2023 BUSINESS CLIMATE ACTION CASES

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Editor's Note

Climate change stands as a shared challenge, impacting individuals worldwide. Its mitigation holds profound implications for the sustainable development of all nations and the collective destiny of humanity. Notably, advancing the "dual-carbon" campaign in China has propelled climate action to a more prominent position on the national governance agenda. This progression is marked by a continuous and intensified commitment to reducing carbon emissions and reinforcing NDC targets, showcasing China's dedication to addressing climate change. Effectively addressing climate change demands collaborative efforts from all sectors of society, with businesses playing an indispensable role. Chinese enterprises have proactively charted low-carbon development paths attuned to local contexts, engaging in autonomous technological upgrades for enhanced energy conservation and efficiency. Their endeavors extend to facilitating industrial chains' green and low-carbon transformation, thereby contributing China's unique wisdom and strength to the global response against climate change.

In a collaborative effort, the C Team and the Center for Environmental Education and Communications of Ministry of Ecology and Environment have co-sponsored the initiation of the collection, screening, and dissemination of 2023 business climate action cases.

Following rigorous review and expert appraisals within the industry, this year's case collection comprises 26 projects spotlighting corporate innovation and emission reduction. These initiatives span diverse sectors, encompassing the transformative landscape of the manufacturing industry, transportation restructuring, energy clean-up, green finance, sustainable consumption, and more. This compilation showcases the cutting-edge transformation experiences of enterprises in their respective fields, featuring a wealth of creative ideas and solutions tailored to address industry-specific challenges. These cases not only pinpoint pain points in the transformation process but also offer practical and impactful paths for industry-wide transformation, underlining their potential for significant impact and scalability.

While serving as a demonstrative platform for the progress and outcomes of numerous emission reduction projects, this casebook acknowledges its limitation in fully capturing all participating businesses' expansive efforts and potential in their green transformation endeavors. The intention is to provide a snapshot, showcasing the determination, wisdom, and impactful actions demonstrated in the transformation campaigns of select industries and businesses. We aspire for this casebook to act as an inspiration, offering a glimpse into the transformative journey of these enterprises and motivating a broader spectrum of businesses to actively participate in innovative emission reduction initiatives. Through collective efforts, we aim to achieve the ambitious "dual carbon" targets collaboratively, fostering a shared commitment to sustainable practices and environmental responsibility.

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November 2023

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Leading low-carbon transformation of the consumer goods industry – Danone Beverages China achieves carbon neutrality across all its plants

Danone Beverages China

Project Overview

As a leading global food and beverage company, Danone has been long dedicated to green operation under "One Planet. One Health" vision and "Impact Journey" sustainability framework.

In early 2022, Danone Beverages China (DBC) Wuhan and Qionglai plants received the PAS2060 carbon neutral certification from SGS, an international testing and certification organization, becoming the first two carbon-neutral plants in China's beverage industry. In 2023, Mizone, DBC's main brand, achieved carbon neutrality across all its plants located in China. The completion of carbon-neutral plants not only provides a valuable solution for green development in the consumer goods industry and contributes to China's 30/60 dual carbon goals.

As early as 2008, DBC has adopted a forward-looking approach to track and calculate carbon emissions across the entire product life cycle. The company is actively exploring methods of green and low carbon operations and achieve many breakthroughs in green power generation, energy efficiency enhancement, packaging optimization, negative emission technology investment, green supply chain implementation and public advocacy.

DBC continue to explore carbon reduction opportunities in entire value chain through empowering. In 2023, DBC co-launched the "One Planet" carbon reduction pledge with nearly 100 of its upstream and downstream suppliers in China, committing to drive carbon reductions and achieve net-zero goals in 2050.

Company/Organization Profile

Danone Beverages China has been deeply involved in the Chinese market for more than 20 years with the main product of Mizone. As the pioneer and market leader of vitamin drinks in China, Mizone has been committed to continuously bring healthier and higher quality products to consumers in the 20 years. At present, the annual production capacity of DBC is over 2 million tons with 5,000 employees in China.

Danone Beverages China adheres to its social responsibility and committed efforts in carbon reduction, green operation, sustainable packaging and circular economy, nutrition and health and contribute to the successful realization of the "Beautiful China" and "Healthy China" strategic goals.

So far, all DBC plants have obtained national or provincial-level "Green Plant" certification and zero waste to landfill certification (highest "3-star" level). All DBC plants have certified as carbon neutral in 2023.

Project Outcome

1. All DBC Plants have utilized 100% green electricity and DBC has installed photovoltaic facilities in all its plants with suitable climatic conditions, contributing more than 20% of the plants' total electricity. Danone also purchases clean energy, such as green steam, resulting in an average 66.3% green energy usage rate across production sites.
2. For Mizone beverages, the average energy consumption per unit has decreased by 72.2%. The production carbon emission intensity, covering Scope 1 and 2 emissions, has been reduced by 92%. These efforts have led to a carbon emission reductions of 180,000 tons, based on the output in 2022 compared to the baseline in 2004.
3. In terms of green logistics, Danone Beverages China promotes the use of electric vehicles in various cities, including Wuhan, Zhengzhou, Chengdu, Shenzhen, Shanghai, Xi'an, Xianyang, etc. The utilization rate of electric vehicles in Wuhan and Chengdu has reached 66% and 46%, respectively, and 16.5% for nationwide urban distribution. DBC aims to increase the proportion of electric vehicles in urban distribution progressively.
4. DBC has implemented a set of effective water management policies. In comparison to the 2004 baseline, the water consumption per bottle of Mizone has decreased by 66%. This achievement has resulted in cumulative water savings exceeding 2.18 million tons. Beyond internal water conservation efforts, Mizone plants also employ advanced wastewater treatment methods, the wastewater that meets relevant water quality standards is provided to local municipal departments for urban road cleaning and landscape irrigation.
5. In 2023, Danone initiated the industry leading "One Planet" Carbon Reduction Pledge. Nearly 100 suppliers have been participated and start taking carbon reduction initiatives.

Project Highlights

Danone Beverage China's commitment to sustainable development has been recognized by external stakeholders and received notable recognitions in recent years, including:

1. All 5 DBC plants have obtained national or provincial level "Green Plant" certification
2. 2023 Paulson Prize for Sustainability Award with "Green Innovation" Category
3. 2023 Sustainable Business Award as Environmental Pioneer by European Union Chamber of Commerce
4. 2023 Low Carbon Pioneer Award by Southern Weekly, a prestigious Chinese media organization
5. 2022 Sustainable Business Award as Decarbonization Pioneer by European Union Chamber of Commerce
6. A role model case in the Third Batch of the China Green Supply Chain Development Report developed by the Ministry of Industry and Information Technology of China in 2022
7. A selected role model case in the report released by UN Global Compact: "Corporate Climate Target Setting, Action and Global Collaboration towards A Net-Zero Future" in 2022
8. A selected role model case in the "Sustainable China Industrial Development Action" publication by the Asia-Pacific Economic Cooperation (APEC)
9. Since 2019, Danone China consistently ranks 1st in The Institute of Public & Environmental Affairs (IPE) Green Supply Chain CITI Index Ranking for the food and beverage industry and ranks 1st in the CATI Climate Action Index of 2023.

Project Implementation

Since the founding of Mizone in 2003, DBC has started its low carbon exploration and transformation journey. Over the past 20 years, the company made progress by strengthening corporate energy management, technological innovation, and supply chain transformation. In 2023, all its plants have achieved carbon neutral, with main projects as follows:

1. Green Energy

DBC is increasing investment in green energy, all DBC plants have utilized 100% green electricity. Rooftop photovoltaic facilities are installed at all DBC plants that meet the climatic conditions with a total installed capacity of 13.26 MWp and a maximum annual power generation of 11,400 MWh. DBC also purchases clean energy, such as green steam, resulting in an average 66.3% green energy usage rate across production sites.

2. Packaging Innovation

DBC is exploring more environment-friendly packaging materials and reducing the use of plastic by improvements in materials and techniques. DBC is doing this while ensuring high packaging quality and consumer experience.

On World Environment Day 2022, DBC announced its collaboration with LanzaTech—a pioneering company specializing in carbon capture and conversion—to invest in the research and development of innovative technology for producing new packaging materials. LanzaTech's cutting-edge "carbon capture" technology utilizes microorganisms to convert carbon monoxide and carbon dioxide found in carbon-rich gas sources into raw materials for PET bottle production. This process will significantly reduce petroleum usage and mitigate the environmental impact of carbon emissions.

3. Reduce Pollution and Carbon Emissions

DBC has implemented a set of effective water management policies and have made great progress step by step in saving water resources by maximizing RO water production and reclaimed water, improving the efficiency of CIP system. Beyond internal water conservation efforts, Mizone plants also employ advanced wastewater treatment methods, the wastewater that meets relevant water quality standards is provided to local municipal departments for urban road cleaning and landscape irrigation. In comparison to the 2004 baseline, the water consumption per bottle of Mizone has decreased by 66%. This achievement has resulted in cumulative water savings exceeding 2.18 million tons.

DBC implemented the waste management actions encapsulated in the 7R Principle (Recognition, Regulation, Reduce, Reuse, Recycle, Recovery, Refuse) and actively managed the recycling and reuse of waste. 2021, DBC plants have all achieved zero waste to landfill certification.

4. Digital Transformation

In 2018, DBC's Zhongshan plant started the "Digital Factory" transformation by applying real-time monitoring, warehousing, order management, and transportation management, achieving "end-to-end" digital management from planning and production to sales. Thanks to digital efforts, the Zhongshan plant reduced energy consumption by 15% over the past three years. Moreover, DBC Wuhan plant was recently recognized as a role model of "the first batch of 5G fully connected factories in Hubei Province in 2023" by the Hubei Provincial Department of Economy and Information Technology.

5. Green Supply Chain

To achieve net-zero emissions throughout the entire value chain by 2050, DBC co-launched the "One Planet" carbon reduction pledge with nearly 100 of its upstream and downstream suppliers in China, committing to promote green operation, set emission reduction targets, improve energy management system, and drive carbon reductions and achieve net-zero goals.

Danone works with the Institute of Public and Environmental Affairs (IPE) to review suppliers' records of environmental compliance and require them to take corrective actions in case of any violation. Danone also encourages suppliers to participate in the Pollutant Release and Transfer Register Program (PRTR) to make their environmental performance more transparent.

Danone has participated in IPE's Green Supply Chain Program since 2017 and has ranked No.1 in CITI (Corporate Information Transparency Index) of the food and beverage industry for 5 consecutive years.

6. Public Advocacy

In 2020 and 2021, DBC launched "LOOP" and "Mizone Huanjin Green Action for College Students" campaigns. By placing smart bottle recycling machines, DBC aims to inspire younger generations in environmental protection, encouraging them to lead green and low-carbon lifestyles. Students from 15 colleges and universities actively joined this initiative. Nearly 80 environmental protection activities were organized by students, with almost 10,000 participants. The campaign reached a cumulative audience of more than 2.18 million people through campus promotions and social media communications.

In 2022, DBC's "Wuhan Green Factory Exhibition Hall" opened its doors. Within the past year, 182 groups from government agencies, enterprises, institutions, media outlets, and schools, with over 4,300 individuals, have visited. This exhibition hall has effectively raised public awareness of the low-carbon lifestyle. As a flagship plant of Danone Beverages China, the Wuhan plant has received various recognitions, including state-level "Green Plant," Water-saving Industrial Enterprise, Outstanding Energy-saving Enterprise, Wuhan's Role Model Factory of Green and Low-carbon Development, and Food Safety Education Center, etc. Leveraging the plant, DBC has held engaging and customized science education activities and promoted industry exchanges. It also designs collaborative programs with universities to foster industry-academia-research synergy in low-carbon transformation.

In 2023, Danone Mizone introduced innovative action on its bottles after achieving carbon neutrality across all plants—a smiley face with the text "From carbon neutral factories" vividly displayed on all Mizone bottles. Danone encourages consumers to live a healthy, low-carbon, and environmentally friendly lifestyle through these actions. It also advocates for the public to pay attention to plastic recycling and embrace green consumption, contributing to a thriving circular economy.

Project Impact & Sustainability

Currently, many domestic consumer goods companies are in the early stages toward carbon peak and carbon neutrality. Knowledge gaps in carbon neutrality still make it challenging for the industry to develop suitable carbon neutrality goals and roadmaps.

Danone Beverages China's exploration and efforts in carbon emission reduction and low carbon transformation have provided excellent examples for the industry and other companies. Danone optimizes its operations and implements energy-saving measures to increase efficiency and transition to a more sustainable energy usage structure. It assesses the environmental performance of its upstream suppliers and advocates for low-carbon practices in the downstream consumption chain, driving the entire value chain toward carbon neutrality.

Through cross-industry collaborations, DBC empowers its upstream and downstream suppliers. Its tailor-made "low-carbon supply chain" training programs have benefited 324 individuals from these suppliers in 2022 and 2023. The initiative fostered the exploration of packaging innovation and recycling opportunities.

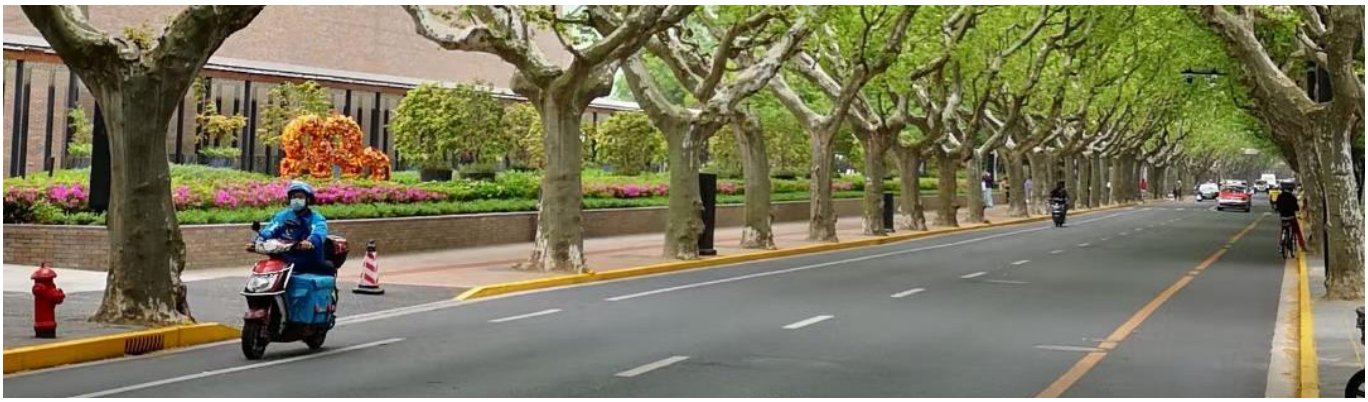
In 2023, DBC initiated the industry-leading "One Planet" Carbon Reduction Pledge, with the participation of nearly 100 suppliers. According to the latest survey, more than 50 suppliers have established greenhouse gas emission control targets. In comparison, 73 suppliers have initiated energy-saving and emission-reduction projects, such as adopting energy-efficient equipment, phasing out high-energy-consuming processes, and implementing waste heat recovery systems. Moreover, 54 suppliers have designated specific carbon emission or energy management roles within their organizations.

Furthermore, under this pledge, some of the suppliers have been inspired and implemented green operations and achieved carbon-neutral factories, such as Zijiang Enterprise.

We believe that with long-term empowerment and collaborations through multiple stakeholders, more "carbon-neutral" plants are expected to emerge within Danone's entire supply chain.

Expert Comments

> Green and low-carbon production methods, along with green supply chain management, are crucial tools for implementing the dual-carbon strategy. Domestic consumer goods companies vary in their awareness of dual-carbon targets, with most of their carbon reduction efforts still in the early stages. Through initiatives such as green supply practices, packaging optimization, enhanced energy efficiency, green logistics, and effective water management, Danone Beverages China has achieved significant energy savings and efficiency gains. This has led to the upgrading of the energy-use structure, empowerment of the upstream supply chain, and the provision of training to suppliers across the chain. These outcomes have facilitated a carbon-neutral transformation across the entire industrial chain, setting an example for industry peers to follow a green and low-carbon development path.



Ele.me “a little carbon” program promotes carbon emission reduction on the consumption side

Ele.me (Alibaba Local Services Group)

Project Overview

Alibaba Local Services company actively fulfills its social responsibilities and works with all parties to promote green and low-carbon consumption. After setting the carbon emission reduction target in December 2021, Alibaba Local Services has been working on the calculation of reduced/avoided carbon emissions for low - carbon scenarios such as “Don’t need cutlery” and “small-portion meals”, then began the set-up of a consumer carbon ledger platform. In April 2022, a consumer carbon ledger platform - the “a little carbon” project was launched on its catering delivery app Ele.me, exploring the establishment of a closed loop of “individual-platform-carbon neutrality”. If everyone chooses low-carbon consumption, and contributes a little carbon emission reduction, many a little makes a mickle, the reduced carbon emissions can be added up, and consumers can develop the low-carbon consuming habit.

The “a little carbon” project solves the problem to a certain extent that it is difficult to measure the quantity of reduced/avoided carbon emissions on consumption side. At the same time, it actively promotes public participation. On the one hand, it lowers the threshold for individuals to participate in low-carbon consumption, and distributes carbon reduction credits for each low-carbon behavior ; on the other hand, consumers can exchange carbon emission reduction credits for rewards or participate in public welfare projects, such as redeeming the credits for environmentally friendly tableware, donating to forest protection projects, etc. Through those engagements, Ele.me continues to increase the number of green consumers and the penetration rate of green consumptions on the supply side. Since the launch of the ”a little carbon” project , more than 70 million consumers on the Ele.me APP have selected “Don’t need cutlery” and “small-portion meals” to participate in carbon emission reductions , with a cumulative emission reduction of more than 50,000 tons .

Company/Organization Profile

Alibaba Local Services company was established in October 2018. It includes business segments such as Ele.me, Koubei, Hummingbird Instant Delivery, and Keruyun. It provides food and beverage retail takeaway, in- store living services, and merchant digital services, which collaborate closely with Tmall, Youku, Hema and other Alibaba ecological business units. As of December 2022, the platform business covers more than 2,000 cities (including cities and counties) across the country, with 370 million annual transaction users and more than 1.1 million monthly active delivery riders.

Project Outcome

1. **Promote the reduction of carbon emissions on consumption side.** From April 2022 to September 2023, there has been more than 70million customers participated in low-carbon consumption, of which the cumulative reduction of carbon emissions is more than 16,000 tons.
2. **Collaborate with merchants to reduce the plastic pollution and use of wood.** Eleme requires all millions of merchants to provide “Don’t need cutlery” option for customers. Also, Ele.me established a sub-management system to push merchants’ to take actions in environmental protection. By the end of Oct 2023, Ele.me had delivered more than 1.4 billion orders for “Don’t need cutlery” , which greatly reduced the amount of single-use plastic tableware used in the takeaway industry by about 7,000 tons , effectively helping “white pollution” control. Also, this measure has reduced the use of disposable wooden chopsticks by about 14,000 tons. After the “a little carbon” project was launched, the number of users who chose “Don’t need tableware” has increased significantly by around10%.
3. **Promote the reduction of food waste.** In September,2022, Ele.me added small-portion meal into the carbon emission reduction scenario. Through providing this option, the “a little carbon” project is estimated to reduce food waste by about 20,000 tons and carbon emissions by about 75,000 tons within one year.
4. **Environmental protection and public welfare.** Ele.me cooperates with Ant Forest to use the credits obtained from environmental protection projects for public welfare, which is equivalent to planting more than 1 million Haloxylon ammonica trees in desertified areas, improving the local ecological environment. In June 2023, Ele.me launched Green Power program with the support of China Foundation for Rural Development to donate green electricity to rural schools, aiming to improve the food cooking and heating system. So far, the electricity donated by Ele.me can support the electric kitchen equipment to cook about 20,000 meals for students.

Project Highlights

1. **Promote the formulation of green and low-carbon standards on consumption side.** Jointly with China Packaging Federation, Ele.me set the group standard “General Specifications for Takeaway Food Packaging” (T/CPF 0057-2023) in July 2023, as well as issued green design guidelines for merchants, focusing on resource conservation and recycling from the source to the end. Together with the Central Environmental Protection Federation and Green Inclusive, Ele.me set the industry’s first group standard “Guidelines for the Accounting of Carbon Emission Reductions in the Catering Industry to Reduce Food Waste” (T/ACEF 059—2023).
2. **Delivered speech at China Pavilion during COP27.**
3. **Awarded the “2023 ESG Case” by People’s Daily in May 2023.**
4. **Awarded the”10 Tech and Innovation Cases of Digital Tech Empowerment for Green Transition” by China Association of Circular Economy in June 2023.**
5. **Awarded “Green Co-Builders” by the 19th Asian Games .**
6. **Participated in carbon inclusion programs and recognized by local governments:** During 2022 and 2023, we participated twice in the “Beijing Green Life Season” campaign guided by the Beijing Municipal Development and Reform Commission. During 2023, participated in carbon inclusion programs organized by Zhejiang Province, Shanxi Province, Jinan, Wuxi, and Ningxia Province.

Project Implementation

1. Strategy planning
   As an instant e-commerce platform, Eleme follows Alibaba's decarbonization strategy and actively promotes carbon reduction works in various fields accordingly. Relying on the business operation in more than 2,000 cities and counties, cooperation with millions of merchants, and services for more than 300 million consumers across the country, Eleme cooperates with all parties to continuously explore and optimize the model of low-carbon consumption.

   Eleme has established a carbon reduction committee, which is led by the president and consisted of dozens of staff including department heads and execution team from marketing, government affairs, CSR, technology and product departments.
2. Development of Carbon Calculation Methodology and Fulfil Industry Gap
   According to the report of the Chinese Academy of Sciences, the carbon emissions generated by household consumption account for 53% of the total. However, how to calculate the carbon emission of household consumption, how to obtain recognition and rewards and have a closed-loop effect, all of those need to be standardized and marketed, as well as be coordinated nation-wide. In December 2021, Eleme and professional organizations began to develop carbon calculation methodologies for carbon emission reduction scenarios on consumption side, including the carbon emission reduction calculation for "Don't need tableware" in cooperation with the Tianjin Carbon Emissions Exchange, and "small-portion meal" and "expiring food" in cooperation with the China Environmental Protection Federation, and carbon emission reduction calculation for takeout ordering scenarios in cooperation with Beijing Environment Exchange, etc. Those calculation methods have been developed into group standards and fulfilled the industry gap.
3. Product Design
   On the consumption side, when placing an order, you must make the choice about "quantity of cutlery", otherwise the order cannot be placed. At the same time, Ele.me recommends the option of ""Don't need cutlery" with providing carbon reduction credits and Alipay's "Ant Forest" "Green energy reward. Since the launch of the project, the amount of consumers selecting "Don't need cutlery" has increased by 10%. Likewise, when consumers choose a smaller meal, they will see a carbon credit reward message when they submit their order. Eleme added a "type" for single-meal and small-portioned meals, which attracts nearly one million merchants to participate. And the sale of small-portioned meals has increased by 30% year on year, which reduces the food waste of about 20,000 tons.

   Open Platform: At present, "a little carbon" program is connected with Taobao "88 carbon account", where consumers can accumulate carbon emission reduction credits across platforms for redeem. At the same time, consumers can get carbon reduction credits by placing orders about "Don't need tableware" and "small-portion meal" in the Ele.me mini program of Alipay and Taobao.

   Technology Innovation: For "Joint-Delivery" option, Eleme has successfully gotten the authorization for the patent of 2 industrial designs (Patent No. ZL 2022 3 0823373.4; ZL 2022 3 0826510.X)
4. Promotional activities
   In the important environmental protection themed days and public welfare activities, as well as the 19th Asian Games, Ele.me invites consumers to participate in the above projects through various forms such as knowledge quizzes and red-envelope rewards, and continues to improve the public awareness of environmental protection.

   In November 2022, Ele. me was invited to attend COP27 and share emission reduction practices.

In 2023, Eleme cooperated with local governments on green inclusive campaigns such as Jinan, Wuxi and Beijing. In July, Eleme got 380 million views on the environmental knowledge puzzle at Weibo.

In 2023, Ele. me Launched the Low-Carbon Asian Games Campaign

As the official electronic food ordering platform of the Hangzhou Asian Games, Eleme launched two Asian Games gifts: e-sports mouse pad and stainless tableware set, which are made of environmentally friendly materials. Consumers can win the gifts as long as they finish the in carbon reduction challenge in their Eleme carbon account. Ele. me issued a total of more than 7,000 copies of the Asian Games gifts.

Eleme's Asian Games gifts have also been included in the "Low carbon account" activity in the Asian Games Village, where the athletes and staff in the village can redeem through corresponding carbon reduction behaviors. Eleme also won the honorary title of "Asian Games Village Carbon Account Green Co-Builder".

Eleme launched a Low-Carbon Partner Plan, and first reached a low-carbon strategic cooperation with Yili Jindian.

Eleme will also continue to apply the scientific carbon reduction standards with actual consumption scenarios, empower more partners and continue to invest in plastics reduction, packaging upgrade, plastics recycling etc. Eleme will link upstream and downstream, and to work with more ecological partners to promote the industry green transformation.

Project Impact & Sustainability

1. **Ele.me and professional institutions carry out carbon emission reduction calculations for reduction of food waste, filling gaps in the industry.** In Feb 2023, jointly with All-China Environmental Protection Federation, we released the group standard "Guidelines for Quantitative Accounting and Management of Food Waste Reduction in Carbon Emission Reduction in the Catering Industry" (T/ACEF 059—2023). This is the first group standard on carbon calculation for food waste in the industry.
2. **Exploration of green packaging standards and carbon calculation. In July 2023, Ele.me and the** China Packaging Federation jointly released the the group standard of "General Specifications for Takeaway Food Packaging" (T/CPF 0057-2023) initiated by Ele.me was publicized for comments. Ele.me now is working with carbon reduction experts to explore possible way of carbon calculations consistent with the above-mentioned green packaging standards.
3. Ele.me will **cooperate with local carbon inclusive mechanisms** , such as giving keynote speech in the 2022 National Low-Carbon Day activity held by the Ministry of Ecology and Environment, participating in Zhejiang carbon inclusive platform, Beijing green life season , Shanxi three Jin low carbon project, etc.
4. Ele.me Launched the **Low-Carbon Partners programs** to explore the cooperation in low-carbon consumption with more brands. Ele.me's first Low-Carbon Partner is Jindian Milk, which provided low-carbon gifts during the 19th Asian Games. Ele.me will cooperate with more brands on green transition.

Expert Comments

Ele.me's "a little carbon" consumer-side carbon emission reduction campaign aims to establish a closed loop of "Individual-Platform-Carbon Neutral." This initiative has led to the development of relevant standards, resulting in significant carbon reduction and environmental benefits, while also encouraging public engagement. Widely recognized and recommended by institutions like the Green Inclusion Carbon Neutral Promotion Center, the campaign is praised for its technical innovation and scalability, setting a positive precedent in the field.

Wumart's IES digital energy management reduces wastage and boosts efficiency

Wumei Technology Group

Project Overview

The stores of retail chains are characterized by wide distribution, large number, high level and hybrid energy consumption, with the common energy consumption mediums including water, electricity, natural gas, diesel fuel, heating, refrigerant and so on. This raises challenges with global management as most of the equipment is not online, and there lacks specialized energy management personnel, making it difficult to deliver the various types of energy consumption assessment tasks set by the head office. There are also many sub-systems of power consumption equipment, which obscures the exact power user, such as air conditioning, lighting, cold chain, back kitchen, leased area, office area and other sub-systems.

Taking a large domestic supermarket as an example. With nearly 100 stores nationwide distributed in more than 50 cities, the total annual electricity consumption is around 170～200 million kWh which, at RMB0.7/kWh, works out to an annual power bill of about RMB120～140 million.

Even for small convenience stores, there is energy consumption within different systems such as air-conditioning, refrigeration, lighting systems, and on-site production and sales systems. But power consumption is only monitored on an aggregate basis, with no sub-system monitoring in place.

Based on the above industry insights, Wumart proposes a set of overarching solutions based on energy consumption digitization, i.e., there are three major application directions in energy efficiency management for the retail industry, namely, energy storage, renewable energy and energy saving, and the three solutions are fused into one to achieve comprehensive digital and intelligent energy efficiency management. Currently the energy saving rate stands at north of 10%, enabling environmental protection and emission reduction while reducing the cost of business operations. It helps corporate governance to improve business efficiency, optimize the relevant manpower by 30%. Efforts will also be made to secure a 20% subsidy for energy saving investments. Upon store-wide application the loss rate is expected to be reduced further across the board. Store asset utilization rate to be increased by 30%, equipment life cycle increased by 20%, annual asset procurement costs decreased by 30%, equipment management staff reduced by 50%, frozen goods loss rate reduced by 80%.

Company/Organization Profile

Wumart Group, founded by Dr. Zhang Wenzhong in 1994, is one of the largest and earliest-developed omni-channel digital distribution companies in China, with famous brands such as Wumart, Merrymart , METRO China, B&T Home, Xinhua Department Store, Chongqing Department Store, under its belt. It has more than 1,800 multi-format stores nationwide, with an annual sales of over RMB100 billion. The company has been selected as one of China's top 500 enterprises for 22 consecutive years, and has led the rapid growth of China's retail industry and technological innovation. The company remains focused on the public's livelihoods and has built up a digitalized supply chain centered on groceries, with over 70% of produce directly sourced from the place of production. Wumart rolled out a modern distribution system, and has successfully acquired and integrated the China-based operations of Fortune 500 companies (METRO AG (Germany) and B&Q (UK)) over the past few years, as well as participating in the mixed-ownership reform of Chongqing Commerical Society/Chongqing Department Store. The company has launched a digitalization campaign to promote the integration of online and offline operations. Wumart Group has become one of the top 500 companies in China's digital economy sector.

Project Outcome

1. The energy saving rate is greater than 10%, which delivers environmental protection and emission reduction while reducing the cost of business operations.
2. It helps corporate governance to improve business efficiency, optimize the relevant manpower by 30%.
3. Subsidize energy-saving investments by 20%.

Project Highlights

The project provides data support for managing the dual-carbon targets and helps to provide the basis for ESG information disclosure for businesses' energy conservation and carbon reduction efforts. The access to data on government energy consumption platforms helps monetize regional policy incentives, reducing the cost of energy-efficient upgrades for businesses. After the launch, the system is connected to Shanghai National Energy Platform for an application for special subsidies, whereby regional stores could receive energy management hardware and software investment subsidies of 20%.

Project Implementation

The stores of retail chains are characterized by wide distribution, large number, high level and hybrid energy consumption, with the common energy consumption mediums including water, electricity, natural gas, diesel fuel, heating, refrigerant and so on. This raises challenges with global management as most of the equipment is not online, and there lacks specialized energy management personnel, making it difficult to deliver the various types of energy consumption assessment tasks set by the head office. There are also many sub-systems of power consumption equipment, which obscures the exact power user, such as air conditioning, lighting, cold chain, back kitchen, leased area, office area and other sub-systems. Taking a large domestic supermarket as an example. With nearly 100 stores nationwide distributed in more than 50 cities, the total annual electricity consumption is around 170～200 million kWh which, at RMB0.7/kWh, works out to an annual power bill of about RMB120～140 million. Against this background, Wumart has devised a set of fully digital and intelligent solutions to enable comprehensive management of energy efficiency. That is, an integrated solution covering energy storage, renewable energy and energy saving dimensions.

