



Hanwha Solutions

Green Financing Framework

March 2021

1. Background of Hanwha Solutions

Hanwha Solutions (the “**Company**”) is a newly formed corporation with the merger of Hanwha Chemical, Hanwha Q CELLS, and Hanwha Advanced Materials in January 2020, with the goal to create a global chemical, materials and energy company that will lead the global eco-friendly energy market and high-value added materials industry. The Company operates in three business areas: chemicals, total energy solutions, and advanced materials. The Company’s solar voltaic division, a part of its total energy solutions, makes up the largest segment of its operations. (Q CELLS made up 37.4% of the Company’s revenue in FY2019)

Hanwha Solutions’ subsidiaries include Hanwha Q CELLS Malaysia within Hanwha Q CELLS, which focuses on photovoltaic module production for solar power generation. Hanwha Q CELLS Malaysia became part of the Company after the acquisition of Q.CELLS, a leading German solar company, in 2012¹, which included Q.CELLS production facilities in Germany and Malaysia. The Company is an affiliate of the Hanwha Group (the “**Group**”), a Fortune Global 500 firm and the 7th largest conglomerate in South Korea with primary businesses in the chemical, aerospace, mechatronics, solar energy and finance sectors.

1.1 Hanwha Solutions’ Q CELLS Division²

Hanwha Solutions’ Q CELLS Division (the “**Q CELLS Division**”) is a total energy solutions provider worldwide. The Q CELLS Division business scope ranges from the midstream of cells and modules to downstream solar solutions for residential, commercial, and industrial buildings, as well as for large solar power plants. The Q CELLS Division has a global cell and module production capacity of 9.0 GW per year and 10.7 GW per year, respectively (as of YE2019). It has captured the biggest market share in the solar-module business in Germany, the UK, Italy, South Korea, and Japan (as of 2018) and is the residential and commercial market leader in the U.S. (as of 2019)³.

Since entering the solar energy business in 2010, the Q CELLS Division has become the world’s leading producer of solar cells and modules. Current production networks span across China, Malaysia, South Korea, and the US. Through continual investment in R&D and manufacturing innovations the Q CELLS Division was able to achieve industry firsts such as production capacity of 1GW of Q.ANTUM cells annually in 2015 in its Malaysia plant. In Q1 2019, the Q CELLS Division penetrated the US market and rapidly expanded by building a 1.7GW capacity module plant in the US state of Georgia.

The Q CELLS Division has bagged a number of awards for its market-leading technology. The polycrystalline Q.ANTUM module, Q.PLUS, won the Module Manufacturing Innovation award at Solar Industry Awards 2015 in Hamburg, Germany. For two consecutive years, the Q CELLS Division has won the Intersolar Award in the Photovoltaics from Intersolar, the most prestigious solar energy conference and exhibition in Europe. In 2017, its Q.PEAK RSF L-G4.2 steel-frame module also won in the Photovoltaics category. The following year, in June 2018, its Q.PEAK DUO-G5 solar module also won in the Photovoltaics category, earning high praise for its 120 half-cell, six-bus bar monocrystalline module that the Intersolar jury panel called “the new standard for residential and commercial rooftops.”

The Q CELLS Division was selected as one of the best photo-voltaic (PV) manufacturers by local installers, having seven consecutive Top Brand PV Europe seals and five consecutive Top Brand PV Australia seals from EuPD Research (as of 2020). It also has five consecutive Top Performer recognitions from PV Evolution Labs (as of 2020). The Q CELLS Division has R&D centres across China, Malaysia, and South Korea with headquarters in Thalheim, Germany, that receive the Hanwha Group’s continuous support and investments to develop solar technology, including Anti-LID, Anti-LeTID, Tra.Q, and more.

The Q CELLS Division is a leading player in the market, with its competitive advantage being its cutting-edge technology and economies of scale. In 2014, the Q CELLS Division entered the rooftop solar power equipment market in Japan and Europe and large-scale power plant markets in the US, Thailand, Chile, and Latin America, and also secured a series of large solar projects across Europe, including UK and France. In 2015, the Q CELLS Division obtained a partnership with US-based NextEra Energy to provide 1.5GW of modules, allowing it to cement its position in one of the world’s largest solar markets. The Company seeks to further advance its solar business through investment in development and manufacture of next-generation modules using N-type and Perovskite-based tandem technologies which boost solar module efficiency, as well as acquisition of solar power generation assets for its downstream business.

