Provisional Translation

The Basic Policy for the Realization of GX : Reference document

End-to-end roadmap for the next 10 years

		2023	2024	2025	2026	2027		2028	2029	2030	2030s	
Government support	Support	Government (e.g., choosing	support integrate areas for long-ter Offer support focus on ex	ed with regulation m multi-year "indus to businesses inve isting technologies	for GX inv trial competi sting early, v	restment to st itiveness buildu with	imulate pul	blic-private inv omic growth" x nercialization/start	vestment "emissions reduc	tion")		
with regulation for GX investment	Regulation /structure	Stronger reg (e.g., higher standar public procurement, Increm	gulations and s ds set by Act on Rationa among other measures mental introduction	tructural develo alized Energy Use, Sophia of stringent regula	pment to o sticated Methods tions in line v	create dema s Act, Building Energ	and for dec gy Efficiency Act cal stages	carbonization	n and new ind	ustries I coverage and introduction	on of	ivate years
	GX Economy Transition Bonds	Issue GX E	conomy Trar	nsition Bonds								olic-pr ext 10
Carbon pricing incentivizes early-stage GX investment	GX-ETS	Experiment •Supported accounting total CO ₂ e	al period (FY2 by many comp for over 40% missions	Y2023-) Full-scale launch of Apanies, of Japan's Stronger discipling Y2023-) Full-scale launch of Actionsfor extend Stronger discipling			issions tradir upport base overnment p ough guidar	ng market (FY2 policies, mandat nce, instructions	026-) ory third-party ce s, and complianc	Furthe •Payr ertification e) (pai	er development nent introduced ementally from FY2033 d auction)	<mark>yen</mark> put t over n
GX investment	Carbon surcharge							Carbon su • Introduce fuel import	rcharge (FY2 carbon surc ers	2028-) harge system f	for, e.g., fossil	+ trillion vestmen
Exploit	Inside Japan	Develop/esta blended final	ablish nce tools vironment for are	Establish/imple	ment blend	led finance						
new financial tools	Inside/ outside Japan	finance and o Develop env markets and	ironment for sus many more	municate globally tainable finance	,	Powerful sup private financ	ply of risk i ce for trans	money by con itions and inn	nbining public f ovations in indu	unds and ustries		
financial tools	Asia	Efforts to materi Organize AZAC ministerial meetings	alize AZEC initiati	ve to push for ener	r energy transition in practical ways (e.g., accelerate AETI implementation, promote the JCM, and bilateral/multilateral energy partnership							nips)
deployment strategy	Global	G7 (hosted by Japan) Create Clean Ma	Extend practionarket, drive innova	cal approaches for tion collaborations I frameworks to le	transition glo (e.g., establish g ead global	obally global methods for e rule-making p	valuating green	products, create nev	v value sets for appred	iating reduction contributi	ion of each business)	0

<Future milestones> Case 1: Hydrogen and ammonia

Domestic targets for hydrogen/ammonia introduction: 3 million tons (ammonia equivalent) each by 2030, 20 million tons hydrogen and 30 million tons ammonia (ammonia equivalent) by 2050. Exploit support programs for building supply chains and establishing facilities over the next 10 years to create large and resilient supply chain (for production/transportation/utilization).

										<u> 2040 </u>		
	2023	2024	2025	2026	2027	2028	2029	2030	2030s	2040s		
	<u>Build large re</u> Establish "S+3Es"	silient suppl ' for hydroge	<u>y chain</u> en/ammonia	S: <u>Safety</u> in business E: <u>Energy security (s</u> and other measure	operation stable supply) by diversifying so es	E: Now "gray" >>> g urces E: Efficiency improv	io <mark>environment-friendly (b</mark> ement and <u>economic inde</u>	lue/green) quickly pendence				
Target and strategy	Focus program stage (up to around 2025 • Revise basic stra • Formulate indust winning global ma • Formulate safety	establishme	dmap or	Promotic goals (up to arou •Large-sc •Develop •Create d market/e	on stage - clear und 2030) cale public/private technologies to re lemand by develop environment	cost/introduc	Sts Note) cost of cost of sup Volume i	costs - hydrogen: ¥ - ammonia: ¥1 supplying hydrogen: more that plying ammonia: almost triple t ntroduced in Japan: 3 (hydrogen and 1% in power g	Dissemination st stimulation and s 30/Nm ³ (CIF) 5-19/Nm ³ -H ₂ twice the natural gas cost, the coal cost million tons ammonia together) eneration mix	Additional and the supply stability - hydrogen: ¥20/Nm ³		
GX investment	Dev RTD to establish	velop/refurbi h Japan's teo	Build large sh infrastructu chnological su	resilient supply ure periority, bu	v chain more than	some ¥5 trillion More tha search center	(lau an some ¥1 t rs More tha	nched around 2027 or af rillion n some ¥1 trilli	ier) >>> Invest	more than rillion over		
	Conceive comprehensive regulation/support-package programs	ensive regu	<u>lation/suppo</u> Bu	rt structure uild large res	silient supply ch	ain inside/out	side Japan fo	or transitioning	to clean hydroge	en/ammonia		
Regulation/ structure	regulation/support-package programs Build large resilient supply chain inside/outside Japan for transitioning to clean Develop programs aimed at support initiatives focusing on price gap from traditional fuel (up to FY2024) Market-building actions aimed at accelerating investment and creating initial demand from public/private entities (e.g., GX League, growth-oriented carbon pricing, transition finance)							Accelerated initial dema developme chain by p	investment and larger and leading to ent of independent supply rivate businesses			
	Formulate hydroge	en safety strat	egy (by FY2022) D	evelop environr	ment encouraging h	/drogen/ammonia	usage, including	rationalization/opt	imization of safety and	d other regulations/rules		
	Support for provid	ding JOGMEC	risk money to	o produce, store, and other hydrogen/ammonia processes								
		v for winnin	a alobal mar							/		
Inter- national	Hydrogen industry strategy for extended innovation support Resource diplomacy to expand supply countries for building resilient supply chain and enhancing competitiveness Survey, demonstration, and other actions for introduction support and user technologies in Asian and other demand countries											
strategy	Lead international	standardization	n discussions									
				Consider CO	2 measurement m	ethods, standar	dization/regulat	ion for hydrogen/	'ammonia usage an	d control \rangle		

<Future milestones> Case 2: Battery industry

Target is to establish a domestic annual manufacturing base of 150 GWh of batteries by 2030. Use Act on Rationalized Energy Use and other tools to approach demand side to create demand over the next 10 years, also focus on investment for battery manufacturing base over the next five years.

											2040	<u>205</u> 0
		2023	2024	2025	2026	2027	2028	2029	2030	2030s	2040	s
	Public/pr	ivate partners	hips for enhar	ncing domestic	manufacturing b	base (investment,	boosting production te	chnologies, etc.)	150 GWh dome	stic manufacturing I	DASE (by 2030 at the	e latest)
Target and strategy	•DX and •Establis >>> manufa	GX to establis sh mother facto acturing process in	sh/enhance ac ory platform w nnovation and ma	ith global deplo ss production to ke	facturing techno oyment in scope eep costs competitive	blogies B th	uild manufacturing hat is internationall	y base in Japan y competitive	Household Commercial/inc	battery system: ¥ ustrial battery syste	10,000/kWh Note) 20,000/kWh Note) 20,000/kW Note) Installation co) Vh Note) costs included
	Some 20	GWh manuf	acturing bas	е		130 GWh in	vestment decision	on	(around 2030) mid-2030 or a	iter	
	Develop •Establish technolog •Establish	next-generation all-solid-state a gies a high-level recy	on technologie and other types rcling technolog	es of large-capacit y for batteries	y batteries and res	source-saving	 Develop stru producing al batteries 	cture for I-solid-state	Full-scale	Introduce innovative batterio	es	
				S	tage gate				all-solid-state			
C Y	Battery	Invest in m	anufacturing	lines for batt	tery and materi	ial	More	e than some ¥	4 trillion	>>> Invest m	ore <mark>than sc</mark>	ome
GX investment	manufactu ring	RTD (next- •Develop so	-generation b	pattery/materi ery technology	al/recycling teo (design, materia	chnologies): n al) ∙Separati	nore than ¥3 trilli on/collection techr	on nologies for recy	cling batteries	¥7 trillion ov	er next 10 y	/ears
	Battery manufactu ring	Mechanism fo	or visualizing C	O ₂ emissions fro	m battery producti	ion						
Regulation/ structure	Demand for electrified vehicles	Clear efficien promoting xE improvement	cy targets set b Vs including ba	y Top Runner pr ttery electric veh	ogram under Act o hicle (BEV) develo	on Rationalized I pment as well as	Energy Use by performance	New 50-7 (20-	/ passenger cars s /0% next-gen. veh 30% EV/PHV)	ales: New pass icles cars sales <mark>xEV</mark>	enger 100% S	
	Demand		g-term decarbo	nized power sou	rce auction (FY20	23) Drive to en	sure decarbonized b	alancing power us	sing batteries and ot	her methods		
	for stationary	Build market	that household	batteries and ot	her distributed pov	wer sources can	enter			Vehicle, stationary, a	nd other types of ba	atteries
	systems	Conceive pro performanced	grams for impro	oving tteries	Setting s	safety and other	standards for station	nary battery syster	m	can be connected to th	e grid as balancing	power
		Strategic form	nulation of globa	al alliance (Japa supply •Stronge	n-US, Japan-Euro r partnerships with	pe, Quad, G7) n relevant entities	s outside Japan		2030)		
Global strategy	Establish international rules, formulate global standards Sec									al production		
		Establish CFI standards for	P international industrial LiB	Bas oth	sed on safety stan er rules to develop e. high-performand	dards for industr market outside ce batteries	ial LiB and Japan for		capacity o	f 600 GWh		,

<Future milestones> Case 3: Iron and steel industry

Clear the target of supplying 10 million tons of green steel in 2030 by leveraging the Act on Rationalized Energy Use, GX investment in step with structural reforms, and other measures to promote fuel/material switching (e.g., shifting to electric furnaces) while procuring electricity priced at internationally competitive levels and winning global market shares through formulation of international rules.

