

Hanwha Newsletter

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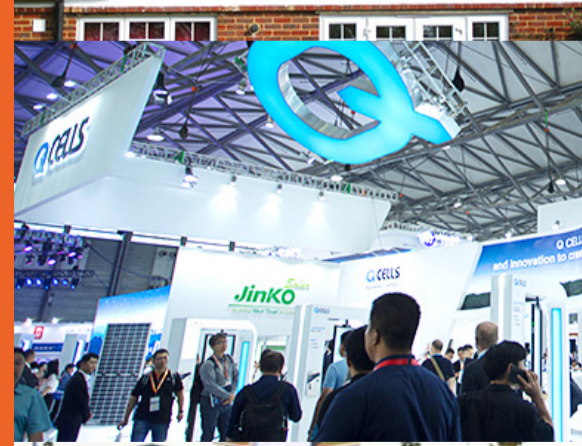
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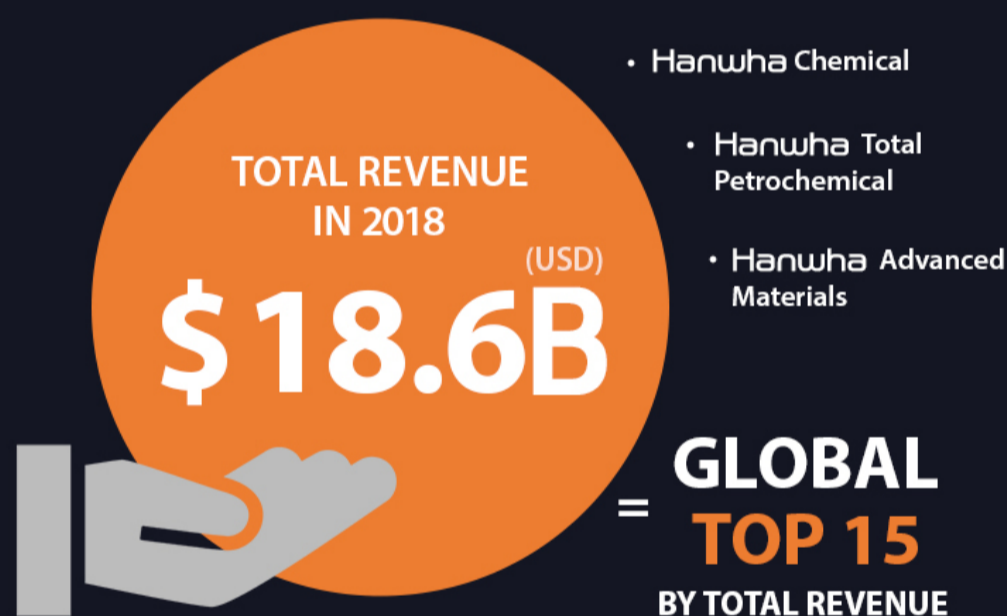
Explore this month's news of Hanwha and its affiliates, taking the initiative in all corners of the world.



Hanwha Pumps Up Petrochemical Production to Maintain Global Leadership

Since entering the petrochemical market in 1965, Hanwha has grown into a major player in a highly competitive global market through vertical integration, optimized production processes, and strategic investments.

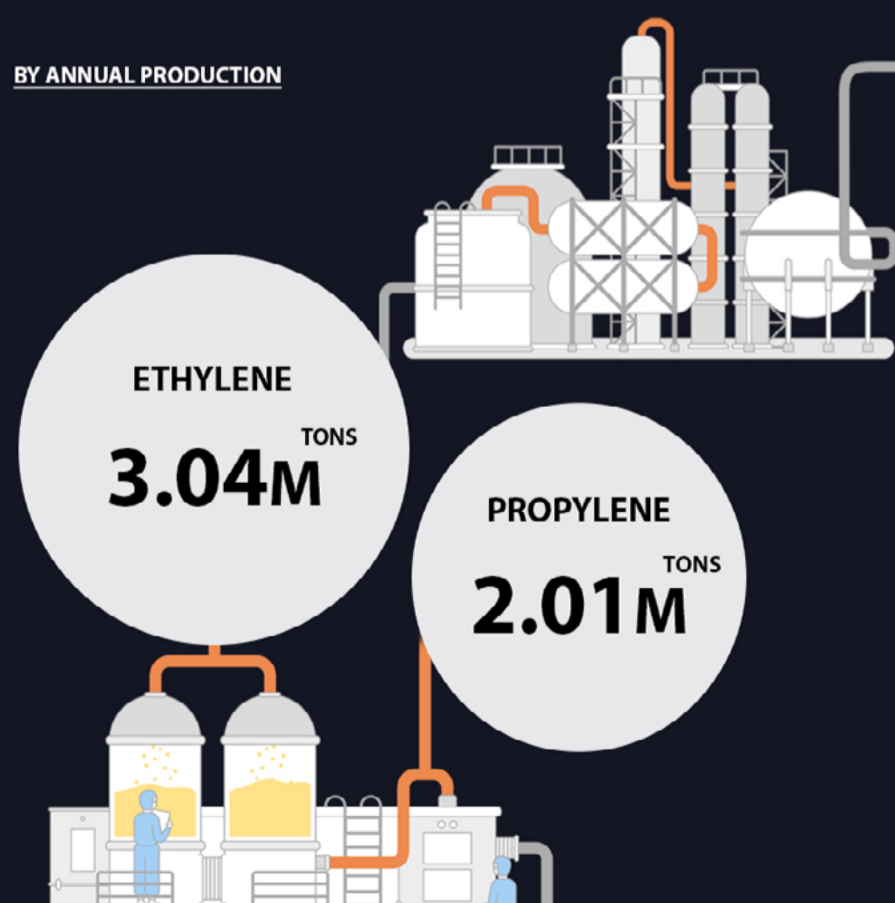
Hanwha is now hard at work further expanding its production capacity to better meet market demands. From processing raw materials to final delivery, Hanwha will strive to consistently provide a high quality of service and products to all of its customers.



Base Chemicals

Hanwha has been a major producer of polypropylene and other base chemicals for more than 54 years. Now, Hanwha is increasing its base chemical production capacity to act as a strong foundation from which it can produce many other petrochemical products.

