

2022 BUSINESS CLIMATE ACTION CASES



Co-Sponsored by



Supported by



万科公益基金会
VANKE FOUNDATION

Editor's Note

The global industrial chain has picked up on the green trend in the wake of a new chapter in the global response to climate change. Guided by its very own "dual-carbon" targets, China has been actively rolling out low-carbon transformations of its industries. A host of businesses have taken initiatives to revamp their production, operation and industrial chains and upgrade the technologies involved, helping to boost their industrial competitiveness and serving as a credit to sustainable development. The constant Covid flare-ups and the subsequent economic slowdowns seen across the world in 2022 have further accentuated the invaluable actions undertaken by Chinese businesses to counter climate change and the accomplishments so achieved, further boosting the momentum for worldwide pivot towards the eco-friendlier model.

The C Team and Center for Environmental Education and Communications of Ministry of Ecology and Environment (CEEC), acting as co-sponsors, has overseen the invitation, screening and dissemination of featured climate action cases by Chinese businesses in 2022.

Through reviews by a panel of industry experts, 27 innovative emission-reduction cases have been chosen as this year's representatives, covering such eight sectors as manufacturing transformation, transportation restructuring, clean energy, building energy efficiency, waste treatment, green finance, green life of public and sustainable consumption. The featured cases shed light on the candidates' cutting-edge transformation experiences in their respective fields, brimming with impactful and actionable novel ideas and proposals that address the transformation pain points and provide viable transformation pathways for industry players.

As a vehicle to showcase the pathways and outcomes of dozens of emission reduction programs, this collection of cases only provides a glimpse at the business-led efforts in green transformation to demonstrate the resolve, wisdom and actions of a number of industries and business players, in the hope of inspiring and motivating more contenders to join in on these innovative acts of lowering carbon emissions to achieve the "dual-carbon" targets.

Co-sponsors: C Team
CEEC

Panel of Experts for Cases Recommendations

(in alphabetical order by pinyin of last name)

HAI Jing Institute of Environmental Risk Prevention and Control of Pollution Control Facilities of South China Institute of Environmental Sciences, Ministry of Ecology and Environment, Director/Professor

LI Lei China Academy of Transportation Sciences, Senior Engineer

LI Xiulan Beijing Innovation Alliance, Zero Carbon Working Committee, Executive Deputy Director

LI Yanping Innovation Center for Pollution & Carbon Reduction, Chinese Research Academy of Environmental Sciences, Deputy Director

WANG Bo Science and Technology Innovation Center of CGN New Energy Holdings Co., Ltd, Senior Engineer (Presiding over work)

WANG Huijun China Beijing Green Exchange, Deputy General Manager

Contents

1

Green Manufacturing

01-02 CATL Unveils the World's First Carbon-Zero Battery Plant

03-04 The Green Aluminum Industrial Park in Wenshan, Yunnan Province

05-06 Reducing Boiler Natural Gas Consumption Per Ton of Steam

2

Energy Transition

07-08 Envision-Group: Driving Decarbonization through Digitalization and Green Energy

09-10 The First Nuclear Energy Heating Project in South China: Zhejiang Haiyan Nuclear Energy Heating Demonstration Project

11-12 Practice of PV-Sand Control in Kubuqi Desert of Elion Resources Group

13-14 GCL: Integrated Wind/Solar Power and Storage Platform

3

Innovative Carbon Reduction in Green Building

15-16 VX Logistics Shanghai Fengxian Lingang Zero Carbon Park

17-18 Energy Efficiency-Focused Retrofitting of the Center for Energy Control at the Wanguocheng MOMA in Beijing

19-20 Carbon Reduction of Pavement in Universal Beijing Resort: Low Carbon Cast-in-Place Decorative Concrete

21-22 Development of Passive House Building Industry Helps Achieve Dual Carbon Goals

4

Carbon Inclusive and Public Participation

23-24 Green Inclusive Cloud: Digital Account Book for Carbon Reduction

25-26 Green Commute Debao: Vehicle Carbon Emission Reduction Inclusion and Verification Services

27-28 mio, a Green Living Application Building an Eco-Conscious Community for Individual Carbon Footprint Reduction

29-30 "Carbon Cabin" Innovation Promotes Community Waste Sorting and Recycling to Reduce Carbon Emissions

5

Green Finance to Accelerate Transition

31-32 Hang Seng China: Green Finance to Empower Low-Carbon Transformation

33-34 Tianfeng Securities Helped Green Financing 27.2 Billion Renminbi Yuan in Three Years

35-36 "Carbon Reduction Insurance" to Construct an Energy-Saving and Carbon Reduction Insurance System on the Energy-Consumption Side

6

Food & Beverage and Sustainable Consumption

37-38 OABC: Zero Carbon Practice of Organic Food

39-40 Creating a Green Ecosystem and Promoting Carbon-Zero Growth of the Dairy Industry

41-42 NetEase Yanxuan Green Packaging Initiative: the Yanxuan Sustainability Plan

43-44 2021 Low-Carbon Co-Op Program

7

Green Transportation

45-46 YanTian Port Pursues a Green and Low-Carbon Way for Port Development

47-48 Lifecycle Carbon Reduction Project of Meituan Bike and E-bike

8

Low-carbon Waste Management

49-50 CPCEP Bio-Energy: Bio-natural Gas & Organic Fertilizer Project with Feedstock of Agricultural Organic Waste

51-52 "Low-carbon" Project of Water Purification Plant

53-54 "Grandblue Model" Promotes Quality, Green and Low-Carbon Development of Cities

CATL Unveils the World's First Carbon-Zero Battery Plant

Contemporary Amperex Technology Co., Ltd.

Project Overview

Established in the Sanjiang New District of Yibin city in October 2019, Sichuan Contemporary Amperex Technology Limited (CATL-SC), a wholly-owned subsidiary of Contemporary Amperex Technology Co., Limited (CATL), is one of the largest EV battery production bases in the world. The company has since been committed to building carbon-zero factories and has independently developed such systems as CFMS (CATL factory management system) intelligent plant management system, digital central production control & management system and AI visual inspection system as technological means to facilitate energy conservation and emission reduction. CATL-SC has also launched shared and electric-based mobility programs among its workforce so that all its employees would contribute towards lowering carbon emissions.

The company has incorporated ecofriendly practices to transform its energy, manufacturing and transport operations by introducing renewable hydropower, the CFMS intelligent plant management system and digital production systems such as MES and visual inspection, as well as developing on-site electric-based logistics. The approximately 1% of carbon emissions that cannot be mitigated through these emission reduction measures are offset through the purchase of emission credits. The company has met its carbon neutral target in 2021 and was awarded the PAS 2060 carbon neutral certification from the world-renowned certification body SGS in March 2022, becoming the world's first zero-carbon battery plant.



Project Highlights

- Building the world's first carbon-zero battery plant, providing pioneering technical solutions to the world-class EV battery production base for achieving net zero;
 - The carbon-zero plant served as a steppingstone to drive up the construction of a net-zero emission industrial estate in the Sanjiang New District of Yibin, advancing the carbon peaking and carbon neutrality efforts of Sichuan province;
 - The development of the carbon-zero plant pioneered net zero practices in the lithium-ion battery sector. The experiences accumulated in the process have been leveraged in conjunction with third-party advisory and certification organizations to conduct almost 100 carbon footprint training sessions for our upstream partners in the industrial chain.
- "Here at CATL-SC, the plant has begun to craft the zero-carbon roadmap at the early stage of its establishment. Through continuous innovation in energy utilization, transportation, logistics, and manufacturing, the factory is able to produce more products of higher quality with less raw materials and carbon emissions. 'Zero carbon' has become one of the core competencies of CATL-SC."——Zhu Yunfeng, General Manager of CATL-SC

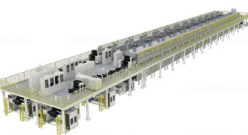
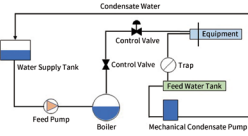
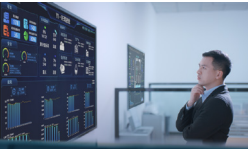
Company Profile



Contemporary Amperex Technology Co., Limited (CATL) is a global leader of new energy innovative technologies, committed to providing premier solutions and services for new energy applications worldwide. The company aspires to replace traditional fossil-based fixed and mobile energy systems with high-efficiency power systems featuring advanced batteries and renewable energy sources such as wind and hydropower, and to innovate existing market applications with an integrated approach focusing on electrification and intelligent technologies. CATL-SC is CATL's largest production base in Southwest China. As of the end of July 2022, the base is to be rolled out in ten phases with a total investment of 56 billion Yuan, spanning across a total area of over 6000 mu (1 mu=666.67sqm.). The base employs a 13000-strong staff.

Project Outcome

- Intelligent CFMS system. It enables automatic equipment optimization and active control. Energy saving: approx. 8%, annual saving of 18973 TCE and reduction of carbon emission of 19792 t CO₂e per annum;
- Quantified equipment operation and energy-saving-focused production scheduling. This effectively prevents unnecessary starting equipment, reduces energy consumption, saving 12373 TCE p.a. and reducing carbon emissions by 15020 t CO₂e per year;
- Steam condensate recovery system. Steam condensate is recycled as boiler make-up water, partially replacing fresh water sources for the boiler, achieving steam condensate recovery efficiency of 80%, saving 7539 TCE per year and reducing carbon emissions by 16284 t CO₂e per year;
- Comprehensive coating machine energy conservation program. Carbon reduction is achieved via intelligent standby of coating machine, balance of oven operation frequency, and other approaches, saving 16107 TCE and reducing carbon emission of 23337 t CO₂e per year.



Project Implementation

Having deemed carbon-zero as a pivotal vision that could potentially sets itself apart from rivals, CATL's Yibin plant has been committed to improving and innovating its energy utilization, transportation and logistics, manufacturing and other practices, while continuously optimizing its product production techniques to reduce carbon emissions. It has become the very first carbon-zero factory in the world's renewable energy sector.

1. Green energy

It has developed a trailblazing smart plant management system, which enables the interconnection of data through automatic capture of the plant system data and equipment operation data. Meanwhile, the systematic facility management platform helps to realize the safe, reliable, high-efficiency and low-carbon operation of the factory. For equipment groups with high-energy consumption, by using a global optimization algorithm, it has calculated each sub-equipment's operating parameters with the lowest total energy consumption of the system.

Prioritizing low-carbon energy sources: CATL-SC is located in Yibin, southwest China's Sichuan Province. Three rivers, namely the Jinsha River, Minjiang River and Yangtze River traverse the city's northern part, providing a superior natural environment, unique geographical location and abundant water resources, which enables the plant to reduce 400000 tons of carbon emissions every year as over 80% of its energy consumption comes from hydropower.

2. Green manufacturing

Digital production management system: CATL-SC has built up a digital central production control & management system, which features global visual management that significantly reduces process loss, an AI visual detection system that automatically learns and extracts defect characteristics to improve the detection rate in multiple production steps such as die-cutting, slitting and winding.

Closed-loop management of recycling scrap: all scrap generated in the manufacturing process will be recycled, with up to 99.3% recovery rate of nickel, cobalt, manganese and other metals.

3. Green logistics and transportation

Electrified logistics: Contemporary Sichuan has comprehensively revamped its logistics chain and on-site transportation, widely adopting autonomous logistics vehicles and electric forklifts to achieve carbon-zero operation on its premises.

Green commute: Its employees are encouraged to adopt electric and shared mobility solutions and incorporate carbon reduction efforts into all aspects of production and life.

4. Offset via carbon credits

Those carbon emissions which cannot be neutralized on the premises, such as refrigerants and fire extinguishers, would be offset through certified emission reduction (CER) trading. This will further highlight the pivotal role of the carbon trading market in attaining the "carbon peaking" and "net zero" goals, and ultimately fostering the development of the green industrial chain.

Project Impact & Sustainability

In terms of energy saving, the CFMS intelligent plant management system is introduced to customize an optimized intelligent plant management system for lithium-ion battery manufacturing plants; the ISO 50001 energy management system is launched across the company's operations; energy-saving scheduling and quantitative equipment operation mechanism are launched to optimize energy efficiency and reduce energy consumption while lowering consumer-side energy use.

In terms of reducing carbon emission, carbon-zero manufacturing has been included as one of the key performance indicators of the production base and a dedicated apparatus is set up to ensure the attainment of its strategic objectives through local standards and policies currently in place. The company has also embarked on a quest to uncover the pathways to whole life cycle net-zero batteries. With a host professional instruments and databases at its disposal, coupled with its proprietary research on upstream energy structure and consumption, the company has established the composition model of carbon footprint of its products and become the first mover among its peers to carry out whole life cycle carbon footprint audit of its offerings.

Expert Comment

Contemporary Sichuan Renewable Energy Technology Co., Ltd. has introduced the CFMS intelligent plant management system and fully incorporated the ISO50001 energy management system into its operations, integrating carbon-zero manufacturing as one of the key performance indicators of the production base to tailor emission reduction measures to local circumstances. The company set out to uncover comprehensive emission reduction solutions from corporate governance and production operation prisms, with the pertinent endeavors being awarded carbon neutrality certificates by international third-party certification organizations. Based on its carbon-zero plants, the company is expected to unveil even more viable paths towards omni-lifecycle net-zero of renewable energy batteries.

The Green Aluminum Industrial Park in Wenshan, Yunnan Province

Shandong Weiqiao Pioneering Group.,Ltd.

Project Overview

Weiqiao Pioneering Group has taken the initiative to transform and actively explore in recent years. Through green low-carbon strategy, scientific and technological innovation, Weiqiao looks to achieve high-quality and sustainable development. In order to optimize its energy structure, Weiqiao complies with the global trend of energy reform and conforms with the national policies of energy structure optimization, key industry distribution adjustment and industrial transfer, Weiqiao regards transforming the energy structure as a cornerstone decarbonization measure. Weiqiao has taken the initiative to relocate part of its electrolytic aluminum smelting capacity to Yunnan Province and established a green aluminum industrial park, which has formed a green power supply pattern with the main source of hydropower, and with wind power and solar energy, significantly reducing the use of fossil fuels and the emission of pollutants and greenhouse gases. In September 2020, Weiqiao's 2.03 million-tonne green aluminum project in the Green Aluminum Industrial Park, located in Yanshan County, Wenshan Prefecture, Yunnan Province, was officially put into production using Wenshan Prefecture's clean energy resources. The industrial park is projected to deliver an annual revenue of around 100 billion Renminbi Yuan, and add more than 12000 jobs. The project came after through investigations and comprehensive planning. By integrating manufacturing, agriculture and forestry industries, the project implemented artificial forestation and closed mountains to cultivate forests around the plant. Through the forest carbon sink, the project facilitated decarbonization, boosted forestry income and promoted industrial poverty alleviation.

Project Highlights

The project constitutes the central part of China's Green Aluminum Valley in the making in Wenshan, contributing two thirds of the total green aluminum production capacity under construction in the prefecture. The project is assisting Wenshan as it pursues the goal of preliminarily completing the core area of "China Green Aluminum Valley" by 2025 and realizing the industrial output value of more than 300 billion Renminbi Yuan. Adopting Shandong Binzhou aluminum industry cluster model, around 20 green aluminum enterprises settled in Yunnan Aluminum Innovation Industrial Park. Weiqiao could directly supply aluminum fluid to these enterprises,largely reducing the cost of energy, transportation and production, also improveing market competitiveness.

The 600KA electrolysis cells were awarded the First Prize of the China Nonferrous Metals Industry Scientific Technology Award in 2016. It is currently the largest electrolysis cells model in the world and can effectively reduce flue gas emission. The current particulate emission has reached 2 mg/m3 with Sulphur dioxide emission 10 mg/m3, both of which much lower than China's Emission Standards for Aluminum Industry Pollutants.

Company Profile



Shandong Weiqiao Pioneering Group is a large-scale private enterprise located in China's Shandong Province. It has remained a Fortune Global 500 company for 11 consecutive years, latest ranking 199, and has been listed as the World's 500 Most Influential Brands for 3 years.

Weiqiao has devoted to the manufacturing industry and has developed complete industry chains and supply chains in textile and aluminum industries. The company's presence in the textile industry ranges from spinning to garments and home textiles, and its involvement in the aluminum industry extends from bauxite mining, alumina to aluminum deep processing. It now owns three public companies, 12 production bases in China and beyond, and around 100000 employees worldwide. Its products serve more than 120 countries and regions. All those make Weiqiao one of the most competitive Chinese manufacturing enterprises.

Project Outcome

The project has so far signed contracts with around 20 aluminum processing and related companies. It has successfully integrated green hydropower and aluminum production, leading upstream and downstream companies to a greener future with Weiqiao's green aluminum.

The first phase of the project, with a built production capacity of 1.08 million tonnes green aluminum, has been completed.

The production capacity has reached 850000 tons by the end of June this year.

The project makes full use of Yunnan's rich hydropower resources. Achieve overall carbon reduction in the industry. According to the average data of the industry, the production of one ton of electrolytic aluminum consumes about 13650 degrees of electricity, generates about 11.5 tons of carbon emissions if the thermal power is used, while the carbon emissions of hydroelectric power generation are zero. With a production capacity of 850000 tons green aluminum, it can reduce carbon emissions by about 8.72 million tons per year.



Project Implementation

The construction of Green Aluminum Industrial Park in Wenshan, Yunnan Province is one of the crucial part in the formation of Weiqiao's eco-friendly market positioning. HQALight, Weiqiao's registered trademark for low-carbon primary aluminum will be mainly produced in the park.

Meanwhile, Wenshan prefecture is rich in clean hydropower and natural resources. In recent years, the prefecture has made great efforts deepening the integration of green energy and green manufacturing, a goal that is highly consistent with the pursuit of Weiqiao..

Weiqiao's 2.03 million tonnes green aluminum project laid its foundation on December 18, 2019, in Wenshan prefecture. On September 17, 2020, the project was successfully put into production.

With a planned area of 10000 Mu and a total investment of 40 billion Renminbi Yuan, the project fully enjoying and utilizing the policy for integrating water, electricity and aluminum promoted by the People's Government of Yunnan Province. By banking on the clean hydropower advantage of Yunnan, the industrial park will replace traditional energy with green hydropower and realize sufficient use of the hydropower. Signed contracts with around 20 green aluminum enterprises settled in Yunnan Aluminum Innovation Industrial Park, Weiqiao could directly supply aluminum fluid to these enterprises through the upstream and downstream industry cluster development model, realizing 100% on-site conversion of aluminum water, and achieving an 80-percent-plus aluminum alloy in situ precision processing rate. The project facilitates a thorough integration of hydropower and aluminum industries and builds a complete green aluminum industrial chain.

The Project adopts a comprehensive ecological model of manufacturing, agriculture and forestry industries, and implemented artificial forestation and closed mountains to cultivate forests around the plant in 23 small classes, with an area of 2669 Mu green area. While promoting its own green development, it also makes an important contribution to building China's Green Aluminum Valley in Wenshan Prefecture. The total production capacity of the project currently accounts for two-thirds of the green aluminum production capacity under construction in Wenshan Prefecture, helping Wenshan Prefecture achieve the goal of industrial output value of more than 300 billion Renminbi Yuan.

Project Impact & Sustainability

Through our projects in Yunnan and alike, Weiqiao focuses on tackling global technical conundrums and leading the industrial innovation in production technology. The project has relocated a total of 2.03 million tonnes of electrolytic aluminum capacity, utilizing the

rich hydropower resources and clean energies in Wenshan Prefecture. According to the official statistics, each ton of thermal aluminum emits about 11.2 tonnes of carbon dioxide per year, while hydropower aluminum basically produces no carbon emissions.

The award-winning 600KA electrolysis cells used in the project is currently the largest electrolysis cells model in the world and can achieve ultra-low flue gas emission of the aluminum electrolytic industry.

In the vicinity of the Green Aluminum Industrial Park in Wenshan, Weiqiao proactively commit ourselves into afforestation and forest reservation efforts to sequester or store carbon.

Currently, Weiqiao is cooperating with Central South University, targeting to carry out extensive and in-depth cooperation on key technologies including carbon-free aluminum electrolysis based on inert anodes, intelligent and efficient aluminum electrolysis, and comprehensive utilization of red mud.

Carbon-free aluminum electrolysis based on inert anodes would effectively reduce energy consumption and improve energy conversion efficiency, while the comprehensive utilization of red mud can make full use of the industrial waste remaining in the process of electrolytic aluminum production and promote green recycling development. The above technologies will be further applied to the park project in the future.

Going down a green and low-carbon development path and adjusting its energy structure, Weiqiao effectively elevate the clean production level of China's aluminum industry.

Expert Comment

Through an energy-focused overhaul of its operations, the company has revamped its business portfolio from focusing largely on fossil fuel-dependent sectors to industries that operate at green-energy (hydro, wind, solar power) industrial estates, addressing the high carbon emission problem of electrolytic aluminum industry from the very root of energy supply, setting an example for the wider sector to pivot towards an "almost net-zero industry". At the same time, the case adopts an integrated ecological model of production, agriculture and forestry in the design and build-out process, and carries out artificial afforestation in the vicinity, fostering carbon emission reduction through forest carbon sink. The practices adopted in the case could potentially be followed by the wider electrolytic aluminum sector in developing a multi-industry network and achieving the industry's carbon-neutral target.

Reducing Boiler Natural Gas Consumption Per Ton of Steam

Humanwell Healthcare Corporation Limited



Project Overview

Yichang Humanwell Pharmaceutical Co., Ltd. (Dongshan site), a subsidiary of Humanwell Healthcare Group, posted a total energy cost of 25037200 Renminbi Yuan in 2019, of which 8964900 Renminbi Yuan or 35.81%, was spent on natural gas, all of which was used in the boiler to produce steam. Lowering the cost of steam production will translate to a swift reduction in the cost of energy used for production.

Findings from an analysis of the monthly natural gas consumption per tonne of steam in 2018-2019 revealed that the per-tonne of steam natural gas consumption was high on low-temperature days. Low temperature of make-up water is a key factor in low boiler cost. Raising the make-up water temperature could effectively reduce fuel consumption.

Three countermeasures have been devised in detail to address the key causes and were implemented between 2019 and 2020:

-Recovery of steam condensate from the lyophilization workshop, concentrated water from the multi-effect distillation machine, concentrated water from the pure steam generator, bottle washing water, cleaning and sterilization drain water from the injection water distribution system and purified water distribution system.

-Steam condensate from the low-dose injection workshop, concentrated water from the multi-effect distillation machine, and concentrated water from the pure steam generator.

-The residual heat from air compressor on lyophilization line one.

The company followed the PDCA cycle to reinforce the achievements of the taskforce.

Project Highlights

The project was awarded the second prize of QC achievements by Yichang municipal government in 2020.

Company Profile



Founded in 1993, Humanwell Healthcare Corporation Limited is a lead player in Hubei province's pharmaceutical sector and a top 30 China-based pharmaceutical company. Its market-leading edge has been established across several segments, such as neurological, steroid hormone and Uyghur ethnic medicines.

Humanwell Healthcare operates by incorporating the efforts to raise ecological awareness into its ecofriendly production practices. On the one hand, the company actively optimizes its equipment and innovate production technologies by building green plants operated under ecofriendly principles, properly balancing pollutant and carbon reduction and the security of energy, industrial and supply chain, and production operations, thereby safeguarding its panoramic upgrade on the dimensions of energy conservation, low carbon emissions, smart manufacturing and more, while fulfilling its corporate social responsibility in environmental protection on an ongoing basis. On the other hand, the company makes a point of engaging in eco-focused public welfare programs, such as SEE's Keep the Smile of Yangtze River, where the protection of finless porpoise has been hailed as a flag-carrier effort for ecological protection in the Yangtze River catchment area.

Project Outcome

The recovery of quality hot water from lyophilization productions was completed in May 2020, where the drain water at temperatures of 60°C and 80°C from lyophilization workshop (I, II) is collected, leading to a 4.42% reduction in natural gas consumption to 87 cubic meters/tonne in 2020, saving 353500 Renminbi Yuan pre-tax for the year.

In May 2021, the facilities for recovering quality hot water in low-dose injection workshop and air compressor residual heat in lyophilization line one was completed, collecting 90°C drain water from the low-dose injection workshop and 65°C drain water from air compressors in lyophilization workshop (I); as of May 2021, natural gas consumption per tonne of steam was reduced to 85.9 cubic meters/tonne.

Cash savings from all three facilities amounted to 578500 Renminbi Yuan (tax exclusive).

The facilities have a capacity of saving 465.5 tonnes of natural gas equivalent per annum and reduce carbon dioxide emissions by about 1256.85 tonnes; the total amount of boiler exhaust emissions also decreased by 4.42%.

Project Implementation

In 2019, the taskforce began working on status quo analytics in light of the fact that the cost of boiler natural gas accounted for 35.8% of the energy cost, and all-natural gas was used in the boiler to produce steam. Reducing the cost of steam production will directly translate to lowered cost of energy used in production. The following targets were identified following a dissection of the cost of steam per tonne: 91.03 cubic meters on average of natural gas consumption per tonne of steam in 2019, with a minimum of 88.29 cubic meters per month. With the optimal operating conditions for natural gas consumption per tonne of steam in 2019 as a benchmark, the target for natural gas consumption per tonne of steam was set at 88.29 cubic meters for 2020, with savings of approximately 246500 Renminbi Yuan tax exclusive. The company also requires a 3% reduction in the cost per tonne of steam, equivalent to a savings of 280600 Renminbi Yuan pre-tax based on steam production in 2019. The natural gas consumption per tonne of steam needs to be ≤ 87.91 cubic meters.

The taskforce went on to identify the key factors. Based on the analytics of economic operating awareness and practice, calorific value of natural gas, damper opening, flue gas recovery efficiency, and boiler make-up water quality, the team came to the conclusion that the temperature of boiler make-up water was the decisive factor (findings from an analysis of the monthly natural gas consumption per tonne of steam in 2018-2019 revealed that the per-tonne of steam natural gas consumption was high on low-temperature days, and that increasing the make-up water temperature could effectively reduce fuel consumption).

The taskforce then devised countermeasures on how to raise the make-up water temperature in the water-production room of the workshops for lyophilized emulsion and low-dose injection, and the air pressure station of lyophilization line one, as follows: recovery of steam condensate from the lyophilization workshop, concentrated water from the multi-effect distillation machine, concentrated water from the pure steam generator, bottle washing water, cleaning and sterilization drain water from the injection water distribution system and purified water distribution system. Steam condensate from the low-dose injection workshop, concentrated water from the multi-effect distillation machine, and concentrated water from the pure steam generator. The residual heat from air compressor on lyophilization line one.

