

Achieving “Zero Emission Tokyo”

Mandatory Installation of “Photovoltaic Power Systems” etc.
in new Residential and Other Buildings

JCLG seminar 2023

“Carbon neutral in
local government projects”

22 November 2023

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1. TOKYO DATA

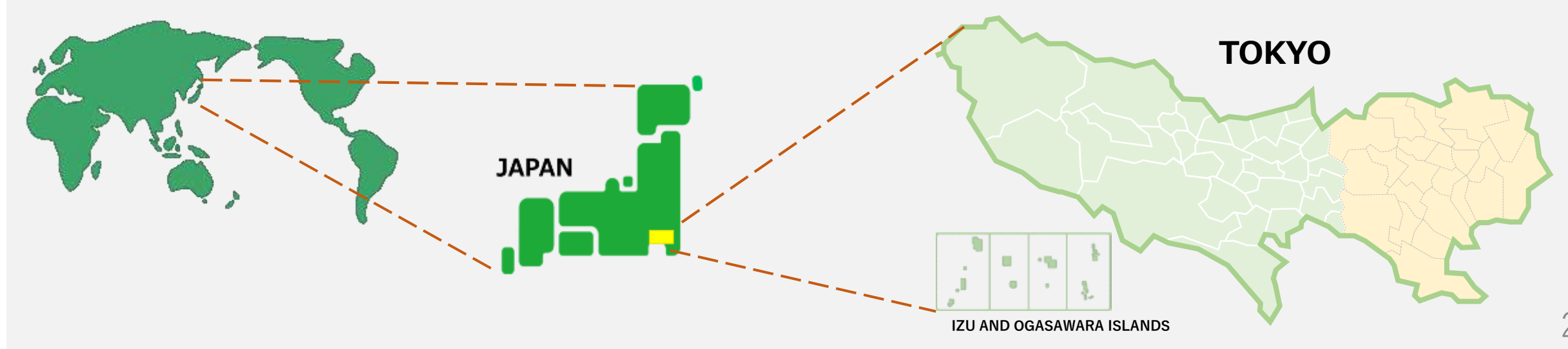
Profile of TOKYO



* approx. 700 billion € (600 billion £)



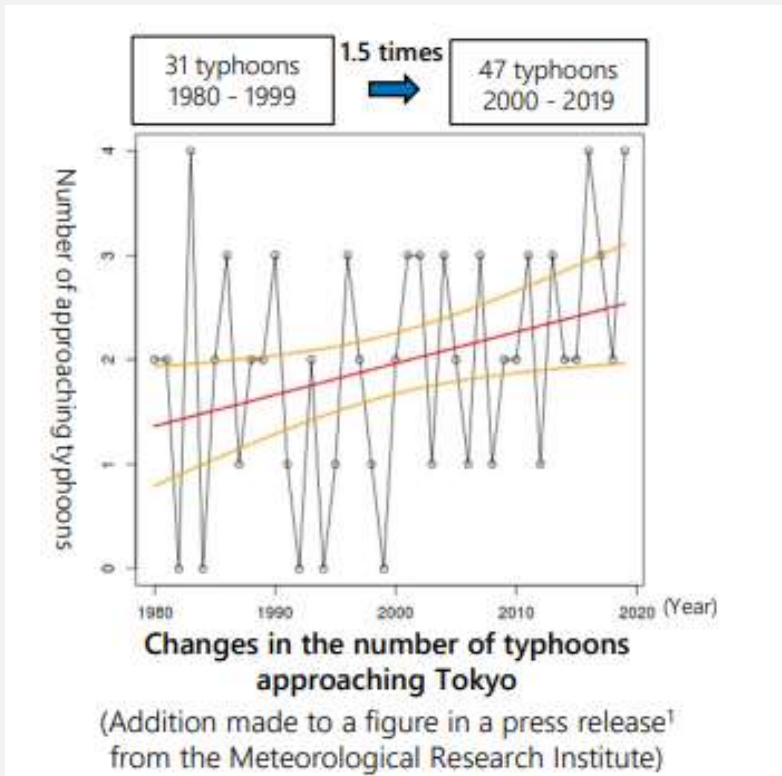
Location of TOKYO



Climate Crisis

**Environmental issues Tokyo faces today
(Climate change and biodiversity loss)**

**⇒ Action required: Accelerate expansion of renewable energy and
change behaviour of individuals**



Typhoon Hagibis (2019)
(Source : Bureau of Construction's website)

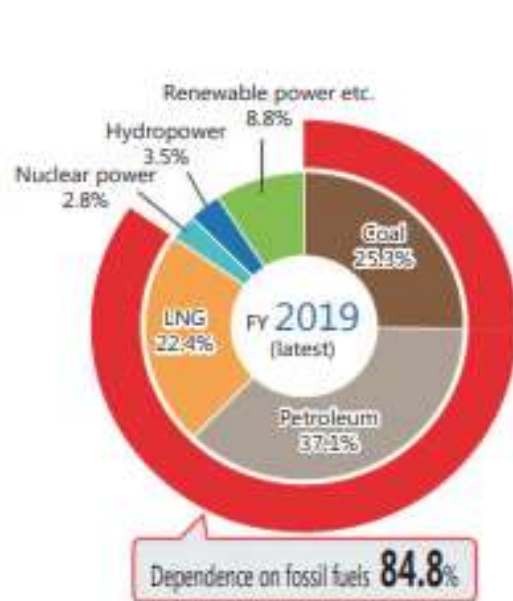
2. Background (TMG Initiatives) ②

Energy Crisis

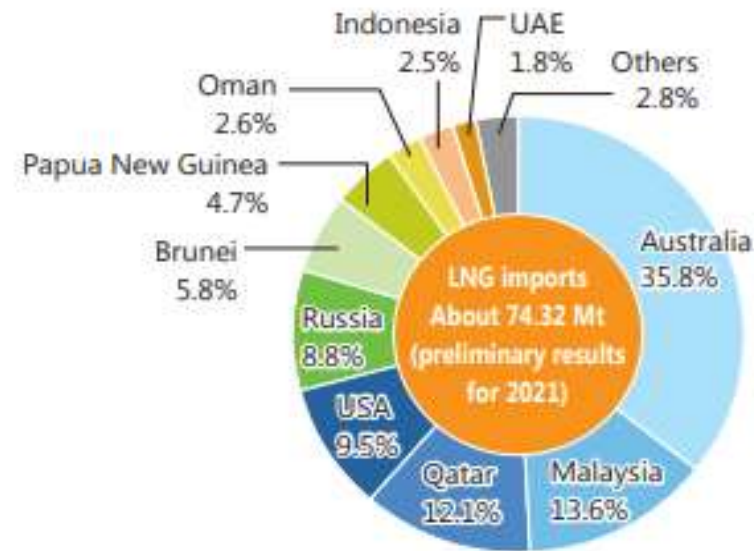
Impending crisis of unstable energy supply

- Primary energy supply mix of Japan
- Low renewable energy supply ratio in Japan

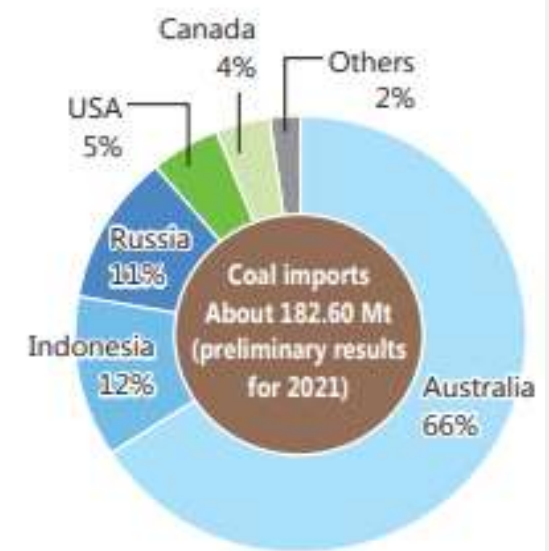
Primary energy supply mix of Japan and fossil fuel exporters to Japan



Source: Agency for Natural Resources and Energy, Japan's Energy 2021 Edition.



Source: FY 2021 Annual Report on Energy.



