17. Realization of Zero Emission Tokyo

1. Overview

In anticipation of the realization of Zero Emission Tokyo * triggered by the Tokyo 2020 Games, we promote energy-efficient measures, expand the introduction of renewable energy, and accelerate the spread of hydrogen energy.

In order to promote energy-efficient measures, we implement initiatives such as the introduction of LED* lighting at Games-related facilities, support for the introduction of zero-emission vehicles* (hereinafter referred to as ZEV) including electric vehicles (hereinafter referred to as EV*), and the Tokyo Cap-and-Trade Program*.

In order to expand the introduction of renewable energy, in addition to the proactive introduction of solar power generation, geothermal heat pumps*, etc. to metropolitan facilities such as Games-related facilities, we promote it also in the industrial and household sectors.

In order to promote hydrogen energy, we establish hydrogen stations* and expand the introduction of fuel-cell* vehicles (hereinafter referred to as FCV*) and fuel-cell buses.

Furthermore, in the city development of the Olympic and Paralympic Village after the Games, we promote initiatives to realize a city that will become a model for a city leading the world in environmental policies, such as introducing hydrogen as the energy utilized in the city.

2. Legacy in a nutshell

Promoting energy-saving measures will improve energy efficiency, optimize energy utilization, and reduce energy consumption, which will lead to a sustainable economic growth while maintaining comfort in the workplace, the house, etc.

In addition, the utilization ratio of renewable energy, which is environmentally friendly, will increase and it will be utilized as one of the main energies that support urban activities. Furthermore, the dissemination as self-consumed energy will improve disaster prevention capabilities in local communities.

The establishment of infrastructures for supplying hydrogen energy and the spread of FCVs, fuel-cell buses, and other fuel-cell equipment will enable many Tokyo residents to utilize hydrogen energy, which will realize a society with reduced environmental impact.

As a result, countermeasures against global warming will advance, and Zero Emission Tokyo that contributes to the reduction of the global CO_2 emissions to virtually zero will be realized by promoting sustainable use of resources.

Stakeholders	The national government, private companies, bus operators, electric power providers, etc.
Type of legacy	Environment & Sustainability
Geographical scope	Tokyo
Timing scope	Long term
Responsible for implementation	TMG (in collaboration with several private companies)
Source of legacy	Action Plan for 2020, Future Tokyo: Tokyo's Long-Term Strategy
Associated SDGs	7- Affordable and Clean Energy, 9- Industry, Innovation, and Infrastructure, 11- Sustainable Cities and Communities, 12- Responsible Consumption and Production, 13- Climate Action, 17- Partnerships

3. Development

(1) Why

Prior to the decision to host the Tokyo 2020 Games, we have been leading the way in countermeasures against climate change such as the introduction of the Tokyo Cap-and-Trade Program and energy-efficient promotion measures.

In order to ensure sustainable operation of the Games, maximum environmental consideration is required and it is necessary to proactively promote environmental measures. In order for Japan, which is poor in resources, to grow sustainably with taking the Games as an opportunity, it is important to promote energy-efficient measures and expand the utilization of renewable energy, as well as to promote the utilization of hydrogen energy which is a next-generation energy with low carbon that will lead to countermeasures against global warming.

(2) When

FY2010	The " Tokyo Cap-and-Trade Program" started
FY2014	The "Tokyo Strategy Conference for the Realization of Hydrogen Society" was held *Established for the purpose of sharing strategies and fostering the momentum in anticipation of the dissemination of hydrogen energy
	The support for the introduction of FCVs, hydrogen station facilities,

	etc. started
FY2015	The "Tokyo Metropolitan Environmental Master Plan" was formulated *Formulated in order to draw a path for the future to solve the issues that TMG should address, respond flexibly to conversions in values, changes in socio-economic conditions, and technological innovation which can be expected as the awareness of environmental measures increases globally in the future, proactively develop advanced environmental measures, as well as announcing anew the policy development to Tokyo residents
	The "Smart Energy Action Plan of TMG" was formulated *In order to promote further smart energy initiatives of TMG, in addition to the target for reducing greenhouse gas emissions*, targets are set for reducing energy consumption and introducing new renewable energy
	The "Fund for the Promotion of Hydrogen Society / Smart Energy City Development in Tokyo" was established
FY2016	The operation of fuel-cell buses for the metropolitan bus services started
	The "Energy Maintenance Plan in the Olympic and Paralympic Village Area" was released *A summary of the future image of energy in the Olympic and Paralympic Village area, the specific details of the development that can be considered at the time of release, and how to proceed with the initiatives, etc.
FY2018	The support for the dissemination of ZEVs started
	Calls for the realization of "Tokyo Zero Carbon 4 Days in 2020*" and the cooperation in "Carbon Offset for the Tokyo 2020 Games*" started
FY2019	“Zero Emission Tokyo Strategy” was formulated *A summary of the vision to achieve reduction of CO_2 emissions in Tokyo to virtually zero by 2050 and concrete initiatives and the roadmap
FY2020	“Carbon Half” was announced in “The Davos Agenda” *Tokyo Governor announced in The Davos Agenda of the World Economic Forum that Tokyo will reduce greenhouse gas emissions by 50% compared to 2000 levels and raise the percentage of power generated by renewable energy to 50% by 2030
	“Zero Emission Tokyo Strategy 2020 Update & Report” was formulated *In order to accelerate effective initiatives for decarbonization, the “2030 Carbon-Half Style” was newly advocated as a vision of social reform in Tokyo for 2030,

	indicating an approach and direction for reform in various policy areas.
	"Zero Emission TMG Action Plan" was established *In order for TMG to lead initiatives that contribute to the realization of the Zero Emission Tokyo, promotion of ZEVs introduction and the reduction of fluorocarbon use is newly included in the target, in addition to the promotion of energy saving and the use of renewable energy. Targets are set in each of these fields.