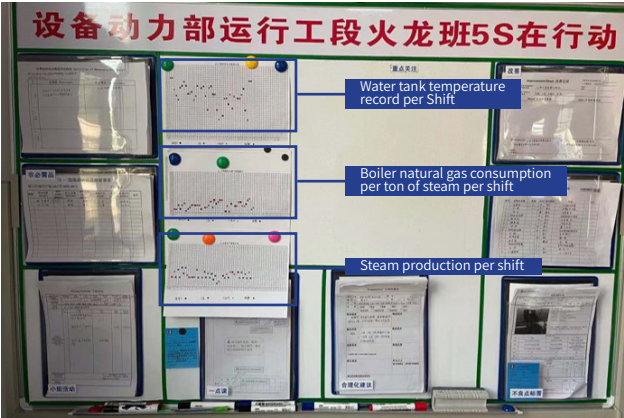
Upon confirming the water quality of the recovered water samples and conducting an economic feasibility analysis, the taskforce proceeded with the following projects. Firstly, recovering the quality hot water from lyophilization productions, which was completed in May 2020. To prevent pipeline rust from intermittent drainage, T304 stainless steel drainage piping was installed at a slope of 1:100 to avoid back pressure by ensuring the natural flow of return water; steam silencers were installed to reduce water hammer impact. However, vibrating and rattling was later discovered in the hot water recovery pipeline, and the recovery pump emitted irregular noise and water pumping was impeded. The team conducted a secondary cause analysis and identified the main cause to be the spontaneous suction of the pump compounded with high-temp water cavitation. They then resorted to cooling down the high-temperature water and calculated the mixing ratio with cold water following the Law of conservation of energy. This was followed by an analysis of water temperature data and the operating status of pumps, to maximize the potential temperature of the mixing water while guaranteeing the operating efficiency of the pump.



Secondly, the recovery of high-quality hot water from the low-dose injection workshop, which was completed in April 2021. Thirdly, the air compressor waste heat recovery of lyophilization line one, which was completed in May 2021. The system enables the automatic switching between the residual heat recovery cooling system and the original cooling system, avoiding potential air compressor downtime due to abnormalities with the cooling source.

Lastly, the company followed the PDCA cycle to reinforce the achievements of the taskforce:

1. The operating procedures were amended to align the taskforce achievements with the production practice;
2. A monitoring graph of natural gas consumption per tonne of steam was developed in conjunction with lean production activities for inter-team evaluation purposes;
3. A digital equipment information platform was mobilized for real-time monitoring of boiler operating status and energy efficiency.



Operation Shifts

Project Impact & Sustainability

The foregoing efforts succeeded on the energy conservation and emission reduction front, contributing towards eco-friendly production. White smoke from the exhaust flue is a sight of the past and the ground is covered with grass never more vibrant in green. With the further optimization of the system, the condensate of the heating and air conditioning in the office area will be recovered, and the heat recovery practices will be rolled out at the new estate, potentially yielding even greater energy-saving benefits for the company. Active preparations are underway. The high-quality hot water from injection preparation workshops used in the facility comply with the quality requirements for boiler water without the need for further processing, such optimum recycling process minimizes recovery cost and maximizes economic benefit of recycling. The technology can be further applied in the pharmaceutical industry, where the hot water contemplated herein can be used as boiler make-up water to raise the temperature of incoming water, reduce fuel consumption. In cases where there are no on-site boilers, the hot water can be used to heat the living and office areas, and for insulating activated sludge in sewage treatment.

Expert Comment

The case is a good demonstration of applying clean production philosophies with closely focusing on the problem of high energy consumption of steam in the production process, making use of innovative technologies following categorized, quality-based and a cascaded energy source approach, materially boosting synergistic pollutant and carbon reduction while yielding substantial economic benefits. The adopted plan is of robust technological and scientific grounds, representative of industry practices and available for rollout in wider scenarios.

Envision-Group: Driving Decarbonization through Digitalization and Green Energy

Envision-Group

Project Overview

Envision set ambitious goals of achieving carbon neutrality in our operations by 2022 and across our entire value chain by 2028—putting us at the forefront of the global decarbonization effort. We are a leading member of the RE100 initiative and are committed to using 100% green electricity by 2025. Envision has also joined Science-based Target Initiative (SBTi), and set a long-term Net-zero target in accordance with the SBTi Corporate Net-Zero Standard.

In order to achieve above goals, Envision has launched many initiatives across our value chain: We abate GHG emission in our operations through energy efficiency improvement, renewable project development and green energy sourcing; Envision has helped more than 100 companies in its value chain to monitor and manage GHG emission using EnOS™ Ark; We also locate the world first Net zero Industrial Park in Ordos, Inner Mongolia, China, and we transit our supply chain to the Park to accelerate the supply chain decarbonization.

Envision is dedicated to offering Net zero Products. Our first batches of EAHE2201A Lithium-ion battery cells are verified carbon neutrality by TÜV SÜD. Envision EN-171/6.5 Galileo Wind Turbine's carbon footprint is 5.56g CO₂e/kWh, a leading low-carbon industrial benchmark. This attributes to Envision's low-carbon design with higher generation capacity and less resources depletion.

As a Net zero Partner, Envision continues to provide our partners with solutions such as carbon management, energy management, renewable energy, energy storage, green hydrogen, carbon offsets. We're committed to driving global decarbonization through digitalization and green energy.

Project Highlights

Envision Group has been placed second on Fortune's 2021 Change The World list, in recognition of its decarbonization innovations for solving the world's toughest sustainability challenges. (Ranked first in terms of individual companies)

Envision becomes CDP's Accredited Solutions Provider (the only gold member then) and provide CDP-reporting companies with end-to-end Net-zero solution including emission monitoring, abatement planning, abatement technologies and connecting certification.

Envision Net Zero Industrial Park becomes a featured case study at Harvard Business School and is taught at Harvard Business School's Global Climate Change courses. Envision also become the only Chinese greentech company in Harvard Business School Case.

Company Profile



Envision Group is a world leading greentech company. With the mission of 'solving the challenges for a sustainable future', Envision continues to promote wind and energy storage as the 'new coal', batteries and hydrogen fuels as the 'new oil', AI and IoT network as the 'new grid', Net Zero Industrial Park as the 'new infrastructure', and enable the creation of the 'new industry' with four pillars combined. Envision designs, sells and operates smart wind turbines through Envision Energy, AIoT-powered batteries through Envision AESC and the world's largest AIoT operating system through Envision Digital. It also owns Envision Virgin Racing Formula E team.

Project Outcome

In 2021, Envision avoided 50000* t CO₂e through energy efficiencies, renewable project development and renewable power sourcing, accounting for 39% of total operational in 2021.

In 2021, Envision launched the world first Net Zero Industrial Park in Ordos, and become operational on April 22, 2022.

By the end of 2021, the cumulated installed capacity of Envision wind turbines exceeded 40GW.

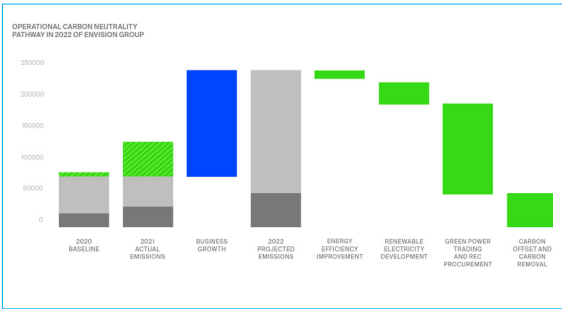
By the end of 2021, Envision served more than 300 companies with its digitalization and green energy solution. We helped build leading Net zero projects and products for our partners such as Boehringer Ingelheim, CBRE, Genki Forest, Saint-Gobain, Starbucks, Toyota, IKEA, Microsoft and Nike.

*In 2021, Envision introduced more than 20 energy efficiency initiatives to avoid 13780 t CO₂e; Our distributed solar and wind projects generated 5237MWh, and avoid 3043 t CO₂e using a 0.581 China average grid emission factor. Through sourcing renewable energy in China, United States and Singapore, we avoided another 33084 t CO₂e. In total, we avoid about 50000 t CO₂e emission in 2021.



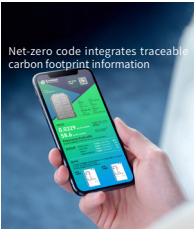
Project Implementation

Net zero Pioneer: Envision Group starts to abate GHG emissions in our own operation and commit to achieve operational carbon neutrality by 2022. Envision sets the roadmap for 2022 carbon neutrality as illustrated. Given the rapid growth, we achieved 50000 t CO₂e abatement through energy efficiency, renewable project development and renewable sourcing in 2021. Compared to 2020, we reduced the carbon intensity by 65% per MW wind turbine delivered and by 16% per battery delivered. We continuously learned from our own journey towards Net zero and enable our clients and partners in their journeys.



Net zero product: Envision conduct life-cycle assessment to understand the carbon footprint of our battery and wind turbine products. We intend to develop low-carbon and Net zero product through lasting value-chain abatement.

Envision AESC delivered the world's first batch of net zero batteries. In 2021 we analyze the carbon footprint of one batch of EAHE2201A lithium-ion batteries produced in Jiangyin factory. In addition to a series of abatement measures and consuming 100% renewable energy, Envision AESC offset the residual emissions from afforestation projects and receive carbon neutral certificate from TÜV SÜD (PAS2060).



Powered by EnOS™ Ark, the Net-zero code integrates traceable carbon footprint information.

We conducted precise LCA of our Galileo wind turbine in Envision's windfarm in Ulanqab, China. The methodology is aligned with Environmental Product Declaration Product Category Rules and interpret the carbon footprint in terms of per g CO₂-eq/kWh. Envision EN-171/6.5 Galileo Wind Turbine's carbon footprint is 5.56g CO₂e/kWh, a leading low-carbon industrial benchmark. This attributes to Envision's low-carbon design with higher generation capacity and less resources depletion.

Global Net Zero Partner: Our work to reduce the carbon footprint within our operations and supply chain is only the beginning. Our ultimate goal is to help as many businesses, governments and organizations succeed in their own net zero journeys.

Envision provides a suite of solutions that includes carbon inventory, tracking, reduction, and offset, combined with improved energy efficiency in heating, HVAC, smart building renovation, solar and wind power, carbon sequestration, net zero factories, and electric vehicles.

By the end of 2021, Envision served more than 300 companies with its digitalization and green energy solution. We helped build leading Net zero projects and products for our partners such as Boehringer Ingelheim, CBRE, Genki Forest, Saint-Gobain, Starbucks, Toyota, IKEA, Microsoft and Nike.

Envision launched the world first Net Zero Industrial Park in Ordos. The Park combines a new green energy system, a net zero digital operating system, and a green industrial ecosystem. In Ordos, this park will generate 300 billion Renminbi Yuan of sustainable industrial output, create 100000 green high-tech jobs and reduce area carbon emissions by 100 million tons per year by 2025.

Envision and Bureau Veritas released the world's first "Global Net-Zero Industrial Park Standard", which put forward four requirements for industrial parks covering Net-Zero energy, intelligent management, industrial recycling and social carbon reduction. The standard was in line with international standards and consistent with the requirements of the Science-Based targets (SBTi), helping the enterprises in the park to achieve voluntary emission reduction targets.

Project Impact & Sustainability

Envision will continue to utilize digitalization and green energy to support the global decarbonization. EnOS™ Ark can accurately track carbon footprints and generate detailed emissions reports. In addition, it provides direct access to markets to obtain green electricity, RECs and carbon credits. Combining EnOS™ Ark with Envision's end-to-end green energy solution, we help our partners achieve carbon neutrality and develop low carbon/net zero products.

Envision is going to promote Net Zero Industrial Park model globally, based on our experience in Ordos and the Net-Zero Industrial Park Standard. Envision signs a Strategic Partnership agreement with the Government of Spain to build the first Net Zero Industrial Park in Europe. And we aims to construct 100 Net Zero Industrial Parks in the next decade.

Expert Comment

Envision Group is a renewable energy equipment manufacturer. In addition to supplying high-performance products and quality services to China-based renewable energy development businesses and facilitating society-wide low-carbon growth, the company is keenly aware of the carbon footprint of its own products and strives to reduce the carbon emissions generated by the manufacturing of new-energy products through streamlined design, energy-saving remodeling and the application of green electricity. Its efforts have yielded outstanding results that worth to be rolled out to a wider extent. At the same time, the company also leverages its industry sway to build up a global circle of net-zero technology providers. It assists local governments and fellow market players to create "net-zero" concepts and products by drawing on its extensive experience and service capability in the area, facilitating society-wide low-carbon growth while fully manifesting its corporate social responsibility.

The First Nuclear Energy Heating Project in South China: Zhejiang Haiyan Nuclear Energy Heating Demonstration Project

China National Nuclear Power Co., Ltd.



Project Overview

The first nuclear energy heating project in South China - Zhejiang Haiyan Nuclear Energy Heating Demonstration Project (Phase I), was officially put into operation on December 3, 2021, in Haiyan, Zhejiang Province, benefiting nearly 4000 households living within the heating range of 460000 m². The project is expected to be 100% completed by the end of the "14th Five-Year Plan" period (2021-2025) and will meet the heating demand from residents living within about 4 million m² in Haiyan.

The nuclear energy heating and energy saving project in Haiyan County underwent a technical transformation of cogeneration of Qinshan NPP units. It is now using the remaining thermal power of nuclear power units in winter to realize central heating of the main urban area of Haiyan County and Ganpu Town. The project features a mature technical route, promising market and great potential and consistent with the State's overall goal for clean, efficient energy and its environmentally friendly use, serves as part of the important efforts contributing to China's ambition of "carbon neutrality and peak carbon dioxide emissions".

The project falls into three phases: Phase I aims to ensure heat supply by the demonstration project to three living communities and senior citizen apartments in Haiyan County in the winter of 2021; Phase II aims to secure the heating conditions for the relevant blocks in the west and north of the main urban area of Haiyan County by the end of 2022; and Phase III aims to meet the heating demand from residents living within about 4 million m², including other zones of the main urban area, Qinshan Street and Ganpu Town.

Project Highlights

Zhejiang Haiyan Nuclear Energy Heating Demonstration Project, as the first nuclear energy heating project in South China, has a total pipe length of about 10 km and extends from Qinshan NPP to the urban area of Haiyan County. Under the premise that original generating capacity and safety performance of these units are not negatively impacted, this project supply a large scale of safe, economical nuclear energy heating with zero carbon to public utilities, residential communities and industrial parks in Haiyan County.

Zhejiang Haiyan Nuclear Energy Heating Demonstration Project (Phase I) was financially supported by the budget of the Central Government under the Circular of Zhejiang Provincial Development and Reform Commission on Investment Plan for Pollution Control, Energy Saving and Carbon Emission Reduction (Dedicated) within the Second Batch of 2022 Central Government Budget issued by Zhejiang Provincial Development and Reform Commission on August 8, 2022, with the funds used for project investment subsidies.

Company Profile



China National Nuclear Power Co., Ltd. (CNNP) (stock code: 601985.SH), one of the largest nuclear power operators across China, was co-founded by China National Nuclear Corporation (CNNC) as the controlling shareholder, China Three Gorges Group Co., Ltd., China COSCO Shipping Corporation Limited and China Aerospace Investment Holdings Ltd.. CNNP's business spans development, investment, construction, operation and management of nuclear power projects; investment in and development of clean energy projects; investment in and investment management of transmission and distribution projects; research on safety technology of nuclear power operation, and relevant technical services and consulting business; and electricity sales.

As of June 30, 2022, CNNP had controlled 25 nuclear power units in operation at total installed capacity of 23.71 GW, 8 units of the projects in progress at total installed capacity of 8.878 GW, and 1 approved unit at an installed capacity of 1.251 GW. CNNP's wind power and photovoltaic power projects in progress and in operation a total of 11.517 GW, including 2.999 GW wind power and 8.518 GW photovoltaic power.

Project Outcome

· Environmental benefits

After full completion and commissioning, this project will supply 704000 GJ heat per year which might have been consumed by electric heating in South China. Compared with coal-fired thermal power units, the project will save about 24000 tons of standard coal per year, thus reducing emissions of 204 tons of sulfur dioxide, 177.6 tons of nitrogen oxide and 63000 tons of carbon dioxide every year.

· Social benefits

This project, as the first nuclear energy heating project in South China, will meet the heating demand from residents living within a scope of 464000 m².

· Economic benefits

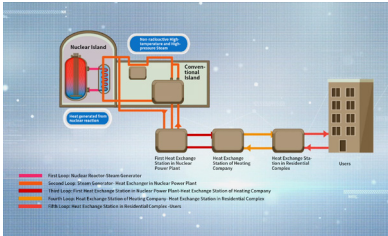
This project also saves the renovation cost as only the external pipe network is replaced for nuclear energy heating, while the indoor heating equipment continues to be used; this kind of heating is priced at 30 Renminbi Yuan per square meter, lower than 46 Renminbi Yuan per square meter for electric heating.

Project Implementation

In 2020, Qinshan Nuclear Power Co., Ltd and Haiyan County jointly launched a nuclear energy heating and energy saving project in Haiyan County, fully taking advantage of the characteristic of zero carbon of nuclear energy and providing centralized heating for residents and public facilities in Haiyan County. The project has a total investment of about 940 million Renminbi Yuan, with a total pipe length of 10 km, extending from Qinshan NPP to the urban area of Haiyan County. The first heat exchange station installed in the Qinshan NPP supplies 130°C water and receives 70°C backwater, thus supplying heat through hot water circulation. After the project is completed, it, which aims to supply heat for an area of 4000000 m² in 2025, covering the main urban area of Haiyan County and the whole area of Ganpu Town, will have a nuclear energy heating capability of 150 MW.

· Principles of nuclear energy heating

Nuclear energy heating works by transferring part of the heat generated by a power plant to a heating company who supplies it through heating network to end users. This process passes through five loops. First of all, the heat generated by nuclear reaction in the first loop heats the water in the second loop through a steam generator to produce high temperature and high-pressure steam. Then, a part of steam will be extracted to heat the water in a heat exchange station in a nuclear power plant, then, the heated water will be transferred to a heat exchange station of a heating company through the third loop, then, water in the heating network of the fourth and fifth loops will be heated in turn. In such a way, the heat generated by the nuclear power plant will be sent to thousands of households through centralized heating.



· Project proposal

According to the plan, the nuclear energy heating project is divided into three phases:

Stage I: The following tasks is to be completed to ensure enough heating in the winter of 2021 and satisfy the heating demand of residents in an area of 464000 m²: technique transformation of the units in Qinshan NPP, and completion of the first heat exchange station in Qinshan NPP, as well as installation of the heating network from Qinshan NPP to three residential communities in the main urban area of Haiyan County and the House for Elderly of Haiyan County.

Stage II: Industrial Heating Works of the Zhejiang Haiyan Nuclear Energy Heating Demonstration Project (Phase II) is going to commence on July 15, 2022. Based on the main heating network of the Phase I of the Zhejiang Haiyan Nuclear Energy Heating Demonstration Project, the Phase II will extend the industrial heating network and supply industrial heat for multiples industrial users in the Qinshan Industrial Park for their development. This action will make an important contribution to reducing carbon emissions, improving the environment and facilitating social and economic development, and open a new chapter for the mutual benefit, win-win and zero-carbon development of enterprises and local governments. After it is completed, it can provide a 24-hour heat supply and an annual industrial heat supply of about 288000 GJ, equivalent to saving about 10000 tons of standard coal and reducing about 26000 tons of carbon dioxide emissions, realizing win-win results of industrial development and energy saving & carbon reduction.

Stage III: It is to plan and construct the supporting heating networks and heat exchange stations outside the main urban area, and expand them to Qinshan Street and Ganpu Town, to meet the heating demand for an area of 4000000 m² in Haiyan County.

· Comparison before and after the project

The project will bring significant environmental benefits to Haiyan County. In comparison with the electric heating method in South China, the project can save 196 MWH of electric energy consumption per year after it is 100% completed and put into operation. At the same time, nuclear energy heating is more stable than boiler heating, so it can better meet the heating demand of residents and save their heating cost, as shown in the calculated data in the table below.

	Heating cost/m ²
Before the project	46 Renminbi Yuan
After the project	30 Renminbi Yuan
Revenue	Decreased by 35%

· Voice of stakeholders

Jin Guigen, a retired employee of Qinshan Nuclear Power Co., Ltd: "We are engaged in nuclear power business. From the very beginning, we discussed the reuse of waste heat of nuclear energy. We thought about it for many years, but there was only one way. This project is beneficial to the local government, to the people of Haiyan, to our employees, and more importantly, to the resources of our country. It is really a multi-win project."

Chen LiaoYuan, a resident of the Maple Leaf Quarters: "I bought a house in the Maple Leaf Quarters, for that it was one of the few quarters in Haiyan with heating facilities back then." The quarters used natural gas boilers for heating in the past, but now it has been changed to nuclear energy heating. However, only the external network needs to be replaced and the existing indoor heating equipment can be used and requires no replacement. The cost of heating in a winter was 46/m² Renminbi Yuan, but it is reduced to 30/m² Renminbi Yuan now. In the case of heating for an internal house area of 70 m², its cost for a winter would be 3220 Renminbi Yuan in the past, but now it is reduced to 2100 Renminbi Yuan, saving 1120 Renminbi Yuan.

Project Impact & Sustainability

The nuclear energy heating and energy saving project in Haiyan County provided a construction scheme for the first multifunctional, fully modularized nuclear energy heating station with independent design. With collaboration of different parties and continuous innovations of technical methods, it took less than 4 months to install the main part of the project and only 40 hours to complete the on-site installation. The difficulties in laying heating pipelines in South China were resolved by digital simulation and improved construction methods. An intelligent heating network management platform was built by adopting the most advanced design concepts in China, to realize the functions such as intelligent scheduling, intelligent patrol and intelligent maintenance.

China's annual heating consumption of coal is more than 800 million tons of raw coal. As the scale of residents' quality of life is improving, the scale of carbon emission is increasing. And nuclear heating is undoubtedly an important means to solve this contradiction. Zhejiang Haiyan Nuclear Energy Heating Demonstration Project, as a pilot project, opens up a new market for the comprehensive use of nuclear energy from coastal nuclear power projects. Use of the waste heat from coastal nuclear power projects will help extend heating area from the coastal area to the hinterland and fit various application scenarios. Conversion of thermal energy into electrical energy or direct provision of high temperature process heat will turn nuclear energy from a single player to a multiple helper, contributing more "nuclear" power to green, low-carbon development.

Expert Comment

CNNP is an electricity provider focusing on the operation of nuclear power plants. It is one of the three largest nuclear power operators in China.

One of the main challenges for China to achieve its net-zero target lies in residential heating. As things stand, it is close to impossible to provide heating in the three northernmost regions relying on electricity alone. Biomass resources, given their limited availability, face the same conundrum. Nuclear-powered heating provides a solution for China to achieve net-zero residential heating.

Nuclear-powered heating is inherently safe, a facility could contain up to five circuits as separate layers of isolation. The layer of heat transfer from the nuclear island to the conventional island serves to shield radiation, and the first station on-site acts as another isolator, enabling fairly high safety standards on site.

Practice of PV-Sand Control in Kubuqi Desert of Elion Resources Group

Elion Resources Group

Project Overview

The construction of Mengxi Base Kubuqi 2 million kW PV sand control project launched on October 16, 2021, which is located in the North project area of Duguitara Industrial Park, Hangjin Banner, Ordos City, Inner Mongolia Autonomous Region, China. With a total investment of 11.5 billion Renminbi Yuan, the project covers an area of 77768 mu (5185 ha.). After completion, the project will supply 4.02 billion kWh of green electricity annually and reduce carbon dioxide emissions by 3.1356 million tons. The main construction contents include:

Construction of a complete set of 2 million MW photovoltaic power station, with 300000 kilowatts of energy storage system. The project has completed the installation of 500 MW of photovoltaic modules.

Under photovoltaic panels, sand-protecting barrier (reed, straw, etc.) are laid to reduce the surface evaporation. Between photovoltaic panels and sand, 58300 mu (3887 ha.) of hedysarummaxim, scoparium, astragalus adsurgens pall etc., are planted to develop high quality forage grass, ensilage, pellet feed processing industry. Up to now, it has completed the planting of 1800 mu (120 ha.) of Atriplex Canescens.

In areas of overhead-strut photovoltaic we build "pastoral- photovoltaic complementary" Livestock breeding zone, which bring up 20000 sheep per year. Manure return to the field to increases soil fertility.

Under the construction of "agriculture- photovoltaic complementary" boutique area of 6500 mu (433 ha.), we palnt potatoes, pumpkin and other economic crops in the improved desert soil. The intelligent water-saving irrigation system integrated with water and fertilizer can save more than 90% water and improve the survival rate by more than 30% compared with the conventional desert planting and irrigation mode.

The construction of windbreak carbon sink forest of 12968 mu (865 ha.). With the mixed seeding of Populus, hedysarum scoparium and HedysarumMaxim.

Project Highlights

The core of PV-sand control mode is "power generation on the panel, planting under the panel, breeding between the panel, sand control and soil improvement, and rural revitalization", which combines sustainable and comprehensive management of desert areas, photovoltaic industry, modern watersaving agriculture, ecological husbandry. Due to its original PV- sand control mode and advanced system design conception, the project won the bid of the first batch of "National Large-scale Wind power PV Base Project", so far is the largest single installed PV-sand control project.

Company Profile



Founded in 1988, Elion Resources Group has worked in the Kubuqi desert for more than 30 years, afforesting more than 6000 square kilometers of the Kubuqi desert, creating ecological wealth of more than 500 billion Renminbi Yuan and lifting 102000 people out of poverty. The United Nations awarded the "Champion of the Earth Award for Lifetime Achievement" to Elion Resources Group. The Chinese government has named the Elion Ecological Demonstration Zone in the Kubuqi Desert as the practice and innovation base of "Lucid waters and lush Mountains are invaluable assets ". During the "14th Five-Year Plan" period, Elion has committed to become the country's leading PV& sand control comprehensive service provider and desert ecological resources development operator. We are cooperating with central enterprises and state-owned enterprises to jointly invest in the construction of tens of millions of kilowatt large-scale wind power and photovoltaic base projects, and building a photovoltaic-hydrogen&sand control low-carbon industrial base.