Toward Zero-Emission Tokyo

2030 TARGETS



- **GHG emissions** in Tokyo compared to 2000 : **50% reduction** (“Carbon Half”)



- **Energy consumption** in Tokyo compared to 2000 : **50% reduction**



- Percentage of **Power generated by Renewable Energy:50%**



2050
Zero Emissions

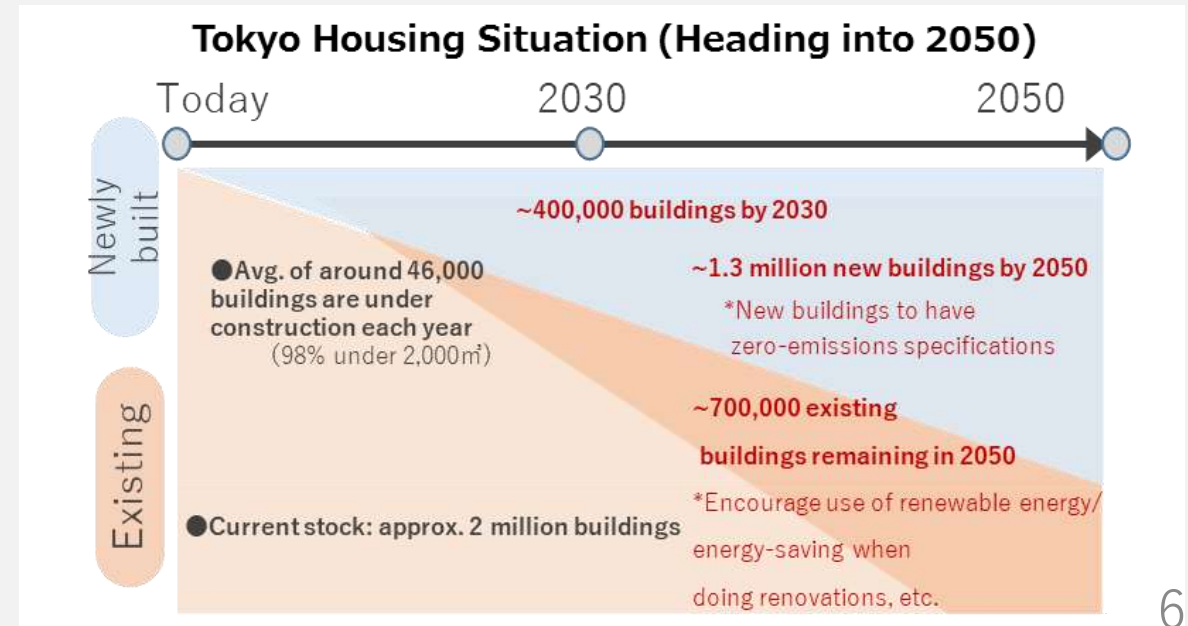
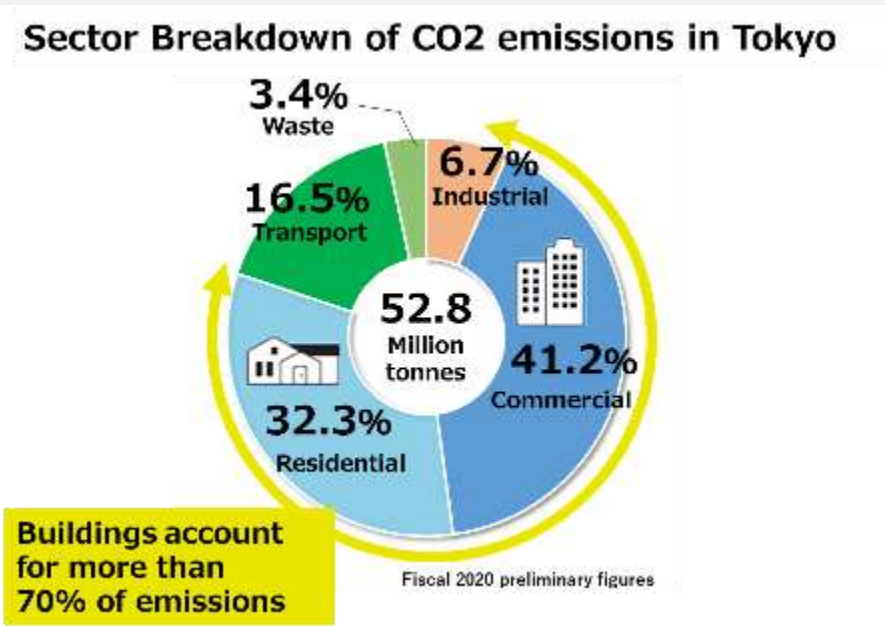
2030
Achieving
“Carbon Half”

2025
Solar Panel
Installation Mandate

Shaping Future Tokyo through Building-related Policies and Measures

✓ Commercial and residential sectors constitute a large share of the CO₂ emissions in Tokyo.

✓ By 2050, about half of the existing buildings (of which 70% is homes) will be replaced by newly-constructed buildings.



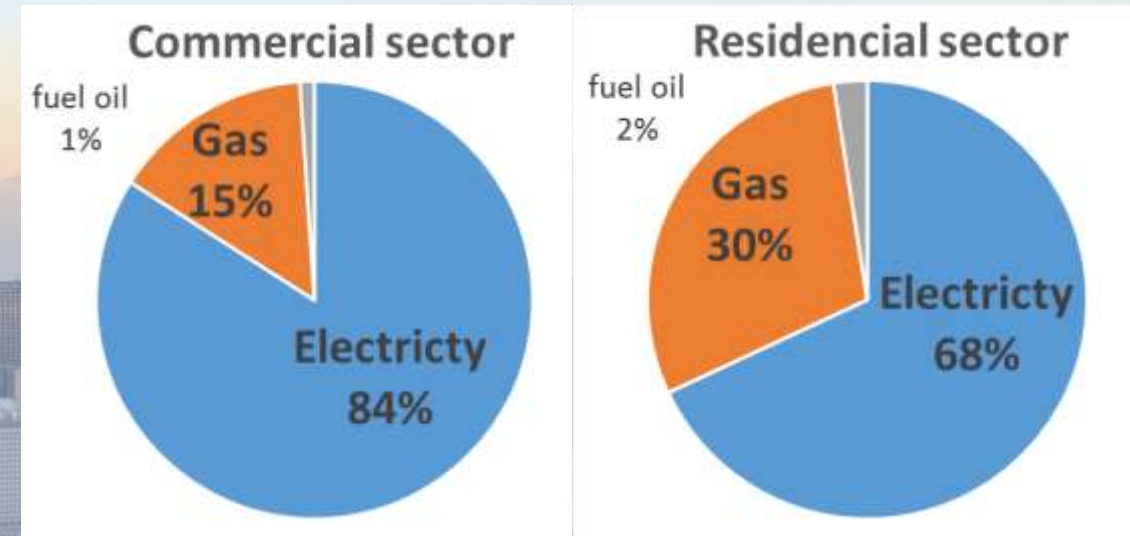
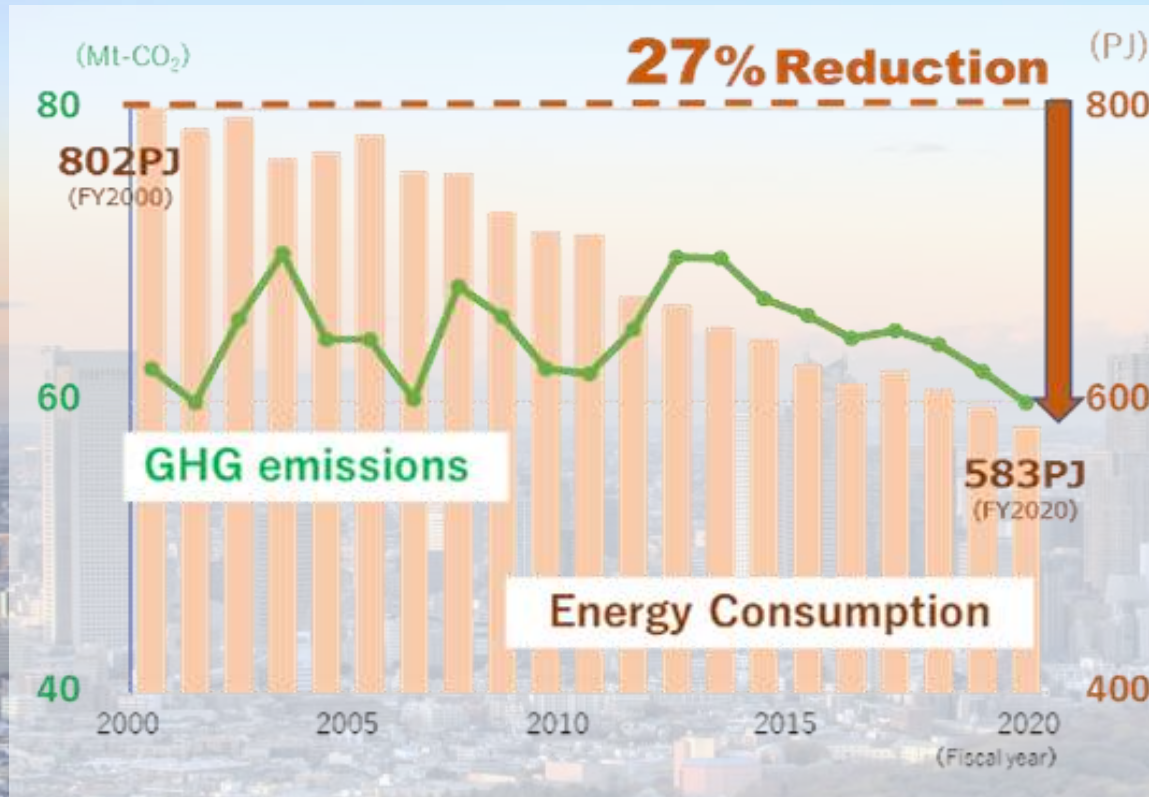
2. Background (TMG Initiatives)