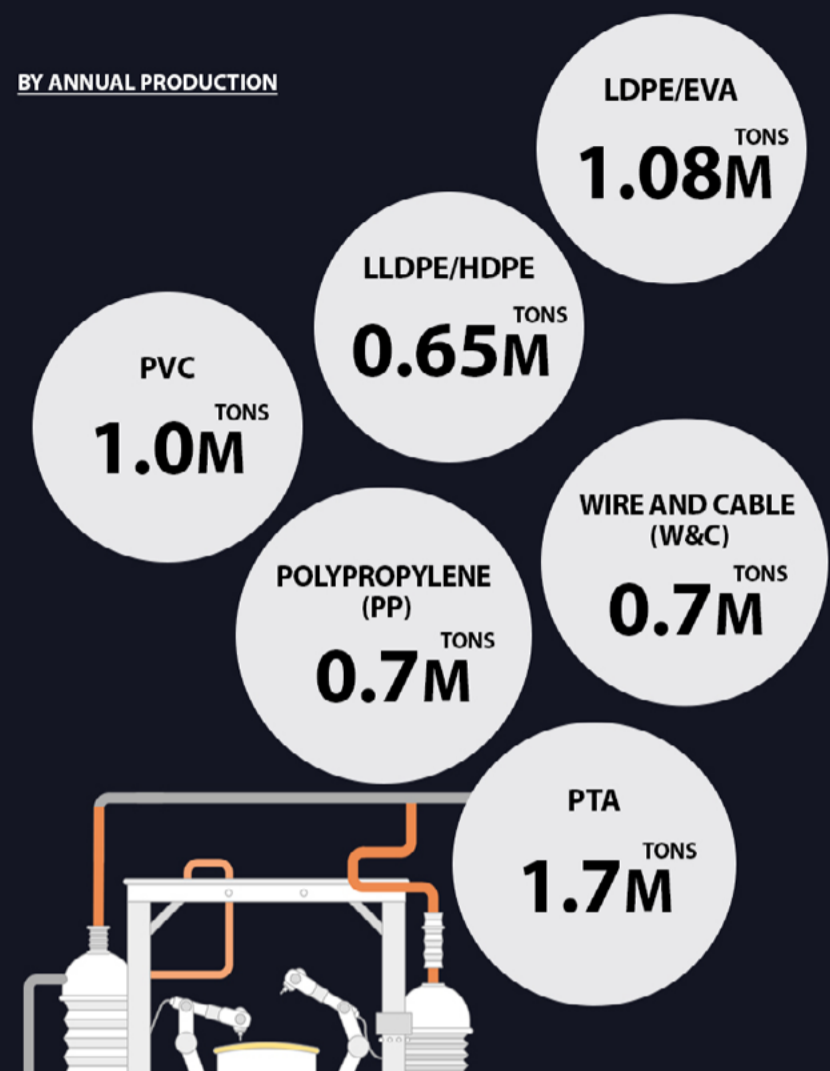
BY ANNUAL PRODUCTION



Synthetic Compounds

In 1972, Hanwha Chemical was the first company in Korea to produce LDPE and LLDPE. Through relentless technology innovations, Hanwha is now the world's leading producer of synthetic petrochemical products, including polypropylene and EVA.

BY ANNUAL PRODUCTION

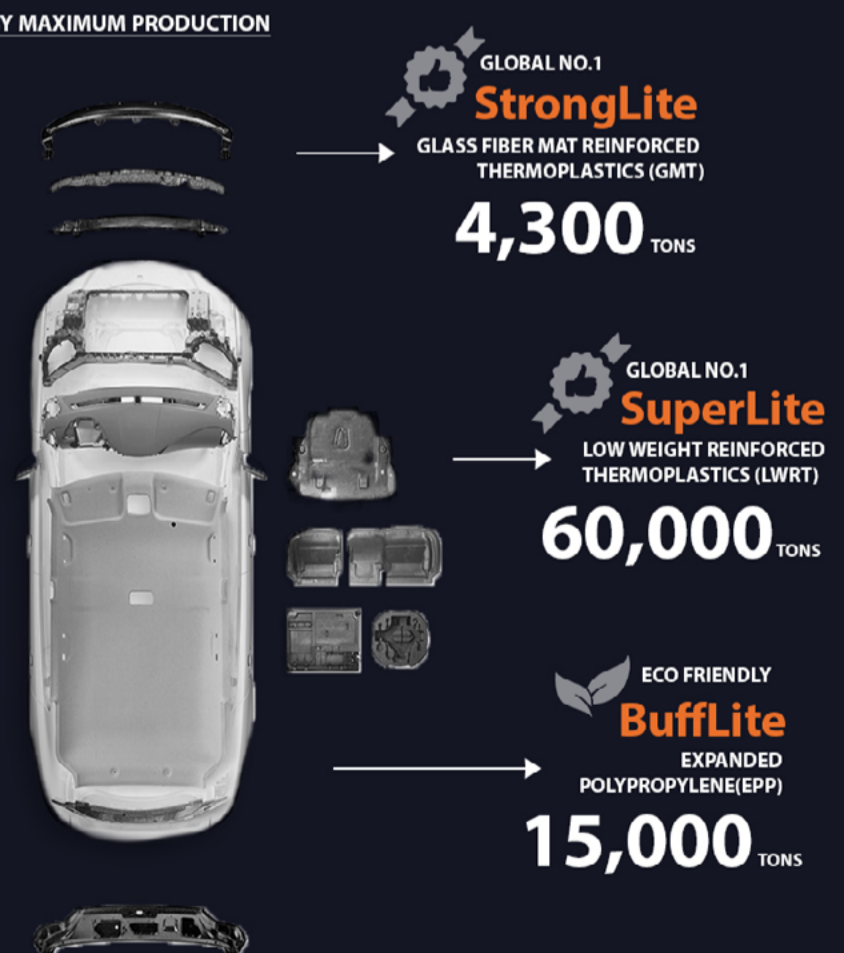


Advanced Materials

Hanwha's petrochemical divisions are synergizing to strengthen Hanwha's position as an advanced materials manufacturer by strengthening cost competitiveness and providing additional value to customers.

Hanwha Advanced Materials now has twelve production operations in six countries, providing a broad and stable base from which customer needs can be swiftly met while maintaining product standards around the world.

BY MAXIMUM PRODUCTION



MEETING THE WORLD'S PETROCHEMICAL NEEDS

For Hanwha, supply chain consolidation and expanded production capacity is not just about achieving a larger global market share. It's also about being able to develop an eco-friendly product catalog and develop high-value added products through technological innovation.

ECO-FRIENDLY PRODUCT

Hanwha is also diversifying its business portfolio and developing eco-friendly technologies to provide sustainable solutions for business and next generation.

Hanwha is ramping up production of ECO-DEHCH, its proprietary environmentally-friendly plasticizer, to supply customers with affordable products that meet ever stringent environmental regulations.



ECO-DEHCH
ANNUAL
PRODUCTION



+50kt
INCREASE

HIGH VALUE-ADDED PRODUCT

As a leader in the global petrochemical industry, Hanwha is focusing on high-value-added products like polypropylene, CPVC and high-activity metallocene hybrid catalyst.

Hanwha is especially actively expanding the production of polypropylene. ■



POLYPROPYLENE
ANNUAL
PRODUCTION



+40Mt
INCREASE

CPVC
ANNUAL
PRODUCTION



+30kt
INCREASE

Rethinking Plastics & Sustainability

With concerns over global pollution mounting more than ever, people all over the world are looking into ways to reduce their impact on the environment. But lost within the discussion about the need to adopt more recyclable and alternative materials is an unexpected fact: plastic can actually have a net positive effect on the environment.

Plastic lowers environmental costs

Polypropylene (PP) is a lightweight, heat-resistant, and non-toxic plastic material that is used in everyday items from baby bottles to household appliances. When used in food packaging, PP and other types of plastic can help **REDUCE FOOD WASTE BY UP TO 20 PERCENT** by preventing millions of tons of food from spoiling and ending up in landfills.