1. Multi-point energy management helps supermarkets with digital and intelligent energy management

The multi-point intelligent energy management E-iot uses AIoT technology to digitize store energy consumption data and incorporates the same with energy management practices to uncover inefficient and wasteful areas for refined management of energy and digital and intelligent operation, systematically improving the efficiency of energy use in three aspects: cost, efficiency and experience. The main functions in this system are: data comparison, data analysis, cost statistics, weekly energy consumption report and business alerts. Through data comparison, the energy consumption of each store is visible. And through the function of data analysis, we can visualize the electricity consumption of the store, reflecting the energy consumption of each functional area in the store and how the figures compare, including like-for-like growth and reduction rate. And the energy consumption weekly report is concluded, i.e., the Dmall APP fills in the cost of each energy consumption system and sums up multi-store cost statistics for viewing, meter usage, and the comparison between the consumption data. In the event of energy consumption exceeding the threshold, the business alert function will generate the information, i.e., the limit breach alarm. One of the operating mechanisms is that the system will batch import alarm rules, and the Dmall APP will push alarm notification according to this rule, which is cascaded up through stores, regions, and headquarters.

2. Take Wumart Store X as an example, the specific case implementation process is as follows

There are many roles and corresponding access in the system in each store. The first is the role-specific access, or the visible function access. Each role contains many function access items. The employee can only view the corresponding function once they are assigned to a role and logged onto the APP/P/PC terminals.

The second one is role: if an employee needs to receive tasks, approvals and messages from the business system, they need to be assigned to specific roles. The roles are system positions, and each position and business system has been preset. For the energy consumption weekly report and alarm notification, tasks are pushed through the roles, which are divided into [Head Office Energy Management], [Regional Energy Management] and [Property Manager].

The third is the data scope: data access defines the scope of data that can be viewed, which decides how many stores employees can see the data of; for example, the head office manager can have access to the data of all stores, regional managers can view the data of the stores under their jurisdiction, and store property managers can access the data of the stores where they are located.

With the corresponding roles and positions, employees or managers can access the corresponding function list, such as the OS basic configuration function, which is a non-energy management feature and an OS standard function that requires personnel access. It is mainly used for the maintenance of store area information.

The system's menu structure: this functional module provides a clear view of the energy consumption levels, costs, energy alarms and the overall weekly report of the store. For example, the energy dashboard displays details of the store's energy consumption, the trend of usage, the distribution of usage and ranking of the energy consumed and other information.

Next, one can compare the energy consumption of stores based on the data provided by the system, and the maximum number of stores supported at the same time is 5 for comparison purposes. This includes usage comparison, usage comparison per unit area, usage distribution comparison and energy consumption ranking, energy costs, etc.

According to the alarm rules created, the system will automatically sound usage alarm for the stores whose energy consumption exceeds the threshold. Alarms will be pushed by the Dmall APP, and by checking the alarm records, one can identify the exact unit of the store that has exceeded the energy consumption threshold. And energy reports can be exported for analysis.

Energy consumption data is viewed online in real time for refined management. And real-time alarm is sounded in the event of equipment energy use process anomalies, where active maintenance is activated in place of manual inspection to improve manpower efficiency. Intelligent analysis of energy consumption data automatically generates weekly reports on energy consumption of stores and feeds the info. to stores, which then fill in improvement plans according to the energy consumption of the week. Big data analysis technology is employed for deep mining of energy consumption data to uncover energy-saving potential and provide energy optimization strategies to reduce corporate energy costs. Through big screen data dashboards' multi-dimensional dynamic display of various types of energy consumption data, optimized strategy support is provided for the head office.

3. Comparison of before and after implementation

Before the application, there were two ways to deal with energy consumption in-store: first, billing only and no measurement, with no control over energy consumption. As a result, the monthly billing logic could not enable energy consumption management, and the lack of control basis led to non-strategic energy consumption. When abnormalities occur in power equipment, unit energy consumption surged, where the overall costs could only be identified ex-post and the problem areas could not be identified; even worse, no effective stop-loss solution was available, not to mention the high costs from manual transcription, and the resulting locating challenges and the lack of strategic basis. The result is that the store energy consumption is counted and reported by dedicated roles manually on a regular basis which disables real-time monitoring of energy consumption anomalies. The problem with manual ledger is long interval between data entries, which fails to inform energy consumption optimization strategy. And energy saving strategy is devised based on human experience, with no data support, making it easy to create an imbalance of ROI with energy saving input.

The most straightforward benefit from application of the system is improved manpower efficiency. Once the energy management system has gone live, the energy consumption data collection process is optimized, resulting in a single-store saving of more than 200 hours of manual labor per month; with the cost of maintenance personnel counted at RMB5,000/month, the annual saving in manpower costs for nearly 100 stores is at a minimum of RMB5.82 million. With on-line online energy management, business process-related features are optimized, leading to a 30% reduction of dedicated personnel. The other aspect is energy saving and cost reduction. Since the launch of the energy management system and through intelligent analysis and refined management, the average monthly energy consumption of Wumart stores year-on-year is lowered by 10%; assuming the annual energy cost of RMB100 million, this represents at least RMB10 million in annual energy saving and cost reduction for the group's close to one hundred stores. Thirdly, the project secured special subsidies from the government. After the launch, the system is connected to Shanghai National Energy Platform for an application for special subsidies, whereby regional stores could receive energy management hardware and software investment subsidies of 20%.

Project Impact & Sustainability

The project provides data support for managing the dual-carbon targets and helps to provide the basis for ESG information disclosure for businesses' energy conservation and carbon reduction efforts. The access to data on government energy consumption platforms helps monetize regional policy incentives, reducing the cost of energy-efficient upgrades for businesses. Upon store-wide application the loss rate is expected to be reduced further across the board. Store asset utilization rate to be increased by 30%, equipment life cycle increased by 20%, annual asset procurement costs decreased by 30%, equipment management staff reduced by 50%, frozen goods loss rate reduced by 80%. On a single store basis, each store needs to be staffed with two operation and maintenance engineers under the traditional operation and maintenance model, with the headcount potentially be reduced to one once the efficiency management system goes live, reducing labor costs by 8k-10k per year; annual energy consumption will be 3 million, working out at a 10% overall energy saving, i.e., about RMB300,000 in energy saving per store; cargo loss could be about 6 times a year, at about RMB5,000 per instance, which works out to a reduction of the cost of cargo loss by RMB30,000; the annual cost savings: $(8 + 30 + 3)*100 = 41$ million. Investment cost: 35 million. Payback period will be one year, making it a sustainable project with multi-store scalability.

Expert Comments

Recognizing the challenges faced by retail chain operators with wide distribution and numerous stores, Wumart has implemented a multi-point intelligent energy management (E-IoT) system. This system spans warehousing, logistics, cold chain, and back kitchen areas, utilizing AIoT technology to digitalize energy consumption data across stores. By leveraging energy management practices, it identifies inefficiencies and wasteful areas, enabling refined energy management and digital operations. This approach addresses the complexities of omni-chain control and management, systematically enhancing business energy efficiency in terms of cost, efficiency, and experience. Wumart's initiative serves as a systematic solution template for energy-saving and carbon reduction in the chain retail sector, providing a platform for reducing greenhouse gases like carbon dioxide and hydrofluorocarbons.

发挥美团连接优势 推动行业绿色低碳转型

——美团外卖青山计划可持续发展实践

Leveraging Meituan's Connectivity Advantages and Promoting the Green and Low-carbon Transformation of the Industry - the Sustainable Development Practice of Meituan Waimai's Blue Mountain Project

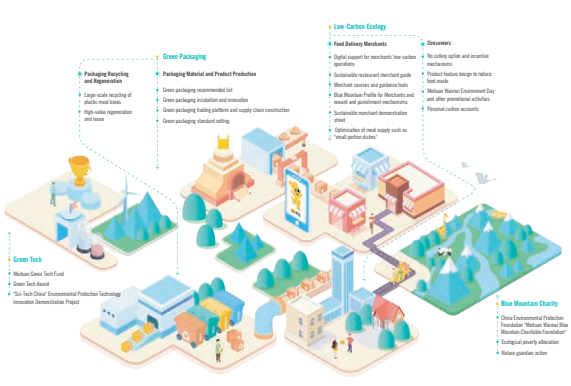
Meituan

Project Overview

On August 31, 2021, Meituan comprehensively upgraded its Blue Mountain Project environmental protection strategy, adhering to the vision of "better life and more beautiful nature" and promoting the construction of a green and low-carbon consumption ecosystem throughout the entire value chain of the food takeaway industry, to support the low-carbon transformation of China and the whole society.

Until August 2023, in collaboration with packaging and recycling partners, Meituan has promoted the normalization of pilot projects for the recycling of meal boxes in 15 provinces and cities nationwide, helping to reduce carbon emissions by approximately 19,000 tons, and released *Green Packaging Solution for Food Takeaway*. Meituan has promoted the concept of sustainable operation to merchants. More than 1 million merchants provided over 6.2 million types of small-sized meals, and over 360 million users have used the "no disposable cutlery" function on the Meituan Waimai app, helping to reduce carbon emissions by approximately 178,000 tons. Meituan has established the Green Tech Charity to support green and low-carbon basic scientific research and the transformation of technological achievements and has awarded 19 individuals in the fields of green and low-carbon materials, carbon capture and utilization, and coordinated control of carbon reduction and pollution reduction. In addition, the first phase of the " 'Innovation China' Meituan Blue Mountain Environmental Protection Technology Innovation Demonstration Project" has selected nine demonstration projects. Meituan has also collaborated with public welfare partners to carry out environmental protection public welfare projects.

Meituan Blue Mountain Project Green & Low-Carbon Action Panorama



Company/Organization Profile

As a tech-driven retail company, Meituan strategically focuses on "Retail + Technology" and adheres to our mission of "We help people eat better, live better".

The Blue Mountain Project is the first environmental protection initiative in the food delivery industry launched by Meituan. Adhering to the vision of "Better Life, Better Nature", the Lush Mountain Project has kept upgrading, forming four major sections of green packaging, low-carbon ecology, Green Tech and Green Charity, so as to drive the building of a green and low-carbon consumption ecology for the whole value chain and boost low-carbon transformation of the country.

Project Outcome

1. Build a Widely Participatory Green and Low-carbon Consumption Field.

(1) Consumers: 360 million consumers have participated in the "no disposable cutlery" campaign of the Blue Mountain Project. The "no disposable cutlery" function has been online for five years, with order proportion increasing nearly 40 times and a total carbon reduction of over 178,000 tons.

(2) Merchants: Over 2 million merchants have the "Blue Mountain Profile for Merchants"; over 1 million Meituan merchants offer over 6.2 million types of small-size dishes; 1.02 million merchants have joined the Blue Mountain Charity action.

(3) NGOs and the public: The online environmental protection promotion has reached 4.8 billion people, while the offline coverage has reached millions. The first batch of 30 environmental NGOs funded by Blue Mountain Charity organized 380 educational activities in 17 provinces across China.

2. Connect All Parties to Promote the Green and Low-carbon Transformation of Food Takeaway Packaging.

(1) Establish a working group for green packaging applications for food takeaway in collaboration with industry organizations and production application enterprises. It has provided green packaging solutions for 6/16 categories of meals, released 161 green packaging lists, and launched 41 types of innovative packaging.

(2) Carry out or plan large-scale garbage classification and recycling of plastic food containers in 15 provinces in China, with a cumulative recovery of about 12,700 tons of plastic lunch boxes, helping to reduce carbon emissions by about 19,700 tons.

(3) Fund environmental protection technology innovation demonstration projects. Build a 10,000-ton food container recycling production line, which has recycled over 4,400 tons and has transformed waste food containers into high-value products such as fine denier polypropylene fiber.

Note: The data is current as of August 2023.

Project Highlights

Green Tech Charity of Meituan's Blue Mountain Project won the 2022 Annual Responsibility Case Award at the China CSR Annual Forum;

In 2023, the story of plastic lunch box recycling in the Meituan Blue Mountain Project, titled *Guarding the 'Green Waters and Lush Mountains' with the Blue Mountain Project*, won the first prize of the China's Ecological Environment Protection Story in the New Era awarded by the Ministry of Ecology and Environment.

Project Implementation

Meituan's Blue Mountain Project comprises four major action areas: Green Packaging, Low-carbon Ecology, Green Tech, and Blue Mountain Charity. It promotes the green transformation of the industry through upstream and downstream collaboration, connects merchants and consumers to build a sustainable consumption system, and establishes an environmental protection public welfare fund to support natural ecological conservation and carbon neutrality technology advancement.

1. Promote the Construction of a Green and Low-carbon Consumption System with Sustainable Mechanisms.

(1) Integrate sustainability into platform mechanism and product design. Include environmental protection clauses in merchant agreements and establish rules to strengthen the enforcement and control of "no disposable cutlery" orders. Through interactive design, reward feedback, and other settings, environmental protection concepts such as reducing the environmental impact of food takeaway and reducing food waste will be embedded in product design and operation.

(2) Drive sustainable transformation of catering merchants. Launch the "Blue Mountain Profile for Merchants" in the app to showcase the environmental actions of merchants, promote the launch of small-size dishes, develop a series of video courses on green operations, and drive the sustainable transformation of the catering industry.

(3) Guide consumers to practice a green lifestyle. In the whole process of consumer ordering interaction, carry out "moderate ordering" reminders, launch the Meituan Carbon Account, and use the Meituan Waimai app to guide consumers to practice green consumption.

2. Support and Facilitate Social Green and Low-carbon Transformation with Public Charity.

(1) Establish the Green Tech Charity to support scientific research and technology transfer. In June 2021, Meituan invested 500 million yuan to launch the Green Tech Charity, aiming to promote green and low-carbon development through technological innovation, encourage more scientific research forces to engage in environmental protection research, support the transformation of green and low-carbon technological achievements from the laboratory to industrialization, and cultivate a group of new forces that provide green services, guide green consumption, implement energy conservation and emission reduction, and promote resource recycling.

(2) Carry out nature conservation actions through the Blue Mountain Public Charity. Effectively improves the ecological quality of protected areas, enhances ecological carbon sequestration, and builds a beautiful home where people and nature live in harmony by taking nature-based solutions to climate change as a path.

3. Explore New Models for Controlling Plastic Pollution in Food Takeaway from a Full Life Cycle Perspective.

The Blue Mountain Project has carried out in-depth environmental impact assessments of the entire life cycle of takeaway packaging, including production, circulation, utilization, disposal, and recycling, established a plastic pollution control approach that emphasizes "reduction, substitution, and recycling," and has formed a green packaging implementation path that covers all participants in the industry chain and drives all stages of the process.

(1) Consolidate industry consensus and promote the construction of a standardized system for green packaging. Blue Mountain Project actively participates in the construction of green packaging standardization and has cumulatively led or participated in the development of 8 national standards and group standards.

(2) Reduce from the source. Meituan Waimai continues to optimize the "no disposable cutlery" product feature, with more than ten iterations of product functionality, advocating for user participation in low-carbon actions.

(3) Expand front-end supply, support green packaging innovation and supply chain construction. The Blue Mountain Project supports green packaging innovation and supply chain construction, expands application scenarios, and promotes industrial development. Meituan Waimai has established the "Working Group for Green Packaging Application for Food Takeaway" with China Packaging Federation (CPF) to promote packaging solution research, incubate green and innovative packaging, and launch a green packaging recommendation list.

(4) Explore back-end disposal to promote the large-scale recycling and reuse of lunch boxes. Meituan collaborates with various parties to promote garbage classification, optimize site selection through big data, and support the construction of collection and transportation infrastructure. Meituan has implemented large-scale and normalized lunch box recycling projects in cities such as Beijing, Xiamen, and Shenzhen.

Project Impact & Sustainability

Promoting the green and low-carbon transformation of food takeaway is a complicated systemic problem. It requires coordinated and joint action by all parties in the industrial chain. In the O2O industry, the platform has the inherent advantages of connecting all parties as well as leveraging capability in promoting sustainable development. The Blue Mountain Project, with its focus on the entire life cycle, innovative collaboration in the ecological chain, sustainable mechanism design, and leveraging of public welfare funds, has typical, representative, and demonstrative promotional value.

The Blue Mountain Project will continue to enhance the depth and breadth of its actions and achieve the 2025 goals of promoting sustainable consumption through digital capabilities, encouraging 500 million consumers to practice green and low-carbon actions, providing green packaging solutions for all platform merchants, and establishing a scaled recycling system in more than 20 provinces.

Expert Comments

China's dual-carbon strategy promotes a green lifestyle, but widespread adoption is hindered by early-stage carbon-inclusive mechanisms. Meituan, as a platform operator, addresses this by implementing the Blue Mountain scheme. This initiative covers Green Packaging, Low-Carbon Ecology, Green Tech, and Blue Mountain Charity, creating diverse low-carbon consumption scenarios. Meituan collaborates with stakeholders to transform takeaway packaging, reducing approximately 19,000 tons of carbon emissions. The Blue Mountain scheme serves as a representative case, setting a precedent for broader implementation in promoting green and low-carbon practices across the entire value chain of the takeaway industry.

Trip.com Group's Environmental Friendly Strategy

Trip.com Group

Project Overview

Trip.com Group has incorporated the ESG (Environmental, Social, and Governance) sustainable development strategy into its corporate mission and has introduced four friendliness-oriented initiatives, including environment friendliness, community friendliness, family friendliness, and stakeholder friendliness, to advance the group's commitment to ESG sustainable development. Regarding environmental friendliness, the group contributes to the industry's carbon emission reduction by offering low-carbon travel products.

In July 2022, Trip.com Group rolled out the "LESS Carbon Neutral Plan", which features four distinct services: Green Living, Green Travel, Green Flying, and Green Business Travel. This has drawn attention from 76 million people to low-carbon hotel products, with 16 million people making reservations for low-carbon travel products. The booking volume for low-carbon hotels has increased by 166% compared with that at the end of 2022. In terms of flights, 92% of domestic flights and 86% of international flights have achieved carbon offsetting, allowing travelers to choose lower-carbon flights as they would like to. 97% of business travel flights are available for carbon offsetting and over 50% of business travel flight orders are for low-carbon options.

Trip.com Group has also released the "Low Carbon Hotel Standard". By calculating the amount of carbon emissions from submitted gas and electricity bills and the amount of carbon emission reductions from low-carbon measures, the group has set industry low-carbon standard thresholds to help hotel partners achieve the goal of limiting the temperature increase to 1.5°C by 2030 as outlined in the Paris Agreement. With low-carbon certification, hotels can boost their brand awareness and attract more traffic. Currently, hundreds of hotels have been selected as fulfilling the criteria for low-carbon hotel standards.

Company/Organization Profile

Trip.com Group is a leading global travel service provider comprising of Trip.com, Ctrip, Skyscanner, and Qunar with the mission "to pursue the perfect trip for a better world".

With the vision "to be the world's leading and most trusted family of online travel brands that aspires to deliver the perfect trip at the best price for every traveler", Trip.com Group enables partners to connect their offerings with users through the aggregation of comprehensive travel-related content and resources and an advanced transaction platform consisting of apps, websites and 24/7 customer service centers. Since the launch of the sustainable development strategy in 2022, Trip.com Group has been dedicated to encouraging more partners to collaboratively engage in low-carbon environmental protection.

Founded in 1999 and listed on NASDAQ in 2003 and HKEX in 2021, Trip.com Group has become one of the best-known travel groups in the world.

Project Outcome

Trip.com Group has launched a sustainable travel plan to promote low-carbon emission reduction in the tourism industry and engage users in sustainable travel practices through its platform offerings and traffic. The group plans to gradually achieve sustainable operation throughout the company and jointly introduce at least 10,000 low-carbon travel products with ecological partners. The group also promotes low-carbon travel knowledge through its websites, mobile apps, and offline stores, engaging 100 million people in low-carbon and sustainable travel practices. Trip.com Group has pledged to achieve a 50% carbon reduction by 2030 and carbon neutrality by 2050.

1. In July 2022, Trip.com Group rolled out the "LESS Carbon Neutral Plan", which features four distinct services: Green Living, Green Travel, Green Flying, and Green Business Travel. This plan spans more than 100,000 green travel products. As of 2023, 16 million people have opted for low-carbon travel.
2. Trip.com Group has released the "Low Carbon Hotel Standard". By calculating the amount of carbon emissions from submitted gas and electricity bills and the amount of carbon emission reductions from low-carbon measures, the group has set industry low-carbon standard thresholds to help hotel partners achieve the goal of limiting the temperature increase to 1.5°C by 2030 as outlined in the Paris Agreement.
3. Trip.com Group Trip.com has conducted comprehensive energy-saving renovations on its headquarters facilities in Shanghai by implementing a photovoltaic power generation system. As a result of these systematic changes, energy consumption for lighting has been reduced by 45%-50%, with the Shanghai headquarters alone saving a total of 2.6 million kWh of electricity, Additionally, by upgrading to 12,571 sets of LED office lighting tubes, the group saves 640,000 kWh of electricity each year.

Project Highlights

With the rollout of "Low-carbon Hotels", "Low-carbon Flights", "Low-carbon Car Use", and "Low-carbon Business Travel".

Over 100,000 green travel products featuring the "Sustainable Travel" tag have been provided, engaging more than 16 million people in low-carbon travel and drawing the attention of 76.52 million people to low-carbon travel.

In terms of flights, 92% of domestic flights and 86% of international flights have achieved carbon offsetting, allowing travelers to choose lower-carbon flights as they would like to. 97% of business travel flights are available for carbon offsetting and over 50% of business travel flight orders are for low-carbon options.

The project has won the Forbes 2023 Carbon Neutral Annual Action Enterprise, NetEase Finance Enterprise Excellent ESG Practice Case Annual Responsibility Pioneer, Xinhuanet Credit Cup ESG Excellent Case and other awards, and has been actively joined by tourism industry partners.

Project Implementation

In July 2022, Trip.com Group rolled out the "LESS Carbon Neutral Plan", which features four distinct services: "Green Living, Green Flying, Green Travel, and Green Business Travel". This plan spans more than 100,000 green travel products.

After a year of exploration, we realized that driving the low-carbon development of the industry not only needs to carry out action initiatives, but also needs to specify the perfect direction for the industry through the form of quantifiable data, and also needs to let partners see the positive feedback of business value.

In 2023, Trip.com Group released the "Low Carbon Hotel Standard". By calculating the amount of carbon emissions from submitted gas and electricity bills and the amount of carbon emission reductions from low-carbon measures, the group has set industry low-carbon standard thresholds to help hotel partners achieve the goal of limiting the temperature increase to 1.5°C by 2030 as outlined in the Paris Agreement. With low-carbon certification, hotels can boost their brand awareness and attract more traffic. Currently, hundreds of hotels have been selected as fulfilling the criteria for low-carbon hotel standards.

The low-carbon hotel standard is a low-carbon road that has never been walked before, and the design of intermediate standards, the construction of low-carbon models, and the collaboration of partners are all facing huge challenges. We believe that as a platform-type travel service provider, connecting partners and users, bringing brand and revenue enhancement to partners, will certainly drive the industry to low-carbon.

So far, 16 million people have opted for low-carbon travel.

In terms of accommodation, 76 million people have been drawn to low-carbon hotel products, and the booking volume for low-carbon hotels has increased by 166% compared with that at the end of 2022.

In terms of flights, 92% of domestic flights and 86% of international flights have achieved carbon offsetting, allowing travelers to choose lower-carbon flights as they would like to.

In terms of car use, new energy vehicle rental orders are growing at a rate of 295% per year. The carbon emissions saved by travelers using new energy vehicles are equivalent to planting 940,000 trees.

In terms of business travel, 97% of business flights are available for carbon offsetting and over 50% of business travel flight orders are for low-carbon options.

Project Impact & Sustainability

Trip.com Group has incorporated sustainable travel into its ESG (Environmental, Social, and Governance) strategies. By establishing sustainable connections between platforms, merchants, and users, Trip.com Group is committed to promoting the industry and users to engage in low-carbon environmental protection practices. Currently, the group has successfully created a significant influence within the industry.

1. Enable partners to offer low-carbon products that meet our platform's standards: Trip.com leverages its platform's traffic and offerings to motivate more partners to supply low-carbon products, thereby enhancing their brand awareness and revenue.
2. Use platform offerings to engage more users in sustainable travel practices: Trip.com consistently promotes low-carbon products to its hundreds of millions of users through its platform offerings, leading to an increase in green product bookings.
3. Promote China's "Low Carbon Hotel Standard" to hotels around the world: Trip.com is promoting the adoption of the "Low Carbon Hotel Standard" among foreign hotels, aiming to elevate this standard from a practice within the Chinese tourism industry to a globally accepted benchmark.

Expert Comments

Trip.com Group utilized its prominent position in the travel industry to implement environmentally friendly strategies, impacting both users and service providers. The project introduced the "LESS Carbon Neutral Plan," encouraging tourists to opt for green modes of mobility under scenarios like "green living," "green travel," "green flying," and "green business travel." This initiative has produced remarkable results. The company also introduced the "Low-Carbon Hotel Standard," providing guidance for the hotel industry to adopt low-carbon standards and achieve carbon reduction goals through metrics such as gas and electricity bills and low-carbon initiatives. The project leverages the Ctrip platform's influence to assist hotels in reaching their carbon reduction goals and encouraging more users to practice sustainable travel. Notably, it has elevated China's low-carbon standard, the "Low-Carbon Hotel Standard," to a global level, emphasizing China's role in the worldwide promotion of low-carbon development.

Dairy Industry-wide Energy Revolution - The Application of Green Energy

Inner Mongolia Mengniu Dairy (Group) Co., LTD

Project Overview

"Dairy Industry-wide Energy Revolution - The Application of Green Energy" project has a start-up date of 2023 and involves sites mainly in Mengniu's own factories and raw milk suppliers. This project is one of applicable measures used by Mengniu to practice "Green" strategy of sustainable development, carbon neutral strategy. The project concentrates on green electricity, solar power, biomass energy, methane in the upstream and downstream of the industrial chain such as ranches and factories to build green energy supply network, increasing the amount of green energy used in the full life cycle of dairy products and decreasing fossil energy consumption, and it is also an effective way for companies to achieve carbon neutrality.

Company/Organization Profile

China Mengniu Dairy Company Limited (Stock Code: 2319) is a leading dairy company, ranking among the top eight dairy companies in the world. Founded in 1999 and headquartered in Hohhot, Inner Mongolia Autonomous Region, China, the Company was listed in Hong Kong, China in 2004 and was a constituent of the Hang Seng Index and Hang Seng China Enterprises Index, and was reelected as a constituent of the Hang Seng Corporate Sustainability Index in 2022. Mengniu focuses on providing nutritious, healthy and delicious dairy products to Chinese and global consumers, forming a rich product matrix including liquid milk, ice cream, milk powder, cheese and other categories. In 2022, the Company's revenue reached RMB 92,593 million.

Project Outcome

1. The usage amount of green electricity in Mengniu factories reached 33.44 million kW·h in 2023.
2. As of 2023, the total installed capacity of distributed photovoltaic cell in Mengniu factories reached 17 MW, and the annual power output was approximately 16 million kW·h. Besides that, the total installed capacity of distributed photovoltaic cell in raw milk suppliers reached 45 MW, and the annual power output was approximately 42.4 million kW·h.
3. There was 132 thousand tons of steam generated by biomass burning in Mengniu factories in 2023. Besides that, the 25 million m^3 of methane was generated, and the power output was approximately 47 million kW·h.
4. In order to install photovoltaic panels on the roof safely, some Mengniu factories chose flexible ones whose weights decrease by roughly 80% than typical ones.
5. Mengniu factories apply the combination of bag dust collector and multi-tube cyclone dust collector for the compliance of environmental emission standards, in order to deal with the exhaust.

Project Highlights

"Dairy Industry-wide Energy Revolution - The Application of Green Energy" project is one of applicable measures used by Mengniu to practice "Green" strategy of sustainable development, carbon neutral strategy. The project concentrates on green electricity, solar power, biomass energy, methane in the upstream and downstream of the industrial chain such as ranches and factories to build green energy supply network, increasing the amount of green energy used in the full life cycle of dairy products and decreasing fossil energy consumption, and it is also an effective way for companies to achieve carbon neutrality.

Project Implementation

1. Green Electricity
   Green Electricity Purchase: Mengniu factories purchase specific amount of green electricity, and obtain two certificates that are "Green Electricity Consumption" and "Green Electricity". The usage amount of green electricity reached 33.44 million kW·h in 2023.
2. Solar Power
   Distributed Photovoltaic Power Generation in Factory: Mengniu factories have been boosting distributed photovoltaic power generation since 2012. As of 2023, the total installed capacity of distributed photovoltaic cell reached 17 MW, and the annual power output was approximately 16 million kW·h.

   Distributed Photovoltaic Power Generation in Pasture: Raw milk suppliers have been boosting distributed photovoltaic power generation on barn roofs since 2021. As of 2023, the total installed capacity of distributed photovoltaic cell reached 45 MW, and the annual power output was approximately 42.4 million kW·h.
3. Biomass Energy
   Biomass for Steam: Mengniu factories burns biomass in a biomass boiler to generate steam for providing heat energy for factory production and daily life. There was 132 thousand tons of steam generated by biomass burning in 2023.

   Biomass for Combined Heat And Power Generation (CHP): Raw milk suppliers fully recycle cow manure to generate methane, and apply the CHP method in providing heat energy and power for factory production and daily life. The 25 million m^3 of methane was generated, and the power output was approximately 47 million kW·h.
4. Different types of photovoltaic panels have widely different weights per square meter, and the load-bearing of building roofs is limited. The weight of photovoltaic panels was not considered in the early established factories, so the weight of typical photovoltaic panels and mounting equipment is approximately 15 kg/m^2 ~ 25 kg/m^2, exceeding the upper limit of the load-bearing of some roofs. In order to install photovoltaic panels on the roof safely, some Mengniu factories chose

flexible ones whose weights decrease by roughly 80% than typical ones.

5. Exhaust Compliance of Biomass Boiler: Biomass fuel is mainly granular fuel made from straw, sawdust, sugarcane bagasse, rice bran, which undergoes the process of crushing, mixing, extrusion, drying, etc. The exhaust of biomass burning boiler contains large amounts of dust and particles, so Mengniu factories apply the combination of bag dust collector and multi-tube cyclone dust collector for the compliance of environmental emission standards, in order to deal with the exhaust.

Project Impact & Sustainability

1. Green Electricity
   Green Electricity Purchase: The purchase amount of green electricity will reach 20 million kW·h annually for next three years.
2. Solar Power
   Distributed Photovoltaic Power Generation in Factory: The total installed capacity will increase by 40%, reaching 23.8 MW for next three years.

   Distributed Photovoltaic Power Generation in Pasture: The total installed capacity will reach 100 MW, and the annual power output will be approximately 93.6 million kW·h in 2025.
3. Biomass Energy
   Biomass for Steam: There will be 250 thousand tons of steam generated by biomass burning for next three years.

   Biomass for Combined Heat And Power Generation (CHP): The methane production will exceed 150 million m^3, and the annual power output will exceed 335 million kW·h for next three years.
4. The use of flexible photovoltaic panel can increase Industrial green electricity usage, and also can meet residents' electricity needs in areas with suitable light intensity and duration. Due to the light weight of flexible ones, the flexible photovoltaic panel can be largely installed on residents' roof without considering the load-bearing safety. For example, there is 60% of solar resource in Africa, but 48% of Africans are still out of power. Without considering other aspects, flexible photovoltaic panel is quite suitable in this area.
5. The combination of multi-tube cyclone dust collector and bag dust collector can be used as a measure of compliance with all exhaust gas emissions in the food industry. It can also be used for dust collection in power, steel, chemical, construction and other industries.

Expert Comments

Mengniu Group is advancing its GREEN sustainable development strategy, achieving a green electricity usage of 33.44 million kWh in 2023. The company's factories and milk suppliers installed 62 MW of photovoltaic panels, generating a total annual output of 58.4 million kWh. Initiatives include biomass steam production, biogas utilization, and lightweight flexible photovoltaic panels. Environmental compliance measures include advanced dust collectors. Mengniu leads in constructing green energy microgrids, incorporating various sources across the industrial chain to reduce fossil energy consumption. The company sets a precedent for industry peers with its science-based, comprehensive approach towards carbon reduction, actively working towards carbon neutrality.