											2	040 20
		2023	2024	2025	2026	2027	2028	2029	2030		2030s	2040s
Target and	Seek mi Quickly e	ultiple options	while paying ive technologies	attention to inf	ternational dev duction steelmak	velopment to	win promising r sage of electric fur	markets, with maces, and othe	an eye to net-ze	ero GH(G emissions to CO_2 emission	by 2050 ns (vs. FY2013)
Sirategy	Quick est	ablishment of g	reen steel marke	et .	:		:			Supply c	over 10 million t	ons of green steel
	Capital expend	Invest in shift e.g. Develop techn Introduce hyc Modify CO	ing production p ologies for removing in drogen reduction URSE50 sys	rocess from blas purities for electric fur steelmaking teo tems	st furnaces to ele haces Full-sc chnologies (e.g., Full-scale c	ectric furnaces cale demonstra COURSE50 fa demonstratio	(electric furnaces, tion acilities)	power infrastruc	cture, scrap yards.	.)	Continuous in needed (extended demon of innovative tech investment in adv inside/outside Jap	Ivestment Istration/introduction Inologies and vanced facilities pan)
GX investment	iture	Introduce r Invest in ene (switch fuels efficient and	eduction iron ergy switching/re in auto power p non-fossil, ene	production fa eduction plants, make sto rgy-efficient equ	eelmaking proce	ther system	S Introduce GX-rea (Decisions to con be based on deve and technologica	ady production avert existing pr elopments in in Il innovations)	process roduction facilities ternational comp	s will etition	¥3 trillion years Note) Operat	tion costs will be
	RTD	RTD for hy Develop el	^r drogen reduc lemental tech	tion steelmat	king with exte	ernal hydrog <mark>ild/test dem</mark>	en supply, and onstration syste	other techno	logies		using o and oth	her actions
	Develo	op compre	<u>hensive re</u>	ulation/su	pport struc	<u>cture</u>						
		Utilize non	-fossil energy	switching ta	rgets in the A	ct on Ratior	alized Energy	Use to promo	ote fuel/materia	I switcl	hing	
Regulation/ structure	Energy usage	Stable proc (e.g., prom increasing	curement of e lote optimizat g DR)	lectricity at ir ion of electric	nternationally city demand vi	competitive ia the Act o	prices n Rationalized I	Energy Use,	and apply elec	tricity p	prices to facil	itate demand-
	Public/private procurement	Promote go Actions inc	overnment pr Iuding push f	ocurement of or disclosure	green steel b of Scope 3 e	by reviewing missions	public procure	ment require	ements			
Intor	<u>Indust</u>	rial strateg	<u>y for winn</u>	ing global	<u>market</u>							
national strategy		Establish a (e.g., establish environment f	platform helpi n measurement m for using mass ba	ng Japan leac tethods and defin lance approach,	the creation on ition for evaluation and gather inform	of global gread of global global gread of global global gread of global global gread of global globa	en steel market ion of both electric a nally to support the	and blast furnace se initiatives)	s, develop	Set sta	tting interna ndards	ational

<Future milestones> Case 4: Chemical industry

In order to complete structural transformation to green chemicals (e.g., processing 2.5 million tons in 2050) leverage the Act on Rationalized Energy Use, GX investment support in step with structural reforms, and other tools over the next 10 years to promote fuel/feedstock switching (e.g., carbon cycling by chemical recycling) while building a circulation system for plastic resources using the Act on Promotion of Resource Circulation for Plastics, reaching out to the global market by formulating international rules.

		2023	2024	2025	2026	2027	2028	2029	2030	2030s	2040 2040s	2050
	270 thousand	Seek mu	Itiple options v	vhile paying at	ttention to glob	al developme	nt to win promis	sing markets, w	ith an eye to ne	t-zero GHG er	missions by 2050	
Target and	tons processed by chemical recycling process	Promote	collaborations	across indust	tries Accele	rate collaborati	ons for building C	CN complexes	1.5 million to chemical re	ons processed by cycling process	In aroun	d 2050
strategy	Biomass	Early es	tablishment	of green cher	mical market				Biomass pla (milestone)	istic up to 2 million	n tons	
	60 thousand tons	Develop F	RTD/business er	vironment to e	stablish carbon-	circulating/deca	arbonized produc	tion process	Establish produc (CO ₂ -based prod ammonia-fueled	tion process technol luction process for b naphtha cracker)	ogies based on carbon circu asic chemical products and	lation
		Structural t	ransformation investion	stment (including I	RTD) (e.g., CO ₂ -based	production facility for o	chemical products, chemi	cal recycling plants, and	ammonia-fueled naphtha	cracker)	Invest more than aro ¥3 trillion over next	<mark>und</mark> 10
		RTD/dem	onstration for CO	2-based chemical	ls production	Implem	entation/extension	of CO ₂ -based che	micals production		years Jote) OPEX costs will be	
	Carbon		ent/extend che	emical recyclin	g plants						incurred separately	by
GX investment	circulation/ de-	RTD/der	nonstration for a	ammonia-fuelec	naphtha cracke	er	Ammonia-fuele	d naphtha cracke	er implementation		using clean energy other actions	and
	carbonization	Energy swit	ching/reduction inv	vestment (incl. RTI	D) (fuel switching in coal-fire	ed auto power plants and ot	ner facilities, moving away fror	n fossil fuel in various producti	on plants, energy efficient equip	ammonia	lote) Decisions to conver	t
		Fuel sv	vitching in coa	al-fired auto p	ower plants (e	e.g., gas or b	iomass)		e-methane Switching to hydrogen.	electricity.	facilities will be base	ed on
		Fuel sv	vitching for gla	ass melting fu	Irnace and oth	ner facilities (e.g., gas)		and others		international compe	tition
		Electri	ication of othe	er facilities, in	vestment for e	energy efficie	nt equipment,	and other app	roacnes	/	and technological	
	Develo	p compre	<u>hensive regu</u>	ilation/suppo	ort structure	Act on Dation				le avritabiaa		
	Eporary upogo	Utilize no	on-rossii energ	gy switching t	argets in the /	Act on Ration	alized Energy	Use to promo		switching		
	Lifergy usage	Stable pro (e.g., prom	curement of ele ote optimization of	ctricity at intern f electricity demar	ationally competed and via the Act on F	titive prices Rationalized Ene	rgy Use, and apply	electricity prices to	facilitate demand-	increasing DR)		
Regulation/ structure	Resource recycling	Leverage	e the Act on P	romotion of F	Resource Circ	ulation for Pla	astics and othe	er tools to build	a system for c	irculating plas	stics	
	Public procurement	Review r	equirements	for public pro	curement		After the review	v, the government v	vill facilitate its publ	ic procurement of	green chemicals	
	Reorganization /consolidation	Clarify th	e cooperatior	n and collaboi works and othei	ration thinking r tools and surve	for building y markets to o	green society otimize facilities					
	Industr	ial strateg	gy for winnin	<u>g global mar</u>	<u>ket</u>							_
Inter- national strategy		Establish (e.g., develop	a platform helpir environment for lever	ng Japan lead th aging mass balance n	ne creation of glo	obal green mat	erial market platform for this by gathe	ering data internationall	y, standardization aimed	d at winning global ma	rkets, or any other actions)	
		Publish globa	al standards for mass	s balance method (2	2025)							/ (

<Future milestones> Case 5: Cement industry

In order to complete structural transformation to carbon-recycling cement (e.g., supplying 2 million tons in 2030), leverage the Act on Rationalized Energy Use, GX investment support in step with structural reforms, and other tools over the next 10 years to promote fuel/material switching (e.g., transformation to cement production process using CO₂ capture method) while creating predictable demand through public procurement and other approaches and reaching out to the global market by formulating international rules.



<Future milestones> Case 6: Pulp/paper industry

In order to complete structural transformation of pulp/paper industry (e.g., switch to bio-refineries), leverage the Act on Rationalized Energy Use, GX investment support in step with structural reforms, and other tools over the next 10 years to promote fuel/material switching while creating predictable demand through public procurement and other approaches and reaching out to the global market by formulating international rules.

											2040	2050
		2023	2024	2025	2026	2027	2028	2029	2030	2030s	\$	2040s
		Seek mult	iple options wh	nile paying atte	ention to globa	al developmen	t to win promisi	ing markets,	with an eye to n	et-zero GHG e	emissions by	2050
Target and	emissions:	Stronger of	competitivenes	s by new colla	borations acro	oss industries	to build CN soo	ciety		CO ₂ emiss reduction f	ions: 38% from 2013	
strategy	vs.2013	Early esta	blishment of g	reen material r	narket					CNF compo Market size	osite material ¥2 trillion —	2050 ► ¥6 trillion
		Develop R	TD/business e	environment to	establish bio	-refineries in p	production proce	ess				
		Structural to (e.g., investme	ansformation in the second sec	vestment (includ ansformation, investr	ing RTD) ment for CNF produ	uction facilities helpi	ng reduce fossil-based	d resin usage)	i		>>> Invest m	nore <mark>than</mark> <mark>1 trillion</mark> over
		RTD/dem	onstration ain	ned at bio-refi	nery transfor	mation)	Implement/ex	tend bio-ref	inery facilities		next 10 ye	ears
		Social im	olementation a	and extension	of CNF proc	duction faciliti	es helping red	uce fossil-ba	ased resin usag	e /	incurred	separately by
GX	Carbon circulation/	_									using cle	ean energy and
Investment	de- carbonization	Energy s	witching/red	uction invest	ment (incl. F	RTD) (fuel swi	tching in private	e power stati s_)	ions and other fa	cilities,	Note) Decis	ions to convert
		Fuel swite	ching in coal-f	ired auto pow	er plants (e c	a das or bior	nass)	5)	Switching to hydrogen,	ammonia, e-	existing pr facilities w	oduction ill be based on
		Building a	idvanced ene	rgy supply/de	mand structu	ire by renewii	ng black liguor	recovery bo	bilers		developme	ents in
		Electrifica	tion of other f	acilities, inves	stment for en	ergy efficient	equipment, an	d other app	roaches		and technol	al competition
	Develo	p compre	hensive reg	gulation/su	pport struc	<u>cture</u>					innovation	s
	Eporal	Utilize no	on-fossil ene	ergy switchir	ng targets ir	n the Act on	Rationalized	l Energy U	se to promote	e fuel/materi	ial switchin	g >
Regulation/ structure	usage	Stable p	rocurement	of electricity	at internati	ionally com	petitive prices	S				
		(Promote	optimization of	of electricity d	emand levera	aging the Act	on Rationalize	ed Energy U	se and other ac	tions)		
	Public procurement	Review re	quirements for	public procure	ement	Based on th	ne result, push f	for introducir	ng green materia	l to governme	nt procureme	ent
	<u>Industr</u>	ial strate	gy for winn	i <mark>ng global r</mark>	<u>market</u>							
Inter- national strategy		Establish a (examples: dev winning glob	a platform help velop environment fo al market)	ing Japan lead r leveraging bio-refir	the creation heries, and gather in	of global gree	n material mark	<et< b=""> e initiatives as wel</et<>	ll as standardize for	For example, C grow by being a especially in ad	CNF market is expe accepted as autom	ected to notive parts, ent-friendly
		Develop me	thods to evaluate	CNF products' pe	rformance				/	this opportunity	urope and elsewhe	ere) - seize

<Future milestones> Case 7: Automotive industry

Make automotive industry carbon neutral (example: new passenger cars sold in 2035 - 100% xEVs) by leveraging Act on Rationalized Energy Use and other tools over the next 10 years to facilitate investment in develop, improve performance, and introduce xEVs, while steadily adapting to international rules to reach out to the global market.