Project Outcome

· Construction of the project invented these new modes of "agriculture-PV complementary", "foestry-PV complementary","husbandry-PV complementary". These modes can provide a scientific reference and data support to replicate the success of the model in China and global desert area. Meanwhile these modes can benefit ecological improvement in desertification region, raise people's income, energy transformation and the harmonious development of society. After the completion of the project, the annual production of potatoes (corn silage) is 15000 tons, pumpkin is 1500 tons, high-quality forage grass is 40000 tons, and the annual production of fattening sheep is 20000. Normal annual income can reach 124.6 million Renminbi Yuan with profit of 32 million Renminbi Yuan.

· After the completion of the project, annual production of green electricity can reach 4.02 billion kWh, equivalent to reduce annual 1.206 million tons of standard coal consumption, reduce carbon dioxide emissions by 3.1356 million tons, reduce sulfur dioxide, nitrogen oxide and carbon by 28900 tons, 8400 tons and 12000 tons respectively.

· After the operation of the project, more than 800 people can be long-term employed, more than 5000 people for temporary employment per year.These employment help to realize the sustainable development of farmers, enterprises, government and social benefits.

· After 3 to 5 years ecological comprehensive treatment, 77768 mu (5185 ha.) of photovoltaic power generation area vegetation coverage rate will rise from 3% to 70%. Starting from the third year after the completion of the project, the desert ecological comprehensive management project can achieve the annual carbon sink quantity of 16322 tons of carbon dioxide equivalent.

· As of October 2022, the project has completed the installation of 500 MW of photovoltaic modules and the planting of 1800 mu(120 ha.) of Atriplex Canescens.



Project Implementation

The PV-sand control project should first carry out the desert field leveling, so that it meets the requirements of photovoltaic construction, and then launch the construction of PV power stations, desert ecological management projects, economic projects under the panel with overall planning. Specifically include:

Construction of PV power station: High-efficiency,low-attenuation,single-crystal,double-sided,double-glass modules are adopted, which can increase the power generation by 5% compared with single-sided PV modules. Advanced cluster inverter scheme is adopted to realize intelligent determination and accurate location of component faults. The adoption of Flexible stent create a 3.5 meters headroom to accommodate large agricultural machinery barrier-free operation; Uav inspection and intelligent cleaning robot are adopted to reduce operation and maintenance costs and improve operation and maintenance efficiency.

In the middle and late stage of the construction, desert ecological management will be carried out, including the construction of windbreak sand belt around the power station, sand fixation and ecological management in the PV power generation area. Among them, the construction of the outer windproof sand belt is mainly to construct the windproof sand belt outside the power station by the combination of arbor, shrub, grass and reed sand barriers. The construction of sand fixation and ecological governance in the photovoltaic power generation area mainly spread reed sand barrier and all kinds of hardy dry land grass seed sand fixation and ecological management, and covers the pile foundation of the upwind photovoltaic power generation area with sand and stone. If there are dunes with large slope in the photovoltaic power generation area, which is not conducive to the construction of flexible stent, salix, hedysarumMaxim, caragana korshinskii and other shrubs can be interplanted for sand fixation and ecological management on the basis of spreading reed sand barrier and various cold-resistant dry land coverts seeds.

The under-panel economic project includes modern water-saving agricultural planting and inter-panel ecological breeding. The steps of under-panel,water-saving modern agriculture is: within the relevant planning block, evenly coated 10cm thick red mud, and natural biological fertilizer to improve soil structure, and then to construct efficient integration of intelligent water-saving irrigation system. After that we start to plant the organic fruits and vegetables such as potatoes, squash and radix isatidis, radix astragali, radix scutellariae and other Chinese herbal medicine in large scale. In consideration of land suitability, market conditions, and also to avoid repeated cropping and reduced production, the under-panel cropping industry implements rotating cropping; The steps of ecological breeding are as follows: With all kinds of high quality herbage and shrub growth year by year, the ecological environment improved step by step. according to the overall planning, we adopt "company + peasant household" mode to build cattle and sheep breeding housing on an appropriate scale. We develop rotational grazing cattle and sheep breeding and free-range poultry industry in the PV power generation zone.

Desertification control and soil improvement Sand mainly by using rhizobia nitrogen fixation by crops, such as liquorice to improve soil structure gradually. Round of sheep and cattle and poultry can improve soil fertility. Using animal manure as fertilizer to plant. Hereunder to form a virtuous cycle to improve the desert land gradually. We develop

ranch, forest land to enhance biological diversity and improve the ecological environment.

After the implementation of the comprehensive ecological management of PV-sand control, the vegetation coverage rate in the photovoltaic power generation area will be increased from 3% to over 70%. The photovoltaic panels can block light and wind to reduce evaporation by 800 mm/y and wind speed by 1.5m/s. The PV-sand control project area covers an area of 210000 mu (14000 ha.) of green planting, of which the photovoltaic power generation area covers an area of 70000 mu (4667 ha.), and directly drives the repair and remediation of the surrounding desert sand of 140000 mu (9333 ha. including 50000 mu (3333 ha.) of wind and sand resistance carbon sink forest belt and 90000 mu (6000 ha.)of air seeding sand fixation area). Nearly 10000 mu (667 ha.) of high-standard water-saving irrigated farmland has been created, and the annual output of potatoes and pumpkins has reached nearly 20000 tons. This has boosted the employment and income of farmers and herdsmen, maximized the use of desert land, and promoted the revitalization of local villages.

Project Impact & Sustainability

Electrical and ecological system can be combined together in the mode to produce green power and green hydrogen, raising livestock and poultry between PV panels and sand, planting economic crops in the desert land. It's a demonstration base of Chinese characteristic common wealthy by PV-sand control mode to common prosperity of wealth and envirement. This mode will provide scientific reference and data support to copy the successful practice in Kubuqi desert to the national and worldwide. This mode can improve ecological environment and promote residents' income in desert region.

As a large-scale, systematic engineering means of sand control, the biggest innovation of PV-sand control mode is the systematic combination of sustainable management of the desert, water-saving agriculture, modern animal husbandry, photovoltaic power industry. All industries developed in a circular and integrated manner. The rapid growth trend of installed capacity of centralized photovoltaic power stations in deserts in northwest China can promote the development of agriculture and animal husbandry industry in desertification areas, drive the income increase of farmers and herdsmen, and help rural revitalization.

In addition to the 200 kW PV desertification control project under construction, Elion Resources Group also plans a 20 GW PV desertification control project in the Kubuqi Desert. And a 500000-kilowatt photovoltaic sand control project in Wuwei, Gansu Province, is under construction and will be completed by the end of 2022.

Expert Comment

In addition to yielding visible carbon reduction results, Elion's innovative photovoltaic sand control technology with large-scale, systematic, market-oriented and industrialized qualities could potentially be highly beneficial to a series of such key issues as desertification control, ecological restoration, biodiversity conservation and rural revitalization—a bona fide sustainable business project that could "turn sand into gold".



GCL: Integrated Wind/Solar Power and Storage Platform

GCL (Suzhou) New Energy Operation Technology Co., Ltd.



Project Overview

Intensified, sophisticated, diversified and intelligence-empowered management of power stations has become an important direction for renewables players to seek breakthrough and been propelled to front and center of the renewables and the wider energy sector.

To cater to the increasingly pressing demand for centralized and diversified production management of power stations, GCL (Suzhou) New Energy Operation Technology Co., Ltd. has in 2019 pioneered a model for centralized operation and maintenance management of photovoltaic power plants located in northwest, south, east and central China, guided by operating philosophies characteristic of "regional management, centralized monitoring, separated shipment and inspection, minimum shift worker, intelligent, diversified and specialized O&M". The trail-blazing "regional operation center + intelligent operation and maintenance platform" model enables centralized O&M management of solar power plants, wind farms and energy storage facilities and the omni-lifecycle management and intelligent operation and maintenance of wind/solar power and storage facilities.

The "regional operation center + intelligent operation and maintenance platform" provides panoramic intelligent analytics featuring high accuracy and reliability, enabling the production management personnel to stay fully on top of the operation status of power station equipment and production and operation indicators while urging the on-site personnel to exercise sophisticated, visualized and efficient operation and management of equipment, monitor the real-time and non-real-time data on on-site production and operation, and provide a better understanding of all kinds of incidental problems, thus enhancing system safety, improving manual efficiency of power plant management, stabilizing power generation revenue, and enabling intelligent management.

Project Highlights

The company has independently developed an operation and maintenance management system for PV power plants, which has been granted six invention patents, six utility model patents and 19 software copyrights. The development encompasses a renewable energy cloud platform with full intellectual property rights and an operating system (OS) for management of legacy assets. The terminals feature unified equipment coding and wide-ranging data access, with a scalable operation and maintenance middle office, including 17 business subsystems for centralized control, scheduling, production and analysis functions. In addition, the project has invested and applied a number of technologies such as cleaning robot monitoring, drone inspection planning, hot spot detection, IV curve scanning, to deliver "one-stop" intelligent operation and maintenance services in the truest sense.

In 2019, the company was rated as China's first "5A" O&M service certifier by China Electricity Council.

Company Profile



Established on May 4, 2015, GCL (Suzhou) New Energy Operation Technology Co., Ltd. is a wholly-owned subsidiary of GCL New Energy Holdings Limited (0451.HK). The company boasts of 32 years of experience in power industry management and 13 in the investment, construction and operation of renewable energy multi-use case power plants, and is committed to building a top-notch "data + operation" renewable energy technology service provider for having the best expertise, growth potential and competitiveness aided by "Internet + big data" and intelligent operation and maintenance technologies, with a view to providing its customers with professional and intelligent operation and maintenance services to maximize their asset value. To date, the company has lent its services to more than 300 renewable energy facilities with total capacity exceeding 10 million kilowatts, covering 27 provinces (municipalities and autonomous regions), and the accumulated raw data assets have reached 720TB+.

Project Outcome

The project generates 3.87 billion kWh of electricity annually, and reduces carbon dioxide emissions by more than 3.86 million tonnes per year compared to thermal power generation.

Through the photovoltaic sand control and ecological farming programs, a total of more than 45000 mu of desert land is treated and utilized.

By building out an ecological breeding base in the solar panel site in the desert, the land on site is fully leveraged for desert reforestation, enabling eco-friendly breeding practices such as photovoltaic cordyceps free-range chicken and photovoltaic free-range eggs, generating close to 1.3 billion Renminbi Yuan in profits per annum.



Project Implementation

Allocation principles followed in project implementation:

Photovoltaic, or solar, power generation has proven to be the most cost-effective way of generating power across a range of countries and locations around the world. The technology is in a position for scaled up applications and poised to replace fossil fuel, hailed as the undisputed first choice in the global race to green energy. Amid the net zero targets, the average installed capacity of solar power generation will reach more than 70GW p.a. during the "14th Five-Year Plan" period, bringing into the spotlight the dire need to address such pain points including quality control, operation and maintenance management and efficiency improvement of PV power generation. In the light of the surge in power plant capacity, it will become ever more imperative to establish a sound model for more sophisticated and intelligent operation and maintenance, at which point superior intelligent operation and maintenance services will become a resource highly sought after.

The AI model developed by GCL New Energy, based on petabytes of data, utilizes technologies such as the Internet of Things, knowledge base and real-time expert diagnostics to implement AI-empowered diagnosis and early warning of daily equipment faults, assist on-site personnel in discovering and implementing equipment troubleshooting and providing fault repair solutions, and provide remote intelligent real-time expert consultation for major faults to guide timely fault repairs. Through in-depth research on AI technology, an AI-based PV power plant O&M management system is developed to address a myriad of pain points in PV power plant management. By integrating Internet technology, digital information technology and new energy expertise, GCL Lighting's one-stop intelligent PV power plant operation service enables the digitalized management of power plants and serves as an impactful measure to maintain and grow the values of legacy assets.

The fundamental principles of "secure partition, network exclusive, horizontal isolation and vertical certification" are upheld in the development of intelligent analytics platform and centralized control system of regional centers, and the implementation and data interaction for the headquarters, regional operation and maintenance centers and subordinate solar power, wind power and storage facilities of GCL (Suzhou) New Energy Operation Technology Co., Ltd. The "extensive defense" and "appropriate security" strategies are adopted, with security protection practices predominantly complying with the "Security Protection Regulations for Electric Power Monitoring System", "Master Plan for Security Protection of Electric Power Monitoring System", "Administrative Guidelines for Network and Information Security in Electric Power Industry" and the "Security Protection Regulations for Electric Power Monitoring System", and the technical requirements for centralized monitoring system of scheduling automation of renewable energy in place in the provinces where it has a presence. For the network-based production control system, the focus is placed on strengthening the boundary protection and enhancing the internal security protection capabilities to safeguard the power production control system and crucial data.

All equipment in the regional centralized control center is exclusively procured for dedicated purposes. Each PV, wind and storage plants adds a new gateway machine for data forwarding, and every equipment installed in the system has power system certification, and the system is physically independent from the dispatching automation system, which does not affect the normal operation of the original dispatching automation equipment.

The regional centralized control center is divided into Zone I (remote control system) and Zone III (production, operation and maintenance management and intelligent analysis system) in strict accordance with the requirements of "secure partition, horizontal isolation, network exclusive and vertical encryption" of the secondary power security protection specification.

Zone I regional remote control system:

Through clustered servers, it adopts SCTE-104 protocol to converge and process real-time monitoring and control data of power stations requiring centralized control, and has monitoring functions.

Zone III regional operation and maintenance system:

A blade server centralized deployment scheme is used to analyze and store data of regional center power plants, and provide production management and intelligent analytics functions at the same time.

The PV power plant O&M management system, has been comprehensively upgraded from the original V1.0 version of the monitoring platform to V3.0 through successive iterations; at the same time, Internet technology and digital information technology are incorporated with expertise in renewable energies to provide one-stop intelligent solutions catering to multiple business use cases. In addition, the company is developing a mobile cloud service APP based on the platform, which will include one mail, two systems (management + data) and six extended features, in an attempt to branch out its service offerings further up and down the industry chain and uncover new growth areas.

Project Impact & Sustainability

The company's innovative model featuring a "regional operation center + intelligent O&M platform" has been covered by mainstream media outlets including the CCTV, BJX.com, Solarbe.com. The intelligent O&M platform has won the highest accolade at the SNEC trade fair for many years in succession, attesting to the wide recognition in the private sector.

Running existing assets has proven to be a pain point for renewables operators on the revenue, cost and cash flow dimensions. Overhauling the decentralized operation mode and refining the O&M services to feature more intelligence-empowered supply will invariably be the mandatory step any industry player must take to ensure future growth. The O&M philosophies under such a model will become a new driver behind the innovation of equipment technology and bolster the operation efficiency of power stations; pushing the industry to pivot from quantitative to qualitative change, thus boosting the utilization efficiency of renewable energy sources such as solar and wind power through intelligent, network-based and refined management.

Expert Comment

GCL New Energy Holdings Limited is one of the pioneering businesses in China to engage in the manufacture and operation of new energy equipment, building up a wealth of resources and technologies across the industrial chain. The company has branched out its operations of late and now operates at the forefront of the operation and maintenance sector.

The case profile submitted by GCL New Energy Operation Technology Co., Ltd. features an integrated operation and maintenance management model for wind/solar power generation and storage, which is a key medium through which the state government plans to establish a new type of power system, featuring a platform-based approach to developing wind and solar resources that is in alignment with what China's policymakers have in mind for the country's renewables sector. The model will facilitate the development and management of carbon-zero renewable energy sources on a wider scale, and could potentially foster China's efforts in scaling up the utilization of renewable energy sources and hitting the country's "dual-carbon" targets ahead of schedule.

VX Logistics Shanghai Fengxian Lingang Zero Carbon Park

VX Logistics Development Co., Ltd.

Project Overview

VX Logistics Shanghai Fengxian Lingang Park is located in Shanghai Lingang Free Trade Zone. The park is a single three-story ramp warehouse with an area of about 37000 square meters, a total warehouse capacity of 19583 plates, and 37 loading and unloading platforms. As the center of fruit supply chain, the warehouse 1# of the park is a rare integrated operation center that integrates pre-cooling, warehousing, cross-storage, quality inspection, inventory management, ripening and packaging in the market. Warehouse 2# and 3# are mainly used for new energy vehicle spare parts storage. Construction of the project began on October 29, 2019, and the investment operations began on March 25, 2022.

VX Logistics Shanghai Fengxian Lingang Park focuses on three dimensions in achieving energy conservation and carbon reduction. The first is green planning and design. Shorten the time for unloading and warehousing through site selection and include the "VX Green Cold Storage Product Standard" into the design bottom line. Designing and installing high-performance electromechanical systems, human induction LED energy-saving lamps, rooftop distributed photovoltaic applications and high-efficiency water-saving appliances to create green buildings. The second is to carry out green construction around pollution control, resource conservation, waste management. The third is green operation, in accordance with the national energy efficiency standards in selecting high-efficiency transformers, air conditioning, pumps, fans and other equipment, rational use of night "valley price", hot fluorine defrost instead of electric defrost, while increasing the curtain and inflatable door seal at the discharge port to achieve energy saving and consumption reduction.

Project Highlights

· On May 19, 2022, VX Logistics Shanghai Fengxian Lingang Park won the first logistics park net zero carbon building certification project issued by TÜV Rheinland Greater China and the Building Research Establishment (BRE).

· On June 17, 2022, VX Logistics Shanghai Fengxian Lingang Park was pre-certified with LEED V4 BD+C Warehouse and Distribution Centers Platinum.



Company Profile



In 2015, Vanke officially launched its independent logistics brand, VX Logistics, which has become an excellent multi-temperature zone integrated logistics solution service provider in China.

VX can provide customers with high-standard warehousing facilities and diversified cold chain logistics services. Its core business focuses on six major urban agglomerations in China, covering 47 major cities, with more than 160 logistics parks, more than 40 professional cold chain logistics parks operating and managing across the country, and a warehousing scale of more than 12 million square meters.

VX helps improve the efficiency of the enterprise supply chain, serves people's better lives, and is committed to becoming a trusted logistics strategic partner of customers.

Project Outcome

· VX Shanghai Fengxian Lingang Park warehouse 1# is mainly used as the fruit supply chain center, warehouse 2# and 3# are mainly used for new energy vehicle spare parts storage. The three warehouses use recyclable wooden pallets and electric forklifts for storage activities. In addition, VX Shanghai Fengxian Lingang Park adopts human induction LED lighting, hot fluorine defrosts instead of electric defrost and improves the utilization rate of "valley electricity" to reduce the energy consumption of operation.

· All warehouse roofs (including 1# cold storage + 2&3# dry warehouses) in VX Logistics Shanghai Fengxian Lingang Park are laid with photovoltaics, with a high-efficiency photovoltaic conversion rate of 21.2% and an inverter efficiency of 98.6%. VX Logistics Shanghai Fengxian Lingang Park mainly achieves zero carbon emissions in the operation stage through energy saving and consumption reduction and rooftop distributed photovoltaic applications.

· Basing on the ASHRAE90.1-2010 Energy Standard for Buildings Except Low-rise Residential Buildings standard, the project energy saving rate has reached more than 50%.

· Indoor sanitary ware adopts high-efficiency water-saving appliances, and the overall water-saving rate of the project reaches more than 50%.

· Rate of waste utilization: 100% of site recycling and/or reuse of harmless construction and demolition materials.



Project Implementation

The warehousing and logistics industry is an important part of the modern supply chain system, and it is also the main node linking the supply side and the demand side. There are also many components involved, so the energy conservation and emission reduction of the warehousing and logistics industry is of great significance to achieving the national carbon neutrality goal. In this context, VX Logistics actively explores the path of carbon emission reduction in logistics parks from three aspects: green planning and design, green construction, and green operation.

1. Green planning and design

VX Logistics Shanghai Fengxian Lingang Park is close to two extremely important ports in Shanghai, Yangshan Port and Nangang Port. This geographical location is significantly beneficial to imported fruit customers, which can shorten the unloading and storage time, reduce the risk of overdue returns and save costs. In addition, the site was selected around the previously developed industrial land, which is conducive to the comprehensive utilization of surrounding resources. The project also set up sufficient bicycle parking spaces and charging pile parking spaces to encourage low-carbon commuting.

Indoor sanitary ware uses high-efficiency water-saving appliances, and the overall water-saving rate of the project has reached more than 50%. Meanwhile, the indoor sanitation appliances and accessories of the project were metered, and water management was carried out by tracking the amount of water used and more water-saving possibilities were found.

The project uses high-performance electro-mechanical systems, human induction LED energy-saving lamps, and lays solar photovoltaic systems on the roofs of three warehouses, with the roof area of 27568 square meters, and a total installed capacity of nearly 3.534MW. According to preliminary estimates, the average annual power generation of rooftop Distributed photovoltaics is about 3.45 million kWh, and the average annual power consumption is about 2.24 million kWh. The electricity generated by rooftop photovoltaics is enough to cover the energy consumption of the No. 1 to 3 warehouses and comprehensive buildings in the logistic park, and the park can achieve Net-zero power carbon emissions. During the life cycle of the distributed photovoltaic system equipment in the park, the energy savings are equivalent to nearly 26000 tons of standard coal. Nearly 68000 tons of carbon dioxide emissions, more than 200 tons of sulfur dioxide emissions, more than 1200 tons of nitrogen oxide emissions, and more than 23000 tons of dust emissions. In addition, in order to meet the hot water demand of the complex building, the project is equipped with a vertical vacuum tube collector on the roof of the complex building, and the total heat collection area of the roof reaches 260 square meters. According to the calculation, based on theASHRAE90.1-2010 Energy Standard for Buildings Except Low-rise Residential Buildings standard, the energy saving rate of the project has reached more than 50%.

2. Green build

VX Logistics strictly abides by the Green Construction Code for Construction Projects. In the construction process, we comprehensively consider the environment and the needs

of the surrounding communities, focusing on the use of material saving and material resources, water conservation and water resource utilization, energy conservation and energy utilization, land conservation and land resource protection, reducing the impact on air, water and land during construction, and creating a clean, tidy, comfortable and safe construction environment. The park also recycles discarded old formwork for exterior stair pedals, water pipe protection, etc., and uses steel scrap for making Horse stool reinforcement.

3.Green operations

VX Logistics Shanghai Fengxian Lingang Park uses screw chillers and evaporative condensers, which is 30% more energy efficient than conventional piston water-chillers. In addition, the project uses a propylene glycol carrier cooling system, R507 refrigerant, which can significantly reduce the refrigerant charge. VX Logistics Shanghai Fengxian Lingang Park is mainly used as a fruit supply chain center, rationally using the night "valley price" to reduce the operating time of the refrigeration compressor during the day, thereby reducing operating costs. Besides, the curtain is added at the unloading port to reduce the running cold caused by the loading and unloading operation, and at the same time, after the vehicle stops at the crossing, the inflatable door seal is used to fill the gap between the transporters and the crossing, reducing the running cold and reducing the energy consumption. Furthermore, VX Logistics Shanghai Fengxian Lingang Park set up a buffer space when entering the hall from the outside and set the door to open the sound and light alarm at the entrance of the buffer space to reduce the cold consumption of the hall.

Project Impact & Sustainability

VX Logistics has built its own development "basic warehousing network" in the past few years. In the future, it will integrate the sustainable concept, requirements, and standardized design to achieve 100% full coverage of green buildings. Based on the "basic warehousing network" and carbon neutrality goal, VX logistics actively builds a green supply chain platform to provide customers with integrated green supply chain solutions and help enterprises improve supply chain efficiency. VX logistics has promoted smart management methods and the most advanced and efficient technology to all its logistics parks, which not only makes technology the basis for efficient management and quality services, but also becomes the basis for carbon reduction actions.

Expert Comment

VX Logistics Shanghai Lingang Park has followed a clear emission-reducing pathway, weaving green low-carbon concepts into the planning and design of warehousing, engineering design and estate operation, blazing open a trail for integrated green supply chain for the wider logistics industry and its customers that can be easily rolled out.



Energy Efficiency-Focused Retrofitting of the Center for Energy Control at the Wanguocheng MOMA in Beijing

First Living Enviroment Tech (Beijing) Co., Ltd.

Project Overview

The featured project was carried out at the Wanguocheng MOMA Beijing of 1 XiangheYuan Road, Dongcheng District in the city of Beijing, an upmarket residential development in the area. Delivered in October 2005, the buildings 3# and 12# featured a central HVAC system with radiant roof air conditionning and displacement ventilation systems. The refrigating staion was approaching 15 years in commission. In March 2019, First Living Environment Tech took over the Center for Energy Control of the two buildings before carrying out a series of work including data gathering, energy efficiency auditing, and evaluation of the overall energy system. It then launched its retrofitting efforts to boost energy efficiency. The renovation was rolled out in two stages: retrofitting of the cooling equipment room and installation of the auto-control platform. Per the requirements of the client and request of the property manager, cooling functions went live on April 25, 2019; and the units were fully retrofitted, installed and commissioned (including the auto-control platform) by May 10, 2019. The energy efficiency-boosting retrofit of the existing building airconditioning system helped establish the metrics for energy consumption, statistics and analysis of energy efficiency, system energy supply and building energy consumption, enabling the management of energy efficiency at varying energy loads of the building, through an AI-empowered platform.

Based on the power use levels between May and September 2018 prior to the retrofit versus May to September 2019 (post-retrofitting), total savings in electricity use during the cooling season is 608161.9kWh, or a saving of 156.55 tons standard coal equivalent which, based on the building carbon emission calculation guide GB/T51366-2019, translates to a reduction in carbon emission of 538 tons and electricity bill savings of 304100 Renminbi Yuan per annum.

Project Highlights

The Wanguocheng MOMA (Beijing) residential compound was awarded 519000 Renminbi Yuan in subsidies as one of the shortlisted energy-saving technology promotion projects by the government of Dongcheng district in 2019, and another 125200 Renminbi Yuan in cash incentives for energy-saving technology retrofits from the Beijing municipal government in 2020.

Compared with the customer satisfaction survey conducted in 2018, there has been a 5% and 3% increase in the satisfaction with ideal room temperature in summers and winters, and satisfaction with the ideal room humidity in summers increased by 3% in 2019.