Ningjin air compressor modification project

JA Solar Technology Co., Ltd.

Project Overview

The air compressor system is an important auxiliary of the PV cell production line, accounting for a large share of annual energy consumption. JA Solar Group (hereinafter "the Group") is deeply committed to the energy saving and carbon reduction of the air compressor system. In order to achieve its strategic goal in the dual-carbon initiative, the Group is committed to cultivating and assembling a team of professional engineers to study the operating mechanism of the air compressor system.

The Group makes full use of the available equipment and, under the condition of minimum-impact modification to the existing equipment and systems, the Group utilizes one or more technologies (artificial intelligence air source control technology, air compressor pipeline energy-saving technology, and drying tower energy-saving technology) to achieve the goal of systematic energy saving by regulating the supply of compressed air in all aspects of the compressed air system, and by reducing the unnecessary losses in each process.

The specific measures mainly include:

First, for the pressure loss and leakage of the air compressor: the focus is on the rational use of energy from the air entered into the compressor to optimize the suction and exhaust valves, air intake filters, sealing gas set and other components, leading to low energy consumption of the air compressor.

Second, improve the dryer cold source in the air compressor, make full use of the medium-temperature cold source to significantly reduce the air compressor's consumption of cooling water, indirectly reducing the consumption of electricity.

Third, make full use of the residual heat from cooling water generated from air compressor as the source to heat process cleaning water, further reducing the overall energy consumption during production.

In summary, this project utilizes the relevant measures to reduce daily electricity consumption of the air compressor by 15%; the annual system electricity saving by 5%; and saving the overall cost by RMB1.15 million/year for the Group.

Company/Organization Profile

JA SOLAR
晶 澳 太 阳 能

JA Solar Technology Co., Ltd. is a renewable energy power generation solution service provider. Leveraging the main industrial chain of silicon wafer - cell - module, supported by PV auxiliary materials and equipment industry, PV + application scenario solutions, the company continues to advance its "one body, two wings" strategy. In 2019, it was officially listed on the A-share market (stock ticker: "JA Solar"; stock code: 002459).

Beijing Jinghong Energy Saving Technology Co., Ltd. was founded on June 1, 2015, and is a wholly-owned subsidiary of JA Solar. The company is located in the national Beijing Fengtai Science and Technology Park and specializes in the promotion and application services of energy-saving and environmental protection technology, with its main business covering the fields of technology development, equipment sales, wastewater recycling and utilization, and solid waste resource treatment. The company has rolled out more than 20 projects in Yangzhou, Yiwu, Hefei, Xingtai, and other locations, such as wastewater recycling, air compressor energy-saving modification, ammonia-containing tail gas resource treatment, monocrystalline furnace energy-saving, argon gas recovery, etc., which have accumulated a total of nearly RMB300 million in cost savings for its clients, and also fostered its own sustainable development and the attainment of the national "dual-carbon" targets.

Project Outcome

Through the overall renovation and revamping of the air compressor system, this project enabled automatic adjustment of the operation and maintenance model of the unit to cater to production needs, reducing heavy-load operating hours of the units and operational energy consumption, which in turn, helping achieve the target of reducing the maximum daily electricity consumption of the air compressor by 15% and the annual system power saving by 5%.

This was then combined with the improvement of the air filter of the air compressor to optimize the cooling system and improve the operating conditions of the units, leading to annual cost savings of RMB1.15 million.

The successful implementation of this program realized an annual reduction of 235 tons of carbon emissions, which enables the Group to independently develop a core solution of air compressor energy saving, which is conducive to the long-term development of the Group and has good social and economic benefits.

Project Highlights

To reach the project goals and achieve scientific energy saving and quantitative carbon reduction, the project organized experts to discover the potential energy saving points of the air compressor system by applying the energy saving scheme formulation process of modeling analysis, quantitative simulation and numerical diagnosis to the air compressor system.

Through an apprenticeship process, where technical experts provide theoretical knowledge; senior operation and maintenance engineers provide project experience; and real-life scenarios provide verification scenarios, where a group of young engineers are quickly trained and the team's ability is strengthened in the field of energy saving.

Through modeling and analysis, the engineer team mastered the key knowledge of the air compressor system operation model and learned to apply them skillfully.

Through quantitative simulation, the engineer team devised the energy consumption standards of air compressors, which made it possible to quantitatively compare the group's air compressor systems and set common goals.

Through numerical diagnosis, the team of engineers built a systematic numerical

database for each operating state of the air compressor energy-saving system, and was able to quickly diagnose the operating state of the system by comparing the indicators in the database.

In summary, the project served as a boost-camp opportunity to enhance the capability of the energy-saving team, who have mastered the core technology of the solution and could apply the theoretical knowledge into real cases. As a result, those actions set a tone for greater energy saving and emission reduction by providing solid theoretical knowledge as well as engineer-based solutions.

Project Implementation

Modification of the compression heat dryer help limit the annual average power of the compressor at below 25KW.

For the modified dryer, the cooling method can be switched to ordinary water-cooling solution as dew point controlling is guaranteed. A 90T cooling tower has a wattage of about 2.2KW, without taking the pump power into consideration, yet the original cooling water needed to be supplied by a water pump.

Replacing the cold water of centrifuges with cooling water. Originally 142KW/h of cold water was required after the modification, and 49-ton cooling tower's turbines have a power wattage of about 1.5KW, without taking pump power into consideration.

Variable-frequency water pumps are used to self-adjust as per the water pressure and enables constant-pressure operation. The cooling tower has variable-frequency fans for self-adjustment according to the water temperature.

By optimizing the compression heat of adsorption load, the Group adopted dew point control to harness energy consumption of the heater, and add inverter cold dryer before adsorption, where most of the moisture will be eliminated by the cold dryer. When the compression heat dew point meets the requirements of the two towers, no switching is made, the adsorption time of a single tower is doubled to reduce the energy consumption by the heater.

The 250KW unit is put through variable frequency modification, with the adjustment range of 40-100%, increasing the amount of variable frequency regulation.

Add a joint control system to enable intelligent start and stop of the screw unit with the change of gas consumption.

The joint control pressure is implemented as the workshop pressure, which is made constant to avoid the waste of gas consumption caused by pressure fluctuation.

All compressors are started and high temperature flow control valves set at the front end. Through control via the Internet of Things, the real-time working condition of the heating state flow to avoid insufficient recycled heat.

The post-processing pipeline system is revamped and one group of high-efficiency filters is added to divert the flow and harness the pressure drop.

Project Impact & Sustainability

Project impact: the air compressor energy saving program can be applied to a numerous industrial applications, such as photovoltaic plants, large public buildings and industrial plants, etc.

Adaptability: when compressed air is used to power some of air-powered equipment and to pump air to some the instruments in the renewable energy equipment production lines, air compressor has become one of the essential equipment for many production and manufacturing industries. As a result of leading to great market prospect for air compressor revamping across wider range of industries, which could both achieve energy saving while greatly boost the level of automation during production.

Project sustainability: the project is an energy-saving project, which helps to improve re-utilization of resources, reduce energy loss, which could help reduce electricity bills and costs, thereby improving economic benefits greater long-term social and environment benefits.

Expert Comments

Air compressors play a crucial role as public auxiliary equipment in the industrial sector, serving various applications and constituting significant energy-consuming assets for businesses. Despite facing more challenges compared to industrial waste heat and pressure utilization or variable frequency fan/pump systems, the energy-saving potential of air compressors is often overlooked by energy-saving companies. JA Solar has taken the initiative to enhance energy efficiency by conducting remodeling on its air compressors. This includes optimizing cold dryers, compressed air pipelines, power equipment, and terminal equipment. The addition of a joint-control system enables intelligent optimization control, unlocking the full potential of compressed air energy savings. JA Solar's project stands as a noteworthy example of energy-saving and carbon reduction efforts for air compressors in China, providing a valuable model for businesses with high-power air compressors.

Fusion Zero-Carbon Industrial Community

Shandong Guoshun Construction Group Co., Ltd

Project Overview

Located in Jinan Economic Development Zone, Shandong Province, the project covers an area of 222 Chinese acres, with construction starting in March 2021 and commissioning at the end of May 2023. Based on the philosophy of integrating "industry and city, industry and agriculture, industry and ecology, and industry and lifestyle", the project consists of five major segments: intelligent steel structure factory, research and development center, zero-carbon building experience center, vocational training center, and sky plant factory. The community practically applies many new technologies, materials, work processes and models, and has set "five firsts" in China: the first "zero-carbon intelligent industrial demonstration community", the first "integrated development community of primary, secondary and tertiary industries", the leading and complete "healthy and comfortable steel structure building with near-zero energy consumption" technology system, the first set of "omni-process intelligent steel structure production line" and the first "sky plant factory", creating a new benchmark for industrialized steel structure buildings and helps with urban renewal, industrial renewal and agricultural renewal. The construction of this community is in line with the national philosophy of green development and sustainable development, and plays an active role in promoting the zero-carbon transformation of industrial estates and helping to attain the dual-carbon goal.

Company/Organization Profile

Shandong Guoshun Construction Group Ltd. is a national high-tech enterprise and a champion enterprise of the manufacturing industry of Shandong Province. It is a leading eco-friendly enterprise that operates in sectors including air pollution control, green assembled building and steel structure international trading with an annual turnover of RMB 5 billion, integrating research and development, design, manufacturing, construction, operation and management, and investment services.

Guoshun Group currently has six subsidiaries, nine scientific and technological innovation platforms, five processing and manufacturing centers, two Grade A design institutes, one green building research institute, more than 340 authorized patents, and was involved in the development of more than 30 international group standards, industry standards and local standards.

Project Outcome

The zero-carbon industrial community project integrates bears testament to the philosophy of "green, low-carbon, and recycling" development in all aspects from design, construction, to operation.

In terms of greenhouse gas emission reduction, the community enables near-zero emission of pollutants and carbon with the design of a zero-carbon estate. The 25,000-square-meter near-zero energy consumption buildings in the community have received the "near-zero-energy building design" indication from the China Association of Building Energy Efficiency. Since its official launch, the energy consumption per unit area of the 15,000-square-meter research and development center registered a mere 12.58 kWh/m^2 between August and October 2023; the energy consumption per unit area of the 10,000-square-meter Experience Hall is only 6.24kWh/m^2. By this statistic, the comprehensive energy saving rate exceeds 60% of the current building energy saving standard. The 2.7MW photovoltaic power generation system is built on the roof of the smart factory, which will be completed at the end of November, and the annual power generation can reach 2.68 million kWh. Energy-saving elevators are installed in the building, which stores the momentum energy of the descending elevator and saves the consumption of electric power; the community energy control system carries out all-around monitoring and management of the energy used in the production, domestic living, and office, which greatly improves the efficiency of energy utilization; the community is equipped with electric coaches and electric tour buses to offer green public travel; more than 30 Chinese acres of modernized sky plant factory yielded green and healthy tomato of 105,000 kilos in April-June 2023, effectively neutralizing carbon emissions.

In terms of resource recycling, the community has dramatically improved the efficiency of resource recycling with assembled steel structure buildings. The R&D Center, Vocational Training Center, Zero-Carbon Building Experience Hall, Smart Factory, and Sky Plant Factory all adopt such technology, and at the end of the building's lifespan, all the steel used can be recycled and reused, which greatly improves the resource recycling efficiency and reduces the carbon emissions of the whole lifecycle.

In terms of clean production, the Community Intelligent Factory has built the first set of "omni-process intelligent steel structure production line" in China, which achieves an annual power saving rate of more than 5% compared with the conventional production line by means of high-precision intelligent production, reasonable production layout, and automatic scheduling, etc. The factory adopts tunnel ventilation and energy-saving technology, which greatly saves energy utilization on the basis of ensuring clean, fresh and healthy air. The community is equipped with a reclaimed water recycling system, which treats mixed wastewater from production, office, and daily life to meet reclaimed water standards, and then uses it for toilet flushing, landscape irrigation, road cleaning, fountains, etc.

The construction of "Fusion Zero-Carbon Industrial Community" adopts the concept of community construction, and builds a multi-functional industrial community and a happy factory characterized by "dual near-zero emission" of pollutants and greenhouse gases followings the principle of zero-carbon design; it also adopts the concept of circular economy, steel structure intelligent manufacturing technology, assembled steel structure construction technology, ultra-low energy consumption building technology, and "five constant" healthy and comfortable building standards to create the first "steel-structure healthy building 'house park' with near-zero-energy consumption" in China. It has provided a practical path and a model to accelerate

the development of nationwide assembled steel-structure building industry, promote "Healthy China" with healthy buildings, promote zero-carbon transformation of industrial parks, and achieve the "dual-carbon" goals in the construction sector. It provides a practical path and precedent, and has a broad scope for further market rollout.

The community will build an industrial complex integrating R&D, production, training, tourism, business and other functions, with an estimated ROI of about 23.3%. Upon reaching full production, it is to achieve an annual output value of up to RMB1 billion in the fields of desulphurization and denitrification, intelligent transformation of sintering machine, transformation of turbine and motor, and intelligent control of high and low voltage; it will also enable the processing, production, and leasing of complete sets of equipment for the production line of intelligent production of bridges, ships, and house buildings, with a revenue of more than RMB 3 billion p.a.

Project Highlights

1. China Association of Building Energy Efficiency: Near-Zero Energy Buildings;
2. Provincial Development and Reform Commission: major project of Shandong Province;
3. Provincial Department of Housing and Construction: high-quality structural project of Shandong Province;
4. Provincial Department of Housing and Construction: Shandong Province construction technology (BIM technology application) demonstration project;
5. Municipal People's Government: key projects of Jinan;
6. Municipal People's Government: key projects of Jinan's "14th Five-Year Plan" for ecological environmental protection;
7. Municipal Bureau of Industry and Information Technology: key advanced manufacturing industry and digital economy project of Jinan;

Project Implementation

Industrial estates are important sources of greenhouse gas and various pollutant emissions due to their clustered development model and concentrated energy and resource consumption. In September 2020, President Xi Jinping proposed the goal of carbon peaking and carbon neutrality. And the promotion of zero-carbon transformation in industrial estates is a focal point for attaining the dual-carbon goal. As such, with the strong backing of Beijing Institute of Technology, China Metallurgical Industry Planning and Research Institute and other organizations, Guoshun Group has invested RMB1.18 billion and comprehensively applied more than 20 years of energy-saving and environmental protection management experience and technology to construct the "Zero-Carbon Industrial Community for Integrated Development of Primary, Secondary and Tertiary Industries", setting a precedent for the synergistic enhancement of pollution and carbon reduction efforts in industrial estates through the concept of community construction.

The community is intelligence, green and integration-orinted, and made five domestic firsts by comprehensively applying renewable energy technology, energy-saving technology, intelligent manufacturing technology, modern facility agriculture technology and intelligent estate technology, and boasts China-leading design, planning, construction and operation.

First, it has created the first "zero-carbon intelligent industrial demonstration community" in China. Through the application of comprehensive technologies of "energy saving, energy creation, energy storage and intelligence", a multi-functional industrial community characterized by "dual near-zero emissions", i.e. near-zero pollutant emissions and near-zero carbon emissions, has been built.

Secondly, it has created the first "integrated development community of primary, secondary and tertiary industries" in China. It integrates intelligent equipment manufacturing, modern facility agriculture, zero-carbon building technology display, leisure travel and other elements, creating a new integrated development model of primary, secondary and tertiary industries, and facilitating a new quest for solutions to balance the occupancy and compensation metrics of industrial and agricultural land.

Thirdly, it has constructed a complete and leading technology system in China featuring "healthy and comfortable steel-structure building with near-zero energy consumption". Relying on the concept of circular economy, assembled steel structure construction technology, ultra-low energy consumption building technology system, and the "Five Constant" healthy and comfortable building standards, a steel structure "house park" with near-zero energy consumption was built on site, which passed the national near-zero energy consumption building certification and provided a new opportunity for transforming the "subsistent" housing to zero-energy "lifestyle" comfortable housing and cost-effective "inheritance" quality buildings.

Fourthly, the first set of "omni-process intelligent production line for steel structure" was built in China. In order to meet the requirements for lean processing of steel near-zero energy consumption buildings, the first steel structure intelligent production line was built through independent research and development, providing more options for the expansion and sustainable development of the steel industry.

Fifthly, it has built the first "Sky Plant Factory" in China. With the introduction of a full set of Dutch technology and equipment, the first modernized sky farm of more than 30 Chinese acres was built, with a production capacity equivalent to that of traditional agriculture occupying more than Chinese 450 acres of land.

Comparison before and after implementation

The community features mature technology and state-of-the-art product quality. The products align with the demand and development trends in domestic and international marketplaces. The construction of the community has become a typical representative of the construction industry, industrial parks, the integrated development model of primary, secondary and tertiary industries and the intelligent manufacturing of steel structure. The project has secured financial support from the US Energy Foundation, the Development and Reform Commission of Shandong Province, the People's Government of Jinan Municipality, etc., and has receiveded the "Near-Zero Energy Efficiency" indication from the China Association of Building Energy Efficiency and recognized as a three-star green building, and won more than 20 national and provincial honors.

Project Impact, Scalability & Sustainability

The community upholds Xi Jinping's thought on ecological civilization as a guide, firmly establishes and practices the philosophy that material wealth originates from a sound natural environment, and sets out development plans with the harmonious coexistence between man and nature in mind. Through the intelligent energy system featuring demand-side energy saving + efficient supply-side utilization, supply-side renewable energy use + supply and demand matching, a zero-carbon industrial estate is delivered. And, guided by the ideas of "constructor of the future building industry" and the concept of "integration of industry and city, industry and ecology, industry and domestic living, industry and agriculture", and under the "technology + capital + government" tri-party collaboration model, the company is committed to the development of zero-carbon industrial communities with technically applicable and economically reasonable energy-saving and low-carbon buildings, clean and energy-generating supply, high-efficiency and low-carbon production, and green carbon credits.

The completion of the community will summarize a replicable and scalable low- and zero-carbon development path under regional industry-city integration for Shandong Province and even the whole of China, and provide useful references for the quest of carbon-neutral paths in other regions; and provide decision-making support for the relevant government departments. In addition, the operation of the community will not only lay a solid foundation for the development of the company, but also greatly promote the development of China's assembled green building parts and components industry.

Expert Comments

The rapid expansion of industrial parks has emerged as a significant contributor to greenhouse gas emissions and various pollutants. Urgent measures are required to implement initiatives focused on energy-saving and emission reduction within industrial parks, aligning with China's ambitious "dual-carbon goal." The "Fusion Zero-Carbon Industrial Community" stands out for its successful achievement of near-zero emission levels for pollutants and carbon within industrial parks. This success is credited to the application of cutting-edge energy-saving, environmental protection, and low-carbon technologies. The implementation of a pre-fabricated steel structure production line has notably diminished the energy consumption associated with constructing new factories. Moreover, the creation of a modern air farm has effectively facilitated the seamless integration of agricultural and industrial development. The strides made toward a "zero-carbon industrial society" serve as a valuable benchmark for the holistic development of industry, agriculture, and cities in China.

AI-driven energy management - The green cornerstone of the first "lighthouse factory" in the panel industry of mainland China

Fuzhou BOE Optoelectronics Technology Co., Ltd.

Project Overview

Fuzhou BOE Optoelectronics Technology Co., Ltd. (hereinafter referred to as BOE (Fuzhou)), a subsidiary of BOE Technology Group, specializes in the investment and construction, R&D, production and sales of thin-film transistor liquid crystal display device-related products and peripherals, which are widely used in various display scenarios such as smart home, smart retail, smart transportation, digital art and so on. The company's annual energy consumption exceeds RMB500 million in costs, of which the annual power consumption exceeds 800 million kWh, accounting for more than 90% of the energy costs. Its factories have long prioritized energy saving and emission reduction since its construction and commissioning. In 2020, BOE (Fuzhou) launched its AI-driven energy management system into operation, and utilized the digital energy management platform and YMS equipment energy analysis system to manage the reduction of energy consumption across the factory, enabling a significant reduction of various indicators, including electricity consumption and water consumption. Based on the AI-driven energy management approach, BOE (Fuzhou) was selected by the World Economic Forum as an Intelligent Manufacturing "Lighthouse Factory" in March 2022 as a typical case of intelligent manufacturing, making BOE the first LCD panel manufacturer in mainland China to be selected, marking a breakthrough in the industry.

Figure 1: BOE (Fuzhou)'s digital energy management platform and YMS equipment energy consumption analysis system

Company/Organization Profile

BOE Technology Group Co., Ltd. is a leading Internet of Things (IoT) innovator, providing smart port products and professional services for information interaction and human health. Fuzhou BOE Optoelectronics Technology Co., Ltd. is a subsidiary of BOE Group, and specializes in the investment and construction, R&D, production and sales of thin-film transistor liquid crystal display device-related products and peripherals, which are widely used in various display scenarios such as smart home, smart retail, smart transportation, digital art and so on.

BOE (Fuzhou) is committed to building a semiconductor display production base at globally-leading automation levels, which fills the gap in large-size LCD panels in Fujian Province's electronic information industry. The company has been awarded the honors of Intelligent Manufacturing "Lighthouse Factory" by the Davos World Economic Forum, National High-tech Enterprise, National Green Factory, integrated development of next-generation information technology and manufacturing industry pilot, model factory for intelligent manufacturing in Fujian Province, and Science and Technology Enterprise in Fujian Province.

Project Outcome

1. AI-driven energy management platform

Since 2020, BOE (Fuzhou) has been deep diving in the field of AI system-based energy management, where it leveraged digital energy management platform and YMS equipment energy consumption analysis system to build transparent energy data dashboards, and improved energy management efficiency. It used intelligent analysis to determine the optimal energy usage and reduce energy consumption. AI energy management platform has the following capabilities:

(1) Full data collection: perfect the number of sensors, omni-process management with linked up energy consumption, production, yield data;

(2) Transparent dashboards: clear view of energy trends, quick query of data, and fast discovery of abnormal energy consumption;

(3) Intelligent optimal operation: AI-based correlation analysis enables optimal operation in combination with the yield rate to give the optimal dosage recommendation;

Between the launch of the energy management platform in 2020 and the end of 2022, the energy consumption indicators have continued to decline, indicating that the energy saving work has achieved remarkable results.

Energy	2019	2022	Ratio of reduction
Electricity (KWh)	821068436	751488000	8.5%
Water volume (m^3)	5622947	4901159	12.8%
Natural gas volume (m^3)	762976	549740	27.9%
Nitrogen volume (m^3)	137002546.7	120953700	11.7%

2. PCW free cooling project

The PCW system provides cooling water for process equipment through medium-temperature chiller, where the water supply temperature is about 20°C, and the return water temperature is about 24°C. New cooling tower system is added to reduce the energy consumption of medium-temperature units by exchanging heat with PCW return water through natural cooling with joint cooling, which can save electricity of 4031.018MWh per year and reduce carbon emission of 2298.89tCO2e per year.

3. Color film wastewater recycling project

The drainage system of CF developer is modified through pipeline, and the drainage water of 12 sets of CF developer water zone is recycled and sent to H-ORG system for treatment, so as to reduce energy consumption, with individual devices' drainage water amounting to 125m³/d, and a total water saving of 125*12=1500m³/d, which is equivalent to 519,000 tons/year.

Project Highlights

1. In March 2022, the company was selected as the "Lighthouse Factory" by the Davos World Economic Forum, becoming the first domestic LCD panel manufacturer to receive this award, and is making insidious efforts to become a frontrunner of intelligent manufacturing and a leader in digitalization in the global manufacturing sector;
2. It won the honors of National High-tech Enterprise, National Green Factory, integrated development of next-generation information technology and manufacturing industry pilot, model factory for intelligent manufacturing in Fujian Province, and Science and Technology Enterprise in Fujian Province;
3. The whole factory is arranged with 33,000 energy collection points, creating an Internet of Things for energy collection with full deployment of the smallest energy-consuming unit;
4. The transparent data dashboard enables quick view of energy consumption levels, data statistics time is thus reduced by more than 90%;

Project Implementation

BOE (Fuzhou) factory mainly produces and manufactures liquid crystal panels, with more than 6,000 equipment deployed. To collect the energy consumption of the equipment, a total of more than 33,000 digital collection points have been installed, which record and upload the energy consumption of the equipment in real time, generating a huge amount of energy consumption data every day or even every hour, which is virtually impossible to analyze manually by traditional means. In addition, the products produced by the factory are swiftly updated and iterated at the same time to cater to evolving market demand, which brings more challenges to the analysis of energy consumption and energy saving efforts. To address the above pain points, BOE (Fuzhou) resorts to digital and intelligent management means to manage the energy consumption of its factories, so as to deliver on energy saving and consumption reduction.

1. Comprehensive implementation of refined management

BOE (Fuzhou) uses energy management platform and YMS process equipment energy consumption management platform to collect energy consumption data centrally and store it in a special energy management database, which is processed by digital tools to form an energy management dashboard that can analyze the energy consumption levels of the factory from multiple dimensions, including target control, equipment operation efficiency analysis, product's unit consumption analysis, etc.; and at the same time, it can carry out machine disparity analysis, assist the management personnel to uncover energy consumption anomalies, adjust the equipment status in time, and control the energy consumption level of each production point.

The use of digital energy management system will quantify the energy savings of energy-saving measures, which is conducive to assessing the implementation of energy-saving measures and the benefits achieved.

2. Effective rollout of intelligent transformation

Since 2020, BOE (Fuzhou) has started its AI intelligent energy management transformation, gradually transitioning from digital to intelligent energy management, mainly applying intelligent algorithms to the process of energy management, using digital tools to build application environments, using appropriate data analysis methods for data modeling, simulating the actual energy consumption of equipment, and formulating reasonable standards and protocols for identifying energy consumption anomalies on this basis. After the framework is built, the intelligent energy management system automatically analyzes and compares the actual energy consumption with the predicted energy consumption of the model, automatically discovers the equipment with abnormal energy consumption levels, and at the same time automatically sends the abnormal energy consumption email to the equipment administrator to investigate and deal with the problem at the site in a timely manner, and continues to follow up on the results.

In addition, according to the data modeling of the interaction between the energy consumption of equipment and other factors such as the external environment, it analyzes large energy consumption systems such as cold and heat sources to enable refined and intelligent management of energy consumption.

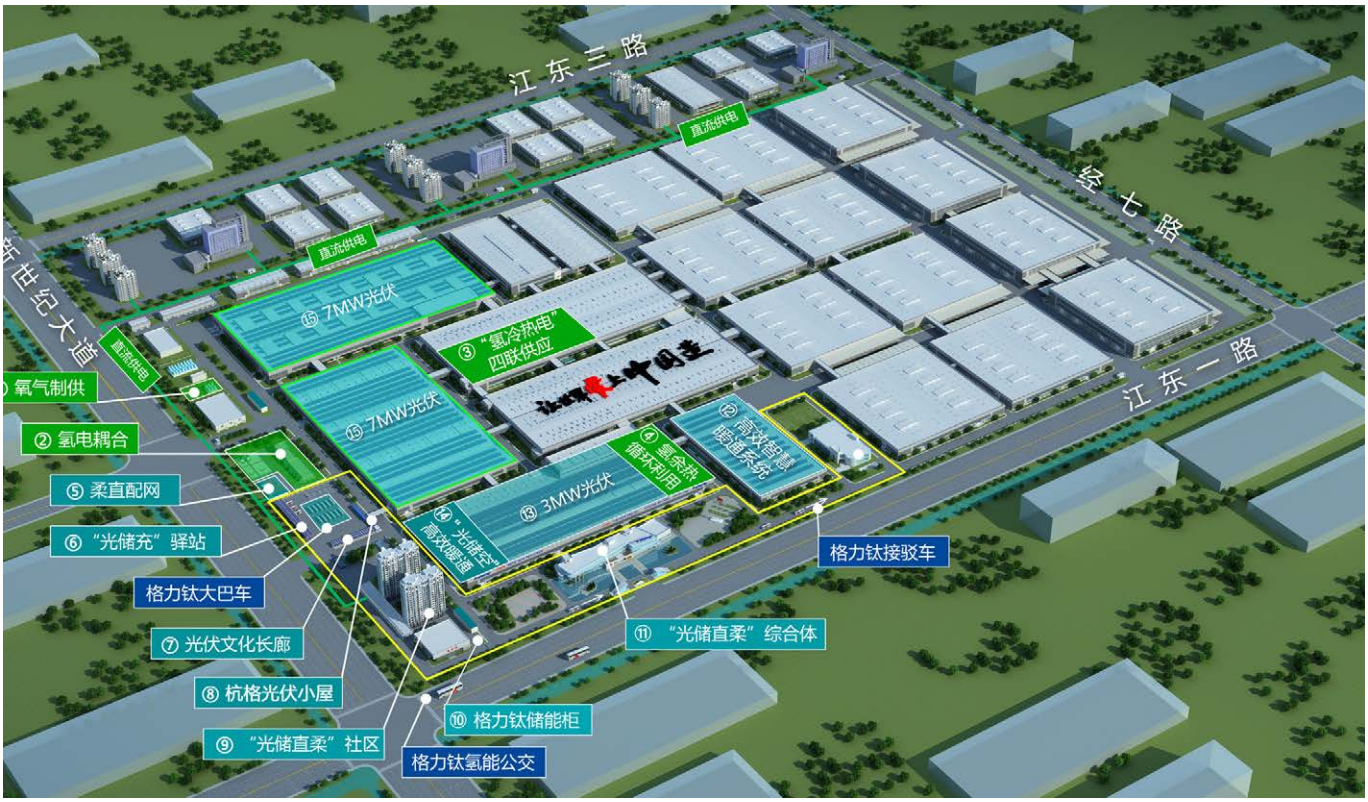
Project Impact & Sustainability

Rated by the Davos World Economic Forum in collaboration with management consultancy McKinsey & Company, the "Lighthouse Factory" program is regarded as "state-of-the-art factory", a role model for "digital manufacturing" and "Globalization V4.0", representing the highest level of intelligent manufacturing and digitization in the global manufacturing sector today. In March 2022, BOE (Fuzhou) was selected as the first LCD panel manufacturer in mainland China to receive this award.

The digital and intelligent energy management platform has high parallel scalability, and can be directly rolled out to the group's various generation lines as well as factories in the display device sector; BOE (Fuzhou) will remain committed to the in-depth, digital and intelligent transformation of energy saving and emission reduction, and will drive up the energy saving and emission reduction efforts of the entire industry while becoming an energy-saving benchmark; and will positively respond to the national call for meeting the "dual-carbon" goal and remain an industry leader.

Expert Comments

In high energy-consuming sectors such as iron and steel, non-ferrous metals, and electric power, the company has been involved in the early development of an energy management system, yielding remarkable results and making significant contributions to energy saving and carbon reduction in China. BOE, a leading LCD panel producer in China, plays a crucial role in AI-driven energy management. BOE (Fuzhou) integrates AI elements into traditional energy management, utilizing natural cold sources for energy savings in the cooling water system. It employs waterjet diversion water-saving technology to reduce water consumption and achieves energy and water savings through color-film wastewater recycling technology. BOE's application of modern digital technology in optimizing energy management and energy-saving remodeling projects serves as a valuable precedent for the LCD industry, setting the stage for reduced carbon emissions.



Gree's Smart Park with "PEDF"

Gree Electric Appliances Co., Ltd.

