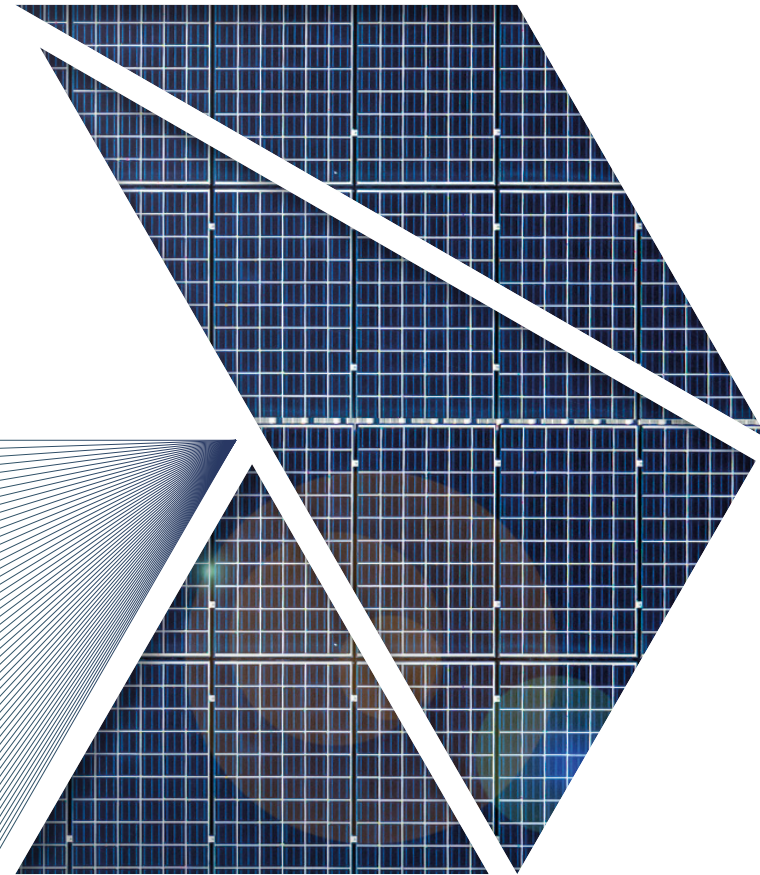


PROMISING FUTURE WITH GREEN ENERGY

2022 HD Hyundai Energy Solutions Integrated Report





PROMISING FUTURE WITH GREEN ENERGY

In our new company name, HD stands for “Human Dynamics,” which is a means to realize the “Human Dream.” With the new name, HD Hyundai Energy Solutions will take another step forward as a provider of total PV solutions that offers customized solar solutions and services for various environments.

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Report Overview

HD Hyundai Energy Solutions has been publishing the Integrated Report since 2021 to provide transparency to our stakeholders on the business performance and social value creation activities across the economic, social, environmental, and governance sectors. In this year's report, we celebrate the 50th anniversary of HD Hyundai Group and share stories about HD Hyundai Energy Solutions' past, present, and future directions through the "Connects the past and the future" section. In an effort to attentively listen to the voices of our stakeholders and understand the financial and non-financial impacts of our corporate activities on society and the environment, we conducted a materiality assessment and interviews with stakeholders to select material reporting issues. HD Hyundai Energy Solutions will continue to transparently disclose ESG management information to the stakeholders through the Integrated Report and actively communicate with them.



2022 Cover Story

Developing world-class products with innovative technology and moving toward the future as an eco-friendly energy solution company, the dynamic and innovative enterprise image of HD Hyundai Energy Solutions is symbolized in connection with the new CI.

Reporting Standards and Framework

This report complies with the requirements of the Global Reporting Initiative Standards 2021 (GRI 2021), an international reporting guideline for sustainable management. To reflect the key issues relevant to the solar industry, we have also followed the disclosure recommendations of the Task Force on Climate-Related Financial Disclosure (TCFD) and the Sustainability Accounting Standards Board (SASB).

Reporting period

This report details our activities from January 1, 2022, through December 31, 2022, and includes activities from the first half of 2023 for significant achievements outside of the reporting period. For quantitative achievements, we have presented three years of data from 2020 to 2022 together so that readers can identify the trends. The reporting cycle for this report is one year, and the previous report was published in July 2022.

Reporting Scope

The scope of the report includes HD Hyundai Energy Solutions and its subsidiaries. We comply with the Korean International Financial Reporting Standards (K-IFRS) for financial performance.

Reporting Assurance

In order to ensure the reliability of the report preparation process and disclosed information, the Korea Management Registrar (KMR), an independent assurance institution, has verified all the data in the report.

Inquiries about the Report

Financial Analysis Team of HD Hyundai Energy Solutions
9F, HD Hyundai Group Global R&D Center, 477, Bundangsuseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
T. 82-2-479-6739 E. sustainability@hyundai-es.co.kr

Interactive Guide

HD Hyundai Energy Solutions Integrated Report 2022 is available on our website (<https://www.hd-hyundaies.co.kr>) as an interactive PDF for more convenient user experience.

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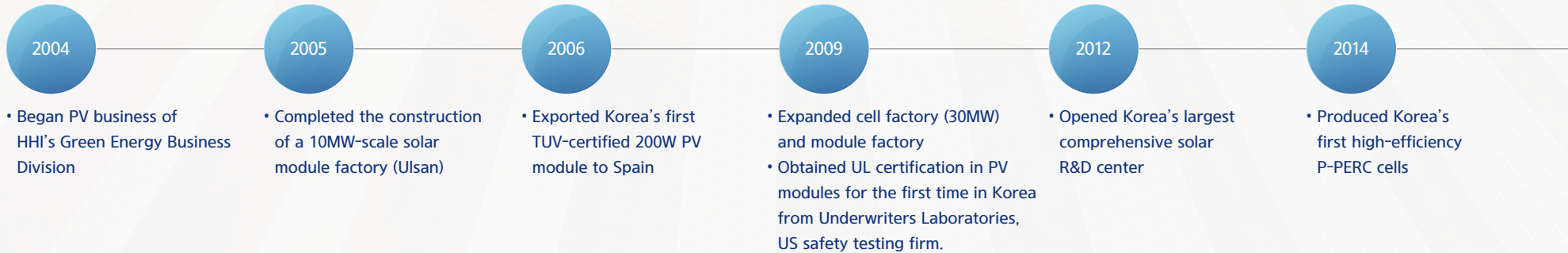
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Connects the Past and the Future

The Rise of a World-Class Shipyard and the Emergence of HD Hyundai Energy Solutions

HD Hyundai Group celebrated its 50th anniversary on March 23, 2022. The groundbreaking ceremony for the Ulsan Shipyard (now HD Hyundai Heavy Industries (HHI)) in 1972 marked the beginning of the 'HHI Myth,' and for nearly 40 years, HD HHI has remained the world's No. 1 shipbuilder with a "Hyundai Sprit" that has not never been discouraged by numerous challenges. HD Hyundai Energy Solutions started its solar business in 2004 as a green energy division of HD HHI. Since then, we have overcome various difficulties and crises in the domestic and global PV markets with the "Hyundai Spirit" and technological innovation, and have firmly established ourselves as a total solution provider in the photovoltaic field.



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Connects the Past and the Future

Leading the Way to a Sustainable Future for 50 Years

As a company with world-class technologies for new solar cells/modules, HD Hyundai Energy Solutions provides optimal solutions for each industry based on its extensive experience and technology. We not only provide AquaMax™, the world's first dedicated floating PV modules, and Aqua Power, a highly durable water-based PV solution that combines the world's best shipbuilding and offshore engineering technologies, but also present customized solar solutions for industries such as Ground PV Solution and Roof-top PV Solution. The Company pursues sustainable management through R&D and investment in eco-friendly and ultra-efficient solar products while preparing for the Zero Energy Building (ZEB) market including future-oriented rollable PV modules. We will take a step forward as a company that is responsible for and leading a sustainable future for the next 50 years.



- Established Hyundai Heavy Industries Green Energy Co., Ltd.



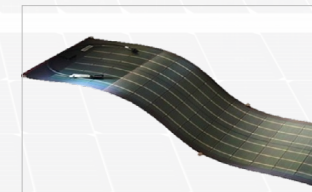
- Completed the largest 65MW solar power plant in Seosan, reclaimed land of Chungcheongnam-do Province
- The Company changed its name to Hyundai Energy Solutions and was listed on the KOSPI.



- Newly-constructed M6 cells and module factory
- Developed and launched "DualMax," Korea's first bifacial PV module



- Changed the company name from Hyundai Heavy Industries Holdings to HD Hyundai, making a new start as HD Hyundai Energy Solutions



Future-oriented rollable PV modules

Now and the next 50 years continue to develop eco-friendly PV modules and innovative technologies.

CEO Message

HD Hyundai Energy Solutions practices ESG management and pursues a sustainable future through eco-friendly solar energy.

Jong Hwan Park CEO & President of HD Hyundai Energy Solutions

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Dear valued stakeholders,

We would like to express our sincere gratitude for your unwavering support and interest in HD Hyundai Energy Solutions.

In the midst of continued uncertainties and inflationary concerns in the global economy over the past year, HD Hyundai Energy Solutions moved forward by laying a foundation for sustainable growth as a solar energy solution company, while greatly enhancing business profitability. Sales in 2022 increased by 66% year-on-year, and the operating profit margin improved significantly. Along with this financial performance, we were recognized for our excellent non-financial management performance by obtaining the best (AA)/excellent (A) environment, society, and governance (ESG) evaluation rating for the second consecutive year.

This year, the internal and external business environments are expected to be even more challenging due to three highs (high inflation, high interest rates, and high exchange rates), rising costs, global recession, international conflicts, and country-centered protectionism in trade policies around the world. However, HD Hyundai Energy Solutions will not be complacent, we will make another leap forward for our top-line growth and continue to implement sustainable management for profitable growth together with HD Hyundai Group, which recently celebrated its 50th anniversary. To this end, we will review our sustainability potentials in all areas of ESG and promote the following in line with our ESG values and direction.

We will take the lead in developing eco-friendly technology and fostering innovation.

Developing technology that focuses on green environment, digitalization, and safety is the keystone that will ensure the sustainable growth of HD Hyundai Energy Solutions. We intend to lead a sustainable future by developing next-generation green and ultra-efficient new products and mass-producing low-carbon and eco-friendly modules through our continuous research and development activities and technological innovation.

We will practice ethical, compliance, and human rights management.

Since declaring its vision, "New 50 Years, New Challenges," last year, HD Hyundai Group has been making every effort to practice ethical, compliance, and human rights management, as the foundation of sustainable management. In line with this, HD Hyundai Energy Solutions is determined to spread a culture of fair trade and ethical management with a firm commitment to ethical, compliance, and human rights management, and to realize a society in which the human rights of all stakeholders are respected.

We will strengthen ESG management in our supply chain, pursuing coexistence with local communities.

Recognizing our suppliers as our valued partners for sustainable growth and building ESG management in our supply chain, we will take the initiative in building an ESG ecosystem where social value is circulated through coexistence and collaboration with local communities.

Centering on the solar energy solution business, HD Hyundai Energy Solutions will continue to practice sustainable management that connects the environment, people, and society in a more harmonious way.

We look forward to your continuing interest and support.

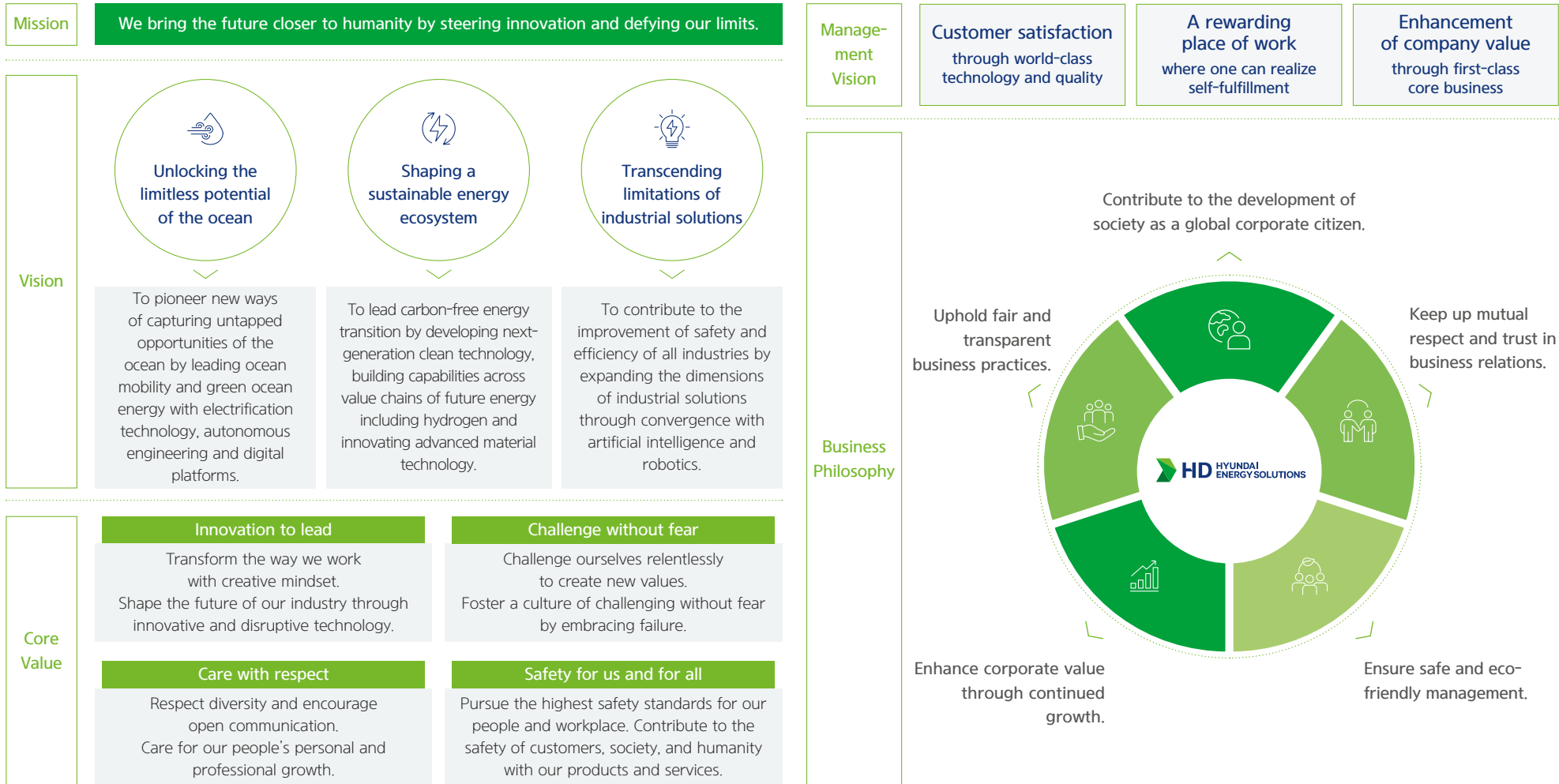
Thank you.



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Management System



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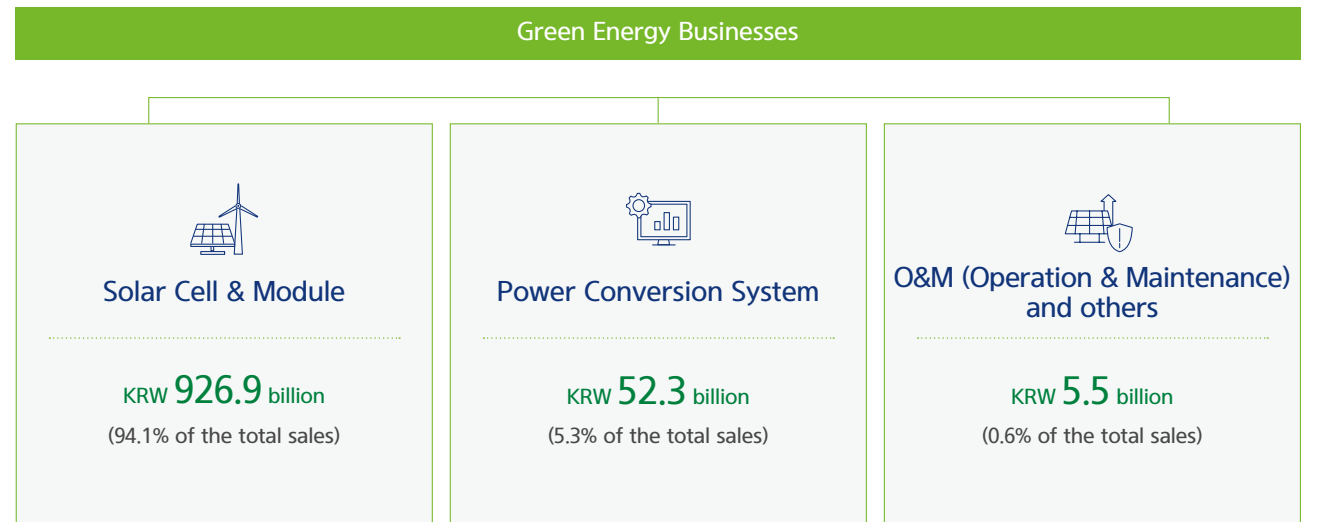
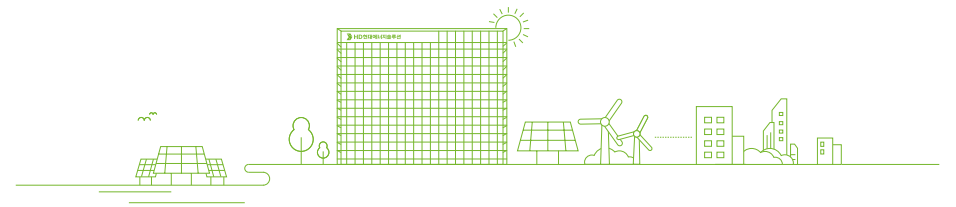
HD Hyundai Energy Solutions

Starting the solar business in 2004, HD Hyundai Energy Solutions has grown into a global company that is a pillar of the sustainable solar energy industry through continuous development of innovation and technology. With continuous investment in R&D and state-of-the-art production facilities, we produce the world's best solar cells and modules, providing customized applications and solutions for various environments and needs worldwide. HD Hyundai Energy Solutions practices sustainable management by providing innovative and eco-friendly energy solutions based on excellent quality control and industry-leading R&D capabilities.

Company Profile (As of December 2022, on a consolidated basis)

Company Name	HD Hyundai Energy Solutions
HQ Address	9F, 477, Bundangsuseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea (Jeongja-dong, HD Hyundai Group Global R&D Center)
Date of Establishment	Date of Establishment: December 21, 2016 (spun off from HYUNDAI Heavy Industries) * Began PV business in 2004 as a business division of HHI
CEO	Jong Hwan Park
No. of employees	248
Revenue	KRW 984.8 billion
Operating Profit	KRW 90.2 billion
Net Profit	KRW 60.6 billion

Sales in 2022



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Business Performance

HD Hyundai Energy Solutions produces and supplies world-class solar cells and modules and is expanding its business into inverters (PCS), solar solutions, and O&M based on continuous R&D investment, expansion of state-of-the-art production facilities, and existing product competitiveness. We offer solutions and services optimized for various solar businesses while enhancing product competitiveness through partnerships with solar cell/module manufacturers. The company strives to develop technologies to improve the efficiency, output, and reliability of solar cell/module products and system products for sustainable growth.

Major Achievements

➔ Sales Increase by Developing New PV Module Products

With continuous R&D activities, HD Hyundai Energy Solutions launched a high-power grade 1 carbon product in the domestic market. In addition, we marked KRW 927 billion in consolidated sales of solar modules in 2022 (cumulative) (KRW 501.7 billion overseas and KRW 425.2 billion domestically) by strengthening product competitiveness, discovering new customers, and enhancing marketing activities. On top of this, the company recorded KRW 45.3 billion in sales of inverters, KRW 6.97 billion in sales of services such as system installation and power plant management, and KRW 5.5 billion in other O&M sales. Based on continuous R&D investments and the expansion of state-of-the-art production facilities, we launched the M10 585W high-power bifacial module and began selling it in earnest to the market in the first quarter of 2022.

➔ Winner of Two “CES 2023 Innovation Awards”

With Hyundai Mobility Solar, HD Hyundai Energy Solutions was honored with an Innovation Award in two categories: Sustainability, Eco-Design & Smart Energy, and Vehicle Tech & Advanced Mobility. Hyundai Mobility Solar is an eco-friendly solar module product that can be integrated mostly with electric and hybrid cars. The Solar car roof uses high-efficiency PV cells and high-transmittance specialty glass for high power output, while solar hood with ultra-thin and flexible technology can be integrated into a variety of vehicle exteriors. The solution enables us to effectively extend the driving range.

➔ Introducing Future-Oriented Products

HD Hyundai Energy Solutions showcased its advanced technology for expanding solar infrastructure at the 2023 International Green Energy Expo. With the introduction of transparent solar windows for BIPV applications that can be simultaneously used as building windows and for energy generation, and rollable blinds utilizing rollable solar modules that can be utilized in various solar shading systems, we are preparing the market for Zero Energy Building (ZEB) using renewable energy in earnest.



2023 Key Plans

➔ Increase Sales

HD Hyundai Energy Solutions has set a management goal of achieving KRW 1 trillion in sales along with a stable increase in operating profit margin in 2023. We plan to respond to the domestic market with a strategy of diversifying product supply in line with customer demand, despite concerns about a shrinking market due to the reduction of the RPS* mandate. For overseas markets, we intend to increase sales by strengthening marketing policies, diversifying products, and expanding new markets.

* RPS or Renewable Portfolio Standards requires South Korea's electricity generating companies to supply a certain percentage of their annual electricity production with electricity generated from renewable energy sources. It has been implemented since January 1, 2012.

