovakia by 2025. ~~Up-to-date data will be supplemented according to the current state, in the final version of the National Energy and Climate Plan~~."*

Reasoning: (Reasoning A: Coal phase out)
We propose that page 146, in part "ii. Current potential for high-efficiency cogeneration and efficient district heating and cooling" is amended to include the following: *"In recent years, biomass-fired boilers have been refurbished in plants using cogeneration of electricity and heat and new biomass-fired boilers have been built, and this trend, to a lesser extent than so far, will continue. It is necessary that systematic measures to reduce fossil fuels subsidisation and consumption by means of increasing energy efficiency and use of RES that fulfil sustainability criteria."*

Reasoning: In 2016, electricity from KVET with fossil fuel as primary source was subsidised by up to EUR 28 million.[32] If profits of the entities burning fossil fuels were not subsidised it would be possible to save at minimum EUR 9 113 502 a year. (Reasoning A: Coal phase out), (Reasoning B: Systematic reduction in fossil fuels consumption)
We propose that Figures no. 34 and 35, on page 153, are supplemented to include data by 2030.

Reasoning: The Figures are incomplete, they only present data by 2025.
We propose that page 157, part "i. Current energy mix, domestic energy sources, import dependency, including relevant risks" is amended to include the following: *"The main local energy*

32 http://www.urso.gov.sk/sites/default/files/OZE_Zoznam-Vyrobcov-s-doplatkom-za-rok-2016ph.pdf

sources are renewable sources and brown coal. No later than the end of ~~After~~ 2023 when the subsidies for the production of electricity from local coal is ended, we expect a significant reduction in brown coal mining. Slovakia will adopt a binding deadline of the closure of coal mining by 2023 and closure of coal burning all over Slovakia by 2025."

Reasoning: Update resulting from the Resolution No. 580/2018;[33] (Reasoning A: Coal phase out)
We recommend that all parts containing the following wording are supplemented and go through due public consultation: *"Will be supplemented according to the current state in the final version of the National Energy and Climate Plan."*

Reasoning: Such provisions do not allow public consultation in compliance with the Regulation of the European Parliament and of the Council (EU) 2018/1999, of 11 December 2018, on the Governance of the Energy Union and Climate Action[34], which defines Public Consultation as follows: *"Without prejudice to any other Union law requirements, each Member State shall ensure that the public is given early and effective opportunities to participate in the preparation of draft integrated national energy and climate plan, the plans for the 2021 to 2030 period (public will participate in the preparation of the final plan well before its adoption), and the long-term strategies referred to in Article 15. When submitting the above documents to the Commission, each Member State shall attach a summary of the public's views or preliminary views."* Part "iv. Description of energy subsidies including fossil fuels subsidies" on page 181 has crucial importance in terms of decarbonisation.

33 http://www.rokovania.sk/Rokovanie.aspx/BodRokovaniaDetail?idMaterial=28001

34 https://eur-lex.europa.eu/legal-content/SK/TXT/HTML/?uri=CELEX:32018R1999&from=EN

IV. Renewable energy sources

Part A. National plan

1. A VIEW TO SUBMITTED NECP SR

Renewable energy sources (RES) are relevant for 3 key areas: RES for heat and cold production, RES for power generation, and RES for transport. Though the 3 areas are different, we have a view of NECP SR as a whole. However, in the analytical part we primarily focus on the proposals on power generation from RES.

We are of the opinion that the primary objective, for which these plans are prepared is to gradually reduce CO_2 emissions to a point where we will return to a level that will not be harmful to plants, animals, or mankind as such. As we perceive Slovak commitments and fulfilment of any goals in this area as too hesitant for long, even though our country itself has already been regularly damaged by droughts and water shortages, or by huge weather fluctuations and the resulting damage to property, we want to strongly urge the involved parties in the first place that they defend the best interests of all the people of the country, both present and future. At the same time, to make the submitted proposal not only a project on paper for "Brussels", but a real guidance that will improve environment and will truly begin a systematic transformation of energy sector, or other industries, in order to immediately and significantly reduce greenhouse gas emissions, to fulfil the commitments made in the Paris Agreement (limit the growth of global temperature by the end of the century by a maximum of 2°C and, if possible, significantly below this level, only by 1.5°C above pre-industrial levels).

Right from the beginning it is necessary to draw attention to absolutely flawed premises with regards to nuclear energy; in no way it is a carbon-free source of electricity production. It is a low-emission source, but it cannot be regarded as emission-free, which is also stated by the World Nuclear Association.[35] For more information, see the text below. The chapter 2.1.1 Greenhouse gas emissions and their removal by sinks states that emission objectives by 2030 will be -12% compared to 2005. However, such a measure fails to comply with the Paris Agreement. A sufficient measure would be a reduction by 55% compared to 2005 and/or 45% compared to 2010. Since 2014, Slovakia's total emissions have not declined at all. The present proposal does not adequately address car emissions (tightening the recommended emission limits on cars sold in the EU and the fact that no petrol-fuelled, combustion or hybrid vehicles should be sold after 2030), the air transport sector (increase tax on aviation gasoline), the building sector (the report fails to mention the EU building sector recommendation, under which all new public buildings as of 1 January 2019 and all buildings as of 1 January 2021 should meet the "almost zero-energy").[36] The chapter 3.1.1 decarbonisation does not take into consideration the fact that heavy energy industry has moved abroad.[37] Thus reduced emissions are not the result of substantial measures adopted in Slovakia, emissions production have only been moved outside the country. Further, claimed increase in the share of bio components in motor fuels breaches the latest scientific findings that have proven this does not lead to reduction in the volume

35 http://www.world-nuclear.org/nuclear-basics/greenhouse-gas-emissions-avoided.aspx

36 Mgr. Alexander Ač, Ph. D., Ústav výzkumu globální změny AV ČR, v. v. i., czechglobe.cz

37 https://www.pnas.org/content/112/20/6271

of greenhouse gas, but, quite the opposite.[38] In aviation emissions, it is necessary to raise taxes on aviation gasoline and charge intercontinental flights as the ETS is inadequate and emissions from this sector increase.