⑤

- Energy Consumption 583PJ (peta joule)
- GHG 59.9million tonnes

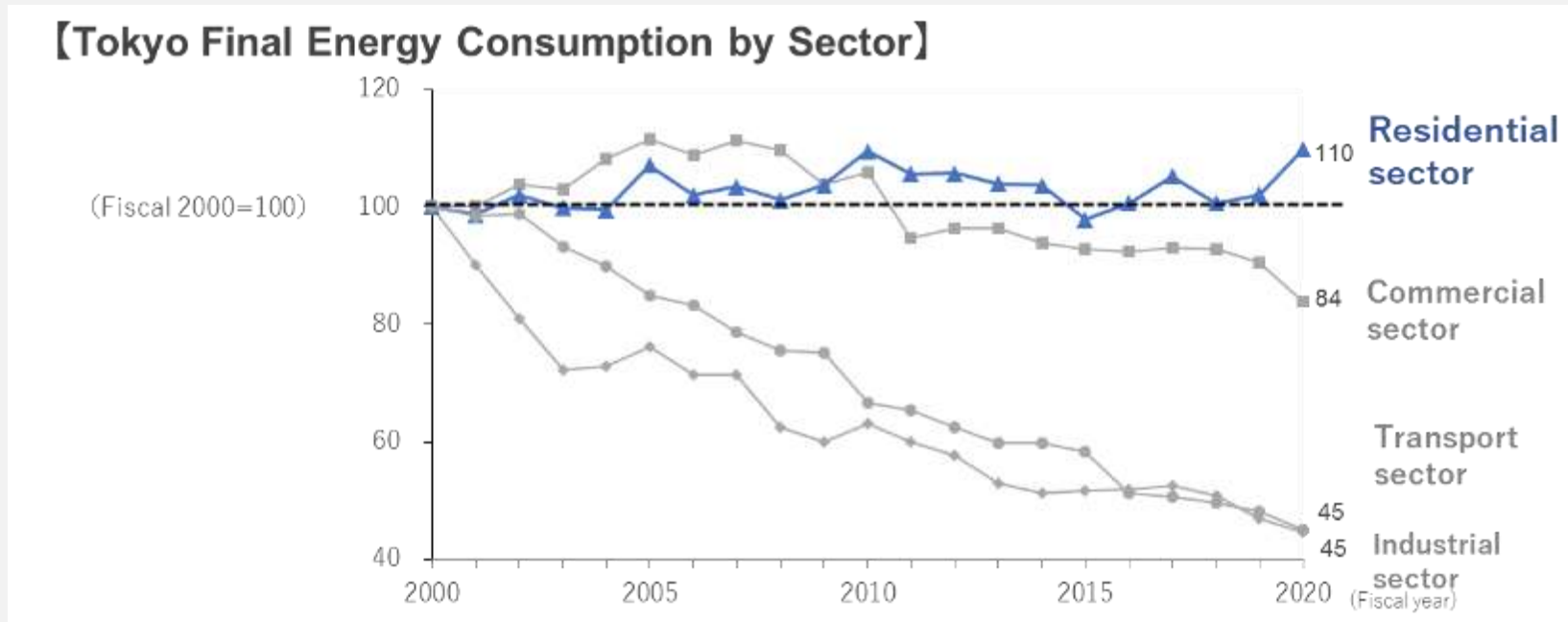
✓ Trend of Energy consumption and GHG in Tokyo

✓ Characteristics of Tokyo : Energy-related CO₂ Emissions by fuel type (2020)

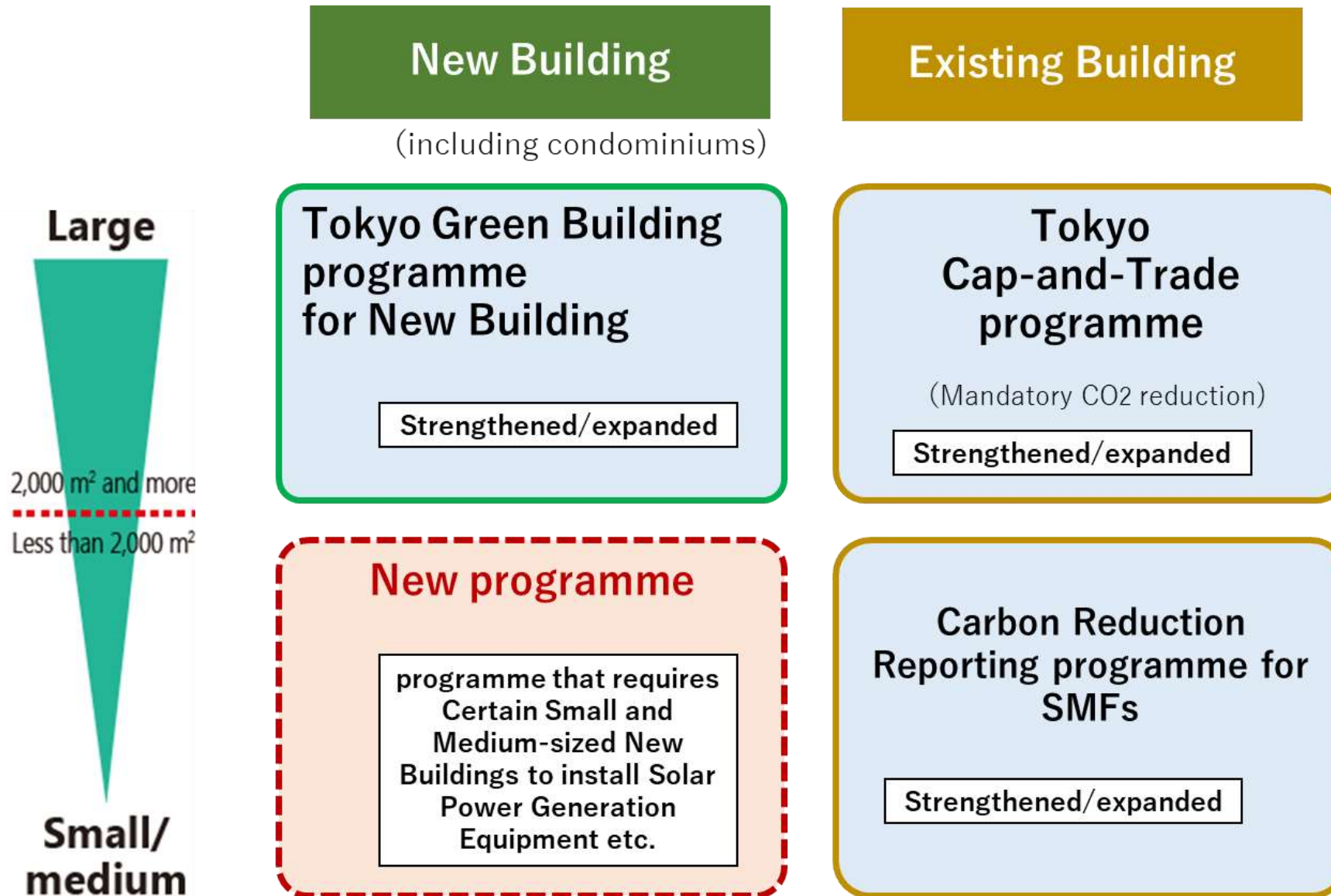


Tokyo's Regional Characteristics: Countermeasures for the Residential Sector are Key

- ✓ The Residential sector was the only sector to record an increase in energy consumption since 2000.
- ✓ Further strengthening of measures is needed.



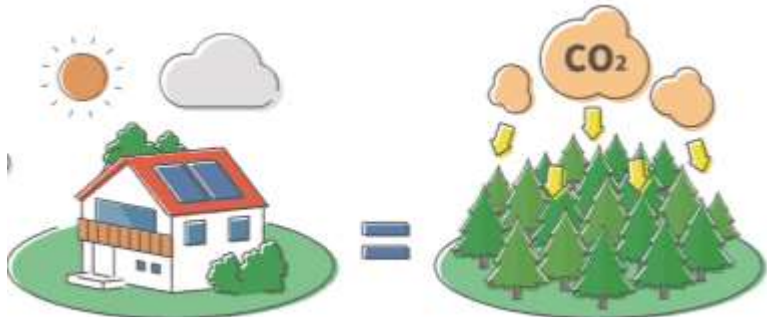
3-1. Reinforcing TMG programmes



3-2. Benefits of Houses with High Environmental Performance ①

- The standardisation of energy efficiency, high levels of insulation, and the installation of renewable energy equipment at houses will bring a variety of benefits to the lives of Tokyo residents.
- It helps ensure the supply of electricity, a lifeline in the event of a disaster, through independent power sources, and improve the health of residents by maintaining a comfortable thermal environment through heat insulation etc.