➔ Secure Original Tandem Technology Based on Ultra-High Efficiency HJT

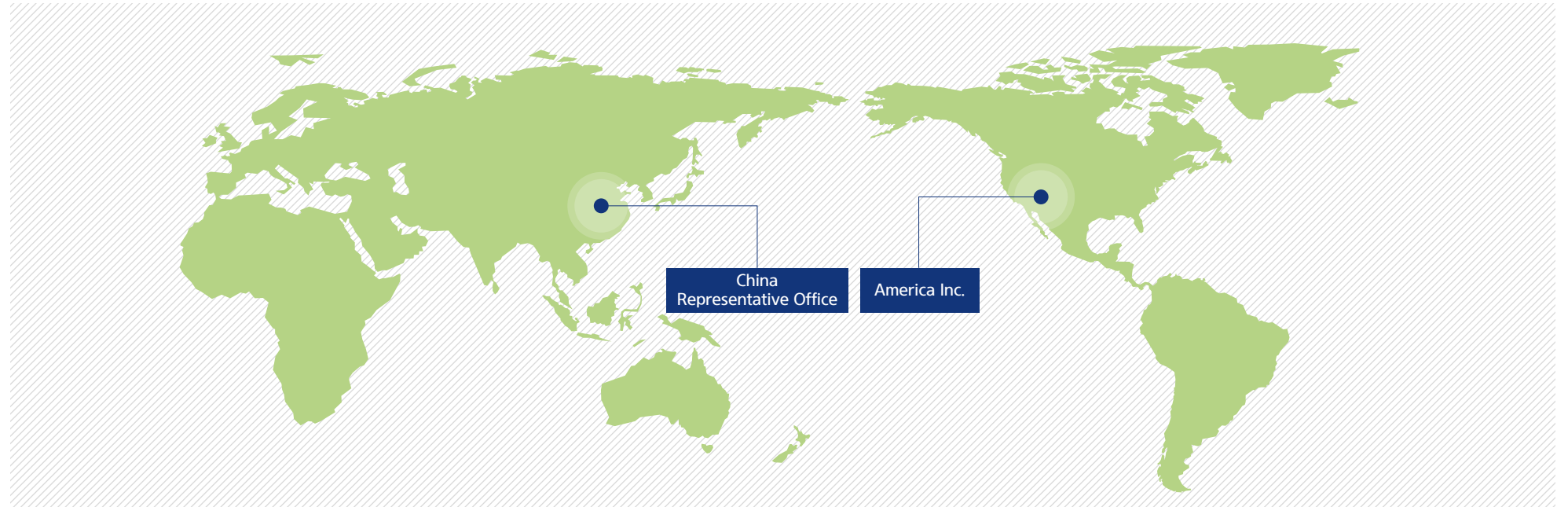
The company was selected as the lead organization for a national project “Advanced technology for mass production of heterojunction (HJT) solar cells and modules with large area and thin wafers” by the Ministry of Trade, Industry and Energy. Through the project, we plan to mass-produce ultra-high-efficiency large-area (M10-class) HJT solar cells by 2026. The goal is to increase the efficiency of PV products, which are currently around 22~23%, to 26%. The HJT is garnering much attention as a next-generation technology thanks to its high efficiency, relatively simple manufacturing process, and compatibility with future ultra-high efficiency PV technology “tandems” with power generation efficiencies of 30% or more, as it can convert larger amount of sun light into electricity.

➔ Strengthen Non-Financial Performance (ESG) Management

HD Hyundai Energy Solutions received an excellent rating from the Korea Institute of Corporate Governance and Sustainability (KCGS) and SUSTINVEST in 2022. The KCGS gave Grade A, the same as 2021, and SUSTINVEST maintained the same rating of AA as 2021. In 2023, we plan to establish a mid- to long-term roadmap for climate change/carbon neutrality in environment area while promoting employment diversity and establishing an ESG evaluation system for suppliers in social area.

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Consolidated Subsidiaries

(Unit: KRW million)

Company Name	Date of Establishment	Location	Main Business	2022 Total Assets
HYUNDAI ENERGY SOLUTIONS AMERICA INC.	Apr. 19, 2019	USA	Sales of PV modules	71,012

Overseas Branches and Subsidiaries

Branch & Office	Date of Establishment	Location	Main Functions
Hyundai Energy Solutions America Inc., CA, USA	Apr. 19, 2019	California, USA	Sales of PV modules
China Representative Office (Hyundai Energy Solutions Co., Ltd. Shanghai Representative Office, Shanghai, China)	Nov. 13, 2019	Shanghai, China	Global sales of PV modules & raw material procurement

Sustainable Business in Value Chain

1. Business Road Map

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PV Business

Centering on the stable sales of the mid-stream business that produces cells and modules, HD Hyundai Energy Solutions is currently expanding into the downstream business of inverters (PCS), EPC, VPP(Virtual Power Plant) Business, O&M and more. We take responsibility for the production and supply of solar modules, the consulting and operation of solar businesses, providing optimal solar solutions through designs for limited space and environment.

High-Quality, Trust-Based Services

As PV modules have 25 years of warranty period for product performance, long-term based trust with customers is particularly important in this market. Given this, HD Hyundai Energy Solutions is leading the solar industry by providing trust-based services that meet the needs of customers based on their faith in our high-quality products.

Becoming a PV Total Solution Provider

Having established a strong position in the solar market, HD Hyundai Energy Solutions is not content to rest on its laurels and intends to move toward becoming an "Energy Solution Provider" as a new growth engine for the future.

We plan to provide customized solutions based on our long-term experience in the solar business and high technology. We will further strengthen our competitiveness in the fields of solar cells, modules, and inverters, and advance our capabilities in plant construction and O&M services to make another leap forward in becoming a PV Total Solution Provider.

Sustainable Business in Value Chain

1. Business Road Map

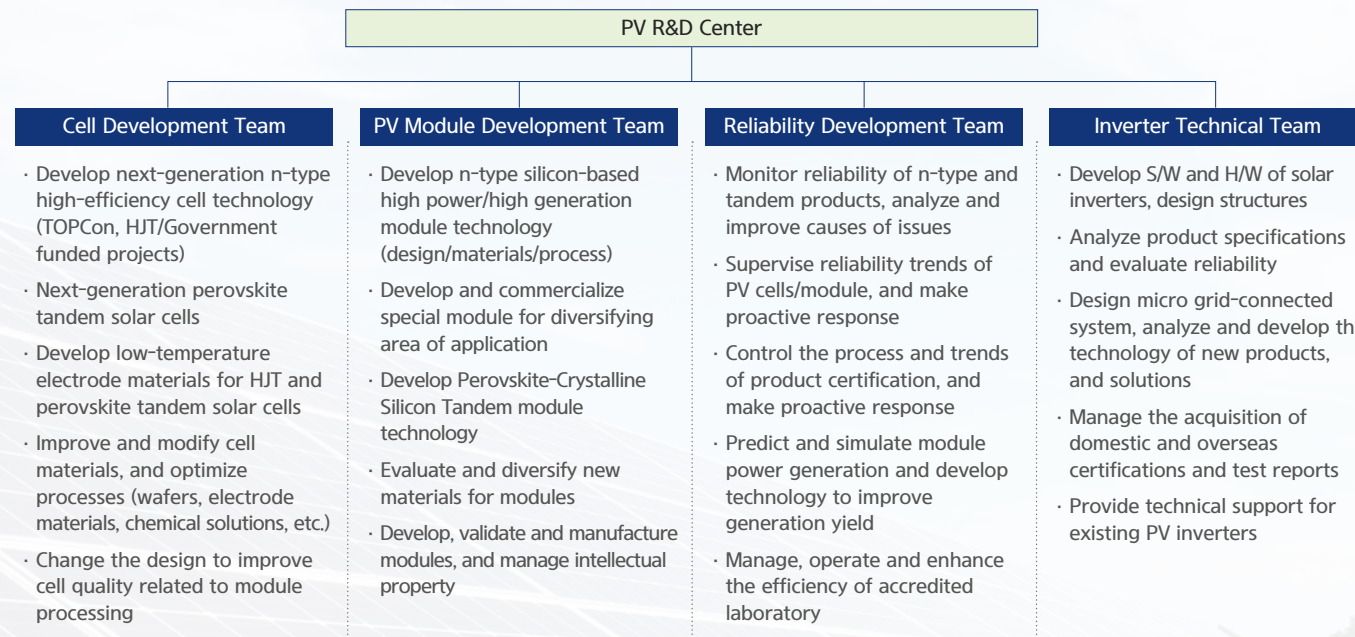
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PV Business R&D

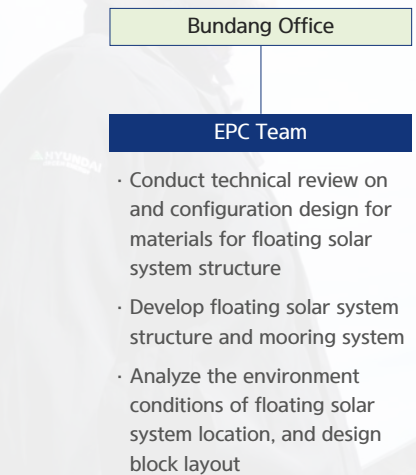
R&D Activities

In an effort to lead the eco-friendly solar industry that can provide optimized solutions to the global crisis of climate change, HD Hyundai Energy Solutions is conducting continuous research activities at the PV R&D Center and its Bundang Office and is striving to secure eco-friendly solar technology through various commissioned research. Our research and development activities are carried out by PV Cell Development Team, PV Module Development Team, Reliability Development Team, and Inverter Technical Team at the PV R&D Center, and EPC Team in Bundang Office. The PV R&D Center develops market-oriented product technologies for efficiency, output enhancement and reliability improvement of solar cell/module products, and power generation simulation while R&D activities related to solar solutions and EPC projects are conducted at the Bundang Office.

PV R&D Center at Eumseong Factory (Responsible for R&D activities)



PV R&D Center in Bundang Office (Responsible for R&D activities)



Sustainable Business in Value Chain

2. Solar Cell/Solar Module

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» OVERVIEW

HD Hyundai Energy Solutions produces high-power solar cells and solar modules. With its double-sided structure, the module can absorb the light from the backside as well, providing high efficiency in power generation and enabling it to make additional generation depending on various installation environments. Our specialized module design boasts unchanged durability even in harsh weather and in conditions with high ammonia and salt.

» 2022 KEY PERFORMANCE

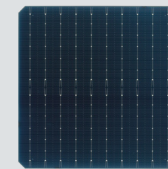
With continuous technology development and advanced product tests, HD Hyundai Energy Solutions provides high-efficiency solar cells and solar modules of the world's highest quality. Based on our R&D activities, we mass-produced highly efficient PERC cells in 2022. Having introduced the latest production facilities through investment in new facilities, we are currently supplying large-area (M6, M10) solar cells with an efficiency of over 23% and 485~590W-class ground-mounted and floating solar modules with high-power generation and low-carbon footprint.



Large-Area Bifacial PERC Solar Cell



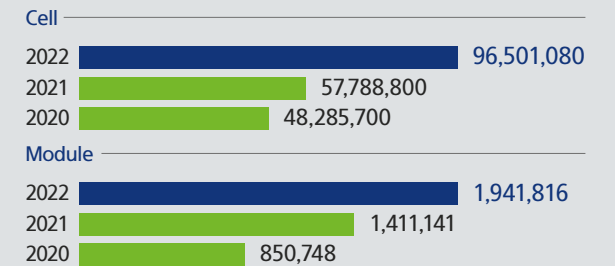
M6 166mm
(8.8% larger than M3)



M10 182mm
(31% larger than M3)

Production output

(Unit: cell/module)



Sustainable Business in Value Chain

3. PV Solutions

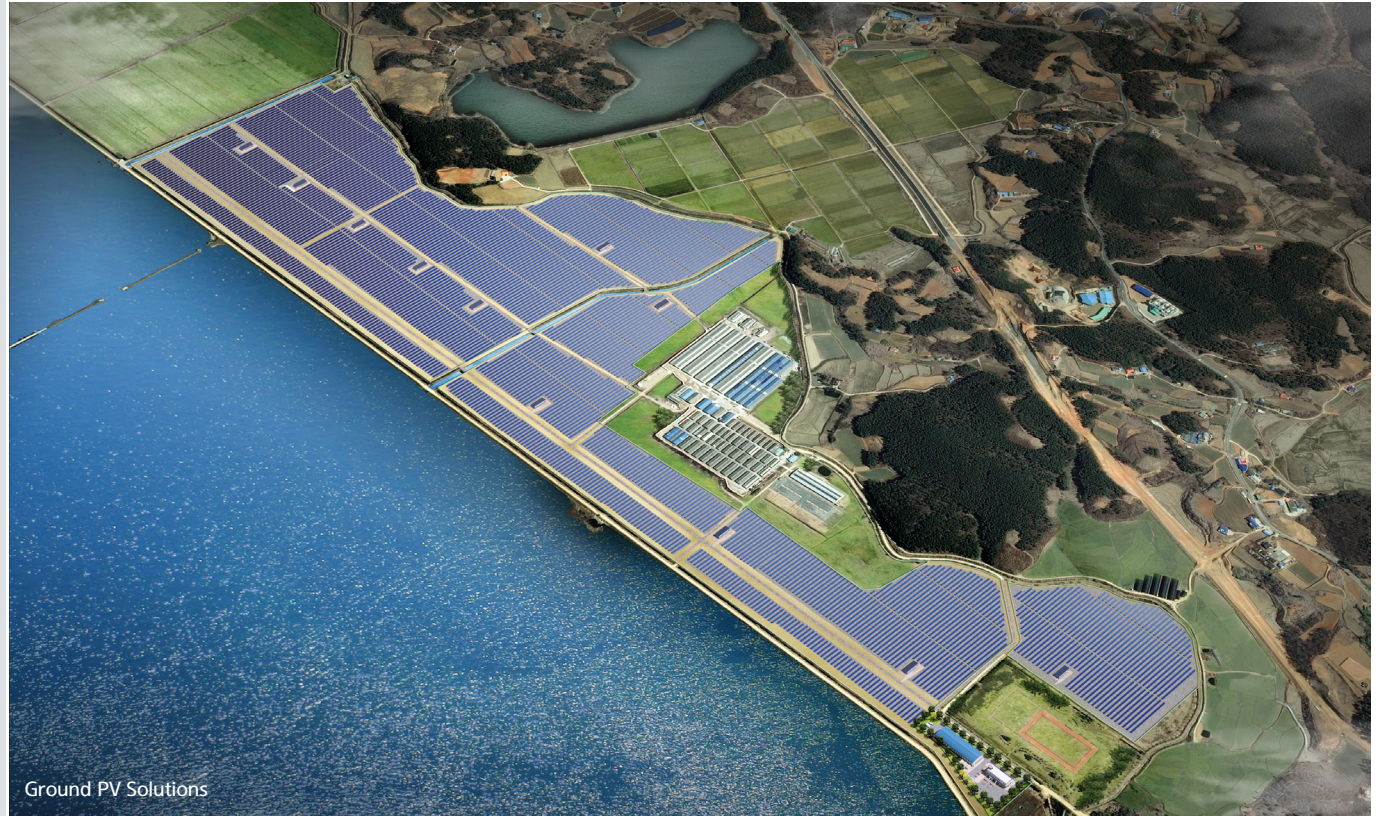
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HD Hyundai Energy Solutions offer the best solutions for each industry based on its extensive experience and technological prowess. We provide optimal ground-mounted solar solutions and rooftop PV solutions that fit the environment and characteristics of the business site. Along with the world's first floating PV module, the highly durable floating PV solutions which integrate the world's best shipbuilding and marine technologies provide customized solutions for the water environment. On top of these, the company is leading various solar businesses that will open up the low-carbon era, such as building-mounted solar, agro-solar, and sound barrier solar.

» 2022 KEY PERFORMANCE

A joint project with HD Hyundai Energy Solutions, the rooftop solar power plant at CJ CheilJedang's Incheon Plant 2 was the first step toward carbon neutrality. With an installed capacity of 870.32 kW, it can generate approximately 1 GW of electricity per year, saving approximately 131 tons of carbon emissions.



Ground PV Solutions



Floating PV Solutions



Rooftop PV Solutions



Building Integrated PV Solutions

Sustainable Business in Value Chain

4. O&M/ VPP Business Service

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HD Hyundai Energy Solutions manages power generation data from more than 8,500 solar power plants with an installed capacity of 1.6 GW through the Hi-Smart system. Having developed and provided Hi-Smart 3.0, a wireless monitoring system that enables real-time remote monitoring of the operation status of all sites nationwide where solar systems are installed, the Company has greatly increased customer convenience. Our comprehensive control room supervises the sites and provides relevant information to customers while our after-sales service response system strengthens customer satisfaction. With the Hi-Smart system which can effectively manage power generation data, we are engaged in a virtual power plant (VPP) business, a power brokerage business that conducts forecasting of power generation, bidding, and settlement. Through the VPP business, HD Hyundai Energy Solutions aims to increase customer revenue by providing them with predicted settlement payments as well as power generation revenue and contribute to grid stabilization by sharing power generation forecast information with the Korea Power Exchange.

*** VPP (Virtual Power Plant) Business System:**

Aiming to efficiently manage small-scale energy resources and stably operate the power grid by the Korea Power Exchange, the VPP System allows power brokers to earn extra gains in addition to existing income from power generation by predicting the amount of renewable energy generation within a certain margin of error one day in advance.



Value Creation

HD Hyundai Energy Solutions delivers economic, environmental, and social performance through the six major capital inputs and management activities. We create value for various stakeholders throughout our value chain and contribute to the sustainable growth of our society, ultimately realizing the Sustainable Development Goals (SDGs).

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ESG Management System

ESG Strategy

HD Hyundai Energy Solutions strives to create shared values in all areas of the economy, society and the environment through our systematic sustainable activities. With our ESG mission, "We create and share economic, environmental and social values through the systematic management of sustainability," we have established three key operation policies: Transparent Disclosure, Systematic Performance Management, and Continuous Improvement. Based on these policies, we plan and carry out activities in each field while actively communicating with our stakeholders through various channels on the results of implementations.



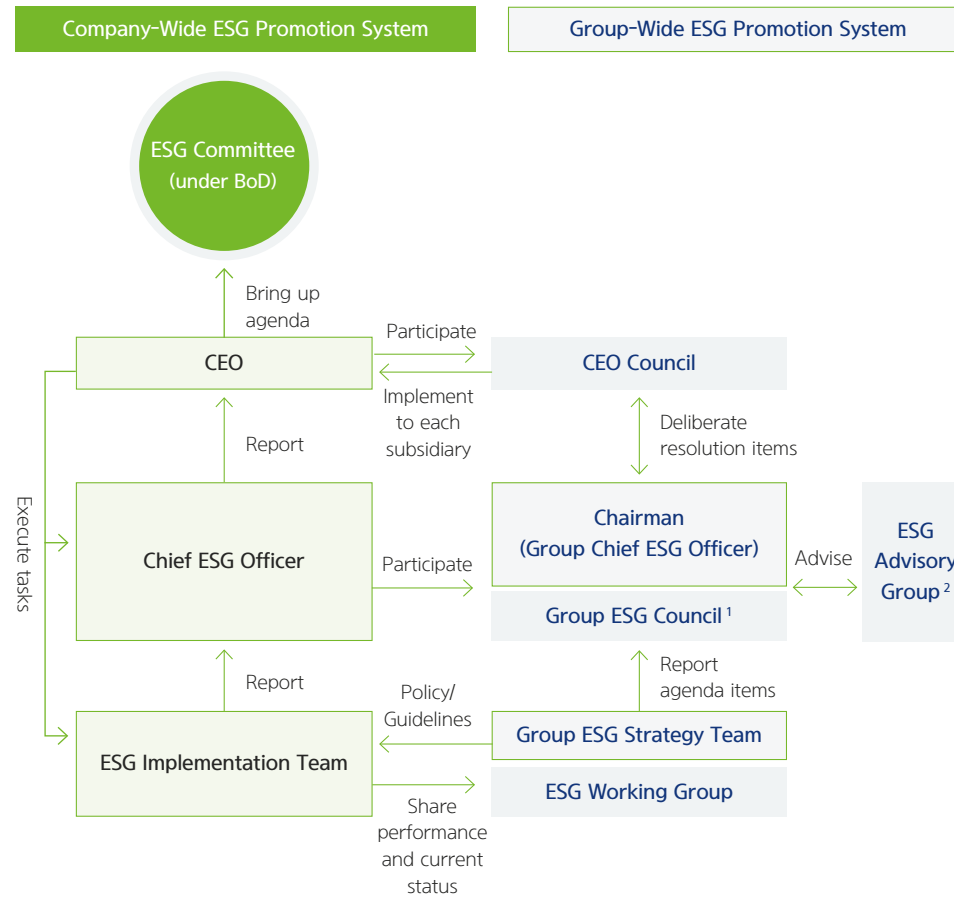
Management Philosophy	Direction	Stakeholders
Upgrade Corporate Value through a Continuous Growth	<ul style="list-style-type: none"> · Secure core capability to drive future growth · Implement flexible business management and global business system 	Customers, Employees, Partner companies, Shareholders, investors
Uphold Fair and Transparent Business Practices	<ul style="list-style-type: none"> · Support open and fair competition in accordance with the free market economy · Promote a sound and transparent corporate governance structure 	Customers, Employees, Partner companies, Industrial circles
Pursue Safe and Environmentally-Friendly Business Practices	<ul style="list-style-type: none"> · Create a pleasant and safe work environment · Conduct environmentally-friendly production activities and technology development 	Employees, Local communities
Promote Strong Labor-Management Relations Built on Mutual Respect and Trust	<ul style="list-style-type: none"> · Foster a vibrant organizational culture based on trust and participation · Perform all duties and responsibilities to enhance corporate competitiveness 	Employees, Partner companies
Demonstrate Our Commitment to Global Corporate Citizenship	<ul style="list-style-type: none"> · Contribute to mankind's prosperity by creating social values · Promote the culture and welfare of local communities 	Partner companies, Employees, Local communities



ESG Management System

ESG Governance

HD Hyundai Energy Solutions shares the basic framework of HD Hyundai Group's ESG policy and strategy. The ESG Committee of the Board of Directors decides ESG strategic direction, plans and implementation. With the ESG team in HD Hyundai Group, we identify key ESG issues and try to come up with appropriate response measures accordingly.



1) Consists of Chief ESG Officers of each subsidiary

2) Consists of outside experts of each ESG section

ESG mid- to long-term initiatives



2022 ESG News

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HD Hyundai Energy Solutions ESG News

HD Hyundai Energy Solutions received excellent assessment results through the ESG evaluation by the Korea Institute of Corporate Governance and Sustainability (KCGS) and SUSTINVEST. Based on the analysis of the 2022 ESG evaluation results, we have derived short-term improvement tasks and mid-term to long-term implementation plans for 2023. Obtaining an overall rating of A from the KCGS for the second consecutive year and the highest grade of AA from the SUSTINVEST, we were recognized for our excellence in ESG risk management.

Analysis on 2022 evaluation results

KCGS				SUSTINVEST			
Environmental	Social	Governance	Overall rating	Environmental	Social	Governance	Overall rating
A	A+	B+	A	85.98 ^{scores}	64.91 ^{scores}	59.55 ^{scores}	AA

Environmental

Excellent Ratings for Green R&D Activities, Green Certifications, and GHG Reduction

We are taking the lead in practicing ESG management through eco-friendly purchasing by establishing the Green Purchasing Policy and Conflict-Free Mineral Policy Standard in 2022. We strive to ensure that the minerals used in our products are ethically and responsibly managed in accordance with the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High Risk Area and require all of our suppliers to comply with international standards and guidelines.



