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100% Renewable Energy Scenario in Tokyo metropolitan area with green recovery by 2050

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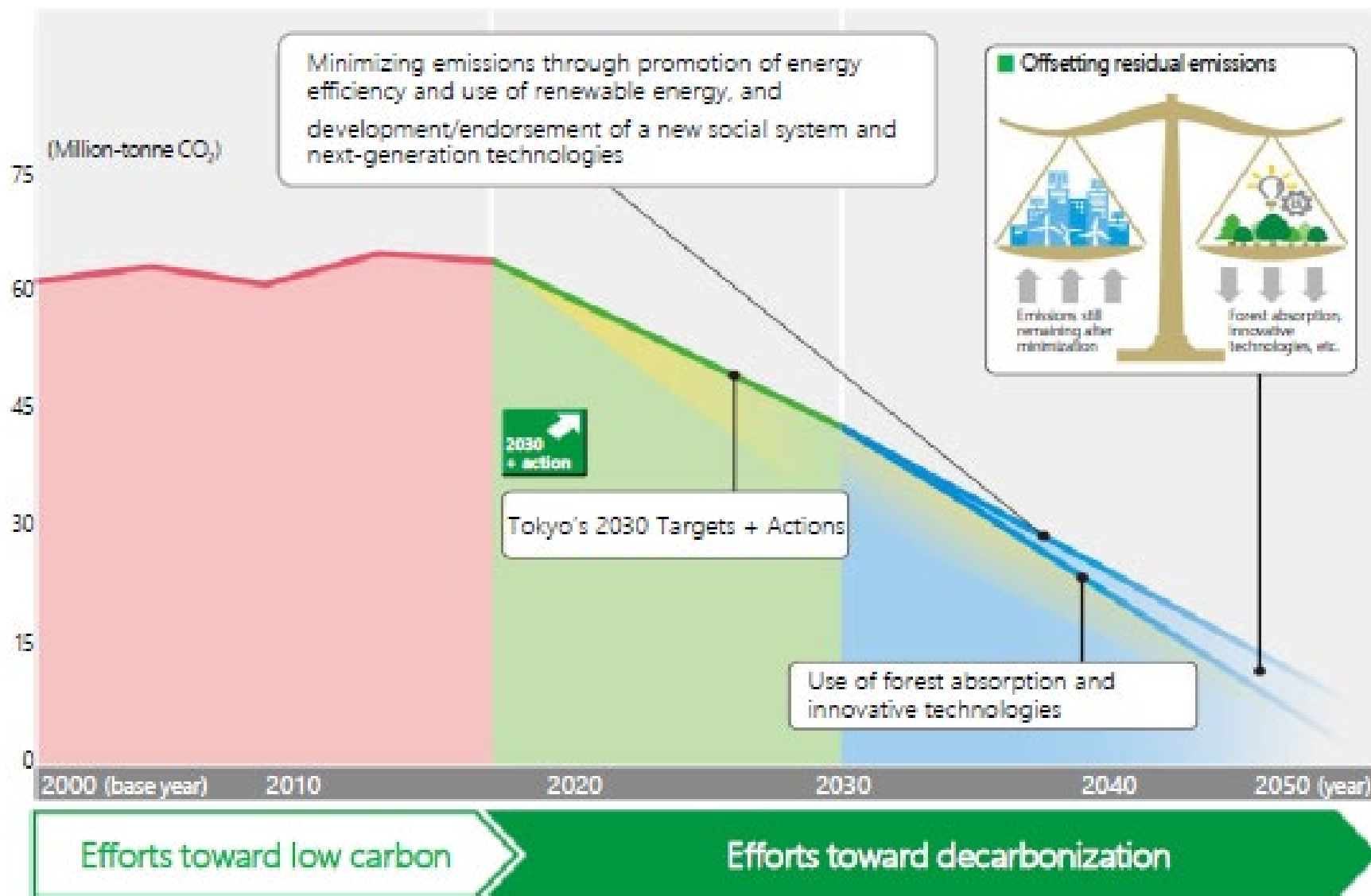
- This study presents investigation of the possibility of 100% Renewable Energy Scenario in Tokyo metropolitan area with green recovery process by 2050.
- To achieve this goal, a scenario for 100% renewable energy in Tokyo is examined, which corresponds to a sustainable economic recovery so called green recovery from the COVID-19, and the potential for energy conservation and the possibility of energy transition through sector coupling are shown.
- The amount of renewable energy introduced in Tokyo will be increased as much as possible in consideration of its potential in the Tokyo area, and mainly solar and wind power electricity will be procured from outside the area.

Acknowledgement:

This study is conducted with Manabu Utagawa(AIST) as a joint research project between Greenpeace Japan, an international environmental NGO, and the Institute for Sustainable Energy Policies (ISEP), and I would like to thank both parties involved.

Zero Emission Tokyo Strategy by Tokyo Metropolitan government

Roadmap for CO2 emissions reductions by 2050



Source: Tokyo Metropolitan Government

https://www.kankyo.metro.tokyo.lg.jp/en/about_us/zero_emission_tokyo/strategy.html

Zero Emission Tokyo Strategy 2020 Update & Report (March 2021)