Environment



Disaster preparedness



Healthy living

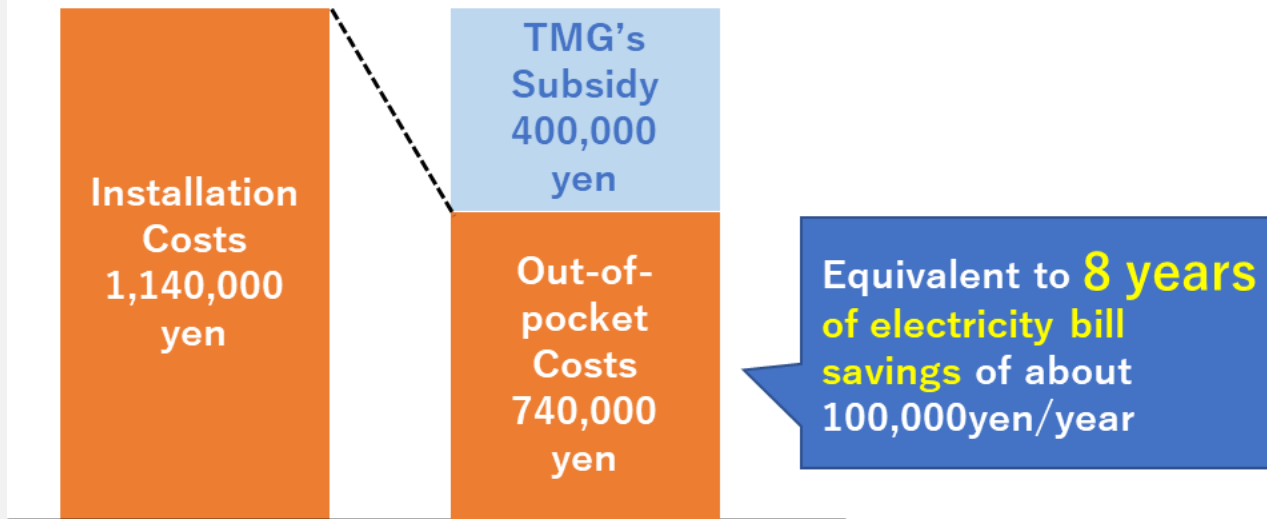


3-2. Benefits of Houses

with High Environmental Performance ②

- Self-consumption and selling of electricity generated by installing a photovoltaic power system reduces the amount of money equivalent to an electricity bill.

If a 4kW solar panel is installed at a new house:

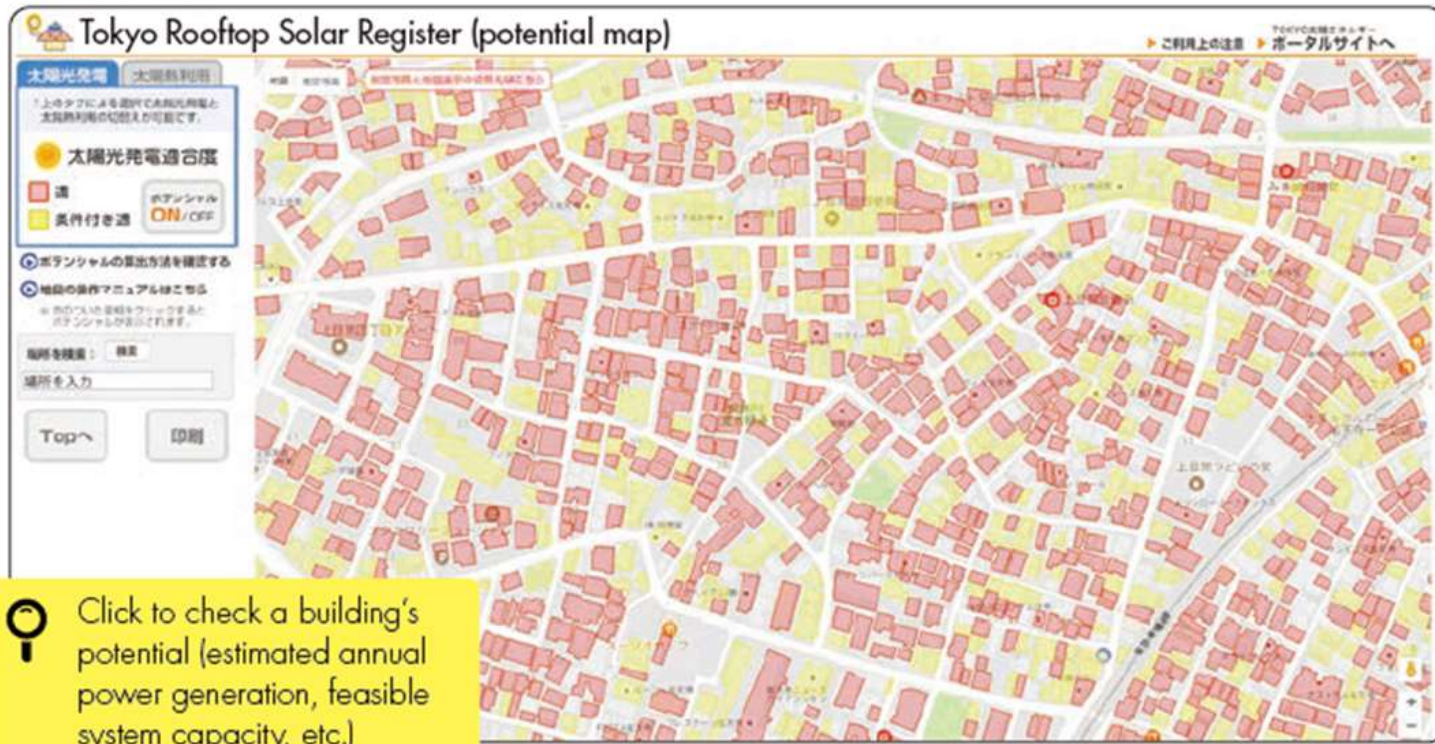


From the 9 year, the cumulative electricity bill savings exceed the initial cost.

*Estimate is based on a household of two or more people living in a ward of Tokyo as of August 2023, and may change depending on future circumstances.

4. Tokyo Rooftop Solar Potential Map

TMG released in March 2014 the **Tokyo Rooftop Solar Potential Map** , showing solar power and thermal utilisation potential for each building and home.



【Reference】

Annual sunshine duration
(1991-2020 average)

Tokyo 1,933 hours/year
(Ref. Japan Meteorological Agency)

London 1,530 hours/year
(Ref. UK Met office)

<https://tokyosolar.netmap.jp/map/>

5-1. Introducing “Mandatory PV installation programme” for new buildings ①

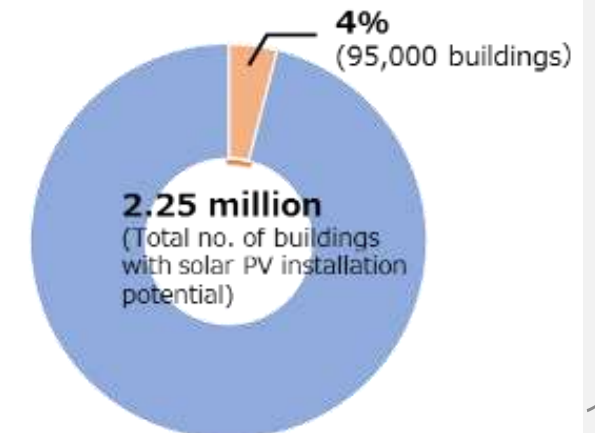
Tapping the Huge Potential of Tokyo’s “Rooftops”

The new ordinance programme requires new residential and other buildings to be built with a **Photovoltaic Power Systems**

- ✓ Around 50,000 new buildings are built each year
- ✓ Current Installation of solar electricity system on residential roofs in Tokyo has been limited
(4 % of all existing buildings in Tokyo)
- ✓ Policies and measures related to new construction standards will be vital in determining the shape of Tokyo in 2050.



Percentage of buildings with solar power generation Equipment installed in Tokyo



5-1. Introducing “Mandatory PV installation programme” for new buildings ②

programme
Summary
(Draft)

❑ Target Buildings

Small and medium-sized new buildings and homes with total floor space of less than 2,000m².



❑ Target individuals

Major housing suppliers that supply over 20,000m² of housing etc. on a yearly basis in Tokyo will be subject to this mandate.

❑ Details of Obligations, etc.

The programme implements **mandatory requirements for thermal insulation, energy-efficient-equipment, installation of Renewable energy equipment and ZEV charging equipment.**

*Another mandatory “Green Building programme” for New Buildings will also require that **large sized buildings** (floor area $\geq 2,000\text{m}^2$) install the Renewable energy equipment and ZEV charging equipment etc.

5-1. Introducing "Mandatory PV installation programme" for new buildings ③

Renewable energy installation standards(kW)

$$\begin{aligned} &= \text{① Number of buildings annually supplied} \\ &\times \text{② Calculation standard rate(\%)} \\ &\times \text{③ Standard generation amount per building(kW) : 2 kW/building} \end{aligned}$$

② Calculation Standard Rate

Rates by Area*	30%
	70%
	85%
Single Uniform Rate*	85%

*Calculated based on TMG survey



Method of compliance with the renewable energy installation standard (example)

* If installation is possible in 500 buildings

$$: 500 \text{ buildings} \times 85\% \times 2 \text{ kW/bldg.} = 850\text{kW}$$



4kW
× 100 buildings
⇒ 400kW

+



2kW
× 250 buildings
⇒ 500kW

+



150 homes that do not
install equipment
⇒ 0kW



Total
900kW
> 850kW

5-2." Mandatory Installation ZEV Charging equipment, and Requirement for Thermal insulation etc.

