

E

# Engagement with the Environment

At the Cosmo Energy Group, we have included Harmony and Symbiosis with the Global Environment in the Basic Concept of Sustainability and taken an array of initiatives with the goal of becoming an environmentally friendly energy corporate group.

As the world's attention is being drawn toward initiatives reducing greenhouse gas emissions, we announced our 2050 Carbon Net Zero Declaration.

Here we introduce our energy-saving initiatives and other environmental measures and activities.

## Reduction of greenhouse gas emissions

As a part of the sustainability plan, we set as a target a 2 million ton (26%) reduction in emissions by FY2030, compared to the FY2013 level, consistent with the orientation of the global community and the Japanese government toward realizing a sustainable society.

In addition, we are targeting a 16% reduction in FY2022, the final year of the plan, again compared to the FY2013 level, so that we are proactively engaged in the advancement of initiatives reducing CO<sub>2</sub> emissions. CO<sub>2</sub> emissions in FY2021 were 6.97 million tons, a decrease of 0.49 million tons from FY2013. (figures marked with ☺ due to the scope of CO<sub>2</sub> data aggregation of in the transportation and other divisions.

Cosmo Energy Group's CO<sub>2</sub> Emissions (10,000 ton/CO<sub>2</sub>)\*3\*4\*5

	FY2013 Actual	FY2019 Actual	FY2020 Actual	FY2021 Actual	FY2022 Target	Vs.FY2013
Transportation division (crude oil, raw materials and products)	90	75	71	77	86	-4
Manufacturing division (petroleum and petrochemical products)	676	650	631	662	598	-78
Other (service stations, research centers, etc.)	4	2	3	2	4	0
Biofuel (with ETBE)*1	-7	-13	-14	-17	-15	-8
Expansion of the renewable energy business (wind power generation)*2	-16	-27	-25	-27	-46	-30
<b>TOTAL</b>	<b>746</b>	<b>688</b>	<b>666</b>	<b>697☺</b>	<b>626</b>	<b>-120</b>

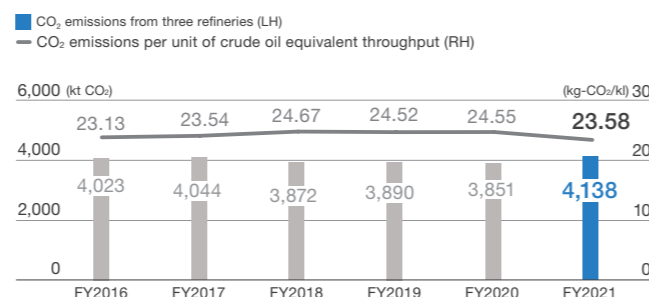
\*1 The amount due to biofuels is the CO<sub>2</sub> emissions reduction due to the contributions of ethyl tert-butyl ether (ETBE)-mixed gasoline, which is considered to have negative CO<sub>2</sub> emissions.  
 \*2 Expansion of the renewable energy business has been calculated using the total power generation volume multiplied by the alternative value for each year. The figure for FY2022 was calculated by using the FY2016 alternative value of 0.587 kg-CO<sub>2</sub>/kWh.  
 \*3 Refer to the Cosmo Energy Holdings' sustainability website for the differences in the methods for calculating CO<sub>2</sub> emissions in Cosmo Energy Group's CO<sub>2</sub> Emissions and the Environmental Impact of Business Activities, disclosed on the website (Japanese).  
 \*4 CO<sub>2</sub> emissions associated with power consumption were calculated using the emission factor of each electric power company. Basic emission factors were applied when calculating the data for FY2020 and before. These were replaced with adjusted emission factors in FY2021. The impact of this change on the CO<sub>2</sub> emissions data for FY2021 is minor.  
 \*5 The FY2020 figures were corrected, reflecting the improvement of the accuracy of aggregation.

## Energy conservation at refineries

In FY2021, the energy consumption rate improved around 4% year on year due to the promotion of energy-saving activities (including the introduction of a system optimizing the utility balance) and the improvement of the plant operating rate attributed to the reduction of failures and the number of maintenance days. However, CO<sub>2</sub> emissions increased approx. 7% year on year due in part to the improvement of the plant operating rate mentioned above.

We will continue to strive for energy conservation both physically (high-efficiency equipment) and non-physically (energy-efficient operation).

CO<sub>2</sub> Emissions and CO<sub>2</sub> Emissions per Unit of Crude Oil Equivalent Throughput



## Two Maruzen Petrochemical projects adopted by NEDO as Green Innovation Fund Projects

Maruzen Petrochemical applied for the Development of Technology for Producing Raw Materials for Plastics Using CO<sub>2</sub> and Other Sources project, one of the Green Innovation Fund Projects offered publicly by NEDO\* jointly with partner companies, and two projects were adopted in January 2022.

