

TERMÍN: 27.03.2022

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Recenzia A
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*Prosím nezasahujte do tejto tabuľky*RECENZENT/KA (meno a priezvisko, pozícia, inštitúcia): **Katarína Svatíková**NÁZOV MATERIÁLU: **Decarbonization of the Slovak economy by 2030: Formulation of marginal abatement cost curves**TYP VÝSTUPU*[1]: **Analýza**

(pri spoločných výstupoch uviesť aj typy individuálnych vkladov):

ANALYTICKÝ ÚTVAR, REZORT: **Ministerstvo financií SR - Útvar hodnoty za peniaze**AUTORI/KY: **Ján Mykhalchyk Hradický, Simona Šulíková, Martin Haluš, Štefan Kišš;**

SPOLUAUTORI/KY: Ministerstvo životného prostredia SR - Inštitút environmentálnej politiky - Katarína Nánásiová - 1 bod; - - ; - - ; - -

RECENZNÝ FORMÁT*[2]: **2****PRIPOMIENKY:**

P.č.	Pripomienka sa vzťahuje k (strana, odsek):	Text pripomienky*[3]	Odôvodnenie pripomienky	Vysporiadanie sa s pripomienkou*[4]
1	Executive summary	The executive summary would benefit from better clarification of some text/numbers in some places, e.g. it is not clear for the reader where the 14.2 MtCO _{2e} comes from (only after reading the paper, explaining that the authors	To improve the readability of the executive summary. The exe summary should be drafted in such a way that it is a stand-alone text. The reader should not have to go to the	Pripomienka bola akceptovaná. Rozdelenie na tri ciele je explicitne vysvetlené na začiatku manažérskeho zhrnutia. Zároveň boli v

		<p>split the analysis into three groups of levers with attached GHG reduction targets for each group of levers). The 3-target approach could be made more explicit at the beginning of the exe summary. You may also consider adding to the text the current level of GHG reduction (in 2019) compared to 1990 level (in the 3rd paragraph where you refer to the 55% target) to place the numbers into context.</p>	<p>report to understand the meaning of some sentences or numbers used.</p>	<p>manažérskom zhrnutí uskutočnené ďalšie zmeny, ktoré by mali zlepšiť čitateľnosť a porozumiteľnosť textu.</p> <p>V porovnaní s rokom 1990 je pokles emisií v období baselinu o 45 %, to sme sa nerozhodli zapracovať do textu, aby v prvom odseku nebolo priveľa čísel, čo by mohlo pôsobiť mätúco. V tomto kontexte si myslíme, že zníženie o 6,3 mil. ton emisií (čo je ekvivalent 15 % súčasných emisií) je pre čitateľa výpovednejšie.</p>
2	<p>Section 1, p.6 when referring to the EU policy context.</p>	<p>You may consider including a reference to the European Green Deal, which among others, also argues for the need of circular economy to decarbonise the EU economy by 2050. Some of your levers are circular economy measures (e.g. the use of alternative materials in the cement industry or those related to waste).</p>	<p>Currently, international policy dialogues are trying to create a better link between a low carbon and a circular economy (some governments even claim there is no carbon neutral economy without a circular economy). The Slovak Ministry of Environment is also trying to create such a narrative.</p>	<p>Pripomienka bola akceptovaná, zmienka o cirkulárnej ekonomike v kontexte FF55 bola pridaná, rovnako tak do sekcie k opatreniam pre sektor cementárni.</p>

	Throughout the report, but in particular at the beginning of section 2.	You may want to explicitly explain the concept of „marginal“ abatement cost. While the use of „marginal“ is included in the title of the paper (and in one heading), the concept of what „marginal“ abatement cost actually means and how the concept was applied within the paper are not properly explained (you refer once to „unit“ abatement costs but mostly just to abatement costs or costs).	To make the paper more precise in its use of terms and to provide a good basis and justification for the objective of the paper (i.e. to develop the MACC for Slovakia).	Pripomienka bola čiastočne akceptovaná. Bol vysvetlený význam a dôvod použitia slova “marginal” v kapitole 2 a doplnené, že pre stručnosť ďalej používame namiesto termín “abatement cost” ako synonymum “marginal abatement cost”.
4	Section 2, p. 9	Section 2 would benefit from an introduction providing an overview of the use of MACCs from the literature (e.g. the objective behind developing MACCs, the different types of MACC (e.g. expert based vs modelling based) in which context they are being used and why, how other countries/organisations have approached the methodology behind developing a MACC, how others have calculated the Y-axis for example, etc.).	This overview sub-section could be short, but it would provide justification for the development of MACC for Slovakia and provide some basis for the choices that you’ve made with respect to the methodology used. It would also show the reader that you have done your homework in reviewing what others have done and applying the lessons learned from others. You refer to some of the literature at some places, but this is not done systematically and the reader sometimes wonders why certain calculation method/assumption has been made.	Pripomienka nebola akceptovaná. Rozšíriť kapitolu 2 o diskusiu o MACC krivkách všeobecne by bolo možné, ale material je už v súčasnej podobe pomerne dlhý. Takáto diskusia zároveň nie je nutná pre pochopenie slovenskej MACC, čo je primárnym cieľom materiálu. Problémom porovnania metodológií je, že autori rôznych MACC kriviek zvyčajne neopisujú metodológiu do detailov, čo do veľkej miery znemožňuje porovnanie