The chapter 2.1.2 Energy from renewable sources describes the main orientations where Slovakia sees potential in this area. The indicative growth trajectory of the submitted plan starts at a 14% share in final energy consumption since 2021. The very introduction we see as confusing, as it is known that Eurostat's latest published data for 2017 show a decline to 11,5% of RES share in gross final energy consumption.[39] Thus, the NECP SR proposal fails to be based on the currently valid data in the very introduction of its analysis of RES share in the final energy consumption. Given the annual growth in gross final consumption of energy and almost no increase in new RES since 2017, it is not realistic that Slovakia would achieve in 2020 the objectives, to which it has committed (see table). Even these objectives, which we were supposed to reach by 2020, have been reduced in comparison with other EU countries, and Slovakia has failed to perform even these.

NATIONAL ACTION PLAN FO THE SR 2010							
The share of RES in gross final consumption of energy							
	2005	2010	2011	2012	2015	2018	2020
RES–heat and cold production	6,1%	7,6%	8,0%	8,5%	10,9%	13,3%	14,6%
RES–power generation	16,7%	19,1%	19,3%	20,2%	23,0%	23,7%	24,0%
RES–transport*	0,6%	4,1%	4,2%	4,3%	6,0%	8,3%	10,0%
Overall share of RES	6,7%	9,5%	8,2%	8,2%	10,0%	11,4%	14,0%
Actual state: year 2010—18,4% energy production from RES (5 280 GWh)							

At the same time, we consider the planned increase from (unfulfilled) 14% of final consumption to 18% by 2030 less than the minimum plan. Taking into account the statements of the Prime Minister Pellegrini at the European Council Summit, on 21 March 2019, who has declared the more ambitious plans to halt global warming, all these data need to be reconsidered.[40]

It is also stated in the introduction that the Slovak Republic has one of the lowest emission energy sources in the EU for the high share of nuclear and natural gas in both electricity and heat production. However, it should be noted that nuclear energy alone is an emitter of emissions, throughout its cycle: uranium mining, its treatment, conversion and enrichment, fuel production, reactor construction, reactor decommissioning, fuel reprocessing, nuclear waste disposal, cultivation of mining and material transport in all stages.[41] At the same time, the NECP SR itself in chapter 2.5. states the need of research and development for sustainable energy in Slovakia, and hence the development of RES technology. Further, in chapter 3.3. energy security and resource diversification are mentioned, and chapter 4.4 shows a chart of the current energy mix of which 88,8% is import dependent. The same chapter states that "Slovakia is almost 90% dependent on the imports of primary energy sources: 100% nuclear fuel, 98% natural gas, 99% oil, and 68% coal." For this reason, we cannot speak about secure and reliable, as well as the low-carbon energy sector, as the Slovak Republic is fully dependent on imports of these primary raw materials from third countries, and it is neither strategic nor secure.

38 https://www.theguardian.com/environment/2017/jul/14/biofuels-need-to-be-improved-for-battle-against-climate-change

39 https://www.energie-portal.sk/Dokument/ministerstvo-ma-na-pokles-podielu-oze-vysvetlenie-urso-sa-vyjadrovat-nechce-104980.aspx

40 https://euractiv.sk/section/klima/news/slovensko-sa-na-summite-hlasi-k-ambicioznejsiemu-klimatickemu-cielu/

41 https://www.iflscience.com/environment/nuclear-power-zero-emission-no-it-isn-t-high-emission-either/

Chapter 4.5.3. Electricity and gas markets, energy prices, states that the market is fundamentally distorted by subsidies mainly to support RES. However, the European Commission's report on energy prices says that state support in Slovakia has risen precisely to fossil fuels between 2008 and 2016.[42] [43] The same EC report also says that Slovakia is already now among the countries with the highest fees (price for distribution, respective tariffs, fees and charges) for electricity (up to 40% of the total price), therefore it is necessary to introduce a reform of pricing, stop support to fossil fuels, and promote competitive renewable resources. The report also says that the increasing share of RES mitigates the effects of volatile fossil fuel prices on the markets. If the security of electricity supply is important for Slovakia and the country wishes to prevent increase in the final prices of electricity, it is necessary to give up fossil fuels, which will have a positive impact on the stability of electricity price. However, it turns out that the growth in electricity end prices is the only effective way of reducing energy consumption and thus reducing CO_2 emissions.[44]

2. NATIONAL OBJECTIVES

National objectives are set as follows and due to the reasons mentioned above, we find them insufficient. For the trajectories calculated and proposed by us, see Annex hereto.

ii. Estimated trajectories of share of energy from renewable sources, by individual sectors, in final energy consumption from 2021 to 2030 in electricity, heating and cooling sector, and in transport.

By 2030, orientation trajectory will reach at least planned contribution of a Member State. The orientation trajectory for Slovakia begins at 14% in 2020.

Figure no. 7 Estimated trajectories

	2021	2022	2023	2024	2025	2026	2027	2028	2029	**2030**
Renewable energy sources– production of heat and cold (in %)	12,9	13,6	14	14,7	15,7	16,2	16,5	16,9	17,2	**17,6**
Renewable energy sources– production of electricity (in %)	22,3	23,1	23,5	23,6	24,4	25,1	25,2	25,3	25,2	**25**
Renewable energy sources– transport (in %)	8,1	8,2	8,6	8,7	9	9,4	9,9	10,8	12,4	**14**
Overall share of renewable energy sources (in %)	**14,0**	**14,7**	**15,1**	**15,5**	**16,3**	**16,8**	**17,1**	**17,4**	**17,7**	**18,0**

Source: Ministry of Economy of the SR

The EU objective, i.e. 32% share of renewable energy in the EU consumption by 2030 seems poor compared to the proposed trajectories of the Slovak Republic.