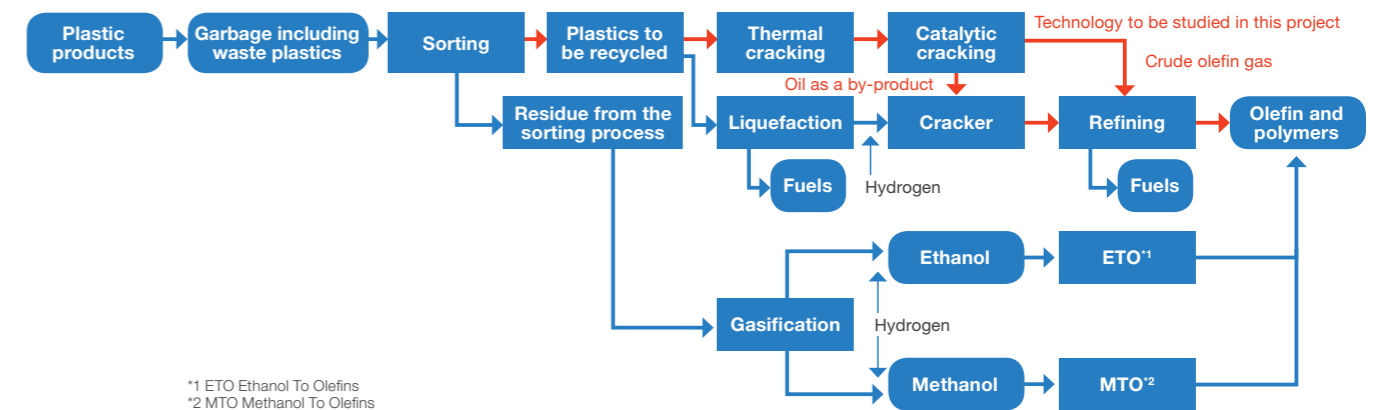
The goal of one of the projects is the practical utilization of naphtha cracking furnaces fueled by ammonia, which is under the research and development subject, "Development of advanced technology for naphtha cracking furnaces." Maruzen Petrochemical jointly submitted the project with Mitsui Chemicals, Inc., Toyo Engineering Corporation and Sojitz Machinery Corporation. Conventionally, naphtha cracking furnaces run on methane-based fuel. The goal of the project is to switch the furnaces to a fuel whose principal component is ammonia, which would reduce the amount of CO<sub>2</sub> emitted during combustion virtually to zero. The projected project period is ten years from FY2021 to FY2030. We aim to complete the feasibility demonstration of an entirely ammonia-fired commercial cracker in the final fiscal year for the achievement of implementation in society. The four companies, which have acquired knowledge and technological capabilities related to ethylene plants through plant operation and construction and the production of equipment, will work together in this project, aiming to enable society to implement entirely ammonia-fired cracking furnaces and contribute to the reduction of CO<sub>2</sub> emissions from the petrochemical industry as a whole.

The other project is aimed at developing a chemical recycling

technology which will enable the production of olefin through the direct decomposition of waste plastics. It is included in the research and development subject, "Development of technology for producing chemicals from waste plastics and rubber." The application was submitted jointly with Sumitomo Chemical Co., Ltd. The reduction of waste plastics and greenhouse gases emitted due to the use of fossil resources as raw materials in manufacturing has been a major global issue. Solutions to this issue include chemical recycling technologies that use waste plastics as raw materials as an alternative to fossil resources. Above all, the development of a technology for the high-efficiency recycling of polyolefin plastic, which is approx. 60% of the plastic waste in Japan, is strongly desired. In response, Sumitomo Chemical and Maruzen Petrochemical launched a joint initiative to establish a chemical recycling technology which will enable the high-efficiency, direct manufacturing of ethylene, propylene, and other raw materials of basic chemical products from polyolefin plastic through the application of the technologies and expertise they have cultivated to date. We will push forward with this initiative with the goal of quickly enabling society to implement this technology. The projected project period is ten years from FY2021 to FY2030. Through this project, we will strive to reduce CO<sub>2</sub> emissions and supply CO<sub>2</sub>-free plant technologies and petrochemical products in the future, aiming to achieve the carbon neutrality of the entire supply chain, including our business partners.