Company Profile

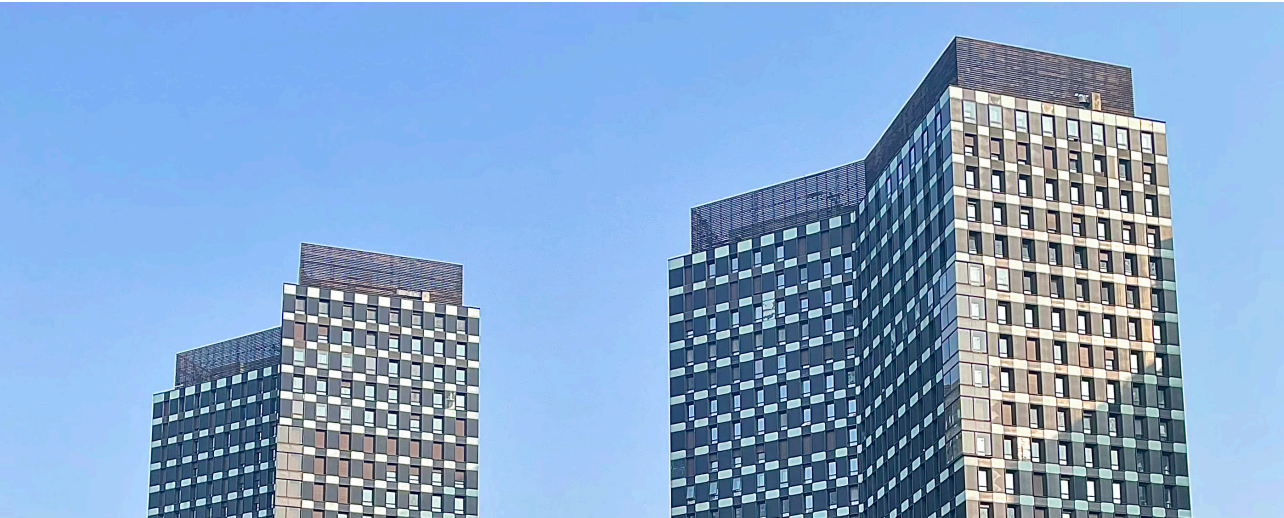


Established in December 2014, First Living Enviroment Tech (Beijing) Co., Ltd. (known as First Living Environment Tech) is a leading building technology solutions provider. Boasting innovative process and omni-journey service capabilities, First Living Environment Tech's operations primarily encompass three business segments: building comfort and energy saving consulting and EPC, energy station construction and operation, and special building technology products. First Living Environment Tech is rich in practical experience and standardized implementation process in creating a highly comfortable living environment and the application of building energy efficiency. Footprint spans across over 40 metropolises in terms of project deliveries, which cover a number of distinct climates, signaling the company's unwavering march towards its "green technology-empowered eco harmony" aspirations.

Project Outcome

Comparing the electricity uses before and after the retrofit, the project achieved 608161.9kWh in total power savings, or 156.55 tons standard coal equivalent, reducing 538 tons of carbon emission, and saving 304100 Renminbi Yuan in electricity bills annually.

Judging by the statistics on owners' thermal comfort-related repair requests post-retrofitting, attesting to the win-win outcome of both energy conservation and improved resident satisfaction.



Project Implementation

Mobilizing its know-how in energy station construction and green energy-saving operation developed through extensive on-site operations.

First Living Environment Tech devised a "bespoke" system solution for the Wanguocheng MOMA project, where it invested, renovated, commissioned and operated the legacy cooling equipment system, replacing which with the brand new high-efficiency Maglev chilling units and upgrading the original automatic control system into an operator-less management system. The multi-pronged efforts have substantially boosted the energy saving rate of the compound, reducing the operating costs while improving energy use efficiency, which perfectly aligns with the trend of clean, low-carbon and intelligent energy consumption.

The cooling equipment room of Phase II Wanguocheng MOMA is located on the lower ground floor (LB2) of Building 12#, which supply airconditioning load for Buildings 3# and 12#. The mainframe is equipped with two Italian branded water chilling units, two cooling pumps, two refrigeration pumps and two cooling towers, with radiant roof air conditioning system at the end and a central HVAC full displacement fresh air system.

The original mainframe features an Italian-branded coole with a capacity of 981kw and input power of 249.9kw and an energy efficiency ratio cop=3.9, which fails to comply with the revised limit for energy efficiency under varying load ratios (Energy Efficiency Limit and Grade of Cooling Water (Heat Pump) Units (GB19577-2015)). The reasons include the lower heat transfer efficiency due to the evaporator and condenser having been erodeding by round-the-clock water damages, and the diminished pressure-bearing capacity of the tube wall due to chemical cleansing and physical treatment, resulting in the risk of expansion and cracking caused by high heat. The user and nominal modes of operation of the unit decreased by approx. 30%, resulting in the unit's incapacity for extreme peak loads and progressively deteriorating comfort levels. In consideration of the user experience, safe equipment performance and overall economic viability, a decision was made to replace the two water-chilling units to meet or exceed the energy efficiency standards in place.

The retrofit of the Center for Energy Control at the Wanguocheng MOMA (Beijing) can be rolled out in two stages: auto-control platform installatin and refrigeration room retrofit.

- Cooling equipment

The cooling unit was replaced with energy-saving products with parameters exceeding the current energy efficiency label: a Carrier screw chilling unit and a Climaveneta Maglev chilling unit. Previous performance data were analyzed and computed to arrive at a diagnostic of the hourly cooling indicators of the building and the equipment load rate, which were used to inform the development of new operating strategies in conjunction with user demand and the characteristic profile of the unit, which ensures sustained efficient operations of the cooling equipment, thereby conserving energy.

- Equipment room electronics

The newly installed automatic control platform enables fully automatic collection and analysis, proportional integral control and security feedback, among other features.

The equipment can automatically carry out data transfer inspection, automatic energy efficiency analysis, load analysis, access external micro-weather stations and import data for enthalpy calculation, convert the unit load and the calculated load of air conditioning terminals, which guarantees the automatic calculation and precise regulation of the unit, reduces the system's dependence on personnel, enabling platform-level project management and improving the efficiency of troubleshooting.

List of retrofitted equipment			
Equipment	Quantity	Unit	Details
KELLY screw chillers	1	Unit	Equipment replacement
Clement maglev unit	1	Unit	Equipment replacement
Freezing pump inverter	1	Unit	New installation
Cooling pump inverter	1	Unit	New installation
Secondary low-range side circulation pump inverter	1	Unit	Retrofit
Secondary high-range side circulation pump inverter	1	Unit	Retrofit
Automatic control platform	1	Set	Integration of distributed energy-saving control elements, enabling remote control of each device and integration of data and information collection

Project Impact & Sustainability

Central air conditioning systems are widely configured in civil buildings across the country and in Beijing, which are faced with a series of wear and tear-related problems such as equipment aging, diminishing efficiency, poor operation and maintenance, and occasional glitches, resulting in significant energy wastage. The legacy system retrofit of Wanguocheng MOMA's Energy Center, on the other hand, has introduced the new high-efficiency maglev units and AI-boosted automatic control system, optimizing and updating the local piping and valves of the system, and replacing with high-efficiency VF pumps, thereby yielding substantial energy saving and emission reduction in civil buildings at reasonably lower costs.

Expert Comment

Environment Tech has "customized" a systemic solution to energy saving and efficiency for Beijing's Wanguocheng MOMA community, which boosted the efficiency of energy use and enabled an intelligent and digitalized auto-control system for the residential development. Highly scalable, the case offers practical experience that can be reenacted in future building energy efficiency and industrial net-zero endeavors.



Carbon Reduction of Pavement in Universal Beijing Resort: Low Carbon Cast-in-Place Decorative Concrete

Beijing Orangestone Technology Company Limited

Project Overview

Beijing Universal Resort is by far the largest Universal Studios Theme Park in the world. The decorative concrete pavement developed by Beijing Orangestone Technology Company Limited accounts for more than 90% of the decorative concrete works in the hardscape project implemented in Beijing Universal Resort, and the R&D is carried throughout the entire project.

Universal Studios has many thematic scenarios and a very rich variety of product applications, including pavements, seat, walls, steps etc., with more than a dozen products by different processes and technologies. With its own advantages of low carbon emissions, durability and personalization, decorative concrete shows its rich artistic expression possibilities. Both to achieve the creative design intent, but also to meet a 50-year operational durability without major repair needs; and compared with traditional stone paving, greenhouse gas emissions can be reduced by up to 33%, carrying great environmental and cost-effective benefits. The more stone paving with low-carbon decorative concrete replaces stone paving, the more sustainable the construction will be.

Project Highlights

- 33% carbon reduction on the pavement of Universal Beijing Resort which has certified by China Academy of Environmental Sciences
- Received the Beijing Great Wall Cup of Construction Engineering Golden Quality Award
- The textures of wood and stone on the pavement of Universal Studios are made of decorative concrete, which has a long service life, saving natural wooden and stone resources, cost effective, and is environmentally and economically sustainable.



Company Profile

ORANGESTONE 橙石

Beijing Orangestone Technology Company Limited is an innovative enterprise in the field of landscape design and construction with special features and market value. Orangestone is a National High-Tech Enterprise and a Small Giant Enterprise of Beijing specializing in innovation.

The company's innovation is reflected in the low carbon value of its main product, cast-in-place decorative concrete systems, which can reduce carbon emission by up to 33% (compared to traditional stone paving).

Decorative concrete engineering requires experienced craftsmanship. The company has insisted on continuously training and improving its team of over 500 craftsmen for more than a decade, enhancing the value of craftsmen themselves; the company also cooperates with vocational schools to cultivate sustainable senior blue-collar backup force for the industry, which fulfills its corporate social responsibility.

Project Outcome

Environmental benefits

- According to the certification from Chinese Academy of Environmental Sciences, decorative concrete pavements can reduce carbon emissions by up to 33% over the full life cycle compared to that of stone paving.
- Reduce the use of natural stone, thus reducing the environmental impact of stone mining.
- It is widely used, as a low-carbon building material in the construction of ecological cities and low-carbon cities, and is closely integrated with resource recycling and environmental remediation.

Social benefits

- Artistic design, highlighting the characteristics and cultural taste of the city

Economic benefits

- Compared with stone paving, decorative concrete pavement is more cost effective.



Project Implementation

Decorative concrete pavement plays a major role in the Beijing Universal Studios project and is an important carrier to accentuate the theme and provide an immersive experience for visitors; it must meet both the design intent of the designers and the durability requirements of 50-year without major repairs. This has put forward strict requirements on the control of material, construction quality and artistic effect of the builder.

The main challenge is that the decorative concrete should have better performance than the stone paving, in the use performance, artistic performance and ecological performance. Orangestone started the related R&D one year before the implementation of the project, using its own technical accumulation, successfully solved the above challenges.

The implemented project has achieved high strength, high durability and high load-bearing capacity in terms of performance, and has considered the artistic design and innovative materials and concrete systems. The relevant R&D was gathered into 10 invention patents.

Sustainability of decorative concrete is reflected in both replacing of natural materials, and lower carbon emissions than stone paving.

1. In terms of reducing the material's own carbon emissions, comprehensive consideration of water-cement ratio and strength, by reducing the amount of cement to reduce carbon emissions; at the same time, adding recycled aggregates (mainly glass and crushed stone) to achieve the recycle waste resources.
2. Material transportation, the company's core technology is mainly reflected in the additives, so that the concrete can cooperate with the commercial mixing stations, which are covered densely in various cities in China, accordingly the same city transportation to reduce the cost of material transportation part and carbon emissions, while the stone generally need to be transported from the place of origin.
3. Reduce carbon emissions in construction phase, the on-site pouring reducing the use of labor and machinery, while stone paving requires twice construction of bedding layer and surface layer.
4. Universal Studios design requires 50-year of durability without major repairs, decorative concrete can successfully meet these requirements, reducing the cost and carbon emissions during operation and maintenance phase.

Carbon reduction

According to the conclusion of a study by the Chinese Academy of Environmental Sciences, "A Comparative Analysis of the Whole Life Cycle Carbon Emissions of Cast-in-

Place Decorative concrete Floors and Natural Stone Paving", the carbon emissions (in terms of CO₂ amount) generated by cast-in-place decorative concrete pavements (22 cm thick) is 77.73 kg/m², and the carbon emissions generated by stone paving is 116.47 kg/m². The decorative concrete pavement process is 33% less carbon emitting than the stone paving process.

Universal Studios project is a new project, Orangestone itself finished a decorative concrete pavement area of 107388 square meters. If the average thickness of decorative concrete is 16 cm, Universal Studios has reduced 3025 t CO₂e from paving alone compared to stone paving.

Project Impact & Sustainability

Replacing stone paving with decorative concrete is in line with the national development strategy. China is gradually limiting the mining of natural stone to protect natural resources, and decorative concrete can be applied to a very wide range of applications, such as urban renewal, heritage site protection, themed landscaping, municipal landscaping, cultural and sports projects, etc. Decorative concrete paving has very good sustainability.

Orangestone has applied this low-carbon technology of cast-in-place decorative concrete to a number of key projects, including Shanghai Disneyland Resort, Beijing Winter Olympics Arena, the Forbidden City and the Imperial Temple. Currently, this technology is also being used in the Beijing Workers Stadium renovation project, which is an advanced low-carbon renovation project for existing buildings - the original stone paving outdoors is replaced by decorative concrete paving (20 cm thick) with an area of 43870 square meters, reducing carbon emissions by 1545 carbon dioxide equivalent tons. High-quality green building is exactly one of the goals of the Workers Stadium renovation.

Expert Comment

The eco-friendly low carbon cast-in-place decorative concrete developed by Beijing Orangestone Technology Co., Ltd. stands out for its substantial carbon reduction outcome without compromising the architectural design aesthetics and artistic values. The technology is fully demonstrated in the construction of Universal Studios Beijing, providing a practical solution for technical innovation in building energy saving and emission reduction.



Development of Passive House Building Industry Helps Achieve Dual Carbon Goals

Sino-German Ecopark Passive House Building Technology Co., Ltd.



Project Overview

A passive house is one building that is adaptive to climate features and natural conditions and, by its enclosure structures with better thermal insulation and air impermeability as well as efficient fresh air heat recovery technology, demands minimum energy for heating and cooling while giving full play to renewable energy, so that a cozy interior environment that meets basic requirements to green buildings is created at a cost of less energy consumption. Passive can save considerable energy from cooling and heating consumption, by avoiding using fossil fuels and thus leading to less hazardous gas emissions.

In 2019, China's first demonstration passive house residential community was built in Sino-German Ecopark, followed by a series of successful applications of passive house technology in kindergartens, schools, offices, apartments and hotels, marking the start of massive promotion of passive house projects. Besides, manufacturers of the doors, windows and fresh air systems related to the passive house industry were brought in and funded. Today, the Ecopark is home to 1 million square meters of passive houses, completed and under construction, which will contribute to the reduction of carbon emission by about 80 thousand tons every year upon completion, representing the Company's fulfillment of the responsibilities and obligations in achieving the dual carbon goals as a state-owned enterprise.

Project Highlights

The passive house projects developed have won the company 14 awards and honorary titles from around the world such as the Sino-German Energy Efficiency Cooperation Projects Award, the High-tech Project of Ministry of Housing and Urban-Rural Development, and the Planned High-tech Project of Shandong Provincial Housing and Urban-Rural Development Department. Sino-German Ecopark Passive House Building Technology Co., Ltd. now has 53 employees, in which 15 are senior title holders and 13 are medium title holders. As a benchmark project in China, the passive house project inside the Ecopark are visited by more than 300 delegations every year.

Company Profile



Sino-German Ecopark Passive House Building Technology Co., Ltd., founded in July 2013, is recognized as one of the Qingdao Municipal High-tech Enterprises. It has a passive house research center to develop passive house technical solutions suitable for different parts of China. Holding a Grade A Building Design Qualification, the Company has integrated the advanced technical ideas with considerable practical experience of both China and Germany with respect to eco-friendly and energy-saving buildings, fostered a business system that combines the passive house planning, design, construction, project management, and building industrial chain as a whole for developing eco-friendly urban areas, and offered passive house technical solutions to many cases of various building types.

Project Outcome

Large-scale development of passive houses can reduce exhaust emissions and the costs for air pollution treatment. The current building energy consumption is 9.76 kgce/m², as approximated by multiplying the designed energy consumption criteria prescribed in the 1980-1981 code by 65%. The energy-saving rate stipulated in China's prevailing Technical Code for Nearly-zero-energy-consumption Buildings is 80% to 90%. However, the energy consumption of the passive house buildings in the Ecopark, as calculated, is 2.79 to 5.58 kg standard coal/square meters, which is 4.18 to 6.97 kg standard coal/square meters lower than the current energy-saving design standard value. At present, the Ecopark is home to 1 million square meters of passive houses, completed and under construction, which will reduce carbon emission by about 80 thousand tons every year upon completion.

Project Implementation

Starting from zero, the Company brings in passive house technology, takes the lead in developing and promoting the passive house industry, and introduces and localizes advanced passive house technologies from abroad. It established ties with Passive House Institute in Germany, University of Innsbruck of Austria, Passive House Japan, Institute for Passive Zero Energy Building of R.O.K., China Academy of Building Research and many other institutions. The key passive house technologies include:

· High-performance thermal insulation technology: The enclosure structures with higher thermal insulation performance are adopted in passive houses. When the insulation layer of an outer enclosure structure reaches a certain thickness that minimizes the energy loss through the structure, the building can heat up itself naturally to a comfortable temperature in winter, and protect the interior space from the sun radiation, shorten the operation time of air conditioners and effectively dehumidify the space in summer.

· Thermal bridge-free technology: The area of an enclosure structure where the heat flux drastically increases is the thermal bridge. The thermal bridge has an even higher impact on passive houses. Therefore, thermal bridges must be strictly inhibited for passive houses by means of thermal bridge-free design for the outer enclosure structures.

· High-performance doors and windows technology: Windows to the outside are one of the major energy consumers and have a considerable impact on the heat environment inside a building especially in places with hot summers and cold winters. In summer, large amount of solar radiation is taken in through windows, which increases the indoor temperature and the workload of air conditioners. That's why the windows' heat transmission, shading and window-wall area ratio are all important factors that influence the buildings' energy consumption.

Most public buildings, due to their large size and the complex structure, are equipped with large windows and glass curtain walls. Therefore, the thermal performance and the air impermeability of the windows are important factors that affect the energy consumption of the buildings. For example, if an outer window is fabricated with the glasses of 6T + 16AR + 6T + 16AR + 6T, and the heat side is of double-layer tempered glasses filled with argon (with a piece of low-E film attached to the inside), the comprehensive heat transfer coefficient is 0.85 W/(m² · K), and the airtightness, the watertightness and the wind load resistance are all of Level 6, the interior space can be heated up while its heat losses can be effectively reduced, leading to a net heat gain value inside the building.

· Air impermeability technology of buildings: Good air impermeability can reduce cold wind penetration in winter, reduce the increase in cooling demand caused by non-controlled leakages in summer, avoid the mildew, moisture condensation and damages of the building caused by humidity, reduce the impacts of noise, air pollution and other unfavorable factors on the interior environment, and improve the occupants' life quality.

· Thermal recycling fresh air units: A thermal recycling fresh air unit is a device that enables the sensible heat or the total heat exchanges between the inlet air and the exhaust. The household integral heat pump fresh air system, with no piping needed on the coolant side, is developed specially for passive houses to meet the air conditioning demand of passive houses. DC variable-frequency compressors are used, and underground water is taken as the cooling and heating source; air replacement,

purification, cooling, heating, dehumidification can be performed; besides, domestic hot water is also an available option.

Since the introduction of the passive house technology into the Ecopark, the Company has started project-based research and measured the passive houses' energy consumption in operation. As per the comparison of actual energy consumption with design data, the passive houses have fully achieved project expectations. With more projects implemented and researches completed, the Company has established an Integrated System of Passive House Technology in Cold Areas and published reports on the study of demonstration projects and other results. And it is promoting and duplicating the technologies to other projects and regions across China.

Project Impact & Sustainability

While developing the passive houses, the Company has more than 30 industry patents approved, of which the independently-developed household integral heat pump fresh air system put an end to the absence of the same kind in China. The underground-water-sourced household heat pump unit and the air-sourced household air heat pump unit have been certified by the Passive Housing Institute of Germany (2019) and applied in projects, providing more equipment options for China's passive house development.

The national code — Technical Code for Nearly-zero-energy-consumption Buildings coedited by the Company has been enacted and enforced by Ministry of Housing and Urban-Rural Development. The 14th Five-year Plan of the Ministry of Housing and Urban-Rural Development proposes that, by 2025, China will build 50 million square meters of passive ultra-low energy buildings.

The extensive application of passive house technology in the civil, public, multi-storey and high-rise buildings will give rise to a large market, and effectively push forward the transformation and upgrading of the building industry which mainly includes doors, windows, insulation, photovoltaic, building shading and the fresh air system. The Qingdao experience and technology in passive house projects are spread and duplicated Shandong, Anhui and Tianjin.

Expert Comment

The organization explores and enables the systematic technological innovation of low-carbon building through the passive-house residential compound pilot, innovating key energy-saving technologies in the construction sector, such as high-performance insulation, non-thermal bridge, high-performance door/window, and heat recovering fresh air unit. The application at the Sino-German Eco Park boasts of 1 million sqm. of passive housing, potentially reducing the on-site building carbon emissions by approx. 80000 tonnes. The case has a profound value in terms of technical and applicational innovation in building energy saving, pollutant and carbon emission reduction, and sets a technological and applicational precedent for low-carbon and net-zero buildings for fellow construction players.

Green Inclusive Cloud: Digital Account Book for Carbon Reduction

Green Inclusive Technology for Carbon Neutrality(Suzhou) Co., Ltd.

Project Overview

Launched in September 2022, the "Green Inclusive Cloud-Digital Account Book for Carbon Reduction" project is an innovative demonstration of diversified carbon inclusive mechanism. Green Inclusive Cloud is a third-party digital platform that measures and records personal carbon reduction amount of green lifestyle. The platform is based on the Association Standard Directives for quantifying greenhouse gas emission reduction of citizens' green and low-carbon behavior. Through the specific calculation engine, the platform can standardize and model the process of outputting carbon reduction amount, helping enterprises to quantify and record users' green behaviors, allowing everyone, every enterprise and every local government to have a carbon account book. Green Inclusive Cloud provides effective environmental protection links for individuals, enterprises, and governments, and provides a base for the construction of whole society participated environmental governance system. The project also transforms carbon inclusive mechanism from single government or enterprise-oriented mode to a government, enterprise, and whole society jointly participating mode.

Currently, Green Inclusive Cloud has successfully supported Luzhou "Green Bud Points" project, Beijing Carbon Inclusive project, Suzhou Carbon Inclusive Platform, and the Low-Carbon Winter Olympics Carbon Inclusive Platform etc., and has cooperated with several industry-leading enterprises to help the country's Dual Carbon target. Until August 10, 2022, the number of average daily users has surpassed 450000, the average daily carbon reduction amount has reached 423 tons, the per capita daily carbon reduction has reached 0.94 kg, and the average daily carbon reduction of enterprises has reached 14.6 tons.

Project Highlights

Our team has been invited to participate in international conferences such as the COP 26 UN Climate Change Conference, China-UK Climate Change and Sustainability Summit, UN Science-Policy-Business Forum on the Environment's (UN-SPBF), and Asian Venture Philanthropy Network's (AVPN) Global conference etc. to share public participated carbon emission reduction cases from China.

Company Profile

Green Inclusive Technology for Carbon Neutrality(Suzhou) Co., Ltd is a comprehensive service provider for carbon inclusive solutions. Our company is committed to establishing a standard system to calculate citizen's carbon reduction amount, constructing a third-party digital platform to measure and record personal carbon reduction amount of green lifestyle, building a 'three-in-one' carbon account book for individuals, companies and governments, and using digital means to support green and low-carbon lifestyle and help the country's consumption to reach carbon neutral. The company is a high-tech enterprise with a number of intellectual property rights and technological achievements, playing a leading role in industry's technology. The company has led several standard construction projects and undertook numbers of government research projects. The company's diversified carbon inclusive solution: 'Green Inclusive Cloud-Digital Account Book for Carbon Reduction'project has won many significant awards.



Project Outcome

Environmental Benefits

· GHG Emission Reduction

Green Inclusive Cloud has covered green life scenarios including cycling, public transportation (bus, subway), garbage classification, vehicle parking, ETC, and the "Clear your plate" campaign, etc. Until August 10, 2022, the number of average daily users has

surpassed 450000, the average daily carbon reduction amount has reached 423 tons, the per capita daily carbon reduction has reached 0.94 kg, and the average daily carbon reduction of enterprises has reached 14.6 tons.

Social Benefits

· Public perspective: promote the formation of a green and low-carbon lifestyle

Green Inclusive Cloud provides innovative, comprehensive and applied consumption carbon reduction solutions based on the "digital carbon neutral + public participated green life" concept. Carbon account book clarifies the personal carbon reduction contributions, records green behaviors in daily life scenarios, such as riding shared bikes, bringing own cups, taking public transportations, having online meetings etc., and then transforms these behaviors to carbon credits that can be used to redeem rewards such as riding cards, movie coupons, and shopping coupons etc., based on <Directives for quantifying greenhouse gas emission reduction of citizens' green and low-carbon behavior>. This mechanism can finally encourage individuals to adopt a greener lifestyle. Until August 10, 2022, the number of average daily users has surpassed 450000, the average daily carbon reduction amount has reached 423 tons, and the per capita daily carbon reduction has reached 0.94 kg.

· Enterprise perspective: help enterprises to undertake social responsibilities

Green Inclusive Cloud aims to build a diversified carbon inclusive system in which the government, enterprises and the public work jointly to reduce our society's carbon emissions. The cooperation partners of Green Inclusive synchronize users' green behaviors to Green Inclusive Cloud after users' complete authorizations. The cloud platform can then help companies to establish, quantify, and record users' behaviors, and integrate multiple resources to provide diversified incentive mechanisms to finally complete companies' account books. The enterprises' carbon account books apply digital technologies to precisely record, measure and evaluate users' carbon emission reduction behaviors, therefore, can help enterprises to connect with users and provide solid scientific and technological bases for enterprises' low-carbon transformation. Currently, our company has formed a countrywide "Carbon Inclusive Cooperation Network" with governments, businesses, and financial institutions to provide more support for enterprises' low-carbon development and personal green behavior. Until August 10, 2022, the platform has connected with 11 enterprises, and the average daily carbon reduction of enterprises has reached 14.6 tons.

· Government perspective: manage cities' carbon emissions and reach carbon neutrality goal.

Green Inclusive Cloud project can manage personal behaviors and use rewards to positively encourage personal and enterprise behaviors to be greener, therefore driving social carbon reduction, improving business environment, and finally stimulating economic growth. Additionally, Green Inclusive Cloud can enhance governments' digital governance ability, help governments to manage carbon emission amount inside the district, and build carbon neutral city samples.