3. POLICIES AND MEASURES

The EC itself in its report "Report on Slovakia 2019–Assessment of the Progress Made in Implementing Structural Reforms, Preventing and Correcting Macroeconomic Imbalances and In-depth Review Results"[45] calls for more efforts in implementation of RES:

42 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2019:1:FIN&from=EN

43 https://www.energie-portal.sk/Dokument/slovensko-dotuje-fosilne-paliva-viac-nez-vacsina-okolitych-krajin-104928.aspx

44 Mgr. Alexander Ač, Ph. D., Ústav výzkumu globální změny AV ČR, v. v. i., czechglobe.cz

45 https://www.energie-portal.sk/Dokument/zavadzanie-obnovitelnych-zdrojov-na-slovensku-vyzaduje-viac-usilia-pripomina-ek-105022.aspx

"In 2017, the share of renewable energy sources decreased to 11.49% of gross final energy consumption, this resulted in certain lag behind the Europe 2020 objective and that is 14% by 2020." And, at the same time, it defines: "The power grid will require additional investments to increase its flexibility in the involvement of diverse renewable sources, as concerns over the grid's stability and security of electricity supply have been raised as the main reasons for postponing the connection (2013), which prevents and is still preventing the installation of new production facilities for renewable energy sources and has caused capacity stagnation in recent years."

Policies and measures for the introduction of RES should follow these basic rules:[46]

- **A more realistic scenario of energy consumption trend:** today we can see how inaccurate estimates of consumption causes deviation from defined objectives for 2020 along with insufficient building of new RES capacities.
- **The costs of resources in construction (by means of comparing LCOE):** already today solar and wind power plants represent the least expensive source of electricity if we compare overall life-cycle costs (LCOE) also compared with fossil and other sources.
- **Intelligent management of distribution systems:** by means of technical measures for intelligent management of distribution systems as well as a change in the tariff structure, we can release significant capacity to connect new energy sources into distribution systems.
- **Development of accumulation:** energy storage plays an important role in balancing the grid system. It creates a flexible system that is valued for its rapid response, especially in times of unexpected demand, and thus ensures stability.
- **Ambitious goals:** as already indicated by the Prime Minister of the SR–Peter Pellegrini at the EC Summit, ambitious goals are needed to ensure fulfilment of the Paris Climate Agreement. Slovakia, as a country heavily dependent on import of all energy carriers, may have the ambition to at least significantly increase RES's share in energy consumption while maintaining economic efficiency (comparison of the costs associated with the construction of sources and the savings achieved in energy carriers imports during the planned lifetime of sources).

46 World Energy Council Slovakia: Možnosti využitia obnoviteľných zdrojov energie na Slovensku a ich vplyv na elektrizačnú sústavu SR, september 2018

Part B: Analytical part

4. CURRENT SITUATION AND FORECASTS OF FUTURE DEVELOPMENT UNDER EXISTING POLICIES AND MEASURES

As mentioned above, achieving RES objective in power generation will be challenging also in view of the year-on-year increase in electricity demand. The study of SEPS, a. s.[47] "Updated Forecast of Electricity Consumption in the SR by 2035" anticipates, depending on the scenario of economic development of the SR, electricity consumption in 2020 at 32–32.8 TWh; and this would require production of 7.3–7.9 TWh electricity from RES.

Based on the assumption that since 2016, for which the latest official data on electricity generation from RES (6 643 GWh) have been published, there has been no significant increase in the installed capacity of RES-based equipment, to reach the objective, in the case of low electricity demand scenario, it would be necessary to provide new capacity by 2020 with annual production app. 650 GWh (for example 650 MW of installed capacity of photovoltaic power plants, 325 MW in wind power plants, or 100 MW in solid biomass or biogas plants).

4.1 POTENTIAL OF RES IN SLOVAKIA

For each type of renewable source, the total potential and technical potential are given. Based on these figures we have recalculated the trajectories (see Annex) and we recommend that the final values in Figure no. 9 of the original NECP SR are corrected according to these figures. For more information, see study WEC SK[48], chapter 3.3.

5. EVALUATING THE IMPACTS OF PLANNED POLICIES AND MEASURES

A study by Sandbag and Agora Energiewende[49] think-tanks says that RES is also supported by economy, as wind and sun are on a par with coal and gas, taking into account their costs. Conversely, in 2017 the price of coal grew by 15 percent and gas grew by 30 percent.

47 World Energy Council Slovakia: Možnosti využitia obnoviteľných zdrojov energie na Slovensku a ich vplyv na elektrizačnú sústavu SR, september 2018

48 World Energy Council Slovakia: Možnosti využitia obnoviteľných zdrojov energie na Slovensku a ich vplyv na elektrizačnú sústavu SR, september 2018

49 https://euractiv.sk/section/energetika/news/obnovitelne-zdroje-vytlacaju-z-europy-uhlie/?utm_source=traqli&utm_medium=email&utm_campaign=1954&tqid=hqXufWt7HEwB55akGVDRFzXOU7L3E.NYNHLnSk4&fbclid=IwAR2VviUwv4HuCZqzWoxUiiuSrDWXNnndLJ1jO9FiJGHou76utvnTO28snXU

The very countries with the largest RES sector are the ones that have experienced the biggest drop in coal use. This contradicts the traditional notion that gas is considered an alternative to coal in the short term. The study says: "In six years, from 2012 to 2018, European annual CO_2 emissions from coal-fired power plants have fallen by 250 million tons, without at the same time increasing emissions from natural gas electricity production,". The study noted that countries planning to eliminate use of black coal usually have plans to expand renewable electricity production. An example is Denmark or the United Kingdom. Capacity growth will also be driven by the falling price of solar modules. They dropped 29 percent in 2018.[50]

Therefore, we strongly recommend involving greater use of renewable sources and completing NIEKP as market prices already apply in this sector. We note that we see huge reserves in transport and cooling and we recommend to seek advice from other professional associations on the NECP SR objectives.

