Research Institute for Applied Knowledge Processing/n

Global Energy Solutions

Sustainable Climate Policy

POSSIBLE CONTRIBUTIONS TO MEET THE CLIMATE TARGETS AFTER THE JUDGEMENT OF THE GERMAN FEDERAL CONSTITUTIONAL COURT[1]

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Ulm, 28.05.2021

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INTRODUCTORY REMARKS

The German climate target by 2030 is increased from 55% reduction to 65% compared to 1990. Since 1990, 40% reduction from about 1050 million tons of CO_2 to 630 million tons of CO_2 has been achieved in the energy-related sector. This was comparatively easy compared to the 55% reduction volume by 2030 envisaged since the end of 2019 – in the first version of the climate protection law – which corresponds to further 160 million tons of reduction volume and a target of 470 million tons of CO_2.

The tightening to a 65% target by 2030, which has now been implemented in the short term, increases the required reduction volume by about another 100 million tons of CO_2 per year to the target figure of only about 370 million tons of CO_2 emissions in 2030. With the current strategies, this cannot be achieved without a massive deconstruction of the German economy and the massive restriction of people's freedoms. The following text gives indications how the additional 100 million tons of CO_2 (even 140 million tons of CO_2 are presented) can be saved along new solution paths at reasonable costs.

The central element of the proposal is a blending quota for synthetic energy carriers / fuels of 15% by 2030. This proportion of e.g. methanol gasoline to conventional gasoline is climate neutral. Chemically, the two substances are essentially identical, just as there is no difference between electricity based on fossil fuels and green electricity. The cost differences compared to today are very small. The amount of CO_2 emissions that can be saved in this way from 2030 onwards is around 60 million tons of CO_2 per year in the energy-related sector. By 2040, a steady increase in the blending quota will make it possible to achieve the majority of the reductions in CO_2 emissions of 400 million metric tons of CO_2 per year required for "climate neutrality 2045" in Germany.

These points would have to be strongly advocated for in the election campaign and included in a future government program. Time is running out for this.

GOVERNMENTAL AND NON-GOVERNMENTAL CONTRIBUTIONS TO SOLUTIONS AND A PROMISING INTERNATIONAL POLICY APPROACH

Governmental Measures

I. Transport and Heat:
Blending rates for synthetic, carbon-neutral energy carriers/fuels of 15% by 2030[3]

1. For all vehicles with combustion engines (cars, trucks)
   (additional reduction potential by 2030: 20-25 million tons of CO_2)
2. For marine diesel and aviation kerosene
   (additional reduction potential by 2030: 5 million tons of CO_2)
3. For heating oil
   (additional reduction potential by 2030: 6 million tons of CO_2)
4. For natural gas
   (additional reduction potential by 2030: 24 million tons of CO_2)

Total reduction potential in I. **60 million tons of CO_2** by 2030.

[3] CO_2 emissions per ton of fuel/heating oil on a fossil basis account for roughly 3.1 tons of CO_2, for natural gas roughly 2 kg of CO_2 per norm cubic meter (Nm^3) or 2.75 tons of CO_2 per ton of natural gas. Additionally, in I.3. and I.4. recycling of CO_2 is possible. Further key figures for I. can be found on the next page.

Background information for I.

Approach/costs:

Points I.1 - I.4 structure the energy-consuming sectors from the application side. We assume that required green energy carriers, such as methanol, methane or ammonia, are produced in the vicinity of large sunny deserts and are imported to Germany, while the further processing, e.g. of methanol to methanol gasoline or methanol kerosene, takes place locally, i.e. in Germany. This corresponds to the situation in the recently launched Haru Oni project by Siemens Energy and Porsche in the Chilean desert, which aims to produce green methanol. It is not unusual for Germany to import energy. It corresponds to the current situation and is helpful, among other things, in preventing our balance of payments surplus from increasing even further. It is obvious that such an import is of central importance under the aspects of development and development cooperation with regard to the production locations.

The main cost input for the production of green energy carriers is green electricity, which can be provided in the world's sunny deserts for a maximum of 2 cents per kWh at the transfer point for electrolysis. As the table below shows, the targeted blending rate of 15% to most fossil-based energy processes in Germany requires about 500 terawatt-hours (TWh) of green electricity per year as input. This is a factor of 2.5 times more than the new renewables (PV and wind) currently contribute to green electricity in Germany. The above-mentioned volume can be realized internationally many times over by 2030, if consumer countries such as Germany ensure plannable purchase volumes through blending quotas and thus create the conditions for international investors and financial market players to become involved. This central prerequisite is still lacking today, interested investors and available financial resources are there.

The following table provides key figures for 5 parameters:

1) Required energy quantities per considered energy carrier.

2) Input quantity of renewable energy to produce the carrier quantity in 1). For this energy, the following applies: primary energy input = useful energy input. Not considered here are the expenditures in the area of electrolysers, the contribution of the CO_2 required for the production of the energy carriers in combination with green hydrogen as well as the subsequent further processing of the energy carriers, e.g. from methanol to methanol gasoline.

3) The cost of the specified input of green electricity based on 2 cents per kWh.

4) The total area required to produce this green electricity if it is only based on photovoltaic. If combined with wind energy, there could be additional benefits depending on the location.

5) the amount of CO2 saved per year in millions of tons.

The production of methanol derivatives, such as methanol gasoline, requires an input of about 2.65 tons of methanol per ton. For production, a total of about 0.5 metric tons of green hydrogen is required per metric ton of methanol-gasoline. Its production requires about 25,000 kWh of

green electricity. Synthetic gas (CH4) also requires about 0.5 metric tons of green hydrogen per metric ton of synthetic gas. One ton of this gas corresponds to about 1,390 standard cubic meters (Nm^3).