Financial benefits

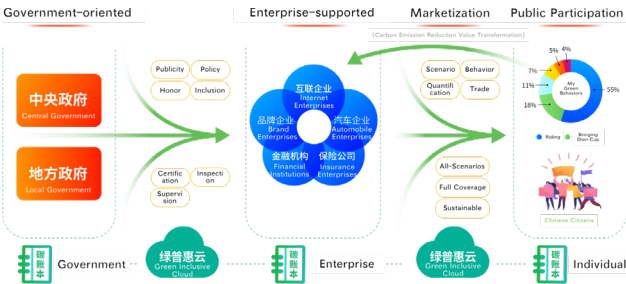
· Innovative Business Model:

The Green Inclusive Cloud Platform establishes a digital account book of carbon emission reduction based on the four-wheel drive incentive model of "public welfare, business, finance and policy so that green behavior can be recorded, quantified, and valued. At present, Green Inclusive Cloud has realized the connection between the supply and demand of emission reduction, as well as the connection between the carbon inclusive system and the green credit system. In May 2022, the Wangfujing Group offset its carbon emissions from public event and realized the event carbon neutral by buying the carbon emission reduction amount recorded in Green Inclusive Cloud. The project provides platforms for government to issue green credit, such as Beijing's carbon inclusive platform "Beijing Green Life Season", to ensure the accuracy, timeliness, continuity, and effectiveness of points distribution, and provide digital and market-oriented support for the government's implementation plans and further strategies.

Green Inclusive Cloud: Digital Account Book for Carbon Reduction



Project Implementation



Green Inclusive Cloud key concept:

Green Inclusive Cloud platform adopts technologies such as the internet, big data, and blockchain, etc., to quantify scattered consumption emission reductions, standardize and model the process of outputting carbon reduction amount through calculation engine, connect green scenarios that are close to public life, and solve the compatibility, and data dispersion problems between different companies. The platform can overcome the difficulty of public participation and platform sustainability, ensuring sustainable operation of carbon inclusive mechanism.

Green Inclusive Cloud system framework:

· Technical bottom layer: data access and big data modeling calculation.

· Operation layer: Green Inclusive Cloud operation terminal (S terminal).

· User layer: Green Inclusive Cloud government terminal (G terminal), Green Inclusive Cloud enterprise terminal (B terminal), personal carbon book (C terminal).

· Entrance layer: Green Inclusive official website, Green Inclusive official WeChat account.

Green Inclusive Cloud technological process:

· Scenario data supports unstructured and structured data access, uses HDFS to access the data warehouse, and performs data cleaning during the access process

· The data warehouse uses RDBMS + Hive and uses distributed computing methods to support the multi-algorithm calculation of emission reduction.

· Use the deduplication algorithm in the data warehouse to deduplicate the emission reduction amount according to the scene, to ensure that the emission reduction will not be calculated repeatedly.

· The user's unified identity is encrypted by the scene enterprise in one-way irreversible encryption, and after the encryption of Green Inclusive Cloud, the users' privacy and security can be protected.

· Use multi-cloud and computer room to separate and deploy data, services, and applications; build bastion host and security systems to ensure data security.

Green Inclusive Cloud implementation case:

Support local government in carbon inclusive areas: Luzhou "Green Bud Points" Project, Beijing Carbon Inclusive platform, Suzhou Carbon Inclusive Platform, Shanxi "San Jin Green Life" Carbon Inclusive platform.

Support large-scale events: The low-carbon Winter Olympics carbon inclusive project, and the experience of this project can be extended to more large-scale events and sport events.

Support enterprises in carbon inclusive areas: Cooperate with Truck Home to establish a truck owner carbon account book, with Meituan Bike to establish a cycling user carbon account book, with GAC Group to build a consumer carbon account book, and with Baidu Maps to establish a user green travel carbon account book, etc.

Project Impact & Sustainability

The "Luzhou 'Green Shoot Points'" project based on Green Inclusive Cloud has won the 2021 Top Ten Public Participation Award in the Ministry of Ecology and Environment's "Action Plan to Enhance Citizens' Ecological Civilization Awareness". In addition, Green Inclusive Cloud's innovative practices and achievements in carbon emission reduction at the consumption side won the second "IFF Global Green Finance Innovation Award", and was listed in the "Forbes" Global Block Chain top 50, etc.

Based on the mature supportive foundation system and sophisticated project experience, Green Inclusive Cloud can quickly replicate those projects in different cities, enterprises, and large-scale events in both domestic and overseas.

Under the country's dual-carbon target policy and the support of the Ministry of Ecology and Environment, the Cyberspace Administration of China, and the Ministry of Transportation, Green Inclusive Cloud and local enterprises have actively cooperated to develop relevant projects, which have sustainable development.

In the future, the platform will cover personal behaviors under more life scenarios to help governments understand enterprises' contributions in carbon reduction, provide governments with evidence to support enterprises, and enhance governments' digital governance ability.

Expert Comment

The "carbon digital account book" model of Green Inclusive has been revamped from being led by a singular government agency or enterprise to a diversified model with the government, enterprises and the public all involved. In accordance with the quantification standards such as the Directives for Quantifying Greenhouse Gas Emission Reduction Of Citizens' Green And Low-Carbon Behavior, it provides science-based methods for quantifying the green behaviors of individuals, enterprises and governments alike. The platform commands public trust and is endorsed by relevant government agencies. It can be easily rolled out in a range of cities, businesses and major events at home and abroad owing to its well-developed underlying support mechanism and sound practical experience. Particularly noteworthy is the platform's extensive coverage and high public uptake, and the visible inclusive benefits to the wider society.

Green Commute Debao: Vehicle Carbon Emission Reduction Inclusion and Verification Services

Shenzhen Debao Technology Ltd.



Project Overview

Green Commute Debao is a multi-faceted platform which is based on several cutting-edge technologies such as Internet of Vehicles, big data, vehicle carbon emission monitor from own independent research and development, carbon inclusive products and service system. As a vehicle carbon inclusive service provider, Green Commute Debao can identify application scenarios, collect data, create products that are attractive to car owners, and provide users with reward points for choosing a less carbon intensive method of travel instead of driving their cars. By allowing users to purchase products and services with a combination of cash and reward points, Green Commute Debao aims to reduce carbon emission generated from traveling by cars and advocate for green alternative transportation methods.

Since it was officially launched in June 2020, Green Commute Debao has applied for 15 patents and developed 27 vehicle carbon emission reduction inclusive services. In two years, Green Commute Debao has achieved nearly 15 tons of emission reduction from over 100000 users in 16 provinces and received 2 awards from Ministry of Ecology and Environment of the People's Republic of China. It has also established partnerships with over 40 renowned companies in the banking, insurance, transportation, and property management industries to continue expanding carbon emission reduction inclusive business. Green Commute Debao strives to help the nation reduce its transportation carbon emissions and explore the feasibility of carbon emission reduction inclusion mechanism by creating a commercialized system that rewards users based on the amount of PHCER issued.

Project Highlights

Received the 2021 Carbon Neutrality Outstanding Case Award from Ministry of Ecology and Environment of the People's Republic of China, People's Daily and All-China Environment Federation.

Featured in the "All People Contribute to a Low Carbon Winter Olympics" report published by Center for Environmental Education and Communications of Ministry of Ecology and Environment. All carbon emission reduction credits generated were donated to help the Beijing Winter Olympics reach carbon neutrality.

Created a vehicle carbon emission reduction data collector, which can collect the real-time vehicle data accurately.

First to create a "carbon inclusion mall" which features diverse types of rewards users can claim by reducing the amount of driving.

Company Profile



Shenzhen Debao Technology Ltd. (Debao Tech) focuses on developing, verifying and trading PHCER generated from car owners electing not to drive. The company specializes in identifying carbon emission scenarios, collecting emission data, calculating carbon footprint, creating carbon emission reduction inclusive products and managing carbon assets.

As a comprehensive vehicle carbon emission reduction inclusion platform, Debao Tech provides a full range of services to the government agencies, corporations and the public. Debao Tech has participated in setting the automobile carbon emission reduction industry standard, a project led by Ministry of Industry and Information Technology of the People's Republic of China. In addition, Debao Tech has received 2 awards from Ministry of Ecology and Environment of the People's Republic of China and is recognized as a national high-tech enterprise.

Project Outcome

· Reduced automobile carbon emission by 150 thousand tons.

Since officially launched in June 2020, Green Commute Debao has provided services to over 100000 users from 16 different provinces and cities. Over two years, 150 thousand tons of carbon dioxide emission reduction was achieved.

· Contributed carbon credits to help Beijing Winter Olympics reach carbon neutrality.

Debao Tech, along with many other companies, encouraged over 2.7 million citizens to participate in events that would lower their carbon footprints. Overall carbon emission reduction generated was nearly 20 thousand tons. All these credits were donated to help Beijing Winter Olympics reach carbon neutrality.

· By reducing the amount of private vehicles on the road, it helps alleviate traffic congestion.

By utilizing the carbon inclusion mechanism, building a transportation emission factor database and rewarding less carbon intensive activities, vehicle carbon emission reduction inclusion projects effectively cut down the frequencies of driving, which alleviate traffic congestions. Green Commute Debao reduced the personal cars driving rate to 38.6%, an 11.4% reduction compared to the statistics published by Beijing Transport Institute.

Project Implementation

Green Commute Debao associates its business model with the national policies tightly, creates carbon ledgers for corporations and individuals, provides various carbon inclusive products and services. It quantifies all the green commute choices users make and ensures users receive actual rewards.

1. Creating Carbon Ledgers for Individual Users and Corporations

Green Commute Debao has built its own automobile carbon emission data collection and information storage platform. Green Commute Debao helps users and its partners create their own carbon ledgers, quantifies and visualizes users' carbon emission reduction according to China's Automobile Emission Reduction Guideline created by Center for Environmental Education and Communications of Ministry of Ecology and Environment and All-China Environment Federation.

2. Vehicle Carbon Emission Reduction Data Collecting Device

The carbon inclusive projects depend on accurate quantification of eco-friendly behaviors. Green Commute Debao offers emission reduction data collecting device to users for precise data collection. The device is based on the industry-leading ASR communication technology platform, equipped with high sensitivity sensor and GPS module. It is capable of recording and storing continuous emission data collection including power on/off, speed, miles traveled, gas consumption, and driving behavior, which will be used for emission reduction calculation.

3. Carbon Inclusive Products and Services Model

Based on vehicle emission reduction data, Green Commute Debao has developed an app offering automobile related products and services that require users to pay cash only on days that they drive their cars. On the days users choose not to drive their cars, they will pay for the services using the emission reduction generated and receive reward points that can be used to exchange various services. this unique business model has the potential to attract large number of users and generate a considerable amount of emission reduction due to the amount of reward it offers and its easiness to promote, which in turn reduces air pollution and moves cities toward carbon neutrality.

4. PHCER

Since 2020, many provinces and cities have introduced carbon inclusion policies to encourage implementing projects that help curtail carbon emission associated with personal consumption. Green Commute Debao specializes in quantifying and verifying vehicle carbon emission reduction, as well as working with local emission exchange agencies on issuing PHCERs for vehicle carbon emission reduction.

5. Carbon Asset Management and Trading

Green Commute Debao offers carbon assets management services to its business partners. Green Commute Debao works with 6 clients and local emission exchange agencies on trading PHCERs issued according to local emission exchange guidelines.

Vehicular carbon inclusion projects have already been implemented in different areas such as Guangdong, Henan, Sichuan, Shandong, Jiangsu, Shanghai and Beijing. Green Commute Debao has served more than 100000 users and recorded a customer satisfaction rate of over 90%. The rate of vehicle non-operating days has reached 61%, which translates to 1.2-1.5 tons of carbon emission reduction per vehicle annually. These projects have achieved 150000 tons of carbon emission reduction in total.

Project Impact & Sustainability

Green Commute Debao created an innovative service model by providing various rewards along with emission reduction trading. By collaborating with over 40 companies in different fields such as insurance, banking, real estate and transportation, Green Commute Debao aims to create a comprehensive carbon inclusion service ecosystem, which helps companies reach digitalization and carbon neutrality, allowing companies to interact with its customers, guide companies to enter the emission trading system, and grows their revenues. By drawing in more companies to participate, Green Commute Debao aims to create a "siphon effect" to attract more users.

Green Commute Debao is the nation's first vehicular carbon inclusion project. It built a comprehensive carbon inclusion products and services system and is capable of satisfying the diverse needs customers may have.

Products include car insurances, gas gift cards and maintenance services, which help customers save a lot of money and reward those who choose more sustainable commute methods, Green Commute Debao successfully persuade existing car owners to drive less, which contributes directly to reducing traffic congestions and carbon emission. This helps create a positive feedback loop to attract more users to join the movement.

Green Commute Debao can quantify users' environmental-friendly behavior and the service can be transferred to many different fields. Since a large portion of the population can participate in it, it also creates a considerable amount of emission reduction. It can serve as a pilot carbon inclusion project for local governments, which aids in controlling greenhouse gas emission and reducing carbon emission from the consumption side.

Expert Comment

The case stands out in its innovative approach to advancing green development in Chinese society on the conceptual, technological and strategic dimensions. To begin with, the case has a good handle on the key to addressing urban mobility-related carbon emissions, that is, to reduce travel by private vehicles. Secondly, it grasps the key to incentivizing the public into reducing such a mode of mobility—by lowering the costs of car owners to prompt the public to travel less by cars. Lastly, the case pinpoints the technological leverage in urban carbon reduction, which is the automotive emission reduction certification and inclusive carbon service.

mio, a Green Living Application Building an Eco-Conscious Community for Individual Carbon Footprint Reduction

MioTech

Project Overview

MioTech officially launched 'mio', a WeChat mini app, on August 2nd, 2021. mio incentivize sustainable activities by rewarding low-carbon behaviors with mio points. Points can either be redeemed for various environment friendly merchandise or used to support UN carbon offset projects and public welfare projects, such as tree planting and habitat conservation for endangered waterfowl.

mio encourages all kinds of daily activities that could reduce one's carbon footprints, where its 'points-to-redeem-or-to-give' model highlights the importance of eco awareness and social values, by supporting sustainable and charitable projects with goals to achieve SDG success. mio's Z-CO is an online content-based community focused on sustainable lifestyles. Z-CO is an acronym for 'Zero-carbon and Cool'. Companies, organizations, brands and influencers could join Z-CO to deliver their values, visions and actions in climate change. Z-CO also help connecting people with various interests and sharing their low-carbon life.

Since launched, mio has gone through multiple version updates and provides ample low-carbon activities for users to earn points, such as walking, cycling, bring own tumblers at cafe, public transportation, new energy charging, plastic reduction, etc. mio's total number of users has reached over one million. In August 2022, mio launched its own ECM System (Employee Carbon-reduction Management System) to help companies accumulate carbon emission reduction data of their employees and up-down stream and build a low-carbon and energy-saving culture at a company level.

Project Highlights

· Through diversified forms of incentives, mio deeply explored the practices of personal carbon accounts, by promoting low-carbon lifestyles and spreading the messages of sustainability and environmental protection to the public, reported by People's Daily.

· mio is a platform that promotes low-carbon life, where I can gain knowledge about carbon reduction and earn prizes by living a green life, commented by mio Low Carbon Challenge first-week champion.

Company Profile



MioTech uses artificial intelligence to solve the sustainability, climate change, carbon emissions reduction, and social responsibility challenges faced by financial institutions, corporations, and individuals. Its comprehensive coverage of ESG data helps financial institutions make the right decisions in green finance and responsible investments. Its software helps corporations manage ESG reporting, improve energy efficiency, track and reduce carbon emissions. Its app builds green-conscious communities and promotes low-carbon lifestyles among individuals. MioTech is a participant pledging its commitment to climate action in collaborations with Climate Neutral Now launched by UN Climate Change, and also a signatory of UNPRI.

Project Outcome

· Since mio launched, mio users have walked in a total of 50.5 billion steps, nearly 34.31 million kilometers, which is equivalent to 856 laps around the Earth. And more than 1.29 million people have committed to a low-carbon life, through charging new energy vehicles, riding bicycles, and bringing their own coffee cups, which accomplished carbon emission reduction over 1661 tons in one year.

· The first mio Low Carbon Challenge was officially launched on November 22nd, 2021, and successfully concluded on January 9, 2022. During this seven-week campaign, more than 200000 people had joined mio's low-carbon challenges. During the campaign, mio Low Carbon Station was launched at Shanghai BFC Market, and the event was reported by Shanghai TV, Tencent Video, YouKu, iQIYI and many other media outlets.

· In August 2022, on the "2022 Shanghai Nightlife Festival", mio Low Carbon Station returned to the BFC Market. Emphasizing the importance of sustainability, mio Low Carbon Interactive Station reused the previous construction materials to minimize the carbon emission. After calculations, the event generated 1.57 tons of greenhouse gas emission, and mio offset the carbon emission generated at the event by purchasing CDM credits certified by the United Nations Framework Convention on Climate Change, thus achieving the goal of 'net zero' emissions.

· MioTech has been actively fulfilling its corporate social responsibilities since launching mio, by supporting public welfare projects such as tree planting, protecting endangered animals and promoting biodiversity, with a cumulative donation of more than 250000 Renminbi Yuan.



Project Implementation

mio advocates low carbon lifestyles and actively incorporates different low-carbon activities and uses science-based approach to calculate carbon reduction emission based on different activities. mio encourages its users to bring changes to the environment with every small low-carbon commitment in their everyday life.

mio's ECM System relies on MioTech's professional experience in carbon management to quantify employees' low-carbon behavior into carbon emission reduction data and provide data visualization tools such as ranking and carbon reduction trend to help enterprises manage and advocate. In different activities, the baseline is set to guide employees to choose a more low-carbon approach. For example, in the travel scenario, airplane is set as the baseline, and only those who choose a means of transportation with less carbon emissions than flying can get low-carbon point incentives. In the meeting scenario, online meetings are more low-carbon, and off-site online meetings can reduce energy consumption compared to same-city online meetings, and employees can get more incentives for initiating online meetings.

mio mini app sets a foundation of an online community, advocating a green and low carbon lifestyle. Collaborating with corporates, government departments and key opinion leaders, mio's capabilities in providing an all-in-one application to drive public engagement in sustainability were well acknowledged.

Highlight Cases:

1. Star Charge Cooperation Project: In August 2021, Star Charge and mio has first established cooperation by jointly promoting EV as a new low-carbon activity. In June 2022, Star Charge users can directly enter the mio mini app to complete their charging process and they will earn mio points as incentives, based on the number of charging degrees.

2. ECM System Project: mio developed a customized employee carbon reduction application for one national commercial bank and provided a general version of ECM System for a listed financial institution. Recently, mio also helped a national large shopping mall to develop its own application to encourage customers to shop 'greenly', by advocating green travel, reducing disposable products, prioritizing the purchase of green certified products, etc.

3. mio Low-carbon Interactive Station: In August 2022, mio and its many low-carbon partners, such as Baidu Map New Energy Navigation, Star Charge, AHS Recycle, etc., jointly promote green low-carbon life, through online marketing, event participation, and provide green trail products as prizes, to build a green community and strive to make 'sustainability' become the theme of everyone's daily life.

Project Impact & Sustainability

mio mini app sets a foundation of an online community, advocating a green and low carbon lifestyle. Collaborating with corporates, government departments and key opinion leaders, mio provides an all-in-one application to drive public engagement in sustainability.

mio mini app's features of 'wide range of adaptation, ample low-carbon scenarios, and flexible access' make it feasible to promote. With tools, such as green community Z-CO, individual carbon emission examination and low-carbon quiz, mio actively promotes low-carbon awareness and builds a strong foundation to explore and establish its future personal carbon account.

Expert Comment

As an inclusive carbon internet platform boasting more than one million communities, MioTech contributes to energy saving and carbon reduction causes and net-zero goals through its 'mio' service. By recording users' green travel behavior and converting mileage into points for carbon emissions reduced, the 'mio' is platform aims to motivate users to opt more for green mobility in day-to-day scenarios, creating a bottom-up environment for lowering carbon emissions. Through its partnerships with global efforts in biodiversity and environmental protection, the platform's "a seamless addition to everyday life, diversified rewards" feature makes it a clear standout for internet carbon inclusive platforms.

"Carbon Cabin" Innovation Promotes Community Waste Sorting and Recycling to Reduce Carbon Emissions

Sichuan Lvdoya Information Technology Co., Ltd.



Project Overview

Lvdoya's Carbon Neutrality Garbage Sorting Cabin (hereinafter referred to as the "Carbon Cabin") was put into use in January 2021 in Cuijin Street, Wuhou District, Chengdu. Over the past year, 40,401 tons of garbage have been recycled, which has been achieved through garbage recycling and carbon offset mechanisms. The carbon neutrality is 50,181 tonnes of carbon dioxide equivalent.

Community residents use the "carbon footprint carbon neutral meter" in the "Carbon Cabin" to weigh the recycled garbage and obtain the carbon emission reduction data of the recycled garbage through Lvdoya's App software" doya coin applet".

"Carbon Cabin" has set up four community sites in Wuhou District, covering nearly 2000 residents, creating a precedent in the field of community carbon reduction garbage classification. It is an effective carrier of the new garbage classification model of "operation" and realizes a carbon reduction innovation model that can be implemented, replicated, and participated in extensible, multi-scenario, and multi-party benefits.

Project Highlights

"Carbon Cabin" is recognized by the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) and recommended to the world as an urban carbon inclusive product.

Selected for the "Chengdu Ecological Benefiting People Project", and nominated for the carbon emission reduction category of the "Global Responsible Tourism Award" in 2021.

Guiying Li, a resident of Yongxing Community: The waste that was reluctant to throw away in the past was always piled up, which not only affected the environment, but also caused discord among families and neighbors. Since the "Carbon Cabin" was built into the community, more and more residents have learned to classify recyclables in the "Carbon Cabin", which not only allows community residents to actively participate in garbage classification and carbon reduction, but also makes the community cleaner.

Rao Cheng, a second-level researcher at Cuijin Street, Wuhou District, Chengdu: Simple operations, intuitive data and timely benefits have attracted a large number of residents to enter the Carbon Cabin. The program marks the specific emission reduction of waste, making the abstract concept of carbon emission more intuitive.

Company Profile



Sichuan Lvdoya Information Technology Co., Ltd.(hereinafter referred to as "Lvdoya") is an urban "dual-carbon" innovative smart technology service provider. Lvdoya is China's first (and only) carbon neutral project executive agency of the United Nations Framework Convention on Climate Change Secretariat. Lvdoya has been actively exploring the field of carbon reduction for 6 years, and pioneered the "Carbon Cabin", which provides a convenient way for the public to contribute climate action. Lvdoya is also cooperating with the secretariat of the United Nations Framework Convention on Climate Change to select carbon reduction case demonstration sites for the application of Lvdoya-related emission reduction products in China to promote local governments in completing the estimation and reduction of greenhouse gas emissions from garbage sorting and recycling.

Project Outcome

Ecological benefits: The total carbon reduction of the Carbon Cabin put into use so far has reached 124,818 tons, with the average carbon emission reduction reaching 0.05 tons per person, the number of participants is 12589 per year. Among them, the roof garden of the Wuhou Carbon Cabin in Chengdu absorbs 3 tons of dust, releases 1.05 tons of oxygen, and reduces carbon emissions by 167.5 equivalent tons through greening.

Social benefits: "Carbon Cabin" has become the best carrier for the linkage of "Five Communities" (communities, social organizations, social workers, social resources and community self-governing organizations) to promote the integration and construction of local communities.

Economic benefits: The "Carbon Cabin" in KaiYuan, Yunnan generates 613000 kWh of electricity through rooftop photovoltaics. "Carbon Cabin" also measures and collects carbon emission reductions from daily low-carbon actions such as garbage classification and carbon reduction through the construction of urban carbon accounts, community carbon accounts and personal carbon account systems, which can form many emission reduction data resources and provide residents with Diversified green action benefits.



Project Implementation

The Lvdoya Team worked with the local government, city management committee, community management and other units in selecting the sites, considering the characteristics of the community and the needs of residents to participate in waste separation and set up two types of waste collection: door-to-door collection and offline collection. Residents can place orders online for waste products that are difficult to carry, and the Carbon Cabin staff will collect them at home, helping residents to solve their waste disposal problems without having to leave home.

At the Carbon Cabin, its functional areas are subdivided into recyclables collection, carbon neutral measurement area, sorted waste storage area, staff rest area, points and gifts exchange area and a publicity area, which has effectively increased the recognition and participation of residents for waste separation and the Carbon Cabin.

In the recycling area, there are five separate recycling zones for textiles, glass, plastic, metal, and paper, where residents in the community can sort their recyclables and, with the assistance of the Carbon Cabin instructors, weighing them through the Lvdoya Carbon Neutral 'meter' and calculate the amount of carbon emission reduction generated by waste recycling. The amount of carbon emission reduction generated by recycling is measured by the Lvdoya supporter, combining international standard data with domestic practice values. Compared to the carbon emissions from the waste itself. Lvdoya also offsets the remaining carbon emissions using global carbon credits (including China's BRT and other carbon credits) and converts the carbon emission reductions into green points on the Lvdoya app, which are credited to the community residents' accounts. Residents can withdraw cash via WeChat to receive cash rewards or accumulate green points to redeem for daily necessities and receive a 'carbon neutral certificate' issued by Lvdoya, increasing the sense of participation in carbon reduction among community residents. Users can also participate in a variety of green and fun low-carbon activities through the 'Doya Coin Applet', including green consumption and public welfare activities.

In addition, the Carbon Cabin's hardware and software system and professional instructors also provide daily waste recycling services for local merchants, helping them to jointly operate waste recycling of plastic, metal and paper with the Carbon Cabin and serve the community to reduce carbon emissions. The "Carbon Cabin" has transformed carbon neutrality from an idea into a visible and tangible action, driving more governments, enterprises, and individuals to actively reduce carbon emissions through waste separation and recycling.

The Carbon Cabin has helped local communities to improve the quality of waste separation and management, cultivate citizens' awareness and habits of green development and green living, and jointly with city administrators, driving 10000 people to participate in carbon emission reduction actions.

Project Impact & Sustainability

The 'Carbon Footprint Carbon Neutral Meter' is an organic combination of digital technology and waste recycling; the 'Blockchain + Big Data' core is used to verify the uniqueness and transparency of carbon footprints and carbon reduction actions, and to promote innovation in carbon accounts based on data security.

The Carbon Cabin uses the incentive mechanism of converting carbon emission reductions into redeemable points to upgrade waste separation actions, promote the enthusiasm of the public for waste separation and recycling, and reduce the difficulty of promoting waste recycling in the community.