(3) Who

TMG (in collaboration with several private companies)

(4) How

① Promotion of energy-efficient measures

A. Promotion of energy-efficient measures in the industrial and business sectors

○ In order to realize "Zero Emission Tokyo" that contributes to the world's net-zero carbon emissions by around 2050, we revised the major policy programs related to countermeasures against climate change based on the Tokyo Environmental Security Ordinance (the Tokyo Cap-and-Trade Program, the Carbon Reduction Reporting Program*, and the Green Building Program*), so as to strengthen "further energy-efficiency activities" and "expansion of renewable energy utilization" in new and existing buildings.

○ In order to realize "Tokyo Carbon 4 Days in 2020", which aims to achieve zero CO_2 emissions in Tokyo for a total of four days during the opening and closing ceremonies of the Games, we implement carbon offset through the CO_2 reduction credit* offered by the target business operators of the C&T system. At the same time, we cooperate with the carbon offset initiatives in the Tokyo 2020 Games.

<Amount of CO_2 reduction credit offered in the carbon offset program related to the Tokyo 2020 Games>

No. of business operator cooperated: 153
Amount offered: 4,188,815t – CO_2
Achievement of "Tokyo Carbon 4 Days in Tokyo": 720,000t – CO_2
Tokyo 2020 Games' cooperation with carbon offset: 3,468,815t – CO_2

○ Regarding the Tokyo Cap-and-Trade Program targeting large facilities, we assist all facilities under this program to fulfill their reduction obligations by hosting forums that introduce examples of good practices, providing technical advice on energy-efficiency by experts, holding seminars on emission trading, etc.

○ For small and medium-scale business facilities that account for approximately 60% of CO_2 emissions in the commercial and industrial sectors in Tokyo, through the operation of the "Carbon Reduction Reporting Program", we promote the grasping of CO_2 emissions and support the implementation of specific energy-efficient measures.

○ We promote initiatives such as conducting energy-efficient diagnoses at individual business establishments, holding workshops in collaboration with municipalities and industry groups, and utilizing consultation desks, and we establish energy-efficient measures led by the private sector by introducing ESCO* operators with know-how in energy-efficient operations, etc.

○ Through the operation of the carbon report* system that shows the energy-efficient level of buildings in an easy-to-understand manner utilizing low-carbon benchmarks*, we support the energy-efficient initiatives at small and medium-scale tenant buildings, etc. in the business sector. In addition, in cooperation with industry groups, etc., we promote the diffusion of carbon reports and enhance the evaluation of low-carbon buildings in the real estate market.

○ For building owners of small and medium-scale business establishments, we clarify the merits of reducing energy costs by implementing energy-efficient tuning*, which is an optimization method for facilities, and raise awareness of optimization methods for facilities.

○ In order to improve the energy-efficient performance of buildings, we restructure the Green Building Program with incorporating the concept of ZEBs*, so as to promote the dissemination of energy-efficient buildings.

○ We support the introduction of a commercial cogeneration system (CGS)* that can supply energy even in the event of a power outage, and promote the development of the infrastructures necessary for energy interchange among buildings with different heat and electricity demand patterns, such as office buildings and commercial facilities.

○ With regard to HFCs* emissions, in order to ensure thorough leakage control from commercial refrigeration / air-conditioning equipment and appropriate

recovery processing, we publicize the Act on Rational Use and Proper Management of Fluorocarbons and strengthen on-site inspections and giving instructions of business operators and building demolition sites, while providing subsidies for small and medium enterprises that intend to introduce energy-efficient non-fluorocarbons equipment.

○ In consideration of a rise in importance of ventilation in business activities, we promote assistance for SMEs that own or use small and medium-sized offices to introduce ventilation and air-conditioning facilities.

B. Promotion of energy-efficient measures in the household sector

○ We subsidize a part of costs to install storage battery systems with the aim of self-supply of electricity and enhancing disaster preparedness using solar power generation systems at home.

○ In order to disseminate windows and doors with high thermal insulation performance, which is one of the characteristics of eco-houses, we support the upgrading to highly insulated windows and doors in the existing houses.

○ In order to disseminate houses with improved environmental performance, we subsidize the expenses for newly built houses to meet the standards of the Tokyo Zero Emission House*.

○ For household appliances, etc., which account for a large percentage of energy consumption, we promote replacement with home appliances, etc. with improved energy saving performances by giving Tokyo Zero Emission Points that can be exchanged with gift certificates the discount tickets for LED lighting products and provide advice on energy saving, thereby promoting initiatives to achieve zero emission at home. With Tradable Green Certificates of about 55 million kWh generated with these efforts, including replacement with energy-efficient household appliances, we use renewable energy at competition venues of the Games.

○ In addition to disseminating information using the energy map that shows the energy characteristics of local communities, we utilize the city development methods such as the "Various Urban Development Schemes *" to promote more efficient utilization of energy in each area and district.

○ We support the initiatives on energy-efficient measures implemented by municipalities according to their regional characteristics.

○ We promote dissemination and enlightenment in order to spread sympathies and actions for the initiatives of "Team Mottainai*" to encourage individual

behavioral change.

C. Promotion of energy-efficient measures in the transportation sector

○ We conducted surveys to examine measures for expanding the introduction of ZEVs.

○ We significantly increase the amount of subsidy for the purchase of ZEVs and electric motorcycles for individuals and companies and expand the number of those vehicles. We also increase the subsidy for ZEV purchasers in cooperation with the Japanese government to diffuse ZEVs quickly.