6. ANNEXES

Figure no. 7 Estimated trajectories

Source: Proposal of SAPI	2021	2022	2023	2024	2025	2026	2027	2028	2029	**2030**
Renewable energy sources–production of heat and cold in (%)	12,9	13,6	14	14,7	15,7	16,2	16,5	16,9	17,2	**17,6**
Renewable energy sources–production of electricity (in %)	22,3	23,1	23,5	23,6	24,4	25,1	25,2	25,3	25,2	**25**
Renewable energy sources–transport (in %)	8,1	8,2	8,6	8,7	9	9,4	9,9	10,8	12,4	**14**
Overall share of renewable energy sources (in %)	**14,0**	**14,7**	**15,1**	**15,5**	**16,3**	**16,8**	**17,1**	**17,4**	**17,7**	**18,0**

Source: Proposal of SAPI	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	**2030**
Renewable energy sources–production of heat and cold in (%)	12,9	12,9	13,6	14,0	14,7	15,7	16,2	16,5	16,9	17,2	**17,6**
Renewable energy sources–production of electricity (in %)	22,8	23,6	23,6	24,1	24,8	25,0	26,0	26,1	26,5	27,0	**27,4**
Renewable energy sources–transport (in %)	8,1	8,1	8,2	8,6	8,7	9,0	9,4	9,9	10,8	12,4	**14,0**
Overall share of renewable energy sources (in %)	**14,4**	**14,9**	**15,1**	**15,6**	**16,2**	**16,9**	**17,6**	**18,0**	**18,6**	**19,4**	**20,1**

Notes and explanations:

- The trajectory fails to include the year 2020 as a stepping stone. We propose to suplement it.
- We propose that the trajectory for electricity production is recalculated taking into account estimated contribution of individual types of technology–see Figure no. 9

50 https://sandbag.org.uk/project/power-2018/

- In accordance with the above mentioned we recalculated the overall share of RES assuming no changes in assumptions about the development of share in individual sectors "electricity", "heat and cold production", and "transport".

Figure no. 8 RES contribution to the final consumption of energy in individual sectors (ktoe)

Source: Ministry of Economy of the SR	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
(A) Expected gross final consumption of renewable energy sources in production of heal and cold	683	714	746	757	784	824	843	847	853	858	866
(B) Expected gross final consumption of electricity from renewable energy sources	598	619	647	666	675	705	733	742	754	756	759
(C) Expected final consumption of renewable energy sources in transport	187	182	182	191	190	189	195	199	205	214	228
(D) Expected overall consumption of renewable energy sources	1.468	1.514	1.575	1.614	1.649	1.718	1.771	1.788	1.811	1.829	1.852

Source: SAPI	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
(A) Expected gross final consumption of renewable energy sources in production of heal and cold	683	714	746	757	784	824	843	847	853	858	866
(B) Expected gross final consumption of electricity from renewable energy sources	**610**	**633**	**662**	**683**	**708**	**721**	**758**	**768**	**790**	**811**	**831**
(C) Expected final consumption of renewable energy sources in transport	187	182	182	191	190	189	195	199	205	214	228
(D) Expected overall consumption of renewable energy sources	1.480	1.529	1.590	1.631	1.682	1.734	1.796	1.814	1.848	1.883	1.925

Notes and explanations:
1. Line B and D were recalculated according to the contribution of individual types of technology proposed by us and specified in Figure no. 9.

Figure no. 9 Estimated overall expected contribution (installed capacity, gross volume of produced electricity) of individual technologies of power generation from RES in the SR in production of electricity in the period 2020–2030.

Source: ME SR	2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Water:	1.626	4.464	1.627	4.467	1.628	4.470	1.629	4.473	1.630	4.476	1.641	4.507	1.731	4.754	1.742	4.785	1.753	4.816	1.754	4.819	1.755	4.822
<1 MW	35	102	36	104	37	107	38	110	39	113	40	116	41	119	42	122	43	125	44	128	45	131
1 MW–10 MW	60	168	60	168	60	168	60	168	60	168	70	196	80	224	90	252	100	280	100	280	100	280
>10 MW	1531	4195	1531	4195	1531	4195	1531	4195	1531	4195	1531	4195	1610	4411	1610	4411	1610	4411	1610	4411	1610	4411
There of pumps:	916	300	916	400	916	400	916	400	916	400	916	400	916	400	916	400	916	400	916	400	0	0
Geothermal	0	0	0	0	4	28	4	28	4	28	4	28	4	28	4	28	4	28	4	29	4	30
Solar																						
photo-voltaic	600	600	620	620	640	640	660	660	680	680	680	680	680	680	680	680	700	700	730	730	750	750
concentrated solar energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tide, wave and ocean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wind:																						
on coast	20	40	30	48	150	120	150	240	150	240	300	480	300	480	300	480	350	560	350	560	350	560
at sea:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biomass:																						
solid	180	990	190	1045	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100
biogas	110	858	130	1014	150	1170	160	1248	170	1326	180	1404	190	1482	200	1560	200	1560	200	1560	200	1560
bioliquids																						
TOTAL	2.536	6.952	2.597	7.194	2.772	7.528	2.803	7.749	2.834	7.850	3.005	8.199	3.105	8.524	3.126	8.633	3.207	8.764	3.238	8.798	3.259	8.822
Thereof combined heat and power plants	290	1848	320	2059	350	2270	360	2348	370	2426	380	2504	390	2582	400	2660	400	2660	400	2660	400	2660