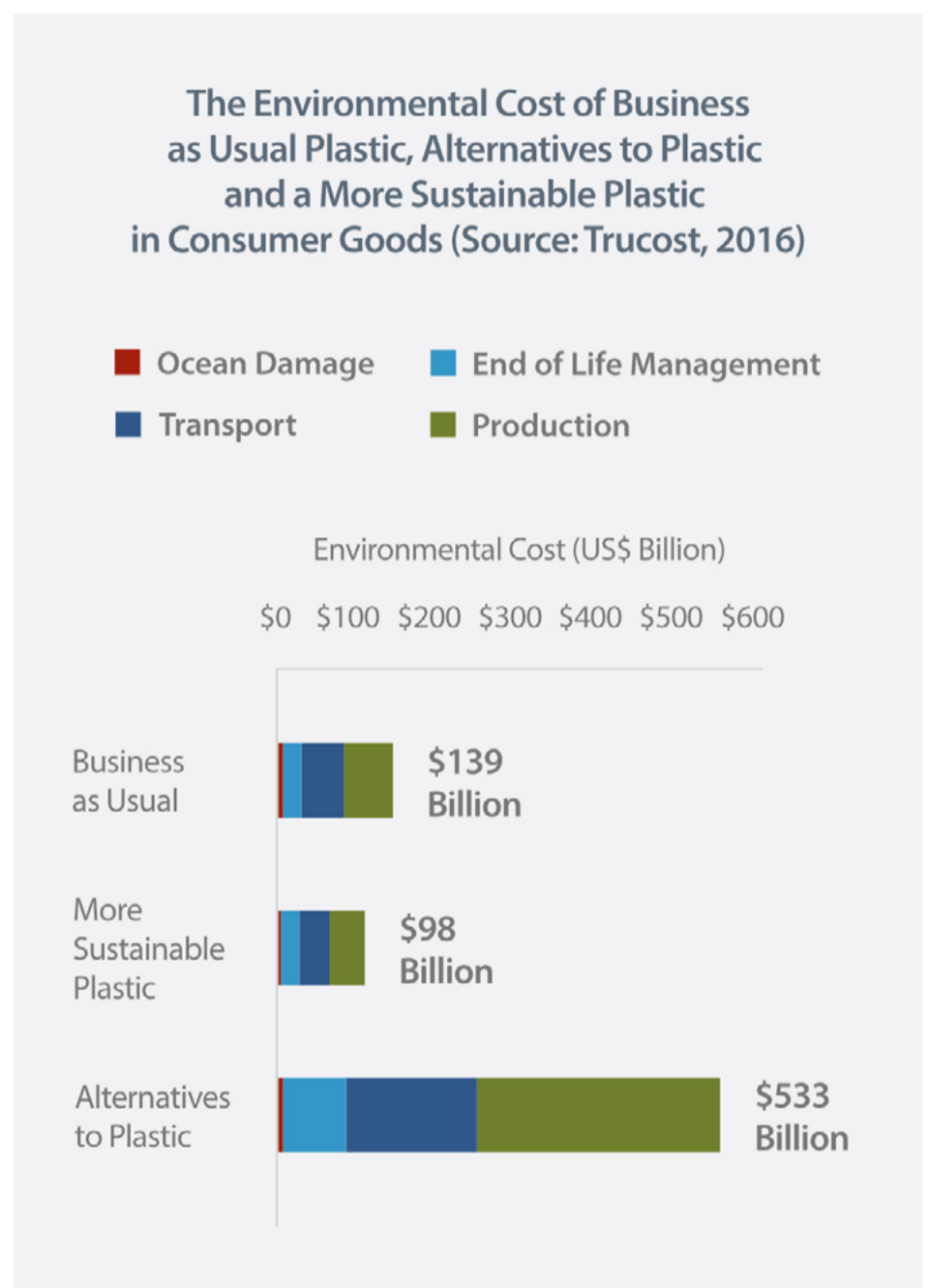
Hanwha Total Petrochemical is one of the major producers of PP currently being used around the world.



Plastic packaging helps to preserve food, thereby reducing an enormous amount from going to waste (source: Getty Images Bank)

Using plastic can have a real financial impact, as well.

A series of studies by **Trucost**, a global environmental data and risk analysis company, showed that using alternative materials instead of plastic in consumer products and packaging actually increases environmental costs by nearly four times, from USD 139 billion to USD 533 billion, annually.



The negative impact on environment is greater when we substitute plastic with alternative materials

Plastic can drive sustainability

Plastic is now the material of choice in automobile manufacturing. Modern innovations mean today's plastics can take up to 50 percent of a vehicle's volume but account for only about 10 percent of its weight.

Advanced polymer materials, such as StrongLite glass mat reinforced thermoplastics (GMT) produced by Hanwha Advanced Materials, are as **DURABLE AS STEEL, BUT IS 20 TO 25 PERCENT LIGHTER**. They are commonly used to produce components such as bumpers, seatback frames, undercovers, and exterior covers for undercarriages.



Automobile manufacturers are increasing the amount of plastic they use to reduce weight and improve fuel economy

Lighter vehicles consume less fuel, emit less carbon and nitrogen oxide throughout their lifespans. For the average passenger car, a 10 percent reduction in weight translates into a **FIVE TO SEVEN PERCENT REDUCTION IN FUEL CONSUMPTION**.

What's even more impressive is that the latest transcontinental airliners' use of plastic composites have been so efficient that they can match the fuel economy of the average family vehicle on a per passenger basis.

Plastic in clean energy

Ethylene Vinyl Acetate (EVA) copolymers are used in a wide variety of applications because they are durable, UV resistant, and waterproof.

One example of EVA application is in solar power. Laminating films made from EVA copolymers are vital for the longevity of solar cells and modules. By protecting the cells and modules' photovoltaic elements from rain, dust, shock, and UV rays, EVA films provide protection, allowing efficiency to be maintained and operate without issues in even the harshest environments for decades.

Hanwha Chemical is the world's largest producer of EVA, with 35 percent market share, the largest in the world. As a result, the EVA produced by Hanwha Chemical and Hanwha Total Petrochemical and used in the production of solar cell EVA, has been designated as a "World-class Product" by the Ministry of Trade, Industry and Energy of Korea. Hanwha Total Petrochemical's market leadership can be traced back to its commitment to quality, innovation, and having successfully become the world's first to commercialize its production of solar cell EVAs using tubular reactor polymerization.



Plastic hybrids are the ideal material to use for manufacturing clean energy products such as solar modules, which require durability and weather resistance

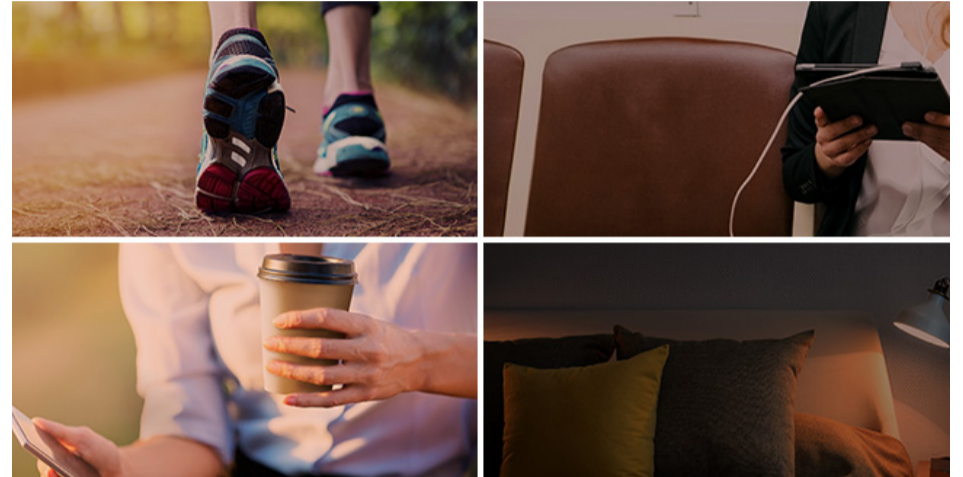
Getting the most out of plastic

Plastic can also be environmentally friendly because of the myriad ways it can be dramatically reduced for disposal or recycled.