○ We conduct research and considerations of zero emission coaches and cargo vehicles, which have not reached the full-scale commercial production stage, and support introduction of community-based bus services for residents.

○ In order to promote the diffusion of ZEVs and electric motorcycles, we held symposiums for business use, and carried out surveys and examinations regarding the dissemination and enlightenment utilizing large-scale events that could attract many people.

○ For business operators using a certain number or more of automobiles, we establish a system to encourage the introduction of ZEVs through environmental management plans of automobiles and through the mandatory system for introducing low-pollution, fuel-saving vehicles.

○ We support research and development conducted by startups in collaboration with large companies, etc., and promote technologies that lead to ZEV development.

○ We subsidize costs to buy ZEVs for rental and car sharing services. We create movement for ZEV promotion by organizing world-class car races of ZEVs.

○ We subsidize purchase of used ZEVs that can be used at the time of disaster in the Tokyo islands.

○ In order to improve convenience of electric motorcycles, we support establishing an environment in in which used batteries can be replaced with fully charged batteries.

○ We support installation of battery charging facilities to commercial facilities, accommodations, etc., in addition to apartments, offices and factories. Also, we introduce a new subsidy system of basic electricity charges to reduce burden of cost increases by a shift to the supply of high-voltage power in relation to the installation of super-fast chargers. In addition, for apartments, we provide support including advice on consensus building with the

management association with regard to the introduction of the facilities.

○ We encourage the installation of battery chargers by introducing an evaluation system of battery charger installation at the construction of buildings of a certain scale or larger.

○ With the revised fire prevention ordinance, we clarify the standards and promote the diffusion of high-output super-fast battery chargers.

○ We provide subsidies for external power supply equipment for EVs and PHVs*.

○ We provide subsidies to the purchase of small electric buses to be introduced to the community bus services, whose demand has been increasing with the growth of the elderly population.

○ In order to disseminate EVs in the Islands area, we conduct surveys on the usability, etc. of EVs for islanders in the form of monitoring lending, and reflect the survey results in measures to promote the dissemination in the future.

○ We include the installation costs of battery charging facilities for public use for business operators and municipalities to the scope covered by the subsidy system, in addition to the equipment purchase costs. In addition, we provide subsidies of three-year maintenance and management costs for super-fast battery chargers.

○ We support the introduction of low-pollution and fuel-efficient hybrid trucks and buses for small and medium transport operators, etc.

○ We support the introduction of universal design taxis* equipped with a wheelchair accessible ramp or lift with high environmental performance.

<Image of the universal design taxi>[1]

○ We prepare training curriculums for the purpose of raising awareness that leads to the practice of eco-driving by business operators and support the initiatives of business operators, as well as promote enlightenment activities in cooperation with related organizations for general drivers.

○ The "Freight Company Fuel efficiency Assessment Program*", which evaluates the efforts of freight transporters to reduce CO_2 emissions, we

[1] Toyota Motor Corporation website
https://toyota.jp/jpntaxi/interior/space/?padid=ag341_from_jpntaxi_wheelchair_detail_interior_space_wheelchair_thumb#

encourage energy-efficient activities in the logistics sector, and promote the centralization of collection and delivery, the implementation of efficient logistics measures, etc. in the vicinity of large-scale offices and in downtown areas and shopping areas, etc.

○ At Tokyo Port, we reduce the energy consumption in the harbor area by promoting modal shifts* through barge transportation, etc.

○ We collaborated on demonstration experiments of parallel hybrid small ships* powered by both an electric power and engine, utilized them for operations, services, inspections, etc., and provided operation data to manufacturers, thereby contributing to the verification and dissemination of the technology for environmentally friendly small ships.

D. Promotion of energy-efficient measures at metropolitan facilities, etc.

○ We promote energy-efficient measures for metropolitan facilities based on the "Zero Emission TMG Action Plan".

○ We ensure that vehicles owned by TMG (excluding special-purpose vehicles) are replaced with ZEVs at the time of renewal. We will achieve a goal to replace all passenger vehicles of TMG with non-gasoline vehicles by the end of fiscal year 2024, and all motorcycles by the end of fiscal year 2029.

○ To prepare for emergency situations, we will arrange external power supply systems for metropolitan buses and vehicles owned by TMG to enable power supply from ZEVs (FC buses and EVs) to external users.

<Image of external power supply>[2]

【Photo】Toyota Motor Corporation

○ We utilize FC buses for metropolitan buses and implement surveys and discussions to introduce electric buses.

○ We take a lead in introducing battery chargers to metropolitan facilities to TMG offices and parks visited by many Tokyo residents.

○ We partially introduce EV ambulances and utilize them for "Daytime Ambulance Services".

○ With the establishment of the "First Aid Team" utilizing small EVs that are highly mobile and environmentally friendly, we shorten the arrival time at disaster sites in narrow road areas that cannot be entered by the existing fire-fighting vehicles, and strengthen response capabilities to diverse demands for

[2] Future Tokyo: Tokyo's Long-Term Strategic Vision (TMG)

fire-fighting.

○ In the water supply and sewerage business, we promote further energy-efficient initiatives in the processes such as purification, transmission, distribution, and sewage treatment process, based on the “Bureau of Waterworks, Tokyo Metropolitan Government Environmental Five-Year Plan 2020-2024” and "Smart Plan 2014", a basic energy plan for sewerage operations.