Start Actions for “Carbon Half” by 2030

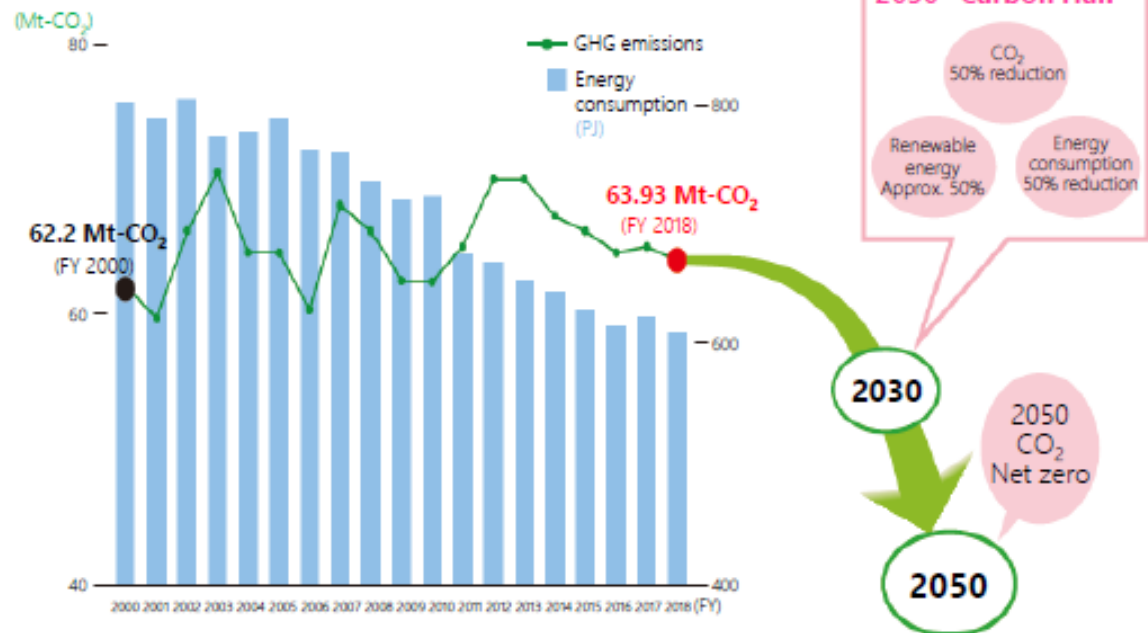


Zero Emission Tokyo 15
Zero Emission Tokyo Strategy
2020 Update & Report

		(Existing targets)	
➢ Reduction of GHG emissions in Tokyo compared to 2000	30%	⇒	50%*
➢ Reduction of energy consumption in Tokyo compared to 2000	38%	⇒	50%*
➢ Percentage of power generated by renewable energy	Approx. 30%	⇒	Approx. 50%*
➢ Phasing out the sale of new gasoline-only passenger cars in Tokyo		⇒	100%
➢ Phasing out the sale of new gasoline-only motorcycles in Tokyo		⇒	100% (by 2035)

* TMG will discuss further these targets and initiatives for these aspects in the Tokyo Metropolitan Environmental Council

Trend of GHG emissions etc.

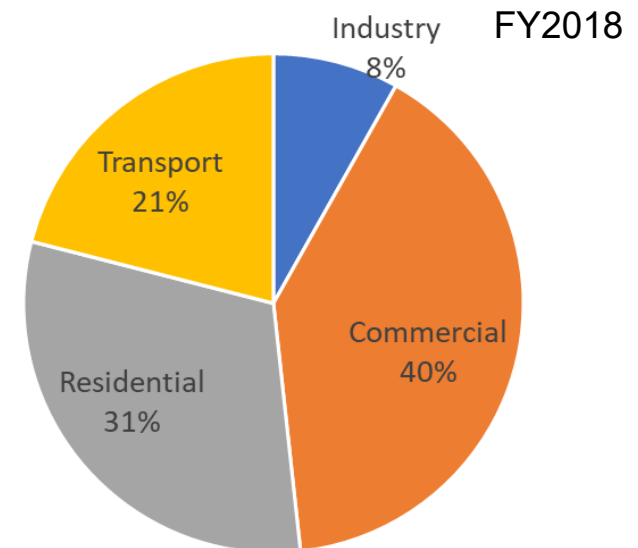
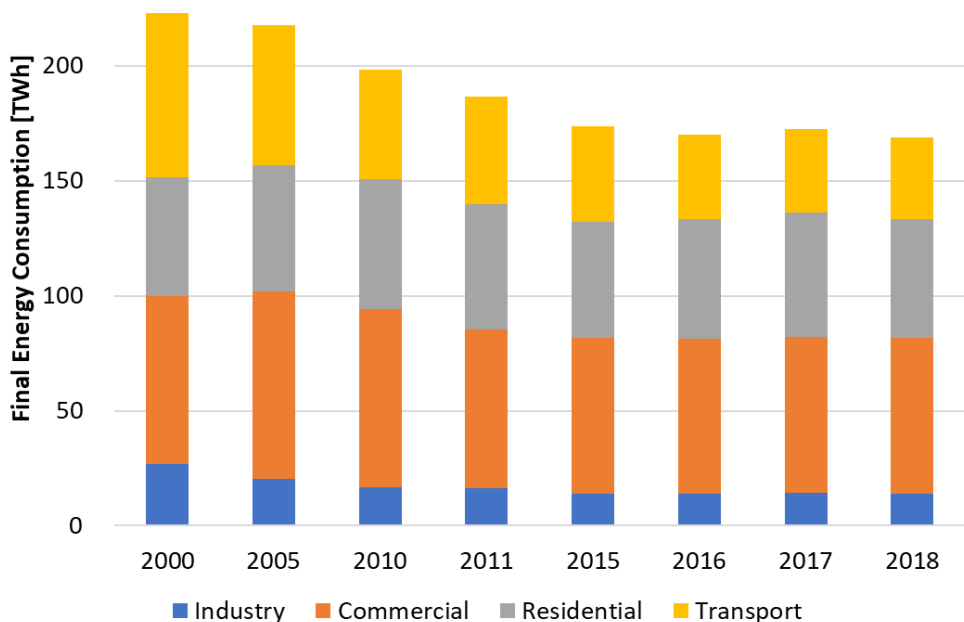
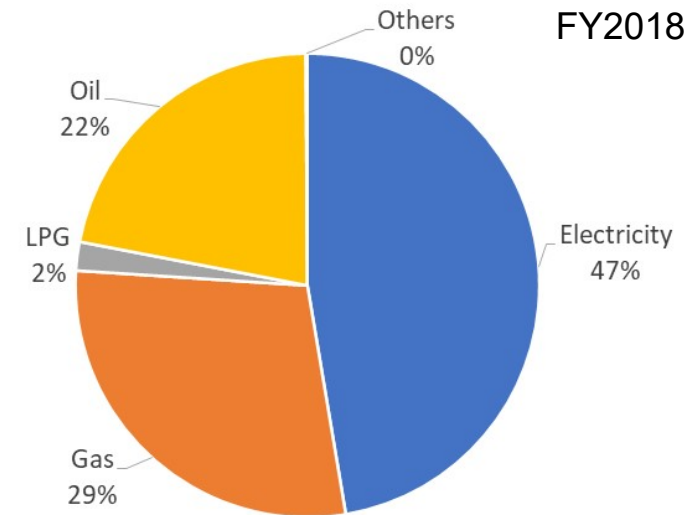
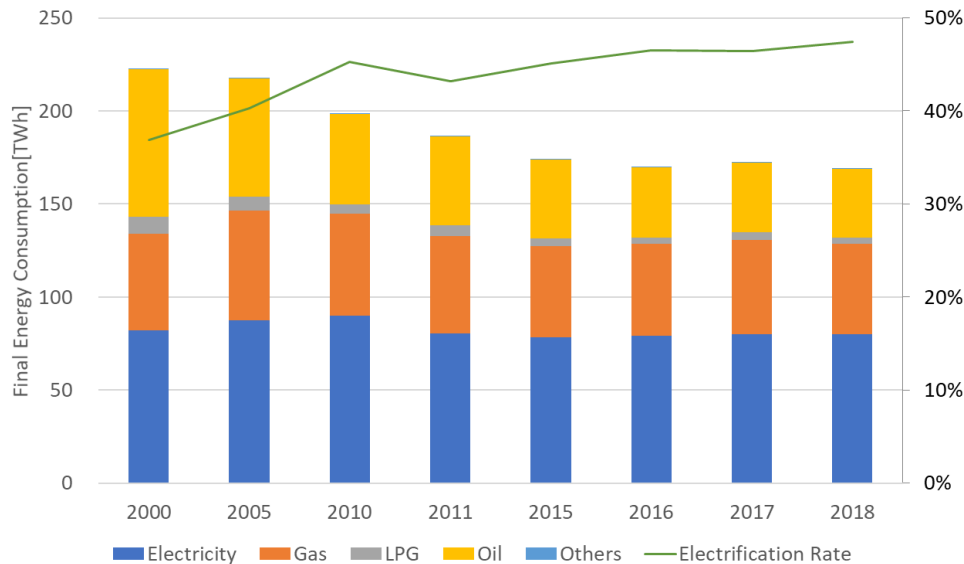