New technologies, like **cold plasma pyrolysis**, allow for increasing amounts of usable material to be recovered during recycling. **Gasification**, meanwhile, can turn plastic into synthetic gasoline and diesel.

The latest developments in plastic manufacturing has led to the development of PP, a plastic product that can be reduced to very little waste because it can be produced without any additives and is 100 percent recyclable. Advancements in plastic recycling technologies has also allowed plastic materials to be recycled multiple times before it is finally discarded.

Plastic is still usable when it is at a point in its lifecycle called Energy from Waste (or Waste-to-Energy). This is when plastic can be burned to produce electricity, reducing the amount of plastic waste going into landfills.



Improvements in plastic recycling technology minimizes the environmental impact of plastic use

Hanwha committed to greener plastic

Hanwha is dedicated to reducing the environmental impact of plastic and going to great lengths to minimize its greenhouse gas emissions. Hanwha's petrochemical plants process the byproducts of plastic manufacturing to create other products, recycle waste heat, and even use the steam generated during the production process to create electricity and reduce reliance on external power plants.



At Hanwha, we are dedicated to minimizing the environmental impact of plastic manufacturing

Plastic is an indispensable material today and will remain vital for the foreseeable future. Hanwha will continue to develop ways to ensure that plastic has a net positive environmental impact.

As a participant and advocate for the United Nations' Sustainable Development Goals program, Hanwha is committed to finding solutions to address major challenges in the environment. From programs to reduce carbon emissions and industry waste to developing more eco-friendly materials and highly efficient renewable energy sources, Hanwha is helping businesses and society work towards a more sustainable future. ■

Hanwha Chemical Envisions a World of Green Plastic

Hanwha Chemical is taking active steps to address global environmental concerns over the use and disposal of plastics. It is committing significant resources to the research and development of safer plastic products, more efficient production techniques, and reducing plastics' overall environmental impact.

Changsuk Seo, Vice President of Corporate Planning at Hanwha Chemical, speaks about environmental concerns regarding plastic usage and Hanwha Chemical's latest environmentally friendly plasticizer.



Changsuk Seo, Vice President of Hanwha Chemical, speaks about how Hanwha Chemical is working to reduce the environmental impact of plastic production and usage

Q1. What is Hanwha doing to reduce the environmental impact of plastic?

At Hanwha, we're trying very hard to make plastic safer for people and the environment. We're constantly refining our production processes to reduce our emissions and eliminate waste.

We're also actively developing environmentally friendly chemical products. For example, Hanwha's patented **ECO-DEHCH** is a non-phthalate-based plasticizer that is safe for humans.

Q2. Can you elaborate on what ECO-DEHCH is?

Plasticizers are compounds added to plastic resins to make them more flexible. Traditional phthalate-based plasticizers can cause long-term health issues; thus, many governments have banned their use in toys and baby products.

ECO-DEHCH is an eco-friendly alternative that doesn't produce any negative health effects. Manufacturers that use plastics made using ECO-DEHCH can label their products as "phthalate free" so that consumers will know that what they're buying is safe.

Q3. What are the biggest markets for such eco-friendly plastic products?

In terms of region, the United States and China have the highest interest in

products like ECO-DEHCH. As for industries, companies that manufacture medical equipment, products for infants and children, and home goods (as in furniture, wallpaper, food packaging) are all looking for safer plastics.

Q4. And how has market response been to products like Hanwha Chemical's ECO-DEHCH?

ECO-DEHCH is receiving a very good response from the plastics market. As consumers' concern for chemical products grow globally, our customers are experiencing, first-hand, the long-term benefits of adopting safe and eco-friendly compounds to produce consumer products.

→ [Read more about how Jeil Wallpaper uses ECO-DEHCH here](#)

Hanwha Chemical is actively responding to the rising market demand for safer compounds and our annual ECO-DEHCH production capacity will go up from 15,000 tons today to 65,000 tons by 2020 as we prepare to commence worldwide sales and distribution.



After eight years of research and development, Hanwha Chemical bridged the gap between durability and safety for plasticizers with ECO-DEHCH

Q5. What about the issue of plastic pollution?

Plastic is an extremely durable material that doesn't break down when disposed of. This is regarded as a negative environmental impact.

Recently a concept called the "circular economy" is attracting attention. In simple terms, a circular economic model uses resource conservation and recycling to turn disposed materials back into raw materials.

Each year, approximately 50 million tons of plastic are disposed of without being recycled. The circular economy will reduce that number as it becomes more widely adopted and gets up to speed.

We're researching how to produce plastic that will help support the circular economic model, such as converting waste plastic back into raw material that can be used to produce virgin plastic. We are also studying technology to produce plastics from raw materials created through microbial fermentation as well as biodegradable plastic which will break down into water, carbon dioxide and organic waste.

[→Read more about the Hanwha's research into sustainability here](#)

Q6. Will people continue to use plastic in the future? If so, why?

Yes, because no other material is as versatile and durable as plastic. There really is no suitable alternative to plastic and using wood-based products can lead to more environmental problems. A leading international chemical consulting firm's analysis indicates that even with recycling and tightening regulations, the demand for virgin plastic will still grow by around 3% annually.

Moving forward, the industry will take a more active role in researching safe and eco-friendly plastic to change consumers' negative perception. Combined with improvements in the circular economy, recycling technologies, and manufacturing techniques, this will positively impact the way we produce, consume, and dispose of plastics in a more sustainable way. ■

Hanwha Launches Campaign to Help Clean Vietnam's Mekong River

- Hanwha donates solar-powered boats for the Clean Up Mekong campaign to remove waste from the Mekong River
- Hanwha Chairman Seung Youn Kim reaffirms Hanwha's commitment to local communities in Vietnam



The solar-powered boats donated by Hanwha to the Clean Up Mekong campaign will use conveyor belts to quickly and efficiently scoop floating trash on the Mekong River's surface

To commemorate World Environment Day on June 5, Hanwha is launching the "Clean Up Mekong" campaign in Vinh Long Province in collaboration with the Vietnam Environment Administration and the Global Green Growth Institute (GGGI) of Vietnam. The campaign will combat the pollutants floating in the Mekong River. Central to the campaign's launch was the unveiling ceremony for solar-powered boats, donated by Hanwha, that will be used to clean the river.