The overall structure of the Carbon Cabin can be customised to suit local conditions, such as installing a 'garden roof' to increase the ecological benefits, or a 'photovoltaic roof' to provide additional emission reduction benefits from photovoltaic power generation.

At present, nearly 10 Carbon Cabins are built in Chengdu, including Wuhou District and Pujiang County, and are being planned in Neimeng and Leshan, as well as the mobile recycling services are being promoted to enhance the convenience and motivation of the public.

Expert Comment

Carbon Inclusion is a pivotal mechanism for inspiring the public to lead eco-friendly and low-carbon lifestyles and keep sustainability in mind when being a consumer. As one of its various use cases that is more in touch with the ordinary users, carbon huts drive up a synergy among the local residents and communities, businesses and government agencies. We look forward to seeing even better thought-out designs and rollout of carbon hubs to inform the further implementation of the carbon inclusion initiative, lending more expertise in enhancing the low-carbon behaviors of residents and raising their awareness on the topic.



Hang Seng China: Green Finance to Empower Low-Carbon Transformation

Hang Seng Bank (China) Limited



Project Overview

Based on the development needs and characteristics of different regions, industries and enterprises, Hang Seng China continues to innovate and expand diversified and customized green financial solutions, so as to provide solid financial support for enterprises to build a green and sustainable development path, actively promote the green transformation of Chinese enterprises and facilitate high-quality green and sustainable development of the economy and the society.

Hang Seng China actively practices the concept of ESG. In 2021, we accelerated green finance innovation, and introduced a number of green finance innovations. For instance, we launched the first Renminbi interest rate derivatives transaction with ESG clauses in China, became the first foreign bank to launch green mortgage business, and launched the first Green Account corporate financial service, online green supply chain financing service and Green Deposit programme for sustainable development and environmental protection projects.

In 2021, Hang Seng China empowered low-carbon transformation of traditional industries, supported the development of green industries, and innovated green financial products. Hang Seng China actively supports enterprises to carry out in-depth, high-quality green and low-carbon transformation and continues to strengthen its green credit services. As of December 31, 2021, Hang Seng China's green credit balance increased by 76.7% compared with last year.

Project Highlights

As the only foreign financial institution among the first batch of initiators, Hang Seng China joined the green and low-carbon development action community of the Yangtze River Delta ecological and green integration development demonstration zone in 2021. We are committed to supporting the overall green transformation of economic and social development by innovating green financial products and services and supporting the development of green industries. In 2021, Hang Seng China closed the first Renminbi interest rate derivatives transaction with ESG clauses, becoming the first bank to complete such a transaction.

Company Profile



After the first office operated in Shenzhen Special Economic Zone in 1985, Hang Seng Bank has been expanding its footprints in the Chinese mainland including Shanghai office in 1991 that was scaled up to Shanghai Branch in 1997; Guangzhou Branch in 1995, namely the first branch in mainland of China; and Hang Seng Bank (China) Limited, its legal person bank based in Shanghai in 2007, which was a milestone in the history of Hang Seng Bank and opened a new chapter in Chinese markets. At present, Hang Seng China has nearly 50 outlets, covering the Pearl River Delta, the Yangtze River Delta and the Bohai Rim Region, as well as Fujian, Yunnan and Sichuan.

Project Outcome

- As of December 31, 2021, secured a growth of 76.7% over the same period last year in the balance of green credit
- Completed the first ESG-linked Renminbi rates derivative
- Launched the first Green Account corporate financial service
- Launched the first online green supply chain financing service
- Launched the first Green Deposit programme for sustainable development and environmental protection projects

Project Implementation

1.Green Credit Accelerating Low-carbon Transformation of Traditional Industries

Hang Seng China has formulated the Green Credit Guidelines of Hang Seng Bank (China) Limited, covering sustainable development and green credit, organization structure for green credit management, green credit management and monitoring procedures, green credit reporting and information management mechanism, green credit internal control and audit, green credit performance evaluation and other aspects.

A company, as a global leader in the color textile industry, is actively exploring the path of green and low-carbon development. Hang Seng China has assisted it in the low-carbon transformation through raw material substitution and energy replacement by offering tailor-made financial innovation products to it. In November 2021, Hang Seng China provided it with a Renminbi trade loan to support the production and promotion of its green low-carbon products in Anhui and Xinjiang.

2. Completion of the First Renminbi Interest Rate Derivatives Transaction with ESG Clauses

In 2021, Hang Seng China closed the first Renminbi interest rate derivatives transaction with ESG clauses, becoming the first bank to complete such a transaction. By introducing ESG clauses into this Renminbi interest rate derivatives transaction, Hang Seng China helped enterprises to prevent and manage potential interest rate fluctuations, and at the same time, helped enterprises that have met ESG targets to lower their financing costs through positive linkage with their ESG performance in the clauses, enabling them to achieve sustainable and high-quality development through low-carbon, energy-saving and environment-friendly practices.

3. Green Mortgage Making Home 'Greener'

In 2021, Hang Seng China reached an agreement with some green housing projects in the Yangtze River Delta and the Greater Bay Area, becoming the first foreign bank to offer green mortgage services. Through green mortgage, Hang Seng China provides differentiated preferential interest rates on local and foreign currency loans to customers who purchase such green homes through the agreement, aiming to encourage customers to establish a lifestyle of sustainable development and promote the overall green transformation of economic and social development.

4. Taking the Lead in Green Supply Chain Financing Service

To help Chinese supply chain enterprises cope with the impact of COVID-19 and climate change, Hang Seng China has increased its investment in supply chain finance, actively promoted the development of supply chain financing business, and become one of the first foreign banks to provide online green supply chain financing services. Also, Hang Seng China has continued to enrich the mode of 'supply chain finance + green finance', using the products and services of supply chain finance to increase financial support to green industries and green projects, and provide comprehensive online financing services for SMEs, thus providing support for the recovery of SMEs in the post-pandemic era.

5. Green Account, Green Deposit and Special Green Loan

Hang Seng China launched the first Green Account corporate financial service. Both

customers in green industries and corporate customers participating in green industry-related projects can open a green account and enjoy a waiver of specified service fees. As of December 31, 2021, nearly 20 enterprises from key green segments have participated in the pilot programme. Hang Seng China also launched the Green Deposit programme, under which the green deposits received will be invested in eligible environmental protection and other green projects in the form of loans, enabling enterprises to grasp the opportunity to invest in sustainable development. Meanwhile, Hang Seng China provided a special green loan to a subsidiary of some central enterprise group in support of 'environmental protection and solid waste control project' in local cities, to jointly promote green and sustainable development of urban environmental protection industry in China.

Project Impact & Sustainability

Based on the continuous innovation and practice of green financial products and services, Hang Seng China has formed green financial case models that can be referenced, replicated and promoted for the green transformation and development of different types of industries such as traditional industries, export-oriented enterprises, and new economies.

The successful implementation of the first Renminbi interest rate derivatives transaction with ESG clauses has a positive demonstration effect on bank-enterprise cooperation in exploring ESG-linked derivatives transactions. While helping enterprises manage exchange rate risks, Hang Seng China further reduces their financing costs and promotes sustainable development of enterprises.

Through the package of green financial products and services such as Green Accounts, Green Deposits, and Special Green Loans, Hang Seng China helps solve the financing difficulties encountered by traditional enterprises in the process of green transformation and development, provides enterprises with comprehensive solutions, and explores more possibility of green financial products such as cash and credit. While further reducing the capital and operating costs of enterprises, more enterprises are encouraged to actively invest in green transformation and development.

Expert Comment

Hang Seng China as the first foreign bank to close the first Renminbi interest rate derivatives transaction with ESG clauses in China, has joined the green and low-carbon development action community of the Yangtze River Delta ecological and green integration development demonstration zone, demonstrating the current status and development plan in implementing ESG concepts and fulfilling social responsibilities. In addition, Hang Seng China provides Green Accounts, Green Deposits, and Special Green Loans for enterprises to facilitate low-carbon transformation, and implements the concept of green finance into investment and financing behaviors, playing a leading role in the development of green finance for foreign banks.



Tianfeng Securities Helped Green Financing 27.2 Billion Renminbi Yuan in Three Years

Tianfeng Securities Co., Ltd.



Project Overview

In 2019, Tianfeng Securities helped enterprises issue green securities products for 7.2 billion Renminbi Yuan; in 2020, it helped issue green securities products for 9.3 billion Renminbi Yuan; and in 2021, it helped issue green securities products for 10.7 billion Renminbi Yuan, from which BYD, Changchun Rail Transit, National Energy, Linchuan City Development Investment and other units benefited.

Actively carry out green research. We donated funds to set up the International Institute of Green Finance of the Central University of Finance and Economics, and released dozens of green finance research reports such as "Green Finance Research Report Of China(2021)", China Climate Finance Report 2020, and Global Green Finance Development Index and Progress Report. In 2021, Tianfeng Securities released the securities industry's first "Double Carbon Action Initiative" "Action Plan" and the securities industry's first "Environmental Information Disclosure Report".

Actively promote green office. Tianfeng Securities focuses on its own energy saving and emission reduction, promoting video conferencing, reducing paper usage, implementing automated office system, and guiding employees to establish a sense of saving. The new office building, Tianfeng Building, was awarded LEED V4 Gold certification, the highest green building rating in the world.

Company Profile



Founded in March 2000, Tianfeng Securities Co., Ltd. is a global fully licensed integrated financial services provider headquartered in Wuhan, Hubei Province. On October 19, 2018, the company landed on the Shanghai Stock Exchange, stock code: 601162. The company has more than 100 branches and securities business offices in key regions and cities nationwide, and has a number of wholly-owned and holding tier-1 subsidiaries, including an overseas subsidiary, with approximately 3000 employees, and has been continuously rated by the China Securities Regulatory Commission as a Class A securities company since 2017.

Project Highlights

· As the first unit in the national securities industry to establish a green finance business unit, the director unit of the Green Finance Professional Committee of the China Finance Association and the director unit of the Green Securities Committee of the China Securities Association, we have formed a professional bond service team to assist new economic green environmental protection enterprises to develop direct financing, so that the real enterprises can obtain lower cost and more stable capital support.

· Awarded the Sina Finance Golden Responsibility Award, the Evergreen Award of Finance and Economics-Green Award for Sustainable Development, and the International Finance News Annual Responsibility Pioneer Award.

· In 2022, the International Institute of Green Finance (IIGF) together with STOXX, a global integrated index provider under Deutsche Borse, jointly developed the world's first index which using a localized index system in China - STOXX-IIGF China A-share ESG Index.

· Tianfeng Building was awarded LEED V4 Gold Certification.

Project Outcome

· Helped issue 7.2 billion Renminbi Yuan of green securities products in 2019; Helped issue 9.3 billion Renminbi Yuan of green securities products in 2020; Helped issue 10.7 billion Renminbi Yuan of green securities products in 2021.

· Published the first "Initiative to Promote "Carbon Peaks and Carbon Neutrality" in the national securities industry; published the first "Action Plan to Promote "Carbon Peaks and Carbon Neutrality" in the national securities industry; published the first "Environmental Information Disclosure Report (2016-2021)" in the national securities industry.

· Donated more than 40 million Renminbi Yuan to set up the national top green finance research center--International Institute of Green Finance of the Central University of Finance and Economics. Jointly with the International Institute of Green Finance of the Central University of Finance and Economics, we have published dozens of carbon neutral research reports, conducted in-depth research in new energy, energy conservation and environmental protection, electric power facilities and other industry fields, and formed influential high-quality investment research reports on green low-carbon industry enterprises.

Project Implementation

In 2019, Tianfeng Securities strictly followed the management norms such as "Code for the Management of Comprehensive Room County of Securities Firms" to create four layers of risk management organizational structure. A set of whole-process risk management mechanism has been established in all aspects of pre-investment assessment, investment decision and post-investment tracking.

Relying on professional operation, Tianfeng Securities has made green bonds and green ABS issuance as the leading business of green finance, with index and scale at the forefront of the industry, ranked fifth in underwriting labeled green bonds and green asset-backed securities in 2020.

Between 2019 and 2021, Tianfeng Securities helped to issue green securities products of 27.2 billion Renminbi Yuan, for instance:

On March 5, 2019, the Company assisted Liuzhou Bank Co., Ltd. in issuing the first issue of 2019 green financial bonds, which will be used entirely within one year for the green industry projects specified in the Green Bond Support Project Catalogue issued by the Green Finance Professional Committee of the China Finance Society.

On August 5, 2019, the Company, as the lead underwriter, assisted Chongqing Nanchuan District Urban Construction Capital (Group) Co., Ltd. to successfully issue "19 Nanchuan Urban Investment Green NPB", with an issue size of 1.08 billion, a bond term of 7 years and an issue interest rate of 7.80%. This bond issue is the first single non-public green bond issue for sponge city construction project in China. The business of Nanchuan City Investment covers urban infrastructure, water conservancy construction, land improvement reserve, education and health, water supply service, recreational property (service), public housing management and other fields.

On March 13, 2020, Tianfeng Securities assisted Qingxin Environment to issue the first green corporate bond of 2020, abbreviated as "20 Xinxin G1", with an issue size of RMB 800 million and a maturity of 3+2 years. The funds raised from the bond issue will be used for the issuer's main business - air treatment, which will help improve energy efficiency, reduce carbon emissions, strengthen industrial flue gas treatment and comprehensive industrial environment treatment, reduce air pollution and improve the ecological environment of the plant.

On May 7, 2020, Tianfeng Securities assisted Shaanxi Yushen Energy Development and Construction Group Co., Ltd. to issue green bonds "20 Yushen Green Bonds" with a total size of 1.2 billion Renminbi Yuan. The successful issuance of "20 Yushen Green Bond" marks the first single green bond in Yulin and is another major breakthrough in the financing of Yulin Economic and Technological Development Zone (Yushen Industrial Zone), which further improves the financing system of the Development Zone and provides strong financial support and guarantee for the infrastructure construction of the Development Zone. The successful issuance of this bond is a positive attempt of the enterprises in the development zone to engage in green finance, which injects "fresh water" for the green development of the economy of the development zone.

On June 17, 2020, the company assisted Public Security County Urban Construction Investment Co., Ltd. in Hubei Province to issue 800 million Renminbi Yuan green bonds "G20 Public Security 1", with a term of 7 years, raising 800 million Renminbi Yuan, mainly for the treatment of three major water systems in Public Security County, including Yangma Irrigation Canal, Zhongdai Canal and Wachi River, with a total length of 18400 meters. The issuance of this green bond will help actively implement the national policy on the Yangtze River protection. The project construction is based on the principle of combining prevention and control, treating both the symptoms and the root causes, and adopting a combination of biological and engineering measures to restore the water ecosystem and increase the water environment capacity in urban areas. At the same time, the project will vigorously carry out the greening of river and canal banks to create a green belt around the city. The construction of the project will effectively solve the shortcomings of people's livelihood and urban construction in Public Security County, guarantee urban safety, improve urban functions, inherit historical culture, highlight urban characteristics, enhance urban quality and improve the living environment.

On September 4, 2020, Tianfeng Securities assisted Chongqing Tongnan District Urban Construction Investment (Group) Co., Ltd. to issue 2020 non-public issue green corporate bonds with a scale of 1 billion Renminbi Yuan. The greening project and shoreline finishing, and restoration project of this green bond issue have positive benefits to slow down global warming, improve and protect the ecological environment quality of Tongnan District and enhance the water quality of Jialing River.

On July 14, 2021, "Tianfeng - Guoneng Leasing 2021 Phase 1 Green Asset-Backed Special Program (Specially for Carbon Neutral)" was successfully established by Tianfeng Securities with an issue size of 984 million Renminbi Yuan. The senior level of the special plan is divided into two types of senior A1 asset-backed securities and senior A2 asset-backed securities, both rated AAA. 70% of the funds raised from this product are intended to be used in the field of wind power generation, which will play a supportive role in environmental improvement, addressing climate change and saving and efficient utilization of resources.

On August 20, 2021, Tianfeng Securities underwrote the "2021 Jilin Changchun City Rail Transit Group Co., Ltd. Green Bond (Phase I)", which is the first green corporate bond in Northeast China and provides a new model for the capital market to serve the national strategy by helping the construction of green low-carbon transportation with financial innovation.

Tianfeng Securities implements dedicated account management for all green bond projects, continuously tracks and monitors the investment of fund-raising, and regularly discloses the operation of the projects and the use of funds to investors every year. Each use of fund-raising funds must be supported by corresponding evidence to ensure the compliant use of funds.

Project Impact & Sustainability

Since 2019, Tianfeng Securities has provided services for the strategic layout, business development and industrial upgrading of green enterprises through green bonds, green industry funds, green industry equity financing and investment in environmental protection enterprises. We have created several "firsts" in China and global green bond market, guiding enterprises (especially traditional enterprises) to reduce the supply of overcapacity and resource-consuming and environmentally polluting capacity, and increase the effective supply of medium-and high-end, green, innovative and efficient products, so as to achieve transformation and upgrading and continuously improve competitiveness.

In the future, Tianfeng Securities will pay close attention to the trend and structural changes of the green transformation of the real economy, increase financing support for private enterprises and help them to finance their development through not limited to green bond issuance. Green bond issuance can be propagated and practiced in industry sectors with a high component of private enterprises, such as new energy vehicles, green service industry, green agriculture, etc. At the same time, innovation will also be carried out in terms of issuer diversification and types of securities varieties, such as issuing special green bonds in the new energy vehicle industry and photovoltaic industry where private enterprises have certain advantages; designing high-yield bonds or convertible bonds that meet the characteristics of small volume, low rating, high technological innovation component and high endogenous growth rate of private enterprises; increasing the development of listed companies of private enterprises, etc., and physically increasing private enterprises moderately Green bonds are held and traded.

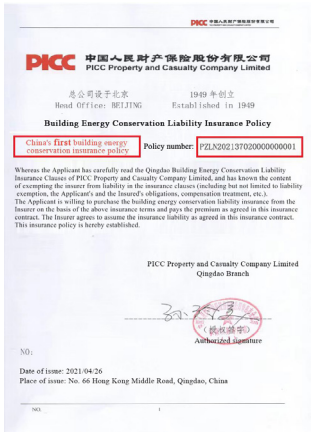
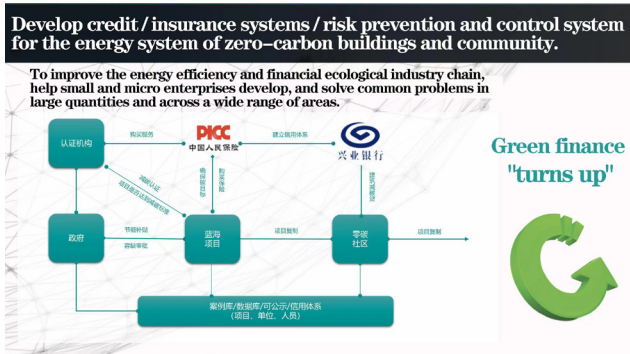
The International Institute of Green Finance (IIGF) of Central University of Finance and Economics (CUFE), established with donations, has published 28 monographs and 1557 IIGF opinion articles from 2019 to 2021, which have been adopted and quoted by relevant government departments, financial institutions, and media, to continuously promote the development of green finance in China and cooperation between Chinese and foreign green finance.

Expert Comment

As the first securities brokerage in China to set up a green finance division, TF Securities co-founded the International Research Institute of Green Finance with Central University of Finance and Economics, which is the first research institute in China established for promoting green finance and perfectly leverages TF Securities' strengths in offering a full package of financial services and the research prowess of the partner university. The endeavor has trained a team of elite researchers in green finance who have produced peer-leading research results, serving as an academic benchmark for the green-focused capital market players. Additionally, the firm finances businesses for their transformation efforts through the issuance of an assortment of green bonds, potentially having fostered green growth for the businesses benefited.

"Carbon Reduction Insurance" to Construct an Energy-Saving and Carbon Reduction Insurance System on the Energy-Consumption Side

Qingdao Lixinda Energy Service Co., Ltd.



Project Overview

On April 26, 2021, PICC P&C Qingdao Branch and Qingdao Lixinda Energy Service Co., Ltd. signed the country's first "carbon reduction insurance" building energy conservation liability insurance policy, providing a three-year energy-saving indicator risk guarantee of cumulatively 3 million Renminbi Yuan, namely, 1 million Renminbi Yuan per year for the operation period of the energy-saving renovation project of Qingdao Blue Ocean Hotel (Huangdao). The "carbon reduction insurance" is insured by the energy conservation service enterprise for the energy-saving renovation project. After the project is insured, the insurance company will be responsible for organizing a third-party risk control service agency to supervise the whole process of the renovation project, and conduct real-time monitoring of the energy-saving indicators of the insured project through scientific and technological means during the operation period. If the project fails to meet the agreed energy-saving indicators during the operation period, the insurance company shall compensate the energy-saving renovation cost of the project according to the insurance contract, or make economic compensation for the excessive energy consumption. And the insurance company will bear the appraisal fees and legal fees that should be paid by the insured due to the insured accident. Through insurance, the project not only solves the problem of capital shortage in energy-saving renovation of buildings, but also improves the owners' willingness to renovate, increases the credibility of the third party and eliminates the owners' concerns.

Company Profile



Qingdao Lixinda Energy Service Co., Ltd. is a professional building energy service provider, providing energy management services including HVAC electromechanical system design optimization, system commissioning, energy management platform construction, energy audit, and energy-saving renovation, operation and maintenance. It has provided HVAC system commissioning and energy-saving renovation services for many large buildings such as the Zero Carbon Community of Qingdao Olympic Sailing Center, Qingdao new airport and Sino-German Ecological Park, serving millions of square meters of public buildings in total. In terms of scientific research, we have carried out international cooperation projects at provincial-and-ministerial level and provincial science and technology projects with the United Nations Development Programme, the Energy Foundation, the Science and Technology and Industrialization Development Center of the Ministry of Housing and Urban-Rural Development, Tsinghua University, the Chinese Academy of Building Research, etc..

Project Highlights

In order to solve the practical difficulties in the energy-saving renovation project, Qingdao Lixinda Energy Service Co., Ltd. proposed requirements to PICC P&C Qingdao Branch, and put forward insurance design ideas, energy saving verification scheme, and built a platform to collect data, so as to facilitate the insurance company's supervision and credibility. "Carbon reduction insurance" provides an innovative credit enhancement mechanism for building energy-saving renovation projects, solves the problem of high investment in the initial stage of renovation, enables the project to better obtain support from government policies and financial resources, ensures that owners and service institutions can continue to benefit from long-term cooperation through third-party supervision, and provides a third-party endorsement and credit enhancement way for energy conservation service institutions. Besides, It provides reliable basis and reference for the owner to carry out renovation work and select technical units. Meanwhile, there are many small and medium-sized energy-saving service enterprises with high technology level in the current market, which need the support of the third party to improve their credit system. The "carbon reduction insurance" green insurance project can provide a breakthrough for their business development.

Project Outcome

- The annual carbon reduction is expected to reach 542.62 tons after the completion of the project.
- Saving 1 million Renminbi Yuan of operation cost annually.
- The energy conservation rate of the project is 21.1%.
- Saving standard coal 440.7 tce/year.

Project Implementation

Huangdao Blue Ocean Hotel is located at No. 66 Changjiang West Road, Economic and Technological Development Zone, Qingdao City. It is a comprehensive building integrating leisure, catering and accommodation with a total floor area of 38000 square meters, 11 floors above the ground, 1 floor underground and 3 floors of podium. It was completed and opened in 2003. With adopting centralized cooling and heating, the hotel set up two gas steam boilers of 1.7T/1.0T to respectively serve the hot water heat exchange system, kitchen steam car system, SPA and laundry.

The energy saving conservation potential of existing systems - very universal

The equipment has been used for a long time, so the efficiency decreases, and the energy consumption is high. The boiler efficiency is only 77%.

Using steam to produce domestic hot water has more energy conversion links, more heat loss and higher production cost.

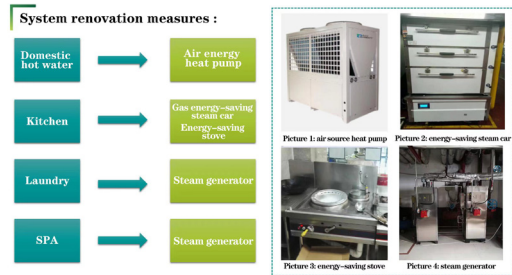
The steamer is far away from the boiler room, and the steam is transported through the pipes, increasing the energy consumption of transportation.

The gas is increasingly in shortage and the price rises.

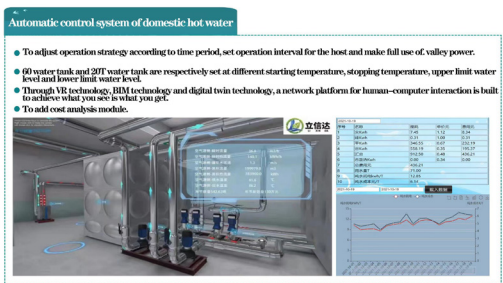
As a pressure vessel, the boiler has potential safety risk and needs maintenance every year.

The awareness of environmental protection has been strengthened, and the boiler needs to meet the requirements of environmental protection, increasing the maintenance cost.

The renovation has been completed including: changing the steam boiler to air source water heater combined with municipal heating system to supply domestic hot water, kitchen steam car to gas vehicle, and fierce fire stove to an automatic induction energy-saving stove. Meanwhile, SPA and laundry room have been installed with small steam generators nearby.



At the same time, the energy consumption monitoring platform and domestic hot water control system are also built for the project to monitor the energy consumption data of the system in real time, optimize the operation strategy, and ensure the long-term effectiveness of energy conservation.



The "carbon reduction insurance" is insured by energy conservation service enterprises for energy conservation renovation projects. After underwriting, the insurance company shall be responsible for organizing a third-party risk control service organization to supervise the whole process of the renovation project, audit the energy consumption of the project at the initial stage, and verify the energy conservation of the project after renovation completion. During the operation period, the energy consumption monitoring platform will monitor the index data (such as the cost of unit domestic hot water) measuring the energy conservation effect of the project in real time. If the project fails to meet the predetermined energy conservation index during operation period, the insurance company will be responsible for compensating the energy conservation renovation cost of the project, or make economic compensation for the excessive energy consumption.

Industrial Bank Qingdao Branch, based on the insurance company's supervision and risk protection of the whole process of energy conservation renovation of the project, has customized a credit loan service plan with the same amount as the insurance policy for enterprises by taking "carbon reduction insurance" as the credit method, which is specially used for the continuous energy conservation renovation of buildings.