Project Overview

Driven by the national "dual carbon" policy, the energy structure adjustment of industrial enterprises is imperative, Gree Electric Appliances Hangzhou base combined with regional advantages, make full use of Jiangdong flexible DC power supply system and the abundant wind and light energy by the Qiantang River, and build Gree's Smart Park with "PEDF" as a whole. Through the application of "wind and solar hydrogen storage multi-energy coupling" and "PEDF" technologies, a coupling system of "grid valley power + new energy hydrogen production and hydrogen fuel cell power generation" is built, and supporting battery energy storage and distributed photovoltaic, a seven-dimensional integrated interconnection and multi-direction flow new source load supply system is built, taking into account the functions of power grid peak adjustment, new energy consumption, hydrogen energy utilization and so on. Maximize the efficient use of renewable energy sources such as solar energy, and promote the zero-carbonization of production and operation at the park level.

Company/Organization Profile

Founded in 1991, Gree Electric Appliances Co., Ltd. is a diversified and technology-based global industrial group, covering the two major fields of household consumer goods and industrial equipment. Its products are exported to more than 190 countries and regions. The company has a complete system of scientific research platform, the existing 16 research institutes, 152 research institutes, 1411 laboratories, 1 academician workstation, with the State key laboratory, the national engineering technology research center, the national industrial design center, the national recognized enterprise technology center, robot engineering technology research and development center each.

Gree adheres to the vision of "making the sky bluer and the earth greener", relies on independent innovation, implements the concept of green and healthy development, pioneered "photovoltaic air conditioning", and creates the era of "zero energy consumption" for central air conditioning. In addition, the extended producer responsibility system is implemented, and the circular development model of "green design-green manufacturing - green recycling" is innovatively proposed to ensure the green and efficient development of the whole industrial chain. Since 2010, Gree Electric Appliances has established six renewable resource bases to realize the development of the whole industrial chain integrating scientific research, production, sales and resource recycling.

Project Outcome

1. Carbon reduction effect: The annual energy saving of the project can reach 1,715.81 tons, the carbon dioxide emission is reduced by about 4757.07 tons, and the annual economic benefit is about 13.557,500 yuan. (The power label system takes 1.229 tons of standard coal / 10,000 degrees),
2. Economic benefits: The maximum hydrogen supply of the park can reach 200kg per day, which can save about 2.56 million yuan of production and input cost for the park per year; After the completion of the 8MW photovoltaic project in the park, it can provide about 8 million degrees of clean electricity for the park every year, and save 7.6 million yuan in annual cost.
3. Social benefits: It has vital technology demonstration and commercial practice value for the advance deployment of hydrogen energy strategy, the occupation of hydrogen energy production-transport industrial chain heights, the optimization of the whole social energy use structure of industrial heat, and even the expansion of external power markets.

Project Highlights

1. Gree Electric Appliances "Gree's Smart Park with PEDF " project was selected as the national "Excellent Practice Case of Corporate Green and Low-carbon Development in 2022", which is the first industrial "PEDF" demonstration park in the country.
2. "Zero carbon source" air conditioning technology won the highest award in the Global Refrigeration Technology Innovation Grand Prix in 2021.
3. Awarded Hangzhou 2022 Green Low-carbon Factory.
4. In 2023, it was rated as a shortlisted scene of "Hangzhou Top Ten Low-carbon Application Scenarios".

Project Implementation

In 2012, Gree Electric Appliances proposed zero-carbon photovoltaic air conditioning and the development concept of "making the sky bluer and the earth greener", and then mastered the "light storage" and "zero-carbon source" air conditioning technology through green technology innovation, and has been the practitioner of creating a better low-carbon life. The Hangzhou production base of Gree Electric Appliances focuses on the optimization and application of key technologies for system operation such as "multi-energy coupling of wind and solar hydrogen storage" and "DC distribution network", focusing on the problems of industrial production energy supply structure and new energy mode, poor flexible power supply capacity, frequency conversion "AC-direct" conversion energy loss and power supply load imbalance. Make full use of Jiangdong's flexible DC power system and the abundant wind and light energy along the Qiantang River, enrich the energy structure of the park, improve the operation efficiency of the park's energy system, expand the local consumption space of clean energy, improve the interaction ability of network load, and realize the multi-energy interconnection "PEDF" demonstration park project.

Project implementation:

1. Flexible DC distribution network: Take the office building as the main body, connect the optical storage and charging shed, DC transfer car charger, DC home appliance production line and so on to the DC system, build the first DC factory application demonstration system in Zhejiang, including: build a 10kV DC distribution room, the power supply is from Hangzhou Dajiang East DC distribution network project; 1 DC converter station from 10kV to 750V, with a planned capacity of 2MW; Construction of 380V AC to 750V DC converter station, capacity 2MW; Build a set of light storage and charging shed, including 3 sets of 360kW bus charging piles and 200kW chargers; DC750 DC power distribution project in the park; Office DC750-DC400-DC48 DC power distribution project, mainly including DC HVAC system, DC lighting system, DC office system, DC data center; One DC household appliance production line; Dc "Zero Carbon Healthy Home" ecological experience exhibition hall project;
2. Hydrogen-electric coupling application: The construction of hydrogen production capacity of 200Nm^3/H alkaline water electrolysis hydrogen production, mainly using photovoltaic and grid valley electricity to produce hydrogen and oxygen, among which hydrogen is used for hydrogen fuel cells and hydrogen fuel logistics forklift in Gree Park, oxygen is used for air conditioning production and welding combustion in Gree Park. Hydrogen fuel cells can rely on stable hydrogen supply to generate electricity and go online during peak hours to alleviate the power shortage in the park. Its power generation waste heat can be used for high-temperature injection molding and data centers, becoming a typical demonstration of the whole industry chain of hydrogen production, hydrogen storage and hydrogen use.
3. "Hydrogen heating and cooling" quadruple power supply application demonstration: hydrogen power generation through fuel cell chemical reaction, while producing low-taste waste heat of about 70°c, in order to improve the overall efficiency, the low-taste heat through adsorption refrigeration and dehumidification air conditioning complex system recovery refrigeration, for data center use, to achieve hydrogen cooling and thermal power quadruple research and application demonstration.
4. "Light storage and charging" station application demonstration: the light storage and charging shed is a system integrating power generation, power storage, charging and parking, mainly composed of distributed photovoltaic power generation system, energy storage system and dc charging pile. Through photovoltaic power generation and energy storage, the system effectively alleviates the impact of charging pile electricity on the grid, and at the same time, it can reduce electricity cost through staggered peak electricity consumption, providing clean green energy and value-added services. Through the establishment of multiple integration, supply and demand linkage, efficient allocation of energy supply, the system effectively reduces the dependence on the power grid, and realizes the "optical storage and charge" safe dc application demonstration.
5. "Light storage" efficient HVAC project: The use of the completed construction of 3MW photovoltaic system, 9.6MWH energy storage peaking system, 1900RT DC HVAC system and 10KV flexible direct distribution network system, the interconnection of all systems, to achieve full DC "light storage" application demonstration.
6. On-site consumption of photovoltaic power generation: Hangzhou Electric planned 3MW photovoltaic project at the initial stage of construction of Hangzhou Base, which will be connected to the grid for power generation in 2020. The second phase plans to invest about 20 million yuan, the construction of a new 5MW photovoltaic project, the current project construction is expected to be connected to the grid by the end of 2023.

Project Impact & Sustainability

Gree's Smart Park with "PEDF" adopts "PEDF" technology, and the photovoltaic direct drive utilization rate is as high as 99.04%, ensuring the overall energy utilization efficiency of the park, and alleviating the impact of the uncertainty of photovoltaic and other renewable energy output on the reliability of power supply of the grid; Promote the large-scale application of renewable energy in the terminal energy system to accumulate valuable practical experience, and play a demonstration and leading role in the comprehensive utilization of renewable energy. On this basis, the development of "zero carbon source" air conditioning technology, the technology integrates efficient vapor compression refrigeration technology, natural cold source (air, water) and renewable energy (solar energy) efficient utilization technology, while using environmentally friendly refrigerant, can greatly reduce the energy consumption and carbon emissions during the operation of air conditioning, compared with the benchmark air conditioning climate impact reduction of 85.7%. "Zero carbon Source" air conditioning technology solution won the highest award in the 2021 Global Refrigeration Technology Innovation Competition, if the effective application and promotion of air conditioning technology with carbon emissions as low as 1/5 of traditional air conditioning, by 2050 can achieve a cumulative carbon reduction of 132 billion tons (about 5.28 times the total carbon sink of China's forests), by 2100 can reduce global temperature rise by 0.5 °C.

Gree zero carbon source air conditioning technology will help accelerate the realization of China's high-quality development, and then promote the "carbon neutral" cause in developing countries and even the world, fully demonstrating China's innovation ability in the field of refrigeration, innovative technological breakthroughs will help "carbon peak" and "carbon neutral" goal landing, bring well-being to the people of the world. Promote China to play a key leading role in the development of the global refrigeration industry to combat climate change.

Expert Comments

Industrial parks contribute significantly to the nation's economy, accounting for 30%, with their carbon emissions comprising nearly one-third of the national total. The genuine pursuit of green and low-carbon development in these parks has become a crucial aspect of implementing the dual-carbon strategy. Gree Electric's Hangzhou base leverages regional resources effectively, making full use of the flexible DC power supply system of Jiangdong and the abundant wind and solar resources along the Qiantang River. This strategic approach results in the establishment of Gree's intelligent park, adopting the "PV-Storage-DC-Flexible" model. Through the innovative implementation of "multi-energy (wind, solar, storage, and hydrogen) coupling" and "PV-Storage-DC-Flexible" technology, a coupling system is created. This system, featuring "grid valley power + renewable energy hydrogen and hydrogen fuel cell power generation," is supported by battery storage and distributed PV. The outcome is a seven-dimensional integration within a new "generation-grid-load-supply" system. This system serves various functions, including peak regulation of power grids, renewable energy consumption, and hydrogen utilization, effectively maximizing the efficient use of solar and renewable energy sources. The initiative pushes for the estate to achieve zero-carbon production and operation. Zhuhai Gree's Intelligent Park serves as a valuable precedent for inspiring green and low-carbon development in industrial parks nationwide.

Astronergy "Zero-Carbon Factory" – Create Blueprint for Carbon Reduction of Enterprise by Actions

Astronergy

Project Overview

In 2022, Astronergy launched the construction of a zero-carbon factory. On July 13, 2023, the first phase factory of Astronergy Yancheng Manufacturing Base completed all procedures for green certification and was officially certified as a zero-carbon factory by TÜV Rheinland. This is the first zero-carbon factory of Astronergy and also the first zero-carbon factory accredited by TÜV Rheinland in the world. The milestone signifies that Astronergy has taken a crucial step towards achieving corporate carbon neutrality by 2050, as asserted in its sustainable development strategy.

According to the world's first comprehensive and quantizable construction standards and evaluation regulations for "zero-carbon factory"—the group standards of *Evaluation Specification of Zero-Carbon Factory* (T/CECA-G 0171 – 2022), Astronergy's assessment criteria for zero-carbon factory encompasses six indicators, including infrastructure, intelligent information management system of energy and carbon emission, utilization of energy and resource, products, implementation of greenhouse gas reduction, and implementation of carbon offset.

Astronergy has obtained complete certification by high starting point for planning, high standards for design, highly automated equipment, and highly intelligent manufacturing. During the construction of "zero-carbon factory", Astronergy Yancheng Manufacturing Base reduced 42,221.37 tons of carbon emission in total, and its renewable energy occupied 69.61% of total energy utilization. The amount of reduced greenhouse gas is equivalent to the effect of planting 2.34 million trees, contributing remarkable environmental benefits.

Company/Organization Profile

Under the CHINT Group, Astronergy is an intelligent manufacturing enterprise focusing on photovoltaic cells and modules. Founded in 2006, it is one of the earliest private enterprises in China to set foot in the photovoltaic field. And it is a pioneer in n-type TOPCon PV modules.

Committed to be the most competitive photovoltaic module supplier worldwide, Astronergy sets its mission to create a sustainable and net-zero carbon world with solar power. Focusing on R&D, production and sales of high-efficiency crystalline silicon PV cells and PV modules, Astronergy has continuously launched the ASTRO series high-efficiency, high-quality, high-performance modules. Big-size wafer tech enables both bifacial and monofacial ASTRO series modules could be perfectly applied in all scenarios such as utility-scale power stations, commercial & industrial (C&I) PV systems and residential PV systems. Pioneered the mass production of n-type TOPCon PV modules and Astronergy keeps leads in n-type TOPCon PV cell tech.

Project Outcome

1. **Rooftop solar:** from cell workshops, and module workshops to integrated warehouse, a total of 26,590 pieces of Astronergy's self-developed and high-efficient PV modules have been installed on the rooftops, covering an area of 80,000 m(2) and with a total installed capacity of around 11MW. The power station is estimated to generate 11,180,000 KWH of clean electricity per year, equivalent to saving 1,374 tons of standard coal or reducing 6,376 tons of carbon.
2. **Solar parking shed:** it covers an area of 4,614 m(2), available for parking 220 vehicles and more than 400 non-motor vehicles, and its annual power generation capacity can reach 920,000 KWH. Moreover, the Base installs 200 solar street lamps, which can save around 30,000 KWH of clean electricity, equivalent to reducing 17.72 tons of carbon.
3. **Green electricity**: the factory has realized 69.6% of green electricity offset proportion and 65.4% of carbon credit offset proportion by purchasing the Renewable Energy Certification.
4. **Automation renovation:**
   Astronergy replaced traditional manual work by developing and introducing dual-arm robots and the image inspection system, raising the automation rate to 95%. The project also upgraded and installed the company's self-developed automatic rinsing system and smart cleaning robot, effectively increasing the revenue of generation while realizing the intelligence of solar power station. It is worth noting that the automated renovation not only increases capacity, but also reduces 30% of personnel. The increase of capacity will enable energy consumption of unit products to be reduced on a large scale.

Project Highlights

1. First TÜV Rheinland certified zero-carbon factory in the industry.
2. Taking zero-carbon factory as a pivot, Astronergy drives Yancheng City to construct related zero-carbon parks, and pushes forward the process of carbon neutrality of Jiangsu Province.
3. Exert a demonstration effect across the industry.
4. By the demonstration effect of the project, Astronergy motivates more enterprises across same region, same industry or those with a desire to reduce energy consumption and emissions to embark on the construction of zero-carbon factories, thereby contributing to greater social benefits.

Project Implementation

As the first "zero-carbon factory" of Astronergy, Yancheng Manufacturing Base saves energy and reduces carbon by precious management and control of factory equipment, and by lowering the energy consumption of operation. From infrastructure to an intelligent information management system of energy and carbon, precious operation of equipment to management of green supply chains, the "green" principle runs throughout the entire flow of production management of Yancheng Manufacturing Base. During the construction of "zero-carbon factory", Astronergy Yancheng Manufacturing Base reduced 42,221.37 tons of carbon emissions in total, and its renewable energy occupied 69.61% of total energy utilization. The amount of reduced greenhouse gas is equivalent to the effect of planting 2.34 million trees, contributing remarkable environmental benefits.

1. Authoritative certification

Since the beginning of construction, Yancheng Manufacturing Base has been attaching importance to green and low-carbon construction, and has obtained important international certifications such as ISO14001 Environmental Management System Certification, ISO14064 Greenhouse Gas Certification, and ISO50001 Energy Management System Certification and the like. Hereinto the ISO 50001:2018 is the energy management system (EnMS) certification standard issued by the International Organization for Standardization (ISO), which demonstrates that Yancheng Manufacturing Base has established a set of complete and effective energy management systems, and it can continuously improve energy performance, and accelerate zero-carbon process. Besides that, the Evaluation Specification of Zero-Carbon Factory (T/CECA-G 0171 – 2022) that Astronergy refers to is the first comprehensive and quantizable construction standards and evaluation regulations for "zero-carbon factory" in the world. In July 2023, the first phase factory of Astronergy Yancheng Manufacturing Base has completed all procedures for green certification, and was officially certified as zero-carbon factory by TÜV Rheinland. This is the first zero-carbon factory of Astronergy and also the first zero-carbon factory accredited by TÜV Rheinland in the world. Astronergy drives the enterprise for green and low-carbon transition, and takes a solid step toward the goal of carbon neutrality.

2. Green planning

The implementation of "zero-carbon factory" mainly includes three facets: improvement of energy efficiency, application of energy-saving technologies, and utilization of renewable energies, saving energy and reducing energy consumption by a series of measures such as waste heat recovery, intelligent energy management, and rooftop solar power generation and the like. Astronergy equips the factory with rooftop solar power stations and builds self-generating power equipment such as solar parking sheds and solar street lamps to reduce carbon emission by renewable energy power; furthermore, the factory has upgraded the energy-saving illuminating system, applies water-saving appliances and equipment, disposes high energy consuming equipment, and uses green architecture materials and low energy consuming building structure; meanwhile, it sets up an intelligent information management system of energy and carbon emission to dynamically monitor and analyze energy consumption. Moreover, the factory has realized 69.6% of green electricity offset proportion and 65.4% of carbon credit offset proportion by purchasing the Renewable Energy Certification.

3. Green manufacturing

From cell workshops, module workshops to integrated warehouse, a total of 26,590 pieces of Astronergy's self-developed and high-efficient PV modules have been installed on the roof, covering an area of 80,000 m^2 and with a total installed capacity of around 11MW. Since combining with the grid on January 7 this year, the power station is estimated to generate 11,180,000 KWH of clean electricity per year, equivalent to saving 1,374 tons of standard coal or reducing 6,376 tons of carbon. The roof of the integrated warehouse in the park first applies Astronergy's self-developed TELOGY photoelectric rooftop system of industrial and commercial buildings, perfectly merging solar power generation with rooftop construction materials of industrial and commercial buildings. The buildings integrated photovoltaics (BIPV) not only effectively increase PV installed capacity by 20% for the integrated warehouse, but also have a nice appearance, which enables PV modules to perfectly fit with the whole building, meeting building requirements such as aesthetics, safety, waterproofing and the like. The Base also builds solar parking sheds, which perfectly combines the sheds with solar power generation, and becomes a model of environmental protection for the application of solar power generation in daily life. This move not only solves the high temperatures in open parking conditions, but utilizes vacant space in the sheds to generate power, realizing self-generation for self-use.

Project Impact & Sustainability

The zero-carbon factory of Astronergy has been reported by mainstream media such as Bei Ji Xing, Solarbe Global and the like, and has been widely recognized by the society.

The successful completion of the first zero-carbon factory certification exerts a demonstration effect across the industry. In the future, Astronergy intends to lead and cultivate a batch of "zero-carbon factories" and to motivate all factories to actively carry out the technical upgrading for energy saving and carbon reduction, the application of renewable energy projects, and the research and development of cutting-edge low carbon technologies, truly decreasing cost and increasing benefits, and endeavoring to realize the carbon peak and carbon neutrality goals. Besides steadily pushing forward the zero-carbon factory of Yancheng Manufacturing Base, Astronergy is in the planning stages for several more zero-carbon factories, hereinto 3 zero-carbon factories will be implemented in 2024, and 8 zero-carbon factories by 2028.

Moreover, at present, the industrial direct carbon emission in China occupies 40% of national total emission, which will increase to 64% when calculating indirect emission. Therefore, Astronergy wishes to motivate, by the demonstration effect of the project, more enterprises across same region, same industry or those with a desire to reduce energy consumption and emissions to embark on the construction of zero-carbon factories, thereby contributing to greater social benefits.

Expert Comments

Astronergy's "Zero-Carbon Factory" project has garnered media attention and acclaim for its energy-saving and carbon-reducing technological transformation. The project emphasizes the application of renewable energy projects and the research and development of cutting-edge low-carbon technologies. Notably, the promotion of the zero-carbon intelligent information system stands out, facilitating synergistic management and control of energy supply and consumption. This integration has led to significant cost reduction and efficiency enhancement, setting a commendable example for peers aspiring to establish their own "Zero-Carbon Factory."

Lenovo's Journey to Net-Zero: Supply Chain Sustainability

Lenovo Group

Project Overview

Lenovo is the first PC and smartphone maker to have its net-zero targets validated by the Science Based Targets initiative's Net-Zero Standard. This effort began when Lenovo's 2030 emissions reduction goals (near-term goals) were validated by Science Based Targets initiative (SBTi) in June 2020. In January 2023, Lenovo Group received validation for its long-term, 2050 net-zero targets from SBTi. Through this process, Lenovo commits to reduce absolute Scope 1, 2, and 3 GHG emissions by 90% by FY2049/50 from a FY2018/19 base year. The remaining 10% residual GHG emissions will be neutralized at the target year as well as any GHG emissions released into the atmosphere thereafter. .

To better promote low-carbon transformation across society, Lenovo Group has been exploring a practical path to net-zero. This path encompasses reducing carbon emissions in its own operations and manufacturing, collaborating with its supply chain to reduce carbon emissions, and helping industry enterprises achieve low-carbon transformation. Lenovo is working with all sectors of society to build a sustainable future.

Focusing on the major challenge of enterprise carbon emissions reduction, which is Scope 3, Lenovo is taking practical actions through more sustainable product design, innovative application of materials, manufacturing more sustainability, product energy efficiency improvement, as well as sustainability in packaging, logistics, take-back programs, and supply chain management.

Beyond its value chain, Lenovo Group is helping clients in different industries manage their emissions through solutions and services. Lenovo's Sustainability solutions are informed from Lenovo's insights, experiences, and digital transformation experiences, enabling many companies to drive their own sustainability objectives.

Company/Organization Profile

Lenovo (HKSE: 992) (ADR: LNVGY) is a US$62 billion revenue global technology powerhouse, ranked #217 in the Fortune Global 500, employing 77,000 people around the world, and serving millions of customers every day in 180 markets. Focused on a bold vision to deliver smarter technology for all, Lenovo has built on its success as the world's largest PC company by further expanding into growth areas that fuel the advancement of 'New IT' technologies (client, edge, cloud, network, and intelligence) including server, storage, mobile, software, solutions, and services. This transformation together with Lenovo's world-changing innovation is building a more inclusive, trustworthy, and smarter future for everyone, everywhere.

Project Outcome

Since 2022, Lenovo Group has accelerated its sustainability transformation, achieving new breakthroughs in areas such as setting science-based net-zero targets, driving low-carbon transformation across its entire value chain, and developing sustainability services and solutions. As of FY2021/22, the progress toward the target of reducing absolute greenhouse gas emissions by 50% for Scope 1 and Scope 2 has reached 15%.

1. **Sustainable Product Design:** The development of revolutionary supply chains, product design and materials have enabled Lenovo to shift to a circular model of "design, use, return." Rather than focusing on making a single product line sustainable, Lenovo is holistically integrating closed loop recycled plastic (plastic from electronics) into a wide range of products.
2. **Manufacturing for Sustainability:** As a global technology powerhouse, Lenovo is innovating to make its supply chain and manufacturing more sustainable, with an opportunity to influence and enhance sustainability throughout our global business. By FY2025/26, 90% of Lenovo's global operations' electricity will be obtained from renewable sources, through the installation of onsite renewable energy generation, entry into power purchase agreements with power providers and/or the purchase of renewable energy credits. Lenovo is aligning its Wuhan and Tianjin factories to the "General Specification for the Evaluation of Zero-carbon Factories" group standard developed by China Electronics Standardization Institute (CESI) and its Hefei-based Lenovo China Future Center (LCFC) was recognized in the Global Lighthouse Network from World Economic Forum. The LCFC has 121 authorized patents in the field of intelligent manufacturing.

Lenovo Group Innovation Industrial Park (Tianjin)

3. **Innovating for Sustainability:** Lenovo's industry-leading Neptune direct water-cooling solution, which recycles loops of warm water to cool data center systems, helps customers to realize up to a 40% reduction in power consumption and a 3.5x improvement in thermal efficiencies compared to traditional air-cooled systems.

4. **Sustainability Services:** Lenovo shares its insights to help customers speed up their sustainability journey with services. Lenovo customers can use sustainability solutions and services to meet their sustainability goals.

Project Highlights

1. Overall: Lenovo is rated AAA by MSCI ESG Ratings, the highest possible rating for corporations leading in ESG programs.
2. Supply chain sustainability:
   - Ranked #8 in the Gartner Global Supply Chain Top 25, a listing it achieved for the 9th time in 2023
   - '#1 in Gartner's Asia-Pacific Supply Chain Top 10 for the 2nd time, with a perfect score in ESG.
   - Lenovo's "Low Carbon Supply Chain Practices" case study was selected as one of the 2023 Forbes China ESG Innovators.
   - Lenovo received the CDP Supply Chain Decarbonization Pioneer Award with leadership recognition across the areas climate change, water security, and supplier engagement.
   - As part of its inclusion in the 2023 Hang Seng Corporate Sustainability Index, Lenovo received the highest score in the IT Industry for Environmental and Social Achievements
3. Flora Wu, Country Director of CDP China, once commented that Lenovo is among the first group of companies in China to managing its scope 3 emissions, and we encourage more such industry leaders to promote and popularize the development and practice of advanced green technologies.

Project Implementation

Driven by the goal of achieving net-zero emissions, Lenovo is working to reduce emissions across its entire value chain, and is on-track to meet it's near term 2030 emissions reduction goals, validated by the Science Based Targets initiative.

As a global technology manufacturing company, Lenovo operates 35 manufacturing bases worldwide, serves 180 markets, and maintains a highly complex global supply chain network with over 2,000 suppliers. Lenovo's annual carbon accounting results indicate that its Scope 3 emissions account for over 99% of total emissions, with sold product usage, purchased goods and services, and product transportation constituting the largest share. Consequently, Scope 3 emissions pose the major challenge for Lenovo in achieving its net-zero goal.

Lenovo has integrated sustainability into the entire lifecycle of design, production, use, and recycling for green products. The company's R&D team collaborates closely with suppliers to introduce recycled materials into products and packaging, promoting sustainable packaging. In terms of sustainable manufacturing, Lenovo has established low-carbon manufacturing bases in several cities. For green logistics, Lenovo promotes emission reduction through multimodal transportation, optimized transportation, integrated utilization, and optimized networks. Additionally, Lenovo provides recycling services for used electronic products for all types of clients, maximizing the value of recycled products and parts, fostering a circular economy.

Currently, Lenovo has applied recycled content (CL PCC) plastics to 298 products. In FY2021/22, Lenovo utilized a total of 130 to 140 tons of ocean-bound plastic (OBP) materials. As part of its initiative to reduce plastic usage, Lenovo was among the first in the industry to introduce materials like bamboo and sugarcane fiber packaging. Moreover, Lenovo has reduced the use of packaging materials by 4,137 tons through the adoption of self-closing boxes.

In addition to these efforts, Lenovo Group has been leveraging its influence to drive its supply chain core enterprises to accelerate their low-carbon transformation. Lenovo has taken a multi-pronged approach to this, including: developing a comprehensive supply chain management plan; strengthening supply chain construction through digital and intelligent technologies; and implementing tailored measures for different types of suppliers.

Driven by Lenovo's initiatives, in FY2022/2023, 45% of its suppliers by spend have committed to set or have set SBTs, which was an increase of 17 percent from the previous reporting period. 72% and 84% of suppliers by spend have public renewable energy goals and are tracking and reporting renewable energy generation and purchases, respectively. Lenovo's long-term goal is to achieve 95% of suppliers by procurement spend to implement SBTs.

Beyond the value chain, Lenovo is striving to contribute to a greener future through ESG services and solutions. Lenovo actively promotes efficiency improvement and emission reduction through digitalization and intelligent transformation. Lenovo's ESG services and solutions encompass ESG general capabilities such as ESG consulting services and corporate ESG management platforms. The company also provides ESG solutions covering environmental, social, and corporate governance. Lenovo's ESG solutions are currently enabling clients in industries such as manufacturing, intelligent buildings, and smart cities to achieve sustainable development goals.

Project Impact & Sustainability

Guided by its net-zero goal, Lenovo is intensifying its sustainability innovation efforts and leveraging its global supply chain influence and service solution capabilities to promote its sustainable innovation strength across industries.

Lenovo has independently developed a range of innovative technologies to enable more sustainable computing, including liquid cooling technology, LAPS, and deep-cooling nitrogen production applications. Lenovo has deployed over 70,000 liquid cooling systems globally, enabling efficient operations in government, education, manufacturing, healthcare, energy, and other industries.

In addition, Lenovo has developed and introduced ESG solutions, primarily focused on enabling its clients in various industries to deliver on their low-carbon transformation commitments. Lenovo recently released the LeGreen platform, which comprises eight functional modules, including product carbon footprint, factory carbon management, supplier ESG scorecard, and an ESG control tower, breaking down organizational barriers with digital intelligence and effectively empowering enterprises in their low-carbon transformation journeys.

In its net-zero roadmap, Lenovo sets a long-term goal to reduce absolute GHG emissions for Scopes 1, 2, and 3 by 90% from the FY2018/19 baseline by FY2049/50 and achieve net-zero GHG emissions across its entire value chain.

Expert Comments

Lenovo Group's comprehensive "net-zero" transformation campaign across its entire value chain is highly commendable. The company actively embraces "net-zero" practices at various stages, including green product design, innovative green materials, environmentally conscious production, increased product energy efficiency, sustainable packaging, eco-friendly logistics, product recycling and reuse, and green supply chain management. By mobilizing its complete value chain, Lenovo fosters collaboration across the supply chain to collectively diminish carbon emissions. This holistic approach not only charts a practical course for low-carbon development in industrial enterprises but also yields positive economic, environmental, and social benefits. The campaign, serving as an exemplary model, offers valuable insights for broader adoption in similar initiatives.

Standards lead the way to a “carbon” future

Guangdong Carbon-Neutral Technology Development Co., Ltd.

Project Overview

Located at No.253,Junma Road,Hengli Town, Dongguan City,Guangdong Province and completed and put into operation in October 2022, Letaron Zero-Carbon Estate boasts of a site area of about 16,000 square meters and a building area of about 45,000 square meters. The project is funded and constructed by Guangdong Letaron Optoelectronics Technology Company Limited (a “Little Giant” business). Since the approval of the revised zoning plan, Letaron, together with more than 80 international and domestic industry, academia and research organizations, has taken the lead in exploring and practicing carbon-neutral industrial parks in China’s optoelectronics sector, and sought to inform the construction of the project via the development of industry standards, and improve said standards by aiming at project buildout. After nearly 5 years, it has achieved 60 zero carbon points with the highest cost performance (infrastructure construction cost ratio), setting out a blueprint for high-quality and innovative development of the industry as well as sustainable development of industrial parks.

The estate features a crossover integration of such innovative technologies as “green building”, “smart energy”, “industrial ecology” and “carbon asset management” to establish an omni-lifecycle management model of zero-carbon industrial parks. Solar photovoltaic panels are installed on the roofs of the estate's buildings to convert sunshine into electricity for production and domestic use; the estate has also built a carbon asset management system and enables digital carbon management and real-time reading of carbon emission data through the online smart meter and software integration control; the estate has an integrated system platform consolidating intelligent management and control, energy saving and emission reduction, which stays on top of the developments on site and provide timely support for a slew of daily management decisions.

Company/Organization Profile

Guangdong Zero Carbon Estate Technology Development Co., Ltd. is a wholly-owned subsidiary of Guangdong Letaron Optoelectronics Technology Co., Ltd. The company was incorporated on September 5, 2019 at No.253,Junma Road,Hengli Town, Dongguan City,Guangdong Province.

Leveraging the intelligent zero-carbon estate program, the company provides one-stop services ranging from planning and consulting, design, construction, operation, certification and evaluation for green- and brownfield industrial parks with a standard-led and design-empowered approach, with the view of building up a sustainable development ecosystem of industrial parks featuring “technology platform + industrial operation + ecological cooperation”.

