LET'S TACKLE CLIMATE CHANGE WITH ZERO-CARBON HYDROGEN

By Prof. Masakazu Toyoda,
CEO & Chairman, Institute of Energy Economics (IEEJ)

To address climate change the world must decarbonise most of its energy mix by the end of this century. While some say, *'Stop using fossil fuels as soon as possible,'* there are aside from energy conservation only two kinds of zero-carbon energy currently available; renewables and nuclear. The question is whether there is enough zero-carbon energy to support the world's economic growth. Although it seems that renewable energy is abundant and everywhere, it is not quite so. Our reliance on renewable energy depends mainly on weather conditions and on geographical features, such as flat and solid land, of the respective countries and regions. Nuclear energy on the other hand faces the serious challenge of public acceptance. The answer is to develop another abundant form of zero-carbon energy and hydrogen is the answer.

Hydrogen offers unique features. First, it can be produced from a variety of energy sources; from fossil fuels (gas, oil or coal) through Carbon Capture and Storage (CCS), from renewable energy through electrolysis and even from nuclear energy through high temperature gasification reactors. Second, it is versatile and can be used for various purposes such as transportation, power generation, heating and industrial use. Third, it has the advantage that it can be easily transported either as ammonia, as liquefied hydrogen or as a mixture with a solvent.

In the broad context of climate change, zero-carbon hydrogen meets at least three important roles.

Firstly, hydrogen can reduce GHG emission in a pragmatic manner. It can be produced from fossil fuels, which currently account for over 70 percent of the world's primary energy supply. As such it is a practical approach because fossil fuels are plentiful. Hydrogen can also be produced through electrolysis from surplus renewable energy, making intermittent renewable energy self-sufficient, without the use of fossil fuel fired plant to cover for shortages or batteries for storage.

Secondly, if hydrogen is derived from fossil fuels it would mean that fossil fuel producing countries could continue to produce. A considerable number of countries, including many in the Middle East, depend on revenues from the export of fossil fuels to support their economic growth. During the energy transition to a net zero-carbon society, demand for fossil fuels will eventually peak, prices will dwindle down and producing countries will lose revenues from those exportable products. That would devastate the fossil fuel dependent economies. This is clearly not a desirable outcome for the fossil fuel producing countries, nor is it for the fossil fuel importing countries, such as those in Asia, whose current growth depends on a steady supply and availability of fossil fuels. If social instability causes supply disruptions it would lead to unnecessary jumps in price, especially for oil, and would prevent importing countries from accessing fossil fuels at affordable prices. Both exporting and importing economies would be seriously damaged. The energy transition will not be realised overnight but will be subject to a long process lasting many years. For example, according to an IEEJ analysis, oil demand could peak soon after 2030 and the price of oil may fall substantially under the assumptions that zero emission vehicles, such as EV and FCV, represent 30 per cent of new car sales in 2030 and 100 per cent in 2050. However, assuming that other current policies continue, the oil demand in 2050 would be almost as large as the present level in 2050 even when it starts declining early 2030s.

Thirdly, zero-carbon hydrogen will help many Asian countries continue to use fossil fuel (particularly coal) fired plants in a more eco- friendly manner. This is because coal can be mixed and co-burn with zero-carbon ammonia or hydrogen and therefore reduce GHG emission substantially. This is good news from the viewpoint of energy security and affordability for the many Asian countries endowed with endogenous coal.

Why are we not using hydrogen then? Are there any challenges left for us to solve? Yes, the challenges are costs, costs and costs! The technologies for producing zero-carbon hydrogen from fossil fuels or renewable energy are well known and established. It is the CCS technology that is not yet affordable, the electrolytic apparatus is rather high-priced and transportation still requires fine-tuning.

What can we do? We need an international collaboration for R&D activities and must create demand through standardisation and regulatory harmonisation in order to reduce costs by 60 per cent or 80 per cent. METI Minister, Mr. Seko, hosted the first Hydrogen Ministerial Conference last October in Japan and is planning to host a second one this September. The Hydrogen Council was established in early 2018 with about 13 (private sector) CEOs and is now growing as an Alliance with more than 60 CEOs. In brief, we need more international collaboration for opportunities to grow.

Let's not miss this one-in-a-million chance to address climate change! ■