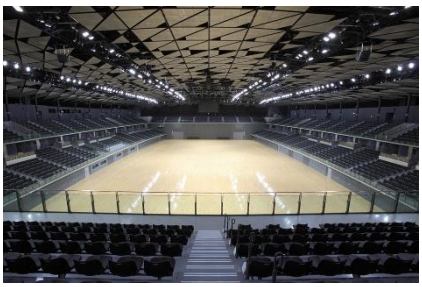
○ In the sewerage business, we establish a system for storing sanitary sewage in trunk sewers, etc. to adjust the amount of water flowing into the water reclamation centers, thereby contributing to power peak shift* and power supply / demand adjustment (demand response*).

E. Initiatives for introducing LED lighting

<Initiatives at metropolitan facilities, etc.>

○ In the existing metropolitan facilities, we introduce LED lighting for lighting equipment with a long usage time on which high energy-efficient effects can be expected and places which citizens have many opportunities to visit. We introduce LED lighting for facilities that are planned to be newly constructed, reconstructed, and renovated in a large scale, and places that have a direct impact on the services for Tokyo residents, in conjunction with new construction and renewal.

<Musashino Forest Sport Plaza, Tokyo Stadium>[3]
(introduction of LED lighting complete)



○ We announce the introduction status of LED lighting in metropolitan facilities.

○ We introduced LED lighting in the metropolitan competition facilities related to the Tokyo 2020 Games.

○ We sequentially convert the lighting on roads and in parks managed by TMG to LEDs in conjunction with new construction, widening, renewal, etc. of the roads.

○ For lighting in common areas, etc. of metropolitan housing, we introduce LED lighting fixtures in conjunction with rebuilding, and we systematically implement update to LED lighting fixtures for the existing housing.

○ We proactively introduce LED lighting in places which citizens have many opportunities to visit, for signposts at bus stops, roof lighting, etc.

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[3] Musashino Forest Sport Plaza, Tokyo Stadium website: https://musamori-plaza.com/facility/mainarena.php

<Initiatives in the industrial and household sectors>

○ In addition to investigating the diffusion status of LED lighting in buildings, factories, etc., we encourage business operators to convert to LED lighting through the operation of the Tokyo Cap-and-Trade Program for large-scale business establishments and the Carbon Reduction Reporting Program for small and medium-scale business establishments.

○ We promote the introduction of LED lighting through green leases*, etc., in which the owners of small and medium-scale tenant buildings and tenants work together to implement energy-efficient measures.

○ We provide technical support for the conversion to LED lighting for small and medium-scale business establishments in municipalities, including facilities in the municipalities, through energy-efficient workshops in cooperation with the municipalities.

○ We investigate the diffusion status of LED lighting in the house and implement public relations utilizing environmental events, etc., so as to foster a momentum for the diffusion of LED lighting.

○ We provide support for projects to diffuse household LED lighting implemented by municipalities.

② Expansion of the introduction of renewable energy

A. Promotion of the introduction to metropolitan facilities

○ We promote the introduction of renewable energy based on the "Zero Emission TMG Action Plan".

○ We implement visualization projects by introducing new technologies regarding renewable energy (for example, solar roads*, vibration power generation*) at metropolitan facilities.

○ Aiming to achieve 100% use of renewable energy for electricity used at metropolitan facilities, we implement the “TMG Buildings Electricity Plan” to verify challenges for the future and utilize post-FIT (Feed-in Tarriff)* renewable energy, including electricity, produced in Tokyo at municipal facilities.

○ In developing the competition facilities, we proactively introduced solar power generation, geothermal heat pumps, etc. that lead to the reduction of CO_2 emissions.

○ We utilize the "Geothermal Heat Potential Map*" that provides an easy-to-understand guideline for the amount of geothermal heat that can be collected

in Tokyo to promote the introduction of geothermal heat in public facilities, etc.

○ In addition to the installation of solar power generation equipment on the rooftops of metropolitan housing, etc., we promote the installation of mega solar* equipment at sewerage facilities.

○ By focusing on energy sources suitable for business characteristics, we expand the utilization of renewable energy such as the small hydropower generation* taking advantage of the difference in height of pipes and waterways in water and sewage facilities, the conversion of pruned branches and leaves in parks to fuel, and the utilization of sewage thermal energy for air conditioning.

○ In addition to promoting energy-efficient measures, in order to further expand the utilization of renewable energy, we systematically introduce the "energy self-contained incineration system", which generates electricity from the waste heat of the incinerator produced in the incineration treatment process of sewage sludge and supplies the electricity necessary for the operation of the incinerator.

B. Promotion of the introduction to houses, business establishments, etc.

○ We promote a self-generation model of power use to reduce CO_2 emissions at home and businesses to zero by providing subsidies for the purchase of equipment to utilize renewable energy, such as solar power, solar heat and geothermal power, geothermal power, and for storage batteries.

<Solar power generation equipment>[4]

○ In order to help homeowners install solar power generation equipment that requires no initial costs and no maintenance, we provide subsidies for installation and management operators, and promote the dissemination of solar energy systems with low carbon that can be utilized even as an emergency power source.

○ We utilize the know-how accumulated in the model projects for supplying renewable energy-derived electricity implemented by the Tokyo Environmental Public Service Corporation (hereinafter referred to as the "Environmental Public Service Corporation") to expand anew the supply

[4] Towards 2020 –Building the Legacy –(TMG)

destination targeting metropolitan facilities, etc. Furthermore, we raise awareness for enhancing the recognition of renewable energy-derived electricity and promoting the expansion of supply.

○ For business operators, we support the introduction of self-consumed renewable energy that contributes to the improvement of disaster prevention capabilities in local communities, independent of the FIT.

○ In order to examine new measures for further introduction and expansion of renewable energy, we carried out surveys on the installation status of solar power generation facilities.