ZEV Charging Equipment Standard

- ✓ For each detached house with a parking space, an electric cable conduit etc. for charging equipment should be supplied, and if the parking area has space for 10 or more vehicles, a normal charging facility must be installed.



Thermal Insulation and Energy-Efficient Performance Standard

- ✓ Standards are set based on a national housing “best-in-class” system.



5-3. Explanation programme

Designated housing suppliers



- House builders
- General builders
- Developers, etc.

NEW

Explanation of
Environmental
Performance

Tokyo Metro Citizens

《owners and purchasers》



“Consideration”
Guidelines

NEW

Provision of
Information

After receiving an explanation about environmental considerations for the building from the supplier/builder, the owner takes the necessary measures and strives to reduce the building’s environmental load.





TMG



- ✓ Implement the mandatory PV installation programme in April 2025.



Global Trends in Mandating Solar Energy

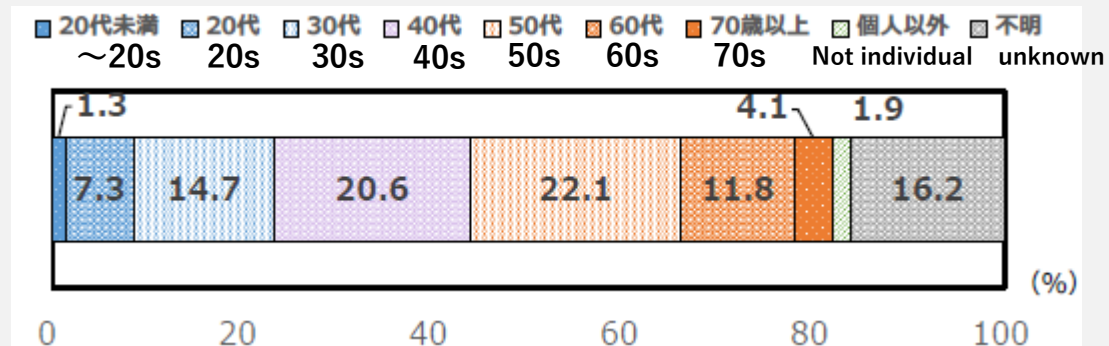
<p>European Solar Rooftops Initiative</p> 	<ul style="list-style-type: none"> ✓ In May 2022, the EU released details on RE Power EU, a plan to end dependence on Russian energy. ✓ European Solar Rooftop initiative: A phased-in legal obligation to install solar panels on public, commercial, and new residential buildings by 2029.
<p>Germany</p> 	<ul style="list-style-type: none"> ✓ States are introducing solar PV mandates (Currently, 7 out of 16 states) ✓ Berlin will make the installation of solar PV systems in houses mandatory from January 1, 2023.
<p>U.S. State of California</p> 	<ul style="list-style-type: none"> ✓ 2020: Solar PV mandate for all new low-rise residential buildings in the state. (With the exemption of houses without sufficient sun exposure or roof space) ✓ 2023: this will apply to nearly all new non-residential buildings as well as multi-family housing.
<p>U.S. New York City</p> 	<ul style="list-style-type: none"> ✓ The goal: 70% of state electricity to come from renewable sources by 2030 ✓ 2019: solar PV/green roof mandate, for new buildings and roof renovations

6-1. Public comments

Public comments

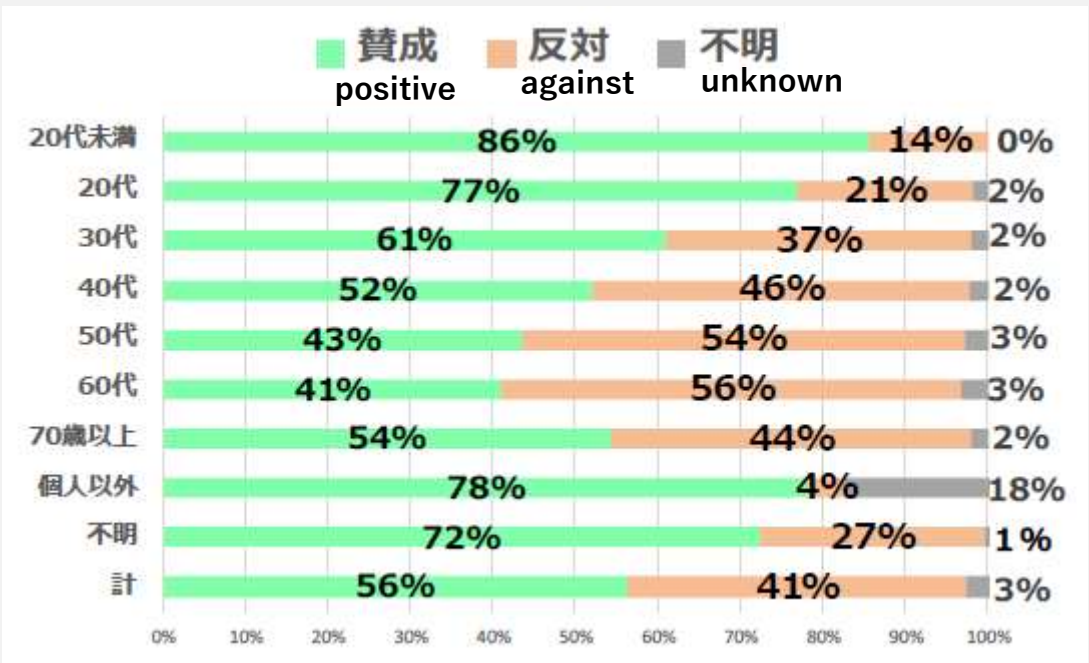
- Called for comments on the revision of the ordinance
- Total 3,779 comments (Individual 3,200 / Business 155 / unknown 424)
- Positive 56%, Against 41%. Positive comments from the young generation

Age range of comments



- Generation more likely to buy a house in the future (20s and younger): 9 %
- Generation most likely to buy a house (30s and 40s): 35%
- Generation over 50s: 38%
- Unknown: 18%

Overview of the comments (by age)



Energy efficiency & Economic efficiency

- ✓ **The costs for installing the photovoltaic appliances, the operation and maintenance fees, disposal/recycling fees, are unclear**
 - Initial costs, operation and maintenance fees, and disposal/recycling fees can be recovered
 - For example, an initial investment of 980 thousand JPY for a 4 kW power generator can be recovered in ten years. (6 years when using existing subsidies)
 - Maximum benefit of 1.19 million yen can be gained through a 30 year period (1.59 million yen when using existing subsidies)

- ✓ **A large burden in addition to the general costs of buying a house**
 - There are several services that allow photovoltaic appliances to be installed without any upfront cost and which will not affect the total construction cost.

Power outage and disaster preparedness

- ✓ **Increasing the number of photovoltaic power generators is important to make Tokyo's housing resilient to disasters**
 - Smartphones, TVs, refrigerators and other home appliances play a critical role in the case of a disaster
 - Photovoltaic appliances that can operate independently in the event of a power failure, can supply electricity that will serve as a lifeline under emergencies.

Installation

- ✓ **Won't photovoltaic power generators harm the environment?**
 - The installation potential of roof-mounted photovoltaic power generators should be exploited to the fullest.
 - Installation should consider roofs at which harm on the environment is minimum.
 - Tokyo, with its many buildings, has great potential for installation of photovoltaic power generators

Disposal/recycling of photovoltaic power generators

✓ Can photovoltaic power generators be recycled?

- Yes, they can. There are several recycling facilities in the metropolitan area.

Safety and security support for Tokyo's residents and businesses

✓ Subsidies, other support measures should not be prioritized over regulation

- TMG has actively offered subsidies but only 20% of newly built homes have photovoltaic power generators installed.
- TMG will create a market where many homes can benefit from solar power generation by making it mandatory to install photovoltaic power generators in new homes.
- TMG's new regulation will facilitate the development of an attractive product line-up in which solar PVs are a standard component.

→The regulation will contribute to carbon neutrality while offering Tokyo citizens an opportunity to purchase disaster resistant, healthy and comfortable housings.

Spreading accurate information and increasing followers

- ✓ **TMG will use various media to: increase the number of followers; establish communication opportunities; and respond accurately to enquiries.**
- ✓ **This will create empathy, attract supporters from both citizens and consumers, and make the system more effective.**
 - TMG's PR magazines and online social media will be used strategically to address a wide range of information, focusing on questions and consultations from citizens and businesses.

Dedicated portals to disseminate information on solar PVs and the institutional system



7-1. Challenges for programme implementation

For Owners and Purchasers

There is much demand for reducing the burden of installing, maintaining, and managing photovoltaic power systems.

Recycling routes for home solar panels are still under development, posing a risk that aging solar panels will not be recycled at the time of removal.

For Housing Suppliers

- Preparations for the development of PV-standardised housing will need to be in place by the start of the programme.
- Businesses already supplying houses with PV systems also need to further advance their proactive efforts.

Raising public awareness

Tokyo residents and businesses have made many inquiries about the new programme.