				<p>našej krivky s relevantnými príkladmi zo zahraničia.</p> <p>Do textu bola aspoň doplnená referencia na text Fabiana Kesickeho, ktorý obsahuje všeobecný úvod do tém MACC kriviek.</p>
5	Section 2 p.9 first paragraph	<p>The paper includes this: „Unit abatement costs may be negative if the given lever is economically beneficial in itself and also abates GHGs.“ You may want to reconsider the use of „economically beneficial in itself“ as the meaning of this term within this context can be confusing. You could replace by something along these lines: „.... if the given lever can simultaneously save money and abate GHG emissions.“</p>	To improve the readability of the text.	Pripomienka bola akceptovaná, text bol nahradený.
6	Section 2 p. 10	<p>You may want to provide additional explanation of the approach taken to calculate the Y and X axes. E.g. it is unclear why you used NPV method to calculate the abatement (of the Y axis) and why you used a 4% discount rate. The abatement potential (x-axis) of decentralised levers (e.g. those leading to heating efficiencies, etc.), I assume</p>	To provide justification behind choices made with the aim to increase the transparency and credibility of the paper.	<p>Pripomienka bola akceptovaná, bolo doplnené vysvetlenie použitia NPV a 4% sadzby. Os X ráta odbúranie emisií iba v roku 2030, keďže emisné ciele rátajú s emisiami v danom kalendárnom roku. Táto</p>

		that these are calculated as a cumulative annual benefit during 2022-2030, is that correct?		metodológia zároveň umožňuje ukázať plný potenciál zníženia emisií decentralizovaných zdrojov. Pre jednoznačnosť bolo spresnenie doplnené do textu.
7	Sections 2 and 3, or into Box 1	You may want to clarify in the paper the timing of implementation of the different levers. E.g. in Box 1 you mention that the levers were assumed to start as soon as possible, but what does this mean? Are all measures assumed to be implemented in 2022 and throughout to 2030 (as the NPVs are calculated for the period 2022-2030)? Does this mean that the calculated abatement potential for the three targets (55%, 67% and 76%) is for this entire period (2022-2030), implying that it is a maximum abatement potential (for that specific lever and target)? Am I implying it correctly that if some levers were implemented at a later stage, this would decrease the total abatement potential for that group of levers? You may want to clarify this in a footnote or as part of the limitations of the approach.	The limitation of the MACC with regard to the timing of the levers is important to know for policy makers. The policy makers need to also understand that the total abatement potential for the three scenarios related to the three indicative targets refers to the maximum abatement potential and will depend on the timing when each lever would be implemented.	Pripomienka bola akceptovaná. Bola upresnená informácia o čase implementácií. Tento bod súvisí s pripomienkou vyššie - ak rozmýšľame o odbúraní emisií v celkových číslach v roku 2030 (a nie ako NPV), tak by to malo dávať lepší zmysel – na odbúranie emisií (t.j. os x) doba realizácie teda vplyv v našom MACC nemá.

8	Box 1 in particular but throughout the paper	(linked to the previous comment) You may want to systematically refer to the reasoning behind the approach taken and assumptions made. You include some justification/source for some of the assumptions but not for all. E.g. is a specific assumption made based on the literature or common practice in other countries, or based on stakeholder consultations, or solely based on your expert judgment?	To increase the transparency behind the approach taken, to increase the credibility and confidence of decision makers using the MACC and to increase the accuracy of the decisions made.	Pripomienka nebola akceptovaná. Na miestach kde čerpáme z externých zdrojov sú tieto uvedené. Keď zdroje nie sú uvedené, tak zdrojom je kolektív autorov, resp. expertíza ÚHP a/alebo BCG. Nanešťastie, z povahy vecí nebolo možné zverejniť zdroje všetkých predpokladov.
9	Box 1	You may want to consider including an additional limitation of MACCs: MACCs represent the abatement cost for a single point in time and hence cannot capture differences in the emission pathways of the different levers.	To clarify some parts of the text for the reader and the implications for policy makers.	Pripomienka bola akceptovaná. Kvôli dôležitosti bola zaradená priamo do textu na strane 9.
10	p.10 and also in other parts of the paper	You mention that some of the levers require gradual rather than one-off implementation, and hence the full benefits of reduced GHG from these levers would be felt only post-2030 (decentralised emitters). Have you estimated the size of the GHG abatement potential from these levers for the post-2030 period? Is the 6 MtCO _{2e} . Mentioned in section 3.3 on p.16 first	Providing an estimate of the level of potential abatement post-2030 from measures implemented pre-2030 could be quite relevant for policy makers.	Pripomienka bola akceptovaná. Hodnota 6 MtCO _{2e} v kontexte dopravy je iba zvyškovou hodnotou emisií v sektore dopravy v roku 2030 (t.j. emisie v baseline mínus zníženie emisií zo všetkých opatrení na dekarbonizáciu dopravy v