○ Based on the liberalization of electricity retailing, etc., in order to enable Tokyo residents and business operators to select electricity by paying attention to the environmental performance, we utilize the Environment Energy Reporting Program* and promote the utilization of renewable energy-derived electricity through "visualization" of the utilization rate of renewable energy for each electric power supplier, etc.

○ Together with the companies in Tokyo participating in the “RE Action” program taking initiatives in the diffusing and utilizing of 100% renewable energy, we develop movements to expand the use of renewable energy including the support for matching of businesses selling renewable energies and other businesses.

○ We promote self-consumption of renewable energy, while promoting initiatives to achieve energy sharing mainly of electricity produced from renewable energy throughout the area utilizing the VPP* system to remotely optimize the management of the facilities.

○ In order to expand the utilization of renewable energy-derived electricity by Tokyo residents, we establish a mechanism for purchasing electricity in groups and develop a new business model to encourage selection behavior.

○ We work to expand the use of renewable energy by providing subsidies for purchasing electricity from power generation facilities using renewable energy built outside Tokyo and for the introduction of renewable energy facilities for self-consumption.

C. Promotion of the introduction to the Tokyo islands

○ We support initiatives to promote the utilization of renewable energy according to local characteristics of municipalities in the Tokyo islands, and promote the dissemination and expansion of low-carbon self-distributed

energy.

○ We support initiatives to expand the utilization of geothermal power generation* in Hachijojima, which is rich in geothermal resources.

○ We promote initiatives to realize the Zero Emissions Island* to fully cover the electricity consumed in the island with renewable energy through a demonstration project to supply electricity produced from 100% renewable energy in Hahajima.

D. Promotion of the introduction through awareness raising and information dissemination

○ We promote the introduction of solar power generation systems and solar heat utilization systems in buildings through information dissemination with the help of the "Tokyo Rooftop Solar Register*".

○ With the aim to expand the utilization of renewable energy taking advantage of the characteristics of Tokyo, we assist railway companies, etc. to introduce solar panels, etc. to the platform roofs of the station buildings, so that they can make an appeal to Tokyo residents and tourists as an environmentally friendly station model.

○ We promote the realization of Zero Emission Tokyo by supporting startup companies to collaborate with large companies and their technology development.

○ To make Tokyo a base where world-class wisdom, technologies and funds for ESG accumulate, we realize the Tokyo Green Finance Initiative to collect funds for ESG both from within and outside Japan, and establish Tokyo's presence as one of global major markets of green finance.

③ Dissemination of hydrogen energy

A. Promotion of the establishment of hydrogen stations

○ We support the establishment and operation of hydrogen stations necessary for expanding the introduction of FCVs. In addition, we support the establishment of hydrogen stations that are suitable for fuel-cell buses.

○ In preparation for the addition of hydrogen stations to the existing gas stations, we

<Hydrogen station using municipal site>[5]
(Dr. Drive Self Shiomi Koen self gas station)

©JXTG Energy

[5] ZEV diffusion program (TMG)

support small and medium-sized gas station operators by providing information necessary for the establishment of hydrogen stations, holding seminars to acquire the technical skills necessary for operation, etc.

○ We support turning existing gas stations into environmentally-friendly multi energy stations by adding a hydrogen station, installing super-fast chargers, and the introduction of ZEV rental cars and car sharing services.

○ In the city development of the Olympic and Paralympic Village after the Games, we promote initiatives to realize a city that become a model for an environmentally-advanced cities, such as introducing hydrogen as the energy utilized in the city.

○ We promote city planning using 100% clean energy, mainly renewable energy and hydrogen, in the bay area making use of green technologies.

B. Dissemination of fuel-cell vehicles, buses, etc.

○ We support the introduction of FCVs for corporations and individuals in Tokyo, as well as support the proactive introduction to vehicles owned by TMG and the introduction in municipalities.

<Fuel-cell bus>[6]

○ In order to accelerate the diffusion of fuel-cell buses, we provide subsidies to purchase the buses and fuel costs.

○ We proactively introduce fuel-cell buses to the metropolitan bus services and promote the dissemination of fuel-cell buses even on the bus services running around Haneda Airport, etc.

○ We work to introduce fuel-cell buses to the BRT* that connects the center of Tokyo and the waterfront city.

○ We collaborate with universities and ward offices to develop vehicles tailored to the needs of the urban areas and test operation of fuel-cell garbage trucks on the garbage collection routes. Also, we conduct data analysis, aiming to diffuse fuel-cell garbage trucks in the future.

< Fuel-cell garbage trucks >[7]

○ We provide subsidies to install fuel cells at home to promote their diffusion, aiming to reduce energy consumption at home and enhance resilience in case

[6] Towards 2020 –Building the Legacy – (TMG)

[7] Future Tokyo: Tokyo's Long-Term Strategy (TMG)

of emergencies.

○ We provide subsidies to install fuel cells for business or industrial applications to business operators, in order to accelerate decarbonation and resilience enhancement in offices.

○ In order to realize social implementation of FC mobility for commercial use at an early date, we consider demonstraton projects for the operation of FC trucks and FC falklifts.

○ Taking the opportunity of the Tokyo Hydrogen Initiative to meet with companies developing hydrogen business on a global scale, we promote collaboration among companies to develop the needs for hydrogen for business and industrial applications in the National Capital Region, such as commercial vehicles and electricity, and further advance social implementation of hydrogen technologies.

C. Awareness raising for a wide range of Tokyo residents

○ To make hydrogen an important legacy for the next generation in the shift from fossil fuels to decarbonized energy, we promote the use of hydrogen by using hydrogen for the first time as a fuel for the Olympic cauldron and the torch for the Tokyo 2020 Torch Relay.