Source: Tokyo Metropolitan Government

https://www.kankyo.metro.tokyo.lg.jp/en/about_us/zero_emission_tokyo/strategy_2020update.html

Final energy consumption and electrification rate in Tokyo

Historical trends(FY2000 – 2018)



Source: Bureau of Environment, Tokyo Metropolitan Government, "Zero Emission Tokyo Strategy", 2019

Concept of energy efficiency and conservation scenario

Assumed changes in activities by 2030 and 2050 (compared to FY2017)

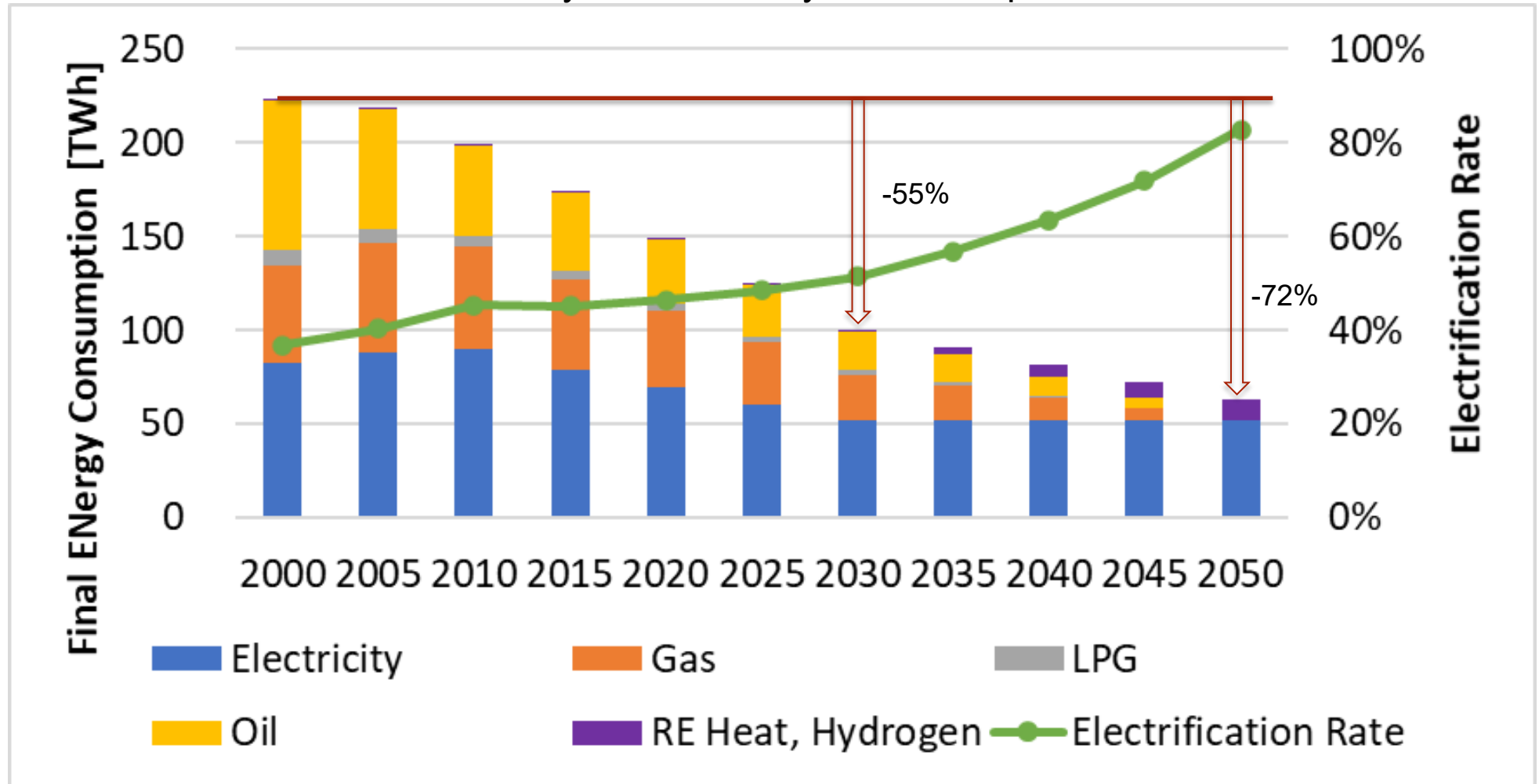
Sector	2030	2050	notes
Industrial	-6%.	-19%.	future population decreasing in proportion. (No overseas relocation is expected.)
Commercial	+2%.	-1%.	Office floor space to be reduced by 10% in 2030 compared to 2017 (otherwise proportional to Tokyo's population); after 2030, proportional to Tokyo's future population
Residential	+5%.	+1%.	Proportional to the number of future households in Tokyo
transport passenger	-10%.	-13%.	10% decrease in 2030 compared to 2017; proportional to the future population of Tokyo after 2030
freight	-10%.	-23%.	10% decrease in 2030 compared to 2017; proportional to the future population of the nation after 2030