¹ https://www.hanwha.com/en/news_and_media/press_release/hanwha_acquires_q_cells_one_of_the_worlds_leading_photovoltaics_companies.html

² https://www.hanwha.com/en/products_and_services/affiliates/hanwha_solutions.html

³ <https://www.hanwha.com/en/sustainability/innovative-solutions.html>

1.2 Hanwha Solutions' Chemical Division

Established in 1965, Hanwha Solution's Chemical Division (the “**Chemical Division**”) is a market leader in South Korea’s petrochemical industry and a global chemical company with high-value-added products, cost competitiveness, and strategic investments. It is total solutions chemical company with streamlined production systems for polyethylene (PE), polyvinyl chloride (PVC), and chlor-alkali (CA).

Developing Green Hydrogen using Electrolyzer Technology

Based on 30 years’ experience of developing an electrolytic cell technology for producing chlor-alkali, the Chemical Division is researching how to produce green hydrogen⁴ at large-scale and affordable prices. This work is done in collaboration with the Korea Advanced Institute of Science and Technology (KAIST), Yonsei University, and Rensselaer Polytechnic Institute (RPI). Currently, the Chemical Division is focused on developing commercial-hydrogen production via anion-exchange-membrane (AEM) electrolysis. This method has the advantages of using relatively affordable electrodes made of either nickel or cobalt as catalysts, which make the process economical to scale up to commercial-production levels.

Through its research into scaling up and refining AEM electrolysis, the Chemical Division seeks to set a new standard for green hydrogen production, by bringing down the amount of electricity needed to produce hydrogen. The goal is the development and application of power-to-gas (P2G) systems that link renewable power plants – such as solar farms and wind turbines – to electrolyzers, wherein surplus and off-peak electricity will help offset the power needed to produce green hydrogen through electricity.

The Chemical Division had previously invested 30 billion won to develop competitive hydroelectricity technology to produce green hydrogen. In 2020, the Company announced the creation of a green hydrogen production complex based on renewable energy through a public-private-government partnership investment project with Gangwon Province and KOGAS-Tech. This green hydrogen technology will convert electricity produced by wind power into hydrogen, and involves establishing a water electrolysis facility and a hydrogen charging station capable of producing 290 tons of green hydrogen annually. The hydrogen will be used to power hydrogen buses, hydrogen trucks and hydrogen passenger cars through hydrogen charging stations.

1.3 Sustainability Commitment of Hanwha Solutions

Hanwha Solutions is committed to environmental sustainability, social sustainability and economic sustainability.

Sustainability Initiatives

Efficient resource management is at the top of the Company’s agenda. In 2011, the Chemical Division joined the Carbon Disclosure Project (CDP) and became the first business in Korea to disclose its carbon management data to the public. In recognition of its efforts, the Chemical Division received the CDP’s Carbon Management Special Award in 2014. Hanwha SolarOne (now Hanwha Q CELLS) was one of the first solar energy providers to receive ISO 14067 certification for quantifying and communicating the carbon footprint of its products. Meanwhile, Hanwha Advanced Materials received ISO 14001 certification for implementing an effective environmental management system⁵.

The Company has also made energy efficiency improvements across its chemical refineries. Related projects include the overhaul of the Chemical Division plant in Yeosu, Korea in 2019, replacing older equipment with high-energy-efficiency models, and saving up to 30,000 tons of greenhouse gas emissions per year. Furthermore, the plant’s toluene diisocyanate (TDI) unit recycles waste heat to generate electricity at an on-site power plant, cutting the plant’s carbon emissions by a further 20,000 tons per year.

The Group has placed greater emphasis on solar energy as a low-carbon electricity source for its global operations, through installation of solar modules at its locations around the world. The Chemical Division is leading this transition by installing solar modules on idle sites at its plants, producing 1.8 MWh of energy per year and reducing carbon emissions by 1,000 tons annually.

The Company has also pursued eco-friendly plastics development. In 2017, the Chemical Division successfully commercialized ECO-DEHCH, an eco-friendly plasticizer, which received Korea’s prestigious IR52 Jang Young-shil Award in 2018 in recognition of its safety and product qualities. Additionally, the Chemical Division is developing eco-friendly bioplastics, including biodegradable plastics made from plant-based starches.

⁴ “Green hydrogen” refers to hydrogen derived from low-carbon production methods. This is usually achieved through electrolysis, a combustion-free process where an electric current is run through water to split it into its constituent hydrogen and oxygen atoms.