2023 2024 2025 2026 2027 2028 2029 2030 Seek multiple options for achieving automotive CN (Building many paths by best combinations of power trains and energy/fuels through innovations) Develop each manufacturer's xEV model range to accelerate xEV dissemination •New xEV sales target Passenger cars: Next generation vehicles -	• All new passenger cars sold: 100% xEVs • All new passenger cars
Seek multiple options for achieving automotive CN (Building many paths by best combinations of power trains and energy/fuels through innovations)	• All new passenger cars sold: 100% xEVs • New xEV sales target Commercial (up to 8.0 ton Total of xEVs and vehicles ready for synthetic or any
Target and strateov	other decarbonized fuel: 100% Commercially available
Transform car usage Full-scale introduction of self-driving cars 5,000 vehicles (Sustainable mobility service leveraging digital technologies, efficiency/productivity improvement in logistics) and collaboration with other industries to bring new mobility services Install charging infrastructure in 150 thousand places, including 30 thousand publicity in 150 thousand places, including 30 thousand publicity includ	e synthetic fuel (Accelerated commercialization)
Note) Basic Policy on Economic and Fiscal Management and Reform 2022 (Cabinet decision of June 7, 2022) With regard to cars, in order to clear the goal of having 100% of the new cars sales to be so-called electrified vehicles (xEVs: electric cars, fuel cell cars, plug-in hybrid cars, and hybrid cars) by 2035, facilitate massive introduction through measures such as promoting large-scale investment for batteries, support for buying cars, and development of charging/filing infrastructure, as well as facilitating transition of small-/middle-sized suppliers and other businesses, while also considering the possibility of using synthetic fuel for internal combustion engines in the future:	th
Investment required for dissemination of electrified passenger vehicles Some ¥12 trillion	\geq
xEVs Investment required for dissemination of electrified commercial vehicles Some ¥3 trillion	\rangle
RTD (for next-generation automotive CN) Some ¥9 trillion	>>> Invest more than around
GX Battery production/RTD investment (see appendix) Some ¥7 trillion	¥34 trillion over next 10
Infrastructure investment Some ¥1 trillion	> years
Carbon-recycling fuel Some ¥400 billion	\rangle
Manufacturing process decarbonization Some ¥1 trillion	\rangle
Clear efficiency targets set by Top Runner program under Act on Rationalized Energy Use by promoting xEV development Efficiency Passenger vehicle standards 2020 Passenger vehicle standards	is 2030
Regulation/ regulation Small freight vehicle standards 2022 Small freight vehicle - next-step standards (P)	2/111111111111111111111111111111111111
Heavy duty vehicle standards 2015 Heavy duty vehicle standards 2025 Heavy duty vehicle next-step standards (P)	
Non-fossil energy usage Rationalized Energy Use Freight carrier/shipper setting ambitious targets for non-fossil switching by FY2030	\rangle
International cooperation for automotive CN (G7, G20, ASEAN, Asia Zero Emission Community, ZEVTC, Glasg	gow Breakthrough)
national strategy Incorporating global/overseas regulations/standards/rules (chargers and CO ₂ emission evaluation methods und 2024-: battery rules in Europe California target for PHEV/EV/ECV: 35% in 2026_68% in 2030_100%	2035: EV/FCV 9

<Future milestones> Case 8: Resource circulation industry

To accelerate resource circulation by arteriovenous collaboration and establish an independent and resilient resource circulation system, build an information distribution platform and other mechanisms using digital technologies over the next 10 years, leading to the creation of resource circulating markets by reviewing institutional frameworks to accelerate arteriovenous collaboration and supporting GX investment in step with structural reforms.

	1		1					-				2040 2050
		2023	2024	2025	2026	2027	2028	2029	2030		2030s	2040s
		Social imp	elementation	of CN/CE-re	ady resource	circulation sy	stem/facility					
	Circular economy	Double the	volume of rec	cycled metal	resource (disc	arded electro	nic substrates a	nd batteries)		Circula	ar economy	
Target and strategy	some ¥50 trillion	Double re	cycled plastic	s, introduce	2 million tons	s of biomass p	olastic			¥80	trillion	
		10% of av	iation fuel use	ed by Japan	's airlines swi	tched to SAF						
		Build sola	r PV panel re	cycling facili	ties and reuse	e/recycling sy	rstems					
GX investment	Arterial investment, venous investment	Investmen (Arterial) • Introduct resource • Introduct • Introduct (Venous) • Introducti • Introducti • Initiatives and othe	it for acceleration of manufact (recycled/bio-bation of manufact ion of manufact ion of facilities for on of metal/Lib/ on of plastic rec for producing/s r eco-friendly m	ating resource uring facilities ased material) uring facilities or lease/sharin solar PV recyce cycling facilities supplying sustan aterial	e circulation for products usi for material-sav ng services cling facilities s ainable aviation	ng low-/zero-ca ring products fuel (SAF) base	rbon circulated	More - arour ¥2 tri	than nd Ilion		>>> Invest around ¥ 10 years	more than 2 trillion over next
Regulation/ structure	Arteriovenous linkage	Review in: Setting targ advancing r •Circulatio building	stitutional frar ets for introduci esource circula n-oriented desig a resource circul	mework to a ng/supplying c tion throughou gn deep-dive, lation system fo	ccelerate arte sirculated resour it the entire supp labels showing or stable supply o	riovenous lin rce, and other a ply chain the percentage of circulated reso	kage rteriovenous initi of circulated mat purces	atives for erial component	,			
	Platform	Using digital	technologies to b	uild information	distribution platfor	rm for ensuring tr	aceability and othe	r mechanisms				
	development	Measure/o	disclose circu	lation rate a	nd CO ₂ emiss	sions						
Inter		Internatior	nal cooperatio	on for bringir	ng circular eco	onomy(G7, G2	0, ASEAN, Expo	2025 Osaka, Ka	ansai, Jap	an)		
national strategy		Compliance	with the revise	d Basel Conve	ention, measure	s to facilitate pr	ocuring recycled	metal resources	from Asia	a and othe	er sources outsi	de Japan
		Complian	ce with plastic	pollution tre	eaty		1					10

<Future milestones> Case 9: Houses/buildings

To realize houses/buildings fundamentally designed to use energy efficiently (e.g., new houses/buildings built in 2030 to have energy efficiency on par with ZEH/ZEB levels), extend/enhance regulation coverage over the next 10 years by leveraging the Building Energy Efficiency Act and other policy tools.

		2023	2024	2025	2026	2027	2028	2029	2030	20	30s	2040 2040s	<u>205</u> 0
	Push t	he improveme	ent of ener	gy efficienc	y in houses/b	uildings for n	et-zero GHG e	emissions by	2050	4			
	Dissen	ninate new ho	uses/build	lings with ZI	EH/ZEB-class	s energy effic	iency		2	030			2050
Target and	Dissen	ninating energ	y efficiend	cy renovatio	ns			-		Ensure new	v. Jings	Ensure ZEH/Z	EB-
onatogy	Higher Demonstration	energy efficie		rds for insula	ated windows	and other bui	Iding material,	push for wide		have energy efficiency of		efficiency on	average
	Wider	introduction o	f wood stru	uctures	/	,					SS ^{Note)}	for house/bui stock	lding
GX investment	Saving energy	New houses/build Existing houses/b (including investn Focus support f	lings: investme building: investr nent required to or introducing	ent required for ZE ment required for develop/dissem insulated windo	EH/ZEB-class energy renovating houses/ inate insulated wind	gy efficiency /buildings with low e dows that have perf e of building mate	energy efficiency ormance that far exc rials with higher effi	eeds Building Mat	erial Top Runner tar	gets)	>> Inve around next 1(est more than d ¥14 trillion c) years	over
	CO ₂ reduction	Investment r	equired for	r using wood	l in non-reside	ential/medium	- and high-rise	buildings					
		Mandatory com requirements fo on the Building	bliance with er r new houses/ Energy Efficie	evels ^{Note)} (no	Note) Addition efficiency star sources, 30- renewables	onal 20% rec andard for ho 40% reducti (20% for sm	duction from the current e ouses except for renewat on for other buildings exc aller structures)	nergy de energy cept for					
	Saving energy	Add spec resid Housing Top F the Building Er	lential compl Runner progr nergy Efficiel	lex to the am based on ncy Act	Raise Ho	using Top Rur	iner standards t	o ZEH level		iewed			
Regulation/ structure			Enforce	energy effic	iency disclosu	ure requireme	nts for house/b	ouilding		y rev			
		Review/disseminate v disclosure requireme	vindow performand	ce Early-sta	age review of FY2 nalized Energy Us	030 targets for the se, also extend the	Building Material	Fop Runner progr	am under the Act	Isuon			
	CO ₂		e.g. Fire resistance material to	Contir									
	reduction	Promote use c	J										
Inter-		ZEB demons	stration and	d disseminat			Indep	endent global					
national strategy		Leverage int	ernational	standards to	o differentiate	from other co	untries' produc	its			outrea	ach	

<Future milestones> Case 10: Digital investment aimed at decarbonization

In order to develop semiconductor industry, continuously invest in semiconductor business and relevant supply chains into 2030s for successful GX, and push for social implementation of next-generation semiconductor, photonics electronics convergence, and other future technologies. Furthermore, leverage these technologies to promote CN in data centers (DCs).

			:			:				ч		2040	2050
		2023	2024	2025	2026	2027	2028	2029	2030		2030s	2040s	
	Expedite (Adding	d/continuous enl resilience to adva	nancement of pro anced semicond	oduction platfor uctors helping C	m for IoT semicond GX, highly indispens	luctors sable semiconduc	ctors, and relevant	SC) by around 20	030	und-2030)	Maintaining/enhancir ecosystem for ensuri production platform f semiconductors that bconomic security, a	ng a semiconductor ng the sustenance or advanced ensures GX, DX, nd other requirements	
	Japan-U	S partnership to	develop producti k	on technology f by around 2027	for next-generation	semiconductors	Establish pro semiconducto by around 20	duction technology ors, investment for 030	for next-genera mass productio	ation in	as well as highly indi semiconductors.	spensable	
Target and						Dissem next-ge	ination and full-scal neration_semicondu	e introduction of i ctor_and	ndigenous	semicondu Build resili	ence into a wide range of se	1 ¥15 trillion in 2030 emiconductors and relevant	SC
strategy	Develop	photonics electro	onics convergend	ce technology in	ndispensable for G	X Secol Inside •Ph •Dis	nd half of 2020s e data centers (DCs) otonics electronics con saggregated computing	vergence	(aro Incl •P	und 203 uding betwo hotonics el Disaggregat	een DCs ectronics convergence ed computing	Between-seco 2030s and 204 Realize photonic electronics conv	nd-half-of 0 s ergence
	From RT	D to social imple	mentation for ne	xt-generation m	nemory and other c	omponents target	ting 2030s to realiz	e next-generation	n computing	platforms		inside package	
	Accele	rate energy-se		expand area			From	RTD to socia	l implemer	tation c	of future techno	logies	>
	Accele	ale energy-so									DC CN by 2040	>	
GX investment	Adding semico RTD a	ding resilience to advanced semiconductors helping GX, highly indispensable <u>niconductors, and relevant SC - more than around ¥5 trillion</u> D and social implementation of next-generation semiconductor, photonics otrapico convergence, and other technological mere than around ¥6 trillion our next 10 years											\rangle
investment	Dissen	ninate energy	y efficient DC	s some ¥1	trillion					Succes		/	/
	Semiconductor facility investment	Business Active ac	s commitme dditional inv	ent for contrestment to	tinuous produ	uction ensur duction (202	e successful 23 onwards)	GX					
Regulation/ structure	Semiconductor RTD	Business o	commitment	for steady s	social impleme	entation of R ⁻	ΓD results (20	23 onwards)					
	DC development	Extend the scope of benchmark scheme under the Act on Rationalized Energy Use to expand energy efficient information processing environment (2022 onwards)											
Inter-		Japan-US partnerships for RTD and social implementation of next-generation semiconductor, photonics electronics convergence, and other technologies (Leverage frameworks such as the Basic Principles on Semiconductor Cooperation and the joint task force agreed by the leaders of both Japan and the U.S.)											
national strategy		Leverage G compliment	GAMS, QUAE tary supply c	D, and other hain, ensuri	multilateral sp ng a stable su	aces to build oply of semice	relationships v	with willing co spensable for	ountries/reg r GX. (202	gions fo 2 onwa	or resilient and irds)		12

<Future milestones> Case 11: Aircraft industry

In order to decarbonize aircraft industry while simultaneously achieving economic growth with next-generation aircraft, develop demonstration model by 2030s and also take actions for establishing international rules as well as study specific measures such as frameworks relevant to mandatory CO₂ reduction under the 2050 net-zero emissions target (ICAO agreement).