Concept of energy efficiency and conservation scenario

Sector	Target	By 2030	After 2030 until 2050
Commercial	Buildings	Insulation standards for new construction and reconstruction until 2024 Introduction of ZEB for new construction and reconstruction from 2025	Introduce ZEB at the time of new construction and reconstruction, and heat insulation retrofitting of existing buildings
	Equipments	Introduce top-class energy-saving equipment at the time of renewal. Switch to electric units and renewable heat for heating and cooling heat use.	
Residential	Houshold	Insulation standards for new construction and reconstruction until 2024 Introduction of ZEH for new construction and reconstruction from 2025	Introduce ZEH at the time of new construction and reconstruction, and heat insulation retrofitting of existing buildings
	Equipment	Introduction of top-class energy-saving equipment at the time of renewal Switch to electric units and renewable heat for heating and cooling heat use.	
Transport	Passenger car	20% conversion to electric vehicles Energy efficiency improvement 80%	All electric vehicles
	Bus	5% for electric vehicles(stock percentage) Energy efficiency improvement 70%.	All electric vehicles
	Trucks	Truck 5% (stock percentage) Energy efficiency improvement 70%.	All electric vehicles
	Railroad, Ships, aviation	Energy efficiency improvements of 10% for rail, 10% for ship, 20% for air	
Industrial		Energy efficiency improvement equivalent to reduction obligation (set to -21% by 2030)	Use of low and medium temperature heat throughout the plant: Partial conversion to electric heat pumps (-70%)

Energy conservation scenario in Tokyo

- Reduction rate of energy consumption in 2030 will be about 55%, and 72% reduction by 2050
- By 2030, reduction of electricity consumption will be 37%, and same reduction by 2050
- Electrification rate will be 52% by 2030, 83% by 2050, compared with 37% in 2000



Renewable Energy Installation Potential in Tokyo area

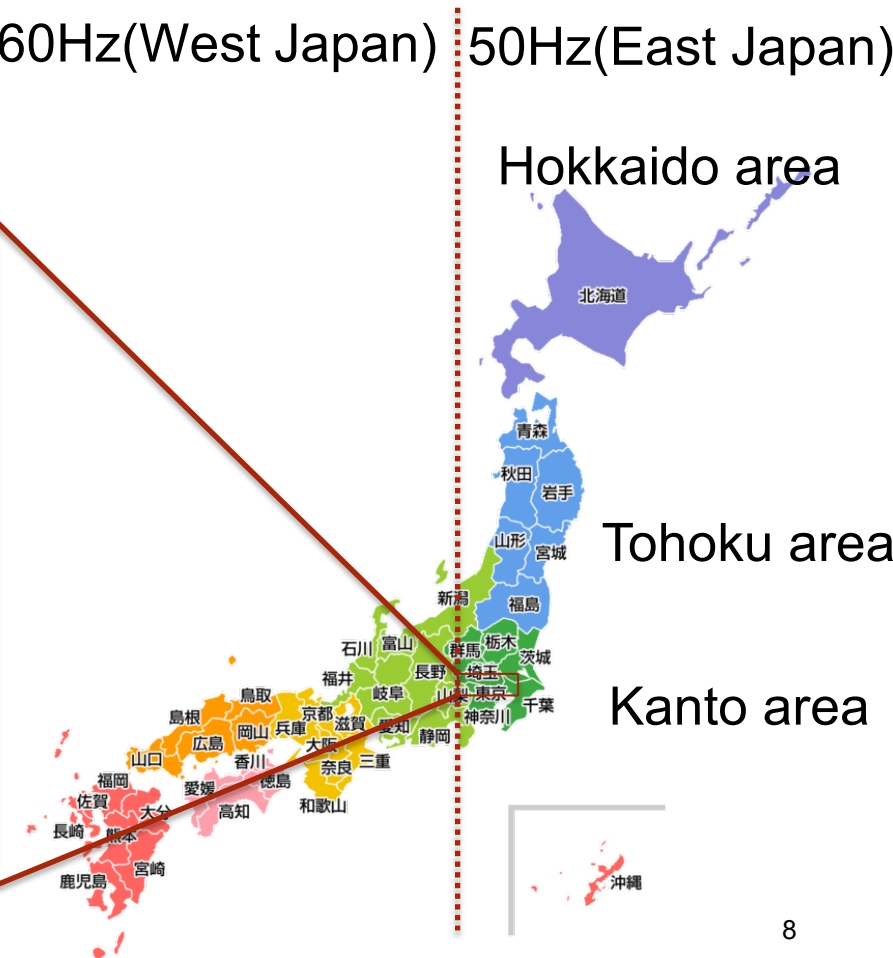
The potential of renewable energy in the region will be examined by referring to the Ministry of the Environment's database: REPOS.

The potential for renewable energy in the Tokyo metropolitan area is assessed by dividing it into two areas, inside and outside of the Tokyo area.

60Hz(West Japan) 50Hz(East Japan)