Social

Excellent Ratings for Workplace Balance Programs, Regular Communication through Labor-Management Councils, Health and Safety, etc.

As a future-leading energy solution company that regards highly of human dignity and value, HD Hyundai Energy Solutions declared human rights management in June 2022 and conducted training on preventing human rights violations in the workplace to fulfill its social responsibilities for employees, stakeholders, and communities.



Governance

Excellent Ratings for Disclosing Mid- and Long-Term Dividend Policy and Performance, Introducing e-Voting System, and Operating ESG Committee.









Appointing a compliance officer and establishing compliance control standards in August 2022, we have laid the foundation for fair and transparent business performance, sound development of the company, and the trust of stakeholders.



Communication with Stakeholders

HD Hyundai Energy Solutions categorizes stakeholders who directly or indirectly affect the company as customers, shareholders and investors, employees, suppliers, and the government, and strives for the happiness of and sustainable value creation for our stakeholders. We listen to their voices through various communication channels to reflect stakeholders' requirements in our management activities and specify relevant items in the Corporate Governance Charter to ensure that their rights are respected.

Stakeholder Engagement

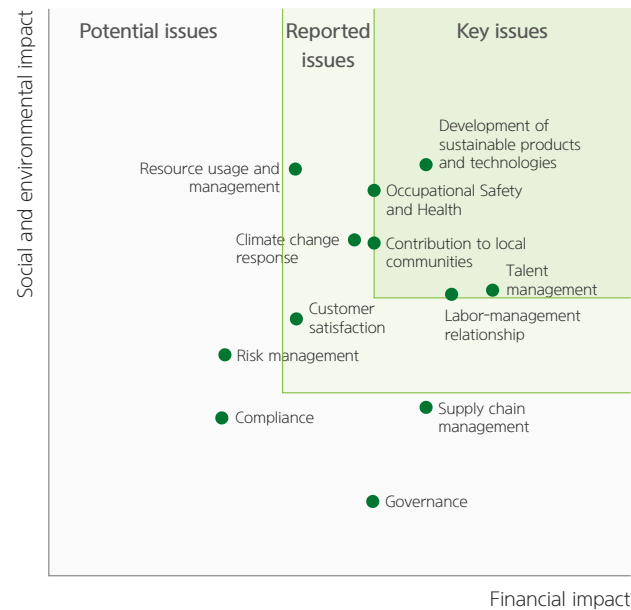
Stakeholder	Key issues and concerns	Major communication channel	Key activities
Customers 	<ul style="list-style-type: none"> Strengthening competitiveness of products and technologies Developing green and high value-added products Enhancing product stability Increasing communication satisfaction 	<ul style="list-style-type: none"> Customer Satisfaction Survey Customer service centers 	<ul style="list-style-type: none"> Conduct quality training for employees Obtain eco-friendly (low carbon) product certification (Korea Energy Agency's Carbon Verification System) Continue product R&D and develop customized solutions
Shareholders and investors 	<ul style="list-style-type: none"> Increasing shareholders value Generating stable business performance Managing business opportunities and risk Practicing sustainable management Transparent governance 	<ul style="list-style-type: none"> Investor Relations (IR) General meeting of shareholders Business report Website 	<ul style="list-style-type: none"> Disclose decisions made by BoD Establish and operate an ESG committee Introduce e-voting system Adopt proxy solicitation system Disclose dividend policy Notify agenda items before the shareholders' meeting
Employees 	<ul style="list-style-type: none"> Ensuring fair evaluation and reward Increasing benefits and strengthening capabilities Promoting labor-management relations and their communication Sharing the current status of the company business Operating safe workplaces and sites 	<ul style="list-style-type: none"> Labor-Management Council Whistleblower system (ethics, human rights) Intranet and company newsletters Conversations with management Management briefings 	<ul style="list-style-type: none"> Operate various training systems Provide education for retirement planning Operate corporate culture TF Offer family Support Program and other benefits Establish PC-OFF program Obtain certification as a family-friendly company
Partner companies 	<ul style="list-style-type: none"> Promoting activities for shared growth Enhancing fair trade Supporting suppliers to enhance their capabilities Safety and Health of suppliers 	<ul style="list-style-type: none"> Meetings with Suppliers Consultation desk for unfair trade Supplier Council 	<ul style="list-style-type: none"> Offer financial support to suppliers Operate a fair-trade system Evaluate supplier safety management activities Provide training and technical support Invite the best suppliers to solar exhibitions and hold meetings with them
Government 	<ul style="list-style-type: none"> Engaging in government policy Participating in and supporting government events Sharing industry and company information Revitalizing local communities Issues related to safety and labor 	<ul style="list-style-type: none"> Policy advisory bodies Policy meetings Visiting National Assembly and government offices 	<ul style="list-style-type: none"> Build a shared growth ecosystem Implement a fair-trade compliance program Adopt and execute an economic sanctions compliance program Organize business portfolio according to government regulations Invest in R&D for eco-friendly energy transition
Local communities 	<ul style="list-style-type: none"> Revitalizing local communities Attracting industries and increasing employment in communities Protecting and improving the community environment Social contribution activities centering on local communities Communication with local communities 	<ul style="list-style-type: none"> Local councils Civic organizations Community service organizations 	<ul style="list-style-type: none"> Operate community talent development programs Support policies for the socially vulnerable Invest in community development Payroll sharing programs participated by employees Social contribution activities participated by employees such as volunteering activities
Media 	<ul style="list-style-type: none"> Business performance and industry issues Key general issues of the company Direction of main businesses of the company 	<ul style="list-style-type: none"> Press Releases Website media center Meetings with media 	<ul style="list-style-type: none"> Deliver press releases in a timely manner Post news on the company website Support journalists
Common 	<ul style="list-style-type: none"> ESG strategy and direction Progress and performance of ESG initiatives ESG ratings 	<ul style="list-style-type: none"> Integrated Report ESG website ESG meetings, conference calls 	<ul style="list-style-type: none"> Publish Integrated Report Share information on ESG website Hold ESG meetings with investors and shareholders

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Double Materiality Assessment

HD Hyundai Energy Solutions conducts a materiality assessment every year to listen to the voices of key stakeholders at home and abroad, and to identify key issues to focus on for sustainable management. Especially this year, our materiality assessment incorporated the 'Materiality' of GRI Standards guideline and the concept of double materiality. Assessing double materiality refers to a topic identification process that considers not only the environmental and social impacts of a company's business activities, but also the impact on corporate value and finance from an external perspective. Through this process, HD Hyundai Energy Solutions has more clearly identified the interests and requirements of its stakeholders and utilized them in preparing the Integrated Report. We plan to actively reflect them in the establishment of its ESG strategy in the future.

Material issue matrix



Double Materiality Assessment Process



Stakeholders and issues

	Issues	Development of sustainable products and technologies	Talent management	Occupational safety and health	Labor-management relationship	Contribution to local communities	Resource usage and management	Response to climate change	Supply chain management	Customer satisfaction	Governance	Risk management	Compliance management
Level of Impact	Social/ environmental	●	●	●	●	●	●	●	●	●	●	●	●
	Financial	●	●	●	●	●	●	●	●	●	●	●	●
Stakeholders	Customer	∇				∇		∇	∇	∇			
	Shareholders and investors	∇							∇		∇	∇	∇
	Employees	∇	∇	∇	∇					∇	∇	∇	∇
	Partner companies			∇					∇			∇	∇
	Government/ National Assembly						∇	∇				∇	∇
	Local communities					∇	∇			∇			∇
	Media			∇	∇		∇		∇		∇	∇	∇

Development of sustainable products and technologies
Talent management
Occupational safety and health
Labor-management relationship
Contribution to local communities
Resource usage and management
Response to climate change
Supply chain management
Customer satisfaction
Governance
Risk management
Compliance management

Customer
Shareholders and investors
Employees
Partner companies
Government/ National Assembly
Local communities
Media

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Development of sustainable products and technologies
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Risk management
Compliance management

● High Impact ● Mid Impact ● Low Impact

Key ESG Issues

Management of key issues

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Issue	Context	Risk & Opportunity	Our Approach	Key Performance	Next Plan
Development of sustainable products and technologies 	<ul style="list-style-type: none"> The Emergence of a New Climate Regime under the Paris Agreement Declaration of carbon neutrality by 2050 Expansion of value and ethical consumption 	<ul style="list-style-type: none"> Setting global GHG reduction targets and enhancing regulation of environmental pollutant emissions. Declaration of carbon neutrality by major investors declaring and requesting stakeholders to participate Increased demand for renewable energy and opportunities to expand green solar energy production 	<ul style="list-style-type: none"> Build green processes Develop low-carbon products Establish eco-friendly social infrastructure for the future by investing in facilities, etc. Review mid- to long-term reduction targets for GHG and hazardous chemicals, water, waste, etc. 	<ul style="list-style-type: none"> Increased green purchases to KRW35.4 billion year-over-year Expanded sales of low-carbon and eco-friendly products to KRW157.2 billion Developed technology for mobility solutions Reduced GHG emissions by 7% below quota (38,240 tCO₂e) 	<ul style="list-style-type: none"> Examine environmental impacts throughout the product life cycle (Life Cycle Analysis) Make continuous efforts to reduce carbon emissions Reduce GHG emissions and monitor air, water, and waste management
Talent management 	<ul style="list-style-type: none"> Increased cross-border and cross-company competition for the talented people Increased demand for horizontal organizational culture Enhancement of legal enforcement, including anti-discrimination and harassment laws 	<ul style="list-style-type: none"> Cultivating convergent talent Developing the next generation of leaders to drive future change Providing a variety of job-specific training opportunities for employees and for the development of global talent Building a great organizational culture to attract and retain the talent 	<ul style="list-style-type: none"> Achieve early transformation of DT awareness among employees as the digital transformation of industrial structures accelerates. Operate a DT talent training system to foster DT talents with specialized skills 	<ul style="list-style-type: none"> Secured the best talent Declared Human Rights Management (June) Conducted self-assessment of human rights materiality (October) 	<ul style="list-style-type: none"> Strengthen human rights management that emphasizes human dignity and value Continuously manage to consider human rights in business activities Expand training opportunities on human rights to overseas operations and supply chains
Occupational safety and health 	<ul style="list-style-type: none"> Stronger demands for safety and health Increased government regulations such as the Serious Accident Punishment Act. Increased demand for safety and health within and outside the organization 	<ul style="list-style-type: none"> Higher expectation for management capability of safety and health with strengthened regulation on OSH Growing importance of competitive edge by strengthening professional management capabilities in the field of OSH 	<ul style="list-style-type: none"> Establish a safety and health management policy for systematic management Strictly comply with laws and regulations along with obtaining safety and health management system (ISO 45001) certification Make continuous evaluations on safety and health 	<ul style="list-style-type: none"> Conducted a risk assessment (May) Achieved Grade A in the Safety and Health Coexistence and Cooperation Program 100% of employees participated in safety training 	<ul style="list-style-type: none"> Conduct regular and frequent risk assessments Provide systematic training to comply with and respond to laws and regulations as occupational safety and health laws and regulations are strengthened
Labor-management relationship 	<ul style="list-style-type: none"> Mutually beneficial labor-management relations are essential for sustainable growth. 	<ul style="list-style-type: none"> The government's willingness to reform the labor market and labor's resistance to it Deepening dual structure of the labor market Labor issues such as the reform of the working hours and job uncertainty. 	<ul style="list-style-type: none"> Strive to establish win-win labor-management relations based on a corporate culture of mutual respect and trust Share human rights management guidelines through employment rules and partner company codes of conduct. Hold labor-management meetings at least quarterly-basis to strengthen working conditions and welfare benefits for employees. 	<ul style="list-style-type: none"> Improved working conditions through labor-management councils: installing vending machines, improving the quality of cafeterias, etc. Introduced a suggestion system (Hi-Square) to collect opinions freely 	<ul style="list-style-type: none"> Continue to build a corporate culture of mutual respect and trust Continuously enhance working conditions and benefits Strive to create a horizontal and free atmosphere
Contribution to local communities 	<ul style="list-style-type: none"> Increased interests and demands for corporate social responsibilities as their social impact grows 	<ul style="list-style-type: none"> Community engagement is important for industries that support local economies, such as manufacturing. Cooperation and coexistence with local communities is a key ESG issue. 	<ul style="list-style-type: none"> Promote social contribution activities based on the three core business areas of 'caring for the underprivileged,' 'community coexistence,' and 'self-reliance of future generations' in line with the SDGs. 	<ul style="list-style-type: none"> Supported 10 vulnerable families in Chungcheongbuk-do Province with KRW 38.95 million worth of solar facilities and installations Participated in the HDHyundai 1% Nanum Foundation Internalized employee social contribution activities 	<ul style="list-style-type: none"> Make continuous efforts to address social issues as a global corporate citizen Strengthen efforts for mutual growth with local communities Increase support for future generations

Environmental Management

HD Hyundai Energy Solutions is building a system to understand and cope with climate change and its impacts. Engaged in the solar industry, a key sector for carbon reduction, we are contributing to the production of eco-friendly energy and the promotion of RE100.

ESG Committee in Board of Directors (BoD)

HD Hyundai Energy Solutions operates the ESG Committee, a body that establishes ESG strategic direction and makes important decisions. Under the Board of Directors, the ESG Committee manages the company to expand its green business and actively respond to climate change in the mid- to long-term. The Committee scrutinizes issues and topics covering the environment, society, and governance, and keeps an eye on the implementation rate of improvement tasks. Realizing our environmental responsibilities such as reducing carbon emissions, enhancing energy efficiency, and recycling waste modules, we intend to strengthen the responsible management of the BoD and ESG Committee. Starting from 2022, the Company is strengthening ESG execution by mandatorily reflecting ESG tasks as performance indicators (KPIs) by divisions/positions.

Policies on Safety, Health, and Environment

HD Hyundai Energy Solutions has established and been implementing policies and goals for safety, health, and the environment. We comply with the Green Procurement Management Standard established in 2022. Furthermore, the Company has established a supply chain ESG management evaluation system and is considering joining environmental initiatives to proactively respond to global environmental regulations and guidelines.

안전 · 보건 · 환경 방침

안전 · 보건 · 환경 관리 체계를 구축하고 전 직원이 안전하고 쾌적한 환경에서 근무할 수 있도록 다음 사항들을 지속적으로 수행하고 발전시켜 나갈 것을 전 임직원 및 모든 이해관계자에게 밝힌다.

- ① 근로자의 생명 보호
 - 법규 및 안전기준 준수 철저
 - 관리감독자 중심 안전관리 추진
- ② 안전한 작업환경 조성
 - 지속적인 작업환경 개선 전개
 - 예방중심의 보건관리체계 운영 추진
- ③ 친환경 자양 기업문화 정착
 - 온실가스 관리를 통한 저탄소 배출
 - 환경오염 예방 및 개선 활동 강화

박종원
대표이사 박종원
현대에너지솔루션주식회사

2023년 안전·보건·환경 목표

중대재해 예방하자

- ① 화재·폭발·누출 ZERO 달성
 - 공정안전관리 이행률 (5' 5급 이상 80%)
 - 법규 준수율 (내역별 부과 2023년 1차 분기)
 - 관리감독자역무 이행률 (1차분 이행 실적 100%)
 - 방문자 안전관리 실적 (출입 전 안전교육 100%, 1차)
- ② 직업병 발생 ZERO 달성
 - 가스/누출 감지기 점검률 (1차/2차 100%)
 - 안전보호구 사용률 (안전보호구 관리 실적 1차/2차 100%)
- ③ 환경사고 ZERO 달성
 - 환경영향 평가, 관리 실적 (1차/2차 실적 100%)
 - 환경영향 기준 준수율 (1차 실적 100%, 2차 실적 100%)
 - 폐기물 분리 배출 실적 (1차/2차 실적 100%)

1. Policies on safety, health, and environment
2. 2023 Goals for safety, health and environment

Strategies for Zero Environmental Accidents

No	Strategy	Goal
1	Strictly maintain and manage environment-related facilities	Daily check
2	Strictly comply with environment and safety standards	Maintain 0 case of violation
3	Strengthen the practice of separating & discharging waste	Monthly or more frequent check

NEXT STEP



Review LCA of PV Module

HD Hyundai Energy Solutions is reviewing the life cycle assessment (LCA) of solar modules to establish a mid- to long-term carbon footprint roadmap.



Recycle Waste Modules

With the implementation of the environmental guarantee system (obligation to recycle waste modules) from January 2023, manufacturers/importers and sellers of PV modules are required to fulfill the obligation to recycle or recover their waste modules. HD Hyundai Energy Solutions will proactively join a cooperative for recycling waste modules (E-Cycle Governance) to fulfill its obligation and to ultimately become an environmentally and socially responsible company.

Human Rights Management

HD Hyundai Energy Solutions has published the Human Rights Management Report in 2022 in compliance with the guidelines set forth by international standards and norms such as “the United Nations Universal Declaration of Human Rights” and the “United Nations Guiding Principles on Business and Human Rights” in order to actively practice human rights management.

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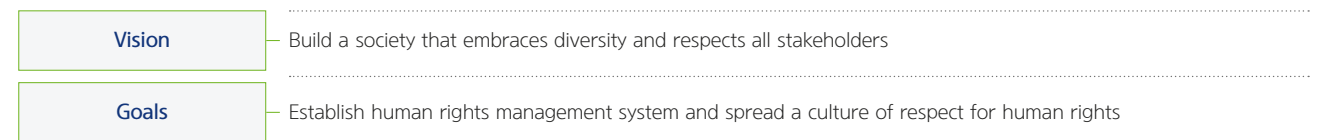
HD Hyundai Solutions’ Human Rights Management Charter

- 1 — HD Hyundai Energy Solutions, as a future-leading energy solution company, declares that it will fulfill its social responsibilities for human rights to its executives and employees, as well as customers, stakeholders, and communities by actively practicing human rights management that values human dignity and values.
- 2 — HD Hyundai Energy Solutions will respect and support the values of human rights, labor, environment, anti-corruption, etc. set forth in international standards and norms such as the ‘United Nations Universal Declaration of Human Rights’ and the ‘United Nations Guiding Principles on Business and Human Rights’ and make an active effort to implement them.
- 3 — HD Hyundai Energy Solutions will strive to prevent human rights violations from occurring in all business operations that are directly or indirectly affected by the company. The Board of Directors, the Chief ESG Officer and related organizations will form a continuous governance system and will establish and implement human rights management practices that specifically stipulate the establishment of human rights management policies, operation of human rights management committees, human rights impact assessment, and remedies for human rights violations.
- 4 — In particular, we recognize the safety and health issues of employees (including employees of suppliers) and the environmental impact on local communities that may occur in Eumseong factory as major human rights issues and intend to continuously manage human rights risks by monitoring and focusing on these matters.
- 5 — HD Hyundai Energy Solutions will make further efforts to strengthen human rights management so that the human rights management charter can be applied to and complied with by not only HD Hyundai Energy Solution’s executives and employees, but also all internal and external stakeholders, including customers, shareholders, business partners, local communities, and the government.

Implementation System for Human Rights Management

Vision and Goals

HD Hyundai Energy Solutions respects the human dignity and human rights of all stakeholders who are directly or indirectly affected by the company, based on which the Company strives to practice human rights management.



Human Rights Management Process



Human Rights Governance



- [ESG Committee]** The highest decision-making body for human rights-related matters
- [Human Rights Management Committee]**
 Make decisions and review performance regarding key human rights management issues
 Commissioner: Chief ESG Officer
 Makeup: Executives and team leaders of relevant organizations (7 members including the Chief, outside experts as needed)
 Responsibilities:
 - Establish a human rights management strategy/policy, and human rights management charters
 - Approve human rights management practice regulations, etc.
 - Come up with an annual promotion plan for human rights management and publish human rights management reports, etc.
- [Human Rights Management Related Organizations]**
 Responsibilities:
 - Establish and implement human rights promotion plans
 - Implement human rights education, monitor, and report on human rights issues
 - Identify human rights risks and areas for improvements, including conducting human rights impact assessments

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Eco Management

Climate Change Response

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Safe Workplace

Human Rights

People

Social Community

Product Responsibility

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ENVIRONMENTAL

Clean & Balanced Landscape

Clean Technology Creation

Clean technology production and Eco management



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— Strategy

The emergence of a new climate regime under the Paris Agreement on Climate Change is demanding more roles and responsibilities of companies for global environmental value as well as the environmental impact of their value-added business activities. As a result, advanced management for low-carbon energy is becoming very important for companies. These changes can provide opportunities for HD Hyundai Energy Solutions that produce green energy.

— Risk Management

Under the philosophy of “Establish an eco-friendly management culture,” HD Hyundai Energy Solutions is building green processes. The Company is committed to continuous R&D and investment to fulfill its roles and social responsibilities for global environmental values by producing low-carbon, eco-friendly products for solar modules needed to produce green solar energy. In addition, we plan to implement the Green Procurement Management Standard and support suppliers in establishing ESG management systems to create an ESG management ecosystem for the supply chain. In response to the government’s Renewable Energy 3020 policy, we are making significant efforts to develop applications and solutions to expand solar energy generation.

— Key Performance

 Increase in green procurement Green procurement increased to KRW 35.4 billion YoY	 Higher sales in low-carbon green products Considerable growth in sales at KRW 157.2 billion YoY	 Developing high-powered mobility PV solutions Development of high-powered car solar roofs and hood	 Renewal of environmental management system ISO 14001 renewal
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— Target

We plan to investigate and manage the environmental impact of our products throughout their life cycle (Life Cycle Analysis) starting from the purchase of raw materials until their disposal. We will also manage our production according to in-house standards that are even stricter than those allowed by the relevant law. HD Hyundai Energy Solutions will continue to make its environmental management efforts by reducing carbon emissions.