"Carbon reduction insurance" provides energy conservation guarantee for building owners and increases their willingness to renovate. At the same time, it has increased the enterprise credit for the implementing units. In the later stage, combined with the green credit loan "building carbon reduction loan", it can solve the shortage of funds for energy contract management companies and help rapidly expand project implementation. In addition, the carbon conservation amount of carbon reduction insurance can be guaranteed, and this also provides a credit guarantee for carbon trading in the later period.

Project Impact & Sustainability

This case verifies that "carbon reduction insurance" can provide energy conservation guarantee for owners and enhance their willingness to save energy and reduce carbon. At the same time, it can also increase the credit of energy conservation service enterprises, solve the problem of project fund shortage, and speed up the replication of demonstration projects in combination with green credit. In May 2022, the country's first energy conservation insurance policy for public institution buildings was also issued. After underwriting hotel buildings, this is an active exploration of "carbon reduction insurance" in the field of public buildings. At the same time, green building insurance has also been introduced in the field of new buildings.

Meanwhile, on August 10, 2022, the Ministry of Ecology and Environment, the National Development and Reform Commission and other nine ministries and commissions jointly issued the Notice on the Announcement of the Pilot List of Climate Investment and Financing, which mentioned that insurance is also an important force in climate investment and financing, and carbon reduction insurance provides a new path for the development of that. Carbon reduction insurance provides a data basis for carbon emission verification through the third-party energy-saving audit and energy consumption platform data. At the same time, the occurrence of insurance policy can also provide a certain corporate credit guarantee for the operation of the national carbon trading market, which has great promotion significance.

Expert Comment

As China's first project to be covered under the 'Carbon Reduction Insurance' building energy efficiency liability insurance policy, it aims to alleviate the cashflow headwinds businesses are braced for amid the energy reform and endorses the reliability of energy-saving retrofits. Through a partnership with insurers, Lixinda (Qingdao) provides customers with energy conserving services with regulatory safeguards via the innovative green insurance as a credit-boosting avenue, prompting its customers to be more willing to carry out energy-efficient retrofits. The project has blazed open a new path for enhancing the credibility of enterprises, which can potentially be rolled out and implemented in parallel with such mechanisms as green lending to further mitigate the financing pressure of energy-saving-minded businesses.



OABC: Zero Carbon Practice of Organic Food

Organic and Beyond Corporation

Project Overview

In 2019, OABC (Organic and Beyond Corporation) began to explore greenhouse gas (GHG) reduction measures based on the life cycle approach (LCA), from raw material production, raw material transportation, product processing and manufacturing, product transportation, to product distribution. We hope to provide stakeholders with examples of carbon neutral practices of small food and agriculture enterprises.

Firstly, in the raw material production, we adopt organic production methods which use no chemical fertilizers and pesticides, avoiding the use of fossil fuels to reduce GHG emissions; secondly, the product adopts environmental-friendly packaging by avoiding plastic lamination. we upgrade part of the packaging to a mixture of bagasse and recycled pulp which can be degraded in the soil in the short term or used for composting.

After achieving GHG reduction in raw material production and packaging, we evaluate the carbon footprint of 32 kinds of products from September 2021 to September 2022 from "cradle to gate" and purchase carbon credits from China's Certified Emission Reduction (CCER) program to offset the remaining emissions: 2029 tons of carbon dioxide equivalent, thus achieving carbon neutrality for 32 kinds of products.

Currently, the GHG emission data of OABC traditional holiday food products and some Global Farm products have been presented to consumers in the form of "small footprints" on the packaging and online product information to help them understand the GHG emissions in the food supply chain and assist them in their purchasing decisions. In addition, OABC has introduced zero-carbon gift packs in its product portfolio and launched the "carbon coins" function on WeChat Mall, so that the GHG reduction value of each organic food product can be shared through the sharing of food.



Company Profile



OABC, founded in 2007, is an organic food company.

We have established farms around the world for organic production practices under the guidance of OABC Food Standards, sharing high-quality regional food through OABC gift cards. From organic to zero carbon, we invest in taste.

As a Global Growth Enterprise Member of the World Economic Forum and a global partner of IFOAM-Organics International (IFOAM-OI), we actively practice corporate social responsibility and promote the development of China organic industry. We are the "Food" representative of World Wide Fund (WWF)'s Earth Hour in 2016 and are co-branding with WWF to work together on the spread of sustainable values. In 2012, OABC Cavell Dark Chocolate offset GHG emissions with reforestation projects in San Martin, Peru and the Amazon, and in 2019, OABC Organic Beef offset GHG emissions from its operations with the Mytrah Wind project in India.

Project Highlights

· The Beijing Municipal Government encourages the development of green and sustainable agricultural production methods. OABC organic farm in Shunyi, which has been certified organic for seven consecutive years and adheres to low-carbon sustainable production methods, received a subsidized government award of 1 million Renminbi Yuan in 2022.

· In 2022, OABC was selected for the "Corporate Biodiversity Conservation Guidebook" case collection (internal review) initiated by Business for Nature (BFN) to share the value of organic business practices for biodiversity conservation.

· At the 2021 Zero Carbon Mission International Climate Summit, OABC organic food was designated as the Zero Carbon Organic Food of the conference to show the carbon reduction potential of the consumption side of the agri-food industry.

Project Outcome

·The GHG emission data of 32 kinds of products were collected, offsetting a total of 2029 tons of CO₂e emissions.

In the process of achieving carbon neutrality of OABC products, we collected the GHG emission data of 32 kinds of products (including cotton fabrics) from the production of raw materials to the distribution of products in one year, enriched the emission database of organic products, purchased China Certified Emission Reduction (CCER) project and offset a total of 2029 tons of CO₂ equivalent. It is equivalent to the annual CO₂ absorption volume of 92227 mature trees.

· New packaging reduces GHG emissions by 11.7%.

In 2022, OABC organic mooncake packaging was partially upgraded from tung wood to 80% bagasse mixed with 20% recycled paper pulp - improving resource efficiency and reducing GHG emissions by 11.7%*.

(Wooden boxes emit 38.36g of GHG per serving, while bagasse boxes emit an average of 33.86g of GHG per serving).

· Report released to explain the potential and value of carbon neutrality in agriculture.

Industry report Organic Agriculture under Carbon Neutrality, prepared by OABC Organic Agriculture Technology Center, combines years of experience from organic industry practice and composes the latest research results under the global vision of carbon neutrality. It presents stakeholders with information on the current status of climate change, the development of domestic organic agriculture, as well as the relationship between carbon neutrality and organic agriculture, and green financial investment opportunities, as an important basis for OABC business operation.

· Exchange and spread of ideas and values.

We have held more than ten seminars under the topic: Sustainable Development under Carbon Neutral, communicated with more than 40 industry experts and organizations, and spread ideas, values and actions of companies and individuals in promoting carbon neutrality and sustainable development, reaching more than 2000 enterprises and more than 100000 WeChat subscription account users.

*Carbon footprint evaluation supported by Carbonstop



Project Implementation

First and foremost, organic agriculture can effectively reduce GHG emissions and be more friendly to the ecology and animals, and the production and consumption of organic food will also promote sustainable development of society and the environment.

From the perspective of the product life cycle, firstly in the production stage: organic agriculture itself is low carbon agriculture, which can maintain soil, ecosystem, and human health.

1. OABC foods are sourced from organic certified farms from domestic and abroad, using ecological farming methods to cultivate and fertilize the ground. According to the United Nations Intergovernmental Panel on Climate Change (IPCC) recommendations, 89% of agriculture GHG reduction potential lies in increasing soil carbon sequestration levels. Compared to conventional farmland, soil carbon sequestration per unit area is at least double under organic farming models.

2. Organic farming eliminates the use of chemical fertilizers and pesticides. The use of organic fertilizers instead of chemical fertilizers reduces nitrous oxide emissions and also avoids the use of coal from the production of fertilizers (coal is both a fuel and a raw material for fertilizer production). An assessment by the French think tank IDDRI states that the transition to organic and other sustainable forms of agriculture in Europe could reduce pesticides by 380000 tons per year, resulting in a 47% reduction in GHG emissions from European agriculture.

Secondly, in the packaging phase, OABC is actively experimenting with sustainable materials such as bagasse and recycled paper pulp to reduce the use of plastic packaging.

In 2022, the packaging of OABC organic mooncakes was upgraded with a new material of 80% bagasse mixed with 20% waste recycled pulp. This packaging update reduced GHG emissions by 11.7% based on the recycling of resources.

Based on the organic production and packaging stage emission reduction, we evaluate the carbon footprint of products from raw material production to product distribution stage based on life cycle approach and purchase the equivalent amount of China Certified Emission Reduction (CCER) to offset the remaining GHG emissions and support clean energy projects. OABC product GHG emissions are accounted for according to ISO 14067 and PAS 2050, using the emission factor method.

By working with Carbonstop to account for GHG emissions from the "cradle to gate" of products, and by accurately quantifying, tracking, and accounting, OABC discloses

emissions data for its business partners and end consumers to assist them in making purchasing decisions. These data will also serve as the basis for reducing the "cradle to gate" GHG emissions of OABC products in the future, so that effective GHG reduction programs can be developed to accelerate the achievement of OABC carbon neutrality goals.

Project Impact & Sustainability

In August 2021, in the presence of the Consul General of Colombia in Shanghai, OABC signed the Colombian Organic Coffee Farming Initiative: the sustainable coffee "OABC Cavell Coffee" will promote the shift from conventional coffee farming to organic coffee farming in Colombia.

In August 2022, OABC and Carbonstop signed the "Responsible Production and Consumption" joint initiative to promote "zero carbon organic food" and provide healthy, moderate and sustainable consumption options for corporate customers and individuals.

By disclosing the GHG emissions data of our products on packaging, we share the value of sustainable food systems to reduce GHG emissions and support more people in practicing sustainable production and consumption.

OABC's business innovation in the segment of production, packaging, transportation, and sales provides a sample of carbon neutral practice in the domestic organic food industry, and a reference of emission reduction in the agri-food system for the achievement of the national carbon neutrality goal.

Expert Comment

Organic and Beyond tailored emission reducing measures to its operations on the basis of carbon accounting throughout the lifecycle of its products, adopting organic ingredient production, eco-packaging and resource recycling, among others. It also purchases compliant carbon credit to offset the remaining emissions to achieve net zero for 32 categories of its offerings. Leaner food and produce makers stand to gain from reproducing the company's carbon accounting method and process, emission-reducing measures and dissemination approaches, which have served as a sounding board for viable solutions to net-zero agribusiness and rural revitalization.

Creating a Green Ecosystem and Promoting Carbon-Zero Growth of the Dairy Industry

Mengniu Dairy (Group) Limited



Project Overview

As a leading dairy company in China, Mengniu upholds the resolute belief that a healthy natural environment is integral to the health of mankind. Guided by its philosophy of "promise a healthier world", the company has set forth the strategic goal of "carbon peaking by 2030 and net zero by 2050" under its "GREEN Strategy" framework, embarking on the journey where Mengniu will lead industrial-chain-wide market players to advance towards a carbon-neutral future.

The company has been committed to late to establishing an environmentally friendly green production and operation system, and has never ceased to pursue new pathways in terms of smart manufacturing, application of carbon reduction technologies, and optimized energy structure, yielding remarkable results in carbon emission reduction across its operations. Mengniu is furthermore committed to building a responsible supply chain, exploring eco-friendly agribusiness practices and innovative low-carbon pastures, managing the carbon footprint of its suppliers, rolling out eco-friendly packaging, pushing for energy saving and carbon reduction up and down the value chain, with a view to leading China's dairy industry towards a "net zero" era and contributing towards China attaining the "dual-carbon" goals laid down by the state government.

Company Profile



Mengniu Dairy (Group) Limited is a specialist dairy producer ranked among the top 10 in the global dairy industry. Founded in 1999 and headquartered in Hohhot, Inner Mongolia Autonomous Region of China, the company became a Hong Kong-listed entity in 2004 and is a constituent of the Hang Seng Corporate Sustainability Index ("HSSUS") in the Hang Seng Corporate Sustainability Index Series, maintaining its status as a core constituent stock of the Hang Seng Corporate Sustainability Benchmark Index in 2021.

In alignment with the United Nations' Sustainable Development Goals (SDGs), the company has progressively improved its corporate sustainability system, formulating an ESG strategy encompassing environment, society and governance - the "Green Strategy", which covers 15 topics under such five sectors as governance-sustainability, responsibility-common prosperity, environment-carbon net-zero, ecosystem-collaborative&accountable, and nutrition-supreme&inclusive. 28 ESG initiatives in total have been devised.

Project Highlights

Mengniu practices "GREEN strategies" by building smart energy systems, developing energy-saving technologies, applying advanced energy management systems and utilizing green renewable energy, yielding visible accomplishments in terms of carbon reduction. As a business entity keenly aware of its corporate social responsibility, Mengniu is focused on addressing the environmental impact up and down the value chain and fosters carbon reduction practices by players operating on the cattle raising, procurement and product side.

· Received the second prize of the National Science and Technology Progress Award from the National Science and Technology Award Committee

· MSCI ESG rating rose to A

· The Hang Seng Corporate Sustainability Index(HSSUS) core component increased its score to A+

· Shortlisted as a "Carbon Neutral Case" in the 2nd Green Economic Development Forum

Project Outcome

Emission reduction outcome across proprietary operations:

· Efficiency boost from intelligent manufacturing, reducing about 30000 tonnes of CO₂e missions p.a. at the production end;

· Application of new energy-saving and carbon-reducing technologies is promoted, with 168 energy- and water-saving technologies and 4 new energy-saving and carbon-reducing technologies developed, and 56 energy-saving retrofits completed;

· Use of renewable energy ramped up, reducing 80000 tonnes of carbon dioxide emissions per annum.

Up- and downstream emission lowering achievements in the company's value chain:

· 2% increase in feed conversion efficiency of Modern Dairy in 2021 compared to 2020, which will reduce ~3% of enteric fermentation emissions and ~6.5% of manure management emissions, for a total emission reduction of ~53000 t CO₂e;

· In terms of biogas power generation and heating on the cattle raising side, there is a reduction in carbon emissions by approx. 50000 tonnes p.a. compared to purchase electricity and heat;

· It facilitated the co-development of a 6 MW distributed photovoltaic power plant by Hefei Farm with a third-party partner, helping the farm to generate 6136 MWh of solar power in 2021;

· Mengniu joined forces with raw milk supplier China Shengmu to carry out carbon sequestration in forests, grassland and farmland, yielding 1.11 million tonnes of carbon sequestration in aggregate;

· Mengniu has realized the recycling of plastic packaging for the first time in the domestic food industry, reducing carbon dioxide emissions by about 300 tonnes per year.

· Mengniu has substituted eco-friendly PP turnover boxes for conventional ones across all its retail terminals, with individual PP boxes registering 57.50% less carbon footprint relative to regular corrugated cartons.

Project Implementation

Guided by its sustainable development strategies, Mengniu implements low carbon and emission reduction initiatives across its own operations and the wider value chain.

1. Corporate operations-wide key emission reduction initiatives:

· Intelligent manufacturing facilitates efficiency boost

A smart energy system is developed to inform the group's energy conservation efforts through an information, intelligence and automation-based approach under a three-tiered (group head office, business division, plant) management model, saving 55 million kWh of electricity and reducing carbon dioxide emissions by about 30000 tonnes per year.

· Boost energy utilization efficiency

Leading international management standards are used as a benchmark to roll out the ISO50001 energy management certification across all proprietary factories; two crucial emission reduction initiatives, "comprehensive utilization of waste heat" and "equipment renewal technology", could save 790 million kWh of fossil energy and reduce carbon emissions by 461500 tonnes per year.

· Optimize energy structure

Built and operating solar photovoltaic power plants with an installed capacity of 15 MW, generating 8698000 kWh of electricity annually; biogas and combustible biomass pellets generated from anaerobic wastewater plants are used as boiler combustion medium to produce steam in lieu of natural gas for production needs, producing approx. 290000 tonnes of steam annually; utilization of renewable energy is ramped up to reduce CO₂ emissions by 80000 tonnes per year.

2. Key emission-mitigating initiatives across the company's value chain:

Cattle raising side

· Years-long production-boosting efforts

Carbon reduction is incorporated throughout efforts to lower carbon emissions in the production of raw milk and across the operation chain, creating a green low-carbon ecosystem powered by the dual drivers of "carbon reduction [in breeding and feeding]" and "carbon sequestration in agriculture, forestry and grass"; bioavailability of raw milk is bolstered through sound feeding management and breeding, and the feed conversion efficiency increased by 2% year-on-year in 2021 by improving the quality of roughage and increasing the proportion of concentrate feed;

· Manure recycling and reuse

The ranches are encouraged to install automatic manure scraping systems and medium-temperature anaerobic manure fermentation system from the get-go. The systems, when operating for manure management and energy utilization purposes, register carbon emissions by over 40% lower than those of the vast majority similar systems; in terms of biogas utilization, there is a reduction in carbon emissions from biomass electricity and heating by approx. 50000 tonnes p.a. compared to purchased electricity and heat.

· Energy saving and emission reduction in pastures and energy structure overhaul

The cattle raising arm of the company commenced their carbon reduction efforts in 2022 from boiler replacement, water-saving retrofit, clean energy, and other dimensions, completing 80 initiatives in the six months to June, with an expected carbon reduction of 86000 tonnes; 67 initiatives are earmarked for the back half of the year, potentially lowering carbon emissions by another 80000 tonnes.

· Carbon sequestration through desert tree planting

Mengniu joined forces with raw milk supplier China, Shengmu to carry out carbon sequestration in forests, grassland and farmland, yielding 1.11 million tonnes of carbon sequestration in aggregate;

Mengniu teamed up with raw milk supplier Modern Dairy to promote carbon sequestration by planting trees on unused land in the pasture to bolster the company's forest carbon sink capacity. Their tree-planting efforts covered an area of 2604 mu in 2021, with an annual carbon sequestration capacity of 2600 tonnes. The tree-planting is expected to be an ongoing initiative in response to calls to counter climate change.

Procurement side

The company joined the SEDEX responsible business platform to carry out supplier ESG management and carbon management, started collecting carbon data from strategic suppliers of the raw and auxiliary packaging materials, and empowered them through carbon management training sessions.

Product side

A green/low-carbon new launch named "Low-Carbon Youyi C", with more recyclable packaging that complies with the CGF's Golden Design Principle, reducing the product's carbon footprint; the new launch became one of the first of such products to be included in Taobao's 88 Carbon Account for low-carbon-related interaction with consumers;

Mengniu made the food industry first to recycle plastic packaging by fully applying PCR (recycled material content of 13% to 24%) as the outer packaging film of its products, reducing CO₂ emissions by about 300 tonnes per year.

Mengniu has substituted eco-friendly PP shipping boxes for conventional ones across all of its retail terminals, with individual PP boxes registering 57.50% less carbon footprint relative to regular corrugated cartons. The move enables the company to reduce its use of paper-based shipping boxes by 670 million p.a., equivalent to a reduction in raw paper use of 103000 tonnes, which is projected to lower carbon dioxide emissions by around 80000 tonnes per year.

Project Impact & Sustainability

In 2021, Mengniu Group set forth the strategic objective of "carbon peaking by 2030 and net zero by 2050" and rolled out a series of initiatives—greenhouse gas management, water resource management and recycling of packaging materials—in an ongoing quest for action plans to address climate change. The company teamed up with players operating throughout the industrial chain to fulfil their corporate social responsibility in eco-preservation, fostering industrial chain-wide synergy in advancing the low-carbon causes. The company has laid out its 2025 low-carbon growth plans, setting out peer-beating targets on the aggregate and intensity of carbon emissions and 179 itemized tasks to be rolled out thereunder. A host of Mengniu-affiliated dairy producers—China Shengmu and Modern Dairy—have acted to pursue technological options for reducing carbon emissions and thus far have finalized their carbon audit, target setting and strategic planning in this respect, leading their peers in China's dairy sector in the path of carbon reduction.

Expert Comment

A dairy product powerhouse, Mengniu Group is one of the first movers in China's dairy sector to aspire for the "carbon peaking by 2030 and net zero by 2050" objectives, manifesting its strong awareness for corporate social responsibility.

NetEase Yanxuan Green Packaging Initiative: the Yanxuan Sustainability Plan

NetEase (Hangzhou) Network Co., Ltd. Mengniu Dairy (Group) Limited



Project Overview

NetEase Yanxuan is a leading private label consumer lifestyle brand in China provided by NetEase, Inc. As part of the Company's efforts toward a low-carbon future, Yanxuan launched a dedicated campaign to increase the sustainability of its packaging, warehousing and logistics, beginning in May 2021.

The Plan aims to develop lighter and more eco-friendly packaging material by leveraging digital technology. By the end of 2021, over 50% of Yanxuan's online orders were packaged with environment-friendly materials, reaching out to more than 6 million consumers and cutting the equivalent of 3879 tons of carbon dioxide.

The Yanxuan Sustainability Plan focuses on two areas: emission reduction through cooperative efforts with suppliers; as well as promoting technological innovation and application among its operations:

·Cooperative efforts in emissions reduction: engage with suppliers that are committed to the same vision for providing low-carbon packaging material; packaging material suppliers of the same tier are prioritized if they have carried out low-carbon practices;

·Technological innovation and application: work on developing lighter and more eco-friendly packaging material by leveraging digital technology. By the end of 2021, we: ①promoted light-weight packaging, including thinning plastic bags and narrowing packing tapes to reduce the use of packing consumables; ②devised a digital scheme for carbon reduction. This includes a packaging recommender system and a product-labeling and order-splitting solution, so that labeled products can be shipped with the original manufacturer's packaging; ③developed a recycling program to promote the use of fully recyclable bubble wraps, reuse of boxes in B2B scenarios and recovery of used cartons; ④adopted degradable materials for package bags, bubble wraps and cellular paper bags.

Project Highlights

Our digital scheme for carbon reduction offers an optimal packaging solution for matching over 20000 products with more than 40 types of packaging materials, raising the space utilization rate of packages by around 13%.

This scheme has obtained three patents:

Method, Device, Medium and Computing Equipment for Determining Container

Method, Device, Electronic Equipment and Storage Medium for Handling Purchase Orders

A Method, Equipment and Computer Program Product for Evaluating Packaging Recommender Algorithm

Company Profile



As a leading internet technology company based in China, NetEase, Inc. (NASDAQ: NTESE and HKEX:9999, "NetEase") provides premium online services centered around content creation.

As the private label consumer lifestyle brand launched in April 2016, Yanxuan is dedicated to helping consumers build a quality, yet affordable, life by providing select daily life products and services. Yanxuan establishes close partnerships with select manufacturers in China to design and manufacture products based on consumer needs and sell them directly to customers. The entire production is under our supervision. This innovative business model has ushered in fresh ideas for the e-commerce industry and demonstrated great social value in China.

Project Outcome

Use of carbon-neutral cartons: Our carton suppliers have reduced carbon emissions during production. The emissions are assessed by SGS, a global leader in the certification of greenhouse gas emissions, before being offset and neutralized by the carbon sink projects purchased from Shanghai Environment and Energy Exchange. From its debut in May 2021 to the end of the year, about 4.08 million carbon-neutral cartons were put into use, which is estimated to reduce carbon dioxide emissions by 128 metric tons per year, equivalent to planting a forest of over 9200 square meters. In addition, Yanxuan produced about 1.13 million more CGP-certified (China Green Product) cartons from October 2021 through December 2021.

Technological breakthrough: Yanxuan thinned package bags from 65µm to 50µm and narrowed packing tapes without degrading robustness and introduced 5000 reusable boxes, which greatly reduces waste and can simultaneously save more than 1 million Renminbi Yuan annually.

Optimizing utilization with packaging recommender system: With this system, Yanxuan saw its utilization rate in packaging volume increase by 13%, which is expected to save about 246400 m2 of cardboard annually, the equivalent of 147 metric tons of raw paper, and at least 18 million plastic inflatable pillows each year.

Adoption of recyclable single-material bubble wraps: All the 1.255 million bubble wraps are fully recyclable, which could save about RMB 30400.

According to China Environmental United Certification Center, these actions have eliminated the equivalent of 3879 metric tons of carbon dioxide in 2021.

Project Implementation

Cooperative efforts to reduce emissions: Shouldering social responsibilities with selected suppliers

1. Use of "carbon-neutral" cartons: Use cartons that achieve "zero carbon emissions" during production. A "Carbon Neutral" logo is printed on the cartons in an effort to raise consumers' environmental awareness, thereby engaging more people in promoting carbon neutrality.

2. Use of CGP-accredited cartons: Part of the cartons have been accredited by China's State Administration for Market Regulation and State Post Bureau for compliance with the Certification Rules for Green Delivery Packaging and the Technical Requirements for Evaluating Green Delivery Packaging.



Technological innovation and application

1. Adopting degradable materials:

(1)The degradable package bags are made of PBAT, PLA and ST, which are raw materials of biodegradable plastic products recognized by the Chinese government. The bag, if buried in soil or composted in microbial environment, will degrade into carbon dioxide and water in three to six months, which can then be used as organic fertilizer; (2)The degradable bubble wraps are made of kraft paper, PBAT, PLA and ST. The bubbles are made of the same materials as degradable package bags (i.e., PBAT, PLA and ST). Covered by brown paper, the wholly degradable wrap offers equivalent buffering performance to conventional wraps; (3)The cellular paper bags are made of kraft paper. They are fully recyclable while showing excellent shock-absorbing performance.



2. Developing a recycling program:

(1)All cartons used in trans-shipment warehouses are recycled or reused; (2)Encourage the reuse of cartons for B2B merchandise transportation. Introduced polypropylene boxes to fast-circulating products. The box can be reused over 50 times and its raw materials are 100% recyclable. In doing so, more natural resources can be conserved, making our packaging more sustainable. Additionally, the overall cost has dropped by 15% to 30% compared with that of traditional packaging materials; (3)Compared with traditional bubble wraps that are the compound of BOPP and PE, the wraps are made of pure polyethylene, which facilitates recycling and subsequent pelletizing.



3. Digital scheme for carbon reduction:

(1)Develop a product-labeling and bill-splitting solution. For shipments with multiple items, some items are labeled in the package recommender system so that they can be shipped with the original manufacturer's packaging. This effectively avoids repetitive packaging, which reduces carton waste;(2)Launch the intelligent packaging recommender system. It matches the most suitable box with each shipment to minimize space waste and use of air pillow. The proprietary algorithm enables a fold-and-pack method for flexible items and tilted placement, ensuring accurate packaging recommendations are generated for special-shaped products.