Tokyo Metropolitan area

Population: 14 M



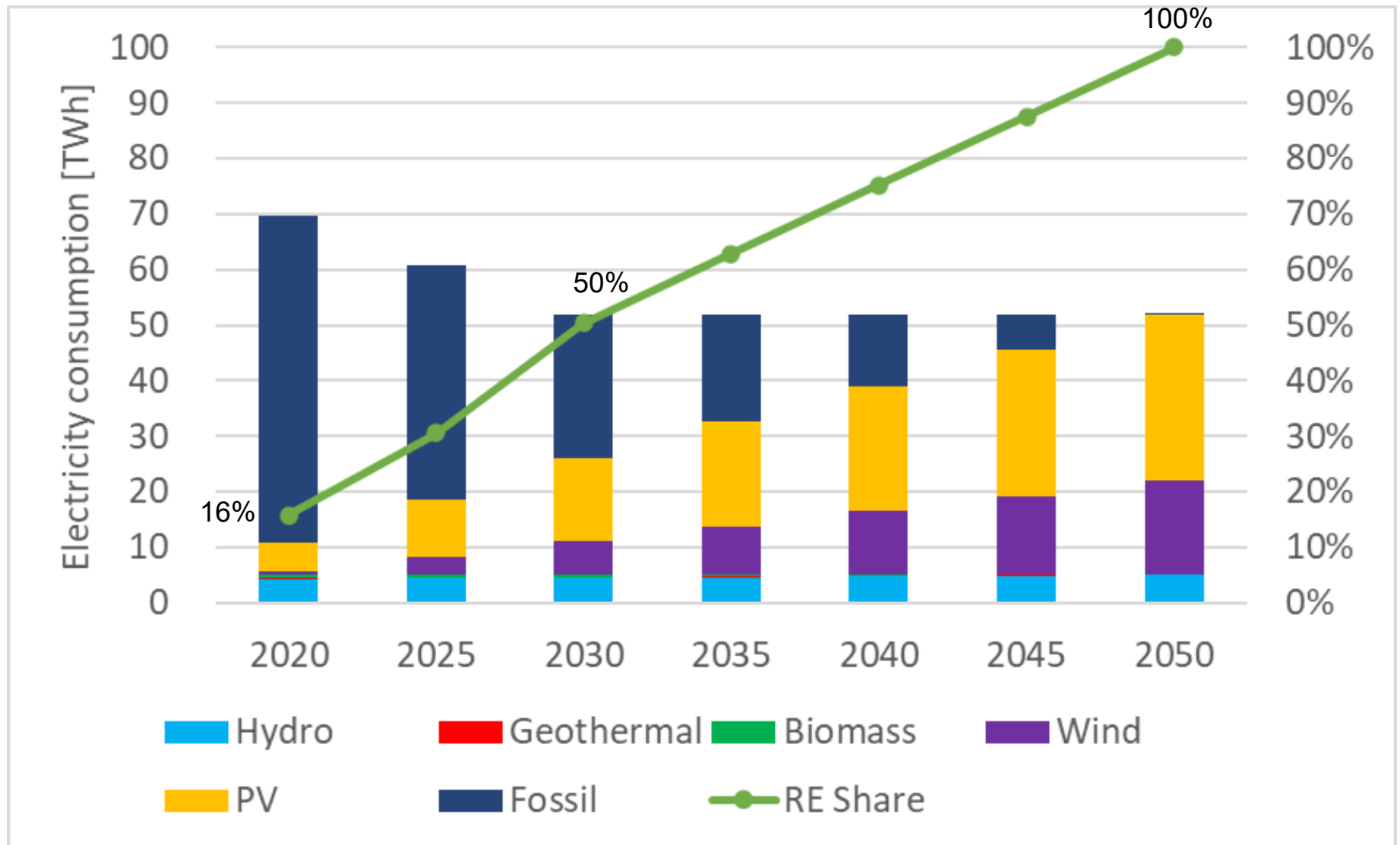
Renewable Energy Installation Potential in Tokyo area

Based on the Ministry of the Environment's REPOS (Renewable Energy Potential System)

Renewable Energy	Installation Potential
PV	15.9 TWh (8.3 GW for residential, 4.7 GW for public space) mainly on roof tops and un-used land
Wind	227.8 TWh (2.0 TWh onshore, 95.6 TWh offshore on fixed type, 130.2 TWh offshore on floating) including TEPCO (mainly Kanto) area
Geothermal power	0.05TWh (7.4MW) Flash, Binary
Small hydro	0.10TWh(15.5MW) excluding existing installation
Solar thermal	6.5TWh(Mainly roofs of buildings)
Geothermal heat	79.2TWh(Including sewage heat, etc.)

“Renewable Energy 100% scenario in Tokyo by 2050”

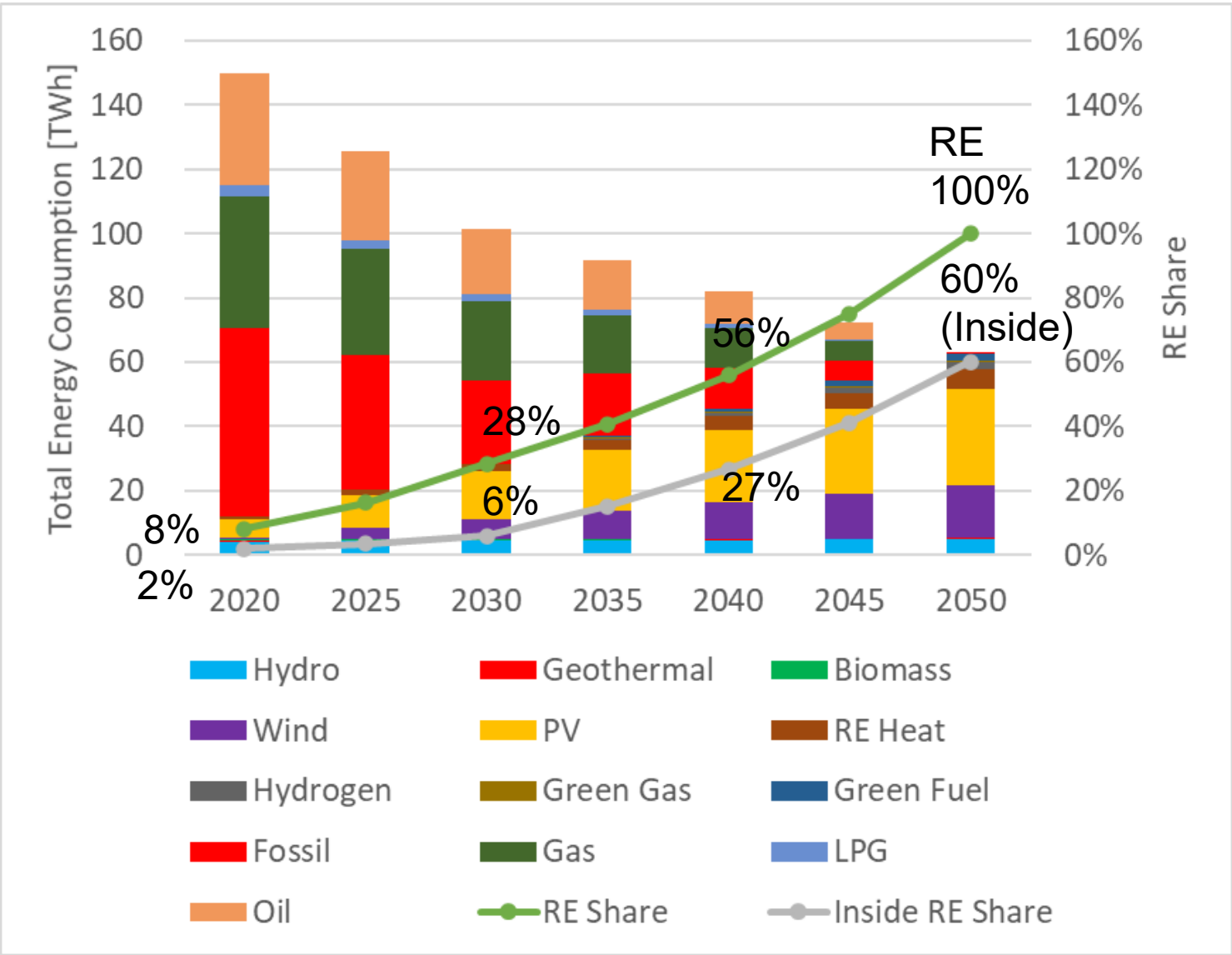
Estimated annual electricity consumption for 100% renewable energy