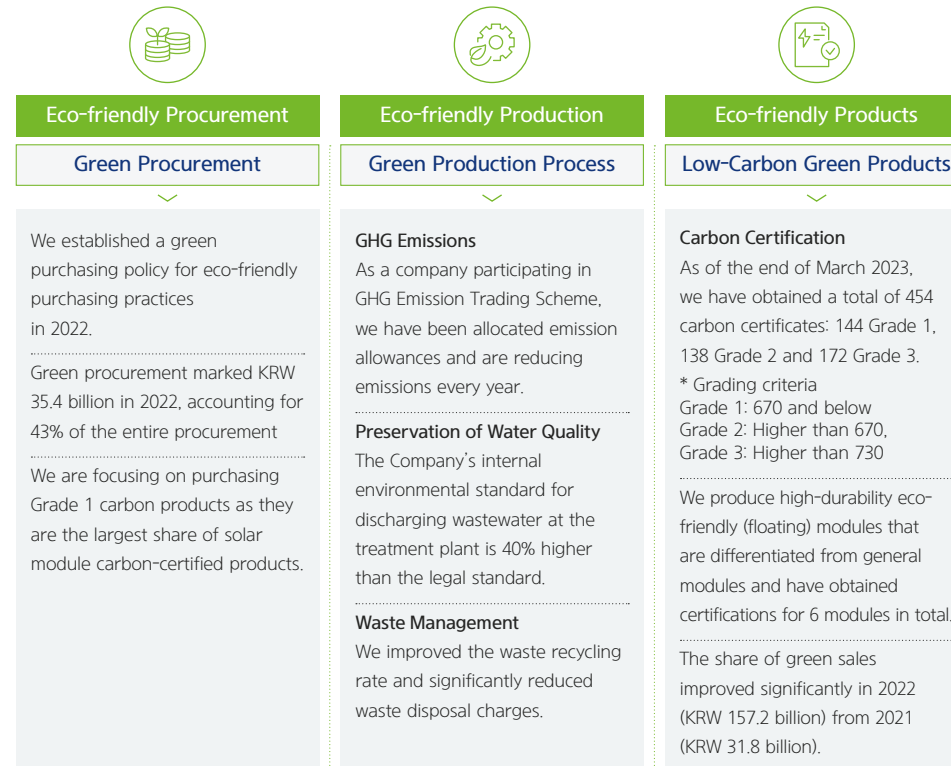
Clean Technology Creation

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STRATEGY

Life Cycle of Green Products

A leading provider of comprehensive PV solutions, HD Hyundai Energy Solutions is expanding sales of eco-friendly products and services related to sustainability, contributing to the construction of an eco-friendly infrastructure of future society by increasing investment in relevant equipment and facilities. To this end, we investigate and manage environmental impacts throughout the entire product life cycle (Life Cycle Analysis), starting from purchasing raw materials until their disposal. In 2022, we established a green purchasing policy to institutionalize eco-friendly purchasing practice. We do have internal standards for air and water emissions from our production processes that are stricter than the legal allowance. This has enabled us to produce low-carbon and environmentally friendly products, significantly increasing the share of eco-friendly sales.



PERFORMANCE

Eco-Friendly Procurement

As a company that leads eco-friendly innovation, HD Hyundai Energy Solutions has established a green purchasing policy in 2022, striving to use and utilize environmentally friendly products for business activities. In addition, we are implementing the "Voluntary Agreement on Green Purchasing in Industries" and continue to contribute to our society as both a green producer and a green consumer that leads green business. As a result of these efforts, the green procurement of raw materials increased from KRW 30.08 billion in 2021 to KRW 35.42 billion, accounting for 43% of the entire procurement. HD Hyundai Energy Solutions is focusing on purchasing Grade 1 carbon products to produce solar modules. In 2022, domestic purchases of Grade 1 wafers amounted to KRW 35.4 billion.

Eco-Friendly Production

In an effort to reduce indirect GHG (Scope 2) emissions from the production of our main products, solar modules, HD Hyundai Energy Solutions continues to introduce new equipment with high productivity in the manufacturing process of PV modules which are, by nature, an eco-friendly product. The company also minimizes LPG and energy consumption by setting the indoor temperature of the factory to around 20°C in winter.

Eco-Friendly Products

Managing the expansion of sales of low-carbon and eco-friendly (Grade 1) products as one of the Key Performance Indicators, the Company posted KRW157.2 billion in sales in 2022, a significant year-on-year growth. In addition, PERC solar cells, high-efficiency n-type solar cells, photovoltaic modules, and BIPV modules (+colored BIPV modules) are products to which green technology classified by the Korea Institute for Advancement of Technology's green technology certification system has been applied. Through our aggressive effort in making silicon wafer thinner, we are reducing the carbon footprint of our solar module products. As of the end of March 2023, we obtained 454 carbon certifications, including 144 Grade 1 certifications. Having minimized the Pb (lead) content in floating solar module products, our floating PV module has acquired high durability and eco-friendly KS certification. Most of all, the maximum power of M6 PV module has been increased to 500W. In addition, we have developed and produced the M10 model, a solar high-power module with a maximum output of 600W, and will carry out continuous R&D activities to reduce carbon emissions, apply eco-friendly materials, and make it easier to recycle them.

Clean Technology Creation

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Green Technology

HD Hyundai Energy Solutions has been making continuous efforts and achievements in renewable energy business and eco-friendly technology development research. While producing PV cells and modules, which are eco-friendly renewable energy sources, we persist in developing high output and high efficiency technologies. The Company has been continuously applying for and registering patents for high-efficiency, high-power, and versatile solar cells and modules, and is also actively securing intellectual property rights for next-generation high-power solar products and systems. We intend to carry out in-depth R&D activities for related technologies in the future.

Since 2014 when we were the very first company to produce high-efficiency PERC PV cells in Korea, the Company has been continuously developing manufacturing technology based on large-area thin wafers. Since the end of 2022, we have commercialized M6 and M10 PV cells, during which the amount of silicon use has decreased. In addition, we use ultra-thin wafers of 150um or less (which emits 12.58% less carbon than 200um and 6.7% less than 175um) to minimize the carbon emissions of PV modules, and intend to further strengthen this effort.

Joint Project with Ministry of Trade, Industry and Energy to Develop Core Technology for Renewable Energy

In May 2023, HD Hyundai Energy Solutions was selected as the lead organization for the solar technology project initiated by the Ministry of Trade, Industry and Energy to develop core technology for renewable energy. The project intends to advance the mass production technology of large-area thin-film HJT solar cells and modules, and plans to mass-produce ultra-high efficiency large-area (M10-class) HJT solar cells by 2026. HJT solar cells can achieve ultra-high efficiencies of 26%, which is higher than conventional PERC and TOPCon cells, and has simpler manufacturing processes. Given this, HJT solar cells are said to be the most compatible for perovskite tandem solar technologies in the future. HD Hyundai Energy Solutions will take the lead in developing tandem solar cell technology in collaboration with domestic industry and research institutes to secure ultra-high efficiency HJT-based tandem source technology, participating in the production and spread of renewable energy.

* HJT (Hetero-Junction Tech.) combines two different technologies into one in manufacturing PV cells.

Developing Car Solar Roofs and Solar Hoods

Our efforts to develop eco-friendly technologies are leading to the development of various applications of solar technology. In the process of developing technologies for higher power and improving the designs of car solar roofs and solar hoods, we have successfully completed a 250W high-power solar roof prototype by using large-area (M6, M10) high-efficiency cells, high-density cell integration technology, and highly integrated wiring technology. The Company has also verified the environmental reliability of the developed solar roof and completed the suitability evaluation for real-world application and durability assessment.



2023 International Green Energy Expo

Green Investment

HD Hyundai Energy Solutions is actively making investment in improving and installing facilities to protect the environment. Part of the investment includes the replacement of the TMS (Telemonitoring System) system for water quality in an effort to comply with the revised communication standard of the official testing method with respect to water pollution process and to improve the quality of the wastewater discharged at our water treatment plant. Furthermore, we are aggressively responding to the revised Water Environment Conservation Act by making preemptive investment in new TOC analysis equipment which is supposed to be installed in 2023. In addition to these investments, the Company is considering other investments in installing additional tanks for stricter chemical treatment and enhancing the chemical performance of wastewater treatment. By changing existing substances to more expensive, specialized ones, we plan to increase the efficiency of biological treatment by more than four times. Through our investment in reducing electricity use, we have introduced equipment with higher productivity and reviewed measures to optimize electricity use, resulting in a 37% reduction in electricity use by 2022.

Investment in Environment

Item	Unit	2020	2021	2022
Environment investment	KRW 100 million	2.8	0.9	2.6

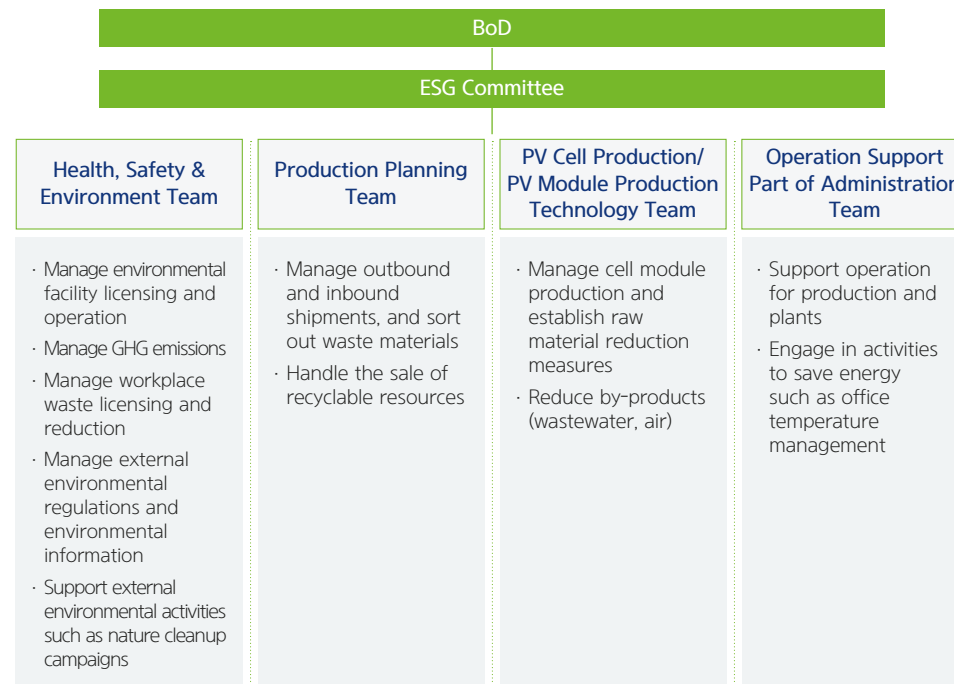
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GOVERNANCE

Establishing Environmental Management Governance

HD Hyundai Energy Solutions continues to seek eco-friendly sustainable management. The ESG Committee under the Board of Directors discusses matters related to recognizing environmental risks and opportunities, establishing strategies and goals, and reviewing details of the mid- to long-term roadmap. The Committee deliberates on matters regarding the company's ESG strategic direction, planning, and implementation, as well as corporate social responsibility, and examines if any support needed for the development and internalization of the company's ESG capabilities.



Environmental Management System (ISO 14001) Certification

HD Hyundai Energy Solutions has established an environmental management system to respond to the needs of various stakeholders and comply with global standards. The Company has also obtained and maintains international certification for environmental management systems (ISO 14001).

PERFORMANCE

Managing Environmental Performance

HD Hyundai Energy Solutions actively promotes eco-friendly management to minimize environmental impact and enhance corporate sustainability, and manages the performance of its implementation according to the environmental performance evaluation system. In addition, we verify and improve the performance through internal and external environmental audits every year.

Item	Unit	2022 performance
GHG emissions	tCO ₂ eq	38,240
Water consumption intensity	Ton/KRW billion	424
NOx emissions	ton	4.2
SOx emissions	ton	0.0
Green procurement	%	4.3
Green investment	KRW 100 million	2.6
Total energy consumption	TJ/KRW billion	0.8

Environmental Education for Employees

HD Hyundai Energy Solutions conducts safety training on hazardous chemicals for all employees and ensures that persons in charge of managing environmental and hazardous chemicals receive compulsory training during the required period.

Name of training	Unit	Completion rate in 2022
Rate of hazardous chemical safety training		100
Compulsory training on environment and hazardous chemicals	%	100

Violation of Environmental Regulation

HD Hyundai Energy Solutions strictly complies with environmental laws and regulations, and has purchased environmental liability insurance to minimize its environmental impact. In 2021, we received an improvement order for exceeding the effluent quality standard, but actively addressed the issue, coming up with preventive measures. In 2022, there were no violation cases for environmental regulations.

Climate Change Response

Making efforts to reduce environmental impact



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— Strategy

In October 2018, United Nations Intergovernmental Panel on Climate Change (UN IPCC) released a special report stating that the increase of global average temperature should be limited to 1.5°C by 2100 to curb the effects of climate change. Under the circumstances, corporate social responsibility is increasingly focused on the environmental damage caused by coal fuel and various wastes generated at business sites, and governments around the world are setting GHG reduction targets and strengthening regulations on environmental pollutant emissions. Major investors and customers are also declaring carbon neutrality, requesting participation of various stakeholders.

— Risk Management

HD Hyundai Energy Solutions is striving to realize carbon neutrality through solar power in response to extreme weather events that threaten the earth and humanity. Setting mid- to long-term reduction targets for greenhouse gases and non-greenhouse gases (hazardous chemicals, water, and waste) and establishing a step-by-step roadmap, we intend to strengthen the system for management by objectives. The Company aims to reduce energy consumption through low-carbon and high-efficiency facilities, process improvement, and operation optimization at business sites. We operate a total of six solar power plants (four in-house and two off-site) to generate eco-friendly energy and apply stricter standards for air quality protection, water quality protection, and waste management along with continuous monitoring activities.

— Key Performance

 GHG reduction <hr/> GHG emissions marked 38,240 tCO₂eq, 7% below quota	 40% stricter than government regulation <hr/> Internal regulations on managing air, water and waste are 40% stricter than the ones imposed by the government	 Recycling rate at 99.8% <hr/> 99.8% of recycling rate by recycling some of the waste that was previously incinerated.
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— Target

HD Hyundai Energy Solutions will continue to make its utmost effort to reduce GHG emissions and manage air, water, and waste. We will strive to reduce our environmental impact by reducing energy consumption through low-carbon and high-efficiency facilities, process improvement, and operation optimization.

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PERFORMANCE

Responding to Climate Change

Having witnessed extreme weather events that threaten the earth and humanity, HD Hyundai Energy Solutions is taking the lead in realizing carbon neutrality and promoting sustainable future energy through solar power. To this end, we have established and implemented the goal of reducing GHG emissions and achieving zero environmental accidents.

The Company thoroughly manages discarding CO₂ welders, regulating gas supply pressure, installing LED lights, and minimizing the operation of air compression facilities. By introducing a plasma-type facility, we have minimized the emissions of N₂O, one of GHGs, for the primary scrubber used in the production process.

As a company subject to emission quotas, we have made continuous efforts to reduce GHG emissions, and recorded GHG emissions that were lower than the quota in 2021 and 2022. Thanks to these efforts, the GHG emission intensity has improved by 15.84% compared to the previous year.

GHG Emissions

	Category	Unit	2020	2021	2022
GHG	Total emissions	tCO ₂ eq	26,397	27,366	38,240
	Direct emissions (Scope 1) ¹⁾	tCO ₂ eq	1,737	2,143	3,565
	Indirect emissions (Scope 2) ²⁾	tCO ₂ eq	24,661	25,223	34,675
	Emission intensity ³⁾	tCO ₂ eq/KRW billion	66.9	46.1	38.8
	Rate of improvement in emission intensity (compared to the previous year)	%	23.6	31.1	15.8

1) Calculation range for direct emissions (Scope 1) data: Eumseong Plant
 2) Calculation range for indirect emissions (Scope 2) data: Eumseong Plant, Bundang Office
 3) Revenue: Based on consolidated financial statements of the annual report

Energy Consumption

HD Hyundai Energy Solutions aims to reduce energy consumption through low-carbon, high-efficiency facilities, process improvement, and operation optimization.

Energy Consumption

	Category	Unit	2020	2021	2022
Non-renewable Energy	Total consumption	TJ	530	539	753
	Direct energy consumption	TJ	22	12	29
	Indirect energy consumption	TJ	508	527	724
	Consumption intensity	TJ/KRW billion	1.3	0.9	0.8
	Rate of improvement in emission intensity (compared to the previous year)	%	21.4	32.4	15.9

Energy Production

HD Hyundai Energy Solutions operates a total of 6 solar power plants (4 in-house and 2 off-site) to produce eco-friendly energy. As of the end of 2022, the total capacity stood at 4MW.

Energy Generation

Category	Unit	2020	2021	2022
Total production (PV)	MWh	3,836.6	4,324.1	4,785.6

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Water Management

The HSE team (Facilities Part) of HD Hyundai Energy Solutions supervises the daily monitoring of water consumption at production sites. Classifying the water resources required for production into water inflow (water intake), wastewater generation (in-plant consumption), and external discharge (discharge), we check daily guidelines and record the data in wastewater operation logbook. At Hanbeolcheon in the Han River basin which is the final discharge point (discharge area), we make use of TMS facilities to measure and monitor pollutants in real time so as to prevent pollution of rivers and local water resources. In addition, we quantify the usage of each water resource item (DI, PCW, etc.) used in production, keep a daily log, and share it with the utility operation team and production team to continue our efforts to reduce water usage and wastewater generation.

The Company measures and monitors daily water consumption, and manages water consumption intensity. As a result, we are witnessing a decreasing trend in water consumption intensity over the last 3 years. In particular, the consumption decreased by 222 tons/ KRW billion in 2022 compared to the previous year.

Water and wastewater management

Category	Unit	2020	2021	2022
Total water consumption	ton	362,607	382,650	417,887
Total wastewater treatment	ton	327,738	304,124	356,076
Water consumption intensity	ton/KRW billion	919	645	424

Managing Hazardous Chemicals

Since our business sites deal with different chemicals, we manage them in a thorough manner. In accordance with relevant laws and regulations, the Company evaluates the hazardousness and scope of impact of chemicals used at the Eumseong factory in Chungcheongbuk-do Province. We have established a safety management policy and a disaster prevention center where detailed guidelines for community coordination were prepared so that relevant information can be disseminated for proper response in case of a chemical accident.

Conserving Atmospheric Environment

HD Hyundai Energy Solutions has established in-house environmental standards that are 50% higher than the legal standards to minimize the generation of air pollutants. When investing in new cell factories, we eliminate the process of using nitric acid (HNO₃), the main source of NO_x gas, to eradicate NO_x generated in the process itself.

Air Pollutant Emissions

		Unit	2020	2021	2022
Nitrogen oxides (NO _x)	Emissions	ton	3.7	1.7	4.2
	Emissions intensity	Ton/KRW billion	0.0094	0.0029	0.0043
	Emission concentration	ppm	17.8	13.4	8.8
Sulfur oxides (SO _x)	Emissions	ton	0.6	0.8	0.0
	Emissions intensity	Ton/KRW billion	0.00015	0.0013	0.0000
	Emission concentration	ppm	0.3	5.5	0.5
Dust	Emissions	ton	2.4	3.1	0.7
	Emissions intensity	Ton/KRW billion	0.0061	0.0052	0.0007
	Emission concentration	mg/Sm ³	2.2	2.9	1.0

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Conserving Water Environment

HD Hyundai Energy Solutions sets and manages the in-house environmental standards on the discharge of wastewater treatment plants that are 40% stricter than the legal standards. We also control the wastewater pollutant concentration on a real-time basis by monitoring the finally-discharged water and conducting TMS inspections to ensure that pollutant concentration does not exceed the standard level. In addition, we control the wastewater generated from production processes and work sites through efficient management of wastewater treatment plant (capacity of 1,800ton/day) operation. In order to reduce the concentration of nitrogen concentration in wastewater treatment discharge, we are trying to optimize the biological treatment process by introducing hydrogen peroxide remover and Ammonia Oxidation bacteria

Water Pollutant Emissions¹⁾

	Category	Unit	2020	2021	2022
COD	Emissions	kg	1,311	730	1,228
	Emissions intensity	Kg/KRW billion	3.3	1.2	1.2
BOD	Emissions	kg	1,311	243	338
	Emissions intensity	Kg/KRW billion	3.3	0.4	0.3
SS	Emissions	kg	164	487	506
	Emissions intensity	Kg/KRW billion	0.4	0.8	0.5
T-N	Emissions	kg	754	5,170	2,845
	Emissions intensity	Kg/KRW billion	1.9	8.7	2.9

1) The data for 2020 and 2021 was modified from the previous reports due to errors in emission calculation.

Managing Waste

Various wastes (waste synthetic resin, waste paint, wastewater sludge, waste wood, waste glass, etc.) generated during the product development process are separated by each type and discharged to waste collection sites, and are legally consigned to a registered waste disposal company. Since 2021, we have taken out the general waste from the business sites that were previously incinerated to a recycling company, which led to an increase in waste recycling rate and a significant decrease in waste disposal charges. As a result, we recycled 99.8% of the waste we generated in 2022.

Waste generation

Category	Unit	2020	2021	2022
Waste generation	ton	4,101.7	4,762.6	7,601.3
General waste	ton	2,793.3	3,599.7	5,169.4
Designated waste	ton	1,308.4	1,162.9	2,431.9
Emission intensity	Ton/KRW billion	10.4	8.0	7.7
Rate of improvement in emission intensity (compared to previous year)	%	28.8	22.8	38.6
Waste disposal	ton	4,101.7	4,762.6	7,601.3
Recycling	ton	3,871.7	4,755.6	7,584.0
Incineration	ton	230	7	17
Landfill	ton	0	0	0
Recycling rate	%	94.4	99.9	99.8

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Safe Workplace

Enhancing Safety and Health Management



— Strategy

HD Hyundai Energy Solutions places the highest priority on the health and safety of its employees. Safety and health are not only a means to realize the value of respecting human beings, but they are also essential to prevent economic losses from disasters. Safety and health must be guaranteed to improve employee productivity. The importance of safety and health is also being driven by other factors as well: growing demand by workers and the internal and external environment such as stronger laws and regulations like the Serious Accident Punishment Act.

— Risk Management

Considering accident prevention and health management of employees as core values of ESG, HD Hyundai Energy Solutions has established a safety and health management policy for systematic management. We have obtained ISO 45001 certification, strictly complying with laws and regulations and conducting safety and health-related assessments. Furthermore, we continue to enhance our safety and health management system by thoroughly preparing measures to prevent accidents from recurring and identifying the causes of accidents after they occur.

— Key Performance

 Risk assessment <hr/> Conducted a risk assessment as we invested in a new cell factory in May 2022	 Grade A in coexistence and cooperation program <hr/> Obtained Grade A from Korea Occupational Safety and Health Agency	 100% participation in safety and health training <hr/> The entire employees took part in safety and health training for 24 hours (10 hours increase YoY)
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— Target

HD Hyundai Energy Solutions will continue to make its best efforts to ensure the health and safety of its employees. We are conducting risk assessments on a regular basis, and plan to thoroughly respond to safety and health-related laws and regulations by designating industrial safety managers, hazardous chemical managers, dangerous goods safety managers, fire safety managers, health managers and more.

