

# *Japanese energy saving and CO2 emission reduction potentials in 2030 in household sector*

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## **Overview**

Japan has submitted Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) in July 2015 as its commitment to contribute to the reduction of greenhouse gas (GHG) emissions to keep global temperature rise to 2 degree Celsius (MOFA 2015). At the INDC, Japan set up 26% reduction target by 2030 compared to 2013 (18% reduction from 1990 level). According to the INDC, the energy mix in 2030 is 22-24% from renewable energy, 20-22% from nuclear and 56% from fossil fuel power generation. It means fossil fuel still has huge proportion accounting for 77% in the total primary energy supply, and 13-14% from renewable energy and 11-10% from nuclear. Compared to the emission reduction target announced in 2010 (25% reduction from 1990 level in 2020) and the discussions held under the Energy and Environment Council after the Fukushima nuclear accidents from 2011 to 2012, it results in a huge setback from the ambitious target.

This paper aims to assess whether Japan can reduce CO2 emissions more than the level the INDC indicates. Although there are various ways to assess CO2 emission reduction potentials in sectors and in both supply and demand side, this paper focuses on electricity demand in household sector and assesses how much energy can be reduced with efforts made in a household and how much the reduction of energy use can contribute to CO2 emission reductions. This paper consists of seven sections. Section two examines CO2 emission and energy consumptions in household sector in 2030 described in the INDC. Section three describes the methodologies and data used in this paper. Measures, which are enhanced after the Fukushima nuclear accident in 2011, to reduce electricity use is described in section four. Section five conducts scenario analysis up to 2030 to identify the reduction potentials by applying different countermeasures. Then, section six examines CO2 emission potentials in household sector in 2030 by applying four CO2 emission scenarios. The base year of the analysis is set as 2013 using the same base year with the INDC. The conclusion comes in the last section to discuss the findings from the analysis and the potentials of reduction of electricity use and CO2 emissions in 2030.

## **Methods**

Based on the analysis of the electricity and CO2 emission reductions required in household sector in 2030 under the INDC, this paper conducts literature review and data analysis. In order to forecast electricity use and CO2 emissions in household sector in 2030, scenario analysis is conducted using time-series regression models.

## **Results**

The result indicates that electricity use in household sector in 2030 expects to be increased by 1.84 TWh compared to 2013 at the BAU scenario. On the other hand, under the INDC, Japan reduces electricity consumptions to 21.59 TWh from 2013. The result of the scenario analysis indicates that only the highest reduction scenario can achieve the target with 26.75 TWh reductions of electricity use from 2013 in 2030. As of CO2 emissions, in order for Japan to meet the INDC target or to reduce CO2 emission from electricity more than the INDC indicates, at least 54 MtCO2 of CO2 emissions from 2013 is needed. However, the result shows that none of the scenarios cannot achieve the target.

## **Conclusions**

The comparison of scenario analysis indicates that in order for Japan to reduce electricity consumptions in households and achieve the target set up by the INDC or to reduce electricity use more than the INDC, energy saving efforts by a household and policies such as electricity market reform are needed. On the one hand, the impacts

generated by deregulation of electricity market cannot anticipate whether it can promote the reduction of electricity use or not. On the other hand, if the deregulation of electricity market is designed to make households to find the necessity or benefits or urge them to reduce electricity use, this event could create a shock to promote additional energy saving efforts in Japan. From the finding, it is clear that in order to achieve the target described in the INDC, further reduction of electricity use and additional improvement of CO<sub>2</sub> coefficient from electricity generation by improving energy mix such as increasing percentages of renewable energy and reducing share of fossil fuels is required.

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