		<p>paragraph referring to the post-2030 abatement potential in the transport sector? If you already have an estimate, you may want to include it in the text.</p>		<p>MACC). Na doplnenie, pre interné potreby sme tiež modelovali dopad spomínaných opatrení v doprave až v horizonte roku 2050, pričom potenciál dekarbonizácie je v tomto horizonte omnoho výraznejší. Toto sme sa však rozhodli nezahrnúť do analýzy, keďže by si to mohlo čitateľa zmiatať, vyžadovalo by si to rozsiahlejšie vysvetľovanie a témou materiálu je horizont 2030.</p>
11	Section 3.1	<p>When discussing the approach and findings related to the iron and steel sector, you may wish to add your reflection on the likeliness of the steel industry implementing the proposed levers.</p>	<p>This may be relevant for policy makers when making a choice which lever to focus on.</p>	<p>Pripomienka bola akceptovaná. Do poznámky bol doplnený súčasný kontext, z ktorého vyplýva, že štát sa pravdepodobne bude musieť na dekarbonizácii podieľať istou mierou.</p>
12	Section 3.2 first sentence	<p>Could you please specify source behind the statement „a significant majority of emissions of these three sectors cannot</p>	<p>To clarify the text and provide more precise statements and statements supported by evidence.</p>	<p>Pripomienka bola akceptovaná, použitý bol navrhovaný zdroj.</p>

		<p>be abated without CCS, what is a result of a significant amount of process emissions (coming from chemical transformation of raw materials) that are difficult to abate.“? Could you also provide an estimate from the literature on the share of process emissions from the cement and lime production? You may consider adding a sentence (with a source) explaining that there are measures that could be taken to mitigate GHG emissions in the construction sector, including the process related emissions. The source that I am aware of includes: Material Economics (2018) The Circular Economy – A powerful force for climate mitigation, which discusses potential measures to reducing cement emissions.</p>		<p>Zvažovali sme zahrnúť aj opatrenia na znižovanie emisií v procese samotnej stavby, avšak tieto by sa nerátali do emisnej bilancie SR, a teda ani do emisných cieľov v roku 2030.</p>
13	Section 3.5	<p>You estimate that the residential and commercial sector would bring only a low GHG abatement potential (but at a negative marginal abatement cost per tCO₂e). This finding seems to undermine the policy decisions made to heavily invest into EE and RES measures in buildings over the last decade(s) with the aim to decarbonise the buildings sector. You may want consider including</p>	<p>To clarify some of the statements and choices made.</p>	<p>Pripomenka bola akceptovaná, dôvod bol vysvetlený v texte kapitoly 3.5. Dôvod tejto zdanlivej kontradikcie bol správne identifikovaný v texte pripomienky. Dodatočným dôvodom je tiež to, že na Slovensku už prebehli rozsiahle tzv. “light”</p>

		<p>a footnote addressing this issue in the paper. Personally, I was wondering why the residential and commercial sector was not included in the list of priority sectors analysed. Is the abatement in this sector so low because you assume only the period 2022-2030 rather than the entire lifetime of a building (around 50 years)? (Figure 3 would also benefit from an explanation for a layman reader of the kind of emissions that are included in the residential and commercial sector – e.g. mostly related to heating).</p>		<p>renovácie – okná, zateplenie strechy a stien. Tieto sú pomerne nízkonákladové a vyžadujú si nižšiu mieru odbornosti. V budúcnosti budú prebiehať najmä “deep” renovácie, ktoré sú finančne náročnejšie a vyžadujú si komplexné zmeny (rekonštrukcie, zmeny vo vzduchovom vedení a tepelnom systéme). Takéto opatrenia sú nateraz na Slovensku málo prítlačivé kvôli cene, čo môže čiastočne vysvetľovať nízky potenciál zníženia emisií. To sa však môže zmeniť s rastúcimi cenami energií.</p> <p>Vysvetlenie obsahu rezidenčného a komerčného sektoru bolo doplnené do grafu 3.</p>
14	Box 3	You mention that investments into RES were not considered in the analysis because the GHG emissions from the	To clarify some of the statements and choices made in the analysis.	Pripomienka bola akceptovaná. Kvôli nízkej emisnej náročnosti výroby

power and heat sector were low. But I would think that increased RES share in the Slovak energy mix would have an important impact on the decarbonisation potential of the country across some energy intensive sectors (including the iron and steel sector). Could you please reflect on this (as a response in this sheet or if you deem necessary in the paper)?