The ceremony was attended by various dignitaries, including 20 representatives from 15 different government organizations. Among those in attendance were Hanwha Communications Committee President and Head Sun-Mok Choi, Hanwha Life Vietnam General Director Back Jong Kook, Senior Vice President and Head of Hanwha Techwin Security Vietnam Doo Hwan Chun, Director General of the Department of Science, Technology and International Relations, Vietnam Environment Administration Ms. Nguyen Thi Thien Phuong, Vinh Long Permanent Provincial People's Committee Vice President Tran Hoang Tu, and Deputy Country Representative of the Global Green Growth Institute in Vietnam Hanh Le.

30 local university student volunteers also attended the ceremony. After the event, everyone took part in the clean-up effort by picking up refuse out of the river.



Hanwha Communications Committee President and Head Sun-Mok Choi (center) and student volunteers cheer before doing their part to pick up trash along the banks of the Mekong River

Combating pollution with solar power

The Mekong is a trans-boundary river that runs through China, Myanmar, Laos, Thailand, Cambodia, and finally Vietnam before discharging into sea. It moves 475 km³ of water annually and supports over 70 million people who rely on it as their main source of water.

However, indiscriminately disposed waste and sewage discharge along the river's length has turned the Mekong into one of the world's ten most polluted rivers. The pollutants ultimately float into the ocean and threaten marine life. As Vietnam is the last country the river runs through, the Clean Up Mekong campaign aims to remove waste before it enters the ocean, at the riverside city of Vinh Long.

The key to the campaign's clean-up efforts will be solar-powered boats donated by Hanwha. Powered and propelled by Hanwha Q CELLS' Q.PEAK solar modules, the boats will be used to scoop up waste in the Mekong River without emitting any greenhouse gases or other pollutants. The boats are also silent, resulting in minimal disturbance to local wildlife.

This campaign is the latest in Hanwha's ongoing efforts to combat climate change and energy poverty, and to encourage responsible consumption in accordance to the United Nations' Sustainable Development Goals (UN SDGs).

The Hanwha Solar Forest campaign is another initiative to support the UN SDGs that works to combat desertification and air pollution by planting new forests with trees grown in solar-powered nurseries. This project was cited as the world-first practice for utilizing solar energy to fight desertification at the United Nations Conventions to Combat Desertification (UNCCD) COP Summit in 2011. And through its Happy Sunshine initiative, Hanwha has donated 1,779kW worth of solar power systems to 254 community development projects and isolated communities since 2011.

GGGI and Hanwha have long worked together to advance green growth and now, given the mounting challenge of solid waste in Vietnam, have come together with the government of Vietnam on this crucial campaign to clean up the Mekong. This campaign links with GGGI's other efforts to improve waste management, such as recycling, reducing and waste to energy technologies.

Ms. Nguyen Thi Thien Phuong, Director General of the Department of Science, Technology and International Relations, Vietnam Environment Administration, said, "I'm pleased that South Korea and Vietnam can work together to solve climate change and environmental issues. I'm hoping that this campaign will be successful and spread throughout the whole of Vietnam."

"I am very proud to be working with Hanwha on an innovative idea to solve the Mekong's waste problem with these solar-powered boats here in Vinh Long," said Tran Hoang Tu, Vice President of Vinh Long Permanent Provincial People's Committee. "Vinh Long will continue to use these donated solar-powered boats to keep the Mekong River clean."

"Solid waste is one of the top issues facing cities in Vietnam" added Hanh Le, Deputy Country Representative of the Global Green Growth Institute in Vietnam. "With Hanwha's solar boats, and the awareness campaign around it, we can begin to see a cleaner Mekong river, which will benefit all of Vietnam".



The clean-up boats Hanwha donated are powered and propelled solely by solar energy, without emitting any greenhouse gases or other pollutants.

Spreading awareness on environmental issues and encouraging public engagement

Ahead of the handover ceremony for the solar-powered boats, Hanwha implemented a social media campaign to raise public awareness on the environmental issues caused by water pollution. The campaign also speaks to the importance of environmentally friendly energy sources and its benefits. The campaign was aimed at supporting the UN SDGs Target 12.5 and 12.8 to

substantially reduce waste generation and to ensure that people everywhere had the information necessary for sustainable development and lifestyle that is in harmony with nature.

Vietnamese citizens were encouraged to spread the news of the campaign by uploading messages of encouragement and support on Facebook – the more messages got uploaded, the bigger a solar hero character became. As a result, 3.4 million video views and more than 9,000 shares were posted on Facebook in just a week. The awareness campaign proved to be a success.

More than just a business opportunity

Back in December of 2018, Hanwha Chairman Seung Youn Kim reiterated Hanwha's commitment to Vietnam, saying: "As a member of the local community, Hanwha won't just be concerned with how we can contribute to the economy, but also how we can help address environmental issues as well."

The Clean Up Mekong campaign builds on this commitment the chairman spoke of and bring about real progress towards cleaning up Vietnam's environment. Prior to Hanwha's solar-powered boat donation, clean-up efforts along the Mekong River were only limited to regions with resources large enough to support them. Waste would have to be manually removed from the water using boats powered by diesel or heavy oil that would inevitably add to the pollution through leaks and carbon emissions.

The boats donated by Hanwha make the clean-up effort significantly greener. Powered entirely by five high-performance Q.PEAK solar modules from Hanwha Q CELLS, they don't emit any pollutants during use. A conveyor belt system installed on board makes collecting waste from the Mekong River's surface faster and more efficient.

With regard to Hanwha's ongoing efforts to make positive environmental change, Sun-Mok Choi, President and Head of the Hanwha Communications Committee said, "As the world's top solar energy provider, Hanwha is contributing to the UN's Sustainable Development Goals through sustainable environment initiatives that utilize clean energy." He added, "In Vietnam, which is an important strategic market for Hanwha, we will set up an infrastructure that will change the way sustainable environment initiatives are undertaken in a fundamental and environmentally friendly manner." ■

Hanwha Shares Its Unique Leadership Development Program at ATD 2019 ICE

- Hanwha presented its unique Hanwha Leader Development Program – a program designed to foster inspirational leaders at ATD 2019
- Hanwha was the only Korean company selected among many others and asked to share its leadership program and best practices at the Association for Talent Development's International Conference and Exposition 2019 (ATD 2019 ICE)
- Retired General Bernard Champoux, vice president of Hanwha Defense and former commander of the Eighth United States Army in Korea, delivered the opening speech to the development program session



Vice president of Hanwha Defense Bernard Champoux presents the Hanwha Leader Development Program at the ATD 2019 ICE in Washington DC

On May 22, Hanwha showcased the Hanwha Leader Development Program – its unique and effective leadership program at the Association for Talent Development's International Conference and Exposition (ATD 2019 ICE) in Washington DC. Hanwha's program is unique because it is an assessment-based program that previously due to the amount of time required were cost-prohibitive and could not be scaled for large companies.

The ATD ICE is an annual world-renowned talent development conference. More than 10,000 talent development professionals from 80 countries attend the conference every year. Around 300 training sessions covering 14 different topics were held at this year's conference. The keynote address was given by Oprah Winfrey. Attendees not only learned about the latest trends and methodologies of talent development, but also had the opportunity to interact with experts from around the world.

Hanwha attends the ATD ICE every year to develop as well as share its human resource expertise and best practices. This year, Hanwha took the opportunity to present its highly effective leadership development program, developed in-house and used very successfully for many years.