\* NEDO: New Energy and Industrial Technology Development Organization

## Conceptual diagram of the "Development of technology for producing chemicals from waste plastics and rubber" project

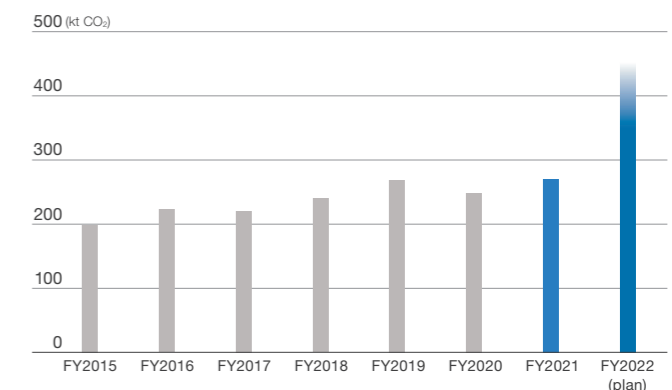


\*1 ETO Ethanol To Olefins  
 \*2 MTO Methanol To Olefins

## Encouraging the wind power generation business and contributing to the reduction of CO<sub>2</sub> emissions

Wind power is an eco-friendly, clean energy without the need for concern over the depletion of resources or CO<sub>2</sub> emissions. The total wind power generation capacity of Cosmo Eco Power Co., Ltd. in the Cosmo Energy Group reached 300,000 kW as of June 30, 2022, contributing to CO<sub>2</sub> emission reduction and to improvement in the energy self-sufficiency rate of Japan, which highly depends on imported energy. Our strategy is to continue new investment in onshore wind farms and to enter the offshore wind power generation business early. Through expansion of the wind power generation business, we aim to be beloved by the local community and to contribute to realizing a sustainable society.

## CO<sub>2</sub> Emission Reduction by the Wind Power Generation



## E Engagement with the Environment

### Cosmo Zero Carbon Solution Released

Cosmo Oil Marketing has rolled out Cosmo Zero Carbon Solution, a product offering a one-stop solution helping companies and local municipalities introduce and effectively utilize renewable energy and EVs for a decarbonized society. It is proposed as a package including four services: (1) Cosmo Denki Business Green, (2) the installation of solar panels for in-house power consumption, (3) car leasing, and (4) EV car sharing. Enabling customers to drive leased EVs charged using green electricity, Cosmo Zero Carbon Solution enables them to reduce their CO<sub>2</sub> emissions easily and steadily without initial expenses. By expanding EV car sharing to residents and

corporations in the neighborhood, customers can reduce costs and contribute to local communities. In addition, in the event of a disaster, the EVs serve the local community as mobile storage batteries.

Cosmo Zero Carbon Solution is a package product of renewable energy originating from the Cosmo Energy Group's business and assets in mobility businesses which is provided as a one-stop solution. Taking advantage of this unique strength of Cosmo Zero Carbon Solution, we will help corporate customers and local governments solve their issues and implement initiatives to transition to a decarbonized society.

### Sales of Cosmo Denki (Electricity) Green

Cosmo Oil Marketing began to sell Cosmo Denki (Electricity) home-use electricity, in FY2019. Four Cosmo Denki (Electricity) home-use electricity plans are available to meet the diverse needs of customers. In recent years, the number of customers demanding environmentally friendly electricity has been increasing in response to growing concerns about the environment and increasing demand for renewable energy. In response, the company began to offer Cosmo Denki (Electricity) Green in December 2019. Cosmo Denki (Electricity) Green is virtually CO<sub>2</sub> emissions-free electricity\*<sup>1</sup> from renewable energy sources, which has environmental value. It enables customers to participate in the Cosmo Oil Eco Card Fund's eco-friendly projects such as environmental

preservation and education.

Further, in October 2020, the company began to provide the Cosmo Denki Business and Cosmo Denki Business Green services to its corporate customers.\*<sup>2</sup> The company also offers a plan supporting the RE100 initiative, an international initiative whose goal is that 100% of the energy consumed by businesses comes from renewable energy sources. This plan utilizes the electricity generated at the Cosmo Eco Power wind farms.

\*<sup>1</sup> Electricity with its environmental value proven by non-fossil fuel energy certificates attesting that the electricity is derived from renewable energy, such as the wind used by Cosmo Eco Power to generate electricity.

\*<sup>2</sup> Cosmo Denki (Electricity) is offered with Cosmo Energy Group company Cosmo Energy Solutions serving as the electricity retailer and Cosmo Oil Marketing as its agency.

### The switch to electricity that is virtually all from renewable energy sources achieved at a total of 603 facilities, including service stations directly operated by the Cosmo Energy Group

As the first step towards the Group's achievement of net zero carbon emissions, in May 2022 we completed the transition of all of the service stations operated by Cosmo Oil Sales to electricity that is virtually all from renewable energy sources. We initially planned to complete the switch over three to five years beginning in May 2021, when we announced this project. We actually completed it much earlier, about one year after the announcement. We are the first oil wholesaler in Japan to begin to switch to electricity that is virtually entirely from renewable energy sources, something we will do at more than 600 locations. Using the Cosmo Denki Business Green scheme, all of the service stations directly operated by Cosmo Oil Sales run\*<sup>1</sup> on electricity that is virtually all from renewable energy sources.

