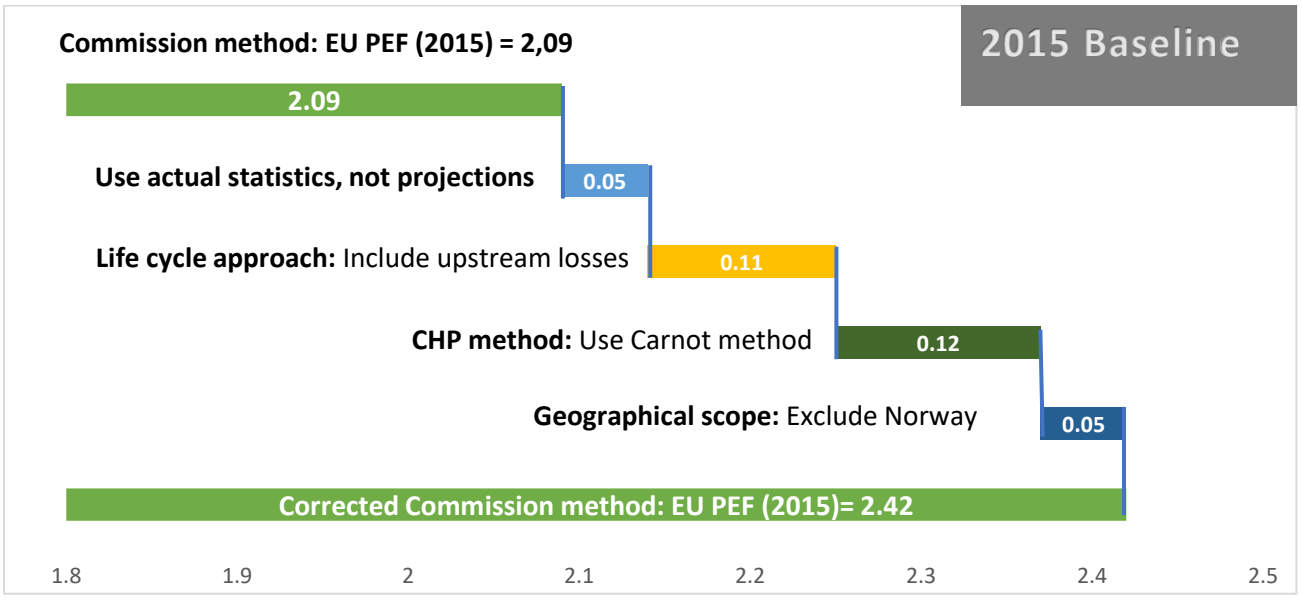
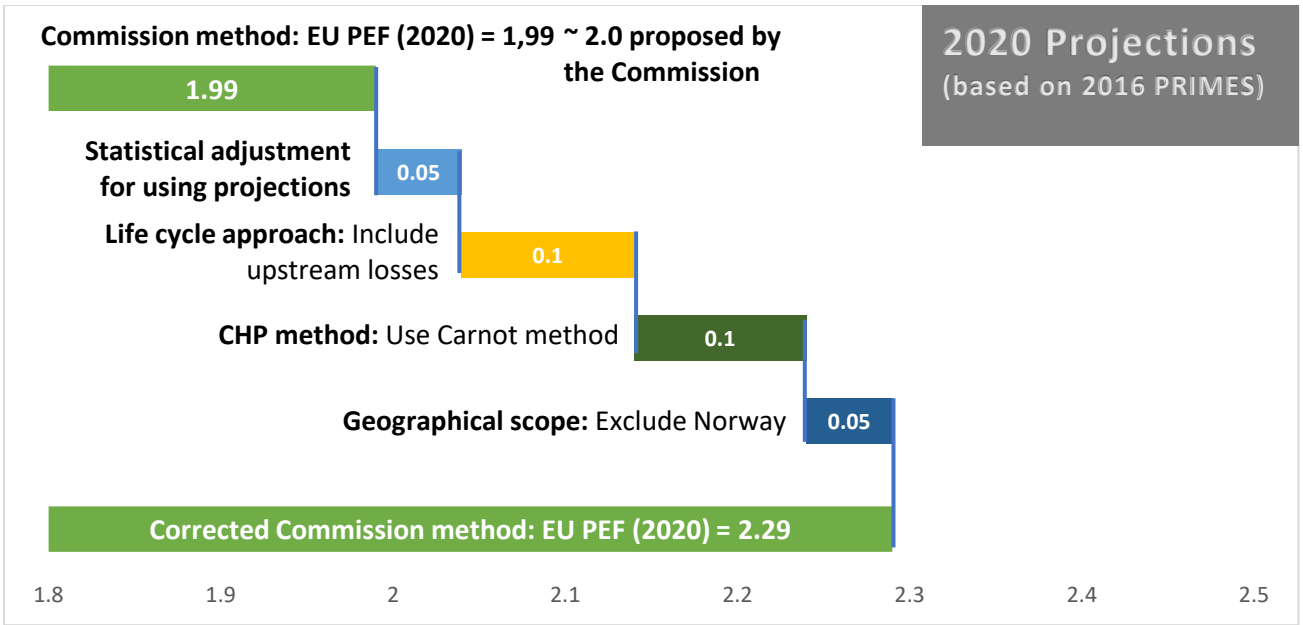
EU primary energy factor for electricity – Getting the methodology right

27 March 2018

The EU Primary Energy Factor for Electricity (EU PEF) value of 2.0, proposed by the European Commission in the 2016 review of the Energy Efficiency Directive (EED), reflects several inaccurate methodology choices, disregarding recognised standards and undermining the ultimate objectives of the EED to deliver energy savings across the entire energy value chain.