○ Regarding the characteristics and safe use of hydrogen, etc., we implement dissemination activities through utilization of the hydrogen information center "Tokyo Hydrogen Museum", which is a base for transmitting hydrogen energy information, and holding events and seminars for general citizens.

○ We promote education to learn about hydrogen, which is expected to be one of the main energies in the future, for children who are responsible for the next generation of society, and implement effective public awareness using media such as SNSs* and pamphlets for Tokyo residents who are not familiar with hydrogen.

○ In order to create a movement toward the dissemination of hydrogen energy, we share information on advanced technologies by the “Tokyo Hydrogen Promotion Team” established through industry-academia-government collaboration and transmitting information by holding relevant events.

○ In cooperation with companies and organizations, we supply electricity using fuel cells at events, etc., so as to visualize the utilization of hydrogen energy.

○ We work to promote understanding of hydrogen by widely transmitting advantages of hydrogen by organizing FCV race events in the future.

○ We establish the “Tokyo Hydrogen Vision (tentative name)” to make CO_2-free hydrogen* as the pillar for realizing decarbonized society in 2050, with the aim of accelerating efforts to realize a hydrogen society in the National Capital Region.

○ We establish an incentive scheme for hydrogen-powered ships, which are expected to be zero-emission ships, and support their launch into operation at an early date.

D. Promotion of utilization of CO_2-free hydrogen

○ We strengthen the think tank functions of the Tokyo Metropolitan Research Institute for Environmental Protection under the Environmental Public Service Corporation which contributes to the solution of diversified and complex needs in the administration of Tokyo such as research on CO_2-free hydrogen*.

○ For the diffusion of renewable energy-oriented CO_2-free hydrogen, we promote the expansion of its use in Tokyo through research and demonstration projects for the utilization of hydrogen.

○ Based on the agreement concerning the research and development of CO2-free hydrogen among the four parties consisting of Fukushima Prefecture, the National Institute of Advanced Industrial Science and Technology, TMG, and the Environmental Public Service Corporation, we promote the utilization of CO2-free hydrogen produced in Fukushima Prefecture in Tokyo during the Games.

○ In cooperation with the national government, etc., we implement initiatives to promote the utilization of CO_2-free hydrogen produced in Fukushima Prefecture, such as information transmission and dissemination at events in Tokyo, etc.

○ We conduct investigation and research on city planning utilizing hydrogen electricity storage systems* using renewable energy and promote new energy management* regarding electricity, heat, etc. of hydrogen electricity storage systems using CO_2-free hydrogen.

○ In preparation for the era in which renewable energy is used intensively, we promote initiatives introducing advanced technologies such as hydrogen stations using renewable energy that are effective for long-term and large-scale storage of surplus power.

○ For the promotion of renewable energy-oriented hydrogen, we support

business operators to introduce facilities that use renewable energy-based hydrogen.

(5) Benefits

The following achievements will expand the promotion of energy-efficiency, the introduction of renewable energy, and the utilization of hydrogen energy, reduce CO_2 emissions, and realize a city which can contribute to countermeasures against global warming. Furthermore, it will be possible to realize a society with disaster prevention capabilities that can maintain a stable supply of energy as self-distributed energy, which will continue to maintain comfort while suppressing energy consumption.

○ LED lighting will be installed in many metropolitan facilities, including the metropolitan competition facilities for the Games.
○ The energy consumption in Tokyo will decrease.
○ The "Tokyo Zero Emission House", a standard for housing with environmental performance that takes into consideration the regional characteristics of Tokyo, will be established.
○ The greenhouse gas emissions in Tokyo will decrease.
○ Next-generation vehicles with high environmental performance will become popular.
○ The sales ratio of non-gasoline vehicles including ZEVs in new passenger cars will increase.
○ The introduction of universal design taxis with high environmental performance will expand.
○ The proportion of utilization of renewable energy-derived electricity will increase.
○ Solar power generation will be widely introduced in Tokyo.
○ The number of sites where hydrogen stations are installed will increase, and FCVs and fuel-cell buses will become popular.

4. Facts and figures

① Promotion of energy-efficient measures	
Diffusion rate of LED lighting at metropolitan facilities (introduction of LED	Reflected in the design and construction of each facility at new permanent venues and existing facilities (11 facilities completed)

lighting at the metropolitan competition facilities of the Tokyo 2020 Games)	
Energy consumption in Tokyo	25.4% reduction (compared to FY2000) (preliminary figures for FY2019) [Reference] 21.1% reduction (from FY2000) (in FY2015)
Establishment of "Tokyo Zero Emission House", a standard for housing with environmental performance that takes into account the regional characteristics of Tokyo	Diffusion of the specifications of "Tokyo Zero Emission House" (Design confirmation review: implemented to 818 cases Subsidies determined to be provided to: 434 houses)
Greenhouse gas emissions in Tokyo	0.2% reduction (compared to FY2000) (preliminary figures for FY2019) [Reference] 6.6% increase (from FY2000) (in FY2015)
Diffusion rate of next-generation vehicles, etc. (HV, PHV, EV, FCV) (passenger cars)	20.1% (in FY2018) [Reference] 14% (in FY2015)
Diffusion rate of next-generation vehicles, etc. (HV, PHV, EV, FCV) (freight vehicles)	0.6% (in FY2018) [Reference] 0.4% (in FY2015)
Ratio of ZEVs (EVs, PHVs, FCVs) and other non-gasoline vehicles to new	39.5% (in FY2019)

passenger car sales	
Introduction of universal design taxi with high environmental performance	Assistance results: 9,044 units in total
② Expansion of the introduction of renewable energy	
Ratio of electricity utilization for which renewable energy accounts	17.3% (in FY2019) [Reference] 11.1% (in FY2015)
Installation volume of solar power generation facilities in Tokyo	610,000 kW (in FY2019) [Reference] 460,000 kW (in FY2015)
Introduction of solar power generation to metropolitan facilities	Approx. 25,000 kW (in FY2019) [Reference] Approx. 13,700 kW (in FY2015)
③ Diffusion of hydrogen energy	
Number of installation locations of hydrogen stations	Number of installation locations: 21 places in total (at the end of FY2020)
Number of fuel-cell vehicles diffused	Number of vehicles owned: 1,097 units in total
Number of fuel-cell buses diffused	85 units in total (at the end of FY2020)