There are some cases where misleading information about photovoltaic power systems has been provided.

There are requests for information on the maintenance and management of photovoltaic power systems.

For Home Owners and Buyers, etc.

- **Subsidies for zero initial cost schemes**
- **Enhancing subsidy programmes** for the cost of installing solar power generation equipment, etc. . (¥100,000~/kW)
- Facilitating **the recycling of residential solar panels**



For Housing Suppliers, etc.

- **Support for business operators** steadily preparing for the programmes to take effect
- **Incentives for efforts** in advance of programme implementation

Public Awareness, etc.

- Establishing a **general consultation hotline**
- **Raising awareness** of the new programme
- **Support for equipment installers, etc.** according to product lifecycles

Ensure the progression to a sustainable city through decarbonization

- ✓ By strengthening and implementing programmes for large new buildings and existing buildings as well as small and medium-sized new buildings, we will achieve Zero Emission Tokyo and contribute to global carbon neutrality.
- ✓ We would like to work together with each city to achieve our common goals by sharing knowledge and expertise on various climate change measures and exchanging opinions.





Thank you for your attention.

Toward a Zero Emission

Tokyo



TOKYO METROPOLITAN GOVERNMENT
<http://www.kankyo.metro.tokyo.jp/en/index.html>

Supplementary material

Concept of Support measures

For Home Owners and Buyers

Subsidies for zero initial cost schemes

✓ **Support businesses that provide zero upfront cost solar installation services**, such as leasing, power sales, or roof rentals

✓ **Reduce the cost of leasing and other expenses** through a scheme that returns an amount equivalent to the subsidy to the home owner/buyer

Enhance subsidy programs for installation costs of solar power generation equipment, etc.

✓ **Support for initial installation costs and costs for upgrading ancillary equipment.** (¥100,000~/kW)

Residential solar panel recycling

✓ **Pursue efforts to establish a recycling route**

✓ **Reduce the burden involved with recycling solar panels** by providing guidance on recycling at the time of disposal

For Housing Suppliers, etc.

Support for business operators steadily preparing for implementation of the program and incentives for early action

✓ To ensure the implementation of the reporting program, **support the business operators that are preparing for the program's implementation** by improving construction technology in order to supply homes with strong environmental performance and develop systems to provide adequate explanations to buyers, etc.

✓ **Provide further support to business operators that make proactive efforts prior to the program's implementation**, allowing owners and buyers to acquire excellent homes with strong environmental performance

Public Awareness, etc.

General consultation hotline

✓ After launching the hotline, **establish a system that will enable appropriate response**

✓ **Respond to a wide range of inquiries and consultations** regarding the new programs, etc. to **facilitate understanding**

Raise awareness of new programs

✓ **Develop multi-faceted PR for all ages and demographics** by **utilizing a variety of content**

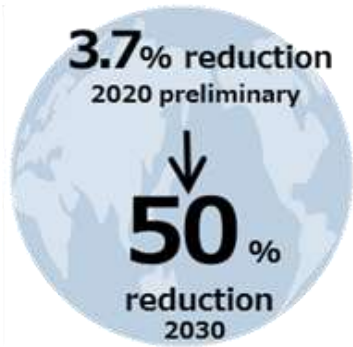
✓ **Promote understanding of the programs by delivering accurate information in an effective and easy-to-understand manner**

Support for equipment installers, etc. according to product lifecycle

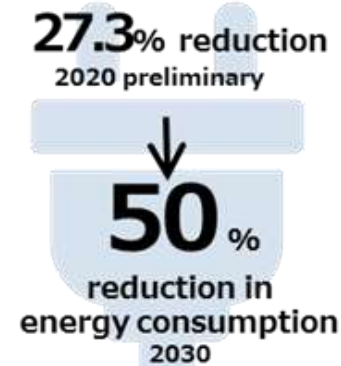
✓ **Promote maintenance and upkeep methods** by holding seminars, etc.

✓ **Raise public awareness about follow-up services after installation** such as day-to-day maintenance and regular inspections

