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You Cannot Make Fuel Out of CO_2

– Correct Taxonomy for Hydrogen and CCU Is Essential –

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There is something worrying in some government committee and council discussions on who should get credit for the CO_2 emissions reduction effect of e-gas/fuel: a view is emerging that the effect should be split between CO_2 capturers (providers) and e-gas/fuel users. This view focuses excessively on the behavior of CO_2 and loses sight of the truth about e-gas/fuel.

The mechanism of e-gas/fuel has two components: hydrogen use and CCU. However, CCU contributes nothing to reducing CO_2 emissions since the CO_2 is merely captured, used, and re-emitted; hydrogen accounts for 100% of the contribution. Put differently, because CCU has 0% contribution and is therefore neutral, CO_2 from any source can be used. According to this mechanism, "e-gas/fuel = hydrogen" and "e-gas/fuel ∉ CCU." Frequently used expressions in Japan such as "create fuel from CO_2" and "carbon recycling fuel" by categorizing e-gas/fuel as CCU may give a misleading impression that CCU actually reduces CO_2 emissions. In other countries, e-gas/fuel is referred to as hydrogen derivatives or hydrogen-based (derived) fuels, which correctly indicate that 100% of the CO_2 emissions reduction effect of e-gas/fuel comes from hydrogen. Hydrogen is itself a fuel, but fuel cannot be made from CO_2 alone. The significance of e-gas/fuel is that it enables hydrogen to be transported and used in an economically rational way without turning existing infrastructure into stranded assets. It absolutely does not mean capturing and using CO_2. E-gas/fuel is a hydrogen carrier, and is merely a workaround until the direct use of hydrogen becomes possible. Thus, we must not make e-gas/fuel an objective in itself.

According to this mechanism of e-gas/fuel, the CO_2 emissions reduction effect should be attributed entirely to users of e-gas/fuel, in other words, hydrogen. Attributing part of the reduction effect to CO_2 capturers would cause serious institutional problems. First, attributing some of the reduction effect to CO_2 capturers that actually have no effect would incentivize the continued use of fossil fuels to produce CO_2 as feed for e-gas/fuel production, hampering efforts to reduce CO_2 emissions. In other words, it would cause a locking-in of fossil fuels and impede decarbonization. Next, if a producer country of imported e-gas/fuel demands credit for part of the reduction effect on the ground that the

CO_2 capture and use processes take place in their country, it would erode the benefit of using imported e-gas/fuel in Japan and push up its real cost. This in turn could undermine the premise that using existing infrastructure for importing fossil fuel has an economic advantage over building new infrastructure for importing hydrogen, and may make imported hydrogen and e-gas/fuel from domestic renewables more economically rational in comparison.

Thus, attributing part of the CO_2 emissions reduction effect to CCU that clearly has no such effect would cause serious issues.

What kind of CCU actually has a CO_2 emissions reduction effect? It is chemical products such as polycarbonate and urethane that do not require hydrogen, can be made purely from CO_2, and can cut fossil fuel consumption. Methanol and many other chemical products require both hydrogen and CO_2 and thus, their CO_2 emissions reduction effect will need to be credited to both. However, in the case of methanol, which can also serve as a fuel, how to allocate the reduction effect may differ depending on the purpose of use. Mineralization by carbonates is in a similar category to CO_2 sequestration, in other words CCS, but it involves substances such as calcium and magnesium, as well as CO_2, and therefore the effect must be allocated to both, as with the case of chemical products.

To promote the use of hydrogen and CCU in a rational manner, it is essential, before designing the institutional system, to ensure correct categorization based on the mechanism of the CO_2 emissions reduction effect.

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