Project Outcome

1. Per the statistical accounting of the *China Building Energy Consumption Research Report 2019* issued by the Specialized Committee on Energy Consumption Statistics of the China Association of Building Energy Efficiency, the annual average consumption of primary energy in general public buildings in Guangdong Province equals to an average energy intensity of about 244kwh/m^2 p.a. per square meter, while the total energy intensity of the Zero Carbon Estate is 124.5kwh/m^2/yr, equivalent to 51% of regular buildings in Guangdong Province, which reduces energy consumption by 49% in total;
2. The project has an infrastructure investment of approx. RMB120 million, with an aggregate cost of about RMB2,630/m^2, a 13% saving vis-à-vis the construction cost of regular industrial parks (about RMB 3,000/m^2);
3. Once launched into operation, the carbon dioxide emissions can be reduced by about 515 tons per year through photovoltaic power generation, industrial ecology, building energy saving, green plant absorption and air source heat pump;
4. The group standard *Technical Guidelines for Design and Evaluation of Smart Zero-Carbon Industrial Parks* is developed and elevated to a local standard of Guangdong Province;
5. Solar photovoltaic panels has been installed on the roofs of the buildings in the estate, with an installed capacity of about 352 KWp and an average annual power generation capacity of about 360,000 kWh. The emission reduction could amount to about 4,106 tons of carbon dioxide throughout the lifecycle of the equipment (based on 20 years).

Project Highlights

Letaron Zero Carbon Estate has become a standardized pilot for the new urbanization drive, a national standardized pilot for circular economy, a net-zero pilot for Guangdong Provincial Department of Ecology and Environment, one of the first-wave carbon-peaking and net-zero pilots of Guangdong Provincial Development and Reform Commission, a standardized industrial park net-zero pilot of Guangdong Provincial Market Supervisory Bureau and Dongguan Industrial Park.

Project Implementation

1. Design is prioritized by engaging an UK design team

The project is designed by Bill Dunster's zero-carbon team from the UK to feature green and low carbon considerations, taking account of local climate traits. Buildings across the entire estate is designed in a cascade from north to south, which both maximizes the natural lighting and ventilation of individual buildings, while reduces the estate's reliance on electric lighting and cooling, and achieve the purpose of energy saving and emission reduction.

2. Development of standards is prioritized to inform project buildout

In the early stages of land acquisition and planning, Letaron Group realized that there was no established domestic standard for the design and evaluation of zero-carbon industrial parks. Therefore, it took nearly 3 years to develop the group standard *Technical Guidelines for Design and Evaluation of Intelligent Zero-Carbon Industrial Parks*, which puts forward specific requirements for the design of building systems, energy systems, intelligent and green production systems, transportation systems, water systems, waste treatment systems, energy monitoring and control systems, environmental monitoring and control systems, and ancillary facility systems of the industrial parks. It also proposes an evaluation index system covering low carbon economy and low carbon management, energy saving and environmental protection, as well as intelligent system, etc. This standard fills a regulatory gap in the country, serves as a theoretical basis for the construction of Letaron Zero-Carbon Estate, and lays the groundworks for further rollout.

3. Building energy efficiency lays a solid foundation for low carbon

The zero-carbon estate has taken into account the climate traits of the region in which it is located and taken the following measures: making full use of natural lighting to reduce lighting energy consumption; giving full consideration to natural ventilation to reduce the indoor temperature; installing PV roof panels extensively to reduce direct sunlight and a garden lawn to absorb direct sunlight, and adopting polystyrene thermal insulation panels to substantially reduce the temperature of the top floor; utilizing the air heat pump to provide hot water for domestic use; installing doors and windows in a recessed style to reduce sunlight exposure, and adopting broken bridge aluminum and double glazing extensively to reduce heat conduction; adopting glass bead thermal insulation mortar for the external walls; and purchasing Dongguan products wherever possible for construction materials and electromechanical equipments, so as to reduce the carbon emission from transportation, among others.

4. Green energy reduces on-site carbon emissions

Photovoltaic panels are installed on the building roofs across the zero-carbon estate with an installed capacity of about 352KWp and an average power generation of about 360,000 kWh p.a., turning daylight into electricity for production and domestic use, reducing carbon emissions. During weekday lunch breaks and holidays, the power generated from the PV panels is grid-connected and transmitted back to the public grid.

5. Transform the production process with green and low-carbon philosophy

Letaron highly values circular development in R&D, design, production and logistics, which is achieved through modular design and production, material turnover box/tray recycling, assembly line carrier recycling, damaged electronic components recycling and replacement, tin scrap material recycling, paper and plastic recycling, etc. The estate's comprehensive utilization of solid waste is up to 95%.

6. Energy saving and consumption reduction by leveraging own strengths

Letaron is a "little giant" business in the photoelectricity intelligent control sector, and is particularly adept at energy saving and consumption reduction through the use of photoelectricity intelligent control technology and equipment. LED energy-saving lamps are responsible for production and resident lighting on the estate, and 300 sets of solar lamps illuminate all external areas, saving 116 kWh of electricity on a nightly basis. The production workshops adopt professional equipment to recover electricity, energy-saving aging cabinets can recover 30% of the electricity; radar sensor lighting systems are installed in underground garage to automatically adjust the brightness of illumination, saving about 65% of power; human body intelligent sensor lights are installed in staff dormitories, saving more than 60% of power.

7. Build a smart energy management system to improve operational efficiency

The project has developed and built a zero-carbon omni-lifecycle management model and platform, which is an integrated system platform for intelligent management and control, energy saving and emission reduction, covering the estate's basic management system, security management system, energy management system, environmental monitoring and management system and other sub-systems, which stays on top of the developments on site and provide timely support for a slew of daily management decisions. The estate has also built a carbon asset management system, which provides carbon emission monitoring, carbon emission accounting and reporting, carbon performance management, carbon asset management and other functions, and enables digital carbon management and real-time reading of carbon emission data through the online smart meter and software integration control.

8. Green and low-carbon becomes the lifestyle-du-jour

The estate has also taken measures in transportation and lifestyle: renewable energy trucks have become the preferred choice for transporting materials and goods; the site also offers a large number of charging piles to incentivize employees to travel in a green and low-carbon fashion, with staff-owned renewable energy vehicles reaching 15%; the estate has planted a wide range of greenery to absorb carbon emissions, encouraging employees to conserve water and electricity, and to actively participate in garbage and pre-owned clothing recycling; it also launched the "Zero Carbon+" magazine to educate the public on the concept of dual-carbon goals.

Project Impact & Sustainability

In terms of technological innovation: 1) the relevant theories of industrial ecology are applied to comprehensively optimize the design, production, sales and recycling of the semiconductor lighting industry, and to lay down the requirements of low energy consumption and up- and downstream complementarity of the industrial chain for tenant businesses, so as to gradually form a circular economy ecosystem within the estate; 2) build a brand-new platform and system in terms of comprehensive management and carbon asset management, enabling intelligent management and dynamic monitoring; 3) a more robust standard system in the green and low-carbon development of industrial parks is established, which will be helpful for project scalability. Next, we will leverage the available resources of the optoelectronic industry in Hengli, adhere to the concept of zero-carbon development, team up with upstream and downstream industry chain partners to build an ecosystem of quality innovative development of the photovoltaic industry, and through piloting and further rollout of the zero-carbon industrial park project, maximize the industrial park's economic, social and ecological benefits, thereby helping promote the quality development of the regional economy, and making our due contribution to the "dual-carbon" goals of China.

Expert Comments

China's total building energy consumption comprises almost 50% of the country's total energy usage. Building operations contribute approximately 25% to this total, with nearly half originating from public buildings, highlighting significant potential for energy savings. The project incorporates innovative technologies like "green building," "intelligent energy," "industrial ecology," and digitalization, resulting in a 50% reduction in the energy intensity of public buildings. It establishes comprehensive management models and standards for low energy consumption in public buildings, serving as guidelines for low-carbon and near-zero-carbon building management and setting a model for energy-saving initiatives in public buildings across China.

Key technologies for the utilization of high-concentration beer wastewater and municipal wastewater in synergistic treatment for pollutant and carbon reduction and utilization as resources

Tsingtao Brewery Co., Ltd.

Project Overview

China's urban sewage treatment plants have low organic matter concentration in their incoming water, thus need to add a large number of chemical carbon sources, resulting in a rapid increase in treatment costs and carbon emissions. China's beer producers have an annual wastewater emissions of more than 100 million tons, which is rich in sugars and other organic matter. In order to ensure compliance with the emission standards, sewage treatment is required before being discharged into the downstream sewage plant, leading to exorbitant treatment costs.

Tsingtao Brewery Co., Ltd. and Qingdao Water Group Co., Ltd. have set up a joint taskforce to address the above industry pain points. The parties engaged in research on the key technology of the co-treatment of high-concentration beer wastewater and municipal wastewater in Qingdao City-owned breweries and municipal wastewater treatment plants for pollutant and carbon reduction and utilization as a resource. They established methodology for the screening and evaluation of biomass carbon in beer high-concentration wastewater, and made a global first in screening out the beer thermal condensates with high COD, high C:N:P as a biomass carbon source suitable for municipal wastewater treatment plants; they pioneered a series of technologies for the separation, collection and resource utilization of beer thermal condensates, and the new model of resource utilization of beer thermal condensates + low carbon co-treatment of beer wastewater and municipal wastewater, which can accurately place high-concentrated wastewater from breweries into downstream wastewater treatment plants as a substitute for carbon source, and discharge low-concentrated wastewater into downstream wastewater treatment plants after simple pretreatment. The approach improves the biochemical viability of the downstream sewage plant, and has been recognized by the ecological, environment and water administrative authorities.

The project won the Second Prize of Qingdao Science and Technology Progress in 2022 and the Third Prize of Science and Technology Progress of China Alcoholic Drinks Association; two invention patents and two utility model patents were authorized, and seven papers were published, with a cumulative cost saving of RMB62.363 million post-rollout and a carbon reduction of 42,000 tCO2e.

Company/Organization Profile

The predecessor of Tsingtao Brewery Co., Ltd. was the Germanic Brewery Company Tsingtao AG, which was founded in Qingdao in August 1903 as a joint venture between German and British businessmen, and it is a long-established beer manufacturer in China. The brand commands a monetary value of RMB240.689 billion, ranking first in China's beer industry for 20 consecutive years. Tsingtao exports to more than 100 countries in the world, and is the fifth largest beer manufacturer in the world. Tsingtao Brewery has won almost all the gold medals in beer quality competitions held since the founding of the PRC in 1949. As of the end of 2022, Tsingtao Brewery has more than 60 beer production businesses in 20 provinces, municipalities and autonomous regions across China.

Project Outcome

1. **Economic Benefits:** The project has been applied in 33 factories of Tsingtao Brewery, saving RMB62.363 million in cumulative wastewater operation and investment costs. If the project is fully implemented in the beer industry nationwide, it is expected that the wider sector will reduce the cost of wastewater treatment by RMB93.68 million, and RMB890 million in upstream and downstream cost savings.
2. **Environmental Benefits:** post project rollout, the amount of sludge produced will be reduced by 24,700 tons. Upstream and downstream carbon reduction of 42,000 tCO2e, of which the brewery is to reduce carbon emissions of 30,000 tCO2e, sewage plants to reduce carbon emissions of 12,000 tCO2e. The project enables comprehensive utilization of 90,000 tons of thermal condensate as an alternative carbon source: 3,422 tons (20% liquid sodium acetate carbon equivalent). In the case of **full rollout across the beer industry**, it is expected to reduce carbon emissions by **53.75 million tons/year**, which is equivalent to planting 480 million 30-year-old fir trees.
3. **Social Benefits:** this project has built up a multi-party joint consultation mechanism; it led the change of industry standards, promoted the release of the amended list of *Pollutant Emission Standards for the Brewery Industry*, and led the revision of water pollutant emission standards for starch and citric acid industries; it explored a new mode of resource utilization, enabled upstream and downstream synergy in reducing pollution and carbon emission; and filled the gaps in the industry, and pioneered the comprehensive utilization of thermal solidification technology in the industry. The project was tabled at the 13th National People's Congress of Shandong Province, and received a reply by the Department of Ecology and Environment and the Department of Housing and Urban Construction of Shandong, and was rolled out across the province.

Project Highlights

The project won the Second Prize of Qingdao Science and Technology Progress in 2022 and the Third Prize of Science and Technology Progress of China Alcoholic Drinks Association; it was selected as one of the 100 typical cases of "Prioritizing Environmental Protection and Promoting Development" by Shandong Provincial Department of Ecology and Environment, and included into the "Catalog of Green and Low-Carbon Technology Achievements (2022)" by Shandong Provincial Department of Science and Technology. It has received media coverage on over 100 occasions by such domestic mainstream outlets as Cenews.com, Economic Daily, Guangming.com, infzm.com. It was praised as "state of the art" by the evaluation panel composed of academician Ma Jun and other experts.

Project Implementation

Qingdao Brewery Co., Ltd. and Qingdao Water Group Co., Ltd. have set up a project taskforce to carry out research on the separation, extraction, and utilization of biomass carbon source in beer wastewater, beer wastewater recycling technology, and high-efficiency denitrogenation and dephosphorization technology for low-carbon co-disposal of beer wastewater and municipal wastewater, and to create a standard operation model of upstream and downstream value sharing of beer wastewater.

Phase I: research for the project commenced in March 2020, and after 6 months of technical study, the extraction of saccharificated thermal condensate with high organic content in beer production wastewater was achieved to enable utilization by municipal wastewater treatment plants, including replacing the traditional denitrification carbon source of municipal wastewater treatment plants and biogas production by synergistic anaerobic digestion with sludge, so as to reduce the input of chemical carbon source and improve the gas production rate of anaerobic digestion, thereby boosting the quality and efficiency of sewage treatment, energy saving and emission reduction.

Phase II: in December 2020, the Ministry of Ecology and Environment issued a revised list of *Pollutant Emission Standards for the Brewery Industry* (GB 19821-2005), which will be used as the pre-treatment emission concentration limit where, through the signing of a legally binding written contract, businesses and the centralized wastewater treatment facility agree on the concentration limit of a certain water pollutant to be discharged to the centralized wastewater treatment facility. Immediately after the release of the amended list, Tsingtao Brewery communicated with the Water Group, Qingdao Bureau of Ecology and Environment, Qingdao Water Bureau and other relevant authorities, and secured the support of the supervisory authorities. With the support of Qingdao Bureau of Ecology and Environment, in May 2021, the breweries owned by Tsingtao Brewery Co., Ltd. and the sewage treatment plant belonging to Qingdao Water Group Co., Ltd. signed an agreement on the indicator discharge concentration limit to enable the synergistic treatment of beer production wastewater and municipal sewage to promote the synergy of pollutant and carbon reduction.

Phase III: upon the signing of agreement with the local plant, Tsingtao Brewery developed a standard literature pack on the standardized discharge of negotiated limits for beer wastewater, and instructed its 58 beer production plants to roll out with tailored approaches to cater to the circumstances of individual plants. 33 factories have entered into contracts with downstream wastewater plants thus far.

1. Comparison before and after implementation

(1) Before implementation

Before the implementation of the project, the cost of wastewater treatment for 33 breweries of Tsingtao Brewery Co., Ltd. amounted to RMB49.11 million p.a.; the capital cost for the proposed green- and brownfield wastewater treatment facilities in three factories totaled RMB32.125 million.

Before project implementation, Qingdao's three municipal wastewater treatment plants needed to spend RMB9.14 million for the purchase of external wastewater treatment carbon sources in 2020-2022, and its electricity bills came in at RMB1.58 million.

(2) After implementation

The outcome of the project have been applied in 33 breweries and municipal sewage treatment plants across the country, with a cumulative cost saving of RMB62.363 million in 2020-2022 and a carbon reduction of 42,000 tCO2e.

2. Official response and support from relevant authorities to the proposal

Based on the project outcome, Tsingtao Brewery Co., Ltd. submitted the *Proposal on Implementing Negotiated Limitations on Emission of Wastewater in Shandong's Liquor Industry* (No. 20220479) to the 13th National People's Congress of Shandong Province.

On March 25, 2022, Shandong Provincial Department of Housing and Urban-Rural Development responded to the proposal (LUJIANBANYIZI (2022) No. 34) that Tsingtao's rollout of direct discharge of brewery wastewater to urban sewage treatment plants has proven relatively effective, and that it will comprehensively promote Tsingtao Brewery's exemplary experience of direct discharge of brewery wastewater to urban sewage treatment plants, to contribute to the national objective of carbon peaking and net zero in Shandong.

On May 23, 2022, Shandong Provincial Department of Ecology and Environment replied to the proposal (LUHUANFU (2022) No. 50) that: Tsingtao Brewery's utilization of wastewater as a resource and low-carbon co-treatment has offered a "Tsingtao solution" for the province's energy conservation, emission reduction and green development of the brewery and wastewater treatment industries, and will vigorously promote the successful experience.

Project Impact & Sustainability

1. Project Impact

The project marked bold innovation and groundbreaking accomplishments in the use of industrial waste as a carbon source and synergistic denitrification of municipal wastewater. For the first time, high-concentration wastewater from beer making and municipal wastewater are synergistically for pollutant and carbon reduction and utilization as a resource, which has expedited the release of the amended list of *Pollutant Emission Standards for the Brewery Industry* (GB 19821-2005). In December 2021, the Provincial Housing and Urban-Rural Development Department issued the *Notice on the Issuance of the Province's Typical Experiences in Urban Drainage Work*, actively promoting the advanced experience of the project. The project has received media coverage on over 100 occasions by such domestic mainstream outlets as Guangming.com, Cenews.com, Sohu.

2. Scalability

Tsingtao Brewery has rolled out the application across its 33 factories in 11 provinces, and has also driven the liquor industry (10 CR Snow, 2 Budweiser, 1 Luzhou Laojiao, and 1 Langjiu) to implement the agreed limits for wastewater discharge. Shandong Province is currently exploring the potential of including 10 other industries (candy processing, starch processing, etc.) to apply the agreed limits for wastewater discharge.

3. Sustainability

To date, Tsingtao Brewery has promoted the application in 33 factories. Tsingtao Brewery has produced a standardized literature pack for the promotion of the project, and will continue to roll out in the remaining 25 factories. The aim is to contain discharge at below the agreed limit across all factories within the next 3 years.

Expert Comments

The project showcases remarkable scientific and technological innovation, addressing a previously unmet need in the industry and earning recognition with the Scientific and Technological Progress Award from China Alcoholic Drinks Association, along with relevant invention patents. It has not only influenced a revision of industry standards but also, through its implementation, demonstrated substantial economic and environmental benefits. The project holds considerable value as an exemplary model and is poised to make a meaningful impact when further expanded.

Bank of Beijing: Creating Innovation Models of Carbon Finance

Bank of Beijing

Project Overview

Bank of Beijing highlights the development of green finance from a strategic height and makes constant efforts to enhance green financial innovation and its comprehensive service capacity. By releasing the green finance brand, "Green Finance +", the Bank has built an integrated green financial service system covering green loans, green bonds, green supply chain and green financial ecosystem.

Bank of Beijing has been promoting the green transformation of its investment and financing structure and taken the lead in carbon finance product innovation. Aiming at the "Duel Carbon Goals", the Bank granted the first CCER-pledged loan in Beijing and the first carbon-quota-pledged loan in Beijing; issued the first domestic "Carbon Neutrality" SME financial bonds in the interbank market; launched the carbon-account-linked loan product "BOB Carbon e-Loan" based on quantifiable environmental benefits; and released "Tan Hui Rong", the comprehensive green financial service plan combining green evaluation, green financing and interest subsidy.

Shouldering the responsibility as a bank based in the capital city, Bank of Beijing continuously improves its low-carbon finance brand. Bank of Beijing Tongzhou Green Branch was established, making it the first branch named after "green" and the first carbon-neutral branch in the banking sector of Beijing. The Bank wan the "3rd IFF Global Green Finance Award — Annual Award". In 2022, its growth rate of green loans ranked first among 24 major banks. As of June 30, 2023, its balance of green loans was RMB 141.517 billion, with a year-on-year growth rate of 51.95%.

Company/Organization Profile

Established in 1996, Bank of Beijing grasps the opportunities of this era and has achieved several development milestones, including introducing overseas strategic investors, public listing, and geographic expansion. The Bank has nearly 640 branches in not only over 10 major domestic cities, including Beijing, Tianjin, Shanghai, Xi'an, Shenzhen, Hangzhou, Changsha, Nanjing, Jinan, Nanchang, Shijiazhuang and Urumqi, but also in Hong Kong Special Administrative Region and the Netherlands. The success of Bank of Beijing has established a classic pattern for innovation development of small- and medium-sized banks.

As of the end of June 2023, Bank of Beijing's total assets amounted to 3.63 trillion Yuan. Net profit of the first half of 2023 reached 14.238 billion Yuan with a cost to income ratio of 24.89%, NPL ratio of 1.34%, provision coverage ratio of 217.65% and CAR of 13.46%. The Bank has achieved outstanding performance internationally regarding all financial indicators. The Bank holds a brand value of 87.6 billion Yuan and ranks No.53 in terms of Tier-1 capital on the latest World Top 1000 Banks list, representing one of the World Top 100 for ten years in a row.

Project Outcome

1. Supported the development of green industry. As of June 30, 2023, the Bank's green loan balance was RMB 141.517 billion, with a YoY growth rate of 51.95%.
2. Leveraged the PBOC's carbon-reduction supporting tools. In the first two quarters of 2023, carbon-reduction loans were issued to 10 key projects, which contributed to the annual carbon reduction of 76 thousand tons of carbon dioxide equivalent.
3. Innovated carbon financial products and formed a green. The Bank cooperated with Beijing Green Exchange to issue the first CCER-pledged loan in Beijing and the first carbon-quota-pledged loan in Beijing under the "Dual Carbon Goals"; issued the first CCER-pledged digital RMB green loan; launched the "BOB Carbon e-Loan", a carbon-account-linked loan product based on quantifiable environmental benefits; launched the "Tan Hui Rong", a green finance comprehensive service plan combining green evaluation, green financing and interest subsidy, with the specialized quota of re-financing and re-discounting.
4. Created a green branch model. Tongzhou Green Branch of Bank of Beijing was set up as the first branch named after "Green" in Beijing, and the Mentougou Green Branch was approved by the regulator for opening, forming a green development pattern with green branches located in both "the east and the west" of Beijing. The Bank's Tongzhou Green Branch achieved carbon neutrality at the operational level in 2021, becoming the first carbon-neutral branch in Beijing's banking industry.
5. Signed the UN's "Principles for Responsible Banking" . The Bank disclosed the ESG Report of Bank of Beijing for two consecutive years, and the Report on Environmental Information Disclosure for the first time in 2023.

Project Highlights

1. The Bank ranked first among the 24 major banks regarding the growth rate of green loans in 2022;
2. The Bank received an excellent ranking in the evaluation of credit policy effect of Chinese banks in Beijing in 2022 by Beijing Branch of the People's Bank of China;
3. The Bank won the "Third IFF Global Green Finance Award—Annual Award";
4. The Bank became the executive director unit of Chinese Society for Environmental Sciences.

Project Implementation

1. Leveraged the PBOC's supporting tools on carbon emission reduction

At the beginning of 2023, Bank of Beijing obtained the qualification to use carbon emission reduction supporting tools from the PBOC. By the end of June, two tranches of the policy-tool-supported-funding have been put in place, which have been used for the issuance of carbon emission reduction loans to 10 key projects such as geothermal pump heating and cooling system engineering in the Government Service Hall of Beijing City Sub-center, which contributed to the annual carbon emission reduction of 76,000 tons of carbon dioxide equivalent.

2. Promoted low-carbon innovative products

The Bank adjusted the green investment and financing structure and took the lead in innovating carbon financial products. In 2021, the Bank launched the first "carbon-neutral" SME financial bonds in the interbank market in China, and launched the first carbon-quota-pledged loan in Beijing under the "Dual Carbon Goals"; In 2022, the Bank disbursed the first CCER-pledged loan in Beijing; in 2023, the Bank issued the first CCER-pledged digital RMB green loan; Beijing Green Exchange launched enterprise carbon accounts and green project system, which can support intelligent monitoring and dynamic accounting by using Internet of Things, big data, AI and block chains. On top of that, Bank of Beijing launched the "BOB Carbon e-Loan", a carbon-account-linked loan product based on quantifiable environmental benefits. It can translate the environmental benefits in the carbon accounts and green project system into tangible financing discounts for companies. With the support of the specialized quota of refinancing and rediscounting, the Bank launched "Tan Hui Rong", a green financial comprehensive service plan including green evaluation, green financing, and interest subsidy.

The Bank facilitated the country's "Dual Carbon" strategic goals and initiated a number of innovations. In 2021, the Bank launched the first supply chain green asset-backed bill underwriting business in China; facilitated public offering of the first batch of REITs in China, which is also the first of its kinds in Beijing, i.e. "Shougang Green Energy" project; and underwrote the country's first Sci-tech Innovation Bill in the field of new energy in 2022.

3. Built the green branch model

The Bank set up the first branch named after "Green" in Beijing, i.e. Tongzhou Green Branch of Bank of Beijing. The establishment of Mentougou Green Branch was also approved by regulators, which makes two green branches one in the east and one in the west of Beijing.

4. Continued building a zero-carbon bank

First, practicing the concept of green and low carbon. The Bank advocated "green office, green procurement, and garbage sorting". The Bank formulated the "Bank of Beijing Green Office Manual" and "Bank of Beijing Green Office Code". The Bank established and improved the rules, policies, and management system of energy conservation and emission reduction, and promoted the green and ecological progress of office buildings.

Second, promoting carbon neutrality in institutional operations. Bank of Beijing Tongzhou Green Branch achieved carbon neutrality at the operational level in 2021, becoming the first carbon-neutral branch in the banking industry in Beijing. Bank of Beijing Shanghai Regional Branch became the first bank in Shanghai to achieve carbon neutrality at the operational level in 2021.

Third, promoting carbon neutrality in conference events. The Bank realized the carbon neutrality in the final event of the Eighth Relation Manager Competition in 2023. The greenhouse gases produced in the product launch of "Bank of Beijing Carbon e-Loan" were neutralized by using CCER.

Fourth, exploring the application of carbon inclusive mechanism. Collaborated with Carbonstop (Beijing) Tech Co., Ltd., the Bank held the activity of "Walking Together with Zero Carbon", and the greenhouse gases generated by the activity were offset by purchasing CCER to achieve carbon neutrality. The "Carbon Light Plan" was released on the spot. By calculating the carbon emission reduction generated by individuals' low-carbon behaviors, the rights and interests of differentiated financial products and services were given, and a carbon inclusive reward mechanism was formed.

"Carbon Neutral Branch", Tongzhou Green Branch of Bank of Beijing

Project Impact & Sustainability

On the one hand, Bank of Beijing launched a number of comprehensive carbon financial service schemes and innovative carbon financial products, which are the first in China and the first in the city. While increasing the supply of carbon finance, it has enhanced the influence of carbon finance in Beijing, and played a leading and exemplary role in serving the real economy with carbon finance services, which can be used for the promotion of comprehensive carbon financial service schemes nationwide and even internationally.

On the other hand, Bank of Beijing continued building a zero-carbon bank, and proactively implemented the concept of carbon neutrality in branch operation, product release, conference events, and other scenes. The Bank established a decoration model of Bank of Beijing's green branch in location selection, design, decoration, publicity, and business promotion, which can be used for replication and promotion nationwide. At the same time, Bank of Beijing, together with Beijing Green Exchange, explored the establishment of evaluation criteria for green branches of banking institutions, and established and improved the evaluation system for green branches.

Expert Comments

With a net-zero end goal in mind, the bank has pioneered a comprehensive green financial services system. This includes innovative carbon financial product development and the introduction of a diverse range of green and low-carbon products. Notably, the establishment of the Bank of Beijing Tongzhou Green Branch, the first sub-branch in Beijing bearing the "green" banner, showcases institutional innovation. The bank's endeavors exhibit commendable green lending performance, providing valuable guidance for the broader implementation of green finance initiatives.

China Minsheng Bank Supports National "Dual Carbon" Strategy with Green Finance

China Minsheng Bank

Project Overview

China Minsheng Bank pays close attention to environmental protection and climate change, proactively responds to the national "dual carbon" goals, actively identifies the risks and opportunities brought about by the "dual carbon" policy, promotes the development of green finance from a strategic perspective, and supports the green, low-carbon and circular economy.

Focusing on the main target of "cutting carbon emission, reducing pollution, expanding green development and pursuing economic growth", the Bank actively implements various national policy requirements, coordinates the promotion of green finance development and the deployments of investment and financing, increases credit support to green finance, effectively serves the real economy, and facilitates high-quality and sustainable development.

In terms of the building of green finance brand, China Minsheng Bank has clarified the main directions of green finance development, including "clean energy, energy conservation and emission reduction, ecological and environmental protection, green upgrading of infrastructure, low-carbon technology, carbon rights trading and green life", launched four major product series, namely "Green Investment Express, Green Financing Express, Green Supply Chain Express and Green Operation Express", and built the comprehensive green financial product and service system of "Minsheng Carbon Peaking and Carbon Neutrality" in an all-round way.

The Bank continuously innovates sustainable financial products and has launched comprehensive financial solutions for key industries and key customers. For example, the Bank has made breakthroughs in green bonds and sustainable development-linked bond businesses; Based on the settlement services of carbon rights trading, the Bank continued to strengthen the innovation of comprehensive services; The Bank has launched the comprehensive service plan of "On the Road with Carbon" for member enterprises of China Carbon Emission Trade Exchange, and become the first in the industry to introduce "Minsheng E-Carbon Loan" for micro, small and medium enterprises, and constantly enriched the "Minsheng Bank ESG Series Index" and other related products.

Company/Organization Profile

China Minsheng Bank was formally established in 1996. It is China's first national joint-stock commercial bank initiated and founded mainly by non-state-owned enterprises. Since establishment, China Minsheng Bank has been adhering to the mission of "serving the public and caring about people's livelihood". Along with the rapid development of China's economy, it has grown into a bank group providing commercial banking, financial leasing, fund management and global investment banking services, and has become an important financial force in supporting the development of the real economy. In the Top 1000 World Banks ranking released by The Banker in 2022, China Minsheng Bank was No.22. In the Fortune Global 500 published by Fortune in 2022, it stood at No. 273.

Project Outcome

1. The Bank strengthens the brand building of green finance and has launched the comprehensive green financial product and service system of "Minsheng Carbon Peaking and Carbon Neutrality".
2. The Bank continuously innovates sustainable financial products and has launched comprehensive financial solutions for key industries and key customers.
3. As at the end of 2022, the growth rate of green credit was 68%.
4. In 2022, the conversions of green credit energy saving and emission reduction were 3,191.2 thousand tons of conserved standard coal equivalent, 4,660.8 thousand tons of CO2 emission reduction equivalent and 890 thousand tons of water consumption reduction equivalent.

Project Highlights

In recent years, China Minsheng Bank has continued to build the green finance brand of "Minsheng Carbon Peaking and Carbon Neutrality". With its good performance in operation management, marketing activities and product model innovation, the Bank has won a series of awards from competent authorities and mainstream media.

Project Implementation

1. Building brand in green finance

China Minsheng Bank continuously enriches and improves the model and connotation of basic green financial products, and integrates product and service support from retail, financial markets and other business lines, so as to build a comprehensive financial service system covering all customer types and multiple business scenarios.

To improve the accessibility to green fund, enhance the efficiency of green investment and financing, optimize the green financial service system, and support the development of green economy in a high-quality manner, China Minsheng Bank has clarified main directions of green finance development, which included clean energy, energy conservation and emission reduction, ecological and environmental protection, green upgrading of infrastructure, low-carbon technology, carbon rights trading and green life, launched four major product systems, namely "Green Investment Express, Green Financing Express, Green Supply Chain Express and Green Operation Express", and has built the comprehensive green financial product and service system of "Minsheng Carbon Peaking and Carbon Neutrality" in an all-round way.

(1) The product of "Green Investment Express" was released to meet the "investment" demands of green industry customers for expanding production capacity.