Source: Proposal of SAPI	2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Water:	2.539	4.676	2.540	4.678	1.628	4.681	1.629	4.684	1.630	4.687	1.641	4.718	1.731	5.144	1.742	5.175	1.753	5.206	1.754	5.209	1.755	5.212
<1 MW	35	102	36	104	37	107	38	110	39	113	40	116	41	119	42	122	43	125	44	128	45	131
1 MW–10 MW	60	168	60	168	60	168	60	168	60	168	70	196	80	224	90	252	100	280	100	280	100	280
>10 MW	2444	4406	2444	4406	1531	4406	1531	4406	1531	4406	1531	4406	1610	4801	1610	4801	1610	4801	1610	4801	1610	4801
Thereof pumped-storage:	1017	423	1017	423	1017	423	1017	423	1017	423	1017	423	1017	423	1017	423	1017	423	1017	423	1017	423
Geothermal	0	0	0	0	4	28	4	28	4	28	4	28	4	28	4	28	4	28	4	29	4	30
Solar																						
Photo-voltaic	600	654	660	719	720	777	780	833	840	888	900	942	960	995	1020	1046	1080	1097	1140	1146	1200	1194
concentrated solar energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tide, wave, and ocean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wind:																						
on coast	3	6	3	6	28	63	78	176	153	344	253	569	303	682	353	794	403	907	453	1019	503	1132
at sea:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biomass:																						
solid	180	990	190	1045	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100	200	1100
biogas	110	770	130	910	150	1050	160	1120	170	1190	147	1029	124	868	112	784	122	854	132	924	142	994
bioliquids																						
TOTAL	3.432	7.096	3.523	7.358	2.730	7.699	2.851	7.941	2.997	8.237	3.145	8.386	3.322	8.817	3.431	8.927	3.562	9.192	3.683	9.427	3.804	9.662
Thereof combined heat and power plants	290	1848	320	2059	350	2270	360	2348	370	2426	380	2504	390	2582	400	2660	400	2660	400	2660	400	2660

Notes and explanations:

1. Based on the 2017 figures, more electricity was produced from hydropower than what is stated as the basic assumption of the MoE SR in 2020. Even the figure of installed capacity of hydroelectric power plants, which is currently higher by 1000 MWe (source: study "The Possibilities to Use Renewable Energy Sources in Slovakia and Their Impact on the Slovak Power Grid"), does not fit. It is unclear what figures were used by the Ministry of Economy of the SR (MoE SR) to base their assumptions.
2. Pump storage power plants produce 423 GWh of electricity a year (source: study "The Possibilities to Use Renewable Energy Sources in Slovakia and Their Impact on the Slovak Power Grid"). The MoE SR stated 300 GWh for 2010; no production is stated for 2030.
3. In 2026, the MoE SR apparently expects to start the operation of WPP Sereď and, at the same time, to increase the installed capacity of another not specified WPP. However, the increase in electricity generated in this year and next years does not correspond to the real utilization factor of this power, which is usually around 5 GWh/MW for river-regulated water power plants. Therefore, we propose to consider this fact when calculating production, i.e. consider additional 79 Mwe.
4. Given the high technical and economic potential of using solar energy to generate electricity in photovoltaic power plants, in particular as local sources to cover consumer own consumption (so-called prosumers), we believe that the proposed trajectory is very little ambitious. In the event that the distribution companies or SEPS do not block the connection of such sources to the systems, the potential of the installed capacity increase of at least 60 MWp per year is usable, which also includes the increase in capacity through auctions. At the same time, it is necessary to adjust the factor of production from the installed capacity GWh/MWp, because with regard to the current average capacity factor of photovoltaic at the level of 1.11 based on the share of 592 GWh/533 MW and taking into regard continuing tendency to changes in climatic conditions in the Slovak Republic in the future, 1.1 GWh/MWp should be considered, but, at the same time, the figure should be adjusted by a factor of decreased efficiency of PV modules at the proposed conservative level of 1% p.a.
5. In the case of wind energy, the production of already existing 3 MW of installed capacity, which generates app. 6 GWh of electricity a year, is not included in the first years, since 2020. At the same time, it is crucial for economic utilization of wind energy technical potential that the utilization factor is minimally 2 GWh/MW, otherwise these investments will not be implemented. However, at the same time, the currently available wind turbine technologies and their accessories can achieve a factor of 2.5 in good wind locations. We, therefore, assume an average utilization of 2.25 in the trajectory. However, due to an unknown reason, the MoE SR incorrectly assumes a lower factor. At the same time, the trajectory of planned increase in installed capacity needs to be adjusted taking into account the fact that currently there is no wind farm construction project with the necessary basic permits (e.g. connection contract). Therefore, it is not realistic to assume that potential auction for the production could be declared in 2020 (they will not be able to do it sooner taking into regard the trends in 2019); by 2022, private investors will be able to build 150 MW of wind capacity. We therefore assume a significantly more moderate increase in capacity, which, however, due to its relatively high technical potential will culminate at a higher figure, than originally assumed by the MoE SR.
6. In the case of biomass use for the production of electricity in biogas plants, it is necessary to take into account the fact that following the end of guaranteed purchase price in 2025, 2026, and 2027 there will be only estimated 20% of producers that will, considering a high operating costs caused mainly by the prices of purchased raw materials, still be profitable when producing electricity from these sources. In these years, therefore, contrary to the assumptions of the MoE SR, we expect a decrease in installed capacity and thus also production. At the same time, we stress that the capacity factor of a biogas plant currently does not reach expected level of 7.8 GWh/MW, but actually considering our real experience with the operation of BGP, it is necessary to assume a factor at the lower level 7.

V. Energy poverty: definitions, research frameworks and challenges for public policy making

Under conservative estimates, more than 50 million households in the EU have serious economic difficulties to pay their electricity bills. EU-SILC statistics show an increasing share of tenants living in households where total cost of housing is more than 40% of their disposable income. For these people, the cost of energy is a problem, they have difficulties to keep their household in adequate heat, free of moisture and yeast.

The price of energy in Slovakia is a medium-price of the EU countries. However, this data fails to show a real severity of the problem. Financial comfort can be better described by the purchasing power of the population, corresponding to disposable income, which can be spent by the population to purchase the necessary goods and services. At this point, Slovakia is already reaching more than 20%, which means that one fifth of household income must be used for housing. Much of the cost is energy. Although Slovakia shows gradual decline in the share of energy costs to total housing costs. If in 2004 employees' energy costs made 68%, in 2017 they dropped down to 58%. With pensioners, the ratio is slightly higher–in 2017 it was 65%.

In general, energy poverty can be defined as inability of a household to ensure the socially and materially necessary level of energy services in the household. Despite the question of how to accurately define and measure energy poverty remains a complicated challenge for researchers and policy makers.

