A vision toward carbon neutrality in the Japanese refining industry March 2021

The Japanese refining industry aims to <u>achieve net zero CO2 emissions(carbon neutrality) associated with</u> <u>business activities and also contributes to achieving carbon neutrality in society</u> through such as supplying low carbon products by accelerating efforts to decarbonize supply chain and products, and by actively tackling R&D and social implementation of innovative decarbonization technologies that can leverage the existing infrastructure(e.g. ①CO2-free hydrogen, ②synthetic fuels, ③CCS/CCU(carbon recycling)).

PA.J

	Now 2030	2050	
(1) Reduction of CO2 emissions from own business activities (Scope 1+2)	Strengthen existing measures, R&D Challenge for the practical use ①Strengthening energy efficiency measures, promoting fuel efficiency CO2 reduction ②Promoting the use and development of renewable energy and zero-emission power sources ③Transforming refining processes ③Transforming refining processes Practical use ④CCS/CCU (carbon recycling) technology development* Practical use	Aiming associa	Contribute
(2) Reduction of CO2 emissions associated with products supplied (Scope 3)	(1)Utilization of first-generation biofuels (2)Development of fuels that contribute to improved fuel efficiency of ICEs (3)Introduction and technological development* of next-generation biofuels (4)Development of CO2-free hydrogen technology*> Practical use (5)Development of synthetic fuels "e-fuel" technology> Practical use (carbon recycling)* Change in user and public awareness, Change in e.g. the automotive industry	for net zero CO2 ated with busines:	e to achieving car for society as a w
 (3) CO2 emission reduction and sink measures Image: Second S	 (1) A low carbonization of value chain (e.g. environmentally friendly products, lubricants) (2) Infrastructure development of hydrogen stations, EV charging (3) Promoting the expansion and the development of renewable business (4) Development of technology for recycling waste plastics * >> Practical use (5) Development of hydrogen supply chain technology * >> Practical use (6) Feedstock conversion of petchem products (biomass/carbon recycling) *> Practical use 	emissions s activities	bon neutrality vhole

Action plan for innovative technology

To achieve carbon neutrality, the Japanese refining industry is tackling "Development of innovative technologies" (e.g. ①CO2-free hydrogen, ②synthetic fuels, ③CCS/CCU (carbon recycling)), by utilizing the assets, human resources, and industrial networks cultivated so far.

	Technology development		fiscal year										
No.			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2050
(2)②	Development of fuels that contribute to improved fuel efficiency of ICEs		R&D		Dem	i <mark>onstr</mark>	ation						
(2)③	Introduction and technological development of next-generation biofuels		1	I	1	I I I	1 1	I I I	1	1 1			
(1)③ (2)④	Development of CO2-free hydrogen technology		1 1 1 1	I I I	1			, , ,	1 1 1 1	 			Challenges for
(2)(5)	Development of synthetic fuels "e-fuel" technology (carbon recycling)		1	I	1	1	1	1	1	1	1		practical application including social
(3)④	Development of technology for recycling waste plastics		1 1 1 1					i					implementation
(3)⑥	Feedstock conversion of petchem products (biomass/carbon recycling)		I	I	!	I	I	!	I	!			
(1)④ (3)⑦	CCS/CCU (carbon recycling) technology development Specifically, CCU (carbonate process), etc.												

Note 1. Since these initiatives include projects that require a large amount of funds for commercialization, we will request the government to take strong support measures. 2. "No." in the table refers to the No. assigned to each technology covered in (1) through (3) of the vision.