(2) The product of "Green Financing Express" was released to meet the "financing" demands of green industry customers for revitalizing and capitalizing assets.

(3) The product of "Green Supply Chain Express" was released to meet the demands of green industry ecosystems for co-building "supply chains".

(4) The product of "Green Operation Express" was released to meed the demands of enterprises and individuals for low-carbon and environmentally friendly "operation" through efficient and convenient services.

2. Innovating sustainable financial products

(1) Supported the product and model innovation by launching the products of "Carbon Emission Reduction Loan" and "Photovoltaic Loan"

(2) Achieved breakthroughs in green bonds and sustainable development-linked bonds businesses

(3) Continuously strengthened the comprehensive service innovation based on carbon trading settlement services

(4) Launched the comprehensive service plan of "On the Road with Carbon" for member enterprises of China Carbon Emission Trade Exchange

(5) Became the first in the industry to launch "Minsheng E-Carbon Loan" for micro, small and medium enterprises to facilitate them to effectively achieve low-carbon transformation

(6) Constantly enriched "Minsheng Bank ESG Series Index" and related products, and innovated and developed "Minsheng Bank Rural Revitalization Series Index". The index helps investors not only gain investment returns from global sustainable development enterprises, but also indirectly invest in enterprises that pay more attention to environmental protection and social development

3. Launching comprehensive financial solutions for key industries and key customers

(1) Launched financial service plans for the low-carbon transformation of the steel industry to help steel enterprises achieve green development in three major areas, namely "carbon free from the source, carbon reduction during production and carbon trading in the following stages"

(2) Launched the comprehensive financial service plan of "Minsheng Easy Storage" for energy storage customers to help them overcome pain points, remove difficulties, and eliminate blockages in the process of green development and transformation

(3) Innovated the green financing models, such as environmental rights and interests financing, launched loans pledged by carbon quota and loans pledged by emission rights

(4) Provided comprehensive financial solutions for key customers. For example, in response to the ESG demands of a large e-commerce customer, the Bank customized the ESG value enhancement consulting service and the green action plan, and drawn up a corresponding customized financial service plan. The plan contained value enhancement analysis and suggestions, formulated a future green action plan in regard to new energy transportation system, distributed photovoltaic strategy, environmentally friendly packaging and deplasticization, and low-carbon operation. To meet the customer's investment and financing needs in green development, the Bank provided "Green Investment Express", "Green Financing Express", green resource sharing services as well as customized green financial service plans. The Bank also has provided high-quality financial services for 23 upstream suppliers of the customer.

(5) Organized the activity of "Enchanting Scenery Tour to the Northwest", focused on the northwest region which is rich in new energy resources, provided professional and customized financial services to customers, and has built diversified ecosystems of new energy industry covering "government, enterprises and banks", in a bid to empower the high-quality development of the new energy industry in the northwest region

6. Responding to environmental risk and strengthening ESG risk management

China Minsheng Bank attaches great importance to strategies related to green development, and regards green finance and ESG management as important parts and directions of its corporate strategies. The Bank has actively deployed works in relation to green finance, climate risk and ESG management, which included establishing the ESG risk management system, formulating credit policies for segmented industries, improving ESG risk assessment procedures, and clarifying climate risk management requirements.

Project Impact & Sustainability

Currently, green development has become a common consensus in the world. It requires the synergistic resonance of policy, industry, science and technology, finance and other factors. To achieve green development, green finance is indispensable, and it is a blue sea with huge potential opportunities. Looking ahead, the demands for green finance will remain strong for a long time. For financial institutions, it also means development opportunities.

Apart from focusing on its own low-carbon development, China Minsheng Bank actively builds and promotes green finance brand, innovates sustainable financial product system, and has launched the comprehensive solutions for industries and key customers, facilitating the rapid development of green credit business.

China Minsheng Bank continues to practice the concept of green development, comprehensively consolidates systems from business operation to internal management, actively innovates products, and strengthens ecosystem-based cooperation. Under the guidance of the "dual carbon" strategy, the Bank has achieved remarkable results in effectively serving the real economy and promoting the high-quality and sustainable development. It has set up an model for the development of green finance of the industry that is referenceable, reproducible and scalable.

Expert Comments

China Minsheng Bank places corporate environmental and social responsibility at the forefront, showcasing a commitment to sustainable practices. The bank has introduced a key product matrix, featuring Green Investment Connect, Green Financing Connect, Green Chain Connect, and Green Operation Connect. This forms the "Minsheng Fenghe" comprehensive green financial system and the "Carbon Path Forward" service solution for businesses in China's carbon market. Pioneering in the industry, the bank launched carbon financial products like "Minsheng Carbon e-Loan" for small and medium-sized enterprises. It actively promotes breakthroughs in transformational financial services, including bond-linked sustainable development, contributing significantly to China's "dual-carbon" strategy. These initiatives enhance the availability of green funding, support innovative carbon financial services, and empower the low-carbon transformation of traditional industries and the green development of emerging sectors.

Dongfang Turbine Co., Ltd./DTC Photovoltaic Energy Storage and Charging Comprehensive Energy Demonstration Area

Dongfang Turbine Co., Ltd.

Project Overview

To support the timely achievement of the company's carbon peak goals, Dongfang Turbine Co., Ltd./DTC initiated the Photovoltaic Energy Storage and Charging Comprehensive Energy Demonstration Area project on December 5, 2022, at its headquarters located at 666 Jinsha Jiangxi Road, High-tech Industrial Park, Deyang, Sichuan Province. This project signifies a significant initiative undertaken by the company to seize the strategic advantage in green and low-carbon technologies, advance research in emerging energy storage technologies, and promote intelligent parking and energy storage applications, thereby facilitating the effective utilization of renewable energy.

The project includes photovoltaic power generation sheds, vanadium liquid flow energy storage battery units, and charging stations. It represents the largest vanadium liquid single-cell stack project in the country, integrating photovoltaic, energy storage, and charging capabilities into one comprehensive energy utilization initiative. Additionally, the project features complementary information technology and intelligent operational systems. By recording the operational status and energy usage data of the photovoltaic car shed, vanadium liquid flow battery, and charging systems, it provides a foundational basis for continuous optimization, management, and control in the subsequent stages.

As of now, the Photovoltaic Energy Storage and Charging Comprehensive Energy Demonstration Area project has been officially put into operation. It is currently in the phase of recording operational data for control and management processes. By overcoming challenges in energy storage technology and implementing intelligent management practices, the project has achieved notable results, providing employees with convenient vehicle usage while significantly reducing emissions.

Company/Organization Profile

Dongfang Turbine Co., Ltd. /DTC is a subsidiary of Dongfang Electric Corporation. Established in 1966 in Hanwang, Mianzhu, the company relocated to Deyang Economic and Technological Development Zone after the Wenchuan Earthquake on May 12, 2008. It spans an area of 1.37 million square meters and is a state-owned high-tech enterprise specializing in the research, design, and manufacturing of large-scale power generation equipment. With the mission "Green Power, Driving the Future," Dongfang Turbine Co., Ltd. /DTC focuses on promoting energy production safety and carbon reduction at the energy production end through advanced green and low-carbon equipment. The company's product range includes thermal power, nuclear power, gas power, industrial turbines, and new energy, among others. These products are exported to 29 countries and regions worldwide, contributing to the energy revolution and enabling a better quality of life.

Project Outcome

Emission Reduction Scope One: The project has an installed capacity of 1.14 MW, operating in a "self-generation for self-consumption" mode, with an estimated annual electricity generation of 864,600 kWh. According to the current national electricity emission factor, it is expected to reduce over 797 tons of CO_2 emissions, equivalent to saving 312 tons of standard coal. These figures have been verified through third-party accounting and verification covering the entire plant area.

Emission Reduction Scope Two: The project involves the installation of 66 charging stations, providing 132 parking spaces with a maximum individual charging power of 60 kW. This initiative encourages employees to use green transportation, indirectly reducing emissions within the plant area.

Improved Working and Living Environment: The photovoltaic car shed addresses the long-standing issue of employees' vehicles being exposed to intense sunlight during summer, enhancing their overall well-being and happiness.

Project Highlights

This project is the largest vanadium liquid single-cell stack comprehensive energy demonstration area in China. It consists of three subsystems: photovoltaic power generation, vanadium liquid flow battery energy storage, and charging stations, forming an intelligent microgrid. Integrated into the company's smart energy system, the project's backend continuously monitors various data in real-time, enabling unmanned operation and intelligent functioning. Upon completion of the project, there

has been a significant increase in employees' enthusiasm for purchasing and using new energy vehicles. Several media outlets, including People's Daily and China News Service, have successively reported outstanding achievements of the project in areas such as photovoltaic power generation, technological breakthroughs in vanadium flow battery systems, and the efficient operation of intelligent systems.

Project Implementation

To deeply expand the new energy market and sustain efforts in innovative research and development in areas such as integrated solar energy storage, charging, and multiple energy sources, contributing to the establishment of a clean, low-carbon, secure, and efficient new energy system, Dongfang Turbine Co., Ltd./DTC initiated the construction of the Integrated Solar Energy Storage and Charging Demonstration Zone. This project stands as the largest vanadium liquid single-cell stack in the country, embodying a comprehensive energy utilization system combining photovoltaics, energy storage, and charging facilities. Overcoming challenges in energy storage technology and implementing intelligent management, the project has demonstrated significant emissions reduction effects while providing convenient solutions for employee vehicle charging needs.

1. Overcoming Energy Storage Challenges:

The project was initiated on December 5, 2022. During the initial stages, the main challenge faced was configuring the energy storage system. While lithium batteries exhibit significant energy storage capabilities, the raw materials for lithium batteries are mostly imported. Leveraging years of in-depth research on vanadium liquid flow batteries, the company opted for vanadium liquid flow batteries due to their long lifespan, low raw material costs, and stable power supply duration. After extensive technical discussions and design reviews, the project successfully achieved a vanadium liquid flow battery energy storage scale of 12KW×4h. The energy storage system demonstrates high reliability, energy efficiency, excellent charge-discharge performance, long cycle life, quick start-up and response, and strong safety features, without the risk of combustion or explosion.

2. Implementation of Intelligent Management:

The project's three subsystems—photovoltaic power generation, vanadium liquid flow battery energy storage, and charging stations—form an intelligent microgrid. All data is integrated into the company's intelligent energy management system, enabling online monitoring and intelligent scheduling of various terminals, achieving unmanned operation and intelligent functioning. This system provides technical support for the project's subsequent management and optimization.

3. Significant Emission Reduction Effects:

The project covers an area of approximately 5600 square meters, utilizing 550Wp monocrystalline photovoltaic modules and 100kW inverters. The distributed photovoltaic installed capacity is 1.14MW, operating in a "self-use" mode. The average annual effective daily irradiation on the plane is 973.5kWh/kWp/year, with a system efficiency of 77.9%. The estimated annual electricity generation is 864,600 kWh. The project is expected to provide the company with over 800,000 kWh of clean green electricity annually, reducing carbon dioxide emissions by over 797 tons, equivalent to saving 312 tons of standard coal. This effectively enhances the company's capacity to address power shortages under extreme weather conditions and reduces the energy consumption and carbon emissions of the company's park. Additionally, the company has implemented favorable charging policies, further stimulating employees' enthusiasm to purchase new energy vehicles and indirectly reducing carbon dioxide emissions.

4. Convenient Employee Car Usage:

Before the project's construction, the company lacked charging facilities for new energy vehicles and the parking area lacked shading during the hot summer season, causing inconvenience to employees. The project, initiated on April 7, 2023, involved the renovation of the existing parking area, covering an area of approximately 10,000 square meters. It is characterized by convenient construction and a short construction period. After completion, the combination of photovoltaic panels and parking lot greenery reduced the parking area temperature, alleviating the urban heat island effect. The project provides 66 charging stations and 132 charging spaces, with a maximum charging power of 60 kW per charging station, effectively meeting the charging needs of employees' new energy vehicles, improving employees' work-life happiness.

Dongfang Turbine Co., Ltd./DTC will continue to uphold the mission of "Green Power, Driving the Future," persistently adhere to green and low-carbon transformation, digital transformation, actively respond to the national call for adjusting the energy structure, innovate continuously in various terminals of the "source, grid, load, storage," create various comprehensive energy systems, and make unremitting efforts to promote the realization of "carbon peak and carbon neutrality."

Project Impact & Sustainability

The project adopts the new technology of vanadium liquid flow batteries, making it the domestically largest single-cell stack with the highest power output in commercial operation. This achievement lays a solid foundation for the exploration of related industries and significantly enhances the company's reputation and influence. The project involved the transformation of the existing parking lot, characterized by convenient construction and a short construction period, greatly enhancing its ease of promotion. This implies that similar projects can find extensive applications in various types of parking lots, including industrial enterprises, municipal parking lots, and highway service areas. Whether in urban or rural areas, commercial or industrial zones, such transformations hold substantial potential for widespread applications.

Expert Comments

The project, despite its compact scale, serves as an exemplary model, showcasing precision carbon reduction methods and technological breakthroughs. Notably, the project features the largest VRB (Vanadium Redox Battery) monopile in China, marking a significant advancement in battery energy storage technology. It establishes a comprehensive energy utilization system that integrates photovoltaic, energy storage, and charging. The project effectively addresses the challenge of parking space shelters, lowers the temperature of the micro environment, facilitates the charging of electric vehicles, and offers a simple and efficient solution for the estate's clean energy self-production and self-sufficiency. It plays a positive role in enhancing the utilization rate of renewable energy in society.The project outlines a concise and clear carbon reduction technology system with the potential for substantial market demand, indicating significant scalability and promising prospects.

100% green electricity“Zero-carbon wisdom” Park

Hangzhou Yuhang District Power Supply Company

Project Overview

Under the background of“Double carbon” target, scientific and reasonable energy-saving and carbon-reducing has become an important path for sustainable development of all kinds of sci-tech innovation parks, industrial incubation parks and industrial manufacturing parks.

In 2022, in response to the core needs of carbon management in industrial parks, and in conjunction with the upgrading of user parks, the company will create three major carbon management tools: clean energy alternatives, energy management upgrades, and diversified and complementary approaches, create a replicable, can be extended industrial park carbon management new model.

To improve energy management and network-charge interaction by developing clean energy on the spot, purchasing green power from outside, building user-side energy storage, centralized charging stations, upgrading air-conditioning efficient energy use, and building a low-carbon management platform in the park, it aims to build a clean, low-carbon, safe and efficient intelligent energy system covering energy, healthcare, artificial intelligence, logistics and other fields, to realize the intelligent interaction between the park and the power grid, to create a low-carbon intelligent industrial park, to set up a clean high-elasticity micro-grid, to create an energy efficient management system, and to form a low-carbon management model for the future park.

Company/Organization Profile

国家电网 STATE GRID
国网杭州市余杭区供电公司 STATE GRID HANGZHOU YUHANG POWER SUPPLY CORPORATION

Hangzhou Yuhang District Power Supply Company is a large county-level power supply enterprise of Zhejiang Electric Power Co. , Ltd. of China National Grid. The power supply area covers 12 street towns in the district and is responsible for operating and maintaining 8220 kv substations, 47110 kv substations, 935 kv substations, the company has won the national power industry party building brand influence enterprise, the National Power Engineering News Propaganda Advanced Unit, Zhejiang province civilized unit, Zhejiang province AAA“Keep the contract heavy credit” enterprise and so on the honor, related projects have won the silver award in the National Innovation and Innovation Competition, the excellent award in the twenty-two th China Patent Award and the second prize in the Zhejiang Science and Technology Award.

The company has taken an active role in social responsibility and launched various energy-saving and emission-reduction activities in cities and towns, as well as voluntary service activities. Through a series of service matrix activities such as “Spring raindrops” and “Worry-free far Hangzhou”, explore out experience, attract social organizations to work hand in hand.

Project Outcome

1. Clean Energy Alternative

(1) integrated rooftop photovoltaic park 8000 square meters of unused roof area, for the park to provide more than 30% of the clean electricity.

(2) green power trading participation in green power trading, the purchase of photovoltaic power needs outside the power, to achieve green energy use within the park, zero carbon.

(3) Building 1014 kv charging posts at the central charging station to meet the needs of 20 vehicles charging at the same time and promote regional green traffic.

2. Upgrade Energy Management

Low-carbon park management system. Real-time monitoring of energy consumption and energy flow in the park, through the dynamic perception of digital twinning technology equipment operating status and future load trends, analysis and early warning.

3. Multi-element synergy and complementarity

(1) create a zero-carbon visitor center. A distributed photovoltaic system was installed on the roof of the visitor center, which realized the integrated application of building light storage and charging.

(2) centralized control of adjustable load construction of a“High-efficiency network-load interaction” module to bring together adjustable elements in the park, including public area lighting, public area air conditioning, photovoltaic, energy storage, charging piles, etc. , to achieve the demand-side response in the peak period of electricity demand“One-key control”, in order to meet the production demand under the premise of effective support grid.

Since the construction of the“Zero-carbon Smart Park”, energy management has been“Considerable, sensible and controllable”, reducing annual carbon emissions by 883.78 tons and saving 285.09 tons of standard coal.

Project Highlights

1. Energy conservation and emission reduction innovation model, give play to the economic value of multi-dimensional. On the basis of meeting the original production demand, the total energy consumption cost of users has been reduced by more than 10% .
2. Efficient Carbon Reduction and promotion management, to create emission reduction management model. The project has been published many times on social media such as municipal development and Reform Public Accounts, Xinhua news agency, local television stations, as well as on the websites of provincial companies, power grid headlines, Zhejiang electric home and other industry media, causing high social and industry attention.

Project Implementation

Located in Yuhang District's futuristic science and Technology City, Hong Yan Park is the epitome of the industrial park's energy woes. With the support of the future science and Technology City (Haichuangyuan) and Wuchang Street, the park will seize the opportunity of the health industry development peak and integrate the mature industry resources in the surrounding areas, aiming to create a"Green recycling science and Technology Ecological Complex", strive to become Zhejiang province with unique industrial innovation service complex, green environmental protection, life and health of the new benchmark. With the entrance of medical and artificial intelligence enterprises, the original transformer capacity of the park is not enough to meet the demand of power supply. There is no unified energy management platform in the park, so we can not know the energy consumption situation of each enterprise directly. At the same time in the face of the demand-side response initiated by the power grid, it can only communicate with enterprises, shut down some of the production equipment, to achieve peak hours to reduce electricity consumption.

Hongyan Park in the construction of low-carbon Park Smart Energy Management System, to create a park energy"A map.". Installation of multi-in-one sensors in public areas to regulate the operation of transformers and improve operational efficiency, and real-time observation of energy consumption in the park, on the temporary use of air conditioning, elevators and other high energy-consuming equipment for independent shutdown. All the energy flows in the park will be displayed to the users through the energy flow diagram, and the dynamic monitoring, energy efficiency statistics, analysis and evaluation of the power nodes will be realized, let the user realize the dynamic management of energy in intelligence and high efficiency, reduce unnecessary waste and reduce cost.

In order to ensure the normal operation of the entire system in the park, the company established"Online + offline" professional electrical operations and maintenance. Set up a 24-hour on-duty hotline to ensure timely response to users. On-line operation and maintenance include equipment monitoring and Operation Analysis, power quality analysis, equipment life cycle management and mobile APP and monthly analysis functions.

For customers who are not good at power analysis, the company can not only analyze the power quality of each monitoring point in the park based on background data algorithms, according to the classification of the actual power distribution situation of the building, the Expert Knowledge Base is comprehensively analyzed. From the low-carbon electricity, economic electricity, operation and maintenance management, defect management, give users detailed analysis and actionable recommendations. All of these, including device life cycle management, can be realized in the mobile APP real-time monitoring, convenient and quick.

Zero-carbon visitor center. Distributed PV is installed on the roof of the visitor centre and perovskite photovoltaic materials are used in the facades of the facades that look the same to take full advantage of the solar energy, accumulating 10 kv of photovoltaic capacity. Equipped with a 20-kilowatt-hour energy storage battery, advanced vanadium flow battery, in order to ensure the safety of electricity under the premise of efficient charge and discharge, improve the effective absorption of new energy, at the same time to protect the rainy weather and night electricity, next to the two charging points and visitors center all electricity from photovoltaic and energy storage, real integration of light storage and storage applications and"Zero-carbon" building construction.

In the low-carbon park management system, set up"Efficient network-charge interaction" module. Collect all the adjustable loads in the park, including public area lighting, public area air conditioning, photovoltaic, energy storage, charging piles, etc. , in the peak period of power consumption can achieve demand-side response"One-key control" to help users timely, efficient and reasonable adjustment of energy consumption strategy. During the peak load period on August 4,2022, the"One-button control" showed its skills, effectively reducing the use of 600 kilowatt-hours of electricity in the park in three hours, while saving the cost of electricity at the same time, for enterprises to bring more than 3000 yuan demand-side response subsidies.

Project Impact & Sustainability

Taking the future research park Hongyan Park as a model, the park's energy efficiency promotion model is realized through the synergy and complementarity of internal clean energy development, external clean energy introduction, energy management system construction, efficient and professional electrical operation and maintenance, and adjustable load pooling and empowerment, the model is widely applicable to all kinds of industrial parks and has been replicated in the future science and Technology City.

At the same time, the model has been replicated in logistics industrial parks such as the Renhe Cainiao Logistics Park, where a 5.3 MW distributed PV roof has been completed, to achieve the goal of generating more than 50% of the park's electricity from self-generated clean energy sources, and plan to combine it with a low-carbon park management system through means such as user-side energy storage, cold chain car charging piles, and intelligent control of cold storage air conditioning, realize the zero-carbon upgrade of logistics park.

Expert Comments

The "Zero-carbon wisdom" Park estate construction project operates entirely on green energy, emphasizing a strategy of "visible, palpable, and controllable" energy management. A "single map" of energy on-site is created, along with an "online + offline" professional electrical operation and maintenance system, and a "high-efficiency grid and load interaction" module. These measures enhance overall energy management, significantly improving energy use efficiency and reducing the estate's energy consumption.While ensuring a lower level of energy consumption, the estate achieves 100% green energy reliance through the implementation of photovoltaic technology and green power trading. The project showcases advanced energy management technology, and its 100% green power supply concept is considered ahead of its time. The result is an on-site energy efficiency model that features the complementary roles of internal clean energy development, the integration of external clean energy, the establishment of an energy management system, efficient and professional electrical operation and maintenance, as well as adjustable load aggregation and empowerment.

Full-electric energy stations create a new demonstration of clean campus heating to achieve youth without "carbon"

State Grid Xuzhou Power Supply Company

Project Overview

In December 2017, when General Secretary Xi visited Xuzhou, Jiangsu province, he put forward a series of important instructions on the remediation of Pan'an Lake coal mining subsidence area in Jiawang district. Xuzhou Jiawang District, which thrives on coal and is trapped by coal, urgently needs to take a road of resource transformation. As the highland of urban civilization, colleges and universities are rich in energy consumption forms and concentrated in innovation elements, which are the highland for demonstration and display of social energy consumption forms, and will also be the demonstration highland for urban low-carbon transformation. At the beginning of 2020, in order to further implement the concept that green mountains and green hills are Jinshan Yinshan, State Grid Xuzhou Power Supply Company took the construction project of full-electric energy station of Pan'anhu Normal University as an example to further promote urban energy conservation, emission reduction and carbon neutralization.

The full-electric energy station project adopts an efficient scientific scheme of "high-pressure solid electric heat storage boiler heating and domestic hot water auxiliary heat + collector solar domestic hot water" to replace the traditional high-carbon emission mode such as natural gas or coal. In September 2020, all the three energy stations involved in the project were successfully put into operation, which solved the heating and hot water problems in the College of Science and Literature of Normal University scientifically, efficiently and low-carbon. The good landing of this project will not only help schools reduce investment and cost, but also help to realize the green and low-carbon transformation of campus and industrial chain, and provide new ideas and models for universities and large factories to solve heating problems.

Company/Organization Profile

国家电网 STATE GRID
国网徐州供电公司 STATE GRID XUZHOU POWER SUPPLY COMPANY

State Grid Xuzhou Power Supply Company, formerly known as Xuzhou Electric Power Bureau of the Ministry of Electric Power Industry, was established in 1950, and was restructured into Xuzhou Power Supply Company in 2000. It has jurisdiction over 7 county-level power supply companies in Tongshan, Xinyi, Pizhou, Suining, Peixian, Fengxian and Jiawang, as well as 14 functional departments and offices, 19 business support and implementation institutions, 1 industrial group company and 119 rural power supply stations, with more than 8,200 long-term employees.

Xuzhou Power Grid is an important hub of "Power Transmission from West to East" of State Grid and "Power Supply from North to South" of East China Power Grid. The company is committed to serving the transformation and development of Xuzhou's resource-exhausted cities, actively exploring low-carbon development paths and contributing to climate change.

Project Outcome

1. It can replace 30 million kWh of energy every year, and reduce the emission of carbon dioxide by 24,000 tons, sulfur dioxide by 742.8 tons and nitrogen oxides by 37.14 tons, truly achieving zero emission of carbon dioxide;
2. Compared with the natural gas scheme, the investment of full-electric energy stations is reduced by 3.5 million yuan, and the operating cost is reduced by about 20%; Compared with the gas boiler scheme, the annual operating cost can be saved by about 141,300 yuan;
3. The first comprehensive energy project in Pan'an Lake area is a model project of electric energy substitution;
4. Full-electric energy stations provide reference, replicable and scalable heating templates in population gathering areas, and promote the green and low-carbon transformation of enterprises and universities.

Project Highlights

Energy conservation and emission reduction: The project adopts a new mode of "peak and valley electricity consumption + solar energy", which greatly improves the environmental protection index of Pan'an Lake scenic spot and provides a good demonstration effect for the green development of Jiawang district.

Personnel training: Through the construction of low-carbon equipment on campus, teachers and students can see, feel and learn low-carbon technology. In the process of entertaining, students' low-carbon awareness and ability have been significantly improved.

User evaluation: The director of the General Affairs Office of the College of Liberal Arts commented that the heating system is more efficient and creates a comfortable campus living environment for students.

Project Implementation

College of Liberal Arts of Jiangsu Normal University is located next to Pan'an Lake Ecological Wetland Park, and there is no municipal pipe network heat source heating nearby. Traditional coal-fired heating will seriously affect the surrounding ecological environment, while gas-fired energy stations have high heating costs and longer heating time. In order to solve the above problems, the State Grid Xuzhou Power Supply Company signed a strategic cooperation agreement with the College of Liberal Arts of Jiangsu Normal University, and realized the deep coverage of clean energy consumption on campus by formulating an efficient scientific scheme of "high-voltage solid electric regenerative boiler heating and auxiliary heat of domestic hot water + collecting solar domestic hot water".

Scientific planning to promote the upgrading of heating energy consumption. State Grid Xuzhou Power Supply Company, in conjunction with Tsinghua University

and Pinggao Group, formed a project research team to deeply study the related technologies of full-electric energy stations, and adopted an efficient scientific scheme of "high-voltage solid electric regenerative boiler heating and domestic hot water auxiliary heat + collecting solar domestic hot water" to form a green heating path.

Use energy intelligently to upgrade heating quality. The project adopts the mode of "8-hour valley heat storage +2-hour flat electric supplementary heating". During the valley power period, the high-voltage power supply supplies power to the electric heating body, and converts the electric energy into heat energy and is absorbed by the energy storage body; During peak power period, the high-voltage electric heating element stops working, and the heat energy stored by the energy storage element is converted into hot water for output. At the same time, the system is replenished by solar energy equipment, which ensures the stable heating capacity of the system and saves the operation cost.

In order to provide excellent and stable heat energy with full coverage and no dead ends, three new energy stations have been built. Among them, the installed capacity of No.1 energy station is 5.6 MW, which provides heat source for heating and domestic hot water in J1 ~ J4 dormitory buildings; The installed capacity of No.2 energy station is 6.5 MW, which provides heat sources for heating and domestic hot water in J5 ~ J8 dormitory buildings, logistics buildings, logistics dormitory buildings, school health centers and commercial streets; The installed capacity of No.3 energy station is 3.3 MW, which provides heat source for heating A1 ~ A5 teaching buildings. After the application of the heating system, the classroom temperature changes from 0°C to 20°C in winter, which takes only 20 minutes, realizing the dual-track parallelism of high efficiency and true environmental protection, and laying a solid foundation for students to create a comfortable campus living environment.

Immersion teaching to cultivate students' low-carbon awareness. As the first comprehensive energy project in Pan'an Lake area, full-electric energy station will become a window to display and publicize the achievements of low-carbon energy management in all directions. Students can learn about various equipment parameters and working principles through immersive experience and close visit, which provides a training venue for low-carbon related training in schools and provides strong support for promoting the replication and promotion of "full-electric energy station".

Since the operation of the project, it can realize 30 million kWh of alternative electricity every year, reduce the consumption of standard coal by 9,900 tons, reduce the emission of carbon dioxide by 24,000 tons, sulfur dioxide by 742.8 tons and nitrogen oxides by 37.14 tons, truly achieve zero emission of carbon dioxide, and effectively help the green development of "Zhenwang Jiawang".

Project Impact & Sustainability

Full-electric energy station has the characteristics of mature technology, low construction and operation cost, etc. It has good reference and reproducibility in densely populated areas such as universities and large enterprises. In the process of promoting the project, the company continued to carry out publicity activities, and actively promoted full-electric energy stations by carrying out news reports in Xinhua. com, The Paper, Netease News, Jiangsu. com and other media at all levels, and by visiting customers and setting up publicity and consultation points with the help of local power supply stations, so as to continuously improve the participation willingness of users such as campuses and industrial enterprises. At present, this technology has been fully applied in Pan'an Lake area.

In the next step, State Grid Xuzhou Power Supply Company will actively communicate with stakeholders, explore replication, promotion and application upgrade in more industries and fields, form project application results from point to area, and contribute to the global response to climate change.

Expert Comments

The project employs an efficient and innovative scientific approach, utilizing a hybrid solution of "high-voltage solid electric thermal storage boiler heating and domestic hot water auxiliary heating + collector solar domestic hot water." This replaces traditional high-carbon emission methods like natural gas or coal, effectively addressing the challenges of campus heating and hot water supply. Positioned as a niche public welfare initiative, the project demands low capital investment and operational costs, all while delivering notable environmental, economic, and social benefits.

"Fishery and Photovoltaic Integration" Draws a Painting of Green Development

Tongwei Co., Ltd

Project Overview

In China, Tongwei vigorously promotes the "Fishery and Photovoltaic Integration" mode, constantly boosts the development of large scale, automatic and intelligent aquaculture, and realizes the production of green and safe aquatic products underwater and clean energy on water surfaces, thus organically integrating photovoltaic power generation with modern fisheries.

Today, with the vigorous development of green and low-carbon industries in Chengdu, Tongwei strives to build "three new" modern industrial parks integrating new fisheries, new energy and new rural, aiming to use the "Fishery and Photovoltaic Integration" project to help urban and rural revitalization construction, add new luster to Chengdu livable city, strive to practice high-quality development of enterprises, and actively promote the construction of park city demonstration zone of Chengdu's new development concept. Truly achieve a long-term, sustainable development exclusive to Fishery & PV Integration.

In terms of modern fisheries, the "Tongwei Fish" produced by the Fishery and Photovoltaic Integration has achieved food safety and digital ID management throughout the industry chain. We have established a number of high-quality breeding bases across the country, and have deep processing bases for products in Chengdu, Hainan and other places.

In terms of photovoltaic power generation, Tongwei has put into operation 52 Fishery and Photovoltaic Integration power stations in 20 provinces and cities in China, with a cumulative grid-connected scale of 3.7GW. By 2025, Tongwei New Energy will strive to complete 8GW of new energy installed capacity and deliver 9 billion KWh of clean electricity to society every year.