* 50% renewable energy electricity case in 2030

“Renewable Energy 100% scenario in Tokyo by 2050”

Total energy composition in the 100% renewable energy scenario

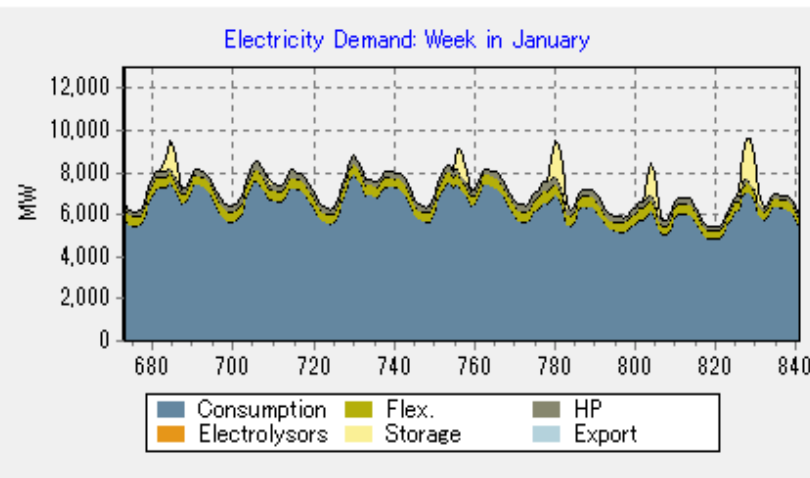


* 50% renewable energy electricity case in 2030

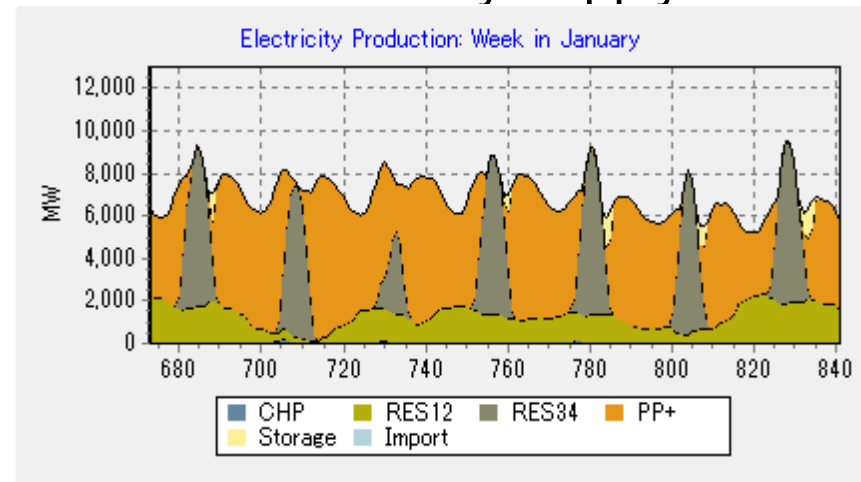
Electricity supply and demand for one week in January

