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Error for the calculation of the greenhouse gas intensity of electricity used in transport in FQD and proposed new RED2

in "Directive (EU)2015/652 laying down calculation methods […] Directive 98/70/EC […] relating to the quality of petrol and diesel fuels"

Introduction

We would like to point out that an error in the calculation of the greenhouse gas intensity of electricity in the Fuel Quality Directive (FQD) and in the amended Renewable Energy Directive (RED2) will cause a deviation between administrative GHG-emission reductions and real emissions.

With currently still small supplies of electricity to the transport sector it does not yet make a big difference, but with the anticipated growth of electric mobility this will lead to higher real emissions than European member states will have reported following the rules for calculation set out in FQD and RED.

These errors need to be corrected, as proposed in this memo.

Errors in the proposed amendment of Fuel Quality Directive (FQD)

1. According to the Fuel Quality Directive a fuel supplier has to lower the supplier's greenhouse gas intensity of all fuels and energy supplied to transport by 6%, compared to the fuel baseline standard for 2020, mentioned in Directive (EU) 2015/652, Annex II (b): 94,1 gCO_2eq/MJ.
2. The formula to determine the supplier's GHG intensity is described in Annex I, Part 1, point 3 of the Directive.

$$\text{A supplier's greenhouse gas intensity}_{(\#)} = \frac{\sum_x (GHHi_x \times AF \times MJ_x) - UER}{\sum_x MJ_x}$$

3. In the above formula the Adjustment Factor AF should be deleted, as will be argued below.
4. In this formula the emission intensity from electricity provided in mobility is to be multiplied with an Adjustment Factor AF of 0.4, following the argument of higher efficiency of battery electricity powertrains.
5. But, efficiency impacts the AMOUNT of energy and does not influence INTENSITY.
   Battery electric vehicle require LESS energy per km compared to internal combustion engine vehicles, regardless of the GHG intensity of that energy. With an Adjustment Factor in the numerator the formula is wrongly impacting the intensity figure, while the character of the energy has not changed.
   (Where internal combustion engine vehicles require 2 MJ for 1 km driven, battery electric drivetrain vehicles only use 2*0,4= 0,8 MJ per km.)

6. The inclusion of the adjustment factor in this formule is a methodological mistake and should be deleted.
7. The formula calculates the GHG intensity of energy per unit of energy supplied.
8. The efficiency factor of electric vehicles over combustion engine vehicles results in a reduced AMOUNT of energy needed for a given number of kilometers driven.
9. The efficiency factor does not impact that character of the energy used.
10. By including the efficiency factor in the above formula, a double counting of the efficiency factor takes place.
11. Let's give an example to show how wrong the formula works out:
12. To keep the example simple no UERs are applied
13. Supplier A provided 250 MJ fossil diesel to a fleet of vehicles.
    The GHG intensity of diesel is 95,1 gCO_2eq/MJ.
    So, the **total CO_{2eq}-emission** from this supplier is:
    250 * 95,1 gCO_2eq = 23,775 gCO_{2eq} = **23.78 kg CO_2eq**.
    The supplier's GHG intensity is, according to the formula:
    (250*95,1)/250 = 95,1 gCO_2eq/MJ
14. Supplier B provides 100 MJ electricity to a similar fleet of (now electric) vehicles.
    This fleet can drive the same kilometres as the diesel vehicles in the case of supplier A, with less energy input, due to efficiency.
    Directive (EU)2015/652 describes how to determine the GHG-intensity of the electricity used in a country, via Part 2, point 6, and is often a country's average number.
    Now, lets use in this case the average GHG-intensity of NL in 2020:
    328,4 gCO_2eq/kWh (EEA-data).
    This equals 91,2 gCO_2eq/MJ.
    The total CO_2eq-emission from Supplier B is:
    100*91,2 gCO_2eq – 9,120 gCO_2eq = **9,12 kg CO_2eq**.
    This amount of CO2eq-emission is significantly lower (-62%) than that of supplier A, demonstrating the benefit of electric mobility.
    The supplier's GHG-intensity, using the formula with the adjustment factor according to the Directive now becomes:
    (100*91,2***0,4**)/100 = 36,5 gCO_2eq/MJ.
    This is a wrong number, as the country's electricity intensity is 91,2 gCO_2eq/MJ as stated earlier, and has not changed.
    The GHG intensity of the electricity used was and is 91,2 gCO_2eq/MJ, and cannot suddenly become 36,5 gCO_2eq/MJ, just like that!
    If this number is used to calculate the total CO_2eq-emission it would become 3,65 kg CO_2eq, which is not in line with the actual emissions, which are already much lower than in the case of Supplier A.