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STRATEGY

Safety and Health Management System

HD Hyundai Energy Solutions tries to create a safe and comfortable work environment based on labor-management trust. Representatives from the labor and management sides are selected and hold the Occupational Safety and Health Committee on a quarterly basis. The Company also appoints and trains supervisors in the field of safety and health to ensure safety management of all work activities at the workplace. We conduct regular and occasional risk assessments to thoroughly respond to relevant laws and regulations by designating occupational safety managers, hazardous chemical managers, dangerous goods safety managers, fire safety managers, and health managers according to regulatory requirements.



Managing Internal Audit and Risk Factors

According to the internal-audit policy in the field of safety and health management, HD Hyundai Energy Solutions conducts an internal audit at least once a year. The Company makes site visits monthly or more frequently to inspect risk factors. Firefighting/fire detection facilities are managed as potential risk factors. Furthermore, hazardous risk prevention plans are prepared and inspections on pressure vessels, gas facility safety, elevators, chemical supply tank safety, conveyor and robots safety, and firefighting are continuously carried out to prevent any possible industrial accidents. At the cell production site, we inspect the substances used and safety protective equipment along with production equipment that deals with hazardous materials while power-generating machines such as conveyors and forklifts are inspected at the module production site. At the utility site, we inspect CCSS, CGSS, and TMA rooms to prevent safety accidents that may occur in the office environment.

PERFORMANCE

Strengthening Internal Capabilities for Safety Management

HD Hyundai Energy Solutions has undertaken company-wide efforts to enhance internal capabilities for safety management. Under the goal of "Preventing Major Disasters," we have made a continuous effort to achieve zero fires, explosions, and leaks, and zero occupational diseases, and zero environmental accidents in 2022. To this end, we established an annual safety and health education program, have provided continuous education, and established a quarterly meeting of the Occupational Safety and Health Committee to make important improvements to the health and working environment of employees. After these efforts were implemented, the results of improvements were shared with employees.

Industrial Accidents

Category	Unit	2020	2021	2022
Fatalities	Persons	0	0	0
Lost Time Injury (LTI)	Cases	1	0	1
Lost Time Injury Frequency Rate (LTIFR)	Occurrence per 1 million hours	2.7	0	2.1
Industrial accident rate	%	0	0	0.4
Severity rate	Days lost per 1,000 hours	0	0	0.3
Occupational Illness (OI)	Cases	0	0	0
Occupational Illness Frequency Rate (OIFR)	Occurrence per 1 million hours	0	0	0
Absentee rate	%	0	0	0
Near miss occurrence rate of full-time employees	%	0	0	0
Near miss occurrence rate of contract workers	%	0	0	0

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Safety and Health Education

HD Hyundai Energy Solutions tries to minimize safety risks by holding meetings and conducting regular and short-term trainings on safety and health. Through these meetings and trainings, we raise the awareness of employees on safety and health, and provide compulsory safety education courses to supervisors, newly-hired personnel and employees whose job position has changed. In 2022, 147 employees participated in safety and health training for 24 hours per employee, an increase of 10 hours from the previous year. In order to protect our employees from various harmful chemicals, we also distribute the Material Safety Data Sheet (MSDS) which contains detailed information on substances involved in each process, hazards, emergency response actions in case of contact or exposure to the hazardous substances so that the employees can frequently check the contents that they are working with. When working with external personnel, the HSE team supervises safety education and workplace management to prevent safety accidents from occurring.

Safety and Health Education

Category	Unit	2020	2021	2022
Participants	Persons	125	120	147
Education hours	Hours	3,000	2,880	3,528
Education hours per person	Hours	16	14	24
Participation rate	%	66	56	59

Activities to Prevent Safety-Related Risks

Through periodic safety inspection activities, HD Hyundai Energy Solutions conducts joint labor-management inspections at each workplace on a quarterly basis and monthly inspections by each department to prevent accidents that may affect not only workers but also the local community. We plan subject-based inspections such as chemical leaks, pinching, collisions, etc. and special inspections for rainy and thawing seasons, and wind and water damages, implementing them on a regular basis. Trying to discover hidden dangers, we try to prevent possible risks and strive to create a safe workplace by posting safety and health-related information on internal bulletin boards. In 2022, we identified a total of 149 hazardous factors and proactively eliminated them, continuing our efforts to create an even safer workplace.

Responding to Disaster and Emergency

HD Hyundai Energy Solutions has established a manual to respond to different disasters and emergencies, and conducted response drills in a continuous manner. In particular, we make thorough preparations to minimize damage to employees and protect company assets from natural disasters such as typhoons and earthquakes. We have conducted regular fire drills in collaboration with the fire department to swiftly respond and minimize human and material damage in the event of a company-wide emergency or safety accident.

Health Management Program

HD Hyundai Energy Solutions conducts various activities to prevent diseases and promote the health of employees. To promote healthy living for not only employees but also their families, we provide them with regular health checkups (general and special) every year and support comprehensive health checkups for long-term employees and their families. To prevent infectious diseases and minimize the spread of them, we support flu vaccination for all employees.

Risk Assessment

Classified to a workplace with hazardous and dangerous facilities in accordance with the Article 44 of the Occupational Safety and Health Act, HD Hyundai Energy Solutions implements a process safety management (PSM) system to prevent serious industrial accidents. As the Company made a new investment in a cell factory in May 2022, we prepared a process safety report, conducted risk assessment and is now carrying out improvement activities. All departments (divisions) prepare and implement standard work instructions and hazardous risk assessments every year whose scope includes all operations and facilities. HD Hyundai Energy Solutions plans to further strengthen compliance with safety rules and safety awareness of all employees through risk assessment.

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Human Rights

Human Rights-Based Talent Management



— Strategy

HD Hyundai Energy Solutions declared human rights management in June 2022. Based on the mission of 'Realizing a society that embraces diversity and respects all stakeholders,' we have human resource management policies, an important element of sustainable management, that honor human rights.

— Risk Management

To lay the foundation for a culture that respects human rights, we share our human rights management guidelines with various stakeholders through the Employment Rules, Labor-Management Council, and Code of Conduct for Suppliers so that this culture is firmly established throughout the company. The Employment Rules for Employees include provisions for prohibiting sexual harassment and violence in the workplace and for appointing an honorary supervisor for equal employment policy. Chapter 8 of the HD Hyundai Group's Code of Ethics for Employees covers 'Respecting and Protecting Human Rights' and does not allow any behavior that constitutes a violation of human rights.

— Key Performance

 <p>Human rights materiality assessment</p> <p>Conducted an internal human rights materiality assessment against the general principles reflected in the Human Rights Code of Conduct in Oct. 2022</p>	 <p>Family-Friendly Company certification</p> <p>Obtained certification as a family-friendly company based on CEO's leadership, implementation of family-friendly programs, evaluation of the level of satisfaction with family-friendly management</p>	 <p>Securing the talent</p> <p>Hired 32 employees for PV business</p>
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— Target

HD Hyundai Energy Solutions will strengthen human rights management that emphasizes human dignity and value. To this end, we will consider human rights in all business activities, providing human rights-related education and training in a continuous manner. We intend to actively manage risk factors related to human rights by expanding relevant education to overseas business sites and supply chains of suppliers.

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Establishing Rules of Practice for Human Rights Management

In order to systematically implement human rights management, and to protect and promote the human rights of our employees and stakeholders, the Company established Rules of Practice for Human Rights Management following the Human Rights Management Declaration. The Rules of Practice specify the general principles of human rights management, human rights management system, Human Rights Management Committee, and remedies for human rights violations. In the process of establishing the Rules, the Compliance Management Office reviewed the laws and the Human Rights Management Committee made a thorough deliberation on the rules.

Rules of Practice for Human Rights Management

General rules	General principles	Human rights management system	Human Rights Management Committee	Remedies for human rights violation
<ul style="list-style-type: none"> · Purpose of human rights management · Definition of terms · Scope of application 	<ul style="list-style-type: none"> · Generalize the elements of human rights that need to be protected, such as non-discrimination and compliance with working conditions 	<ul style="list-style-type: none"> · Human Rights Declaration · Governance, Dedicated organization · Human rights education and training 	<ul style="list-style-type: none"> · Establishment and its functions · Makeup · Human Rights Impact Assessment 	<ul style="list-style-type: none"> · Human rights violations Remedies · Protecting the information of complainants

PERFORMANCE

Securing the Talent

HD Hyundai Energy Solutions is committed to attracting and nurturing talented people who are the key to corporate growth. Through a transparent and fair recruitment process, we objectively evaluate the competencies and qualities of applicants. In 2022, we actively recruited new employees (32 people) in the field in line with the growth of the solar business. We have also provided fair opportunities to high-performing contractors and converted them into regular employees.

Category	Unit	2020	2021	2022
Total employees	Persons	188	213	248
Regular employees	Persons (%)	143(76)	164(77)	190(76)
Non-regular employees	Persons (%)	45(24)	49(23)	58(24)

Enhancing Employees' Capabilities

HD Hyundai Energy Solutions has established a competitive education system and learning infrastructure to foster talented people who will lead the changes of the world. Employees are provided with timely training programs tailored to their roles, positions and job functions, which include both regular and non-regular employees. We offer different training opportunities to foster and nurture next-generation leaders, convergence talents, job specialists and global talents. Responding to the shift to a digitalized office environment, we provided company-wide education and training programs in 2021 to nurture highly-capable personnel and to raise the employees' awareness of Digital Transformation.

Nurturing Leaders

The roles of leaders are crucial to flexibly respond to the rapidly changing business environment and take the lead for future changes. To foster the next generation of leaders, HD Hyundai Energy Solutions offers the HHI group Leader Course (HLC) and HHI group Technical Leader Course (HTLC) to those selected as future leaders. These courses are designed to provide hands-on training through Action Learning which is centered on solving business-specific issues.

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STRATEGY

Fair Evaluation and Compensation

HD Hyundai Energy Solutions implements a transparent performance evaluation and compensation system. The organization's goals and team members' KPIs are aligned for systematic performance management while team leaders offer periodic coaching and feedback on team members' strategic tasks. In this way, we pursue not just improving the organization's performance but also enhancing employees' capabilities. Since the company spin-off (December 2016), HD Hyundai Energy Solutions has continued to strengthen its compensation (wage) system and welfare benefits so that employees can enjoy a better quality of life. To this end, we established specific performance goals via a top-down method according to KPIs (key performance indicators) and provide reasonable compensation to our employees through various ways such as wage increases, year-end bonuses, promotions, etc., according to their performance. HD Hyundai Energy Solutions has established a system that ensures fairness and transparency by conducting compensation, promotion, fostering, and underperformance management based on personnel evaluations. Using MBO (management by objectives) and KPI (key performance indicator), we calculate evaluation ratings based on the achievement of individual work goals and use them as the basis of various personnel evaluations. To enhance transparency and fairness in the personnel evaluation system, we introduced procedures such as disclosing the results of primary, secondary and adjustment evaluations, accepting appeals from employees, and conducting personnel evaluations for each employee twice a year.

Performance evaluation


Category	Unit	2020	2021	2022
Eligible for competency development evaluation	%	14.9	13.6	19.5


*Employees subject to MBO evaluation (Department heads and team leaders excluding CEO and COOs)


Enhancing Welfare System


HD Hyundai Energy Solutions has continued to strengthen the compensation (wage) system and welfare benefits so that employees can enjoy a better quality of life. Since the spin-off from HD Hyundai Heavy Industries in December 2016, we have aimed to maintain and increase the average service year of existing employees and new hires. For employees' work-life balance, the Company has adopted the selective work hours system since 2021, listening to the voices of our employees and trying to establish effective systems for the balance of work and life. The system is to provide "practical support to different demands of employees" and has been implemented in a way to respond to those demands.

System to enhance welfare benefits

- 
Enhanced maternity protection

Created an organizational atmosphere where employees can freely make use of the pregnancy, childbirth, and childcare system based on which all eligible employees (7 persons) took parental leave.
- 
Work-life balance

Introduced and implemented a selective work hours system in September 2021, allowing employees to freely determine their work hours per month.
- 
Retirement planning education

Run an education program on retirement planning to help employees stay healthy and secure stable life after their retirement.
- 
Retirement plan

Introduced defined contribution (DC) plan with annual payments for employees entitled for wage peak system (56 years and older) in 2021.

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Enhancing Maternity Protection

HD Hyundai Energy Solutions supports employees with children in many ways. We try to create an organizational atmosphere where employees can freely use related systems for pregnancy, childbirth, and childcare systems, supporting their stable return to work by reassigning them to their previous jobs. The Company does not allow any discrimination or disadvantage against employees who use the maternity protection system.

Maternity protection program

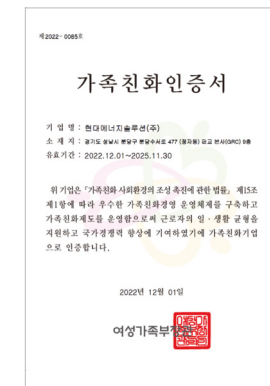
Item	Description
Prenatal and Postpartum Work Hours (Including miscarriage and stillbirth)	<ul style="list-style-type: none"> Workers who are pregnant or gave birth less than a year ago are prohibited from working at night and on holidays. Prohibit pregnant workers from working overtime, and limit overtime for workers who have given birth less than a year ago according to the limit stipulated in the Labor Standards Act. Workers who are in the first or second trimester of pregnancy can reduce their work hours (2hours/day)
Prenatal checkups	<ul style="list-style-type: none"> Provide time for pregnancy health checkups (Max. 1 time/week, 4 hours/checkup)
Maternity leave (Before and after childbirth)	<ul style="list-style-type: none"> Grant 90-day maternity leave before and after childbirth (120 days for multiple births)
Miscarriage/stillbirth leave	<ul style="list-style-type: none"> Grant leave depending on the number of pregnancy week (Maximum 90 days)
Congratulatory money for pregnancy and childbirth	<ul style="list-style-type: none"> Pregnancy payment: KRW 300,000 Childbirth payment: KRW 500,000
Parental leave and reduced work hours for child-rearing period	<ul style="list-style-type: none"> For employees with children under the age of 8 or 2nd grade or below in elementary school. Employees can have parental leave under the Equal Employment Opportunity Act and are guaranteed one year of reduced working hours even though they have used up the parental leave period. Any unused parental leave can be used as additional reduced working hours.
Parental leave	<ul style="list-style-type: none"> For employees with children under the age of 8 or 2nd grade or below in elementary school.
Fertility Treatment Leave	<ul style="list-style-type: none"> Grant no more than three days of leave per year (the first one day paid) for an employee who undergoes fertility treatment, including artificial insemination or in vitro fertilization.
Guaranteed time for breast-feeding	<ul style="list-style-type: none"> Provide 30 minutes of paid breast-feeding time twice a day for female employees with infants under one year old

PERFORMANCE

Parental leave

Category	Unit	2020	2021	2022	
Number of employees who took parental leave	Male	Persons	5	2	6
	Female	Persons	2	1	1
Number of employees who returned to work after parental leave	Male	Persons	4	4	4
	Female	Persons	0	1	1
Percentage of employees who worked for 12 months or longer after returning to work	Male	%	100	100	100
	Female	%	100	100 ¹⁾	100

1) 2021 data was modified (The data was missing in the previous report)



Family-Friendly Company Certification

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People

Labor-Management Cooperation





— Strategy

Win-win labor-management relations are an important growth engine for corporate management. Recognizing that all of our employees are valuable future competitiveness, we are building win-win labor-management relations based on a corporate culture of mutual respect and trust. The Company is continuously striving to build an advanced labor-management culture through sincere communication.

— Risk Management

HD Hyundai Energy Solutions is committed to creating a corporate culture that grows and coexists with its employees together and guarantees the freedom of collective bargaining in accordance with laws and regulations. We hold labor-management council meetings at least once a quarter to improve the working conditions and welfare system. Three people from employer's side and the other three from employee's discuss, consult, and implement the measure to improve working conditions and welfare systems in an egalitarian and liberal atmosphere. Through Hi-Square, a platform where employees can freely and anonymously voice out their suggestions, we are engaged in different activities to improve labor-management culture.

— Key Performance

 Labor-Management Council <hr/> Four times a year (quarterly-basis) Key performance includes installation of vending machines and improvement of company restaurant	 Hi-Square <hr/> A platform where employees can freely and anonymously voice out their suggestions
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— Target

HD Hyundai Energy Solutions will continue to create a corporate culture of mutual respect and trust. We will improve working conditions and welfare benefits and build a horizontal and free working environment where the company and its employees can grow together.

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STRATEGY

Labor-Management Council

HD Hyundai Energy Solutions holds labor-management council meetings at least once a quarter to improve employees' working conditions and welfare benefits. The council consists of three employers and three employees and holds regular consultations in an egalitarian and liberal atmosphere to enhance working conditions and welfare benefits. In 2022, we made the Eumseong factory commuter bus free, installed multiple vending machines, improved the quality of company cafeteria, purchased dormitory equipment, and lowered dormitory fees through the meetings.

Labor-Management Council Meetings in 2022

 <p>Number of meetings</p>	Four times a year (quarterly-basis)
 <p>Key performance</p>	Free commuter bus in Eumseong factory, installation of multiple vending machines, quality improvement of company cafeteria, purchase of dormitory equipment, and lowering dormitory fees

Employees Status

HD Hyundai Energy Solutions seeks to cultivate human resources that are in line with what HD Hyundai Group is looking for: "leaders who will lead the future," "job specialists," and "global convergent talents." Over the past three years, the number of employees has increased, and we have provided group introductory training for the new employees to help them understand the current status and management strategy of HD Hyundai Group. All the newly hired are provided with learning and training opportunities for the value system and basic skills that every member of the Group is expected to possess. Even after new employees are placed in their department, they are assigned with the mentors who support their work.

PERFORMANCE

Number of employees

Category		Unit	2020	2021	2022
Total employees		Persons	188	213	248
Age group	Age below 30	Persons (%)	43(23)	46(22)	56(23)
	30-49	Persons (%)	119(63)	134(63)	162(65)
	Age 50 or above	Persons (%)	26(14)	33(15)	30(12)
Contract type	Regular worker	Persons (%)	143(76)	164(77)	190(77)
	Non-regular worker	Persons (%)	45(24)	49(23)	58(23)

Workforce diversity

Category		Unit	2020	2021	2022
Gender balance	Total number of females	Persons (%)	28(15)	40(19)	44(18)
	Female in management positions	Persons (%)	0(0)	0(0)	0(0)
	Female in executive positions	Persons (%)	0(0)	0(0)	0(0)
	Female in revenue-generating departments ¹⁾	Persons (%)	19(10)	30(30)	16(31)
	Newly recruited female ²⁾	Persons (%)	15(50)	30(36.6)	19(23.4)

1) Revenue-generating departments refer to those that directly contribute to revenue (sales, etc.), excluding support departments such as HR, IT, legal, etc.
 2) Positions in special services include newly-hired females.

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PERFORMANCE

Recruitment and Years of Service

	Category	Unit	2020	2021	2022
Recruitment	Total no. of recruitment	Persons	6	23	32
	New employee	Persons	1	1	9
	Experienced employee	Persons	0	18	23
	Local employee	Persons	5	4	0
Turnover	No. of turnovers	Persons	52	69	44
	Turnover ratio	%	27.7	32.4	17.7
	Voluntary turnover ratio	%	12.8	20.7	11.7
Years of service	Average years of service	Years	9.7	8.9	7.9
	Male	Years	11.0	10.4	9.0
	Female	Years	2.2	2.4	2.6

Wage

	Category	Unit	2020	2021	2022
Average wage	Employee	KRW 1,000	66,884	68,713	75,702
	Male	KRW 1,000	71,189	76,569	82,292
	Female	KRW 1,000	42,284	34,739	45,147
Equal pay	Employee	%	59.4	45.4	54.9
	Management position	%	-	-	-
	Non-management position	%	73.3	67.6	71.3

Labor-Management Communication

HD Hyundai Energy Solutions has provided various channels to facilitate communications other than regular labor-management council meetings. We hold regular management briefing sessions for employees to form an internal consensus on overcoming business crises and enhancing competitiveness. We keep our ears open to ideas and complaints to improve facilities provided to the employees such as business sites, cafeterias and staff accommodation. Listed on the stock market in 2019, the Company has introduced an employee stock ownership system to share the company's management performance with employees.

Revitalizing Internal Communication

HD Hyundai Energy Solutions aims to build an organizational culture where horizontal and liberal communication can be promoted, which can successfully facilitate organizational innovation. We practice open communication by holding CEO meetings and periodic town hall meetings by each business division. At town hall meetings, our CEO and other executives listen to employee questions anonymously and answer them in real time, giving our leadership direct access to employee feedback and sharing the company's vision and direction with all employees to foster a culture of transparent and candid communication.

Hi-Square

We have a company platform called Hi-Square which allows employees to make various suggestions anonymously and to exchange their ideas freely. Suggestions made through Hi-Square are discussed at the Labor-Management Council, and the best suggestions are actively implemented for cooperative labor-management relations.

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Social Community

Co-prosperity with Local Communities





— Strategy

HD Hyundai Energy Solutions is a responsible member of the social community and respects corporate social responsibility and values. As the social impact of companies grows, interest and demands for corporate social responsibility (CSR) are increasing around the world. HD Hyundai Energy Solutions intends to come up with concrete ways to coexist with the community to secure sustainable competitiveness and fulfill our duties and responsibilities as a responsible member of society.

— Risk Management

The management philosophy of HD Hyundai Energy Solutions is to contribute to social development as a global corporate citizen. Based on the philosophy, all employees try to participate in sharing activities to create “A Better World, A Brighter Future” and promote social contribution activities on the three core business areas of “Caring for the Underprivileged,” “Co-prosperity with Local Communities,” and “Self-reliant Future Generation” in line with the SDGs.

— Key Performance

 <p>Installation of PV Modules for the Underprivileged</p> <p>Supported the equipment and installation of PV facilities with a scale of KRW 39 million to 10 households of the underprivileged living in the Chungcheongbuk-do Province in 2022 and supported to install solar facilities for the vulnerable households in Gangwon-do Province in the first half of 2023</p>	 <p>Scholarships and Donations</p> <p>Total amount of donation: KRW 159.5 million to Yonsei University, Eumseong High School, Maegoe High School, Chungbuk Community Chest of Korea and more</p>
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— Target

HD Hyundai Energy Solutions will make a continuous effort to solve social problems as a global corporate citizen. To this end, we will support the underprivileged, try to prosper together with local communities, and continue social contribution activities for the independence of future generations.

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Based on our business philosophy of fulfilling social responsibilities and contributing to the development of the community and country, HD Hyundai Energy Solutions strives to become a company that is loved by everyone. All employees of the Company try to participate in sharing activities to realize “A Better World, A Brighter Future,” and carry out social contribution activities based on the 3 key business areas of “Caring for the Underprivileged,” “Co-prosperity with Local Communities,” and “Self-reliant Future Generation” in line with SDGs. We share the management objective of HD Hyundai 1% Nanum Foundation, “a loved company that contributes to the development of the community and country,” and intend to fulfill corporate social responsibilities.