											2040	2050
		2023	2024	2025	2026	2027	2028	2029	2030	2030s		2040s
De	carboniz	e aviatior	<u>n industry wh</u>	<u>ile simultar</u>	neously achie	ving econo	omic growth v	with next-ger	neration airc	raft _	Realize next-generation a aircraft in the second I	aircraft (introduction of small half of 2030s or beyond)
Target and strategy	Focused Conceptual redevelop demo Focus study for 	technologica esearch, developn onstration environ or international rul	al development ar nent of core technologies ment, build structure for o le-making	1d strategy forn for next-generation a domestic/international	nulation> ircraft, I partnerships	<technologic <ul=""> Develop/demonst Develop demonst Create market by </technologic>	cal demonstration rate flight system by integ ration model of next-gene engaging with internation	and market creat grating elemental technolo eration aircraft nal rule-making initiatives	ion> ogies -Evaluate sa feasibility, an for social imp	ation> fety, business d other factors lementation	Next-generation ai development/mas (application of the technologies to la scope)	ircraft ss-production stage a relevant arger aircraft is within
	Realizing sto Create dema	eady growth o and for next-ge	f aircraft market thro eneration aircraft in	bugh developmen line with basic pr	nt/demonstration of S inciples set by ICAO	AF production te 's net zero emissi	chnologies, introduc ions target and revis	tion of fuel-efficient ed Civil Aeronautics	t aircrafts, and othe s Act	r actions Increased s	upply of indig	jenous SAF
	Public/pri	vate invest	ment for next-g	jeneration air	craft - more tha	n around ¥4 t	rillion					
	Aircraft	Conceptua (Marketab	al research on next ility, environmental	-generation airc impact, technol	raft ogy)	Build demonst	ration model of nex	t-generation aircra	ft	Flight demon- stration		
	echnologies	Develop teo hydrogen te	hnologies for next-ge chnology, weight sav	neration aircraft (e ing, and efficiency	lectrification, improvement)	Integrate elem ground demon	ental technologies, strations)	system developme	ent, Flight demons (Use existing suited to each for demonstra	tration test beds technology tion	2040 2030s Relia net-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft development/mass-production si (application of the relevant technologies to larger aircraft is scope) Next-generation aircraft around ¥5 trillion of next 10 years net-zero GHG eemiss by 2050 in the fiel international aviat	re than
GX investment Develop demonstration environment inside Japan (New test facilities in line with energy source transformation, facilities for validating the entire system. Public/private SAF investment: production technology development, mass-scale demonstration, production fac Develop (biomass-based) SAF production technologies Develop (synthetic fuel) SAF production technologies Pilot plant of Develop (synthetic fuel) SAF production technologies Pilot plant of	Core to	Develop der (New test fa	monstration environm acilities in line with ene	quired r	round ¥5 t ext 10 year	r <mark>illion</mark> over rs						
	Public/privat	ic/private SAF investment: production technology development, mass-scale demonstration, production facilities, and so on Around ¥1 trillion										
	stment for production f											
	C/ N	Develop (sy	nthetic fuel) SAF proc	duction technologie	es	Pil	ot plant demonstration	n F	Image: Second state of the second s			
	Inter-	Study spe Preliminar	cific measures suc y discussions for 2	h as frameworks 025 ICAO Asser	s relevant to mandat mbly Prelimina	tory CO ₂ reductions for	on under the 2050 2028 ICAO Assembly	net-zero emissions	s target (ICAO agr ons for ICAO Assemblies in 203	eement) 0s and beyond		
Regulation/		Study/pror	mote specific meas	uresincluding fra	ameworks relevant	to mandatory CO	D ₂ reduction		·		et-zero GH	
Siluciule	Inside Japan	Create de aircraft se Create de	ecarbonization pr ector (revised Civ decarbonization pro	vil Aeronautics	for airlines based Act) Facilitate decarbor	on the goverr	nment's basic poli	icy for promotion	i of decarboniza		by 2050 in internation	the field of nal aviation
		Strategi	c partnerships v	with manufac	turers outside Ja	apan for next	-generation airc	raft				
	Aircraft	Study part	nership strategies			Extended strategic	partnerships for technolo	gy demonstrations and b	uilding demonstration a	ircraft		
Inter- national strategy		Establis	h international r	ules (safety s erships Er	standards for ne	w technologi y with rule-making	es), formulate g ng process for each	lobal standards	6			
	SAF	Build str registere	ucture for partned and certified	ering with rav as CORSIA-	w material supp compliant fuel, i	liers outside . nitiatives for	Japan, build stru raising SAF mix	ucture for havin ture rate under	ig indigenous \$ · ASTM regula	SAF tions		13

<Future milestones> Case 12: Zero-emission ship (maritime industry)

In order to clear goals such as net-zero GHG emissions for international shipping by 2050 and those set by the Plan for Global Warming Countermeasures, establish regulatory and structural frameworks by leading initiatives such as the introduction of zero emission ships and so on as well as discussions to establish international rules over the next 10 years to build up international competitiveness of maritime industry.



<Future milestones> Case 13: Bio-manufacturing

To build a bio-economic society, push for developing bio-manufacturing technologies and introducing bioplastics and other various bio-based products to a wider audience. To facilitate transformation to bio-based processes, advocate establishment and standardization of programs for evaluating environmental values, together with creation of predictable demand through public procurement and other measures, leading to the development of markets inside and outside Japan, thereby stimulating investment inside the country.



<Future milestones> Case 14: Renewable energy

To maximize the introduction of renewable energy sources, strive for social implementation of next-generation renewable energy technologies over the next 10 years by, for example, establishing a structure for mass production of next-generation indigenous solar PV panels and developing large-scale offshore wind projects.

											2040	2050			
		2023	2024	2025	2026	2027	2028	2029	2030	2030s	2	040s			
		Maximize the ir	ntroduction of renewa	able energy that	can coexist with lo	ocal communities	Bring renewable	power generation	mix to 36-38%	³⁰ Introduce nex technologies	t-generation renewa	ble			
		Indigenous	next-generation	solar photov	oltaics (includ	ling perovskite)								
Target and strategy		Establish teo through u demonst	chnologies ser-side rations	monstration-ready fie	Establ	lish specific ac demand, set rel	tions for evant rules	Quickly build structure GW-class equipme	e for production of ent aiming FY2030	Social imple insic	ementation in m le/outside Japan	arkets			
		Formulate offs	shore wind project	S			Total projec	ct capacity of over 1.0	GW every year	▲2030: 10 G	W 🔺 2	040:			
		Consider targets introducing floating	for models Project for with 203	nulation in line 0 Energy Mix	Start operation of r based on the Act on of Marine	more than one large offshor h Promoting the Utilization of e Renewable Energy Power	e wind project in standard are Sea Areas for the Developme Generation Facilities	ent		project tot capacity	al 30-45 GV total (V project apacity			
		Appropriate exec	ution of FIT/FIP program	s, accelerated GX ir	nvestment for initiativ	ves led by local commu	inities to introduce ren	ewables (some ¥2 trill	ion each year) [FY2011	: 10.4%, FY2021: 20	8%, FY2030:36-38%]	\square \square			
		Cap burden on	citizens (leverage au	ctions, demand-si	de leading introduct	tion of renewables w	ithout depending on I	FIT/FIP)	:						
	Solar PV	[FY2011: 0.4%, I	FY2021: 8.3%, FY2030:	14-16%] RTD for ne	xt-generation solar P	V cells, mass-scale de	monstration, establish	mass production sys	stems	Expand mass production structure					
		[FY2011: 0.4%, FY	2021: 0.9%, FY2030: 5.0	%]											
GX investment Geotherm Hydro	Wind	Develop cost-reducir	revelop cost-reducing technologies Demonstration projects for floating wind in different sea areas Auction for floating models Social implementation of floating models												
investment	vvina	Build large and	I resilient supply cha	in for wind turbine	es and their compon	ents, floating founda	tions, and other elen	nents of offshore wir	nd industry	>					
		Japan-style cer	ntralized approach fo	r wind data (FY20	23-) and submarine	e geotechnical surve	/s used as basis for	auctions (bidding	from FY2025 onward	s)	>>> Public/priv	ate more than			
	Geothermal	[FY2011: 0.2%, F)	Y2021: 0.3%, FY2030: 1.0	%] Geothermal r	resource surveys, F	RTD for innovative	geothermal power g	eneration			around ¥20 t	r <mark>illion</mark> over			
	Hydro	[FY2011: 7.8%, F)	(2021: 7.5%, FY2030: 11	%] Initial stage but	siness feasibility s	tudy, renovation of	existing facilities	:	-						
	Bio	[FY2011: 1.5%, F)	(2021: 3.2%, FY2030: 5.0	%] Wider and app	propriate introduction	n in compliance with	life-cycle GHG and	other sustainabili	ty standards	/					
		Institutional measu	res Steady impl	ementation of p	orograms with col	llaborations betw	veen relevant min	istries and mun	icipalities, timely	and appropriat	e reviews as requ	ired			
		business disciplir	ne Stea	dy management of d	lisposal cost reserve	program, planned resp	onse to mass-scale dis	posal in the second	half of 2030s (appro	priate reuse/recycling	and/or disposal)				
Regulation/ structure		Review rules	for replacement/a	ddition/capacit	y increase	Maximum exploitat	ion of existing rene	wables (solar PV o	f almost 60 GW)	Lon	g-term power s	ource			
		Set targets for different facility types	Promote introduction of rener	wables by public sector pl	lanning/implementation lead Solar PVs installed on 60	ding the way, install solar PVs 0% of new houses (in FY20	s on around 50% of public bui 30)	ildings or more wherever ap	plicable (in FY2030)	Leverage next-	generation solar to furt demand	ner increase			
		Offer support for introduction introduction based on the Pr based on the Act on Ration	based on the Act on Special Measu omotion of Global Warming Counter alized Energy Use and Sophisticated	res Concerning Procurement measures, Building Energy E I Methods Act	of Electricity from Renewable E Efficiency, Civil Aeronautics, Air	Energy Sources by Electricity Util rport, Promoting Generation of E	ities, formulation of projects based of lectricity from Renewable Energy	on the Act on Promoting the Utili Sources Harmonized with Sources	lization of Sea Areas for the Develo d Development of Agriculture, For	ppment of Marine Renewable estry and Fisheries, and other	Energy Power Generation Facilitie Acts, as well as push for using more	s, facilitate non-fossil energy			
Inter-	Solar PV	International deplo	yment strategy based on	Settin	g international sta	andards for evaluation	on methods through p	partnerships with int	ernational research ir	nstitutions	Independent aloba				
national strategy	Wind	Asia Zero Emissio ideas	on Community and other	Promo	ote international st	andardization of off	shore floating wind, v	with a view to reachi	ing Asia		outreach	/ 16			

<Future milestones> Case 15: Next-generation network (grid and balancing power)

In order to maximize the introduction of renewable energy, build a resilient next-generation electricity network by accelerating grid development based on the Master Plan while promoting DR based on the Act on Rationalized Energy Use over the next 10 years.

