

# 100% Renewable Energy Scenario 2050 for Japan

JUST (Japan's Union of the Concerned Scientists on Energy Mix and Climate Target),  
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JUST studied **100% Renewable Energy Scenario 2050** and calculated the possible greenhouse gas emission reductions amount under the scenario, based on the latest surveys on energy efficiency improvement and domestic renewable energy sources in Japan. The results are as follows,

## 1. Change of social and economic activity toward 2050

The largest change that shall happen is **“Population Decrease”**. In 2017, National Institute of Population and Social Security Research showed that the population forecast for 2050 will be 101,920 thousands from 127,090 thousands in 2015. This is 19.8% decrease during 35 years. The annual growth rate of GDP is 1% from 2010 to 2015, but the end use energy demand decreased at the rate of minus 1.6% annually. The energy demand and economy already decoupled. We assumed this trend will continue.

The level of social and economic activity will decrease along with the population change. And we assumed it will affect the end use energy demand. Furthermore, we assumed the paper consumption will decrease by penetration of electronic communication devices, the recycle ratio of steel will increase from 30% today to 60% in 2050, RE100% will demolish the oil refining and transport of fossil fuels, and the production and possession of car will decrease by car sharing systems with driverless vehicles

## 2. Improvement of energy Efficiency

Energy efficient devices such as LED, inverter controlled motors and heat pump will be widely used. We assumed the energy efficiency in industry sector will be improved by 20% to 2050. All of the passenger cars will be EV, and trucks will be EV and FCV by half and half. Buildings will be highly insulated and be equipped with PV on the roof and wall. Many of ZEH (Zero energy house) and ZEB (Zero Energy building) will be built and they will reduce energy demand drastically. We estimated the end use energy demand will be 4,442PJ (45.9% of 2015 level 11,853PJ) by combination of efficiency improvement and activity change as shown in Fig.1.

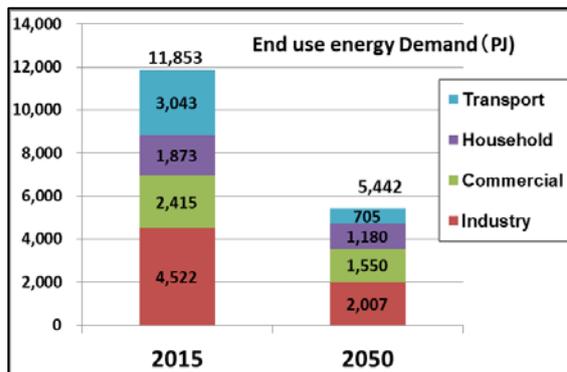


Fig.1 End use energy demand

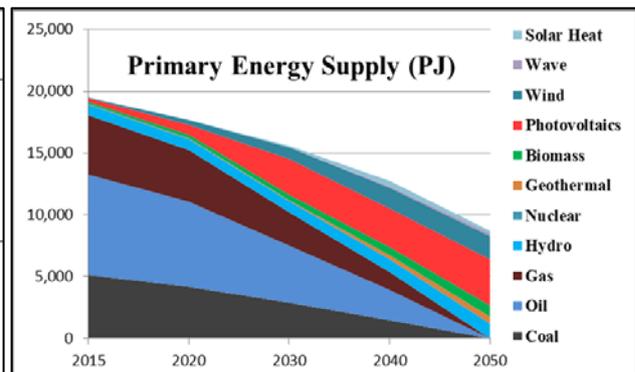


Fig.2 Primary Energy Supply

### 3. Renewable energy 100%

Renewable energy will expand. The nuclear power and fossil fuel use will phase out toward 2050. Renewable energy, such as hydro, photovoltaics (PV), wind, geothermal, solar heat and biomass are domestic and self sufficient resources. They will supply to 100% of energy end use. The electricity generated by renewable resources will be supplied to pure-electricity demand (lighting, motor, air conditioner, and electronic device).

Furthermore the electricity generation will expand to 160% of pure electricity demand. The excess electricity will be used for fuel demand such as automobiles (EV and FCV), high temperature heat and hydrogen for industry, and heat pump for low temperature heat. Biomass will be used for aircraft and heating demand. EV will be equipped with rooftop PV which will supply 20% of annual electricity demand of the vehicle. Ships will be driven by electricity and hydrogen. Solar heat will be used for low temperature heat demand. The scale of renewable energy supplies is within the energy potentials surveyed officially.

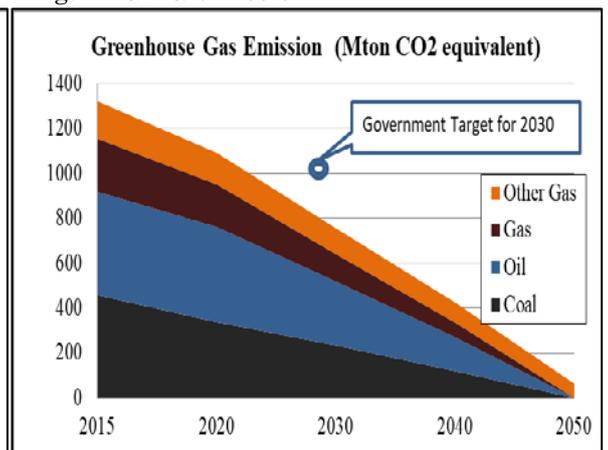
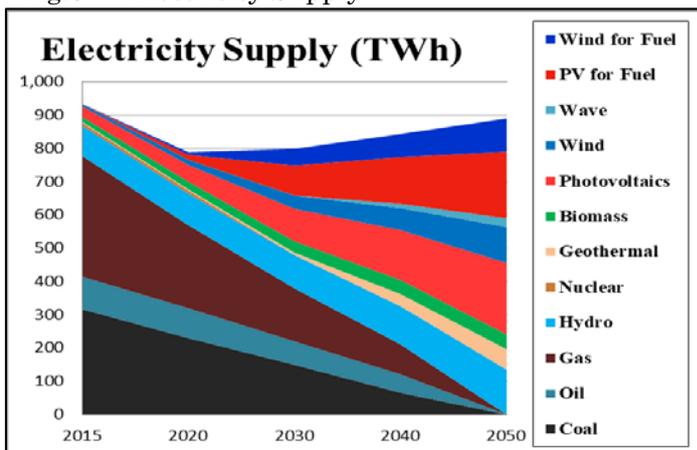
Fig.2 shows primary energy supply. Fig.3 shows the structure of electricity supply. It shows that the electricity demand decrease for the beginning, but PV and wind will gradually increase to supply excess electricity for fuel demands after 2020. The capacities of electricity generation are PV 375GW, wind power 87GW, hydro power 46GW, geothermal 10GW, and wave power 10GW in 2050.

### 4. Greenhouse gas emission (GHG)

100% Renewable Energy Scenario 2050 of JUST shows zero emission of CO2 in 2050. But some of the methane, HFC and other gas will remain as 64 million ton CO2 equivalent in 2050. Fig.4 shows the transition of GHG emissions of JUST scenario. The Japanese Government submitted the emission target in 2030 for INDC (Intended Nationally Determined Contribution) under the Paris Agreement. It is 1,042 million ton CO2 equivalent, which is minus 26% from 2013 level as shown in Fig.4. This number includes absorption by forest. Government already decided to decrease GHG by 80% in 2050, but the INDC of Japan shows nothing about this fact.

Fig.3 Electricity Supply

Fig.4 GHG emission



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