Support Activities of HYUNDAI Heavy Industries Group (HHI Group) 1% Nanum Foundation

Since January 2020, the HD Hyundai 1% Nanum Foundation has been renewed and expanded to all affiliates. Employees of HD Hyundai Energy Solutions are voluntarily donating 1% of their monthly wage to the foundation. A total of 92 employees donated about KRW 34.383 million in 2022. For transparency of the activities and budget accounts of the 1% Nanum Foundation, we produce a monthly report for sponsor companies and post promotional materials.

HD Hyundai 1% Nanum Foundation’s projects are categorized into Sharing Warmth, Sharing Co-Prosperity, and Sharing Hope. One of the sub-programs under Sharing Co-Prosperity is a community contribution project that integrates the voice of employees by utilizing 50% of employee donations. In 2022, the funds raised by HD Hyundai Energy Solutions’ employees were used for six public welfare projects.

Through the Chungbuk Community Chest of Korea, the Company supported senior centers and low-income households in Eumseong during the Lunar New Year and Chuseok holidays, as well as teenage heads of households in Eumseong. Funds were also utilized for various public service projects, such as sponsoring scholarships for academically outstanding students in low-income families at Eumseong High School and Maegoe High School.

Support Activities of HD Hyundai 1% Nanum Foundation in 2022

<p>Sharing Warmth</p>	<p>April 19 – Supported the competition program for the disabled</p> <p>October 13 – Provided vouchers for heating oil</p> <p>December 29 - Opened the 12th branch of Soup Kitchen in Dong-gu, Incheon</p>
<p>Sharing Co-Prosperity</p>	<p>January 19 – Provided low-income families with holiday gifts</p> <p>July 1 – Offered scholarships for academically outstanding low-income students by high school</p> <p>August 10 - SOS Fund: Supported the victims of heavy rains in central Korea</p>
<p>Sharing Hope</p>	<p>March 14 – Launched Hope Sketch, a renovation project for old facilities</p> <p>April 25 - Launched a competition, Together Program (Multicultural/Single Parent Families)</p>

Internalizing Employee Social Contributions

We are committed to ensuring quality education and promoting lifelong learning opportunities to create a foundation for the growth of future generations. As part of an industry-university collaboration with Yonsei University, HD Hyundai Energy Solutions sponsored two scholarships of KRW 10 million to the Global Leaders College (GLC) of Yonsei University. We also delivered a total of KRW 2.75 million scholarships to Eumseong and Maegoe High Schools in Eumseong region where our production site is located.

Since 2020, employees of HD Hyundai Energy Solutions have voluntarily donated their blood to help medical institutions with difficulties in blood supply due to COVID-19 pandemic. To continue our blood donation activities more systematically, we established a regular blood donation partnership with the Korean Red Cross (Seoul Nambu Red Cross Blood Center), located in our headquarters in 2022. The collected blood was delivered to medical institutions in need via the Seoul Nambu Red Cross Blood Center. The blood donation event is a vital activity that saves the lives of neighbors who need blood transfusions. We plan to continue taking part in this activity.

HD Hyundai Energy Solutions donated KRW 100 million to the National Disaster Relief Association to support the bereaved families and injured victims of the 1029 disaster in 2022, and to contribute building a social safety system (psychological treatment and prevention education).

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Contributing to local communities

As face-to-face activities were restricted due to COVID-19, HD Hyundai Energy Solutions continued its social contribution activities centered on Eumseong, Chungcheongbuk-do Province where our business plant is located. We provided the underprivileged with solar facilities and supported its installation so that they can make use of more economical and eco-friendly energy.

Supporting the Underprivileged

HD Hyundai Energy Solutions continues to support senior centers and low-income households in Eumseong, Chungcheongbuk-do Province where our factory is located. In 2022, a total of KRW 5.24 million worth of dried fish and white rice were delivered to underprivileged households selected by Soi-myeon Administrative Welfare Center and senior centers in Soi-myeon, Eumseong through the Chungbuk Community Chest of Korea. In 2023, we plan to implement various support projects for the marginalized and vulnerable in the local community. For the independence of future generations and families in need of protection, we provide welfare support for child breadwinners in Eumseong region. In 2022, we provided living expenses to four single-parent families and children in foster care selected by the Eumseong-eup Office. We will continue to support projects for children in foster care to contribute to the independence of future generations.



Delivering New Year's gift to the vulnerable in Eumseong region (January 19, 2023)

Green Energy Support Projects

In May 2022, HD Hyundai Energy Solutions helped 10 vulnerable families to install KRW 38.95 million worth of solar facilities through a partnership with Chungcheongbuk-do Province, which contributed to spreading eco-friendly energy and reducing energy costs for vulnerable residents. It was even more meaningful in that we contributed to the local community through solar cells and modules produced at the company's Eumseong factory.

In an effort to realize the sharing of renewable energy and spread social consensus on energy conservation by providing solar facilities to vulnerable groups exposed to relatively harsh environments in Gangwon-do Province, we signed an MOU with the social contribution participants in the region (private/public/corporation/cooperative) in March 2023. It is a social contribution program among the private and public sectors, and cooperatives that promotes such projects as PV (electricity) facility installation, boiler (heat) inspection, health checkups, hair and beauty services, and food provision, establishes a service system for new and renewable energy and launches a volunteer group. Among these programs, HD Hyundai Energy Solutions will participate in activities to support solar facilities.

Donation Amount

Category	Unit	2020	2021	2022
In-kind donation	KRW 1,000	2,688	1,929,554	42,880
Cash donation	KRW 1,000	12,539	5,000	115,150
Donation for Social investment	KRW 100 million	0.4	19.6	1.6

Volunteer Hours

Category	Unit	2020	2021	2022
Volunteering activities	Hours	80	104	84

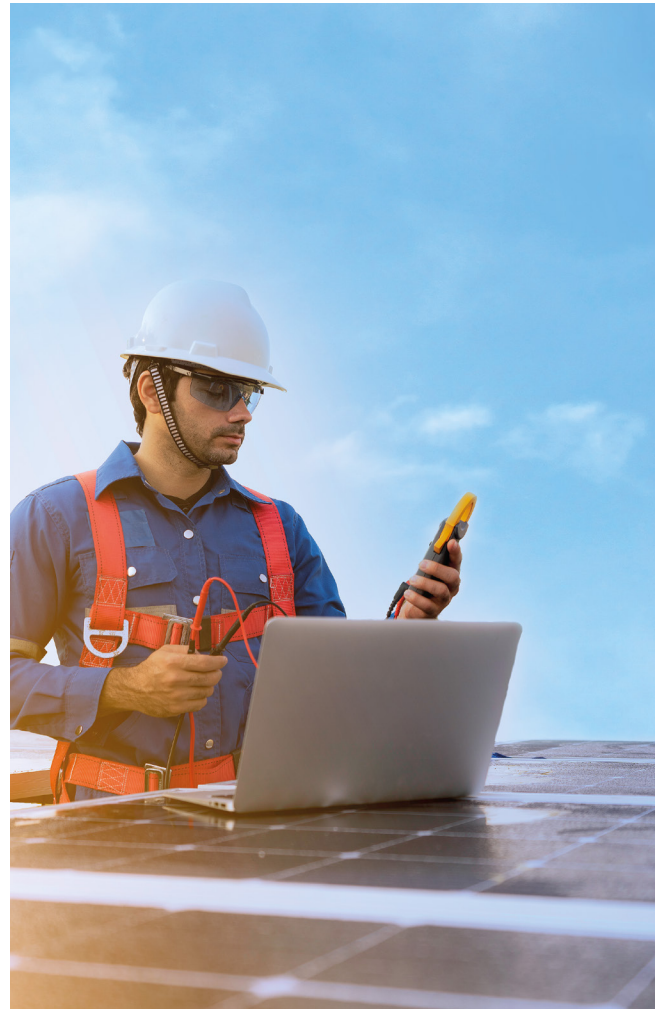
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Product Responsibility

Quality Management



— Strategy

Quality is the essence of the value a company delivers to its customers and the source of its competitive advantage, so much so that a failure in quality can affect a company’s very existence. As technology and business environments are rapidly changing and regulations around the world are intensifying, the importance of technology innovation and response to the future based on quality management has never been greater.

— Risk Management

HD Hyundai Energy Solutions has established and continuously implements a quality management policy to enhance stakeholders’ satisfaction and trust, and to comply with customer requirements and related regulations. The Company supports the growth and development of our partner companies under the core value “Just, Fair and Legitimate Performance.” We will create a healthy corporate ecosystem where everyone can grow hand-in-hand by establishing fair trade practices and supporting partners in enhancing their competitiveness

— Key Performance

 <p>Technical Advancement for PV Products</p> <hr/> <p>Launched the Korean high-power M10 585W bifacial module</p>	 <p>Conflict-Free Mineral Policy</p> <hr/> <p>Established conflict-free mineral policy in 2022</p>	 <p>Supply Chain Management</p> <hr/> <p>Operate a supply chain management system that includes risk management for non-financial conditions to ensure the sustainability of the supply chain</p>
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— Target

HD Hyundai Energy Solutions will continue to secure global quality competitiveness through proactive quality management and needed innovation for the best quality. We will support our suppliers to continue fair trade and strengthen their competitiveness.

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Advancement of PV Products

HD Hyundai Energy Solutions continues to improve its solar products. The floating PV module is designed with a double-sided structure that can absorb light from the back of the module as well to maximize power generation efficiency, and additional power generation can be made depending on the installation environment. Our outstanding quality is the driving force behind the production of solar modules that can withstand harsh weather conditions such as heavy snow and strong winds, as well as high levels of ammonia and salt. In addition, LID (Light Induced Degradation) and PID (Potential Induced Degradation) prevention technologies minimize output degradation that can occur after module installation, providing higher power generation returns. Furthermore, HD Hyundai Energy Solutions R&D Center is a certified laboratory by UL and VDE, two of the world's leading certification organizations, to ensure world-class quality through rigorous product testing. This confidence in product quality is the reason behind we offer a 25-year product performance warranty and customer after-sales service. By developing and producing low-carbon and eco-friendly PV modules, the Company is leading the way in protecting the environment while enhancing quality competitiveness. In addition to ISO 9001 (quality management) from an ISO certification body (KIWA), we have obtained ISO 14001 for conducting environmental management and ISO 45001 for systematically managing the safety and security of an organization by predicting and preventing various risks that may occur in the workplace. Regarding the solar inverter business, we supply high-efficiency and high-reliability stream inverters with KS certification and central inverters developed with our own technology.

Customer Satisfaction

To strengthen customer satisfaction and trust, and fulfill customer requirements and legal requirements, HD Hyundai Energy Solutions has established and implements a quality policy. By maintaining international standards such as ISO 9001, ISO 45001, and ISO 14001, we intend to ensure the reliability of our quality management system. Furthermore, we provide customers with detailed information on our products through our website and product catalogs.

Major Partners

Complying with international standards and norms, HD Hyundai Energy Solutions maintains fair, reasonable, and transparent relationships with its suppliers. As of the end of March 2023, we have established relationships with a total of 411 suppliers (307 domestic and 104 overseas) based on our business sites such as headquarters in Bundang, Eumseong Plant, Chinese branch, and US

corporation. From these partner companies, we're supplied with 7 types of core materials, and a total of 40 types of items to manufacture and sell PV modules and inverters. We have 307 domestic suppliers, 28 non-Chinese overseas suppliers, and 76 Chinese suppliers. The Purchasing Team in Eumseong Plant and the Global Sourcing Team in Shanghai, China oversee suppliers by each region.

Managing ESG-Related Risk of Partner Companies

HD Hyundai Energy Solutions promotes the growth and development of partner companies under the core value of 'Just, Fair and Legitimate Performance.' We try to create a healthy corporate ecosystem where everyone can grow together by establishing fair trade practices and supporting partners in enhancing their competitiveness. To this end, we are applying the same supply chain management policies of HD Hyundai Group affiliates to all the suppliers, including the Code of Conduct. We plan to establish an ESG management system model for supply chain and implement it by stage to check potential issues and risks. In the future, the Company will develop ESG indicators customized, establish an ESG self-diagnosis framework, and revise standard contracts for suppliers.

Human rights management	Safety and health	Environmental management	Ethical management	Business management
<ul style="list-style-type: none"> Prohibit discrimination and harassment in employment Ensure freedom of association Prohibit child labor Guarantee voluntary employment Manage working hours Provide wages and benefits 	<ul style="list-style-type: none"> Establish safety and health management system Respond to emergency Manage industrial accidents and disease Make safety diagnosis Manage the safety of machinery, equipment, and facilities Conduct health management Provide safety and health training 	<ul style="list-style-type: none"> Establish environmental management system Manage air pollutant Manage water resources and water pollutants Conduct chemicals management Manage energy use and GHG emissions Carry out waste management Manage levels of noise and vibration 	<ul style="list-style-type: none"> Ensure transparency in trading relationships Create a desirable and fair-trade environment Disclose relevant information Protect information and prevent retaliation 	<ul style="list-style-type: none"> Make autonomous and independent decision, and improvement Communicate with stakeholders Manage supply chain in a responsible manner

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Non-Financial Risk Management for Supply Chain

To ensure the sustainability of our supply chain, we operate a supply chain management system that includes risk management for non-financial conditions. If a supplier is deemed to have ethical management problems, we exclude the company from supplier registration. In addition, if there are violations such as quality problems, ethical breaches, collusion, or acts that hinder shared growth, we impose restrictions in accordance with our policy for supplier management, such as limiting participation in tender to raise their awareness.

Questions for evaluating partner companies

No.	Question	Evaluation
1	Is the in-house supplier's Safety and Health Council operated adequately?	A
2	Does the contractor impose health and safety hazard conditions on its sub-contractors?	A
3	Are the supplier's resting facilities, etc. in good condition?	A
4	Is the Safety and Health Council which oversees (short-term) sub-contractor operated adequately?	B
5	Are work tools, equipment, and safety equipment adequately maintained and sanitized?	A
6	Does the company reflect its safety and health improvements (budget, etc.) in establishing an annual safety and health plan?	A
7	When external suppliers calculate the purchase cost of products and services, do they include the cost of safety and health in the delivery price?	B
8	Is the level of safety and health management evaluated when selecting external suppliers?	B
9	Is the related department proactive in resolving problems?	B
10	Have human and material investments been made to promote cooperation?	A

Grade A in the Cooperation Program

In April 2022, HD Hyundai Energy Solutions conducted risk assessments at all workplaces of its suppliers, identified areas for improvements, and shared the results. As a result of these efforts, the Company obtained Grade A (top 10%) in the Safety and Health Cooperation Program by the Korea Occupational Safety and Health Agency.

Survey on the level of participation and satisfaction of partner companies (representatives and employees)

Item	Agree	Disagree
I understand what the cooperation program is about.	67%	33%
The cooperation program needs to improve only facilities.	20%	80%
The cooperation program has improved the safety of workplaces.	79%	21%
The cooperation program is helpful for partner companies.	87%	13%
Workers participated in risk assessment.	100%	0
Workers' opinion was integrated into risk assessment.	100%	0

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Governance



— Strategy

HD Hyundai Energy Solutions continues to raise the independence, expertise and diversity of the BoD based on the recommendations of the Corporate Governance Code. To strengthen the independence of the BoD, the majority (60%) of the board members is appointed outside directors to create an environment in which they can express their opinions free from the interests with the company, the management, and controlling shareholders. In 2022, we established and announced the Corporate Governance Charter as part of our efforts to establish sound governance. The Charter is an institutional device to effectively manage corporate management and coordinate the interests of various stakeholders. Through these activities, HD Hyundai Energy Solutions continues to raise independence and transparency in governance.

— Risk Management

The various stakeholders who directly or indirectly affect and are affected by a company are critical to the survival and sustainable growth of the company. In particular, the BoD should exist to serve the shareholders and the company and not be dependent on the CEO or management. For the sustainable growth of the company, the BoD should consist of experts with a high level of professionalism and ethics who can represent the interests of various stakeholders. In particular, the BoD plays an important role in determining the direction of ESG business.

— Key Performance

 <p>Corporate Governance Charter</p> <hr style="border-top: 1px dotted #ccc;"/> <p>Established to realize management philosophy and solidify sound governance</p>	 <p>Committees in BoD</p> <hr style="border-top: 1px dotted #ccc;"/> <p>Outside Director Recommendation Committee (2 meetings), Audit Committee (6 meetings), ESG Committee (2 meetings)</p>
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— Target

HD Hyundai Energy Solutions will continue to secure independence and diversity for the BoD. We will enhance the expertise and diversity of the BODs by appointing outside directors who have seasoned experience in different industries. The Company will promote the gender diversity of the BOD in the long term as well.

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GOVERNANCE

Board of Directors

HD Hyundai Energy Solutions aims to protect the interests of all stakeholders in a balanced manner by forming a professional and independent board of directors. As of December 2022, the Board of Directors consists of 5 members, including 2 internal directors and 3 external ones. The Company appoints experts who possess the necessary knowledge and different industry experience in management, economics, finance and accounting, and law.

Composition of BoD

Category	Name	Gender	Position	Career Background	Subcommittee	Expertise
Internal director	Jong-Hwan Park	Male	Chair	Current) CEO of HD Hyundai Energy Solutions	Outside Director Recommendation Committee, ESG Committee	Business management, law
	Seok-Joo Kang	Male	Director	Current) Managing director of Management Planning 1 in - HD Hyundai		Business management
External director	Jeong-Ku Oh	Male	Director	Former) Advisor at HYUNDAI Accounting Corporation		Financing, accounting
	Dong-Seok Oh	Male	Director	Current) Lawyer at Kim and Chang Law Firm	Outside Director Recommendation Committee, Audit Committee, ESG Committee	Laws and regulations
	Seong-Moon Kim	Male	Director	Current) Professor at Yonsei University Business School		Business management

Board Skills Matrix

Category	Jong-Hwan Park	Seok-Joo Kang	Jeong- Ku Oh	Dong-Seok Oh	Seong-Moon Kim
Leadership	●	●	●	●	●
CEO experience	●				
Risk management	●	●	●	●	●
Finance/accounting			●		●
Policy/administration	●		●	●	●
Sales/marketing	●	●			●
Laws/regulations	●			●	
Year of appointment	2021	2022	2019	2019	2019

Responsibilities and Operation

The Board of Directors makes decisions on the basic policies and resolutions on important matters related to the execution of business. By identifying the different interests of the company and shareholders, the Board forms management strategies, makes major decisions, and effectively supervises the management. It also plays a role in establishing an integrated risk management system and making proactive response to the risks.

HD Hyundai Energy Solutions has a Board of Directors Regulation for its efficient operation. Holding regular meetings on a quarterly basis and temporary meetings as needed, the Board transparently discloses agenda and items passed through an electronic disclosure system. In 2022, the Company held seven BoD meetings and passed a total of 15 agenda items. We have a support department dedicated to BoD activities. The department provides reporting materials such as management information in a timely manner for the smooth execution of the directors' duties and assists the directors with Q&As and other additional requests.

Operation of BoD

Category	Unit	2020	2021	2022
Meetings	Number of times	8	10	7
Resolved agenda	Number of items	13	21	15
Attendance rate	%	90%	88%	94%

Diversity of BoD

Category	Unit	2020	2021	2022	
By age	Aged 30-year to 49-year-old	Persons (%)	2(40)	2(40)	2(40)
	50-year or older	Persons (%)	3(60)	3(60)	3(60)
By gender	Male	Persons (%)	5(100)	5(100)	5(100)
	Female	Persons (%)	-	-	-

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Independence of BoD

To strengthen the independence of the BoD, the majority (60%) of the board members is appointed as outside directors, and the head of the committees with the BoD are all outside directors who don't have special relationships with major shareholders, management, and affiliates. To ensure diversity and different expertise of directors, the Board is composed of professionals with job expertise in different fields such as finance, law, and management. The Company doesn't discriminate or limit the appointment and evaluation of directors based on age, gender, education, birthplace, etc.

Enhancing Board's Capabilities

In 2022, we provided the board with two training programs so as to improve the expertise of Directors. By conducting the training on recent trends in audit committee and on implications of illegal cases related to management/audit committee, we tried to raise the awareness of the importance of internal audit and compliance management. Furthermore, the Company offered other training opportunities to strengthen response capabilities of HD Hyundai Group for changes in global macro economy to ultimately stimulate management innovation. To enhance the understanding of the solar industry, the Financial Analysis Team of HD Hyundai Energy Solutions organized a training program on the solar market and its outlook in which all outside directors participated.

Committees within BoD

We have three committees within the Board of Directors: The Outside Director Recommendation Committee, the Audit Committee, and the ESG Committee. The Outside Director Recommendation Committee reviews the outside director candidates who can enhance the BoD's independence, expertise and diversity, and recommend selected candidates to the general shareholders' meeting. Consisting of all outside directors, the Audit

Committee examines the accounting and financial affairs of the Company. The ESG Committee deliberates the strategic direction, plan and implementation of ESG to enhance ESG management.

Committee	Number of members	% of outside directors	Number of meetings held
Outside Director Recommendation Committee	4	75%	2
Audit Committee	3	100%	6
ESG Committee	4	75%	2

BoD Remuneration

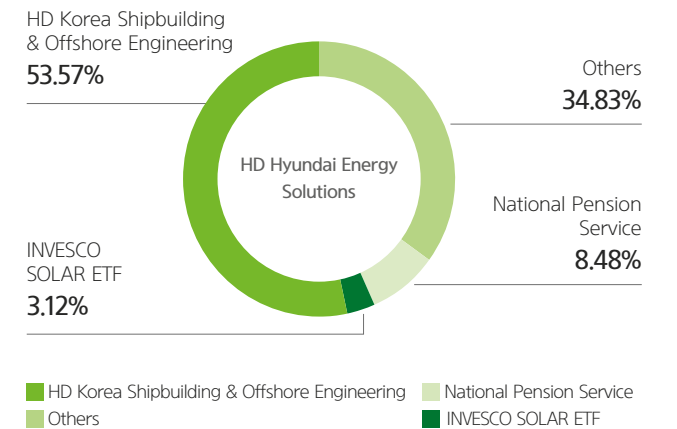
The ceiling of the BoD remuneration is decided after the approval is granted from the general shareholders' meeting to ensure transparency and justification. The 2022 general shareholders' meeting approved KRW 1.4 billion for the annual remuneration ceiling for directors. The remuneration payment details for the directors are disclosed in the annual report in terms of the number of directors and the total amount paid. The Board's remuneration is made up of a basic annual salary and a performance-based payment. The basic annual salary is composed of base salary and position salary while the performance-based payment is determined based on the results of organization and HR evaluation within up to 70% of the basic salary.