											2040	2050
		2023	2024	2025	2026	2027	2028	2029	2030	2030s	s 204	l0s
Target and strategy		Build next-ge Grid dev Establish (20 Outlook for introducing stationary batteries up to 2030	eneration netw elopment Master Plan D22) Building bal	Align with th ancing power	e Master Plan a. Accelerated intro response	to accelerate g	rid development	power generatio	n mix to 36-38%	2030 Mas rend dev netw netw	ss-scale introductic ewable energy by eloping next-gener vork	and
	Grid	Complete e	xisting inter-grid narine <mark>DC t</mark> rans	l connection pro	ojects (-FY2027 Detween Hokka) iido and Honsh	Grid develop	ment in line with	n the Master Plan	Some ¥6-7 trillion		\rangle
GX investment	Balancing power	Accelerated introduction of stationary battery systems that can be leveraged as balancing power (a. Offer support for introduction and other assistance to establish business model, b. develop environment for smooth grid connection, c. extend profit-making opportunities) Leverage hydrogen for balancing power, produce hydrogen inside Japan using water electrolyzers leveraging surplus renewables and others Accelerated introduction of controls systems required for demand response										investment und ext 10
	Grid	Esta Creat (Deve Gric	ablish Master P e environment elop a mechanis I development i	an (FY2022) for supplying rec sm for smoothly n line with the M	<mark>quired funds (m</mark> raising funds n laster Plan	nulti-trillion yen leeded for grid	<mark>scale)</mark> development)		>			
Regulation/ structure	Image: Selancing power Image: Selancing power source power source decarbonized balancing power using pumped storage hydro, battery, and other methods Balancing power Facilitate DR among large-scale consumers based on the Act on Rationalized Energy Use, build market that home-use batteries and other distributed power sources can enter Vehicle, stationary battery system Conceive programs for improving performance of home-use batteries Setting safety and other standards for stationary battery system											
Inter- national strategy		Electricity s	ystem: using la	ge projects in J	apan as basis f	for reaching ou	t to overseas ma	rket		\rangle		1

Ensuring safety as top priority, develop/build next-generation advanced reactor embedded with new safety mechanism.

											2040	2050			
		2023	2024	2025	2026	2027	2028	2029	2030	2030s		2040s			
	Accele (Actua	rated developm	ent in line with te es and other milesto	echnological s	stages ^{Note)} Target da tion projects will be de	ates for RTD mileston	es based on intervie ans created by oper	ws with different op ators, on the conditi	erators and other part on that approval from	ies. host communities o	an be gained	1.)			
Target and strategy	innovative light water reactor	Basic	design			Deta	led design			Production/ construction	O	peration			
	Note: Commercial reactor Small light water reactor Conceptual design						Basic des	sign	Detailed design Construction			Operation			
	Note) Demonstration reactor Fast reactor Note) Demonstration			Conce	ptual design			Bas	ic design	Detailed design	Productio constructi	n/ on Operation			
	High temperature gas-cooled reactor	e Basic design					Detail desig	ed In Pro	duction/const	ruction	Ор	eration			
	Nuclear fusion	Conce	eptual design			Deta	iled design			Product	ion/con	struction			
	Establish business environment for next-generation advanced reactor and focus RTD investment														
GX		Establish business environment for advanced light water reactor, develop RTD platform for developing/building next-generation advanced reactor													
investment		RTD, design, and demonstrating hi and fast reactor	d other activities for t gh temperature gas-	facilities cooled reactor	Development, ¥1 trillion over	construction, oper next 10 years	ration, and other a	activities for high t	emperature gas-cc	ooled reactor and	fast reactor	>>> invest around			
	<u>Faci</u>	litate introduc	tion through re	gulations fo	<u>r energy usage</u>										
Regulation/		Introduce long-term decarbonized power source auction		Facilitate intro	duction by building bu	usiness environment f	for steady managem	ent of long-term dee	carbonized power sou	rce auction and oth	er activities				
		Facilitate intro	duction by "manda	atory non-fossil	power source perc	centage" provisions	s in the Sophistica	ated Methods Act							
	<u>Faci</u>	litate developr	nent and win m	arkets outsi	ide Japan throug	gh international	l partnerships								
Inter- national strategy		Use Japan-UK Hig	n Temperature Gas-coo	led Reactor Cooper	ration, Japan-US Fast Rea	actor Cooperation, Japar	n-France Fast Reactor (Cooperation, and other	programs to join demons	tration reactor projects	outside Japan	win overseas markets			
		Suppliers with com	petitive edge reaching o	ut to overseas mark	kets, increasing the numb	er of suppliers with poter	ntial to operate outside	Japan	Winning ma	arkets outside Jap	ban				

< Future milestones> Case 17: Transportation sector Note) Except for maritime/automotive/aircraft industries already mentioned

The transportation sector accounts for almost 20% of Japan's total CO₂ emissions. In order to transform the demand structure and save energy as well as use more non-fossil fuels for rail and other transportation modes as well as human and goods movements, based on the Act on Rationalizing Energy Use and other provisions, facilitate initiatives for switching to clean energy sources in planned and strategical manners over the next 10 years so as to increase private investment in transportation business and other relevant industries.

											<u>2</u> 040	2050			
		2023	2024	2025	2026	2027	2028	2029	2030	2030s	2040s				
	Human movement	Promote net-zero GHG emissions in public transportation sector, advocate using public transportation													
	Goods	Seek decarbo	Seek decarbonized logistics for net-zero GHG emissions by 2050												
Target and strategy		Promote 2H3T	movement ^{Note)} util	izing railway asset ar	er forms of decarbonized energy										
		Set directions for 2 Support programs	2H3T and other initiat s for 2H3T and other ir	ves (surveys) itiative	Accelerate 2 •Accelerate r •Promote set	2H3T and other initiativ renewables power generati ctor coupling with urban pla	VES on/transportation utilizing r anning and community-end	ailway assets ompassing mobility projects		Realize railway sector CN before 2050 Contribute to reduce CO ₂ in other sectors by leveraging railways					
	Kaliway	Facilitate introdu fuel-cell railway •Pilot project to intra and other operators) •RTD/demonstratio •Grants to subsidize	uction of energy ef vehicles oduce energy efficient on for fuel-cell railway e vehicles	ficient/CO2-saving ve /CO2-saving ears-vehicles rehicles (establish basic technologies	• Disser (core going to JR • Disser more w • Furthe (Develop	ninate energy efficient videly er RTD/demonstration	t/CO ₂ -saving vehicles for fuel-cell vehicles at implementation, create	and fuel-cell vehicles		Social implementation of fuel-	cell railway vehicles				
GX investment		Accelerate int	troduction of EV (b	us/taxi) to public tran	sportation sector, s	upport community-leve	el energy managemen	t systems		\mathbf{b}					
	movement	Advocate trav	velling on public tra	ansport by improving	Ž										
	Goods movement	Decarbonize	logistics facilities,	improve efficiency an	d other aspects of l		\geq								
		Introduce en RTD/demons Introduce sol	ergy efficient/CO ₂ stration for fuel-ce lar PVs, batteries,	-saving cars Il railway vehicles and other technologie	· Intro	oduce more energy eff ther RTD/demonstratic oduce more solar PVs	ficient/CO ₂ -saving cara on for fuel-cell railway , batteries, and other t	s vehicles echnologies		Social implementation of fue Increase share of GX-ready advanced models sold outs	I-cell railway vehicles railway vehicles and other ide Japan				
		RTD/demonstrati	ion for the integrated h	ydrogen stations in key re	: gional cities acting as h	nydrogen supply centers	•	:	•	Commercialization of the integrated hydrog	en stations				
	Railway	RTD/demonstrati	ion for hydrogen suppl	y chain inside Japan takir	Ig advantage of existing	rail freight transport netwo	orks and stocks	•		Social implementation of supply chain					
		Advocate travelling on public transport by improving public transportation network service, facilitate modal shift to rail freight transport													
		Carbon neutral Resear Prepare	railway project (pro rch e CN execution pla	visional) Note	e) Construction of new I	Bu lines with net zero CO_2 em	ild new lines based or ission leveraging CO ₂ -savi	CN execution plan		Sequential operation launch, br	inging carbon neutral railway				
			up to 2024												
	Human movement		Target: 1,200 plans	Facilitate the crea	ation of local public	transportation plans b	ased on the Act on Re	vitalization and Rehab	ilitation of Local Public Tr	ansportation Systems					
Regulation	Goods movement	Certify/suppor	t initiatives for imp	roving efficiency in lo	gistics based on the	e Act on Advancement	t of Integration and Str	eamlining of Distributio	n Business	·					
/structure	Non-fossil source usage	Facilitate railw	vay operators' swit	ching to non-fossil en	ergy sources based	d on the Act on Ration	alized Energy Use		· ·						
	Deregulation	Establish/revie	ew technical requi	rements for fuelcell ra	ilway vehicle and th	the integrated hydroger	n stations	·							
Inter-		Seize initiative	e in creating intern	ational standards for	fuelcell railway veh	icles and the integrate	d hydrogen stations			\rangle					
national strategy	Rail way				Promote railwa Establish techr	y vehicles and other to nological platforms for	echnologies with GX a fuelcell railway vehicle	dvantages outside Jap as and the integrated h	: an ydrogen stations, such as	✓ : fuel cell packages, also promote them of	outside Japan				

<Future milestones> Case 18: Infrastructure areas

To decarbonize industries and ports while enhancing their competitiveness, development of Carbon Neutral Ports (CNP) and decarbonization of their construction processes will be promoted. Introduction of renewable energy sources by leveraging airports, roads, dams, sewers, and other components of infrastructure, a thorough reduction of energy consumption, and development of cities and communities that will help decarbonization, among other projects, will be facilitated.