⁵ <https://www.hanwha.com/en/sustainability/sustainable-operations.html>

The Chemical Division has also engaged in waste recycling. For example, the Chemical Division's manufacturing plant in Ningbo, China, accepts waste anhydrous hydrochloric acid from a neighboring plant and recycles it to produce polyvinyl chloride (PVC). The Chemical Division is also the first in the world to develop recycling technology that turns waste materials from toluene diisocyanate (TDI) manufacturing back into raw materials that can be processed into adhesives, automotive materials, and other industrial goods.

Investment in the Hydrogen Economy

Besides investing in development of green hydrogen technologies under its Chemicals Division, the Company has also made a number of investments in hydrogen-related assets to further grow its clean energy business through to 2025, as it plans to establish an entire value chain across the hydrogen business from production to storage and distribution. In 2019, the Company acquired a local high-pressure tank facilities manufacturer, TK-FUJIKIN, to mass produce hydrogen fuel tanks and hydrogen tanks for trucks. In 2020, the Company signed a deal to acquire a US hydrogen tank maker, Cimarron Composites LLC⁶. The acquisition will help Hanwha Solutions secure advanced technologies required for hydrogen tanks for vehicles, trailers, high-pressure tanks for charging stations and others.

⁶ As hydrogen needs to be compressed at a high pressure to be used an energy source, making high-quality tanks essential for fuel development.

2. Hanwha Solutions Green Financing Framework

Hanwha Solutions and its subsidiaries (belonging to photovoltaic business for renewable energy) intend to use this Framework as the basis to issue Green Bonds, Loans and other debt instruments (“Green Financing Instruments”). The Green Financing Instruments will fund Eligible Green Projects that conform to the green finance principles listed below:

- International Capital Market Association (“ICMA”) Green Bond Principles (“GBP”) 2018⁷,
- ASEAN Green Bond Standards (“GBS”), issued by the ASEAN Capital Markets Forum (ACMF) in October 2018⁸, and/or
- Loan Market Association (“LMA”) Green Loan Principles (“GLP”) 2021⁹

In aligning with the above principles and guidelines, the Company’s Green Financing Framework is presented through the GBP/GBS/GLP’s four core components as well as its recommendation for external review:

- (a) Use of Proceeds
- (b) Process for Project Evaluation and Selection
- (c) Management of Proceeds
- (d) Reporting

Bonds issued under this Framework may take the form of public transactions or private placements, in bearer or registered format, and may take the form of senior unsecured or subordinated issuances. Such Bonds and any loans entered into under this Framework will be standard recourse-to-the-issuer obligations and investors will not bear the credit risk of the underlying allocated eligible asset exposures.

2.1 Use of Proceeds

The Company and its subsidiaries (belonging to photovoltaic business for renewable energy) will allocate an amount at least equivalent to the net proceeds of the Green Financing Instruments issued under this Framework to finance and/or re-finance, in whole or in part, green projects which meet the eligibility criteria of the following Eligible Green Project categories (“Eligible Green Projects”), as defined as below.

A maximum [3] year look-back period would apply for refinanced projects and we expect to be fully allocated within [1] year from the issuance of the Green Financing Instrument.

Eligible Green Project category	Eligibility Criteria	Eligible Projects	Relevant UN Sustainable Development Goals (SDG)
Renewable Energy	<p>Expenditures for, and refinancing of, the Company’s renewable energy/clean energy business, including:</p> <ul style="list-style-type: none"> • Solar Cells and Solar Modules under its Q CELLS Division and its subsidiaries and R&D in solar cell and module production • Investment in solar power generation assets (including building and operation) and downstream distribution of energy based on solar power generation • Investment in green hydrogen businesses and/or projects, including R&D in green hydrogen production, storage and distribution. • Acquisition¹⁰ and investment into assets in relation to green hydrogen businesses including assets for hydrogen storage and distribution 	<ul style="list-style-type: none"> • Investment in Q CELLS Division and its subsidiaries for production of solar cells and modules and R&D • Acquisition of solar power generation assets and investments into solar energy retail business • R&D of Green Hydrogen Electrolysis Technology by Chemical Division • Acquisition and investment in assets for hydrogen storage and distribution 	 

⁷ In alignment with ICMA Green Bond Principles, June 2018, <https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/>

⁸ In alignment with ACMF Green Bond Standards, October 2018, <https://www.theacmf.org/initiatives/sustainable-finance/asean-green-bond-standards>

⁹ In alignment with LMA Green Loan Principles, February 2021, <https://www.lsta.org/content/green-loan-principles/>

¹⁰ If acquisition of a business is involved for allocated proceeds, Hanwha Solutions would use a pro-rata allocation of green proceeds based on % book value of eligible green assets within the acquired company's balance sheet

2.2 Process for Evaluation and Selection of Projects

Hanwha Solutions and its subsidiaries (belonging to photovoltaic business for renewable energy) have established the Green Financing Working Group (“GFWG”) with responsibility for governing and implementing the initiatives set out in the Framework. The GFWG is composed of Accounting Team, Planning Team, Legal Team and Environment & Safety Team, while being coordinated by International Finance Team or Finance Team.