(Items in the table are achievements to March 2020 unless otherwise noted)

5. Explanation of Terms

LED	An abbreviation for Light Emitting Diode. Compared to incandescent and fluorescent lamps, it has advantages such as long life, power saving and compactness
EV	An abbreviation for Electric Vehicle. A car that is equipped with a motor and control device (inverter, etc.) instead of an engine and uses electricity charged in the battery instead of

	gasoline
Zero-emission vehicle (ZEV)	Electric vehicles (EV) , plug in hybrid vehicles (PHV) and fuel-cell vehicles (FCV) that do not emit exhaust gas such as carbon dioxide when traveling
Tokyo Cap-and-Trade Program (C&T Program)	A system that establishes an upper limit for greenhouse gas emissions at individual business establishments, etc., guarantees secure implementation of emission reductions, and allows transfer or acquisition of the excess or deficiency through emissions trading
Geothermal heat	Energy that utilizes the thermal characteristics of the ground where temperature changes between daytime and nighttime or among the seasons are small.
Hydrogen station	A facility for supplying hydrogen to fuel cell vehicles. This includes an off-site type that stores hydrogen transported from outside in the hydrogen station, and an on-site type that reforms city gas, etc. to produce hydrogen in the station
Fuel cell	A system that generates electricity by reacting hydrogen with oxygen in the air to directly produce electricity. Only water is discharged at the stage of use
FCV	An abbreviation for Fuel-cell Vehicle. A car that runs by rotating a motor with electricity generated through a chemical reaction between hydrogen and oxygen
Greenhouse gas emissions	The total amount of 7 types of gases, such as carbon dioxide, methane, and dinitrogen monoxide, emitted in line with human activities, which is converted to the amount of carbon dioxide
Smart energy city	A vision of the future of urban energy use that will realize simultaneously three targets such as low carbon, comfort, and disaster prevention based on reasonable "smart power saving"
Zero Carbon 4 Days in 2020	Initiatives to zero all CO_2 emissions to be discharged in Tokyo for a total of four days during the opening and closing ceremonies of the Tokyo 2020 Olympic and Paralympic Games
Carbon offset for the Tokyo 2020 Games	Initiatives of the Tokyo Organising Committee for the Olympic and Paralympic Games aimed at offsetting CO_2 emissions from the Tokyo 2020 Games that cannot be reduced

	with the emission reduction efforts only by reduction efforts with the CO_2 reduction credit.
Carbon Reduction Reporting Program	A system to promote the grasping of CO_2 emissions and the implementation of specific energy-efficient measures and reduce CO_2 emissions associated with business activities by obligating the target business establishments to submit a global warming countermeasures report in order to promote the implementation of countermeasures against global warming at small and medium-scale business establishments in Tokyo
Green Building Program	A system that obligates the building owner to submit a plan describing the status of energy efficiency, greening, solar power generation, etc. when newly constructing or extending a building whose total floor area exceeds a certain standard, conducts and announces grade evaluation of the initiative level, so as to encourage proactive initiatives related to energy-efficient performance, etc.
CO_2 reduction credit	The amount reduced beyond the reduction obligation by the covered facilities of the C&T Program through energy-efficient initiatives, etc. (excess reduction amount) They also include the amount such as credits of small and medium-sized facilities in Tokyo and the reduction outside Tokyo.
ESCO	An abbreviation for Energy Service Company. Business that cuts costs by optimally managing customers' energy use and receives a certain amount as a reward from the results
Low-carbon benchmark	Classification of the CO_2 emission level by symbols "A4 to C" depending on whether it is higher or lower than the average value of CO_2 emissions per square meter of total floor area for each industry calculated based on the data of the Global Warming Countermeasures Report
Carbon report	A report that shows the energy-efficient levels (the CO_2 emission results and the implementation status of energy-efficient measures, etc.) of small and medium-scale tenant buildings in seven stages. It is assumed that building owners, etc. will use it for appealing environmental performance during real estate transactions

Energy-efficient tuning	Adjustment of facilities and equipment that demonstrate energy-efficiency effects in accordance with changes in actual usage of buildings
ZEB	An abbreviation for Net Zero Energy Building. Buildings where primary energy consumption is reduced by improving energy-efficient performance, utilizing renewable energy, etc., resulting in zero or almost zero net annual consumption
Cogeneration system (CGS)	A system that effectively utilizes heat generated in conjunction with power generation for air conditioning and hot water supply. High energy utilization efficiency of about 75 to 80% can be achieved
HFCs	Specified CFCs (fluorocarbon used instead of chlorofluorocarbon: CFC or hydrochlorofluorocarbon: HCFC (hydrofluorocarbon: HFC)). The ozone layer depletion coefficient is zero, but the greenhouse effect is high
Vehicle-to-home system	A system that allows electric power to be interchanged between EVs, plug-in hybrid vehicles, FCVs, etc. and houses
Tokyo Zero Emission House	A house that shows the standard of heat insulation and equipment performance in specifications as a standard for houses newly built in Tokyo with the aim of raising the minimum heat insulation and energy-efficient performance of newly built houses to a certain level, based on the regional characteristics of Tokyo
Various Urban Development Schemes	Schemes that relax the floor area ratio, etc. for good building plans that make public contributions such as securing open spaces. General name of 4 systems regarding the district plans that designate redevelopment promotion districts, the specified blocks, and the high-level use districts based on the City Planning Act , and the comprehensive design based on the Building Standards Act
Team Mottainai	An organization aiming for raising the individuals' "consciousness of Mottainai (wastefulness)" so as to encourage the transformation of their consumption behavior through efforts such as saving food, saving materials, and saving energy. This team consists of companies, NGOs, individuals, etc.