Cosmo Oil Sales, which is in charge of sales at service

stations, operates a total of 603 service stations, vehicle inspection stations, etc. across Japan that consume approx. 40 million kWh of electricity annually.\*<sup>2</sup> The annual CO<sub>2</sub> emissions due to the power consumption of our service stations was 16,000 tons of CO<sub>2</sub>.\*<sup>3</sup>

The Cosmo Energy Group will continue to work to help achieve a sustainable society by playing a leading role in the spread of renewable energy while also catering to its customer needs.

\*<sup>1</sup> Excluding CO<sub>2</sub> emissions from the use (consumption) of fuel oil and other products sold at the service stations

\*<sup>2</sup> As of May 31, 2022, the number of services stations among the 603 directly operated facilities was 589.

\*<sup>3</sup> As of the end of FY2021 Figure as of the end of FY2021 from the page of the Group's website introducing its sustainability activities

### Contributing to the decarbonization of the aviation sector with a next-generation aircraft fuel

In the aviation industry, ICAO\*<sup>1</sup> set the target of keeping the total CO<sub>2</sub> emissions from international aviation at or below the 2019 level from 2021 onward, at its general meeting held in 2016. The means of achieving this target include the use of SAF.\*<sup>2</sup> In Japan, ministries, agencies and private enterprises are working together to replace 10% of the fuel consumed by domestic air carriers with SAF by 2030.

In this environment, Cosmo Oil has set the target of supplying 300,000 KL of SAF per year by 2030. We will work

to build an SAF supply chain in Japan by striving to diversify raw materials, manufacturing processes, and other elements, such as the commercialization of SAF made from used cooking oil from refineries (selected by NEDO in July 2021\*<sup>3</sup>) and considering manufacturing using Alcohol to Jet (ATJ) technology, which uses ethanol as the raw material.

\*<sup>1</sup> ICAO: International Civil Aviation Organization

\*<sup>2</sup> SAF: Sustainable Aviation Fuel

\*<sup>3</sup> Selected by the New Energy and Industrial Technology Development Organization as a Development of Production Technologies for Biojet Fuels and Development of a Supply Chain Model through Demonstration Project.

## Biodiversity Initiatives

### Oil development with consideration for the surrounding environment

Generally, oil exploration and production business entails risks that could affect the environment in terms of its exploration, development, and production processes. We see environmental preservation activities as a priority issue and are promoting initiatives to minimize environmental impact.

In the Hail development project, a detailed environmental impact assessment was conducted and approved by the government prior to the development. During the development, a system to inject wastewater, waste soil, sewage-containing water and other waste generated from drilling into the ground was established, and a zero-discharge operation was implemented. In addition, silt curtains were installed to prevent pollution of the ocean from dredging and disposed dirt as well as muddy water caused by the construction of an artificial island. Moreover, environmental monitoring of air, water quality, aquatic life, and birds is being conducted, which ascertained that the operation is conducted without environmental impact. We will continue to advance oil development with consideration for the surrounding environment.

In addition, Cosmo Energy Exploration & Production began zero-flaring operations in which all the associated gases from crude oil production are reinjected into the oil reservoir for the first time in the Middle East in 2001. This technology, which enables both environmental protection and the improvement of the oil recovery rate, is closely connected to CCS and CCUS which inject CO<sub>2</sub> into the ground for storage and use. Leveraging our operational experience and technologies, we will strive to develop and apply decarbonization technologies to achieve net zero carbon emissions by 2050.



Installation of silt curtains

Zero-discharge operation

### Environmental protection activities in oil producing countries

On Mubarras Island, where we have oil pre-treating, storage, and loading facilities, we are involved in wide-ranging environmental protection activities, including the planting of mangroves and other green development, the protection of coral in the sea, and the protection of osprey, a rare bird species.

On Mubarras Island, water production equipment is used to produce fresh water from seawater. The fresh water is provided to employee residential facilities and crude oil processing facilities. Cosmo Energy Exploration & Production has been actively involved in green development on the island, which had previously been a desert island. In order to re-use precious manufactured freshwater, the company treats sewage-containing drainage water and uses it for watering planted trees.

In addition, we have been planting mangroves around Mubarras Island for 30 years. This initiative, the Mangrove Planting Program, was recognized by the World Association

for Waterborne Transport Infrastructure (PIANC) as a program which contributes to creating a natural ecosystem and preventing coastal erosion. We were granted official status as a Supporter of Working-With-Nature in July 2021. We were internationally recognized as "having advanced, comprehensive thinking focused on achieving business objectives while respecting the nature" in our oil exploration and production sites. With this honor, we will continue our business activities which work with nature.



Mangrove planting

Mangrove pool