Example of energy balance analysis in EnergyPLAN

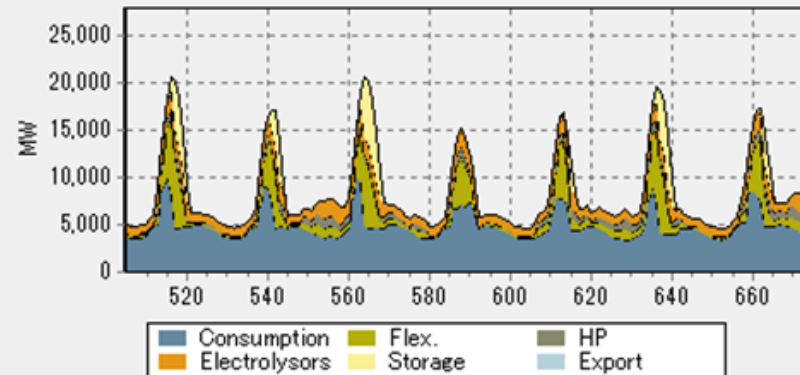
Electricity Demand



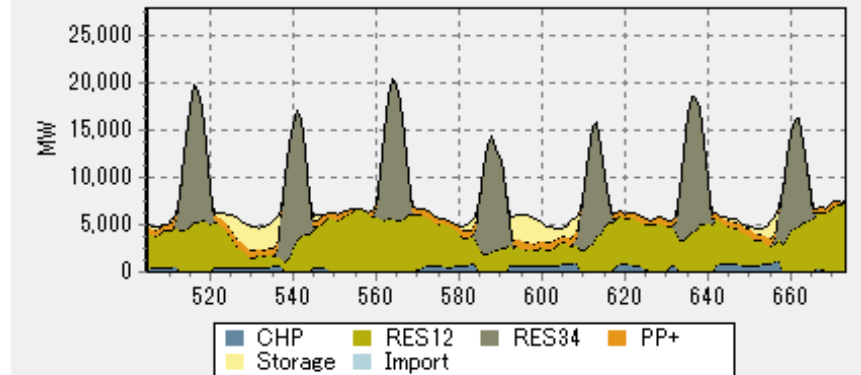
Electricity Supply



Electricity Demand: Week in January



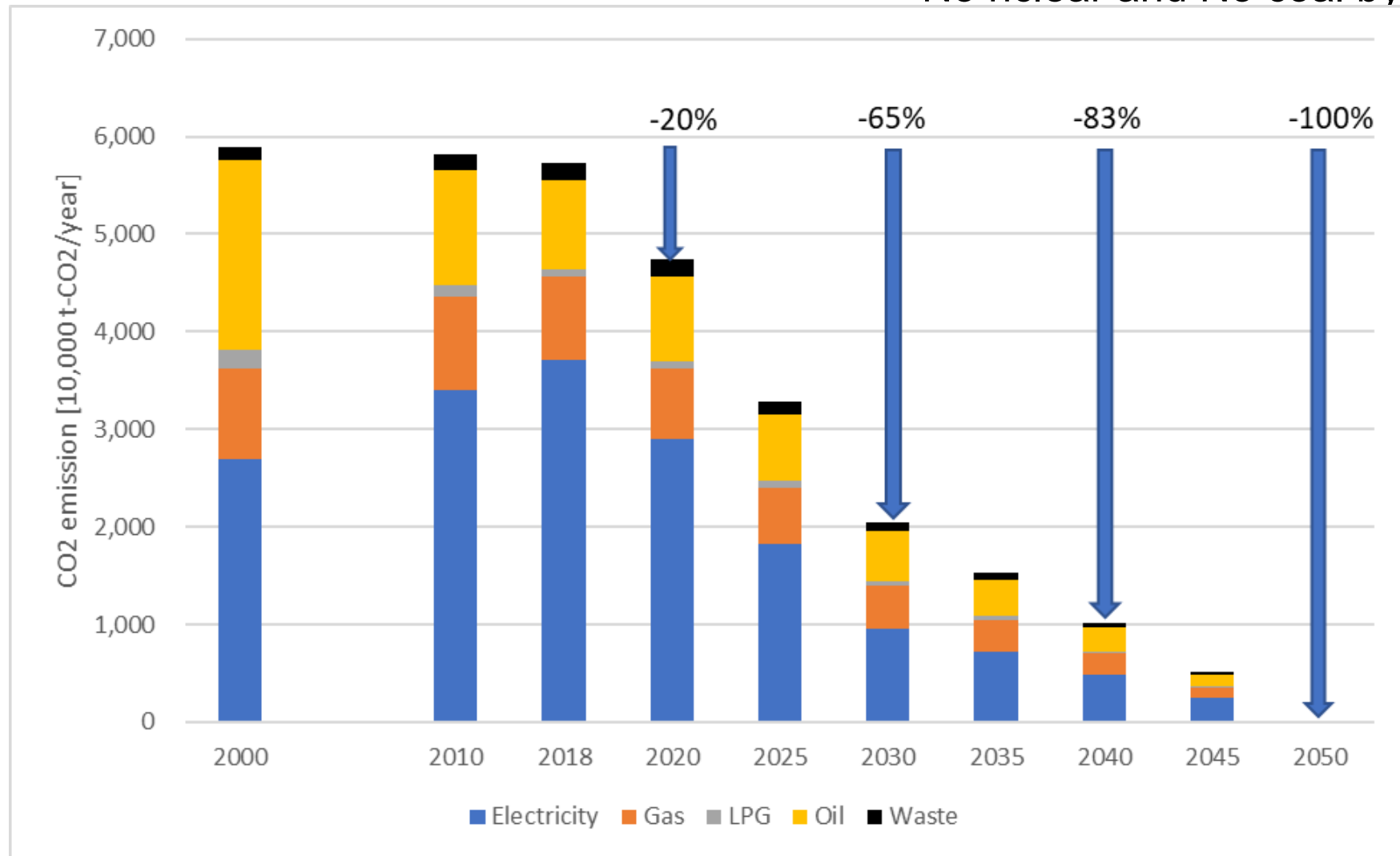
Electricity Production: Week in January



“Renewable Energy 100% scenario in Tokyo by 2050”