													2040)	2050
		2023	2024	2025	2026	2027	2028	2029	2030			2030s		2040s	
	CNP	Facilitate carbor	n neutral port (CN	IP) projects (Create plan	ns for promoting port	decarbonization, add	d advanced and pro-de	carbonization functio	nality to port facilitie	es, build environment	t for accepting hyd	lrogen, ammonia fuel, and other decar	rbonized energy sour	ces)	
Target and	Construction work	Achieve net-zero Gl	HG emissions throug	; phout the entire life cycle (p	romote building material t	that can reduce CO ₂ in di	: irectly managed construction	work, innovative constru	tion machines (e.g., ele	: ectrified, hydrogen, bio), ar	nd ICT-controlled wor	k in directly managed and municipality-manage	ed construction projects)		
strategy	Energy conservation and renewables by leveraging infrastructure and other resources	Promote leverage of energy used b	ging spaces avail	able at airports, roads	, dams, sewers, a	and other diverse	e infrastructure that	can be utilized to	introduce/disse	eminate solar PVs	, hydro, bioma	ss, and other types of renewabl	le energy sources	s / thorough reduc	otion
	Urban planning	Use energy mor	e efficiently throu	ighout the entire city b	y introducing gre	en urban plannin	ng, push for introduc	ction of green in fr	astructure						<u> </u>
	CNP	Decarbonize vel	hicles/equipment	used at ports, introdu	ice LED lights to p	private berths, ins	stall solar PV powe	r generation facil	ities, decarboniz	ze work vessels					
	Construction work	Introduce constr	ruction materials	that can reduce CO ₂ ,	innovative constr	ruction machines	(electrified, hydrogen,	bio), and ICT co	nstruction machi	ines					
	and	Save energy use	ed for airport bui	dings (focus introduction	of more efficient equi	ipment, BEMS, and	other technologies whe	n replaced, use LED	for lighting/lamps),	, shift airport vehic	cles to EV/FCV	r			
GX	Energy conservation ar renewable energy by veraging infrastructure a other resources	Introduce advan	ic Wireless Power Transl	hts, push for installing	g EV chargers at i	roadside rest stop	p, and public roads tion projects on pub	in general blic roads					\longrightarrow		
Investment		Develop environm Hybrid dams and o	nent for leveraging riv other projects for ge	ver boats for public constru nerating more electricity by	ction work, introducir hydro (introduce advance	ng flap gates and oth ced dam control systems	ner mechanisms to man , adding dam height to contro	age riverine control s ol waterflow and generate	ystems without usir more electricity)	ng power A	aximum implei	mentation at suitable dams and	rivers		
		Install power gener treatment facilities)	ation equipment usi	ng biomass digestion gas f	rom sewers (technologi	ical development through	innovative sewer technology	y demonstration projects,	dissemination of sewer	treatment technologies b	y developing carbon r	eutral community model			
	<u> </u>	Further introduc	tion of maximum	solar PV and others t	echnically possib	le to airports, roa	ads, sewer systems	, navigation signa	als, and other pu	ublic facilities					
	Urban planning	solutions	an structure transfor	nation with Compact Plus	Network and other m	leasures , evolution o	of areal energy systems	s, advanced and env	ronment-trienaly pri	ivate urban developn	nent ventures, and	i urban green spaces by implementing	g green infrastructure	and other nature-ba	sed
	CNP	Revised Port and H Note) Clarification purposes, sin	Harbor Act Note) e on of roles ports and ngle point of contact	nacted (2022) harbors play in the Basic for licensing and other adr	Wider introduction of Policies, introduction ministrative processe	facilities required for of mechanism for fa	r supplying fuel to LNG acilitating CNP construc	-/hydrogen-fueled ve tion, addition of port	ssels, or other emis facilities required for	ssions-reducing mate or supplying fuel to LN	rial, as well as de IG-/hydrogen-fue	carbonized cargo operation machinery ed vessels, or other emissions-reduci	y ng material, less strir	gent regulations for	structure
		Pilot project for usin	ng construction mate	rials that can reduce CO ₂	Revision of sta	andards and othe	er requirements for	dissemination of	construction ma	terials that can re	Ni educe CO ₂				
	Construction work	Launch program for cert	tifying innovative constru	ction machines	Extending the scope of	machinery certification (to	o electrified models), incentivizing	the use of certified machi	nery in directly managed	d construction work	Exte	nding the scope of machinery of	certification (to fue	cells, hydrogen engi	ines)
		Facilitate training IC	CT implementation w	orkers on both client and c	onsignee sides, visu	alization of construct	tion site data to drive ef	ficiency improvemer	t, among other actic	ons	Note) Also facil carbon infrastru	itate the development of incentive pro icture in Hokkaido	grams such as the pi	lot construction proje	ct for zero-
Regulation/	and	Each airport adr	ministrator to crea	ate decarbonization p	romotion plans ba	ased on the gove	rnment's basic poli	cies for promoting	aviation decart	bonization (revised	Civil Aeronautics	Act and Airports Acts)			$ \longrightarrow $
Structure	ration a ergy by ructure rrces	E.g. Discussion on	allowing drivers to te	emporarily leave highways	for recharging, install	lation of EV chargers	s and hydrogen stations	s at roadside rest sto	p, development of te	echnical guidelines fo	or placing solar P	/ power generation systems on roads			$ \longrightarrow $
	gy conserv ewable en ging infrast other resou	Discussion on promo non-powered technologi	ting ways to leverag ogies	e river boat traffic, establis	h standards and requ	irements for E	Building environmer	nt for river boat tra	affic to reduce C	O ₂ , facilitating the	e application of	non-powered technologies to	other areas throu	gh standardizatio	n
	Enerç ren leveraç	Sounding private	businesses and	other entities, surveys	(for hybrid dams)	Pr (Ac	ogram design for in	ncreasing hydro p nd allocation rule dise	ower generation	n and energizing l	local communit	ies by creating new frameworks	s for public-priva	e partnership	
	Urban planning	Promote Compa introduce private	et Plus Networks investment med	through location opt	imization plans ar astructure	nd other measure	es under the Act on	Special Measure	es concerning U	rban Reconstruct	ion (CO2 reduction	on by consolidating urban functionalit	ies, promoting the us	e of public transporta	ation),
	CNP	International cod	operation about (CNP Initiative (Japan-U	S CNP Cooperation,	Quad Shipping Task	(force, etc) and esta	ablishment/trial/o	peration of certifi	ication program fo	or port terminal	decarbonization with an eye fo	or international de	ployment	
Inter- national	Construction work	Export innovativ	e construction m	achines to Europe an	d other environme	entally advanced	regions to capture	demand outside	Japan, compliar	nce with internatio	onal standards	for ICT construction work			
strategy	Energy conservation and renewable	Align with the Kuma biomass power of	amoto Initiative for W generation systems.	/ater (April 2022) to promo)	te acceptance of high	+-quality infrastructur	re leveraging technolog	ies that can balance	climate change miti	igating actions and co	ountermeasures c	utside Japan (operation improvement	t and modernization c	f existing dams, depl	oy sewer
	infrastructure and other resources	Extending energ	gy efficient infras	ructure technologies i	nternationally										

<Future milestones> Case 19: Carbon-recycling fuel (SAF, synthetic fuel, e-methane)

In order to promote the usage of SAF, e-fuel, e-methane, and other products that can help decarbonization, work on developing/demonstrating technologies and capital investment, while developing regulations/structures and coordinating discussions on the establishment of international rules over the next 10 years.