In terms of urban-rural integration, Tongwei keenly captures opportunities in the rural leisure tourism market under the strategy of rural revitalization. On the basis of penetrating the primary and secondary industries, Tongwei takes humanistic care as the concept, takes sustainable knowledge science research and agricultural experience as the theme, and explores the development space of the Fishery and Photovoltaic Integration in the field of tertiary industry, so as to achieve the integrated development of high-quality urban and rural industries.

Company/Organization Profile

Tongwei Co., Ltd., controlled by Tongwei Group, is a large-scale private technology-based listed company with the dual main businesses of agriculture and new energy as its core. The company now has more than 200 branches and subsidiaries all over the country and overseas, with more than 50,000 employees. It boasts an annual feed production capacity of more than 10 million tons, an annual production capacity of high-purity crystalline silicon of 420,000 tons, an annual production capacity of solar cells of more than 90GW, an annual module production capacity of 55GW, and a cumulative installed and grid-connected capacity of PV power stations based on "PV+fishery" of 3.7GW. Tongwei plans that the cumulative production capacity of high-purity crystalline silicon and solar cells will respectively reach 800,000-1 million tons and 130-150GW from 2024 to 2026.

通威股份 TONGWEI CO., LTD.

Project Outcome

1. In terms of ecological and environmental benefits, by the end of 2022, the cumulative on-grid electricity of the Fishery and Photovoltaic Integration project has reached 9.163 billion KWh, equivalent to saving 2.7626 million tons of standard coal. Based on the "2019 Emission Reduction Project China Regional Power Grid Baseline Emission Factor" published by the Ministry of Ecology and Environment of Cihna, the cumulative reduction of carbon dioxide has reached 7.032 million tons. It is equivalent to planting 38,507.27 hectares of forest.
2. In terms of economic benefits, In 2022, the cumulative on-grid electricity of Tongwei Fishery and Photovoltaic Integration power station reached 9.163 billion degrees, and the annual settlement electricity reached 4.06 billion degrees.
3. In terms of social benefits, Tongwei pursues sustainable development through "Ecological Protection + Industry to Help Agriculture". After it is completed and put into operation, the project will provide a new way for local villages to increase employment and collective income, and advance agricultural transformation and national rural revitalization.

Project Highlights

1. Flexible support: Under the headroom with a high coverage of 7 meters for the photovoltaic panel of the fully flexible support system, the temperature of the breeding pond is 3-4 degrees lower than before without shelter, the stress resistance of fish and shrimp is enhanced, and the probability of the fish pond turning over is reduced to ensure the breeding yield.
2. Intelligent operation: Fishery and Photovoltaic Integration Intelligent Cloud Platform, you can view the real-time efficiency and statistical overview of specific power generation around the country, and connect the country's Fishery and Photovoltaic Integration power generation. Tongwei has also taken the lead in building a "Fishery & PV & Charging & Storage" demonstration park, which collects equipment such as automated farming, photovoltaic power generation, energy storage system and charging pile, greatly accelerating the pace of energy structure adjustment, and promoting the process of energy revolution and intelligent energy use.
3. Awards: The contribution of Fishery and Photovoltaic Integration to sustainable

development has been widely recognized by all sectors of society, and has won 2021 China Agricultural Brand Rural Revitalization Ten Outstanding Contribution Award, 2022 China's Top10 Carbon Neutral Demonstration Cases, 2023 GoldenBee CSR China Honor Roll - Impact · Leading Enterprise, etc.

Project Implementation

The "Fishery and Photovoltaic Integration" model fully considers the protection of biodiversity in the farming process, and adopts a variety of technological innovations to achieve the harmonious unity of ecosystem protection, power generation efficiency and farming efficiency.

In terms of power generation photovoltaic, the Fishery and Photovoltaic Integration model considers the appropriate conditions for fish pond culture, and innovatively adopts flexible support technology, with a maximum span of 40 meters, a depth of 7.2 meters, and a headroom of up to 4 meters, which ensures efficient conversion of electric energy at the same time, brings better ventilation effect, more light transmittivity, higher dissolved oxygen, and is more beneficial to the growth of shad-like fish algae. As for the flexible support system construction scheme, Tongwei has 37 related technical patents. Based on the flexible support structure with innovative technical features such as the simulated string truss structure and Cross-Tie lateral vibration reduction system, Tongwei has realized the world's largest span zero deflection component installation plane of more than 40m in a single span and 920m in a continuous manner, reducing the number of pipe piles (columns) per megawatt to less than 50, and reducing the amount of steel per megawatt to less than 15t. They are 1/6 and 1/3 of the traditional fixed brackets, and the technology is comprehensively leading the industry.

In terms of rice and fish farming, in order to prove the promotion possibility of the "Fishery and Photovoltaic Integration" model, its contribution to the dual-carbon goal and the overall economic and social benefits of the model, Tongwei has launched project cooperation with a number of scientific research institutes. Among them, the "Fish&PV integrated efficient rice-fishery comprehensive cultivation" project, which was carried out in cooperation with the Fisheries Research Institute of Sichuan Academy of Agricultural Sciences, was applied in the "PV + Fish +Rice" ecological cultivation technical regulations with green quality as the core, established a resource-saving and environment-friendly fish and rice ecological cultivation model, and won the Sichuan Provincial Science and Technology Progress Award. Specifically, the project is mainly aimed at the low level of field engineering, low efficiency of comprehensive utilization of resources, and low level of production standardization faced by rice and fishery breeding, integrating and innovating eight key technologies for improving quality and efficiency of rice and fishery breeding with the core content of "reasonable dense planting, fertilizer control and drug reduction, and precise control", providing technical support for standardization and industrialization development of rice and fishery breeding.

In terms of tailwater treatment, in order to avoid damage to the local native environment caused by production waste as much as possible, the Fishery and Photovoltaic Integration model is innovatively equipped with a tailwater treatment system composed of microfilters, three-stage sedimentation tanks, biological filters, constructed wetlands and ecological ditches. The system uses aquatic plants and microorganisms to purify and absorb nutrients in the tail water, realizing the ecological symbiosis effect of breeding without water change and normal growth without fertilization, and establishing the ecological balance relationship of harmonious coexistence of fish, vegetables and aquatic microorganisms.

At present, Tongwei has developed and constructed 52 bases based on "Fishery and Photovoltaic Integration" in 20 provinces and cities across the country, and the cumulative installed capacity has reached 3.7GW. With the further development of photovoltaic industry technology, the company will continue to improve the economy of the "Fishery and Photovoltaic Integration" development model through the use of efficient components, flexible supports, automated construction and other ways, continue to promote the implementation of more projects in accordance with the development principle of "into scale", "into clusters" and "into benefits", continue to promote the transformation of fisheries and aquaculture, and produce more clean energy. It is expected that by 2025, the installed capacity of photovoltaic power stations based on the "Fishery and Photovoltaic Integration" model will reach 8GW, transporting 9 billion degrees of clean electricity for the society every year, helping China's green sustainable development while realizing enterprise economic benefits.

Project Impact & Sustainability

Since the launch of the project, Tongwei has actively cooperated with domestic and international research institutes and universities, carried out 21 project research, industry-university-research cooperation, and government research and development projects, obtained 4 identification (evaluation) results of "Fishery and Photovoltaic Integration", won 7 government science and technology progress awards, and published 32 papers and special reports, laying a theoretical and practical foundation for the development of Fishery and Photovoltaic Integration. As a representative of Chinese enterprises, Tongwei participated in the relevant meetings of the United Nations Convention to Combat Desertification, and participated in the research of photovoltaic and ecology of the Asian Development Bank and the Sustainable Renewable Energy Development Agency for many times, and made positive contributions to the standardized development of the industry.

The flexible bracket has the characteristics of large span, high headroom and less consumables. In order to realize the efficient collaboration between agriculture and photovoltaic, Tongwei has been committed to the research and development and design of the flexible bracket for a long time. Up to now, the company has obtained 37 technical patents related to the construction scheme of flexible support system, and in 2022 led the preparation of China's first flexible support industry guidance standard "Guide for design and installation of photovoltaic flexible support structures", which greatly filled the gaps in the industry, realized the standardization and standardization of flexible support design and installation technology, and promoted the pace of construction. At the same time, it will lay the foundation for flexible support technology in the field of photovoltaic support, landing and scale.

Expert Comments

Tongwei has successfully launched 52 new power stations across 20 provinces and cities in China, employing the innovative "Fishery and Photovoltaic Integration" model. This initiative has established a "Three New" modern industrial estate that integrates new fishery practices, renewable energy, and new rural development. The approach addresses the challenge of land resource demand in large-scale photovoltaic projects while advancing energy substitution in rural fishery farming and supporting farmer-centric policies. Recognized with green and low-carbon awards, these projects showcase an effective path for the synergistic development of green agriculture and green energy. The implementation includes standardized flexible photovoltaic support and other technologies, resulting in tangible environmental, social, and economic benefits.

Digital mobility aids in the low-carbon transformation of urban transportation

DIDI

Project Overview

Didi, as a typical representative in the field of digital mobility, is built on the foundation of efficient resource utilization. Through technological means, it enhances the operational efficiency of urban transportation and the capability of digital services, propelling the industry towards a more shared and intensive development. In2020, Didi accelerated the promotion of green transformation in urban transportation nationwide in China.

1. In terms of approach, it starts from four aspects: scientific quantification, rational planning, effective management, and active promotion. Along with partners both inside and outside its platform ecosystem, Didi is creating a new green mobility ecosystem, facilitating green and low-carbon development in transportation and society as a whole.
2. In terms of measures:

a. Electrification of transportation tools, promoting the transition from gasoline to electricity in ride-hailing vehicles. Over 3 million new energy vehicles have registered on the platform.

b. Efficient utilization of resources by developing carpooling and ridesharing services to enhance the efficiency of road and transportation tool utilization.

c. Low-carbon travel structures; the platform's carbon benefit product, "TanYuanQi," has been implemented in 298 cities nationwide.

d. Green electricity sourcing by exploring microgrids and V2G technology, assisting China's new electricity system development through demand-side response.

e. Digitization and intelligence in the transportation system by developing autonomous driving and smart traffic signal control technologies, pushing the digital and intelligent transformation of the transportation system.

Company/Organization Profile

Didi Global Inc., established in June 2012, is a globally renowned one-stop digital mobility platform. It provides digital transportation services such as ride-hailing, taxis, shared bicycles, ridesharing, and car rentals in over ten countries, including China, throughout Asia, Latin America, Australia, and Europe. The platform also operates diversified businesses, including freight, vehicle services, and food delivery. Since its inception, the platform has been dedicated to increasing vehicle sharing rates, promoting the development of non-motorized transportation, and advancing the electrification of transportation tools. It focuses on collaborating with partners within its ecosystem to create a green mobility environment. The platform has 587 million active annual users worldwide and has registered over 3 million new energy vehicles.

Project Outcome

1. **Electrification of transportation tools**: the promotion of "oil-for-electricity" for online vehicles, with more than 3 million new energy vehicles registered on the platform. As of June 2023, more than 2.7 million pure electric vehicles and more than 400,000 plug-in hybrid new energy vehicles have been registered on the DDT platform, totaling more than 3 million new energy vehicles registered on the platform. This is equivalent to one out of every five new energy vehicles in China registered on the DDT platform.
2. **Efficient utilization of resources**: the development of carpooling, hitchhiking and other "micro-bus" attributes of carpooling transportation to improve the efficiency of road and transport utilization. Carpooling and hitchhiking are typical modes of transportation sharing, with the attribute of "micro-bus". Dripping carpooling covers 284 cities, and hitchhiking covers more than 300 cities nationwide.
3. **Low-carbon transportation structures**: the digital carbon product "Carbon Yuanqi" has been launched in 298 cities. 2022, the digital carbon product "Carbon Yuanqi" launched by DDT will provide creative low-carbon travel guidance in the whole process of taxiing on the user's side, and continue to motivate users to choose low-carbon travel modes. Users can choose low-carbon travel modes, and it has already landed in 298 cities.
4. **Green electricity sourcing**: exploring microgrid and "V2G" technologies to help build China's new power system through demand-side response. As of June 2023, the cumulative scale of power sales is 500 million kWh, the cumulative number of power demand response times is 650+, and the cumulative response time is 3400+ hours.
5. **Digital and intelligent transportation systems**: developing automatic driving and intelligent information control technology, and boosting the digital and intelligent transformation of the transportation system with technological innovation. DDT's autonomous driving has operated safely for more than 1,200

days; the "intelligent information control system" can reduce the average delay time of congestion at intersections by 10%-20% through optimizing the signal system.

Project Highlights

1. In September 2023, Didi was awarded as an "Outstanding Case for 2023 Low-Carbon Transition and High-Quality Development."
2. In April 2023, Didi was selected as a "Green Low-Carbon Partner" for the Shanghai Energy Conservation Publicity Week activities of 2023. The related work achievements were recognized by the organizing committee.
3. In 2022, Didi Qingju was honored with the "Industry Leading Enterprise Award" in the Power Battery Recycling and Utilization Corporate Evaluation event.
4. "Didi Digital Mobility Green Index", jointly compiled by the Smart Transportation Division of the National Engineering Laboratory and the Didi Development Research Institute, was released by Academician Zhang Pingwen at the inaugural Digital Ecology and Governance Forum and the Digital Ecology Index 2023 Release Conference.

Project Implementation

Didi is primarily exploring and making breakthroughs in five aspects to promote the electrification of transportation vehicles, efficient resource utilization, low-carbonization of travel structures, greening of power sources, and the intelligence of the transportation system.

1. **Electrification of Transportation Vehicles:** By promoting the transition of ride-hailing vehicles from traditional fuel to electric power, the platform has accumulated over 3 million registered new energy vehicles. Electric vehicles, recognized internationally as zero-emission transportation, do not directly emit carbon dioxide during road travel. Even considering the indirect emissions from power generation, the carbon emission intensity per unit of operational mileage is only about half of that of traditional fuel vehicles. The electrification of transportation vehicles is a crucial choice for energy conservation and carbon reduction in urban transportation. Digital transportation companies, represented by ride-hailing services, play a significant role in driving and demonstrating the development of the new energy vehicle industry in China.
2. **Efficient Resource Utilization**: Developing shared transportation with attributes of "micro-public transit," such as carpooling and ride-sharing, enhances the efficiency of road and transportation resource utilization. Didi's carpooling and ride-sharing services are typical forms of shared transportation, having attributes of "micro-public transit," with carbon emission intensity per unit turnover comparable to public transportation. For example, an electric ride-hailing vehicle with a consumption of 16 kWh per 100 kilometers has a carbon emission intensity of about 93g CO2 per unit turnover. Assuming two passengers share the ride, the intensity decreases to approximately 46g CO2, which is lower than the carbon emission factor of 67g CO2/p.km for low-carbon commuting published by the Beijing low-carbon travel methodology and slightly higher than the carbon emission factor of 39g CO2/p.km for rail transportation.
3. **Low-Carbonization of Travel Structures:** Launching the "Carbon Universal" product in 298 cities, actively developing public transportation, shared transportation, and slow transportation, and increasing the proportion of low-carbon travel can effectively reduce the overall carbon emissions and intensity of transportation. Didi's platform provides various green travel services, including shared bicycles, shared electric bicycles, carpooling, ride-sharing, and electric vehicles. At the same time, leveraging digital means, Didi explores initiatives such as Carbon Universal, carpooling environmental incentive plans, and Xiaojue Energy's low-carbon home, contributing to carbon inclusiveness.
4. **Greening of Power Sources:** Exploring microgrids and "Vehicle-to-Grid (V2G)" technology, supporting the construction of China's new power system through demand-side response. From the consumer side, deploying distributed photovoltaics and participating in demand-side response through vehicle-grid interaction (V2G) is an effective way to actively reduce carbon emissions from transportation electricity consumption. Xiaojue Charging actively explores V2G technology, enabling vehicles to be charged with green electricity and assisting in the construction of China's new power system through demand-side response.
5. **Intelligence of the Transportation System:** Developing autonomous driving and intelligent traffic control technology to promote the digitization and intelligence transformation of the transportation system. With continuous technological advancements, road traffic is moving towards a smart road network. On the one hand, the coordinated system of vehicle-road-cloud, connecting people flow, vehicle flow, and data flow, provides a basic guarantee for the intelligent transformation of the transportation system. On the other hand, innovative developments in intelligent transportation technologies such as autonomous driving, deeply integrated with the smart road network, drive the collaborative innovation of intelligent transportation digitization. Didi's autonomous driving has been in safe operation for over three years, and the "Intelligent Traffic Control System" can reduce the average delay duration at congested intersections by 10%-20% through signal system optimization.

Project Impact & Sustainability

Didi propels the transition of ride-hailing vehicles from gasoline to electric, fosters the growth of carpooling and ridesharing services, launches the platform's carbon inclusivity product "TanYuanQi" explores microgrid and V2G (Vehicle-to-Grid) technologies, and advances autonomous driving and smart traffic control technologies to boost the digital and intelligent transformation of the transportation system. Judging from these measures, Didi's "dual carbon" efforts not only have short-term effectiveness but also long-term sustainability. By establishing a new green mobility ecosystem with partners both inside and outside of its platform, a beneficial mutual cooperation mechanism can be formed. Didi's continual investment in technological innovation provides solid technical support for low-carbon development. In the future, Didi will continue to integrate technology, resources, and partners, promoting the industry's transition towards shared, intensive, digital, and intelligent green low-carbon transformation.

Expert Comments

As a global one-stop digital travel and freight service platform, Didi Global bears a significant responsibility for promoting the green transformation of transportation, and it has undeniably made substantial contributions in this regard. The project actively advocates the concept of green development, promotes the "EV in lieu of gas" campaign, and encourages the broader adoption of renewable energy-fueled online hailing vehicles. Didi Global has introduced the "micro-bus" carpooling transport approach, enhancing the efficient utilization of transportation resources. The company employs the "TanYuanQi" digital carbon benefit mechanism to incentivize low-carbon travel. The project explores the application of green carbon reduction technologies, utilizing microgrid and V2G technologies to achieve a green power supply. Furthermore, Didi Global has developed autonomous driving and intelligent information control technologies to enhance the digitalization of the transportation system.The project has produced significant carbon reduction results with notable social impact and industry guidance value, demonstrating remarkable sustainability in technological innovation.

NaaS: Invigorate Green and Low-carbon Transport with Connected Charging Network

NaaS Technology Inc.

Project Overview

Founded in 2019, NaaS (NASDAQ: NAAS) is a subsidiary of Newlinks Technology Limited, a leading energy digitalization enterprise in China. NaaS is also the first US-listed EV charging service company in China, listed on NASDAQ on June 13, 2022. As a "connector" in the new energy sector, NaaS has been spurring the development of full-chain energy conservation and emission reduction to contribute to global carbon neutrality, mainly through the below perspectives:

Green Use of the Source: NaaS provides charging stations with clean energy electricity transaction. In 2022, NaaS' electricity transaction amounted to 439 million kWh, of which 393 million kWh was clean energy (photovoltaic, wind power, hydropower), accounting for 89.52% of the total, and a total of 309,100 tons of carbon dioxide emission reduction was achieved through the purchase of clean power electricity.

Green Use of Charging Stations: NaaS is actively exploring innovative power generation scenarios under the goal of "dual-carbon". By installing distributed photovoltaic (PV) on the roofs of charging stations and supporting energy storage facilities to realize self-generation and self-consumption of clean energy, NaaS helps operators use PV to charge new energy vehicles, which improves energy supply and effectively reduces the cost of purchasing electricity for charging stations.

Greening Use of Energy: NaaS actively carries out the innovative mechanism of carbon benefits, and encourages users to use the carbon account function through cooperation with its strategic partner, Kuaidian, to obtain carbon credits, which can be exchanged for credits in the carbon mall, thus incentivizing users to participate in carbon emission reduction.

Company/Organization Profile

NaaS Technology Inc. is the first U.S. Listed EV charging service company in China. The Company provides one-stop EV charging solutions to charger manufacturers, charging station operators, OEMs and other industry partners, including site selection consulting, software/hardware procurement, EPC engineering, operation & maintenance, energy storage, PV and autonomous charging robot, delivering better charging experience to EV owners and more efficient operation to industrial partners. On June 13, 2022, the American depositary shares of the Company started trading on NASDAQ under the stock code NAAS. Upholding the vision of "Empower the World with Green Energy", NaaS is committed to improving the stability and efficiency of global transport energy network.

Project Outcome

1. In H1 2023, NaaS reduced 1.463 million tons of carbon emissions, up 109% from a year earlier. NaaS' *2022 ESG Report* suggests that in 2022, the Company recorded an annual carbon emission reduction of 1.8477 million tons, a year-on-year increase of 106.22%; it purchased 393 GWh electricity generated by clean sources, representing 89.52% of the total.
2. Teaming up with strategic partner Kuaidian, NaaS takes the lead in the industry to launch carbon account program and to promote inclusive carbon innovation mechanism. By charging, users can get and include carbon points in their carbon account. The carbon points can be redeemed for items available in carbon mall, as an act of inspiring users to engage in reduction of carbon emissions and promoting green and low-carbon transport. By the end of 2022, the number of users with carbon accounts reached 463,000.
3. NaaS explores cutting-edge charging technologies to empower networking of green and intelligent transport facilities. In response to demand for charging autonomous driving cars, NaaS develops its own autonomous charging robot. The robot breaks through limits of site and power capacity in fixed charging pile construction, and thus satisfies demand for easier and more efficient charging service. Car owners simply need to put an order via the phone with one click, and then the autonomous charging robot will complete the whole process of automatic vehicle locating, precise parking, automatic docking, charging and undocking via mechanical arms, and automatic return and recharging, effectively enhancing charging experience.

4. Winning the bid for Anji New Energy Project, NaaS sets a world-leading paradigm of "integrated PV-storage-charging-swapping" heavy truck stations - Anshan Station. Integrating PV, energy storage, charging and battery swapping, the project features 430 charging spaces, 458 chargers, and two heavy truck battery swapping stations to provide charging and swapping services for 1,800 heavy trucks and small EVs in Anji County. In addition, the project is also equipped with 36 integrated energy storage cabinets of 233kWh with a total energy storage capacity of 8,388kWh, as well as a distributed PV systems with a total installed capacity of 4,205.4kW. Upon completion, Anshan Station is expected to generate

4.328 million kWh of electricity annually, saving 1,358.9 tons of standard coal and reducing carbon emissions by about 3,580.5 tons per year.

Project Highlights

In September 2023, NaaS was assigned by Sustainable Fitch **the highest ESG entity score in China** of "76", and an ESG Entity Rating of "2". Sustainable Fitch defines NaaS as a **contributor to the uptake of EVs and transition to a low-carbon transport economy in China, with business showing promising environmental and social benefits.**

Putting climate change and broader ESG topics over others in business strategy, NaaS was awarded **"ESG Innovator"** at the **CIFTIS 2023** in September 2023.

In August 2023, NaaS became **China's first new energy charging service provider joining "Science Based Targets initiative (SBTi)" with an ambitious target** to limit global warning to 1.5°C. NaaS has also set targets to reduce its Scope 1 and Scope 2 emissions by 42% by 2030 compared to that of 2022, and is committed to reducing its Scope 3 emissions in the near term.

In the same month, NaaS was included into the second Wallstreetcn.com rankings of **"Zero Carbon Future, ESG Innovative Practices List".**

In December 2022, NaaS was commended for the **Green Development** at the seventeenth **"People's Corporate Social Responsibility Award".**

In August 2022, NaaS was awarded "2022 Best Community-based Charging Service Provider Brand in China" by chongdian360.cn.

Project Implementation

Carbon dioxide emissions from transport industry accounts for around 10% of the national total, and road transport represents roughly 80% of total carbon emissions in the transport industry. Therefore, reduction of carbon emissions in transport industry is of crucial significance to achieving carbon peak and carbon neutrality in China.

1. NaaS collaborates with Kuaidian to empower green transport

NaaS has set in place a charging network jointly with Kuaidian, connecting thousands of branded charging operators, such as TELD and StarCharge. Using one-click charging pile search, online navigation, charging pile search map, one-click payment and other innovative features, users increase efficiency for charging pile search at lower energy consumption.

Additionally, teaming up with strategic partner Kuaidian, NaaS takes the lead in the industry to launch carbon account program and to promote inclusive carbon innovation mechanism. By charging, users can get and include carbon points in their carbon account. The carbon points can be redeemed for items available in carbon mall, as an act of inspiring users to engage in reduction of carbon emissions and promoting green and low-carbon transport. By the end of 2022, the number of users with carbon accounts reached 463,000.

2. NaaS provides lifecycle solutions for charging station operators to support the construction of new infrastructure of charging piles.

Well organized and functioning stations are conductive for promoting sound development of the charging industry and accelerating transformation in the energy structure. By providing solutions of site selection, planning, construction, operation and maintenance across the lifecycle of stations, NewLink improves the utilization efficiency of charging piles and the operation quality of charging stations, as an act of fueling healthy development of new infrastructure of charging piles and fulfilling carbon neutrality.

3. Green source and green station to enhance the consumption of clean energy.

Green source: NaaS engages charging stations in clean energy-generated electricity transactions. In 2022, NaaS purchased 393 million kWh of electricity generated by clean energy source (PV, wind power, hydropower), which represented 89.52% of the total electricity purchased (439 million kWh); through purchase of clean electricity, 309,100 tons of carbon dioxide emissions were curtailed.

Green station: mounting distributed PV and relevant energy storage facility on the station building roof, NaaS helps charging station operators to generate power for their own use and charge EVs by photovoltaic power, resulting in better energy supply structure and lower cost of electricity purchase for stations. For distributed PV projects of charging stations, NaaS provides a comprehensive solution integrating project planning, procurement, construction, and daily operation and maintenance.

Project Impact & Sustainability

Under the NaaS (NewLink as a service) mode in a class of its own, NaaS builds a new digital charging ecosystem linking charging pile manufacturers, charging station operators, OEMs and users together. By leverage of digital technology, the Company streamlines operation of the ecosystem and delivery of energy and ensures sound development of EV industry.

NaaS is now expanding its business landscape. Since 2023, the Company has contracted with Hyundai Motor, PICC Real Estate, CR Capital MGMT and other World Fortune 500 companies; inked a strategic cooperation agreement with the Government of Tengzhou City, Shandong Province, known as the "Capital of Lithium Battery"; with arrangements in third-tier cities, expressways, rural areas and other application scenarios with high demand for charge services; engaged in extensive cooperation pertaining to charging infrastructure building, digital and smart utilization of new energy, and green transport infrastructure, as part of an interconnected energy ecosystem. Improving services with breadth and depth, NaaS aspires to become a new energy ecosystem enterprise with global vision.

With efforts afoot to tap into overseas market, NaaS makes "China's practice" of charging services apply worldwide. In Europe, NaaS announced plans to acquire Charge Amps, a leading EV charging solutions provider in Europe with 22% Swedish market share. With the establishment of EU Headquarters in the Netherlands, the Company initiates the comprehensive layout in the European charging service market; in the Middle East, NaaS engages in in-depth discussion on potential strategic cooperation with authorities and energy firms of the UAE, Oman, and Saudi Arabia; in Southeast Asia, NaaS communicates with local energy and Internet-based firms and deploys its charging solution via its Singapore office; in Japan, NaaS is now digging deep into potential opportunities of development on local market through negotiation with local energy companies.

Expert Comments

NaaS's core business serves as a crucial foundation for energy transition and plays a key role in driving the shift from fuel vehicles to renewable energy vehicles. Beyond offering basic charging services, this project incorporates a mechanism and technological innovations to increase the proportion of clean energy procurement. It optimizes the self-sufficiency capacity of photovoltaic power plants, develops the function of charging carbon accounting, conducts research and development on automatic charging robots, and establishes an integrated "solar-storage-charging and switching" station for haulage trucks. This initiative forms a closed loop of comprehensive emission reduction actions guided by the principles of promoting carbon emission reduction services, applying carbon emission reduction technology, and actively reducing carbon emissions.In addition to delivering significant carbon reduction outcomes, the project has garnered extensive social recognition and impact. The technology and services are poised for further rollout, presenting substantial potential for ongoing carbon reduction and scalability.

The World's First Smart Zero-Carbon Port

Goldwind Science & Technology Co.,Ltd.

Project Overview

In 2021, Goldwind Science & Technology Co., Ltd. (referred to as Goldwind) partnered with COSCO Shipping (Tianjin) Co., Ltd. and Tianjin Port Group to establish the world's first smart zero-carbon port. The port, situated in the Beijiang Port Area of Tianjin Port, features facilities that rely solely on electricity. Based on the in-depth investigation of the energy demand and load characteristics of Tianjin Port, Goldwind has carefully demonstrated the feasibility and adaptability of low-carbon technologies, such as renewable energy, smart microgrid systems, and new energy conservation methods, in port scenarios. Consequently, they devised an integrated smart energy solution encompassing power generation, grid management, load optimization, and energy storage, thereby achieving the world's first "Smart Zero-Carbon" port that runs on 100% self-generated green electricity, with 100% of its energy being green. In 2022, the project was awarded the *Carbon Neutrality Certificate* by the China Classification Society. In the same year, Goldwind, Tianjin Port Group, and Tianjin Research Institute for Water Transport Engineering, M.O.T., jointly released the *White Paper on Carbon Neutrality in Ports* to provide valuable insights and experiences to assist other ports in achieving their carbon neutrality.

Company/Organization Profile

As a trusted global strategic partner in clean energy, Goldwind is committed to building an energy foundation to "drive a renewable future" centered on the EOD (Ecology-Oriented Development)+ENERGY clean energy industry model. With reliable products and solutions in energy development, devices, services, and utilization, we help cities and enterprises with comprehensive and sustainable economic, ecological, and social development. Since we started our business, we have witnessed and experienced the growth and prosperity of China's renewable energy industry. We have helped clients worldwide tap into the value of clean energy with comprehensive and in-depth internationalization capabilities. Goldwind's business network covers 38 countries across six continents. As of the end of June 2023, our global cumulative wind power installed capacity exceeded 105GW, and our operations and maintenance (O&M) service capacity exceeded 61GW. We have independently invested in, constructed, and operated wind farms with a capacity of 7GW, managed clean energy assets of 19GW, and promoted the implementation of over 500 zero-carbon projects. With years of best practice in clean energy, Goldwind has frequently been recognized as "Corporate Climate Leader", "ESG Strength Pioneer Enterprise of the Year, "Most Respected Company in Asia", and "Best Investor Relations Company", and awarded "Top 50 Most Innovative Companies in the World", "Carbon Clean 200", "Top 500 Global New Energy Companies", "New Fortune Best Listed Companies", "Fortune Top 500 Chinese Companies", and other accolades. In the annual evaluation of the State-owned Assets Supervision and Administration Commission of the State Council, Goldwind's offshore wind turbine was shortlisted as one of the "2022 Top 10 Pillars of China", alongside other models of China's intelligent manufacturing such as the domestic large aircraft C919, the Fujian, China's third aircraft carrier, and the new generation of artificial sun.

Project Outcome

1. The green power generation reaches approximately 90 million kWh on an annual basis, making it the leading port nationwide in terms of green power, accounting for 14% of the total power generated.
2. The carbon emission is reduced by about 75,000 tons per year, which is equivalent to 210,000 trees;
3. Compared to traditional automated container terminals, It has achieved a remarkable 17% reduction in energy consumption.

Project Highlights

As a recognition of these achievements, the zero-carbon port at Tianjin Port was honored with the prestigious "2021 Pioneer Award for Contribution to China Wind Power".

Project Implementation

(I) Power Generation

In consideration of local conditions, the available vacant area at the port has been effectively utilized for wind power and PV projects. This is done to guarantee a steady supply of renewable energy for the automated facilities within the park. By constructing several Goldwind wind power generators and PV power generation devices, Goldwind has succeeded in establishing a smart and eco-friendly energy supply system featuring the elements of "wind power, solar power, and energy storage". All these efforts have been made possible through meticulous site selection.