Category	Unit	2020	2021	2022
Total amount of remuneration	KRW 1,000	648,182	518,620	788,438
Average remuneration per person	KRW 1,000	129,636	103,724	157,688
Pay gap between CEO and other employees	Times	7.0	4.9	8.0

Shareholders and Dividend

As a listed corporation in the securities market, the number of HD Hyundai Energy Solutions' outstanding shares as of the end of 2022 is 11,200,000 of which 53.57% is held by the largest shareholder, HD Korea Shipbuilding & Offshore Engineering. To increase the convenience of shareholders in exercising their votes, we have implemented an electronic voting system from the 2021 general meeting of shareholders so that the shareholders can exercise their voting rights without time or place restrictions. In 2022, we expanded the rights of the shareholders by introducing a policy that allows proxy voting. In the case of dividends, the status and amount are determined in overall consideration of business conditions. When there is a need to pay dividends, we determine the status and amount according to the internal policy for dividends and the decision made is announced and informed to shareholders by the disclosure system.

Shareholding Percentage of HD Hyundai Energy Solutions



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Ethics & Compliance

Ethics and Compliance Management



— Strategy

There has been increased emphasis on corporate ethical and legal responsibilities. Legal violations pose substantial risks to organizations, and ethical responsibilities shouldn't be taken lightly. As the prolonged global pandemic has worsened polarization among social and economic players, stakeholders are paying greater attention to ethical management, demanding companies to comply with relevant laws and regulations.

— Risk Management

HD Hyundai Energy Solutions tries to create a fair and transparent corporate culture by establishing an ethical and compliance management system to fulfill corporate ethical responsibilities and build stronger trust in stakeholders. With a firm belief that ethical management underpins a trusted and esteemed company, the Company has established and practiced the sets of ethical standards including the Charter of Ethics, the Code of Conduct, Special Code of Conduct and Business Ethics Action Program. In 2022, we laid the foundation for compliance management by appointing a compliance officer and establishing compliance control standards.

— Key Performance

 Self-check for ethical management <hr/> Conduct self-check to diagnose the level of awareness on ethical management	 Foundation for compliance management <hr/> Appointment of compliance officer and establishment of compliance control standards	 Compliance training <hr/> Four trainings for the entire employees (246 employees participated)
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— Target

HD Hyundai Energy Solutions will make a continuous effort to comply with relevant laws and fulfill its ethical responsibilities in carrying out corporate management. Focusing on the Charter of Ethics and the Code of Conduct, we will regularly check the standards for correct decision-making and behavior of our employees, including responsibilities to customers, shareholders, suppliers, and society and the country, and strive to understand and practice the Code of Ethics correctly.

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STRATEGY

Ethical Management System

HD Hyundai Group has been committed to embedding a corporate culture of ethics into every corner of the organization by putting transparent management into action and pursuing persistent innovation. With a firm belief that ethical management underpins a trusted and esteemed company, the Group has established sets of ethical standards including the Charter of Ethics, the Code of Conduct, Special Code of Conduct and Business Ethics Action Program. In addition, the Code of Conduct for Business Partners has been formulated with the purpose of sharing the requirements they have to meet when trading with the Group, based on which a variety of educational and promotional programs have been mapped out. Through these efforts, the Group has operated a feasible and practical ethical management system.

Charter of Ethics of HD Hyundai Group

“We pursue to be a respected and trusted company that positively contributes to its customers, shareholders, and society with the Hyundai Spirit. To achieve this goal, we hereby establish this Charter of Ethics, which defines our standards of conduct to follow in accomplishing faithfully our original role and social responsibilities as a corporate entity and we declare that we shall comply with this Charter of Ethics.”

- 1 — We shall be an ethical company that abides by all domestic and international laws and regulations through fair and transparent management practices.
- 2 — We shall achieve customer satisfaction by meeting their needs and expectations.
- 3 — We shall pursue maximizing the shareholder’s value through fair and efficient management.
- 4 — We shall work to fulfill our social responsibilities and duties as a member of our community and contribute to the development of our nation and society.
- 5 — We shall work to create a transparent and clean corporate culture through fair competition and trading practices.
- 6 — We shall pursue to be a company with the highest quality human resources that offers equal opportunities to our employees in a safe and comfortable working environment.

Grievance Settlement System

HD Hyundai Energy Solutions makes it mandatory to operate a grievance settlement system where employees can raise concerns that might cause negative consequences and incidents including human rights issues, and the organization can settle or correct them. The grievance settlement committee is responsible for making prompt response to prevent sexual harassment in the workplace and implementing disciplinary HR measures against violators reflecting the victim’s wishes. To raise the awareness of the implementation of Equal Employment Opportunity and Work-Family Balance Assistance Act and voluntarily improve unequal practices, we appoint an honorary employment equality supervisor who oversees grievance reporting and counseling in the Company.

Reporting Channels

We have an ethical management reporting system where our employees can raise ethical and compliance issues in the workplace or contractual relationships. The system has various communication channels to report unethical matters or corruption within the company. The employees can report by phone, email, fax, mail, and on-site visits, and their identity is strictly protected. The Company also operates a reward system for those who make reports. In 2022, a total of two reports were received and investigated, one of which was found to be a violation of ethical management, and the proper measures were taken for the violator in accordance with relevant regulations.

Scope of Reporting

- Accepting money or entertainment from internal or external stakeholders in connection with your job duties.
- Taking unfair advantage of one’s position or duties or abusing one’s position of authority
- Causing economic losses to the company through fraudulent means or intentions providing economic benefits to a counterpart for the purpose of obtaining unfair profits
- Violating relevant laws and regulations in transactions with the Company
- Any other unethical behavior that is not appropriate for an ethical employee.

Self-Check for Ethical Management Compliance

In an effort to ensure that employees understand and practice ethical standards correctly, HD Hyundai Energy Solutions established the Charter of Ethics and Code of Conduct in 2005 to provide standards for the correct decision-making and behavior of employees, including responsibilities to customers, shareholders, business partners, society, and the country. In 2022, we conducted a self-check on ethical management compliance, in which employees diagnosed their own ethical awareness and checked whether they have a good understanding on relevant laws and internal regulations.

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Ethical Education and Promotion

With the aim of creating a better understanding of our ethical management system and sharing our vision, we have provided group training along with online educational programs. In addition to regular training, we filmed promotional videos that feature our ethical management system, raising our employees' awareness of business ethics. The content encompasses ethical issues that we may encounter in the workplace, such as corruption or discrimination. Q&A sessions were also prepared to create an opportunity for all our employees to improve their ethical awareness and put ethical concepts into practice.

Category	Unit	2020	2021	2022
Education hour per person	Hours	0.3	0.3	0.4
Ratio of employees educated on ethics	%	43.6	64.8	83.9

Compliance Officer and Compliance Control Standards

HD Hyundai Energy Solutions conducts regular inspections and training to improve employees' awareness of compliance and manage the risk of legal violations. We also carry out various support activities to establish a culture of compliance management and achieve sustainable growth. In 2022, we appointed a compliance officer and established compliance control standards to lay the foundation for fair and transparent business.

Compliance Training

We provide compliance training on a regular basis for new executives, department heads, team leaders, related job managers, and new employees. We also conduct online and offline training following the identification of business areas with significant compliance issues based on risk assessment results and disseminate awareness of compliance management among our employees.

Category	Unit	2020	2021	2022
Number of compliance training provided	Cases	2	4	5
Number of trainees for compliance training	Persons	2	209	261
Number of teams who inspected risk factors related to subcontractor trade	Number	0	24	23
Number of legal consultations given for fair trade		0	0	21
Number of legal consultations given for anti-corruption and economic regulations	Cases	0	1	1
Other legal consultations		17	69	110
Number of violations against Improper Solicitation and Graft Act		0	0	0

Voluntary Compliance Program

Part of compliance activities, the "Voluntary Compliance Program for Fair Trade" or "Compliance Program (CP)" has been established and operated by the company to promote understanding of and comply with the Fair-Trade Act. In November 2022, HD Hyundai Energy Solutions reaffirmed its commitment to comply with the Voluntary Compliance Program for Fair Trade, announcing the publication of Fair Trade Compliance Manual (Fair Trade Act, Subcontracting Act) to the entire company and helping all employees comply with fair trade regulations and implementing the Compliance Program.

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Digital Security

Information Security



— Strategy

In the wake of the COVID-19 pandemic, the importance of securing corporate information and privacy has become even more critical. Failure to protect information, a company's core asset, puts it at a competitive disadvantage. Companies that fail to protect personal information are also exposing themselves to a variety of risks.

— Risk Management

HD Hyundai Energy Solutions utilizes the security system of HD Hyundai Group to protect internal data from external threats through 24-hour control. Based on the certification for the international standard for an information security management system (ISO 27001), we established an information protection management system, which was renewed in February 2023. The Company also has a designated Chief Information Security Officer (CISO) and Chief Privacy Officer (CPO) who discuss security-related issues and reflect them in policies.

— Key Performance

 Culture to Ensure Information Security <hr style="border-top: 1px dashed #ccc;"/> <p>Spent 3.65% of investment in information technology to protect information</p>	 Enhanced Protection for Customer Information <hr style="border-top: 1px dashed #ccc;"/> <p>Strengthened policies to protect customer information</p>
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— Target

HD Hyundai Energy Solutions will continue its efforts to protect corporate and customer information. In 2023, we plan to upgrade our information protection management system, build next-generation enterprise resources planning (ERP), and introduce personal information encryption solutions.

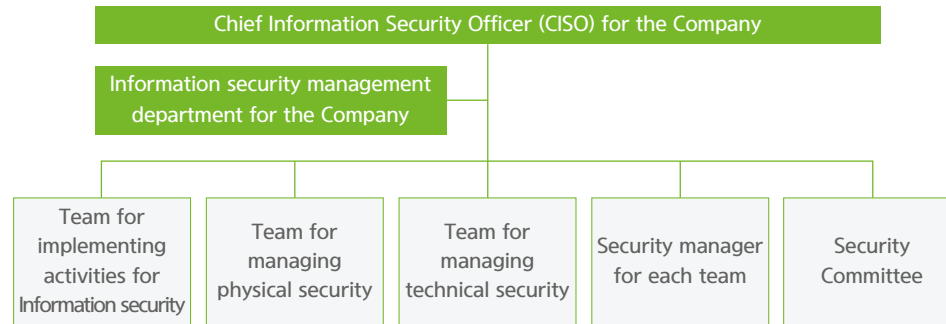
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Advancing the Management System for Information Security

HD Hyundai Energy Solutions protects the in-house data from external threats through security control operated 24 hours a day, 365 days a year, using the security system of HD Hyundai Group. We appoint a Chief Information Security Officer (CISO) for systematic management of information protection who comprehensively manages the security of information system and major in-house information.



Culture that Ensures Information Security

Even with security solutions and systematic tools in place, information security accidents by internal employees may occur. The effectiveness and efficiency of information security can be improved by analyzing the work processes and behaviors of employees, and raising awareness of information in a way that reflects their work patterns. HD Hyundai Energy Solutions conducts security training every month by utilizing the security portal system within HD Hyundai Group and designates security days to conduct information security education and training regularly. We continuously invest in information protection, and 3.65% of our investment in information technology is used for information protection.

Category	Unit	2020	2021	2022
Information security training	Conducted	√	√	√
Personal information protection training		√	√	√

PERFORMANCE

Customer Information Protection

With the rapid transition to the Fourth Industrial Revolution, the scope and range of personal information is expanding due to the Internet of Things and artificial intelligence. Companies see customer information as an asset that can create added value. The leakage of personal information can have a devastating impact on companies and their customers, which is why protecting customer information is becoming even more important.

- Refrain from collecting personal information indiscriminately.
- Distinguish between optional information and information necessary to provide services when collecting personal information.
- Prohibit in principle the processing of unique identifying information such as resident registration numbers and sensitive information such as religion and health data.
- Notify customers when sharing personal information for promotional and sales purposes and manage it thoroughly.
- Store personal information using safe methods such as DB supplementary programs and encryption software.
- Understand and comply with the information retention periods stipulated by laws and regulations if that information needs to be stored.
- Destroy personal information files in an unrecognizable manner after using them for intended purposes.
- Install a signboard with CCTVs.
- Make sure to prepare guidelines on personal information protection.
- Prepare for personal information leakage notifications, mediation for collective dispute, and class action lawsuits.

Category	Unit	2020	2021	2022
Total no. of information leakage	Cases	0	0	0
No. of information leakage regarding customer data	Cases	0	0	0
Fines for violation of information leakage related laws and regulations	KRW 1,000	0	0	0

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Risk & Opportunity

Risk Management



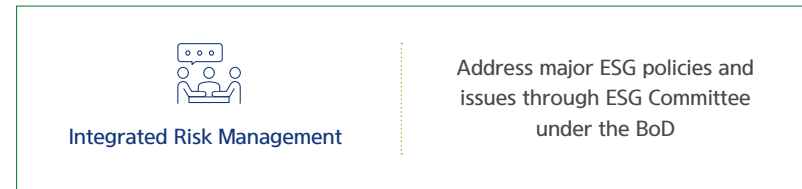
— Strategy

Corporate risks may arise in the non-financial sector as well as in the financial sector. How proactively these risks can be managed in an integrated manner is becoming a key of business management.

— Risk Management

With the Board of Directors at the center, HD Hyundai Energy Solutions manages both financial and non-financial risks for the Company. In particular, the ESG Committee under the BoD discusses major ESG policies and issues and supports the implementation of practical tasks. We manage ESG risks such as information security and aim to conduct sustainable management by identifying and analyzing risks and opportunities and seeking preemptive response measures.

— Key Performance



— Target

HD Hyundai Energy Solutions intends to further enhance integrated risk management with the ESG Committee.

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GOVERNANCE

Integrated Risk Management

HD Hyundai Energy Solutions manages both financial and non-financial with Board of Directors at the center. In particular, the ESG Committee under the BoD addresses major ESG policies and pending issues, supporting the execution of practical tasks. Capitalizing on the ESG governance, we manage ESG risks, such as environment, safety and health, ethics and compliance, supply chain, and information security, identify financial and non-financial risks and analyze their impacts, followed by establishing preemptive countermeasures to secure the foundation for sustainable growth. The Chief ESG Officer (Finance and Accounting Officer) reports on risk management activities to the BoD. The executive in Eumseong site serves as Chief Safety Officer who identifies possible risk factors in the production process and takes actions for the areas of improvement.

RISK MANAGEMENT

There is growing interest and demand in ESG management with increased social awareness on ESG initiatives. Under the circumstances, HD Hyundai Energy Solutions is trying to make greater efforts in developing eco-friendly solar products and strengthening risk management.

Non-Financial Risk Management

The ESG Committee under the BoD makes decisions on strategic direction, plans and implementation measures for ESG management, supporting practical execution of related tasks for non-financial risk management. The Committee also identifies and manages ESG risk factors related to safety and health, ethics and compliance, supply chain, information security and more.

Financial Risk Management

We identify financial risks, classifying them into foreign exchange, credit and liquidity risks to manage them by the characteristics of each risk. Appropriate financial management policies are established and operated in the financial sector while the Audit Committee supervises the management. Besides, we established and operated the internal accounting management regulations in accordance with the Act on External Audit of Stock Companies and related enforcement decree aiming at transparent internal accounting management, thereby raising the reliability of the financial statements through a reasonable and effective operation.

Risk & Opportunity

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RISK MANAGEMENT

Emerging Risk Management

We identify and categorize emerging risks. The ESG Committee discusses the identified risks and proactively seeks and implements countermeasures for major issues through resolutions of Board of Directors.

OPPORTUNITY

There has been growing social awareness of eco-friendly products as sales of green modules (Carbon Certification Grade 1) are steadily increasing since 2020 when HD Hyundai Energy Solutions began producing them. Under the circumstances, we intend to continuously increase the investment in the development of eco-friendly technologies by utilizing our excellent R&D capabilities.

TARGETS

With the ESG Committee at the center since its inception in 2021, the Chief ESG Officer and all executives and employees continuously monitor financial and non-financial risks and emerging ones, and establish strategies and policies in a timely manner. The Company will proactively respond to changes in the internal and external environment to mitigate risks and establish and implement mid- to long-term goals to turn crises into opportunities.

Emerging Risks of HD Hyundai Energy Solutions

Types of risk	Description	Company's response
Global economic recession	· Unprecedented quantitative easing in the wake of the COVID-19 pandemic, tightening policy due to inflation, fast recession in global economy amid Russia-Ukraine war	· Secure price competitiveness and maintain profitability through continuous growth and productivity improvement, including strengthening product competitiveness through investments in new facility · Respond to the risks related to credit, liquidity and market, and strengthen financial risk management, including risk management objectives, policies, risk assessment, management procedures, and capital management,
Increased price of raw materials	· Rising global commodity prices as the prolonged Russia-Ukraine war threaten corporate profitability	· Secure additional supply capacity and increase production flexibility through partnership with top-tier international solar cell/module manufacturers
Transition to green economy	· The need to generate profit through eco-friendly activities across the value chain for human survival and corporate sustainability due to climate change.	· Establish a mid- to long-term strategy for climate change response and carbon neutrality and prepare a step-by-step roadmap to achieve the goal. · Advance environmental management through participation in environmental initiatives such as the Carbon Disclosure Project (CDP) and TCFD.
Human rights management	· Stricter regulations on strengthening human rights inside the company as well as related due diligence, and the need to manage human rights such as respect for human rights responsibilities and human rights risk assessment	· Held the Human Rights Management Committee in 2022 to sign the Human Rights Management Declaration and deliberate/resolve on the Practice Regulations to conduct human rights impact assessment. · Identified and evaluated possible internal and external human rights impacts in corporate operations, business activities, and supply chains, for its domestic business sites.
Supply chain management risks	· Increased uncertainties in global business due to EU supply chain due diligence legislation and the need to strengthen ESG management in supply chain	· Comply with HD Hyundai Group's supply chain management policy and established the 2022 Green Procurement Policy Standard and Conflict-free mineral policy. · Diagnose the ESG management of suppliers and establish a management system to strengthen ESG management for supply chain while continuously check global supply chain issues and risks and respond them proactively.

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Summary of Consolidated Financial Statements

(Unit: KRW million)

Title of account	2020	2021	2022
Current assets	311,596	445,279	490,182
Cash and cash equivalents	112,116	128,291	68,761
Short-term financial assets	-	5,000	-
Accounts Receivable and other receivables	78,868	117,525	140,423
Inventories	109,965	186,226	273,182
Others	10,647	8,237	7,816
Non-current assets	146,646	160,280	162,644
Long-term financial assets	2,369	2,380	2,294
Tangible assets	99,604	114,247	119,450
Intangible assets	7,211	7,880	8,122
Others	37,462	35,773	32,778
Total assets	458,242	605,559	652,826
Current liabilities	108,258	255,777	237,449
Non-current liabilities	21,240	29,462	33,844
Total liabilities	129,498	285,239	271,293
Capital stock	56,000	56,000	56,000
Capital surplus	105,855	105,855	105,855
Accumulated other comprehensive income	4,503	4,591	4,686
Retained earnings	162,386	153,874	214,992
Total equity	328,744	320,320	381,533

(Unit: KRW million)

Title of account	2020	2021	2022
Revenue	394,397	593,164	984,812
Operating profit	8,781	9,495	90,166
Net profit (loss)	6,224	(6,656)	60,610
Earnings per share (loss) (Unit: KRW)	556	(594)	5,412
Number of subsidiaries included in the consolidation	1	1	1

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GRI Content Index

| Statement of use | Having applied the GRI Standards, the period for this report is from January 1, 2022 to December 31.

| GRI 1 used | GRI 1: Foundation 2021

| Applicable GRI Sector Standards | There are no applicable GRI Sector Standards as of June 2023, the date of publication of HD Hyundai Energy Solutions Integrated Report.