Below are showed the impacts on the proposed EU PEF when improving the Commission's methodology:





While recognising that methodologies to calculate the EU PEF may differ, corrections performed for key assumptions in the European Commission methodology reveal that **2.3 is a more appropriate value for the average annual EU PEF in the EED** than the 2.0 proposed by the European Commission.

Outside the EED, i.e. for legislation related to buildings and space heating, an adapted approach and a dedicated impact assessment will be needed to determine the appropriate PEF, in order to account for the seasonality of heat and the marginal impact of additional electric heating in the energy system.

Corrected Commission assumptions leading to a revised EU PEF in EED from 2.0 to 2.3

- **Using statistics will always be more accurate than projections (2.0 corrected upwards by 0.05 or more)**: to calculate the PEF, the Commission chose to use the 2016 PRIMES projections for 2020, instead of the latest statistics. Using the latest statistics accompanied with a regular update of the EU PEF will better reflect the actual energy mix. Correcting for the gap between projections and statistics would account for at least an additional 0.05 in the EU PEF.

- **Including upstream energy losses (2.0 corrected upwards by 0.10 or more)**: Upstream energy losses (before the point of generation) should be included for a more accurate assessment of the whole energy system efficiency. This will allow for more exact choices by policy-makers, consumers and better planning for energy savings. The Commission excluded from its final analysis upstream losses (e.g. approx. 10% for fossil energy sources and approx. 15% for biomass sources), despite established European standards documenting these losses[1] and despite the fact that these losses were included in the analysis done by the consortium appointed by the Commission to assess and propose a revised EU PEF in EED[2]. The application of the upstream chain also ensures that there is a fair differentiation between fossil fuel energy sources (PEF of 1.1 upstream) and non-combustible RES, e.g. PV, hydropower, wind, normally associated with no losses (i.e. PEF of 1.0)

- **Using the recognised Carnot method to account for cogeneration in the mix** (**2.0 corrected upwards by 0.10 or more)**: The allocation of energy savings from cogeneration must fairly account for the efficiency gains from the electricity produced by cogeneration. The Commission chose the Finish method, against experts' advice, which over-allocates energy savings delivered by cogeneration installations to the electricity output compared to the heat output. Also, the Finish method cannot be correctly applied to the different cogeneration technologies included in the Eurostat data. Because it ensures better allocation of efficiency gains from the use of cogeneration, the Carnot method benefits from wide industry recognition and is legally backed by Annex 6 of the Renewable Energy Directive recast.

- **Clarifying the geographical scope (2.0 corrected upwards by 0.05)**: Additional resources were allocated to include Norway in the EU PEF calculation, as Norway is not normally included in the PRIMES projections and an extra database was required. This choice seems arbitrary at best, given that EU countries engage in cross border electricity trade with several non-EU countries. In addition, in Norway 97% of the electricity mix is based on hydro-power (equivalent to a PEF of 1.0), so this country should be treated as an outlier. Otherwise all non-EU countries connected to the European Continental Synchronous Area (e.g. Serbia) should also be included for consistency reasons.

In addition to the above corrections resulting in a EU PEF of 2.3 in the EED, when carrying out comparison among heating technologies a seasonal marginal PEF is more appropriate instead of the annual average PEF in the EED.

- **Seasonal instead of annual PEF (2.3 corrected upwards)**: The electricity supplied for electric heaters coincides with the winter peak demand (heat consumption is at least 2 times higher than average electricity consumption) and thus a seasonal PEF is more appropriate for space heaters.

- **Marginal instead of average PEF (2.3 corrected upwards)**: When switching to electricity-based heating, the additional electricity demand will not be covered by renewable energies and base load power plants, but mainly by (marginal) less efficient and more polluting peak load plants (mostly gas and oil turbines), which will adjust their power generation accordingly. Therefore, the marginal PEF is more appropriate for space heaters to reflect the use of a less efficient energy mix.

[1] ISO 52000-1 on the calculation of the energy performance of buildings, CEN mandate M/480 implementing EPBD

[2] Consortium Led by Fraunhofer ISI. See Discussion paper for the REVIEW OF THE DEFAULT PRIMARY ENERGY FACTOR (PEF) REFLECTING THE ESTIMATED AVERAGE EU GENERATION EFFICIENCY REFERRED TO IN ANNEX IV OF DIRECTIVE 2012/27/EU AND POSSIBLE EXTENSION OF THE APPROACH TO OTHER ENERGY CARRIERS, 19/05/2016