PHV	An abbreviation for Plug-in Hybrid Vehicle. A hybrid vehicle that can be charged from the outside like an EV. This vehicle is usually driven by electricity and runs as a hybrid vehicle when the battery is going to run out, for example when driving for long distances
Universal design taxi	This refers to a general taxi that is easy to use for everyone with consideration for people with impairments and the elderly, for example, having a wheelchair accessible ramp or lift in a wide opening and allowing wheelchair users to ride while seated
Freight Company Fuel efficiency Assessment Program	A system that assesses the education system for drivers, the fuel economy management status, etc., in order to evaluate the daily efforts of CO_2 reduction such as eco-driving by freight transporters. The evaluation is expressed by the number of three stars based on the deviation value calculated from the actual driving fuel consumption of all vehicles of the business operator in comparison to the average fuel consumption value determined by TMG
Modal shift	To shift the mode of transportation. Specifically, the freight transportation by truck should be converted to transportation by ship or train with a low environmental impact
Parallel hybrid small ship	A small ship equipped with a "parallel hybrid system" powered by both electric and engine power. It is equipped with a 200V external power supply function, and it can realize zero emissions and high quietness during navigation using only electric power, resulting in an environment-friendly ship with low exhaust gas and low noise
Peak shift	To shift the time when electricity is used into the period of time when there is relatively little electricity demand, such as at night, in order to lower the power consumption during peak hours of electricity demand
Demand response	A mechanism that encourages consumers to reduce demand through incentives as one of the methods for optimal control of power supply and demand
Green lease	In a tenant building, the building owner and the tenants collaborate to voluntarily make arrangements based on

	contracts, memorandums, etc. regarding the reduction of the environmental burden such as energy efficiency in real estate and the improvement of the work environment, and practice the contents of the arrangements
Housing stock	The total amount of houses existing at a certain time
Solar road	Pavement-type solar panels installed on the road or the ground
Vibration power generation	Power generation methods such as floor power generation that generates energy by vibration caused by human walking
FIT (Feed-in Tariff System)	A system that obligates electric power suppliers to purchase electricity generated using renewable energy sources (solar energy, wind power, hydropower (less than 30,000 kW), geothermal heat, and biomass) at a price determined by the national government for a certain period. Costs required for purchases by electric power suppliers are covered by renewable energy levies that are borne by the public as part of the electricity bill
Geothermal Heat Potential Map	A map that shows at a glance the approximate amount of potential geothermal heat collection in Tokyo
Mega solar equipment	M (mega) is a prefix meaning 1 million (10 to the power of 6). This refers to solar power generation equipment with an output of 1 million W (= 1,000 kW) or higher
Small hydropower generation	There are several definitions, but in Japan, it often refers to hydropower generation with an output of 1,000 kW or lower, which is positioned under the New Energy Act, and this definition is also adopted by the Japan Small Hydropower Utilization Promotion Council
Environment Energy Reporting Program	A system that obligates companies that supply electricity in Tokyo to submit a plan that describes initiatives to improve the environmental performance of electricity, such as the reduction of CO_2 emission coefficient and the introduction of renewable energy, as well as annual performance reports
VPP (Virtual Power Plant)	Virtual Power Plant is a system to centrally control demand in the region and power generation and storage using IoT and cloud as if it is a power generation plant.
Geothermal power generation	A power generation system that extracts steam and hot water from a geothermal reservoir deep in the ground (about 1,000

	to 3,000 m underground) that is heated by the heat of magma in order to rotate the turbine. Flash power generation that directly rotates turbines with steam is common, but binary power generation methods are also increasing
Zero Emissions Island	Initiatives to minimize CO_2 emissions through energy efficiency and significant utilization of renewable energy on the island to build a sustainable society
Tokyo Rooftop Solar Register	A web map system that calculates the potential of solar energy introduction for each roof of the building in consideration of the effects of shade, etc., and displays the suitability of the installation of solar power generation and solar heat utilization systems
BRT	An abbreviation for Bus Rapid Transit. A new public transportation system that has transportation capabilities and functions comparable to trams and new transportation systems with flexibility thanks to adopting articulated buses, IC card systems, etc.
SNS	An abbreviation for Social Networking Service. A service that enables social networks to be built on the web
Tokyo Hydrogen Promotion Team	An organization established with more than 100 private enterprises and local governments in Tokyo in order to foster a movement powered by both public and private sectors for the dissemination of hydrogen energy (started in November 2017)
CO_2-free hydrogen	Hydrogen, etc. produced by electrolyzing water with electricity generated by renewable energy
Hydrogen electricity storage system	A mechanism for storing hydrogen produced by electrolyzing water. When energy is needed, hydrogen will be supplied to the fuel cell to generate electricity and heat
Energy management	To understand comprehensively energy supply and demand conditions, operate equipment and facilities efficiently, and realize comprehensive energy efficiency

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