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GRI Standards 2021	Disclosure item	Indicator	Page	Remarks		
General Disclosures						
GRI 2: The organization and its reporting practices	2-1	Organizational details	3, 10, 12			
	2-2	Entities included in the organization's sustainability reporting	3			
	2-3	Reporting period, frequency, and contact point	3			
	2-4	Restatements of information	37, 45			
	2-5	External assurance	76~77			
	GRI 2: Activities and workers	2-6	Activities, value chain and other business relationships	12, 18		
		2-7	Employees	47		
		2-8	Workers who are not employees	47		
		GRI 2: Governance	2-9	Governance structure and composition	21, 57	
			2-10	Nomination and selection of the highest governance body	57~58	
2-11	Chair of the highest governance body		57~58			
2-12	Role of the highest governance body in overseeing the management of impacts		57			
2-13	Delegation of responsibility for managing impacts		57			
2-14	Role of the highest governance body in sustainability reporting		21, 57~58, 65			
2-15	Conflicts of interest		57~58			
2-16	Communication of critical concerns		57~58			
2-17	Collective knowledge of the highest governance body		57~58			
2-18	Evaluation of the performance of the highest governance body		58			
2-19	Remuneration policies	58, AR 300~301				
2-20	Process to determine remuneration	58, AR 300~301				
2-21	Annual total compensation ratio	58				
GRI 2: Strategy, policies and practices	2-22	Statement from the highest governance body	8			
	2-23	Policy commitments	27, 43			
	2-24	Embedding policy commitments	26~27			
	2-25	Processes to remediate negative impacts	60			
	2-26	Mechanisms for seeking advice and raising concerns	60			
	2-27	Compliance with laws and regulations	61, 63			
	2-28	Membership associations	78			
GRI 2: Stakeholder engagement	2-29	Approach to stakeholder engagement	23			
	2-30	Collective bargaining agreements	47~48			

GRI Standards 2021	Disclosure item	Indicator	Page	Remarks
Material Topics				
GRI 3: Material Topics 2021	3-1	Process to determine material topics (Set boundaries for reporting content and topics)	24	
	3-2	List of material topics (Set boundaries for reporting content and topics)	25	

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GRI Standards 2021	Disclosure item	Indicator	Page	Remarks
Material Topics				
Development of sustainable technology				
GRI 3: Material Topics 2021	3-3	Management of material topics	25	
GRI 201: Economic Performance 2016	201-1	Direct economic value generated and distributed	10, 51, 68	
	201-2	Financial implications and other risks and opportunities due to climate change	74~75	
Labor/management relations				
GRI 3: Material Topics 2021	3-3	Management of material topics	25	
GRI 402: Labor/Management Relations 2016	402-1	Minimum notice periods regarding operational changes	47	
Occupational Health and Safety				
GRI 3: Material Topics 2021	3-3	Management of material topics	25	
GRI 403: Occupational Health and Safety 2018	403-1	Occupational health and safety management system	40	
	403-2	Hazard identification, risk assessment, and incident investigation	40~41	
	403-3	Occupational health services	39~40	
	403-4	Worker participation, consultation, and communication on occupational health and safety	41, 48	
	403-5	Worker training on occupational health and safety	41	
	403-6	Promotion of worker health	41	
	403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	40	
	403-8	Workers covered by an occupational health and safety management system	41	
	403-9	Work-related injuries	40	
	403-10	Work-related ill health	40	
Talent management				
GRI 3: Material Topics 2021	3-3	Management of material topics	25	
GRI 404: Training and Education 2016	404-1	Average hours of training per year per employee	41, 43	
	404-2	Programs for upgrading employee skills and transition assistance programs	43	
	404-3	Percentage of employees receiving regular performance and career development reviews	44	
GRI 405: Diversity and Equal Opportunity 2016	405-1	Diversity of governance bodies and employees	47	
	405-2	Ratio of basic salary and remuneration of women to men	48	
GRI 407: Freedom of Association and Collective Bargaining 2016	407-1	Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk	47~48	
Contribution to local community				
GRI 3: Material Topics 2021	3-3	Management of material topics	25	
GRI 413: Local Communities 2016	413-1	Operations with local community engagement, impact assessments, and development programs	50~51	
GRI 414: Supplier Social Assessment 2016	414-1	New suppliers that were screened using social criteria	53~54	

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GRI Standards 2021	Disclosure item	Indicator	Page	Remarks
Economic Performances (GRI 200)				
GRI 203: Indirect Economic Impacts 2016	203-1	Infrastructure investments and services supported	51	
	203-2	Significant indirect economic impacts	49~51	
GRI 205: Anti-corruption 2016	205-1	Operations assessed for risks related to corruption	59~61	
	205-2	Communication and training about anti-corruption policies and procedures	61	
GRI 206: Anti-competitive Behavior 2016	206-1	Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	61	
Environmental Performances (GRI 300)				
GRI 302: Energy 2016	302-1	Energy consumption within the organization	35	
	302-3	Energy intensity	35	
	302-4	Reduction of energy consumption	35	
	302-5	Reductions in energy requirements of products and services	34~35	
GRI 303: Water and Effluents 2018	303-1	Interactions with water as a shared resource	36	
	303-2	Management of water discharge-related impacts	36	
	303-3	Water withdrawal	36	
	303-4	Water discharge	36	
GRI 305: Emissions 2016	305-1	Direct (Scope 1) GHG emissions	35	
	305-2	Energy indirect (Scope 2) GHG emissions	35	
	305-4	GHG emissions intensity	35	
	305-7	Nitrogen oxides (NO _x), sulfur oxides (SO _x), and other significant air emissions	36	
GRI 306: Waste 2020	306-1	Waste generation and significant waste-related impacts	37	
	306-2	Management of significant waste-related impacts	37	
	306-3	Waste generated	37	
	306-4	Waste diverted from disposal	37	
	306-5	Waste directed to disposal	37	
Social Performances (GRI 400)				
GRI 401: Employment 2016	401-1	New employee hires and employee turnover	48	
	401-2	Benefits provided to full-time employees	44	
	401-3	Return to work and retention rates after parental leave by gender	45	
GRI 416: Customer Health and Safety 2016	416-1	Assessment of the health and safety impacts of product and service categories	39, 53	
	416-2	Incidents of non-compliance concerning the health and safety impacts of products and services	39, 53	
GRI 418: Customer Privacy 2016	418-1	Substantiated complaints concerning breaches of customer privacy and losses of customer data	63	

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Topic	Code	Accounting Metric	Unit	Company's response
Greenhouse Gas Emissions	TC-SC-110a.1	Percentage subject to emission restrictions (eg. K-ETS) of Scope 1 emissions	tCO ₂ eq	3,565
	TC-SC-110a.2	Discussion of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets	-	35p, 74p~75p
Energy Management in Manufacturing	TC-SC-130a.1	Percentage grid electricity	%	96.1%
Water Management	TC-SC-140a.1	Total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress	ton	417,887
Waste Management	TC-SC-150a.1	Amount of hazardous waste from manufacturing	ton	2,431.87
		Percentage recycled	%	99.8%
Employee Health & Safety	TC-SC-320a.1	Description of efforts to assess, monitor and reduce exposure of employees to human health hazards	-	40p~41p
	TC-SC-320a.2	Total amount of monetary losses as a result of legal proceedings associated with employee health and safety violations	KRW	None
Recruiting & Managing a Global & Skilled Workforce	TC-SC-330a.1	(1) Percentage of employees that are foreign nationals	%	0.8
		(2) Percentage of employees that are located offshore		1.2
Product Lifecycle Management	TC-SC-410a.1	Percentage of products by revenue that contain IEC 62474 declarable substances		Not applicable
	TC-SC-410a.2	Processor energy efficiency at a system-level for: (1) servers, (2) desktops and (3) laptops	%	Not applicable
Materials Sourcing	TC-SC-440a.1	Description of the management of risks associated with the use of critical materials	-	53p~54p
Intellectual Property Protection & Competitive Behavior	TC-SC-520a.1	Total amount of monetary losses as a result of legal proceedings associated with anti-competitive behavior regulations	-	None
Activity Metrics	RT-EE-000.A	Total production	-	Cell: 96,501,080 Module: 1,941,816
	RT-EE-000.B	Percentage of production from owned facilities	-	Eumseong factory 100%

UN SDGs

HD Hyundai Group's SDG Activities

HD Hyundai Energy Solutions is implementing 11 goals and 26 targets with HD Hyundai Group out of the 17 Sustainable Development Goals that the United Nations announced in 2015 to achieve sustainable development by 2030. The Company is striving to solve and improve not only economic performance, but also universal human issues caused by the environment and economic and social sectors.

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Key SDGs	Target	HD Hyundai Group's Contribution
	3.4 Prevent and treat non-communicable diseases and promote mental health and well-being	· Provided healthcare and medical expenses for employees, operated health promotion centers and oriental medicine clinics, and provided psychological testing, group counseling, group psychological education, and professional services to promote mental health.
	3.8 Achieve universal health coverage, access to quality essential healthcare services and access to safe, effective, quality and affordable essential medicines and vaccines for all	· Operated employee health management programs such as smoking cessation clinics and obesity clinics.
	3.9 Reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	
	4.4 Increase the number of youth and adults who have relevant skills including technical and vocational skills for employment, decent jobs and entrepreneurship	· Nurtured technical personnel through systematic technical training programs, including the Core Technology Transfer System, to train excellent human resources
	4.5 Eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, indigenous peoples and children in vulnerable situations	· Participated in national human resource development consortiums
	6.3 Reduce untreated wastewater and improve water quality by reducing pollution, minimizing the release of hazardous chemicals and increasing water recycling	· Managed wastewater discharges with internal environmental standards which is stricter than legal standards, minimized wastewater generation through proactive source-based management, and monitored water quality in real-time
	7.2 Increase the share of renewable energy in the global energy mix	· Developed eco-friendly and efficient products
	7.3 Double the global rate of improvement in energy efficiency	· Reduced energy use by installing high-efficiency LED lighting.
	8.2 Achieve higher levels of economic productivity through the diversification of industries including high-value-added ones, technological upgrading and innovation	· Expanded value-added industries by building DT-based smart shipyards, increased economic productivity, and created jobs
	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation and encourage the formalization and growth of micro, small/mid-sized enterprises including through access to financial services	· Created quality jobs through employment · Conducted fair and objective personnel evaluations and operated a compensation system for all employees
	8.5 Achieve full and productive employment and decent work for all women and men including the disabled and youth, and equal pay for the work of equal value	· Provided training and financial services for shared growth with suppliers · Established a roadmap to promote group-wide human rights management
	8.6 Reduce the proportion of youth not in employment, education or training	
	8.7 Prohibit forced and child labor	

Key SDGs	Target	HD Hyundai Group's Contribution
	9.4 Increase resource-use efficiency and adopt clean and environmentally sound technologies	· Reduced fuel costs and optimized energy with a resource management system
	10.4 Adopt policies, especially fiscal, wage and social protection policies and progressively achieve greater equality	· Carried out sharing activities by caring the underprivileged, supporting local communities and future generation
	12.2 Achieve sustainable management and the efficient use of natural resources	· Obtained international certification of environmental management systems
	12.4 Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle and significantly reduce their release to air, water and soil	· Installed prevention facilities, trained personnel in charge of environment management, and minimized pollutant emissions through periodic inspections
	12.5 Reduce waste generation through prevention, reduction, recycling and reuse	· Replaced hazardous chemicals and regularly inspected relevant facilities
	12.6 Encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle	
	13.2 Integrate climate change measures into national policies, strategies and planning	· Managed energy use and GHG emissions by business site and emission facility based on IPCC international standards and national GHG emission guidelines. · Operated ESS (Energy Storage System) · Participated in the demand response management system of the Korea Power Exchange
	14.1 Prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	· Provided eco-friendly maintenance services for existing ships through ballast water treatment systems and sulfur oxide emission treatment systems.
	14.2 Sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans	· Secured needed equipment to prevent marine accidents that may occur when entering and leaving ships, and conducted continuous safety management, driver training, and joint drills.
	16.3 Promote the rule of law at the national and international levels and ensure equal access to justice for all	· Conducted transparent and accountable management through compliance and ethical management system
	16.5 Reduce corruption and bribery in all their forms	· Implemented a rational governance structure that maintains checks and balances
	16.6 Develop effective, accountable and transparent institutions at all levels	· Pursued inclusive management activities by involving various stakeholders in management, including communication with labor unions.
	16.7 Ensure responsive, inclusive participatory and representative decision-making at all levels	

TCFD Index

HD Hyundai Energy Solutions is proactively responding to the climate change crisis and striving to realize sustainable carbon neutrality for coexistence with humanity around the world. We plan to join the global climate change crisis response and ultimately achieve net zero emissions by operating our solar solution business, which supplies eco-friendly energy.

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TCFD Recommendations		HD Hyundai Energy Solutions' Actions
Governance: Disclose the organization's governance around climate-related risks and opportunities		
a	Describe the board's oversight of climate-related risks and opportunities.	The Board of Directors of HD Hyundai Energy Solutions fully recognizes the importance of responding to climate change, and the ESG Committee oversees all ESG issues, including climate change-related topics. In 2022, the ESG Committee held two meetings and focused on establishing climate change response policies, strengthening the environmental goal management system, preserving biodiversity, activating environmental communication, and establishing plans and roadmaps for eco-friendly supply chain management to establish and disclose environmental goals. The ESG Committee also discussed issues that have a significant impact on management and financial strategies, such as climate change response and performance indicators.
b	Describe management's role in assessing and managing climate-related risks and opportunities.	In an effort to swiftly grasp opportunities and risks posed by climate change and manage them, we have built a climate change response system between the management, working groups and experts. In detail, we put in place the organizations responsible for climate change affairs, such as Chief ESG Officer and the HSE Team while operating the ESG Advisory Group comprised of professionals by sectors. The departments in charge of environmental affairs make discussions on related agenda items and key issues on a regular basis, and then report on the results to the CEO. The CEO brings up the agenda items at the ESG Committee meetings, and the final decisions are made by the committee. The resolved issues are handled by the department in charge, and the management keeps track of the implementation and manages the goal and performance.
Strategy: Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material		
a	Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	HD Hyundai Energy Solutions categorized risks and opportunities that climate change may entail by the time of occurrence. In detail, we classified them into short-term (within 5 years), mid-term (between 5 to 10 years) and long-term (after 10 years). The impact that they may have on our business and finance will be analyzed later. We regard the government's regulations on GHG emissions and tightened obligation of disclosure as short-term risks while decrease in investment stemming from insufficient response to climate change and negative reputation as mid- to long-term risks. Physical risks are natural disasters caused by abnormal weather events such as floods, typhoons, or forest fires. On the other hand, we recognize growing global demand for solar system arising from the expanded use of renewable energy, and the development of technologies for super high-efficiency cells and modules as business opportunities.
b	Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	Rising demand for carbon neutrality at home and abroad, which is evidenced by the raised NDCs (Nationally Determined Contributions) for 2030, gives growing demand for new and renewable energy. Against this backdrop, HD Hyundai Energy Solutions takes financial and strategic perspectives to unpack risks and opportunities stemming from climate change, and then came up with countermeasures in consideration of their financial influence. We have responded to the growing demand for renewable energy by continuously investing in R&D and expanding production facilities. The resulting increase in sales can lead to new R&D investment opportunities for eco-friendly product development. The Company produces and sells low-carbon modules through carbon certification (Grade 1), minimizes Pb (lead) content in its floating solar module products, and actively invests in eco-friendly technology development such as bifacial solar modules that can improve power generation efficiency. We intend to continue to develop next-generation cells/modules with high efficiency.
c	Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios	With the purpose of identifying the impact that climate change may have on our business operations, we analyze physical and transition risks based on 1.5°C and NDCs scenarios. We are not subject to the government's Greenhouse Gas and Energy Target Management System since our business sites' GHG emissions do not exceed the standard. However, Eumseong Plant is categorized as the business site emitting more than 25,000tCO ₂ per year, so it falls under the Carbon Emissions Trading Scheme. And we are inspecting regulation-related risks including Carbon Tax, Carbon Border Adjustment Tax, and Carbon Trading Scheme to keep up with and reflect the changes in the Korean government's plan and climate change policy.

TCFD Index

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TCFD Recommendations		HD Hyundai Energy Solutions' Actions
Risk Management: Disclose how the organization identifies, assesses, and manages climate-related risks.		
a	Describe the organization's processes for identifying and assessing climate-related risks.	The department responsible for risk management and the department in charge of climate change affairs identify and assess risks. They work together to respond to the identified ones and come up with improvement tasks to prevent possible risks from occurring.
b	Describe the organization's processes for managing climate-related risks.	We always monitor manufacturing sites to manage climate-related risks, and the amount of effluent discharged is managed as daily data. In the event of a risk occurrence, it is immediately reported to the CEO, and if it is of importance, the CEO brings up this issue at the ESG Committee for decision making. By doing so, HD Hyundai Energy Solutions is making all-out efforts to control the risks possibly posed by climate change.
c	Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	Climate-related risk is incorporated into the company-wide risk management process. The identified risks and opportunities are reported to the ESG Committee. The committee takes charge of comprehensively managing and responding to those risks. In addition, we will forge the ESG management organizational structure and streamline the management into the integrated one in order to advance our comprehensive risk management.
Metrics and Targets: Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.		
a	Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.	As part of the effort to evaluate risks and opportunities stemming from climate change, HD Hyundai Energy Solutions manages our GHG emissions, GHG emission intensity, energy consumption, renewable energy generation, waste generation and recycling and water use as metrics. This data is disclosed through our annual integrated reports. In 2022, our emissions amounted to 3,565tCO ₂ eq (Scope 1) and 34,675tCO ₂ eq (Scope 2). We saw our GHG emission intensity on the decrease over the past three years. We continue to track and manage the data to mitigate emissions down the road. Going forward, our focus will be also on the formulation of the mid- to long-term target and step-by-step roadmap for non-greenhouse gases.
b	Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 greenhouse gas (GHG) emissions and the related risks.	
c	Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	

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Third-Party Assurance Statement

To readers of 2022 HD HYUNDAI Energy Solutions Integrated Report

Introduction

Korea Management Registrar (KMR) was commissioned by HD HYUNDAI Energy Solutions to conduct an independent assurance of its 2022 Integrated Report (the "Report"). The data and its presentation in the Report is the sole responsibility of the management of HD HYUNDAI Energy Solutions. KMR's responsibility is to perform an assurance engagement as agreed upon in our agreement with HD HYUNDAI Energy Solutions and issue an assurance statement.

Scope and Standards

HD HYUNDAI Energy Solutions described its sustainability performance and activities in the Report. Our Assurance Team carried out an assurance engagement in accordance with the AA1000AS v3 and KMR's assurance standard SRV1000. We are providing a Type 2, moderate level assurance. We evaluated the adherence to the AA1000AP (2018) principles of inclusivity, materiality, responsiveness and impact, and the reliability of the information and data provided using the Global Reporting Initiative (GRI) Index provided below. The opinion expressed in the Assurance Statement has been formed at the materiality of the professional judgment of our Assurance Team. Confirmation that the Report was prepared in accordance with GRI standards 2021 was included in the scope of the assurance. We have reviewed the topic-specific disclosures of standards which were identified in the materiality assessment process

- GRI Sustainability Reporting Standards
- Universal standards
- Topic specific standards
 - GRI 201: Economic Performance
 - GRI 203: Indirect Economic Impacts
 - GRI 306: Waste
 - GRI 402: Labor/Management Relations
 - GRI 403: Occupational Health and Safety
 - GRI 404: Training and Education
 - GRI 405: Diversity and Equal Opportunity
 - GRI 406: Non-discrimination
 - GRI 407: Freedom of Association and Collective Bargaining
 - GRI 413: Local Communities
 - GRI 414: Supplier Social Assessment
 - GRI 416: Customer Health and Safety
 - GRI 418: Customer Privacy

As for the reporting boundary, the engagement excludes the data and information of HD HYUNDAI Energy Solutions' partners, suppliers and any third parties.

KMR's Approach

To perform an assurance engagement within an agreed scope of assessment using the standards outlined above, our Assurance Team undertook the following activities as part of the engagement:

- reviewed the overall Report;
- reviewed materiality assessment methodology and the assessment report;
- evaluated sustainability strategies, performance data management system, and processes;
- interviewed people in charge of preparing the Report;
- reviewed the reliability of the Report's performance data and conducted data sampling;
- assessed the reliability of information using independent external sources such as Financial Supervisory Service's DART and public databases.

Limitations and Recommendations

KMR's assurance engagement is based on the assumption that the data and information provided by HD HYUNDAI Energy Solutions to us as part of our review are provided in good faith. Limited depth of evidence gathering including inquiry and analytical procedures and limited sampling at lower levels in the organization were applied. To address this, we referred to independent external sources such as DART and National Greenhouse Gas Management System (NGMS) and public databases to challenge the quality and reliability of the information provided.

Conclusion and Opinion

Based on the document reviews and interviews, we had several discussions with HD HYUNDAI Energy Solutions on the revision of the Report. We reviewed the Report's final version in order to make sure that our recommendations for improvement and revision have been reflected. Based on the work performed, it is our opinion that the Report applied the GRI Standards 2021. Nothing comes to our attention to suggest that the Report was not prepared in accordance with the AA1000AP (2018) principles.

Inclusivity HD HYUNDAI Energy Solutions has developed and maintained different stakeholder communication channels at all levels to announce and fulfill its responsibilities to the stakeholders. Nothing comes to our attention to suggest that there is a key stakeholder group left out in the process. The organization makes efforts to properly reflect opinions and expectations into its strategies.

Materiality HD HYUNDAI Energy Solutions has a unique materiality assessment process to decide the impact of issues identified on its sustainability performance. We have not found any material topics left out in the process.

Responsiveness HD HYUNDAI Energy Solutions prioritized material issues to provide a comprehensive, balanced report of performance, responses, and future plans regarding them. We did not find anything to suggest that data and information disclosed in the Report do not give a fair representation of HD HYUNDAI Energy Solutions actions.

Impact HD HYUNDAI Energy Solutions identifies and monitors the direct and indirect impacts of material topics found through the materiality assessment, and quantifies such impacts as much as possible.

Reliability of Specific Sustainability Performance Information

In addition to the adherence to AA1000AP (2018) principles, we have assessed the reliability of economic, environmental, and social performance data related to sustainability performance. We interviewed the in-charge persons and reviewed information on a sampling basis and supporting documents as well as external sources and public databases to confirm that the disclosed data is reliable. Any intentional error or misstatement is not noted from the data and information disclosed in the Report.

Competence and Independence

KMR maintains a comprehensive system of quality control including documented policies and procedures in accordance with ISO/IEC 17021 · 2015 - Requirements for bodies providing audit and certification of management systems. This engagement was carried out by an independent team of sustainability assurance professionals. KMR has no other contract with HD HYUNDAI Energy Solutions and did not provide any services to HD HYUNDAI Energy Solutions that could compromise the independence of our work.

May 2023 Seoul, Korea

CEO *E. J. Hwang*

GHG Verification Statement

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HYUNDAI ENERGY SOLUTIONS Co., Ltd.

The Korea Management Registrar Inc. (hereinafter “KMR”) has conducted the verification on the greenhouse gas (hereinafter “GHG”) emission (Scope 1, 2) of HYUNDAI ENERGY SOLUTIONS Co., Ltd. (hereinafter “the Company”) in 2022.

SCOPE

Verification of all places of business and emission facilities under the control of the Company

STANDARDS

- ISO 14064-1:2006, ISO 14064-3:2006
- IPCC Guidelines for National Greenhouse Gas Inventories (2006)
- Guidelines for Reporting and Certification of Emissions in the Greenhouse Gas Emissions Trading Scheme

LIMITATIONS

The verification has inherent limitations that may arise in the process of applying standards and methods.

Opinion

- GHG verification has been performed to meet the reasonable assurance level according to the verification standards.
- We express that no significant errors were found in the calculation of emissions during the verification process, and that relevant activity data and evidence were appropriately managed and calculated. As a result, we express an “qualified” opinion.
- Criticality: meets the criterion, which is less than 5%

GHGs Emission	Direct emission (Scope 1)	Indirect emission (Scope 2)	Total (tCO ₂ eq)
2022	3,567	34,675	38,240

Energy Consumption	Fuel	Electricity	Steam	Total (TJ)
2022	29	725	-	753

※ Scope 1&2 emissions are value of GHG submitted to the Ministry of Environment.

March 31st, 2023
CEO **Eun Ju Hwang**

Authorized By *E J Hwang*



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Membership and Award Status & Public Information

Membership Status

Korea Photovoltaic Industry Association
 Korea New Renewable Energy Association
 Korea Environmental Engineers Association in Chungbuk
 Korea Electrical Contractors Association

Award Status

CES 2023 Innovation Awards in November 2022

Public Information

Disclosure Channels		Main Contents
HD Hyundai Energy Solutions website	https://www.hd-hyundaies.co.kr/	Introduction of the company, IR, products & dealerships, online customer service
HD Hyundai Energy Solutions blog	https://blog.naver.com/hyundai-es-blog	HD Hyundai Energy Solutions' products and news
HD Hyundai Group Business Ethics website	https://ethics.hdhyundai.co.kr/html/main.html	Group ethics management direction, Code of Ethics, online report / counseling
HD Hyundai Group Webzine "Magazine H"	http://www.hdhyundai.co.kr/magazine-h	Chanel for HHI Group's general management status (monthly)
Financial Supervisory Service DART	https://dart.fss.or.kr	Various data disclosures made either mandatorily as a listed company or voluntarily
Investor Relations	https://www.hd-hyundaies.co.kr/invest/ir.do	Regular announcement on business performance and outlook