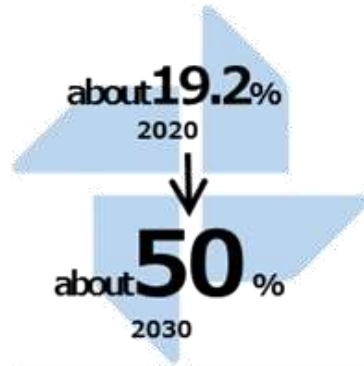
2030 GOALS



▶ **Greenhouse Gas Emissions** ◀
compared by 2020 levels



▶ **Energy Efficiency** ◀
compared by 2020 levels

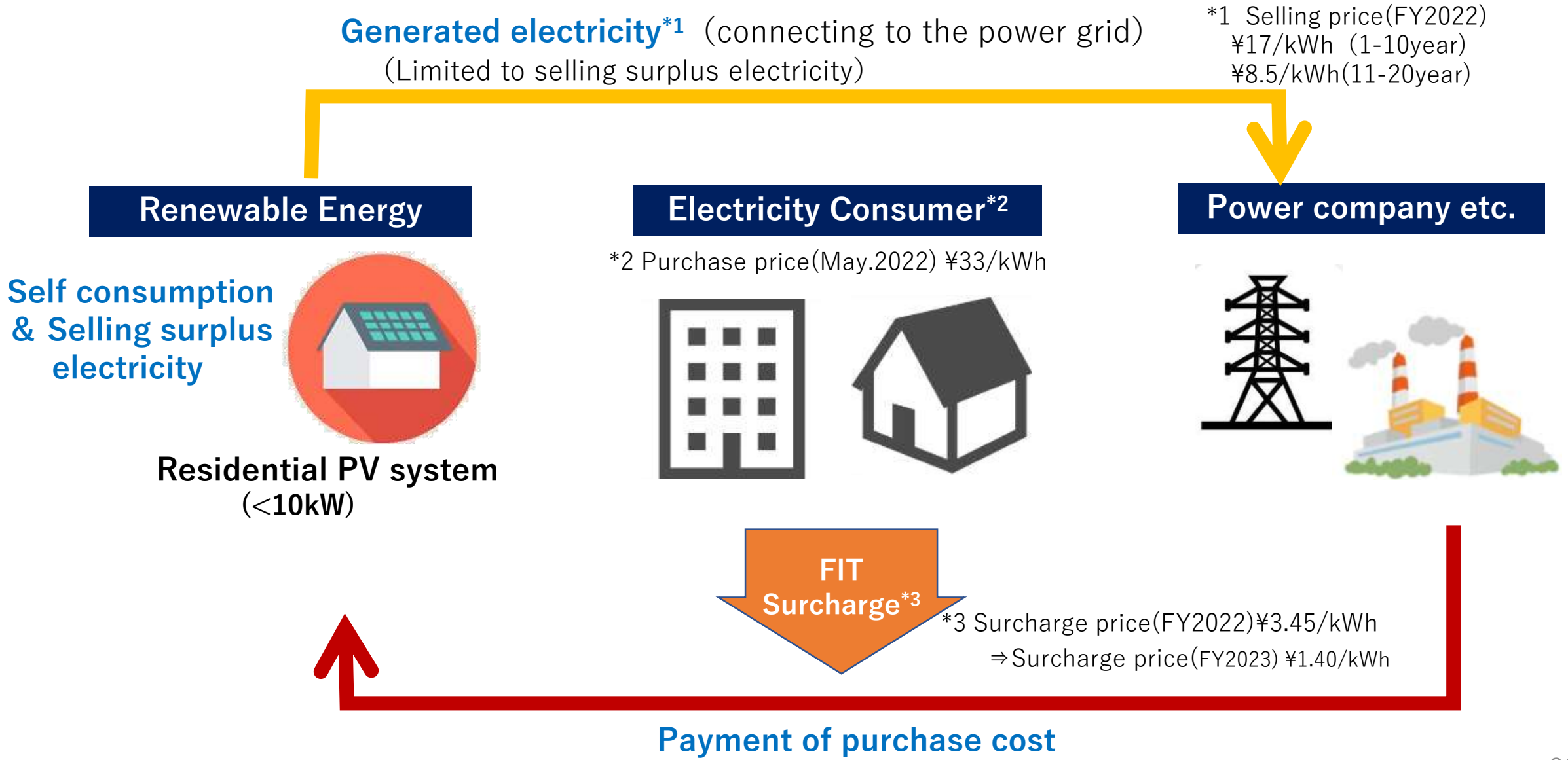


▶ **Renewable Energy Target for Electricity Use** ◀

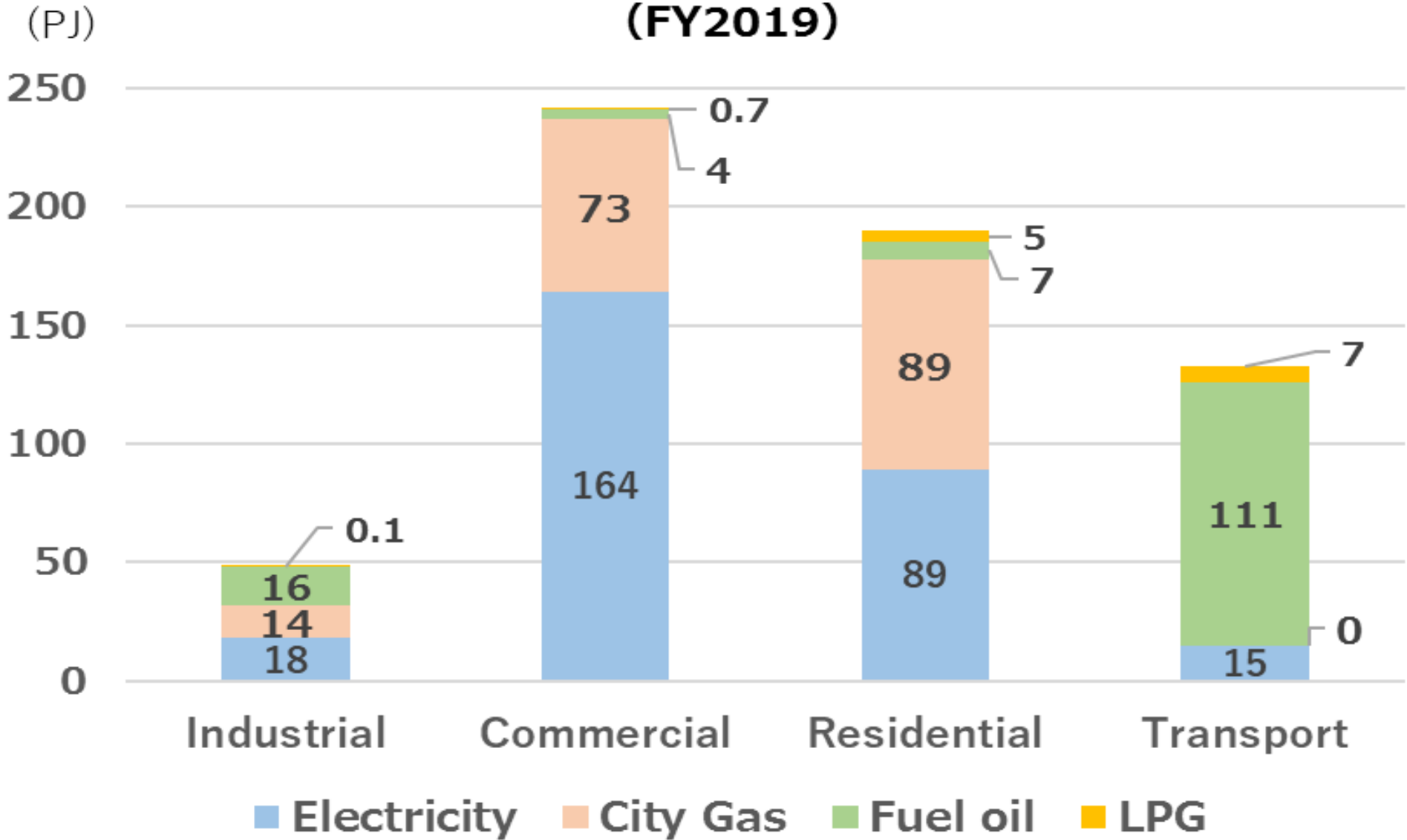


▶ **Renewable power used at TMG facilities** ◀
(Governor's bureaus/departments)

FIT scheme (for Residential PV system)



Final energy consumption by sector in Tokyo (FY2019)



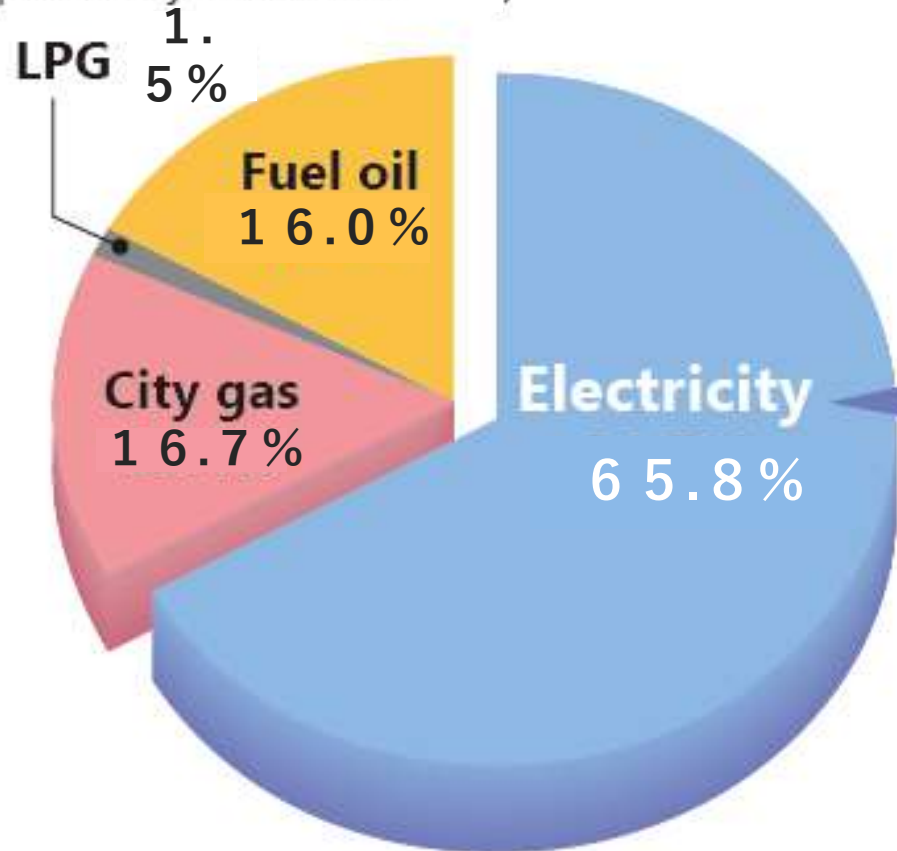
Characteristics of Tokyo : Energy Consumption by Sector

	Final energy consumption (PJ)				Increase rate (%)	
	2000FY	2010FY	2015FY	2020FY	Vs.2000	Vs.2010
Industrial sector	96.5	60.9	45.2	44.8	△53.5%	△26.4%
commercial sector	262.8	278.2	237.8	220.5	△16.1%	△20.7%
Residential sector	185.6	203.2	181.7	204.0	9.9%	0.4%
Transport sector	257.4	171.5	150.1	115.1	△55.3%	△32.9%
Final consumption sectors total	802.2	713.8	625.8	584.4	△27.1%	△18.1%

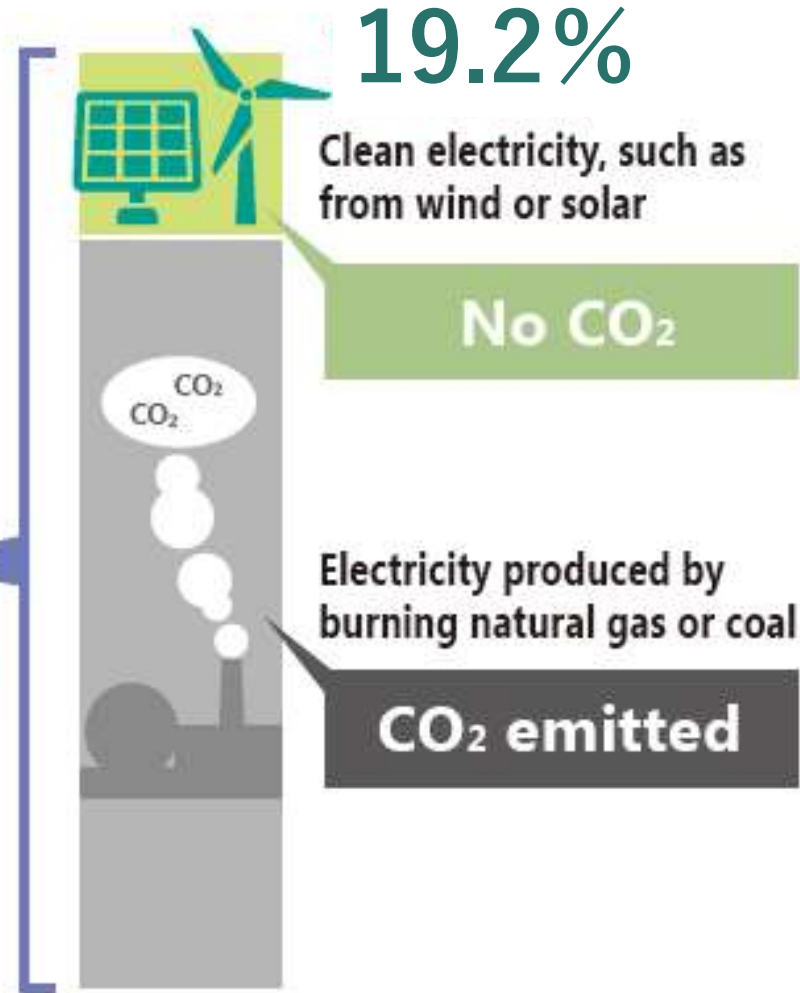
Characteristics of Tokyo

: Energy-Related CO2 Emissions in 2020

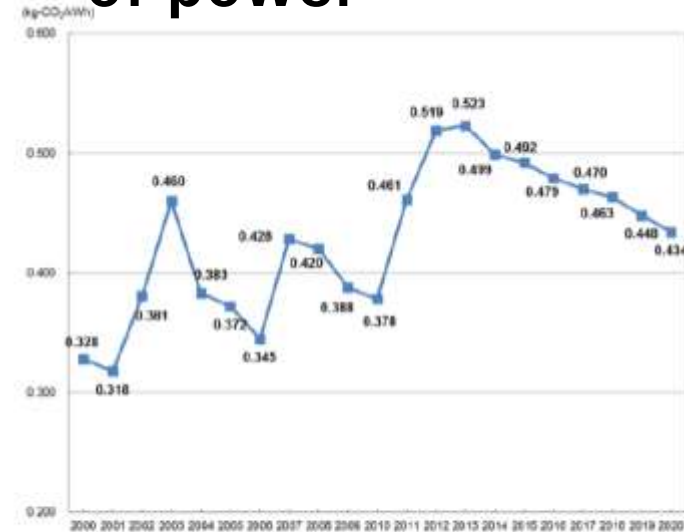
Breakdown of energy-related CO₂ emissions in Tokyo
(preliminary results for FY 2020)