The paradox of energy poverty is that people with lower income sometimes have to pay more for energy than those with higher income. This is caused by their bad quality houses with poor insulation, their inability to invest in energy-saving measures, cost-effective home appliances or more efficient lighting. For them, energy costs per square meter, volume of space or intensity of lighting in a given space, are higher.

Energy poverty issue is no new to Slovakia. Under the Act No. 250 on Regulation (of 2012), the Regulatory Office for Network Industries (RONI) is obliged to prepare the Concept of Protection of Consumers Fulfilling Energy Poverty Conditions. The Slovak Government's Statement of Policy for 2016-2020 says: "The Government will simultaneously strongly support the protection of vulnerable consumers, including tackling energy poverty."

In 2006, RONI declared that by the end of the year Slovakia will pass the Energy Poverty Act. A working group containing the representatives of the Ministry of Economy, Finance, and Labour and Regulatory Office was established. The first legislative proposal to address energy poverty was prepared. Consultation procedure regarding the proposal was completed on 3 January 2017. In total, 101 proposals for modification were received, thereof 49 were crucial. In April 2019, RONI submitted for inter-departmental consultations the *Concept of Protection of Consumers Fulfilling Energy Poverty Conditions*. The concept introduces the term energy poverty and proposes solutions, which, however,

mainly use already applied approaches such as housing benefit, detached house thermal insulation benefit, subsidies for elimination of breakdowns in residential buildings or establishing employment programs including investment incentives aimed at increasing the employment rate. It is up to a political discussion, whether this first step will be followed by the next ones.

Energy poverty has been increasingly integrated in the program of the EU institutions, and Member States consider it a serious issue of regulation and energy sector development, as well as, a factor when drafting social and environmental policies. The interdependence between the definition of energy poverty and the policy framework to prevent and mitigate energy poverty remains an open challenge in Slovakia.

ENERGY POVERTY AS A CHALLENGE

The price of energy in Slovakia is a medium-price of the EU countries. However, this data fails to show a real severity of the problem. Financial comfort can be better described by the purchasing power of the population, corresponding to disposable income, which can be spent by the population to purchase the necessary goods and services. At this point, Slovakia is already reaching more than 20%, which means that one fifth of household income must be spent on housing, just below the European Union average.

As Europe-wide data on the share of energy costs to disposable income are not available, we will use the cost of housing in proportion to total disposable income to express Slovakia's position in the pan-European area. Housing costs are one of the indicators that include energy costs and there is significant inherent correlation. They express how much of their income people have to put aside and how much they will spend on other activities–whether necessary such as food, but also for clothing, footwear, furniture, recreation or health.

Despite the fact that Slovak households spend a similar proportion of their income on housing compared to an average European household (in 2007, the SR allocated 20.6% of its disposable income for housing costs; the EU average is 21,4%), the long-term trend shows an increase in some categories of housing costs. This mainly applies to one-person households, where housing costs make up to 35% of household income. A similar situation was recorded in 2008 since when the ratio fell down to 28%. However, there has been a repeated increase since 2014 with values reaching those of 2008. Multi-member households spend by 13% less on housing and the trend is unchanged–families with at least two members must allocate 22% of their income for housing costs.

Energy makes much of housing costs–in Slovakia we see a gradual decline in the share of energy costs in total housing costs–in 2004, employees' energy costs amounted to 68% and in 2017 only 58%. For pensioners, the ratio is a bit higher–in 2004, energy costs fell from 74% to 65% in 2017. A continual decrease in the share is important. This is probably caused by a higher energy standard which is linked with increasing energy efficiency of both, movable and immovable properties–whether the house as such as, well as all electrical power household appliances.

As expected, the most burdened group are the pensioners who back in 2012 had to allocate 20% of their income to cover energy costs. Gradually, by 2017, the energy cost ratio has fallen down to 17%, despite they still remain in the group of people endangered by energy poverty. In the case of earning residents, whether employed or self-employed, electricity, gas, and fuel costs are gradually falling down to 11% and/or 9,7%.

The trend of gradual reduction of the share of energy costs also reflects in the structure of households, the number of household members. The highest spending show households with no children, in 2006

they had to spend almost 20% of their income on energy. Over the next 10 years, they dropped by 7% down to 13% in 2015. Similar decline, though not such a significant one, can also be seen with other households.

Energy poverty, like other forms of poverty and social exclusion, results from a combination of complex, interconnected institutional and structural challenges. Slovakia needs to implement security mechanisms to protect vulnerable households from energy poverty. Sufficient information and analysis interconnected to public policy framework is the basis for that. So far, integrated discussion and interpretation of the problem within the relevant scientific and political communities have been missing. The aim should be to create a systematic understanding of the problem and a subsequent political response. It is an uneasy task and basic questions must be addressed first, e.g. how to define energy poverty? how to decide which households are exposed to energy poverty? Last but not least, what political options and practical measures to solve the issue do we have available?

FROM PROBLEM DEFINITION TO ASSESSMENT OF ITS EXTENT

Energy poverty has been defined in many ways. It is sometimes described as "the inability to heat a house to an adequate (safe and comfortable) temperature due to low income and inadequate (energy inefficient) house." Then, energy poverty can be broadly defined as "the inability of a household to access to or afford energy services in a household on a socially and materially necessary level."

One of the definitions of energy poverty focuses on the percentage limit of net disposable income. People who have to spent on energy more than the limit are already under the threat of energy poverty. If such a limit were 10% (as it once was in the UK), almost all households would be affected by energy poverty in Slovakia. The worst are the households with no children, which in 2005 spent up to 20% of income on energy. However, the situation in all types of households is improving and expenditure of families with children is falling to 11%; below 14% in childless households.

Another indicator pointing at the risk of energy poverty focuses on the number of people who are unable to pay their bills. Arrears indicate a problem. At the same time, research in Central Europe shows a high payment discipline of its population where arrears are a sign of a serious state.