To conclude:

15. The GHG-intensity of electricity can not change due to the efficiency of the electric vehicle.
    It only depends on a country's electricity production profile.
16. As a result, the Adjustment Factor should not be used when calculating the supplier's GHG intensity (and the resulting EU Member States GHG intensity)
17. If this formula remains unchanged, the reported EU's CO_2eq-intensity figures in transport deviate from reality.
18. In the current situation, with low shares of electricity in road transport, the impact of this error is still small, but the error will increase exponentially with higher shares of electricity deployment.

Errors in the proposed amendment of Renewable Energy Directive (RED2)

1. Another important issue to consider:
2. In the amended RED 2 proposal, published under the 'Fit for 55' package two errors are in the approach to determine the CO_2eq-intensity gains of electricity

in mobility.
These errors need to be corrected, as proposed below.

3. First, for the determination of the CO_2eq-intensity gains a life-cycle approach is used for fuels and the fuel baseline standard value.
   This means from well-to-wheel.
4. But, for electricity the tank-to-wheel methodology is used, which sets electricity at 0 gCO_2eq/MJ, with the argument that electricity is the preferred option.
   This is methodologically incorrect.
5. The methodology for the GHG intensity of electricity as set out in Directive (EU)2015/652, Part 2, point 6, is adequate and should be continued in the amended RED2 proposals.
   While EU Member States take effort to increase the share of renewable energy in electricity generation, the GHG intensity will decrease accordingly.
6. The proposal for the amended RED2 proposes a fossil fuel baseline standard when electricity is used in transport and refers to the following values:
   183 gCO_2eq/MJ [1].
   This value is taken from the current Renewable Energy Directive (EU) 2018/2001. The Directive sets a fossil fuel baseline standard to compare the CO_2eq-intensity gain when sustainable bioliquid is used to produce electricity.
7. The point we make here is that electricity in transport avoids liquid fuels like petrol and gasoline. Therefore, the CO_2eq-intensity gain of electricity should refer to the transport fuel baseline standard of 94,1 gCO_2eq/MJ, as stated in Directive (EU)2015/652.
8. Moreover, it is unclear to us why the proposals for the RED2 amendment has taken the value of 183 gCO_2eq/MJ as a reference.
9. Anyway, taking this value for fossil electricity as a reference would lead to an overestimation of the GHG reduction impact.

To conclude:

10. The climate gains of using electricity in transport lies in the lower total AMOUNT of energy, due to the better energy efficiency, over liquid fuels.
11. The efficiency factor should not be incorporated in GHG intensity calculations.
12. The GHG intensity of energy carriers and fuels should be based on a well-to-wheels basis.
13. The GHG intensity of electricity used in mobility should be based on a Member State's average intensity value and not assume electricity as being 0 gCO_2eq/MJ.
14. The fuel baseline standard for energy used in electricity should be in all cases the value 94,1 gCO_2eq/MJ, as mentioned in Directive (EU)2015/652, or an equivalent updated number.

[1] This value equals 658,8 gCO_2eq/kWh, a number that must reflect the GHG intensity of coal and natural gas used for electricity production in EU at a given year. It remains unknown which reference year was used for this. To compare: the highest GHG intensity figure in 30 years for EU28 was 524 gCO_2eq/kWh, or 145,6 gCO_2eq/MJ, in 1990.