51.05 MT-CO₂ in FY 2020



CO₂ emission factor of power

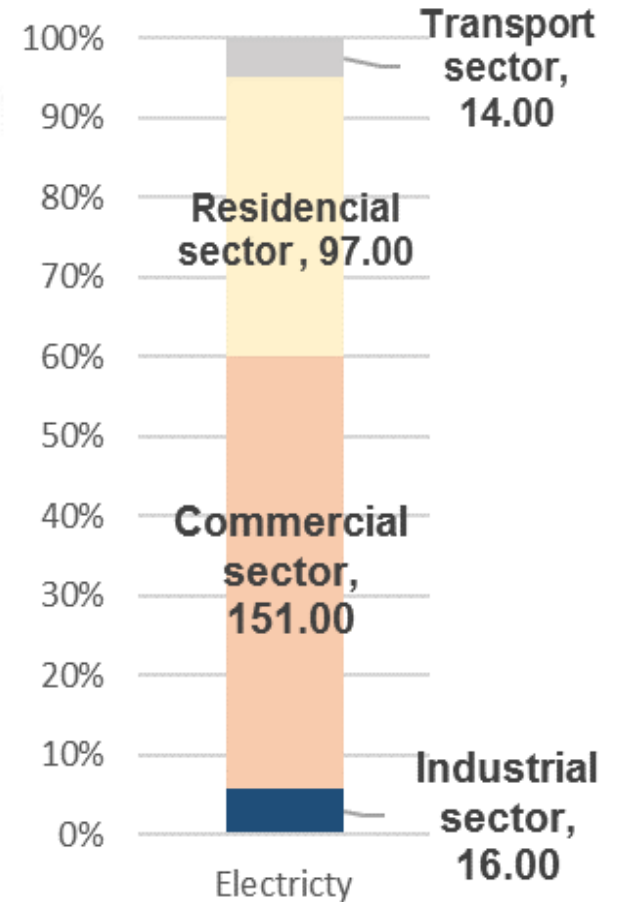
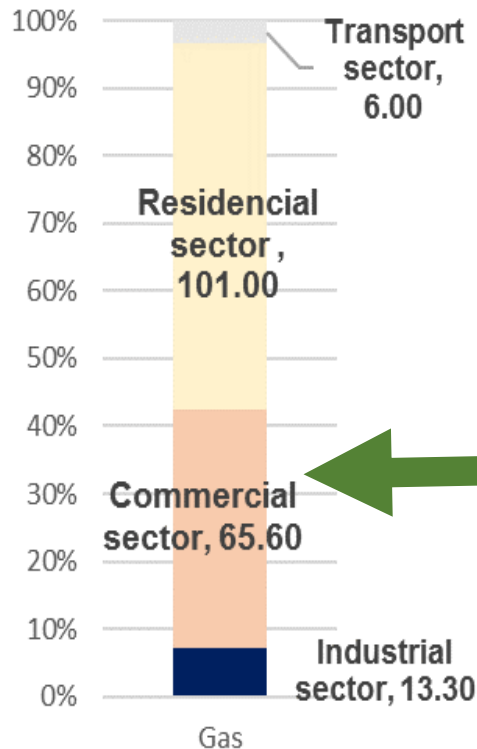
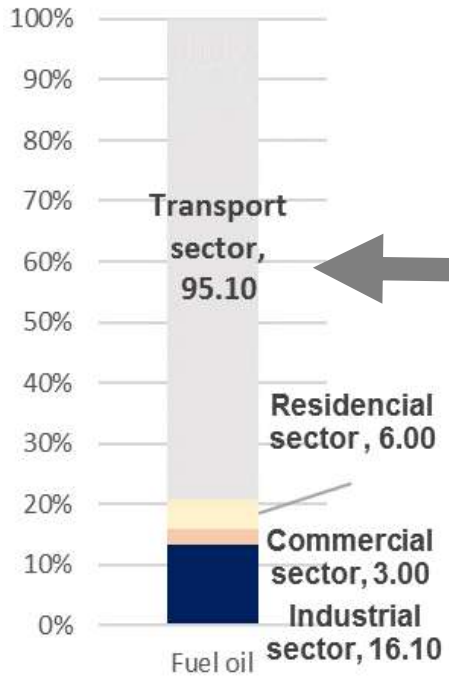
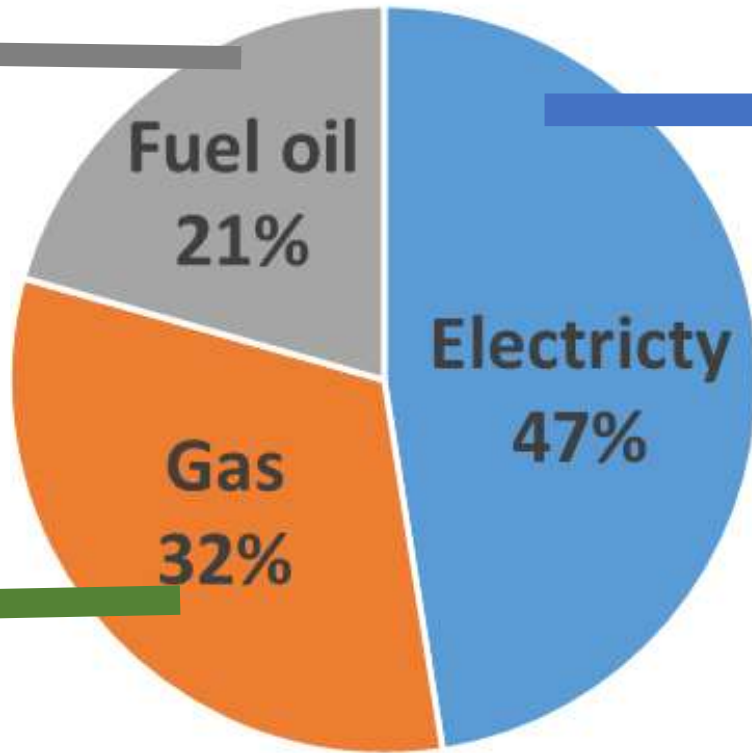


(※) 都内に電力を供給している各電気事業者の二酸化炭素排出係数(実排出係数)及び都内内の電力需に基づき、都で計算した加重平均

Characteristics of Tokyo

: Energy Consumption by fuel type

Total of Energy Consumption by Fuel Type



Characteristics of Tokyo : CO₂ Emissions by Sector

	CO ₂ emissions(Mt-CO ₂)				Increase rate (%)	
	2000FY	2010FY	2015FY	2020FY	Vs.2000	Vs.2010
Industrial sector	6.79	4.55	4.31	3.64	△46.4%	△20.0%
Commercial sector	20.48	24.35	26.43	21.75	6.2%	△10.7%
Residential sector	12.83	15.59	16.63	17.05	32.9%	9.4%
Transport sector	17.65	12.06	11.28	8.60	△51.3%	△28.7%
Energy-related CO₂	57.75	56.56	58.65	51.05	△11.6%	△9.7%
Non-energy-derived CO ₂ emissions	1.2	1.56	1.69	1.77	47.4%	13.6%
Total CO₂ emissions	58.95	58.11	60.34	52.82	△10.4%	△9.1%

Data of Housing in Tokyo

(Housing and Land Statistics Survey)

Number of Households (2020)

Single	Multiple
3,400,000	3,650,000

Number of Housing (2020)

	Detached house	Apartment
Metropolitan Area	2,239,700	814,100
Suburban Area	1,612,500	258,300

Year of build

(dwelling unit)

		Detached house	Apartment
Metropolitan Area	~1980	964,000	2,206,500
	1981~2000	1,156,500	5,073,400
	2001~	1,274,100	5,738,500
Suburban Area	~1980	450,300	688,300
	1981~2000	1,004,900	1,863,800
	2001~	1,119,800	1,422,300