Hanwha began the training session by discussing the difficulties around discovering and developing inspirational leaders. It was a challenge that was all

too common among the audience made up of hundreds of talent development professionals from around the world. Hanwha systematically addressed the problem and walked through its leadership development much to satisfaction of everyone attending the session.

The session was led by vice president of Hanwha Defense Bernard Champoux, the former general and commander of the Eighth United States Army in Korea. During the Q&A session, the international group of talent development professionals in the audience asked many in-depth questions, indicating a high level of interest in the Hanwha Leader Development Program.

Like most companies, Korean firms make decisions to promote employees based on three criteria: past performance, current level of competency, and amount of time spent in current role. Hanwha's Leader Development Program takes a more objective approach to assess an employee by gauging leadership abilities, management knowledge, and other attitude. When identified, the employee is trained for middle management. Hanwha's system involves an Assessment Center that allows multiple evaluators to comprehensively assess an individual's skills and competencies across multiple tasks.

During his keynote speech, Vice President Champoux emphasized that developing the right leaders can determine the success or failure of companies, just as

inspirational leadership of General Douglas MacArthur changed the course of the Korean War.

“We are a vibrant, growing Global Fortune 500 company whose decades of success in numerous competitive markets has clearly demonstrated to us the critical value of identifying and growing strong leaders.” said Vice President Champoux, giving a positive endorsement of the Hanwha Leader Development Program, adding: “Based on my experience of leading 20,000 US troops, I can say that the excellence of Hanwha’s leadership program comes from how it measures an individual’s competence and how it provides opportunities for self-evaluation and development.”

Mr. Champoux went on to say that Hanwha is investing heavily in employee leadership development on a level that would match other global companies.

The presentation focused on the critical success factors used in the Hanwha Leader Development Program. Case studies were reviewed to show that in addition to determining whether a candidate deserves a promotion, an evaluation is also used to decide the candidate’s role, management level and business unit within Hanwha.



Hanwha Leader Development Program in action. Multiple evaluators conduct a comprehensive evaluation of each candidate's leadership qualities.

At the end of the session, one HR development specialist remarked: “It was impressive to see how something like an Assessment Center that would typically require a lot of money and manpower, was modified to meet the program’s purpose and characteristics to maximize educational effectiveness while reducing costs.” ■

Hanwha Aerospace Acquires American Aircraft Engine Component Manufacturer

- Hanwha Aerospace acquires 100% stake in EDAC Technologies through USD 300 million deal
- The acquisition establishes an American foothold and allows Hanwha Aerospace to expand its business and enhance its high-tech capabilities
- Hanwha Aerospace will leverage the acquisition to make a great leap forward in its goal of becoming a leading global aerospace company



From its base in Connecticut, USA, EDAC Technologies' high-tech facilities will help expand Hanwha Aerospace's manufacturing capabilities

On June 10, Hanwha Aerospace announced that it signed a deal to fully acquire EDAC Technologies, an American aircraft engine component manufacturer. The deal is expected to be worth around USD 300 million, which will be finalized once negotiations are completed.

This is the latest step in Hanwha Aerospace's goal of becoming the global number one partner to the world's leading aircraft engine manufacturers. Hanwha Aerospace made a preliminary bid for EDAC Technologies in April of 2019 and entered a period of due diligence before making a final offer.

EDAC Technologies is an aircraft engine component manufacturer based in Connecticut, with a workforce of 590 people. It recorded USD 150 million in revenue in 2018. EDAC Technologies' primary customers are GE and Pratt & Whitney and it produces aircraft engine components such as integrally bladed rotors and engine cowling.

Through this acquisition, Hanwha Aerospace will be able to secure a foothold alongside leading global aircraft engine manufacturers like Pratt & Whitney and GE, obtain more orders, and expand its product portfolio. EDAC Technologies also provides high-end processing capabilities to make Hanwha Aerospace even more competitive.

The acquisition provides design, development, and technological capabilities for Hanwha Aerospace to become a Tier-1 supplier for risk and revenue sharing partnerships. In addition, it provides a base from which Hanwha Aerospace can expand its American operations.

"Based on the advanced technology we've acquired over the past 40 years and our product quality, we've recently entered into risk and revenue sharing partnerships,

which have high barriers of entry in the global aircraft engine market," said President and CEO of Hanwha Aerospace Hyun-woo Shin.

He added: "With our acquisition of EDAC, we will continue to expand our global presence to achieve our goal of becoming the world's number one partner in the aircraft engine industry."



Hanwha Aerospace produces advanced aircraft engine components at its flagship plant in Changwon, Korea

Due to the increasing amount of air travel and cargo volume, the global aircraft engine component market is expected to grow by 6% annually and reach USD 54.2 billion by 2025. To help foster this growth, Hanwha announced that it will invest KRW four trillion by 2022 to expand its aircraft component and defense units overseas.

Hanwha Aerospace is Korea's only gas turbine engine manufacturer. It entered the aircraft engine industry in 1979, providing maintenance services for gas turbine engines. Since then, Hanwha Aerospace has produced over 8,600 aircraft engines. ■

Hanwha Q CELLS Takes the Great British Solar Crown for the Second Year in a Row

- Hanwha Q CELLS increased its market share by 3.8% in 2018 to maintain its market leadership
- Hanwha Q CELLS meets the specific needs of British consumers and their purchasing requirements with world-class technology and high-yield products
- Hee Cheul (Charles) Kim, CEO of Hanwha Q CELLS: "We will use Hanwha Q CELLS' unrivaled technology and product quality to accelerate



High efficiency, output, and customizability has made solar modules from Hanwha Q CELLS #1 in Great Britain

For the second year in a row, Hanwha Q CELLS topped the British solar module market. According to EuPD Research, Hanwha Q CELLS was number one in the British market in 2018 with 13.6% market share, up 3.8% from 2017. This achievement reflects the ability of Hanwha Q CELLS' highly efficient and customer-oriented product portfolio to successfully appeal to the British market.

With constant demand for high-efficiency energy products and with the cost of renewable energy being similar to traditional energy sources, there were no surprises when the government in Great Britain took the lead on climate change. On May 1, the British Parliament declared the world's first climate change emergency and committed its government to achieve net-zero emissions by 2050. This turned out to be an opportunity for Hanwha Q CELLS. The company took the lead in the British market by correctly identifying and responding to the market's needs to offer customers high-efficiency solar modules and customized solar solutions. Hanwha Q CELLS launched an aggressive marketing campaign targeting local suppliers.

In order to meet British consumers' diverse needs, Hanwha Q CELLS introduced the Q.HOME, a residential solar energy solution capable of energy production, storage, and management. Hanwha Q CELLS also offered the Q.FLAT, a commercial installation platform that reduces construction time and costs.

Hanwha Q CELLS' technological capabilities are highly regarded in Great Britain. The company's high-output Q.PEAK DUO solar module won British Solar + Power

Management Magazine's Award for Excellence in 2017. And the Q.FLAT-G5 installation system won the Solar PV BOS Award at the Solar + Power Awards 2018 for revolutionizing flat roof installations – the system eliminates the need for any penetration to the roof and is instead more stable and safer once installed.

"Being number one in the British market is a testament to Hanwha Q CELLS' brand power," says Hee-chul Kim, CEO of Hanwha Q CELLS. "We will use Hanwha Q CELLS' unrivaled technology and product quality to accelerate our growth in the European premium solar market."