Based on data, it is expected that Slovakia is not a country where the population has a problem to pay their energy bills. However, this view may be distorted by the approach of Slovaks (and also of other post-communist countries) to paying energy bills and thus ensuring the security of energy availability. Empirical findings show that Slovaks pay their bills irrespective of the amount of their income and disposable funds remaining for them. Energy poverty therefore does not seem to be a problem in such a country, even though the financial situation of its population may be serious. In a country like Slovakia, this factor indicator should be given less weight.

Another monitored indicator in the EU is sufficient household heating. Slovakia is one of the countries where only a small part of the population is unable to heat their homes to a desired comfort. In 2017, 4.3% of Slovaks struggled with this problem, with the value of this indicator is gradually decreasing. The European country with the most significant problem of household heating in 2017 was Bulgaria, where 36,5% was unable to get required temperature at home. It was followed by Lithuania with almost 30%.

Another criterion pointing to the problem of energy poverty is the share of population living in unsuitable residential premises with leaking roofs, damp walls or dysfunctional windows. The index turns out to be surprisingly positive for Slovakia–after Finland, Slovakia is a country with the best

technically equipped buildings (on the other hand, neighbouring Hungary with comparable past appears worst technically equipped). At this point, comprehensiveness of data, the manner of its collection, and hence credibility of research results should be considered. By mere observing the surrounding states, but also using other socio-economic statistical data, the inaccuracy of data that misrepresent the view of Slovak situation could be stated.

Identifying the extent and structure of energy poverty is crucial for any policy, as it defines the cost of solutions. But this seemingly simple question has complex answers. The following three main methods are currently most often applied in the calculation:

- Approach examining income and expenditure of households;
- Approaches based on subjective own self-evaluation of respondents (EU-SILC);
- Quantitative and qualitative approaches based on field research and direct measurement (case studies).

At the same time, energy poverty is deeply linked to life cycle. In all European countries, the most vulnerable groups are mainly retired people, single parents, multi-members families, ethnic minorities (especially Roma in Central and Eastern Europe) or immigrants. Up to 10.3% of households with single parent and dependent children in Slovakia are unable to keep their home adequately heated (EU SILC 2014). When making estimates, we also take into consideration cultural factors.

The discussion on the definition and calculation of energy poverty is currently on-going in many European countries and it seems we are unable to reach a single approach. Each alternative, discussed, tested or taken approach has its own logic and impacts. Energy poverty is always rooted in local conditions and realities and will require a sensitive estimates and responses within the general framework of discussion on poverty and practice.

For the purpose of defining energy poverty, the 2016 RONI concept proposed the following definition of "energy poverty" as a state when an average monthly household's expenditure on electricity, gas, heating, and hot water makes a significant share of average monthly income of households.

The nature of the definition as such requires clarification, i.e. what is "a significant share of an average monthly income of a household". *The Concept of Protection of Consumers Fulfilling Energy Poverty Conditions*, submitted in April 2019, for inter-departmental consultations, defines energy poverty as "a state when individuals or households do not have sufficient funds to provide heating and other energy needed for the functioning of a household, which in the Slovak Republic represents 10.0% of a household's average energy expenditure of the total net income of a household, and, at the same time, such household qualifies for a benefit in material need."

Effort to define the problem is a positive step forward. At the same time, in view of the problems described above using various possible approaches that are applied in the world, it is clear that without a legally anchored definition and a better system of interconnection to public policy, Slovakia is only at the beginning of a system approach.

In order to ensure effective public policies and measures, the next steps should be aimed at the following 3 identified areas:

1. **Definition and monitoring of energy poverty:** The first step in identifying a true extent of the problem is to measure energy poverty based on defined and agreed indicators. These need to be

monitored to understand the trend and extent of energy poverty. For this purpose, we recommend the following steps:

- Make a more detailed analysis of the problem at local level;
- Continue discussions on adopting a measurable and generally acceptable definition of energy poverty;
- Prepare and adopt national and pan-European indicators for the monitoring of energy poverty;
- Improve data collection based on selected universal indicators to achieve results that are comparable among individual countries, monitor changes in various time periods and continuously monitor energy poverty statistics;
- Define vulnerable groups at national level.

2. **Energy efficiency measures:** Energy poverty should be included in the national energy efficiency programs. National energy poverty programs should offer implementation mechanisms specifically designed to improve energy efficiency for vulnerable consumers. The measures to address energy poverty through the adoption of energy efficiency measures should focus on:

- Low energy efficiency costs and energy saving measures (efficient indoor lighting, door and window dressings, reflecting films for radiators, thermometers, etc.);
- Exchange of household appliances ("old-for-new");
- Exchange of inefficient heating systems (if possible, use renewable energy sources);
- Various levels of additional equipment for buildings' envelope (repeated installation of renewable energy in buildings, if possible);
- With vulnerable groups, in-depth renovation of buildings should be supported and if this is not possible due to deteriorated condition of a building, substitute rental or social housing should be ensured;
- Such subsidies should be introduced that are suitable and beneficial for low energy households (e.g. substantial funding) and especially in-depth renovation of houses;
- Interest-free loans should be supported especially for the purposes of in-depth renovation;
- State social housing fund should be re-established and living conditions improved.

The lack of funds for measures to reduce energy poverty is a common problem in the CEE region. EU funds, i.e. those provided through cohesion funds should offer financial interventions specifically designed to address energy poverty. At national level, funds available through different schemes should also be considered–i.e. through the emissions trading scheme and/or obtained through the "polluter pays" systems or the solidarity fund–primarily to finance energy efficiency improvement in vulnerable households.