elektrickej energie na Slovensku po odstavení Novák a Vojan by náhrada elektrickej energie zo siete za elektrickú energiu plne z OZE nepriniesla výrazné zníženie emisií (v prípade projektu s najväčším dopytom po elektrine – EAF hrubé nápočty hovoria o necelých 200 ktCO₂eq).

Ešte dôležitejší je však metodologický problém – ak by sme nahradili elektrickú energiu zo siete OZE, tak aby sme mohli v MACC hovoriť o nejakom znížení emisií, zároveň by sme museli zatvoriť nejakú elektrárňu na fosílna palíva. Na Slovensku zostáva de facto už iba elektrárňu na zemný plyn Malženice, tá je však kľúčová pre vyrovnanie výkyvov siete.

Kvôli týmto praktickým a metodologickým výzvam

				sme sa rozhodli podobné opatrenie do MACC nezahrnúť, avšak súhlasíme, že v horizonte po 2030 (keď budú komerčne dostupné spôsoby skladovania elektrickej energie) toto bude veľká téma.
15	Section 4.3, p. 23 last paragraph	You mention this: „As was pointed out before, the methodology used does not fully capture the decision-making of the industries. Therefore, higher funding than required in the point emitters' sector is desirable as it gives the state leverage to motivate industries to decarbonize and increase their competitiveness. The funds in Modernization Fund come from the ETS allowances that are predominantly bought by the industrial players. Therefore, it is fair that a share of the revenues return to the industries regardless of whether their projects would be beneficial from the business perspective“. You may want to clarify more the argumentation in this paragraph, in particular the last sentence is not clear.	To clarify the text for the reader.	Pripomienka bola akceptovaná, text bol zmenený.

16	Throughout the report, but in particular when first time mentioned	The report would benefit from an addition of dates by when the coal power plants would be decommissioned (or the nuclear power plants fully operational) or the Novaky mine closed.	This will make the timing of the levers clearer for the reader and for policy makers.	Pripomienka bola akceptovaná. Pri prvých zmienkach o uzavretí elektrární a bane sú uvedené roky, rovnako tak aj v sekciách, ktoré opisujú tieto opatrenia. Nepovažujeme za potrebné pridať termín aj ku spusteniu EMO3 & EMO4, keďže v texte sú spomenuté iba raz (a raz v manažérskom zhrnutí).
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CELKOVÉ HODNOTENIE (recenzent/ka vyplní túto časť po vysporiadaní sa s pripomienkami analytickou jednotkou):

The report discusses the findings of the modelling of the first Slovak marginal abatement cost curve (MACC) for 2030. Through analysis of 58 levers, the report identifies three emission-reduction goals based on the MACC, distinguishing between levers with differing GHG abatement potentials as well as marginal abatement costs. The results of these findings can help Slovak policy makers inform their choices around prioritising interventions and investments aimed at decarbonising the Slovak economy. While the use of MACCs has its limitations (outlined within the report), the analysis in the report provides insights into the magnitude of marginal abatement costs of selected measures as well as their potential GHG abatement in 2030. Overall, the analysis is well structured and the argumentation is well developed. The used assumptions and methodology to derive the MACC for Slovakia are also clearly stated to the extent possible. The report is also suited for audiences with different levels of expertise in the topic.

[1] Výber medzi: 1. analýza (komplexný analytický materiál s návrhmi konkrétnych systémových opatrení); 2. komentár (rozsahovo menší analytický materiál venujúci sa konkrétnemu čiastkovému problému); 3. manuál (metodické usmernenie vyplývajúce z potreby zjednotenia procesov a postupov v konkrétnej oblasti).

[2] Formát 1 pre komentár/manuál (2 recenzenti bez povinného odborného workshopu); Formát 2 pre analýzu (3 recenzenti a povinný odborný workshop).

[3] Do tabuľky značiť pripomienky zásadného metodologického a obsahového charakteru (nie štylistické či gramatické opravy).

[4] Vyplní analytická jednotka: pripomienka bola akceptovaná / pripomienka nebola akceptovaná a zdôvodnenie / pripomienka bola čiastočne akceptovaná a zdôvodnenie.