In October of 2018, Hanwha Q CELLS partnered with local London suppliers and agreed to supply 1.5MW of Q.PEAK DUO solar modules to Solar Together London, a residential solar power project in Great Britain. In November, just one month after signing the deal, Hanwha Q CELLS began supplying high-power solar modules to around 600 households in five boroughs of London.

[Table 1] GB Solar Module Market Share (%)

Company	2016	2017	2018	Percentage point change (2017 ~ 2018)
Hanwha Q CELLS	3.9	9.8	13.6	3.8
JA Solar	3.6	5.3	13.1	7.8
Sharp	0.0	0.4	10.1	9.7
Yingli	2.3	0.0	9.5	9.5
Canadian Solar	8.3	4.0	8.6	4.6
SunPower	3.3	5.6	7.3	1.7
Panasonic	2.4	3.9	6.2	2.3
LG Electronics	4.4	5.1	5.5	0.4
Jinko Solar	2.8	0.0	5.0	5.0
First Solar	0.0	2.2	4.4	2.2
Kyocera	0.0	0.0	2.2	2.2
Trina Solar	5.2	4.5	1.9	-2.6
Other	63.9	59.2	12.5	-46.7

*Based on a sample survey of solar module installers

(Source: EuPD Research 2018)

[Table 2] GB Power Generation Unit Price (\$/MWh)

	Coal	Gas	Nuclear	Wind	Solar
Low	65	85	202	58	86
High	110	94	240	76	104

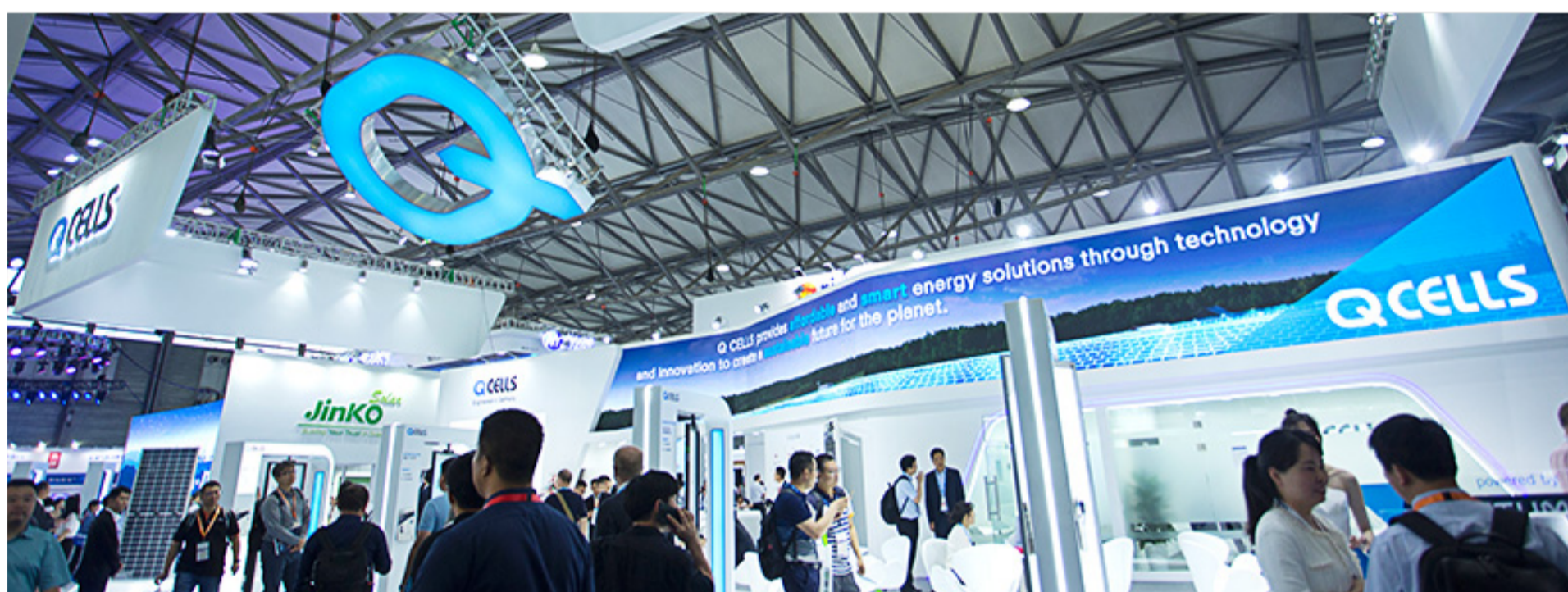
(Source: BNEF New Energy Outlook 2018 - LCOE)

[Table 3] GB Solar Market Scale (MW)

	2018	2019	2020	2021	2022	2023
Total	227	239	278	228	219	268
Residential	103	75	15	18	20	24
Commercial	46	39	33	45	54	64
Utility	78	125	230	165	145	180

Hanwha Q CELLS Displays Broad Range of Q.ANTUM DUO Modules at SNEC 2019

- Hanwha Q CELLS released its next generation Q.PEAK DUO-G7 solar module, which applies Hanwha Q CELLS' advanced Q.ANTUM DUO and 12-bus bar technologies, at the large scale solar trade show in Shanghai, China
- Other Q.ANTUM DUO module highlights included a glimpse at the Q.PEAK DUO L-G5.3/BF glass-glass bifacial module and the Q.PEAK DUO-G6, which is made using larger wafers for higher power output



Hanwha Q CELLS Co., Ltd. ("Hanwha Q CELLS" or "the Company"), one of the largest solar cell and module manufacturers in the world, participated in the SNEC 2019 PV POWER EXPO, the largest solar trade show in the world, which was held in China from June 4 to 6, 2019. Hanwha Q CELLS exhibited at booth N1-510 a broad range of Q.ANTUM DUO solar modules at the expo, which is renowned for gathering together the industry's latest technologies, extensive solar products, and integrated PV solutions from all around the world.

The Chinese solar industry continues to exert a substantial amount of influence on the international solar landscape, helping to cement SNEC's position as the industry's foremost solar power event. Immediately after last year's show, the Chinese National Energy Administration (NEA) announced the 531 policy, which undoubtedly jolted the PV industry. The implementation of the 531 policy indicates the acceleration and determination of China's grid parity process, which many expect will have a significant impact on the global industry.

However, China still managed to install 44.26 GW of new solar capacity in 2018 according to Bloomberg New Energy Finance (BNEF). This figure, while below initial expectations, still represented approximately 40% of all PV installations for the year. In 2019, the country is forecast to maintain a high volume of PV installations, thanks to the solar FIT preliminary issued by China's National Development and Reform Commission (NDRC).

Hanwha Q CELLS continues to deliver superior quality to China with the Q.PEAK DUO-G7

At SNEC, Hanwha Q CELLS introduced the Company's next-generation product, the Q.PEAK DUO-G7 solar module, which applies 12-bus bar technology with Hanwha Q CELLS' proprietary Q.ANTUM DUO technology. This module delivers outstanding and enduring high performance. The 120 half-cell product can reach a power output

of up to 335 Wp as well as an efficiency rate of up to 20.2%. The larger 144 half-cell version can produce up to 405 Wp power output, with an efficiency rate of up to 20.3%. The superior Q.PEAK DUO-G7 series is an ideal solution for all types of solar applications, from residential and commercial and industrial (C&I) to the utility sector.