3. **Seeking structural solutions:** In order to improve the planning and implementation of energy poverty measures, we propose the following recommendations that define the approach applied in drafting of such measures:

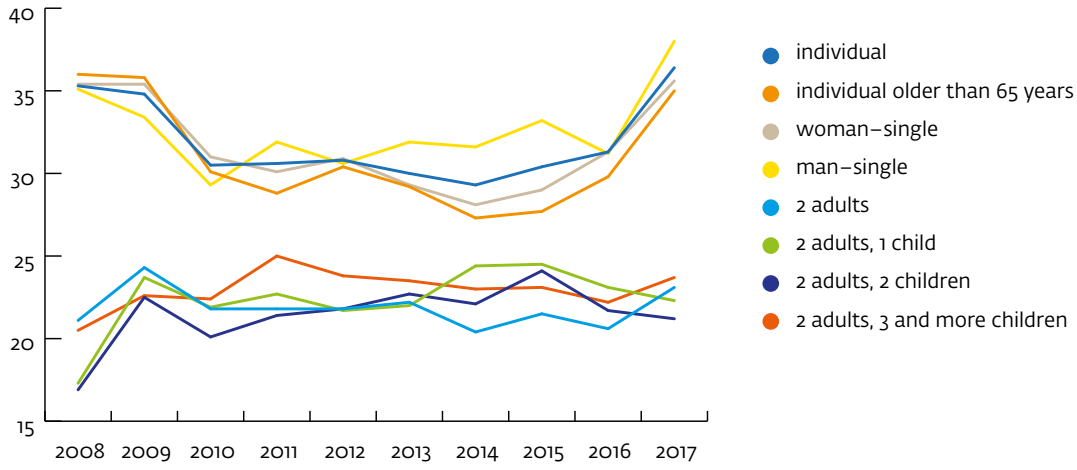
- Prepare long term strategies in addition to the short-term ones;
- Recognize the nature of a problem that is specific for particular region and engage local stakeholders in drafting strategies;
- Ensure sustainability of energy efficiency policies and measures by transferring responsibility for the problem solving from local stakeholders and non-for-profit organisations to the state administration bodies and self-governing authorities;
- Build up capacities of the state administration bodies and self-governing authorities, so that they take over their roles in addressing energy poverty issues;

- Propose, implement, and monitor energy poverty policies in a fully participative way that integrates a large range of stakeholders, with a special focus on developing links among social, energy, and environmental sector;
- Ensure monitoring and evaluation of energy poverty measures and programs;
- Support social players, public administration bodies, researchers, and scientists as well as non-for-profit organisations by providing a larger amount of funds specifically aimed at energy poverty;
- Stimulate links between social, energy, health, and environmental institutions and stakeholders and establish models for data exchange;
- Make effort to harmonize energy and social policies (social support linked to energy poverty and vice versa) and integrate energy poverty policies in a larger political framework such as employment, housing or social security policies.

Given the complexity of the problem and its rooting in social, economic, and environmental context, we are unable to design a simple solution–"a desk solution". Therefore, it is extremely important to address the problem by linking the knowledge and experience of different sectors (energy, social area, environment, housing, health, employment, and other relevant professionals).

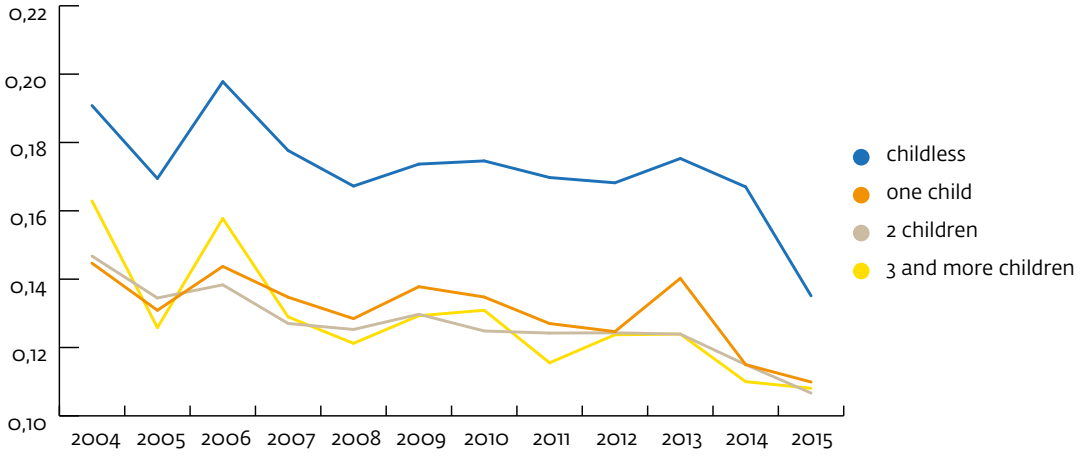
ANNEX 1: CHARTS

Chart 1. Slovakia. The share of housing costs in disposable income in %.



Source: Eurostat

Chart 2. The share of energy costs (electricity, gas, and other fuels) structured by the number of household members, in proportion to total net income of households recalculated per one member of a household.



Source: Statistical Office of the SR

VI. About the Slovak Climate Initiative

The vision of the Slovak Climate Initiative is to make political leaders in Slovakia work towards a climate-fair society which can be achieved through both, targeted reduction in greenhouse gas emissions and adoption of specific measures:

1. investing in energy efficient buildings (construction and renovation);
2. producing energy from renewable sources;
3. phasing out fossil fuels; and
4. developing a support scheme for disadvantaged groups to facilitate access to basic energies (energy poverty).

The establishing members of the Slovak Climate Initiative are: Budovy pre budúcnosť (BPB) / Buildings for the Future, Priatelia Zeme–CEPA / Friends of the Earth–CEPA, Slovenská asociácia fotovoltického priemyslu a OZE (SAPI) / The Slovak Association of Photovoltaic and Renewable Energy Industry, and Prognostický ústav SAV / The Institute for Forecasting SAS.

The members of the Slovak Climate Initiative in the long-term seek change in public policies towards energy efficiency, the use of sustainable renewable sources, climate change mitigation and adaptation, and air quality improvement.

Establishing members:

BUILDINGS FOR THE FUTURE

Priatelia Zeme CEPA

SAPI Slovak Association of Photovoltaic Industry and RES

Institute for Forecasting Slovak Academy of Sciences

A STUDY OF THE SLOVAK CLIMATE INITIATIVE ON INTEGRATED NATIONAL ENERGY AND CLIMATE PLAN OF THE SR

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May 2019

www.klimatickainiciativa.sk

Slovak
Climate
Initiative