2023 2024 2025 2026 2027 2028 2039 2030 2030s 2040s Targed and statistical statis statistical statis stati											2040	2050				
GX 		202	3 2024	2025	2026	2027	2028	2029	2030	2030s	2040s					
Target and strates Image: and the social of production to full the strate is so the strates is trates is trates in the local as a strates is trates in the local as a strate is trate strate is a strate is trate in the local astrate is tr		SAF	Create demand for SAF by advo Realize stable production/supp type of fuel	ocating ICAO's target o ly of indigenous SAF by	f achieving net zero y developing produc	emissions by 2050 as ction technologies, ma	s well as basic policies ass-scale demonstratio	based on the revised Civi n, large investment for pr	il Aeronautics Act oduction facilities for this	10% of aviation fuel used b operator in 2030 switched t Increased suppl	y Japan's air transportation o SAF y of indigenous SAF	2050 CN				
Image: Section 1 Leveraging the advantage that new supply infrastructure or demand-side actions are not required, a. quickly establish mass- production technologies and b. Co, emission rules, while c. realizing mass production/supply by large investment. Image: Comparison of the supply infrastructure or demand-side actions are not required, a. quickly establish mass- production technologies and b. Co, emission rules, while c. realizing mass production/supply by large investment. Image: Comparison of the supply infrastructure or demand-side actions are not required, a. quickly establish mass- production technologies and b. Co, emission rules, while c. realizing mass-production facilities and note equipment. Image: Comparison of the supply infrastructure or demand-side actions the requipment. Image: Comparison of the supply infrastructure or demand-side actions the supply infrastructure or demand-side actions the supply infrastructure or demands rules whereas the requipment. Image: Comparison of the supply infrastructure or demands rules in the supply infrastructure or demands rules in the supply infrastructure or demands rule in the supply infras	Target and strategy	e-fuel	RTD and upscaling of production tandem with creation of hydroge the shift from fossil fuel with a fo	n facilities for reducing n/ammonia supply chai cus on aircraft, automo	synthetic fuel costs in, creation of rules obiles, vessels, and	, strategic formation of for CO ₂ emissions wh other modes of mobil	of production sites for on the fuels are used, a lity.	carbon recycling fuel in and other actions to drive	2030 • Introduce synthet	ic fuel	•Commercialize synthetic fuel (Maximum acceleration)					
Application Public/private SAF Investment: production technology development, mass-scale demonstration, production facilities and other equipment		e- methane	Leveraging the advantage the production technologies an	nat new supply infra d b. CO ₂ emission r	astructure or dem ules, while c. real	nand-side actions a lizing mass produc	are not required, a. c ction/supply by larg	quickly establish mass e investment.	- Domestic introdu	ction: 1%	Domesti Note) Same p	2050 c introduction: 90% rice level with LNG				
GX Mass-production Mass-production Mass-production Mass-production Mass-production Plot plant demonstration Further development Development<		Publi	c/private SAF investment: produ	ction technology deve	elopment, mass-sc	cale demonstration,	production facilities	Some ¥600 billion		Increase supply		\rightarrow				
GX investment Develop highly efficient and mass-scale production technologies for synthetic fuel Plot plant demonstration Further development to reduce cost Massive investment for production facilities and other equipment GX investment Technology verification/demonstration based on existing technologies for synthetic fuel production facilities, and more Some 420 billion Massive investment for production facilities and other equipment Public/private e-methane investment: production technology development, production facilities, and more Some 420 billion Reg. develop highly efficient and mass-scale production reduinties, and more Some 420 billion Public/private e-methane investment: production technology development, production facilities, and more Some 420 billion Reg. develop highly efficient and mass-scale production project (Stage 1) Staf •Study specific measures used to mere specific measures production and other equipment Reg. develop highly efficient project (Stage 2) Reg. develop highly efficient project (Stage 2) Regulation/ structure effect Discuss the non-fossil switching targets for gasoline and other provisions under the Sophisticated Methods Acts, study/develop mechanisms for certifications and transferring environmental values New goals to facilitate supply-side usage Inter- national structure • effect Discuss the non-fossil switching targets for gasoline and other provisions under the Sophisticated Methods Acts, study/develop mechanisms for certifications and transferring envintice structure New goals to facilitate s		De	elop (biomass-based) SAF Juction technologies Mass-production demonstration Massive investment for production facilities and other equipment >>> Invest more than around ¥3 trillion over next 10 years													
GX investment Technology verification/demonstration based on existing technologies for synthetic fuel production Massive investment for production facilities and other equipment Publiciprivate synthetic fuel investment: production technology development, production facilities, and more Some ¥20 billion Messive investment for production and usage in Japan in Bitteria area and manufacturing sites leveraging hydrogen and removable every Regulation/ For elabele datape to sense youthing prediction production production rules (Stage 1) Technology development, production production rules (Stage 2) Regulation/ Staf •Study specific measures such as frameworks relevant to mandatory CO ₂ reduction under the 2050 net-zero emissions target (ICAO agreement) •Create decarbonization promotion plans for airlines based on the government's basic policies for promoting availation decarbonization (revised Civil Aeronautics Act) enter Staf •Study/develop mechanisms for certifications and transferring entrimement available and other provisions under the Sophisticated Methods Acts, study/develop mechanisms for certifications and transferring entrimement available New goals to facilitate supply-side usage 0 Study/develop mechanisms for certifications and transferring entrimement available database of the presence available methods Acts agrees to study by the presence available methods acts for SAF matases has and other areas entrimement available. New goals to facilitate supply-side usage Inter- national strategy • Study/develop mechanisms for certifications and transferring entrifications with Pro		Dev	velop highly efficient and mass-scale	production technologies	for synthetic fuel	Pilot plant demor	nstration	Further development	to reduce cost Massive and oth	e investment for production faci er equipment	lities Increase supply	SAC TO YOURD				
Public/private synthetic fuel investment: production technology development, production facilities, and more Some ¥400 billion Development Development <thdevelopment< th=""> Development</thdevelopment<>	GX	Te	chnology verification/demonstration back	ased on existing technolo	ogies for synthetic fue	el production	Massive investmer	nt for production facilities ar	nd other equipment		<u> </u>					
Public/private e-methane investment: production technology development, production facilities, and more Some ¥2 trillion Beindsmethal Advites including development and introduction of technologies for mass production and cast reduction/introduction of interhane/demonstration and introduction of methanation production and usage in Japan In littoral areas and manufacturing size leveraging hydrogen and remeable energy Is do dealed deup for energe regulation (see the second s	investment	Public	c/private synthetic fuel investment: production technology development, production facilities, and more Some ¥400 billion													
Activities inducting development and introduction of therhologies for mass production middle lages 1 Begin domains cappy Fig and detecting development and introduction of therhologies for mass production middle lages 1 Begin domains cappy Fig and detecting development and introduction of therhologies for mass production middle lages 1 Begin domains cappy Regulation SAF •Study specific measures such as frameworks relevant to mandatory CO ₂ reduction under the 2050 net-zero emissions target (ICAO agreement) •Create decarbonization promotion plans for airlines based on the government's basic policies for promoting aviation decarbonization (revised Civil Aeronautics Act) e-fuel Discuss the non-fossil switching targets for gasoline and other provisions under the Sophisticated Methods Acts, study/develop mechanisms for certifications and transferring environmental values e-fuel Study/develop mechanisms for certifications and transferring environmental values New goals to facilitate supply-side usage Perthane SAF •Set various ways to offer support) Private businesses building independent supply chain Station for programs with other countries to start supplying in Japan and increase the volume, coordinate actions to establish CO ₂ emission rules New goals to facilitate supplying and and increase the volume, coordinate actions to establish CO ₂ emission rules International strategy Coordinated actions with Project Candidate countries (Stage 2-) to establish CO ₂ emission rules Cordinated actions wi		Public	/private e-methane investment: production technology development, production facilities, and more Some ¥2 trillion													
For detailed using to constant project (Stage 1) Livest in overseas production project (Stage 1) Livest in overseas production project (Stage 2) Function For detailed using to constant project (Stage 1) Livest in overseas production project (Stage 2) Regulation/ structure SAF •Study specific measures such as frameworks relevant to mandatory CO ₂ reduction under the 2050 net-zero emissions target (ICAO agreement) ·Create decarbonization provided using to constant project (Stage 2) e-fuel Discuss the non-fossil switching targets for gasoline and other provisions under the Sophisticated Methods Acts, study/develop mechanisms for certifications and transferring environmental values e-fuel Study/develop mechanisms for certifications and transferring environmental values Sophisticated Methods Act targets to facilitate supply-side usage New goals to facilitate supply-side usage e-fuel Sudy/develop mechanisms for certifications and transferring environmental values Private businesses building independent supply chain . Seek various ways to offer support Private businesses building independent supply chain Private businesses building independent supply chain . Seek various ways to offer support Private businesses building independent supply of feedbooks for SAF production inside Japan, and also to win SAF markets in Asia and other areas ·Build atructure to having indigenous SAF registered and certified by the ICAO (for environmental sustainability, CHG emission rules Intervin the coordinated actors. docus multitarial ru		Activiti	as including development and introduction of technologies for mass production and cost reduction/introduction of biomethane/demonstration and introduction of methanation production and usage in Japan in littoral areas and manufacturing sites leveraging hydrogen and renewable energy													
SAF -Study specific measures such as frameworks relevant to mandatory CO2 reduction under the 2050 net-zero emissions target (ICAO agreement) -Create decarbonization promotion plans for airlines based on the government's basic policies for promoting aviation decarbonization (revised Civil Aeronautics Act) e-luel Discuss the non-fossil switching targets for gasoline and other provisions under the Sophisticated Methods Acts, study/develop mechanisms for certifications and transferring environmental values e-luel Study/develop mechanisms for certifications and transferring environmental values Sophisticated Methods Act targets to facilitate supply-side usage New goals to facilitate supply-side usage e-luel Study/develop mechanisms for certifications and transferring environmental values Private businesses building independent supply chain .Seek various ways to offer support Private businesses building independent supply chain .Seek various ways to offer support Private businesses building independent supply chain .Build soluteure for having indegenous SAF registered and certified by the ICAO (for environmental subanability, CHC emissions evaluation, and other qualities), initiatives for raising SAF mature rate under ASTM regulations e-luel Joint programs with other countries to start supplying in Japan and increase the volume, coordinate actions to establish CO2 emission rules In few wh the coordinated actions with Project candidate countries (Stage 2-) to establish CO2 emission rules e-luel Joint programs with other countries to start sup		FS and o	detailed design for overseas production project (Stage 1	Invest in oversea	s production project (Stage 1)		Begi Furti	n domestic supply her investment for overseas producti	on project (Stage 2-)						
Regulation/ structure e-fuel Discuss the non-fossil switching targets for gasoline and other provisions under the Sophisticated Methods Acts, study/develop mechanisms for certifications and transferring environmental values e-fuel Study/develop mechanisms for certifications and transferring environmental values Sophisticated Methods Act targets to facilitate supply-side usage New goals to facilitate supply-side usage e-fuel Study/develop mechanisms for certifications and transferring environmental values Private businesses building independent supply chain New goals to facilitate supply-side usage Inter- national strategy • Build collaborative systems with dedstock suppliers and other players outside Japan to ensure stable supply of feedstocks for SAF production inside Japan, and also to win SAF markets in Asia and other areas • Build structure for having indigenous SAF registered and certified by the ICAO (for environmental sustainability, CHG emission realations evaluation, and other qualities), initiatives for raising SAF mixture rate under ASTM regulations e-fuel Joint programs with other countries to start supplying in Japan and increase the volume, coordinate actions to establish CO ₂ emission rules In line with the coordinated action, discuss multileral nues for CO ₂ emission candidate actions. with Project candidate countries (Stage 2-) to establish CO ₂ emission rules Capture demand for switching from natural as to e-methane		SAF	Study specific measures such as frameworks relevant to mandatory CO ₂ reduction under the 2050 net-zero emissions target (ICAO agreement) Create decarbonization promotion plans for airlines based on the government's basic policies for promoting aviation decarbonization (revised Civil Aeronautics Act)													
Bit did Study/develop mechanisms for certifications and transferring environmental values Sophisticated Methods Act targets to facilitate supply-side usage New goals to facilitate supply-side usage International strategy SAF •Build collaborative systems with feedstock suppliers and other players outside Japan to ensure stable supply of feedstocks for SAF production inside Japan, and also to win SAF markets in Asia and other areas •Build structure for having indigenous SAF registered and certified by the ICAO (for environmental sustainability, GHG emissions evaluation, and other qualities), initiatives for raising SAF mixture rate under ASTM regulations e-fuel Joint programs with other countries to start supplying in Japan and increase the volume, coordinate actions to establish CO ₂ emission rules In line with the coordinated actions, discuss multilateral rules for CO ₂ emission rules e-methane capture demand for switching from natural ast to ensure stables on rules Capture demand for switching from natural action rules	Regulation/	e-fuel	Discuss the non-fossil switch	ng targets for gasolir	ne and other provis	sions under the Sop	histicated Methods A	cts, study/develop mech	nanisms for certifications a	and transferring enviro	nmental values					
Inter- SAF •Build collaborative systems with feedstock suppliers and other players outside Japan to ensure stable supply of feedstocks for SAF production inside Japan, and also to win SAF markets in Asia and other areas Build structure for having indigenous SAF registered and certified by the ICAO (for environmental sustainability, GHG emissions evaluation, and other qualities), initiatives for raising SAF mixture rate under ASTM regulations e-fuel Joint programs with other countries to start supplying in Japan and increase the volume, coordinate actions to establish CO ₂ emission rules Coordinated actions with Project Coordinated actions with Project candidate countries (Stage 2-) to establish CO ₂ emission rules Capture demand for switching from natural as to e-methane Capture demand for switching from natural as to e-methane Capture demand for switching from natural Ca		<u>e-</u>	Study/develop mechanisms for	Sophisticated	d Methods Act targ	ets to facilitate supp	New goals to facilitate	ate supply-side usage								
SAF •Build collaborative systems with feedstock suppliers and other players outside Japan to ensure stable supply of feedstocks for SAF production inside Japan, and also to win SAF markets in Asia and other areas International strategy •Luel Joint programs with other countries to start supplying in Japan and increase the volume, coordinate actions to establish CO ₂ emission rules In line with the coordinated actions, discuss multilateral rules for CO ₂ emission e-fuel Coordinated actions with Project candidate countries (Stage 1) to establish CO ₂ emission rules Coordinated actions, discuss multilateral rules for CO ₂ emission capture demand for switching from natural as to e-methane Capture demand for switching from natural cas to e-methane Capture demand for switching from natural cas to e-methane Capture demand for switching from natural cas to e-methane Capture demand for switching from natural cas to e-methane capture demand for switching from natural capture demand for switching c		methane	environmental values •Seek various ways to offer supp	Private busine	esses building inde	ependent supply cha	ain									
Inter- national strategy e- methane countries (Stage 1) to establish CO ₂ emission rules countries (Stage 2-) to establish CO ₂ emission rules Coordinated actions, discuss multilateral rules for CO ₂ emissions candidate countries (Stage 1) to establish CO ₂ emission rules Capture demand for switching from natural gas to e-methane		SAF	Build collaborative systems with feedstor Build structure for having indigenous SAF	k suppliers and other players registered and certified by th	outside Japan to ensure s le ICAO (for environmenta	stable supply of feedstocks t al sustainability, GHG emissi	for SAF production inside Japa ions evaluation, and other qua	an, and also to win SAF markets litites), initiatives for raising SAF r	in Asia and other areas mixture rate under ASTM regulations							
strategy e- methane Coordinated actions with Project candidate countries (Stage 2-) to establish CO ₂ emission rules Coordinated actions, discuss multilateral rules for CO ₂ emissions Capture demand for switching from natural cas to e-methane Capture demand for switching from natural cas to e-methane Capture demand for switching from natural cas to e-methane Capture demand for switching from natural Capture demand for switching from n	Inter- national	e-fuel	Joint programs with other countries	to start supplying in Jap	oan and increase the	volume, coordinate act	ions to establish CO ₂ em	ission rules				,				
e- establish CO ₂ emission rules Capture demand for switching from natural gas to e-methane	strategy		Coordinated actions with Project	Coordinated a	ctions with Proje	ect candidate cou	Intries (Stage 2-) to	establish CO emis	sion rules	In line with the coordinated action	s, discuss multilateral rules for CO ₂ emission	ns				
Capturing demand for switching fuel to natural gas and advanced ways of using natural gas in Asia and other regions		e- methane	establish CO ₂ emission rules	Capturing demand for	or switching fuel to	natural das and ad	wanced ways of using	natural das in Asia and	other regions		Capture demand for switching from gas to e-methane					