Hanwha Q CELLS' Q.ANTUM and Q.ANTUM DUO Technology

Q.ANTUM technology is Hanwha Q CELLS' premium technology brand. The Company's patent-protected and unique passivation technology is a key ingredient in our Q.ANTUM modules. Additional cutting-edge technological and security features of Q.ANTUM Technology include excellent Anti-LID (light induced degradation) and Anti-PID (potential induced degradation) performance, as well as Hot-Spot Protect and traceable quality with Tra.Q Laser Identification, to protect against counterfeiting. Q.ANTUM DUO technology adopts these characteristics in a half-cell architecture, complete with innovative wiring interconnection.

Q.ANTUM and Q.ANTUM DUO technology ensures that Hanwha Q CELLS' modules are able to achieve remarkable output in performance and quality. This pioneering technology is also a firm market favorite, and, in May of 2019, Hanwha Q CELLS surpassed the production volume threshold of 15 GW of Q.ANTUM solar cells and modules since first commercializing this technology in 2012. This milestone demonstrates Hanwha Q CELLS' leadership position in the area of PERC-based technology.

Besides the Q.PEAK DUO-G7, Hanwha Q CELLS also presented a number of other advanced Q.ANTUM DUO products at SNEC. The Hanwha Q CELLS booth (N1-510) included a prototype of the Q.PEAK DUO L-G5.3/BF – a bifacial, glass-glass monocrystalline solar module, as well as the Q.PEAK DUO-G6, which is manufactured with larger wafers for a power increase of around 6%. Also on display was the Q.PEAK DUO BLK-G5 all black solar module and the Q.PLUS DUO RSF L-G5.3, which is a multi-crystalline half-cell solar module with an innovative steel frame. ■

Explore this month's news of Hanwha and its affiliates, taking the initiative in all corners of the world.



United States of America



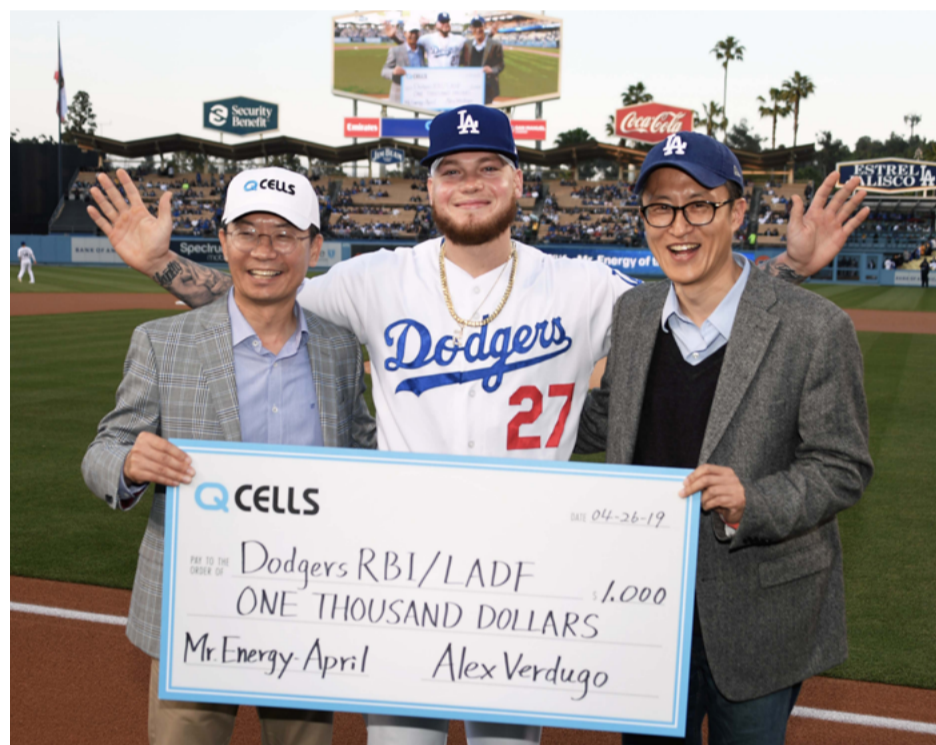
Hanwha Q CELLS America Inc.

Hanwha Q CELLS America Inc. Takes Solar Out to the Ballgame

Hanwha Q CELLS America Inc. signed a multi-year partnership with the Los Angeles Dodgers baseball team to promote both the company and solar energy at Dodger Stadium. Through this partnership, Hanwha Q CELLS America Inc.'s branding will be prominently displayed throughout the stadium during home games, and the company will collaborate with the team on a number of promotional campaigns.

This is a great opportunity for Hanwha Q CELLS America Inc. to further promote the benefits of solar energy in the state of California, currently the United States' leading user of solar energy, and to Dodgers fans around the world.

Learn more about the partnership and branding campaign on Facebook at: www.facebook.com/QCELLSNorthAmerica



China



Hanwha Total Petrochemical Co., Ltd. Holds Special Customer Events at CHINAPLAS 2019

Hanwha Total Petrochemical Co., Ltd. impressed visitors at CHINAPLAS 2019, the world's third largest plastic trade show, in Guangzhou, China. 3,400 exhibitors from 40 different companies participated in this year's CHINAPLAS event, with 180,000 visitors streaming through the venue.

For four days, from May 21 to May 24, Hanwha Total Petrochemical Co., Ltd. held special technical seminars and threw a banquet to strengthen the company's ties with customers.

85 participants from 50 customer companies attended Hanwha Total Petrochemical Co., Ltd.'s technical seminars. They got to examine product samples and learn how to best utilize the products in Hanwha Total Petrochemical Co., Ltd.'s extensive catalog. Sessions jointly conducted with a processing machinery company were particularly well-received.

Jean-Marc Otero del Val, Hanwha Total Petrochemical Co., Ltd. EVP, also welcomed



147 customers from 88 companies to the banquet, thanking them for their continued support and promising to continue providing top-notch products and services by making new investments and expanding production facilities throughout 2019 and 2020. The banquet featured a variety of performances and concluded with a lucky draw with special prizes for the winners.

Following the success of these customer outreach efforts at CHINAPLAS 2019, Hanwha Total Petrochemical Co., Ltd. plans to continue organizing special events and seminars to help maintain a high level of customer satisfaction.



Saipan



Hanwha Hotels & Resorts

Saipan World Resort

Fun in the Sun for Kids at Hanwha Saipan World Resort

Hanwha Saipan World Resort recently opened its doors to all children, offering them a day of fun and adventure in celebration of Children's Day. The resort's Waterpark and Kids Prim Team planned a jam-packed day for the kids, including an obstacle course, a water balloon fight, mask making sessions, and a host of other fun and games. Guests of all ages staying at the resort were also provided with free cotton candy by the culinary department.

Mike Babauta, Team Manager with Hanwha Saipan World Resort's Local Sales & Marketing and Kids Prim, declared the event to be a runaway success, with the



kids particularly enjoying the free cotton candy. He hopes that everyone who enjoyed Children's Day at the resort will come back next year for even more fun in the sun. ■