Based on our analyses, we expect methanol gasoline (including all current taxes) to cost less than 2 € per liter. If the climate neutrality of this gasoline is recognized by political-regulatory means, the climate levy for this proportion will no longer apply as part of a blending quota. Since fossil-based gasoline will be 20 cents or more per liter more expensive than today over the next few years due to the increasingly growing climate levy, the price difference between fossil-based gasoline and methanol gasoline will largely level out. At a 15% blend, the impact of methanol gasoline on the final gasoline price is insignificant. For the customer, the situation does not change compared to the foreseeable price path in the future. In this respect, no separate social compensation needs to be organized.

Tabular compilation of key data for I:

Field of application	Quantity of energy carriers per year for 15 % blending quota	Input quantity of renewable energy	Total cost of renewable energy based on methanol equivalents[4]	Area of PV at favorable locations in North Africa	Amount of CO_2 saved per year
1. Car/Truck (gasoline, diesel)	7,5 million t [5]	190 TWh [6]	3,7 bn. €	34x34 km²	24 million t
2. Aircrafts/Ships (kerosene/marine diesel)	1,6 million t	40 TWh	0,8 bn. €	16x16 km²	5 million t
3. Heat (heating oil)	2 million t	50 TWh	1,0 bn. €	18x18 km²	6 million t
4. Hear/Industry (natural gas (CH_4))	12 bn. Nm³	215 TWh	4,3 bn. €	37x37 km²	24 million t
Total Methanol derivatives	11,1 million. t [7]	495 TWh	9,9 bn. €	56x56 km²	59 million t
Natural gas	12 bn. Nm³ [8]				

[4] Based on 2 Euro Cents per kWh green electricity
[5] t means ton
[6] TWh means terawatt-hour
[7] Corresponds to roughly 29 million tons of methanol as basis
[8] Nm³ means normal cubic meter

II. Stronger cooperation with our European neighbors and their activities on the topic

5. Acceptance of climate neutrality of electricity from nuclear power plants
   (e. g. for the production of green hydrogen)
   (additional reduction potential until 2030: 5 million tons of CO_2)
6. Use of CCS (e.g. injection of CO_2 in already exploited gas depots)
   (additional reduction potential until 2030: 5 million tons CO_2)
7. Acceptance of CCU, i. e. recycling of CO_2, e. g. in steel, cement, and many other industrial and energy applications.
   (additional reduction potential by 2030: 10 million tons of CO_2).

Total reduction potential in II. of **20 million tons of CO_2** by 2030.

III. Broad participation of German politics in international climate protection projects[9]

8. **Rainforest Immediate Action Program** by the German government a spart of a commitment in the area of nature-based solutions

   (additional reduction potential from 2030 per year: 10 million tons of CO_2; costs (estimated) 500 million euros per year)

9. State-financed CO_2 compensation (without rainforest activities) with crediting to the German emissions volume

   (additional reduction potential from 2030 per year: 50 million tons CO_2)

   Reduction potential III.8 and III.9 total 60 million tons of CO2 by 2030.

Total reduction potential of III.8 and III.9 of **60 million tons of CO_2** by 2030.

Total reduction potential

The total reduction potential of all governmental measures (I.1 - III.9) amounts to

140 million tons of CO_2

by 2030.

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[9] The topic should also be included in the negotiations in Glasgow on international cooperation in the field of climate protection and incorporated in the climate agreement (Article 6). The focus should be on nature-based solutions to generate negative emissions. This would enable the simultaneous promotion of many SDGs, especially also in the areas of nutrition, biodiversity, jobs, education and human development. In any case, it is important that Germany makes corresponding international contributions. After all, the real problems in the climate sector are international by nature. They can only be tackled through international cooperation.

Government support for complementary non-governmental measures

In addition to the described governmental measures, there should be targeted governmental support for non-governmental measures aimed at offsetting CO2 in the areas of individual mobility and heating/cooling at the end of CO2 recycling chains.

CO_2-Compensation

Promotion of CO_2 compensation measures of **non-state actors** (in the logic of the Development and Climate Alliance).

Additional reduction potential from 2030 onwards in addition to the 140 million tons from government measures: **50 million tons of CO_2** per year.

The volumes listed here for voluntary compensation measures by non-state actors compensate for any CO_2 emissions that may still occur in the proposals (I.1 - I.4) depending on the design of technical solutions at the end of CO_2 recycling chains.

A promising international policy approach

A central new proposal for the COP26 in Glasgow

(possibly also already in preparation for the G7 Summit in June 2021).

A cap-and-trade system as a "club approach" of interested states based on their existing NDCs. The total cap per year is the sum of the remaining CO2 budgets of the club members when fulfilling their NDCs. The distribution of the total cap thus formed is done along the remaining CO2 budgets of the members. The "trading" made possible by this approach is attractive for all partners. Partners from developing and emerging countries could additionally be promised a climate financial compensation. One possible instrument is a special type of certificate for financing conditional NDCs by non-state actors, e. g. financed by companies from industrialized countries that want to become climate neutral or climate positive.

It is important to complement this cap-and-trade system with a program in the area of Natu-re-based Solutions, which significantly increases the volume of tradable certificates for club members by generating negative emissions. Here, the issuance of the certificates would finance the Nature-based Solutions program. This club program would be highly attractive for all members. Certain developing and emerging countries would receive a lot of money this way. For all participants, the more Nature-based Solutions certificates are generated, the higher the annual CO2 volumes that are still permissible. It is to be expected that over time more and more countries will want to join the club. This would open the way from the Paris Agreement to a global cap-and-trade system and would represent a decisive step towards overcoming the challenges in the climate realm.