CO2 emissions reduction in a 100% renewable energy scenario

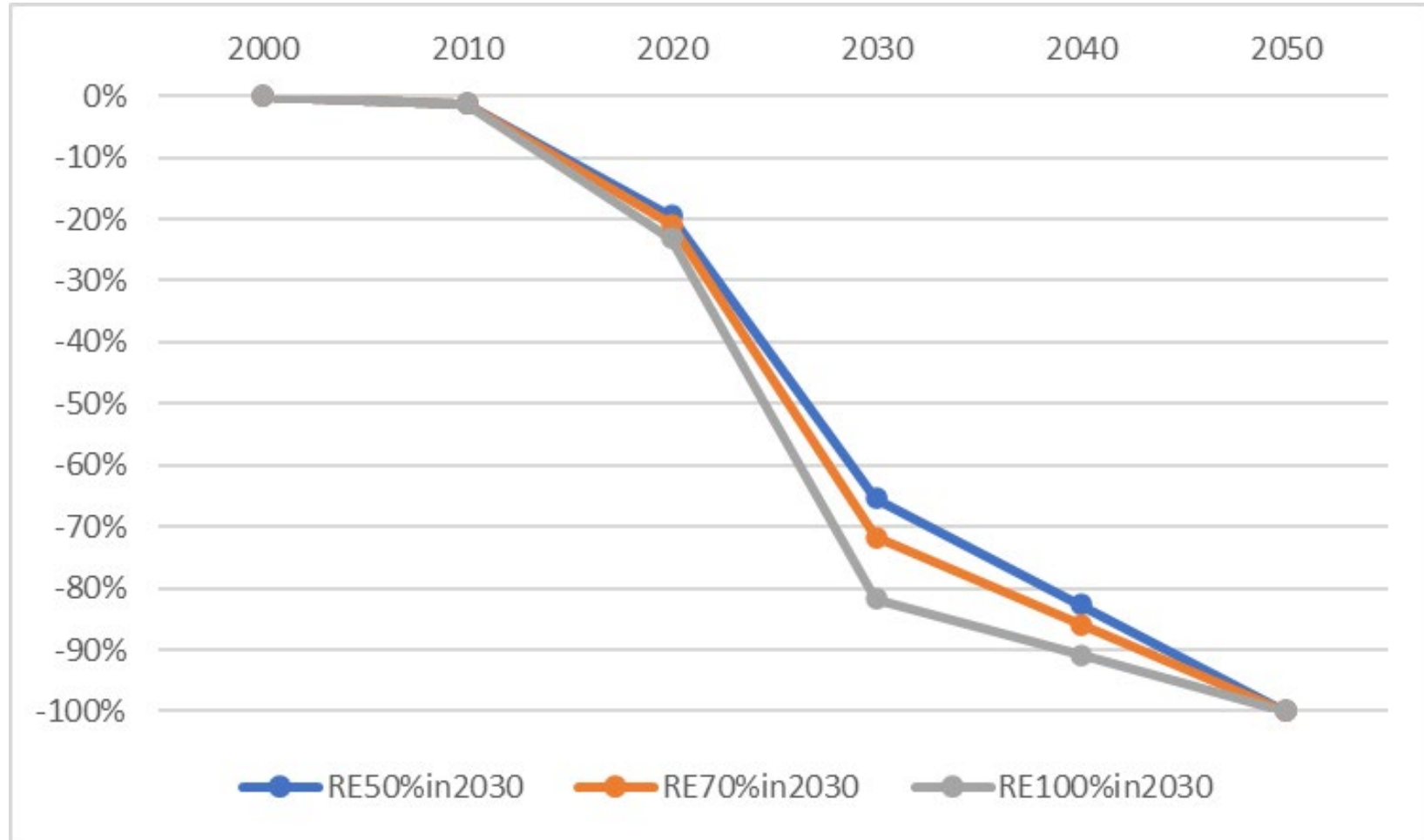
* No nuclear and No coal by 2030



* 50% renewable energy electricity case in 2030

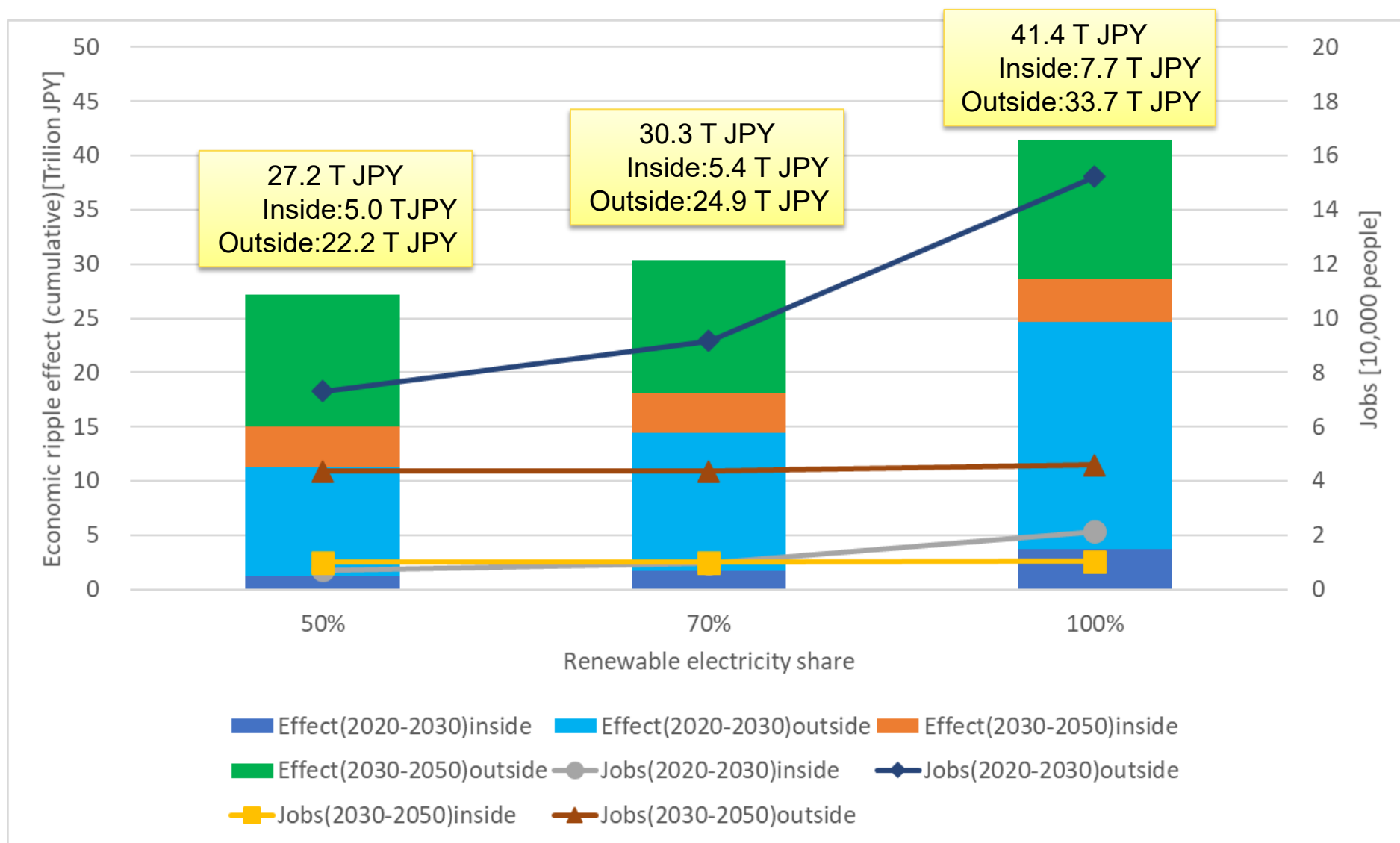
“Renewable Energy 100% scenario in Tokyo by 2050”

CO2 emissions reduction in 100% renewable energy scenarios



“Renewable Energy 100% scenario in Tokyo by 2050”

Comparison of economic ripple effects and employment in renewable energy scenarios



Concluding Remarks

- This study developed a 100% renewable energy scenario that is compatible with green recovery in response to the Tokyo Metropolitan Government's "Zero Emission Tokyo Strategy,"
- Based on the energy conservation scenario, we examined a scenario in which 100% renewable energy is used for final energy consumption in all sectors, and conducted an energy model analysis using EnergyPLAN.
- In order to realize this 100% renewable energy scenario, it is important to set a clear goal and develop a roadmap, so that various stakeholders in Tokyo can promote the introduction of renewable energy in this region, including the surrounding areas. Local energy projects should be promoted on a public and private basis, and for each sector to procure sustainable renewable energy electricity from outside the region.

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Thank you !

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