<Future milestones> Case 20: CCS

In order to secure the annual CCS capacity required for achieving net-zero GHG emissions by 2050, build advanced CCUS value chain and win CCUS markets in Asia over the next 10 years, and also develop CCS business acts as quickly as possible to create business environment for launching businesses by 2030.



<Future milestones> Case 21: Food, agriculture, forestry, and fisheries industry

- Based on the Strategy for Sustainable Food Systems, MIDORI (launched in May 2021) and MIDORI Act (established in April 2022 and enforced in July 2022), promote initiatives to transform the agriculture, forestry, fisheries and food industries to decarbonize and reduce environmental burden.
- Forest, agricultural land, seaweed forest, other places where the agriculture, forestry, and fisheries operate play an indispensable role as greenhouse gas sink in achieving net-zero GHG emissions by 2050. Their function will be enhanced by stakeholders' behavioral changes and other methods in order to attract private investment.

									2040 2050						
	2023	2024	2025	2026	2027	2028	2029	2030	2030s	2040s					
	Build su	Build sustainable food systems by the Strategy MIDORI (by achieving zero CO ₂ emissions in agriculture/forestry/fisheries, and other measures)													
	Green	growth for	economy a	and societ	y realized	by forest, fo	orestry, ar	nd wood ind	lustries		,				
Target and strategy	 R&D for Convering Renewing Visuali Impleming Developmenteria 	or electrificat rsion to hybr vable power zation of gre nention of el opment/disse als, utilizing	tion of agric rid horticultu generation eenhouse g ite-tree, dig emination o them in urb	ulture mac ure facilities leveraging as reductio ital technol f modified l an structur	hinery s local bioma ns, facilitate ogies, and ignin and o es	ass resource e J-Credit uti other innova ther new woo	s Ilization tions in fore od-derived	estry	Demonstration / dissemination of new enviror Demonstration / introduction of local production management system More investment for private businesses and c Mass production and usage of new wood-der resources	Iment control technologies on for local consumption energy wissions indust other entities to leverage forest resources ived material to move away from fossil	ry/ D ₂ ries				
GX	Investr (Energ power	Investment for structural transformation (Energy-efficient agriculture machinery, heat pump, local production for local consumption renewable power generation facilities, airborne laser scanning for advanced forest resource data)													
	R&D	R&D (Zero emissions horticulture facility, VEMS (Village Energy Management System), modified lignin technologies to replace high-performance plastics													
	Initiativ	Initiatives/innovation to reduce environmental burden based on the Strategy MIDORI and MIDORI Act													
Regulation/ structure	Consum	ners behavio	oral change	s by visuali	zation of de	ecarbonizatio	on in agricu	llture/forestr	//fisheries, increase supply of environmenta	ally-friendly agricultural products	ŀ				
	Levera manag	ge/promote ement	e nature-ba	ased credi	ts (forest/a	agricultural	land/ blue	carbon as	carbon sink) to help businesses reduce	GHG and carbon neutral	ŀ				
Inter- national strategy	Work through the Japan-ASEAN Midori Cooperation Plan and other frameworks to promote the Strategy MIDORI as a model for initiatives in Asia monsoon regions. Also vigorously push for implementing technologies that can help mitigate climate change impacts through joint international research in the Asia monsoon regions and other places										, 23				

<Future milestones> Case 22: Community and daily life

In order to decarbonize communities and daily life, deploy designate Decarbonization Leading Areas, accelerate implementation of priority measures proactively for administrative work and projects in municipalities, including businesses owned by them, and spread initiatives of regional decarbonization throughout Japan, and also encourage behavior change and life style transformation through new national movements and other programs to create widespread demands for decarbonized products, and facilitate structural transformation of industries and society based on characteristics of each community.

		203	.020	40	_2050							
	by around 2025 up to 2030		2030s	2040	S							
	Create more than 100 Decarbonization Leading Areas		Achieve decarbonization communities before 2050	in many 0, transition to r	next							
Target and strategy	Clear FY2030 reduction targets for greenhouse gas reduction in buildings sector		period in which local societies, having surmounted challenges for their									
	Clear pioneering targets set in line with government action plans											
	Regional revitalization achieved											
GX investment	Renewable energy, stationary storage batteries, xEVs, private transmission lines Next-gene Houses/buildings (ZEB/ZEH and insulation-improvement renovation) Produce/u Note) New technologies will be applied as they are developed	eration se gre	solar PVs (including een hydrogen	perovskite)	>							
Regulation/ structure	Designate Decarbonization Leading Areas to encourage competition between different areas Accelerate support through grants and special provisions for municipality finance Stronger local government action plans as requirement for grants and other support Visualize municipality initiatives' progress Enhance initiatives through local government action plans program Accelerate priority measures focus actions through grants and Special Grants to Local Governments • Engage residents and businesses to accelerate region-wide decarbonization • Proactive decarbonization of administrative processes in municipalities, including businesses owned by them PPA model support, assist local businesses in installing CO2-reducing facility, electrification, fuel switching, and other actions											
Line of the second s	Support offered through the Japan Green Investment Corp. for Carbon Neutrality and Encourage behavior change, lifestyle transformation, and stimulate demand through new nation	Support offered through the Japan Green Investment Corp. for Carbon Neutrality and local financial institutions Encourage behavior change, lifestyle transformation, and stimulate demand through new national movements and other programs										
Inter- national strategy	Make cities more decarbonized and more resilient through city-to-city collaboration Facilitate formation of international cooperative programs for regional decarbonization in collaboration with stakeholders	$\overline{\langle}$			24							

Future steps for renewable energy policy - Spring 2023 -2025 2030

[Build next-generation network]

- Fully leverage the potentials of sites suited to renewable energy facilities by installing submarine cables for DC transmission from Hokkaido (new 2 GW capacity (FY2030))
- Enhancing east-west inter-grid connection by scaling 50-60 Hz conversion capacity (from 2.1 GW to 3 GW (FY2027))
- Grid development based on the Master Plan due FY2022 (some ¥6-7 trillion: estimate by the Organization for Cross-regional Coordination of Transmission Operators, JAPAN)
- Develop environment for raising funds (several trillion yen) needed for grid investment (extension of period covered by grid development subsidy (allocated from renewable energy tariff revenues

and other sources), loans by public organizations)

2050

[Sec ● Acc - Est	ure balancing power] celerated introduction of stationary battery systems ablish introduction outlook for 2030, stimulate private investment	a. Grid development and securing balancing power for mass-scale introduction of renewable energy
- Mar intr • Lor - Us	And other actions to create more revenue opportunities, develop environment enabling smooth grid connection, boduction assistance and other measures to help businesses become self-sustainable quickly Ig-Term Decarbonized Power Resource Auction a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for rechargeable batteries, a the long-term decarbonized power source auction to be launched in FY2023 to facilitate investment for term decarbonized	
● Lev - Bu Es fue	Perage hydrogen and ammonia Id large and resilient supply chain, encourage domestic production using surplus renewable energy and other sources tablish comprehensive structure based on regulation-support package, including support focusing on price gaps from existing Is and support for facility development	Volume to be introduced (hydrogen/ammonia) 2030: 3 million tons / 3 million tons 2050: 20 million tons / 30 million tons
[Acc ● Ind From	elerated innovation] igenous next-generation solar PVs (perovskite, rooftop and wall surface installations) n user-side demonstration (FY2023-) to demand creation (FY2026-) to early-stage GW-class mass production (FY2030)	Solar 2030: 104-118 GW
• Off From	shore wind setting target for introduction of floating types (FY2023) to offshore demonstration of floating types (FY2023-) to bidding for floating	types (second half of 2020s)
Fron	In centralized wind data and submarine geotechnical surveys (2023-) to auctions based on the results (2025-) Total project capa [Maximum introduction of indigenous renewable energy] ● More stringent regulatory measures for stronger business discipline	Formulate offshore windacity ofprojectsry year2030: 10 GW2040: 30-45 GW
b. Maximum introducti indigenous renewak energy 36-38% in 2030 (Cabinet decision of Octo	 Leverage auctions and new programs (FIP) to alleviate burden on citizens (FY2022-) Extended introduction of renewable energy coexisting with local communities Public sector leading by example: install about 50% of applicable structures (6.0 GW) Facilitate renewable energy that can coexist with local communities using promotional district Act on Promotion of Global Warming Countermeasures and other methods (8.2 GW) Maximum exploitation of existing renewable energy (solar PV: some 60 GW): facilitate a increase output and turning them into long-term power sources Steady management of disposal cost reserve program, planned response to mass-scale of the source of	ct program under the revised additional investment to disposal in the second half of
	increase output and turning them into long-term power sources ● Steady management of <u>disposal cost reserve program</u> , planned response to mass-scale of 2030s	disposal in the second half of 25

Future steps for nuclear energy policy