The GFWG will:

- Ratify eligible business and projects, which are initially proposed by constituent team members
- Undertake regular monitoring of the asset pool to ensure the eligibility of businesses and projects, whilst replacing any ineligible businesses and projects with eligible new green assets
- Facilitate regular reporting on any Green issuance in alignment with our Reporting commitments
- Manage any future updates to this Framework
- Ensure that the approval of Eligible Green Projects will follow the Company’s existing credit/loan/ investment approval processes

2.3 Management of Proceeds

A dedicated ledger (the “Ledger”) will be established to record the allocation of Proceeds. The GFWG will track the Proceeds via a formal internal process to ensure linkage to Eligible Green Projects.

The Ledger will contain the following information:

- I. Green Bond (or loan) details: pricing date, maturity date, principal amount of proceeds, coupon, ISIN number, etc.
- II. Allocation of Proceeds:
 - a. The Eligible Green Projects List, including for each Eligible Green Project, the Eligible Green Project category, project description, Company’s ownership percentage, total project cost, amount allocated, settled currency, etc.
 - b. Amount of unallocated Proceeds

Any proceeds temporarily unallocated will be placed in short-term liquid money instruments such as cash and market securities according to the Company’s investment guidelines.

2.4 Reporting

On an annual basis until full allocation of proceeds to Eligible Green Projects and on a timely basis in case of material changes, Hanwha Solutions and its subsidiaries (belonging to photovoltaic business for renewable energy) will provide a dedicated green bond report with the following aspects:

I. Allocation Reporting

- a. The amount of Proceeds allocated to each Eligible Green Project category
- b. When possible, descriptions of the Eligible Green Projects financed, such as project locations, amount allocated, etc.
- c. Share of financing vs refinancing
- d. Selected examples of projects financed
- e. Amount of unallocated Proceeds

II. Impact Reporting

Hanwha Solutions and its subsidiaries (belonging to photovoltaic business for renewable energy) will provide reporting on the environmental benefits of the Eligible Green Projects potentially with the following impact indicators. In addition, calculation methodologies and key assumptions will be disclosed.

Eligible Green Project Categories	Eligible Projects	Impact Indicators
Renewable Energy	<ul style="list-style-type: none"> Investment in Q CELLS Division and its subsidiaries for production of solar cells and modules 	<ul style="list-style-type: none"> Number of Q.ANTUM solar cells/modules produced (number per year) Annual renewable energy production (equivalent in GW) Annual production capacity (in GW)
	<ul style="list-style-type: none"> Acquisition of solar power generation assets and investments into energy retail business 	<ul style="list-style-type: none"> Installed capacity of renewable energy (MW) Annual CO2 emission reduced or avoided (tons/ year) Annual renewable energy production (MWh)
	<ul style="list-style-type: none"> R&D of Green Hydrogen Electrolysis Technology by Chemical Division 	<ul style="list-style-type: none"> Information on their progress in R&D (such as the outline of projects participated in)
	<ul style="list-style-type: none"> Acquisition and investment in assets for hydrogen storage and distribution 	<ul style="list-style-type: none"> Total storage capacity of hydrogen tanks (metric tonnes)

3. External Review

a. Second Party Opinion

Hanwha Solutions and its subsidiaries (belonging to photovoltaic business for renewable energy) have appointed Sustainalytics to assess this Green Financing Framework and its alignment with the GBP/GBS/GLP, and issue a Second Party Opinion accordingly. The Second Party Opinion will be made publicly available on the Company's official website.

Amendments to this Framework

The GFWG will review this Framework on a regular basis, including its alignment to updated versions of the Principles as and when they are released, with the aim of adhering to best practices in the market. Such review may result in this Framework being updated and amended. The updates, if not minor in nature, will be subject to the prior approval of the Company and Sustainalytics. Any future updated version of this Framework that may exist will either keep or improve the current levels of transparency and reporting disclosures, including the corresponding review by an external reviewer. The updated Framework, if any, will be published on our website and will replace this Framework.