(II) Grid Management

Goldwind's cutting-edge autonomous microgrid technology, compliant with IEC, is leveraged to coordinate power distribution, energy storage, and adaptable load management. By harnessing the power of intelligent forecasting and advanced algorithms, this groundbreaking technology ensures an independent and self-sustaining grid operation while maximizing the efficient utilization of renewable energy.

(III) Load Optimization

The primary power-consuming equipment, transportation tools, and mobile machinery at the port have undergone extensive electrification. This includes the utilization of high-voltage (HV)-powered quay cranes and gantry cranes, as well as the implementation of HV shore power systems at all three berths. Additionally, all transport vehicles and mobile machinery at the port have been converted into electric alternatives, such as electric ART (Automated Rail-mounted Trucks), electric heavy-duty trucks, electric forklifts, electric stackers, and electric loaders. Simultaneously, advanced monitoring and control technology, along with big data analysis, is being employed to improve operation efficiency and increase the rate of energy conservation.

(IV) Control

The digital twin system for the port incorporates advanced technologies, such as 3D engines and IoT. This allows for the seamless integration of data synchronization and source, data visualization, and business visualization of the entire port energy system. Additionally, a low-code approach is utilized to customize a smart energy control platform specifically tailored for the port. Meanwhile, by leveraging these technologies, the digital twin system promises optimal allocation and intelligent prediction of clean power generation and load. This leads to an improved energy utilization rate and facilitates efficient port operation with low energy consumption.

Project Impact & Sustainability

In January 2022, the China Classification Society granted the *Carbon Neutrality Certificate* to the world's first smart zero-carbon port. In the meantime, Goldwind, Tianjin Port Group, and Tianjin Research Institute for Water Transport Engineering, M.O.T., collaboratively released the *White Paper on Carbon Neutrality in Port*s to provide guidance and insights to assist other ports in achieving carbon neutrality.

Expert Comments

Goldwind Science & Technology Co., Ltd. (referred to as Goldwind), in collaboration with Tianjin COSCO and Tianjin Port Group, has jointly developed the world's first "Smart Zero-Carbon" terminal. This initiative has established an integrated "Generation-Grid-Load-Storage" smart energy solution for zero-carbon terminals. The project stands as the world's inaugural "Smart Zero-Carbon" terminal utilizing 100% electric energy, completely self-generated, and self-sufficient in green electric energy. With an annual generation of approximately 90 million kWh of green electricity, it reduces carbon emissions by about 75,000 tons per year and exhibits a 17% lower energy consumption compared to traditional automated container terminals. The project has earned the "Carbon Neutral Certificate" from the China Classification Society (CCS). Goldwind has successfully constructed the first zero-carbon port through its dedicated efforts in zero-carbon infrastructure and energy quality and efficiency enhancement, establishing a solid precedent for future zero-carbon port construction.

Syngenta Group China promoting “low-carbon” wheat

Syngenta Group China

Project Overview

Low-carbon wheat refers to the comprehensive application of carbon reduction and sequestration measures in the production process, thereby reducing greenhouse gas emissions. Syngenta Group China and Nestle China have jointly established a regenerative agriculture demonstration farm in Huantai, Shandong Province, to promote low-carbon wheat production based on the principles of regenerative agriculture since August 2022.

Key initiatives for low-carbon wheat production include minimum seeding technology, precise application of fertilizers and pesticides, crop diversification and multi-functional belt. Compared with the local traditional wheat, Huantai low-carbon wheat yield per mu increased by 7.5% in 2023. According to cool farm tool calculation, it produces 32% less greenhouse gas emissions than conventional wheat (parameters such as straw returning, nitrogen application, minimum tillage, cover crops etc. put into cool farm tool, and carbon emission will be calculated by this tool)

At the same time, Syngenta Group China, relying on its Modern Agricultural Platform MAP, promote the wheat minimum tillage seeding technology as a key measure in Hebei and other North China Region, covering an area of 6,000 mu in 2022 and 10,000 mu in 2023.

Company/Organization Profile

As one of the four business units within the Syngenta Group, Syngenta Group China is the leading partner for agricultural technology and innovation in the country. Our diverse portfolio encompasses crop protection, seeds, crop nutrition and farmer service in China.

Based in China as a prominent participant in global operations, Syngenta Group China is committed to combining Syngenta Group’s leading global innovations and talent resources with its local expertise, market insights and professional teams in China, to empower agrotechnological innovation, high-quality sustainable development, and the rural revitalization in China by accelerating the modernization of the country’s agriculture industry.

Syngenta Group China’s vision is to be “the most influential agri-tech innovator in China and beyond”, and its mission is “to enable everyone in the food chain ecosystem to prosper”, with sales of $8.6 billion by 2022.

Project Outcome

Syngenta Group China grows 200 mu of low-carbon wheat on its Huantai farm.In 2022, promoted wheat minimum tillage seeding technology of 6,000 mu, and expand to 10,000 mu in 2023 in Hebei Province.

Low-carbon wheat production abide the principles of regenerative agriculture and has the following effects:

1. Precise application of pesticides and fertilizers can reduce the amount of pesticides and fertilizers used. The low-carbon wheat on Huantai farm has achieved 30-50% fertilizer saving through soil testing and formulated fertilizer, fertigation and other management technologies.
2. Increase wheat yield. Compared with the local traditional wheat, Huantai low-carbon wheat yield per mu increased by 7.5%.
3. Improve soil health. Studies have shown that continuous application of regenerative agricultural measures will effectively increase soil carbon content.
4. Reduce greenhouse gas emissions during crop production. According to cool farm tool calculation, Huantai low-carbon wheat produces 32% less greenhouse gas emissions than conventional wheat.
5. Increase farmland biodiversity.

Project Highlights

Agricultural raw materials account for the largest proportion of GHG emissions across the entire value chain of food companies, and promoting regenerative agricultural practices in the production of agricultural products can restore soil fertility and help food companies reduce GHG emissions in the supply chain and achieve Scope 3 reductions target. The low-carbon wheat produced by Syngenta Group China and Nestle China will not only increase wheat production, but also contribute to greenhouse gas emission reduction, which will contribute to the agricultural green and low-carbon development in China.

Project Implementation

Key measures for low-carbon wheat production:

Minimum tillage seeding: After the corn straw is crushed and returned to the field, do not till the land. Applying wheat minimum tillage seeding technology which will combine ditching, fertilizing, seeding, covering and suppressing all together at one time. Compared with conventional tillage, rotary tillage and seeding after maize harvest, wheat minimum tillage seeding technology reduces the application of machine operations 2-3 times, reduces soil disturbance, and also reduces carbon emissions from machine use.

Precise application: The soil is sampled and tested, and the formula fertilizer is applied according to the soil properties and nutrient content. The fertigation technol-

ogy can effectively improve fertilizer utilization efficiency and reduce the amount of fertilizer used, which is also conducive to the emission reduction of greenhouse gases such as nitrous oxide.

Crop diversity: Increasing the variety of farmland crops and increasing biodiversity through multiple crop rotation.

Multifunctional belt: Planting flowers or shrubs on the edge of farmland provides semi-natural habitats for insects and animals such as butterflies and beetles, reducing the risk of soil erosion and promoting farmland biodiversity while protecting the soil.

Syngenta Group China, in addition to using the above measures to promote the low-carbon wheat demonstration in Huantai, Shandong Province, has also promoted minimum tillage wheat seeding technology to farmers in Hebei Province through MAP, whilst providing precision fertilizer application to help farmers reduce agricultural production costs and reduce agricultural greenhouse gas emissions while ensuring production.

As wheat minimum tillage seeding technology is a relatively new technology in North China Region, farmers are used to 2-3 rotation tillage after corn stalks returning to the field, and this technology is still in the early stage of promotion and is gradually gaining recognition from farmers.

Project Impact & Sustainability

Wheat minimum tillage seeding technology reduces soil disturbance, has a very positive effect on soil health, and it can also improve wheat resilient to low temperatures. Because wheat minimum tillage seeding technology reduces the application of machines in the field, it is a cost-saving technology for wheat farmers in North China Area. During the promotion of this technology, farmers' main concern was wheat yield. As farmers gradually deepen their understanding of this technology and realize that this technology will not reduce wheat yield, they will accept this technology.

In the future, Syngenta Group China will continue to promote wheat minimum tillage seeding technology in North China Region through MAP to reduce greenhouse gas emissions in wheat production and help farmers better cope with the impact of climate change. Minimum tillage wheat seeding technology promotion area has reached 10,000 mu in 2023.

Expert Comments

Syngenta Group (China) and Nestle (China) have collaboratively established a regenerative agriculture pilot site in Huantai, Shandong Province. By employing low-carbon wheat production methods, such as no-tillage sowing, precise application of chemical fertilizers and pesticides, crop diversification, and multi-functional marginal zone construction, the harvested low-carbon wheat demonstrated a 32% reduction in greenhouse gas emissions compared to traditional methods. The project yielded multiple benefits, including cost reduction, increased yields, improved efficiency, emission reduction, and enhanced biological diversity of farmland. Utilizing the modern agricultural service platform MAP, the companies are extending the promotion of low-carbon wheat planting technology, particularly focusing on no-tillage sowing, in other regions around the Yellow and Huaihai Seas, such as Hebei. This initiative actively contributes to the green, low-carbon, and sustainable development of agriculture in China.

“Tianning No. 1” Zero-Carbon Smart Park, China Huadian

Beijing Tianning Huayun Culture & Technology Co., LTD.

Project Overview

“Located in Xicheng District, Beijing, Tianning No. 1 Cultural and Technological Innovation Park covers a total area of about 79,000 square metres (Phase covers about 32,000 square metres), and is a typical representative of the evolution of Beijing’s industrial civilisation to an ecological civilisation.

“Tianning No. 1” is the predecessor of Beijing No. 2 Thermal Power Plant. With the shutdown of the oil-fired generating units, No. 2 Thermal Power Plant has successfully completed its historical mission for a period of time, and most of the plants and equipments in the park are in an idle state. In this context, the park has completed its first transformation through systematic upgrading, realising the gorgeous transformation of the industrial park into a cultural and creative park.

Since the dual-carbon strategy was put forward, China Huadian Tianning No. 1 has been based on the energy industry, carried forward the responsibility of the central enterprise, played the role of demonstration and leadership, and made efforts to refine and explore, striving to be the “dual-carbon” leader of China’s power generating enterprises, and participating in the governance of global climate change. 2022, Tianning Huayun has responded to the national policy call, and will continue to participate in the global climate change governance. In 2022, Tianning Huayun will respond to the call of national policy and make great strides in the direction of conceptual upgrading, industrial transformation, ecological construction and high-quality development. Taking zero-carbon planning as an entry point, relying on specialised comprehensive energy solutions, and on the basis of the mature carrier, industry and culture of “Tianning No.1”, Tianning Huayun will build a zero-carbon industrial park of international advanced level by integrating and applying the latest technologies and concepts, and become a benchmark model of “zero-carbon park”, exporting solutions with “Chinese characteristics” for China and the world to cope with climate change, and becoming a new business card of “Carbon Neutrality” in China.

“Tianning No. 1 Zero-Carbon Smart Park integrates core technologies, scenarios, modes, concepts and achievements, systematically sums up the experience of all aspects of the project process, and forms an industry-leading development paradigm. Through the application of autonomous products in all scenarios, the participation of domestic authoritative think tanks, the innovation and leadership of cultural and institutional construction, and the extensive participation of all stakeholders, we have explored a set of comprehensive solutions under the “zero carbon” application scenarios by giving full play to the advantages of various resources in the carbon-neutral ecosystem for joint discussions and construction.

Company/Organization Profile

Beijing Tianning Huayun Culture & Technology Co., LTD. is a company established by China Huadian Power Generation Operation LTD., a second-tier unit of China Huadian Group Corporation, for the purpose of better revitalising state-owned assets and promoting the protection and reuse of the industrial sites of the former Beijing No. 2 Thermal Power Plant (hereinafter referred to as No. 2 Thermal). It is produced by Huadian (Beijing) Co-Gneration Co., LTD., funded by China Huadian Power Generation Operation LTD., and jointly registered.Tianning Huayun is mainly responsible for the spatial planning transformation and operation of the industrial site of Huadian (Beijing) Thermal Power Co., Ltd.’s Tianning Temple plant, and to create a “Tianning No. 1” Culture and Technology Innovation Park, with cultural, financial and technological fusion and with innovative and forward-looking features in accordance with superimposed functional positioning and development requirements in the westside in the context of the promotion of cultural and technological industry development in Beijing.

中国华电集团有限公司
CHINA HUADIAN CORPORATION LTD.
北京天宁华韵文化科技有限公司
BEIJING TIANNING HUAYUN CULTURE & TECHNOLOGY CO.,LTD.

Project Outcome

1. Comprehensive Emission Reduction

Photovoltaic Power Generation: The total installed capacity of photovoltaic roofs in the park is 0.4MWp, with an expected annual power generation of 447223kWh, accounting for about 70% of the park's total annual electricity consumption, reducing 446 tons of carbon dioxide, 13.4 tons of sulfur dioxide, and 6.7 tons of nitrogen oxides.

Clean Energy Facilities: By increasing the number of points and deploying a variety of microsystems, a developed and efficient photovoltaic facility network is formed in the park, maximizing the reduction of traditional energy consumption within the park's internal system.

Neutralization and Offsetting: Through a series of emission reduction measures and technologies, the "Tian Ning No.1" zero-carbon smart park emitted 924 tons of carbon dioxide in 2022 and received a "Carbon Neutral" certificate issued by the authoritative third-party National Inspection Group the park is recognized for achieving 100% carbon neutrality.

2. Energy Saving

The park, through green building operation planning and upgrading the lighting system, maximizes the improvement of lighting efficiency, with the annual electricity consumption of the public area lighting facilities expected to decrease by 30%.

3. Cultural Advocacy

The park continuously strengthens cultural propaganda, forms a low-carbon alliance with the enterprises settled in, and constantly enhances its brand influence. In 2023, the park was selected as an excellent project case by the Polaris Network comprehensive energy service.

4. Innovation in Philosophy and Standards

The park starts from all aspects of planning, technology, construction, application, and system, formulates an "integrated" solution for the development of a zero-carbon park, establishes a standard system for the zero-carbon park, and forms an industry-leading development paradigm.

Project Highlights

The project has obtained the "Carbon Neutral Certificate" issued by the State Administration of Quality Supervision, Inspection and Quarantine.

The project was selected as one of the excellent project cases of integrated energy services by Polaris Network in 2023.

Project Implementation

1. Formulate systmatic zero-carbon planning

Experts are invited to participate in depth, through the park system to carry out a comprehensive inventory, combing, sorting, and formulating reasonable emission reduction measures, starting from the source of emissions, to maximise, quantify and minimise the impact of carbon emissions generated.

2. Drawing up a carbon neutral roadmap

Taking into account the park's energy consumption characteristics, historical emissions, emission reduction potential and other factors, to formulate a development plan for the park's carbon neutrality, and give specific implementation suggestions. On the premise of ensuring high quality operation, propose reasonable emission reduction targets for the park. Combine the park's carbon emissions, carbon planning, and carbon reduction measures, and propose a market-based solution to the "zero carbon" goal.

3. Carry out zero-carbon system transformation

Electricity consumption is the main source of energy consumption in the park, and the park uses renewable energy as much as possible for energy substitution to minimise the impact of carbon emissions from purchased electricity.

(1) **Large-area construction of roof photovoltaic and photovoltaic carport.** The park took the lead in building distributed PV projects on the roofs of the first phase of buildings, and selected sites for the construction of PV carports, which were formally put into operation and generated electricity on 21 March 2022, with a total installed capacity of 0.4 MWp, and an estimated annual power generation of 447,223 kWh, accounting for about 70 per cent of the park's total annual power consumption.

(2) **Placing a large number of photovoltaic facilities**. The park has increased the construction and placement of low-carbon infrastructure, selecting and placing more than 20 photovoltaic facilities such as photovoltaic street lamps, photovoltaic walls, photovoltaic bins, photovoltaic seats and other photovoltaic facilities, and through photovoltaic power generation, it has provided a brand-new experience for the park's dispersed infrastructure with a wide range of functions such as lighting, charging and sound, so as to realise the power supply and charging needs of the park's outdoor recreational facilities by 100%.

(3) **Intelligent micro-grid scenes**. By integrating the cultural and creative features of the park, the park has increased the design and transformation of special scenes, including the glass landscape architecture of tellurium chromium photovoltaic power generation glass, and the transformation of the demonstration point for increasing the temperature of the fish pond's photo-thermal system, and so on. By integrating photovoltaic, solar thermal and other operation systems with the park's characteristic scenes, the park has created "edutainment" characteristic scenes.

(4) **Upgrade of the lighting system**. 25% of the electricity consumption in the public area of the park comes from the lighting system. Through green construction and operation planning and design, and analysis of equipment energy consumption, the park has achieved a comprehensive iteration and low-carbon upgrade of the lighting system. Through the transformation and management improvement of energy-saving lamps and intelligent sensor control panels, the energy-saving design and intelligent control of building lighting are strengthened to maximise lighting efficiency, and the lighting facilities in the public area are expected to reduce electricity consumption by 30% throughout the year.

4. Pioneering green power trading

On the basis of the annual power generation of roof photovoltaic in the existing park, which accounts for 70% of the total annual power consumption of the park, the park actively explores the pilot demonstration of green power trading. Through careful study of relevant policies and careful organisation of green power trading, with the support and help of Huadian Clean Energy Company, the park has finely predicted the power station's power generation, scientifically formulated green power trading strategies, and successfully completed the green power trading in the Electricity Trading Centre, and completed the first green power trading on October 15 this year, marking the formal entry of "Tianning No. 1" Culture and Science and Technology Innovation Park into the ranks of green power trading. Tianning Huayun has also become the second one in Huadian Group and the first one in the operating company to successfully realise 100% green power usage, laying a solid foundation for further improving the revenue of new energy projects.

5. Build an intelligent management and control platform

The park establishes a scientific and efficient energy and carbon emission management system, builds a digital management platform for online monitoring, real-time collection and comprehensive management of energy and carbon emissions, and carries out intelligent monitoring around the main energy-using facilities, and displays the effectiveness of emission reduction for different emission sources in real time.

6. Implanting the concept of zero-carbon culture

Cultural construction is the highlight of zero-carbon development in the Park, organically combining zero-carbon culture with the strong cultural heritage and innovative atmosphere of the Park. The Park actively cooperates with the outside world to continuously expand the consensus on zero-carbon culture. It has created a strong zero-carbon cultural atmosphere in the Park by launching action initiatives, strengthening cultural propaganda, planning thematic forums and strengthening institutional guidance.

Project Impact & Sustainability

1. Leading the development of industry standards.

The project focuses on the core aspects and common elements of park construction, integrates core technologies, scenarios, modes, innovations, concepts, and results, to form industry-leading development paradigms, and transforms relevant results and experiences into landing standards for zero-carbon parks. Starting from regions, parks, communities, campuses, buildings and enterprises, we explore the typical templates of zero-carbon parks under the cultural, creative and technological industry through modularised design, application of typical scenarios, and testing of practical results.

2. Drawing China's "Carbon Neutral" New Business Card

The project is designed to maximise the mobilisation of high-quality resources in the carbon neutral ecosystem through the application of autonomous products in all scenarios, the participation of authoritative domestic think tanks, the comprehensive innovation of culture and system, and the participation of all stakeholders in the project. Through strengthening media and conference publicity, we publicise our achievements and exchange experiences, so as to create a "golden business card" of carbon neutrality in China's energy industry.

3. Forming a model that is promoted in all scenarios and standards in all regions.

Through one-stop, modular and configurable model construction and standard design, the project has explored a set of comprehensive solutions for "zero carbon" application scenarios. On this basis, through model improvement and module configuration, the project can be expanded to other zero carbon scenarios, enriching the zero carbon models for various scenarios, such as schools, hospitals, parks, hotels, shopping malls, service areas, ports and parks, becoming a typical model to be replicated and extended in the whole scenario and on a large scale.

Expert Comments

China Huadian Corporation's "Tianning No. 1" Zero-Carbon Smart Park represents a transformative initiative, converting the unused production area of the former Beijing No. 2 Thermal Power Plant. Leveraging core technologies, use cases, models, and achievements of zero-carbon estates, the project incorporates rooftop photovoltaic panels, microgrid construction, energy-saving modifications, digital and intelligent control, green power trading, and carbon credits. This comprehensive approach establishes a zero-carbon estate in the cultural and creative sci-tech industry. The project has obtained carbon-neutral certification from a third-party organization and established a virtuous interaction model between the estate operator and various community stakeholders. The success of this model provides scalability for future expansion into other use cases, including schools, hospitals, parks, hotels, shopping malls, service zones, ports, and parks.

Modern Farming (Group) Co., Ltd Manure Resource Utilization Project

Modern Farming (Group) Co., Ltd

Project Overview

As a leading enterprise in China's dairy cattle breeding industry and a pioneer of 10,000-head farms in China, Modern Farming's self-built farms are equipped with manure resource utilization systems (hereinafter referred to as "the system"). The System consists of anaerobic fermentation treatment and energy utilization facilities for manure, with fermentation system, biogas purification system, biogas utilization system, and post-treatment system, among others. In the project, manure is scraped into the underground pipeline through the automatic scraping system, and transported to the anaerobic fermentation system for medium temperature anaerobic fermentation, and the biogas produced by the fermentation is used to generate electricity and heat; the biogas residue produced by solid-liquid separation of the anaerobically treated manure can be used as high-quality bedding material for cows. The liquid manure is then transported by pipeline or vehicle to planting bases around the farm to replace chemical fertilizers and fertilize the fields, further producing high-quality roughage for cattle to consume and empowering the upstream supply chain.

The system effectively promotes the use of green energy, reduces greenhouse gas emissions and minimizes soil pollution. Compared with alternatives, the system can reduce carbon emissions on manure management and energy utilization units by more than 40%, and provide clean energy for the Group's heat supply and power generation, further reducing carbon emissions from purchased electricity and heat. At the same time, the system saves a large amount of land resources and reduces pollution emissions by centralizing manure and biogas treatment.

Company/Organization Profile

Modern Farming (Group) Co., Ltd (hereinafter referred to as Modern Farming) was founded in Ma'anshan City, Anhui Province in 2005 and listed on the Hong Kong Stock Exchange in 2010. As a leading enterprise in China's dairy cattle breeding industry, the corporation leveraged digital innovation to build up an entire industry chain spanning "from a single strand of hay to a glass of milk", and sets industry benchmarks with high quality and standards. The company has established a mutually beneficial partnership with its strategic shareholder Mengniu Group.

Modern Farming is the a pioneer of 10,000-head farms operator in China, and currently operates more than 50 large-scale farms across the country, with a controllable herd of more than 480,000 cows, a daily output of 7,700 tons of fresh milk, and a market share of 8%. On top of strengthening and optimizing the raw milk business, the Group has established an omni-industry chain ecosystem integrating land and grass, feed, breeding, dairy and beef cattle breeding, trading platform, and Digital Intelligence Cloud cattle breeding.

In addition, the Group is keenly aware of the importance of sustainable development and has published annual ESG reports for a decade, taken the lead in setting industry-leading dual-carbon targets, successfully joined the United Nations Global Compact (UNGC). Modern Farming vigorously promotes the green transformation of the industrial chain, and carries out regular supportive campaigns for rural revitalization and education aid in support of common prosperity.

Project Outcome

Modern Farming's manure resource utilization system takes into account social, environmental and economic benefits and significantly reduces the production of greenhouse gases in the dairy farming process, reducing soil pollution, increasing the use of clean energy, and lowering the operating costs for businesses.

1. In 2022, through the application of the manure resource utilization system, Modern Farming produced 165 million Nm^3 of biomass biogas in total , thus replacing fossil energy and reducing 160,000 tons of carbon dioxide emissions; replacing 40% of the farm's purchased electrical energy.
2. One of the products of the manure resource utilization system, "liquid manure", is used as organic fertilizer as an alternative to chemical fertilizers. Liquid manure is a high-quality organic fertilizer, which contributes to the formation of a granular structure in the soil and improves the soil quality. At the same time, the systematic treatment of liquid biogas reduces pollution emissions and soil contamination.

3. Liquid manure fertilization results in crops of higher quality and yield and reduces dependence on imported feedstuffs. High-quality feed also improves cattle's digestibility of roughage and reduces methane emissions from the enteric fermentation process.
4. The project achieves 100% replacement of cattle bedding resources and produces more than 2 million cubic meters of bedding in 2022, replacing 100% of purchased bedding. Discounting the system's operating costs, the annual direct economic benefits will reach more than RMB200 million; at the same time, during its fermentation process the microorganisms harmful to cows and crops are killed during fermentation process , improve the living environment of the herd, reduce the incidence rate of mastitis, and improve the welfare of dairy cows and the unit yield.
5. The system significantly reduces the Group's labor costs on manure transportation, feed and fertilizer procurement procedure, and the cost of purchasing bedding and chemical fertilizers. This sustainable business model turns cow manure, traditionally thought of as waste, into a valuable source of energy and fertilizer.

Project Highlights

The system was selected for the official release of "Accelerating the 2030 Agenda for Sustainable Development by Implementing Global Development Initiatives: Corporate Carbon Neutrality Target Setting and Global Cooperation" by the United Nations Global Compact (UNGC) in 2023, and was hailed as a balanced sustainable development model that is safer, more environmentally friendly, and economically more efficient.

Project Implementation

Upholding the principle of "integrated, coordination, circulation and regeneration", Modern Farming insists on adopting the systematic concept of source reduction, process control, end utilization and forage reuse to build the manure resource utilization system.

1. Reduction at the source

The company adopted new process, new technology and new equipment to start from the source of manure generation in livestock and poultry farms, reducing its generation and emission, and relieving the pressure of subsequent manure treatment and utilization.

(1) Cow manure quantity reduction

Modern Farming reduces the emissions of cattle manure in the farm by strengthening scientific feed preparation technology and biotechnology while ensuring animal production performance. At the same time, it improves feed conversion efficiency and reduces the unit carbon emission intensity of enteric fermentation, and realizes a 2.7% reduction in the unit carbon emission intensity of enteric fermentation in 2022.

(2) Sewage reduction

In order to reduce the amount of water used in farming and the production of sewage, Modern Farming has constructed precision spraying facilities in Ma'anshan, Shanghe, Hongya and other farms, saving water and electricity, with an average water-saving rate of 39% on cow cooling water, and significantly reducing sewage emissions from ranch farming areas. In 2022, the pilot ranches saved a total of some 25 million kWh of electricity, and reduced emissions of 14,000 tons of carbon dioxide.

3. Process control

(1) Manure fermentation system

The manure fermentation system includes manure collection tanks, pre-treatment tanks, fermentation pools (tanks), and equipment pipelines. The manure and urine produced in the barn are scraped to the flume at the edge of the barn by the scraper, and then flushed to the manure collection tank at the end of the ditch by the flushing branch pipe. The manure in the pool is transported to the pre-treatment pool by a transfer pump. The supernatant in the pre-treatment pool is pumped into the backwash pool, and the backwash pump in the backwash pool flushes the supernatant back to the manure ditch. The sediment in the pre-treatment tank is sent to the anaerobic fermentation tank by submersible sewage pumps to ferment and produce biogas. The whole process is enabled through underground pipes and automatic manure scraping system, which saves labor and avoids scraping and transporting manure by vehicles, reduces the use of fossil energy and lowers the emission of greenhouse gases.

(2) Biogas production and utilization system

The biogas produced in the anaerobic fermentation is purified or goes into the biogas generator for power generation, which converts the biogas energy into electricity for the use of the field, or goes into the biogas boiler section for use, providing heat for its own circulatory system and other gas-using points. 500,000 tons of heat was produced by biogas in the year of 2022, generating 25 million kWh of electricity, replacing purchased fossil energy, and reducing the GHG emission by 160,000 tons of carbon dioxide.

(3) Post-treatment system

The post-processing system includes a solid-liquid separator, a biogas cabinet, a temporary storage tank and a digestate tank. The remaining products of fermentation are collected in the discharge tank and transferred to the solid-liquid separator by the discharge pump (submersible pump) for solid-liquid separation.

4. Terminal usage

(1) Utilization of solid manure

After anaerobic fermentation, the solid manure produced by screw extrusion is reused as bedding material, and the annual reuse of solid manure is 2.05 million square meters, completely replacing the purchased bedding material and reducing the greenhouse gas emission caused by its transportation.

(2) Liquid manure utilization

As of 2022, Modern Farming built 915km of liquid manure transportation pipeline and fertilized an area of 1,155 hectare, replacing trucking with pipeline transportation, reducing the greenhouse gas emission of the liquid manure transportation process by about 50%.

5. Forage reuse

The forage produced with the application of the liquid manure produced from farm manure treatment is reused in feeding. Compared to purchasing imported roughage, this recycling model that utilizes the farm and the surrounding land to grow can achieve a reduction of about 0.5-1 ton of fuel consumption per ton of dry matter feed from shipping, and a reduction of about 60 kg of carbon dioxide emissions per ton from transportation.

Project Impact & Sustainability

Against the backdrop of China's comparatively scarce land resources and soaring demand for dairy products, manure resource utilization systems can help to achieve large-scale farming, which in turn can help to alleviate pressure on the country's land supply by improving strained pastures. Recycling systems can turn "burdensome" manure into a resource that can be processed to help grow higher-quality crops, which can then be converted into high-quality silage for feed formulations, reducing the dependence of companies and countries on imported bulk feed and achieving national food security.

The application of the Manure Utilization System is not limited to the dairy farming industry. All animal breeding industries can draw on this concept and remodel their manure treatment systems and fermentation processes based on the features of animal manure, meeting energy needs while reducing pollution.

In 2021, Modern Farming launched the "Dual Carbon Program". And in 2022, Modern Farming sets a quantitative target for carbon intensity emissions through 2035: with 2021 as the benchmark year, the Group set to reduce unit carbon emissions by 20% in 2035. At the same time, the company will include 10,000-head farms and ultra-large farms with low carbon emission intensity as the model and star example of "carbon emission reduction" into the strategic plan, to bear testament to the synergistic development of low carbon, enhanced quality and efficiency, and strengthen the confidence of the industry for sustainable development.

Expert Comments

Livestock and poultry manure, a crucial biomass resource, requires proper treatment to prevent pollution. The traditional "isotopic" management model in the breeding industry, though common, has led to environmental issues and societal concerns. Modern Farming integrates planting and breeding, employing a medium-temperature anaerobic process for biogas production. Power is generated through cogeneration (CHP), and liquid biogas serves as an organic fertilizer, minimizing the need for high-quality forage imports. Biogas residue replaces purchased bedding, notably reducing mastitis incidence in dairy cows. The "in-situ" disposal model on large-scale farms emerges as the future trend for livestock manure management, reducing energy consumption, environmental pollution, and bringing substantial economic benefits to businesses.

2023 Business Climate Action Cases

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ACKNOWLEDGEMENT

We thank SEE Foundation for support.

DISCLAIMER

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CCCA
CHINA CORPORATE CLIMATE ACTION
中国企业气候行动

Printed on eco-friendly paper

China Corporate Climate Action (CCCA) is a non-profit cooperative network initiated by Vanke Foundation, SEE Foundation and C Team together with various partners at the Global Climate Action Summit in September 2018.

Consisted of industry associations, business enterprises, non-profit organizations, and research institutions, CCCA is committed to driving the carbon reduction, green transformation and green innovation of the whole industry chain and industrial clusters through the leadership of industry organizations, promoting enterprises to integrate climate change into their development strategies and corporate social responsibility, promoting sustainable business models and climate solutions, and linking relevant technical support and financial resources for enterprises.