4. Light-weight packaging:

(1)The thinned package bags from 65µm to 50µm without degrading robustness to cut the use of plastics; (2)The narrowed packing tape from 48mm to 45mm, saving the equivalent of 30000 rolls of tape per year. In addition to lowering cost by 8%, produce less waste.



Project Impact & Sustainability

Impact on the Industry:

·On October 14, 2021, Yanxuan delivered a keynote speech at the 2021 International Packaging Innovation Forum (IPF) in China to share our green packaging system and philosophy with audience from government, colleges and enterprises.

·Yanxuan's packaging recommender system presented at the forum was highly received as an industry practice for potential business partnerships.

·Yanxuan has set a good example for industry peers in cooperative emissions reduction, and technological innovation and application. These efforts have injected great momentum into a more sustainable e-commerce industry and supply chain.

·Through a livestream co-hosted with local market regulators, Yanxuan introduced more sustainable packaging best practices to other tech companies in the Binjiang District of Hangzhou, Zhejiang Province, driving them to join in on our journey towards a more sustainable way of packaging.

Outlook:

1. Establish a preliminary partnership with the Circular Economy Research Center of Tsinghua University to jointly formulate initiatives on green packaging for the express industry.

2. Plan to introduce a system (or improving the current one) to calculate Yanxuan's overall carbon emissions and record our contributions to carbon emission reduction in a more detailed way.

Expert Comment

The Internet platforms plays a pivotal role in the value chain and the broader carbon reduction efforts. The Yanxuan Sustainability Plan offers an innovative technical solution to reducing carbon emission across the supply chain of Internet players. The prospective partnership among industry, academia, and research entities stands to bring about even further viable options for green and low-carbon growth in the logistics industry.

2021 Low-Carbon Co-Op Program

Impact Hub Shanghai

Project Overview

The "Low-carbon Co-op Program" (abbreviated as Program below) , co-hosted by Impact Hub Shanghai and Green Startups, aims to explore innovative approaches to low-carbon transformation in three to five industries within five years. Officially launched in March 2021, the first Program focused on the topic of low-carbon innovation in the food and beverage industry. By deepening connections between big companies and startups, the project increases the possibility of potential cooperation, accelerates the implementation of sustainable innovation solutions, and helps the industry tackle sustainable development issues and the global climate crisis.

Through in-depth interviews with industry partners including Aptar Group, Cargill China, Danone China Beverage, STARFIELD Food & Science Technology, and several well-known domestic dairy companies in China, the Program identified various application scenarios in design & production, processing, packaging & distribution, and retail & recycling in the industry value chain. 18 enterprises, selected from over 100 small- and medium-sized green startups registered across China, entered the Program to carry out pilot projects. By early 2022, six startups have launched pilot cooperations with industry partners.

Project Highlights

The project invited leading companies in the industry through open solicitation and targeted invitations. Participants included Aptar Group, Cargill China, Danone China Beverage, STARFIELD Food & Science Technology, as well as global top 500 companies.

The project received a total of two million of government funding, subsidies, and awards. Participating startups gained a total of 63 million Renminbi Yuan in venture capital, of which Carbonstop raised 50 million Renminbi Yuan .

The low-carbon solutions provided by the participating startups will benefit 20.5 million people, including employees of the participating startups, customers and users.

Company Profile

Impact Hub Shanghai

Impact Hub is a global network of impact-driven entrepreneurs, creators, innovators, and intrapreneurs-taking action to create a better tomorrow for people and planet. Founded in London in 2005, Impact Hub has grown to a network of 16000+ members, spread across 100+ cities and 60+ countries. In 2017, Impact Hub Shanghai broke ground in China. Like our worldwide counterparts, we support entrepreneurs with incubation programs and community events, address the innovational needs of corporates, institutions, and governments, and incubate solutions to systemic challenges-all towards the United Nations' Sustainable Development Goals.

Green Startups

Green Startups is a pioneer acceleration platform for Green Innovation and entrepreneurship in China. Our approach, described as "accelerating" + "impact investing", helps early startups with an environmental intent to overcome survival barriers and to sustain development, in order to achieve "from 1 to 10" growth. Green Startups has engaged with more than 2100 Green entrepreneurs, mentored 200 startups, developed an exclusive curriculum and tutoring system, and accumulated abundant expert resources.

Project Outcome

- The project reduces emissions by about 931 tons of carbon dioxide equivalent, achieved through indirect emissions reduction using renewable energy or energy-saving equipment.
- The project saves about 70000 tons of water through sewage treatment.
- The project protects more than 40 million square meters of land, including the use of degradable plastic film in about 26.7 million square meters of land and the use of microbial bacterial agents in about 13.4 million square meters of land.
- The project disposes of 1.5 million tons of sludge and livestock manure, 10000 tons of bagasse, and reuses 100000 packaging boxes.
- The project has explored new models for achieving carbon neutrality, proving their replicability in different industries.



Project Implementation

China's carbon peak and neutrality goals cannot be achieved without the large-scale application of low-carbon innovative technologies. To make this happen, it is crucial to strengthen the collaboration between startups with innovative technologies and leading companies in the industry.

Startups developing low-carbon innovation technologies often face a common dilemma that their technologies lack specific application scenarios and thus it's difficult for them to reach out to potential customers. Also, being at an early stage, the startups find it difficult to raise enough funding for the implementation of their technologies. The lack of application scenarios and funding limits the further iteration and optimization of innovative technologies, leaving many emission-reduction technologies with high potential in the laboratory, with no chance to contribute to low-carbon development.

The goal of designing and executing the "Low-carbon Co-op Program" is to support these startups to scale up and enter the market faster, better, and more effectively. In other words, the Program strives to connect the innovative solutions of startups with companies who demand a low-carbon transformation in a more close and realistic way. Technological solutions with high potential to reduce emissions will be verified and iterated through practices in actual application scenarios, resulting in their success in the market. Thereby while empowering startups, the Program also contributes to accomplishing carbon peaking and neutrality goals.

Through one-on-one in-depth interviews with large companies requiring low-carbon transformation, Impact Hub Shanghai and Green Startups assist the companies to identify and classify the demands and pain points in their value chain. These identified demands are the real market opportunities and scenarios for startups to apply their products and services. Meanwhile, Impact Hub Shanghai and Green Startups offer the participating startups capacity building courses, allowing them to understand the market better as well as their strengths and challenges. Acting as the "bridge" for collaboration and the "mentor" of coaching and support during the process, Impact Hub Shanghai and Green Startups themselves are significant resources for the growth of the startups.

All in all, the first Program provided 85 startups with capacity training, identified 18 of them with high potential, and gave them chances to negotiate with the industry partners about possible future cooperation. Given the diversity of the low-carbon technologies these startups develop, it would be thrilling if these technological solutions can be successfully applied to the scenarios in leading companies.

Beyond Feed, Jianoon (Beijing) Agri-Biotech Co., Ltd, Carbonstop, ZANT, Zhengzhou Guoyan

Environmental Protection Co. LTD, and Qianhai Snail Mom Technology have launched pilot cooperations with industry partners. Empowered by the Program, the participating startups gained a total of 63 million Renminbi Yuan in venture capital, of which Carbonstop raised 50 million Renminbi Yuan .

Project Impact & Sustainability

Through the Program, Impact Hub Shanghai and Green Startups are exploring an innovative model for achieving carbon neutrality through studying and testing patterns for collaborations between low-carbon startups and leading enterprises.

From the first year's work, we realize that the promotion of low-carbon innovative solutions in general requires long development cycles and in-depth validation from customers. In addition, the diversity of industrial structures and capital structures in different industries affects the adoption of innovative models; specifically, it is often decided by the company's financial strength, organization structure, and transformation cost.

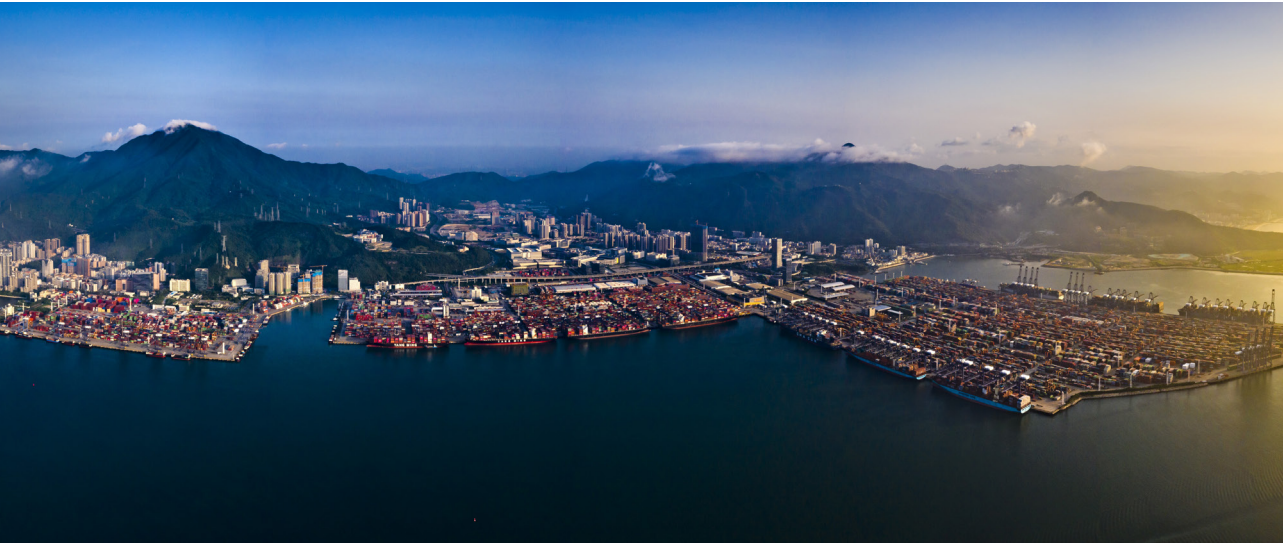
The length of the Program is set at five years, hoping to identify the collaboration model in various industries. 2021 "Low-carbon Co-op Program" tested the matching procedures in the food and beverage industry, developed well-structured training courses for startups, and published an Industry Matching Manual. In 2022, the second Program operates in two tracks-industrial manufacturing, and agriculture and food-which will further test the scalability and sustainability of the model.

Expert Comment

Impact Hub Shanghai and Green Startups is committed to helping early-stage entrepreneurs in the environmental sector to break free from financing challenges and shortages in application scenarios. The low-carbon programme model not only provides application scenarios for startups with innovative technologies, but also serves as a conduit to addressing the low-carbon requirements and pain points identified by big corporations in their particular production areas. This model boasts of clear project boundaries, strong implementability, and substantial benefits for all counterparts, thus can be drawn upon by players in the real industry and financial institutions to some extent.

YanTian Port Pursues a Green and Low-Carbon Way for Port Development

Shenzhen Yantian Port Group Co., Ltd
Hutchison Ports YANTIAN



Project Overview

Yantian Port always upholds environmental protection in port construction, operation, and corporate culture to pursue a green and low-carbon way for Port development. By integrating the green development philosophy into the whole process of all aspects of services, From 2019 to 2021, 133988 tons of carbon emissions were reduced by Shore-to-ship power supply system, Gantry crane "replacing oil with electricity" and LNG trailer projects;

Since 2015, Yantian Port has been actively promoting shore to ship power supply. It is one of the container terminals with the largest shore power supply capacity, as well as the leader in the utilisation of shore power in domestic container ports. When vessels use shore power, they tap landside electricity for their power needs at berth instead of running diesel-fuelled auxiliary on-board engines, significantly reducing pollutant emissions and improving the overall environmental pollution indexes of the port.

Since 2007, the port has been converting the diesel-driven gantry crane to run on electric power. It is the first port in China to promote the diesel-to-electric-driven gantry crane conversion on a large scale, and is also one of the ports with the most electrically driven gantry cranes in use. The diesel-to-electric conversion saves 80% of diesel consumption, reduces 95% of exhaust emissions, and produces less noise, greatly improving the port environment.

Yantian Port has been promoting the application of liquefied natural gas (LNG) tractors since 2008. LNG engines offer huge advantages over diesel engines in terms of reducing pollutant emissions, making the terminal area much cleaner.

Project Highlights

- Yantian Port won the "Best Green Container Terminal" award three times in four years from 2019 to 2022.
- It obtained ISO 50001 and ISO 14001 certifications by continuously improving its energy management system.
- It was awarded the "2019 Excellent Project of Pollution Control in Shenzhen".
- It was awarded the "Demonstration Project of Shore Power" by Ministry of Transport.
- It was awarded the "First Prize of Science and Technology Award" by China Water Transportation Construction Association.

Company Profile



Yantian Port, a joint venture between Hutchison Ports and Yantian Port Group, is one of the world's largest container terminals run by a single operator, the preferred port-of-call for mega-vessels and the terminal-of-choice for cross-border e-commerce in South China. As a natural deep-water port and free of siltation, Yantian Port has the only approaching channel of 18 metres deep and 475 metres wide in the Greater Bay Area, allowing two-way and year-around navigation for 200000-DWT vessels simultaneously. With 20 deep-water container berths, it is capable of handling import, export and transshipment cargoes for multiple mega-vessels concurrently.

Project Outcome

- In 2019, Yantian Port fulfilled the energy consumption and intensity control targets set out in the 13th Five-Year Plan ahead of schedule;
- From 2019 to 2021, 133988 tons of carbon emissions were reduced by shore-to-ship power supply system, electrification of diesel-driven rubber-tyred gantry cranes and LNG tractor projects;
- It is one of the container terminals with the largest shore power supply capacity in China.



Project Implementation

Yantian Port is committed to establishing a green and low-carbon port. It has taken the following measures to save energy and reduce emissions:

1. Actively promote shore to ship power supply.

At present, Yantian Port has built 6 sets of portable shore power supply systems, covering a total of 17 ultra-large deep-water berths with a coverage rate of 85%, which can meet the electricity demand of the world's largest container ships. It is one of the container terminals with the largest shore power supply capacity and the largest number of berths in China's coastal ports. It was awarded the "Demonstration Project of Shore Power" by Ministry of Transport, the "First Prize of Science and Technology Award" by China Water Transportation Construction Association and other honors.

Large vessels, especially container vessels, usually rely on burning fuel oil to meet their power needs at berth, which generates large amounts of harmful gases such as sulfide and nitrogen oxides that pollute the surrounding environment, while the shore power supply allows vessels to turn off their auxiliary on-board engines, greatly reducing exhaust emissions and minimising the impact to the surrounding environment. The shore power project can significantly save energy consumption, improve energy consumption efficiency, reduce exhaust gas emissions, and save fuel oil costs. It enables crew members to work in a cleaner port environment and raises awareness of energy conservation and emission reduction among port and ship operators. From 2019 to 2021, 17681 tons of carbon dioxide emissions from vessels were reduced by adopting shore power supply.

2. Convert the diesel-driven rubber-tyred gantry cranes to run on electric power.

Yantian Port is the first port in China to promote the diesel-to-electric-driven rubber-tyred gantry crane conversion on a large scale, and is also one of the ports with the most electric- rubber-tyred gantry cranes in use. In this way, each crane can save 80% of energy and reduce 95% of exhaust gas emission. In addition, the noise in the crane operation area can be reduced from 110 decibels to 60 decibels. By using electric rubber-tyred gantry cranes, the port reduced 114901 tons of carbon dioxide emissions from 2019 to 2021.

3. Expand the use of LNG tractors.

In 2010, Yantian Port was the first in China to use LNG tractors on a large scale, with four LNG refueling stations built. At present, there are 165 natural gas tractors operating 24 hours a day at the port. The most obvious advantage of using natural gas over conventional fuel oil is the clean nature of its emissions. LNG tractors significantly reduce PM2.5 emissions. Thus, 1406 tons of carbon dioxide emissions were reduced by using LNG tractors from 2019 to 2021.

Project Impact & Sustainability

Yantian Port builds mobile power base stations for supplying shore power, which can supply power separately or in parallel for each two sets, realising "high voltage on board, separation of vessel and port, uninterrupted power supply, and multi-berth coverage". The rubber-tyred gantry cranes use the latest power configuration and can be powered by both slip wire and hybrid lithium battery, addressing the shortage of pure electric rubber-tyred gantry cranes. At the port, traditional fossil energy has been gradually replaced by low-carbon electricity, and the green energy systems used by large port equipment reduce carbon dioxide emissions by more than 30000 tons per year.

In the future, Yantian Port will continue to pursue the green and low-carbon way for port development and enhance energy efficiency through the electrification of fuel-oil-driven port machinery such as tractors, forklifts, and vehicles. It will also explore the application of renewable energy in localized scenarios to create a green, low-carbon, and eco-friendly port ecosystem.

Expert Comment

Yantian Port is hailed as a leader in China's transportation industry on the energy saving and emission reduction front through its incessant rollout of green and low-carbon port developments, serving as a key example in pushing the transport sector to go green. Through the shore-based vessel power supply, "dissel to electricity" for gantry cranes, clean energy LNG trailer application, Yantian Port has become a benchmark for reducing carbon emissions at coastal container ports, expediting the course for China's transportation industry to attain the dual-carbon goals.

Lifecycle Carbon Reduction Project of Meituan Bike and E-bike

Hanhai information technology (Shanghai) Co, Ltd



Project Overview

On World Environment Day 2019, Meituan Bike and E-Bike launched the Lifecycle Management Project, which follows the circular economy principles of reduce, reuse and recycle, and aims to enhance the environmental benefits of Meituan Bike and E-Bike, by exploring a series of initiatives to reduce the carbon footprint of production and improve the amount of carbon reduction through the operation. By 31 August 2022, Meituan Bike and E-Bike had achieved 100% recycling of end-of-life bikes; realized the use of recycled plastic in plastic parts such as Bike fenders, baskets and E-Bike seat buckets, with the utilization rate of recycled plastic reaching 70%; reused 1.48 million tires and 1.26 million smart locks; innovatively used Meituan Bike tire recycled materials to pave playgrounds. A total of 23 playgrounds, with a total area of 11000 square meters, had been donated to rural areas, benefiting thousands of rural children. The above initiatives have resulted in a 74.3% (84 kg) reduction in the life-cycle carbon footprint of Meituan Bike and a 24.2% (114.4 kg) reduction for Meituan E-bike. According to the "Report on pollution and carbon reduction of bike share" released by the Environmental Development Center of the Ministry of Ecology and Environment, it is estimated that in the past year, Meituan Bike and E-bike operated a total of 8.45 billion kilometers and help to reduce travel carbon emissions by 437000 tonnes.

Project Highlights

Mobike, the predecessor of Meituan Bike, was awarded the title of "Champions of the Earth" in 2017, in recognition of its great contribution to promoting low-carbon mobility and mitigating air pollution and climate change. The project of donating recycled tire materials to build playgrounds in rural areas was selected as one of the "Top 10 Public Participation Cases" in the 2022 "Beautiful China, I am a contributor" action plan to raise citizens' awareness of ecological civilization.

Company Profile



As a tech-driven retail company, Meituan has a strategic focus on "Retail + Technology" and adheres to our mission of "We help people eat better, live better". Since established in March 2010, Meituan has advanced the digital upgrading of services and goods retail on both supply and demand side. Together with our partners we provide quality services for consumers. Meituan Bike (previously known as Mobike) was founded in January 2015. Using the innovative IoT technology and Smart-Lock, users can easily find bikes and E-bikes when needed. In 2017, Meituan Bike received 2017 Champions of the Earth award from the United Nations for contribution to low carbon transport.

Project Outcome

The Lifecycle management project of Meituan Bike and E-bike has the following outcomes:

-In the manufacturing and recycling stage: reduced the lifecycle carbon footprint of Meituan Bike by 74.3% (84 kg) and Meituan E-bikes by 24.2% (114.4 kg) through recycling old bikes, reusing reusable parts, and utilizing recycled plastic.

-In the operation stage: drove nearly 100 million users to adopt Meituan Bike and E-bike as a low-carbon mode of travel in the past year, promoting to them the concept of green and low-carbon living. Helped the users to adopt low-carbon travel over 8.45 billion kilometers, and reduced carbon dioxide emissions by 437000 tonnes, carbon monoxide emissions by 2606 tonnes, hydrocarbon emissions by 223 tonnes, nitrogen oxide emissions by 219 tonnes, and fine particulate emissions by 70 tonnes in the past year.

-In the reuse stage: reused over 50000 tires and turned them into 23 playgrounds with an area of over 11000 square meters, and donated them to rural areas, benefiting thousands of rural children.



Project Implementation

The project has two main objectives:

1. Reduce the environmental footprint of Meituan Bikes and E-bikes.
2. Expand our contribution to reducing pollution and carbon emissions.

Building on these objectives, the project is human-centered, with the higher requirement of helping the public to build a low-carbon lifestyle and enhancing the sustainability of society.

For Objective 1, the project adopts the principles of circular economy and proposes several implementation options.

1. Product Durability Enhancement Program.

The durability of the products was considered at the early stage of the development of Meituan Bike and E-bike, such as requiring all parts to meet 1.1 times the number of fatigue tests required by ISO 4210; all plastic parts are required to meet xenon lamp test for more than 200 hours; the baskets are tested with twice the normal load, etc.

2. Parts reuse program.

Meituan Bike and E-bike have built a whole lifecycle intelligent management software, which records the maintenance records of each bike component and traces its service life. Data from the software is used to optimize the design and manufacturing to improve the service life of bikes, thus reducing resource consumption and carbon emissions. In particular, smart locks, baskets, frames, and wheelsets are reused after robust testing.

3. Application of recycled materials.

Meituan Bike and E-bike innovatively use recycled plastics (including recycled materials from takeaway food containers) to make plastic components such as mudguards, baskets, and seat buckets. A set of Meituan Bike mudguards requires around 70 grams of takeaway meal box recycled material. After recycling, cleaning, melt granulation, modified granulation, melting and molding, and performance testing, the takeaway food containers can be made into bike fenders.

4. 100% recycling of end-of-life bikes.

Every Meituan Bike and E-bike supports "Beidou + GPS" multi-mode satellite positioning technology and 4G communication ability to monitor the status of each bike and ensure each one can be repaired or recycled. The company has established bike management and scrapping standards, and is collaborating with the recycling industry (e.g. China Recycling Resources Development Co., Ltd. and Tianjin Xinneng Recycling Resources Co., Ltd.) to provide recycling services for Meituan Bike and e-E-bike.

5. Innovative reuse of selected materials.

Meituan Bike and E-bike innovatively recycle the tires of scrap bikes for the paving of playgrounds and donate them to children in rural areas. Some of the plastic comes from the recycled materials of Meituan Bike's polyurethane tires, which have been rigorously tested and all indicators comply with the Chinese national standard 36246-2018 "Synthetic Material Surfacing Sports Grounds for Primary and Secondary Schools". The project provides safe and comfortable standard basketball courts for rural children while

enhancing the awareness of low-carbon travel by encouraging public participation.

In response to Goal 2, Meituan Bike and E-bike is committed to making low-carbon travel more accessible and enjoyable for more people, and reducing high-carbon modes of travel such as small cars. By leveraging the advantages of an internet-based platform, the company has introduced "carbon reduction contribution" in the Meituan App, guiding users to accumulate carbon reduction contribution through biking and e-biking, and encouraging users who have achieved the carbon reduction target to redeem cycling coupons and participate in public welfare activities, attracting nearly 100 million users to participate in low-carbon travel. At the same time, the company actively held activities during "World Earth Day", "World Environment Day", "Energy Saving Publicity Week" and "World Cycling Day " to promote the concept of low-carbon travel to the general public. Between August 2021 and July 2022), Meituan Bike and E-bike helped the users to adopt low-carbon travel over 8.45 billion kilometers, and reduced carbon dioxide emissions by 437000 tonnes, carbon monoxide emissions by 2606 tonnes, hydrocarbon emissions by 223 tonnes, nitrogen oxide emissions by 219 tonnes, and fine particulate emissions by 70 tonne.

Project Impact & Sustainability

With the help of Beidou position system and IOT communication technology, Meituan Bike and E-bike significantly improve the positioning accuracy of bikes. To improve operation and maintenance efficiency, Meituan has developed electronic fencing and intelligent scheduling, which further helps energy saving and emission reduction by guiding users to park bikes carefully and reducing transportation costs and energy consumption of manual operation.

At present, Meituan Bike and E-Bike have submitted 585 patent applications at home and abroad, including more than 230 invention patent applications and more than 360 patent authorizations, making the company with the most core intellectual property rights in the bike share industry.

Meituan Bike and E-bike have won the China Patent Award issued by the State Intellectual Property Office for two consecutive years and also won the titles of "National Intellectual Property Advantage Enterprise", "Beijing Intellectual Property Demonstration Unit" and "Zhongguancun Intellectual Property Key Demonstration Unit".

Expert Comment

The Meituan Bicycle and E-bike lifecycle pollutant and carbon reduction program has a high profile and yield material and outstanding results both in terms of society-wide awareness and concrete emission reductions. The program, through the reuse of equipment and the innovative application of waste tires, improves the carbon-reduction capacity of its operations and sets an example for green growth and raises public awareness while fulfilling Meituan's corporate social responsibility; through the development of shared two-wheeled vehicle business, it advocates the concept of green living and drives up scale of green mobility across the wider society, soundly aligning the development of enterprises with carbon reduction actions.

CPCEP Bio-Energy: Bio-natural Gas & Organic Fertilizer Project with Feedstock of Agricultural Organic Waste

CPCEP Bio-Energy Co., Ltd.



Project Overview

As an agricultural waste, crop straws are prone to becoming an environmental liability and potentially causing societal strains if not treated and reused properly. CPCEP Bio-Energy, to counter climate change and reduce greenhouse gas emissions, has proposed an innovative solution to the production of clean energy and organic fertilizer from agricultural waste.

Construction of the world's first rice straw-based bio-natural gas project—Huai'an bio-natural gas and Organic Fertilizer Project—commenced at the Huai'an National Agricultural Science and Technology Park in Jiangsu province in 2019 and became fully operational in October 2021. The project is a net-zero recycling pilot launched by CPCEP Bio-Energy for meeting the dual (2030 & 2060) carbon target of the state government.

The project spans about 80000 square meters of land and has a capacity of treating 350000 tonnes of water submerging manure from pig farms and 53000 tonnes of rice straw per annum by leveraging state-of-the-art technologies from the Netherlands and Germany and the vast quantities of rice straws in the Huai'an area. The agricultural wastes are put to a microbial anaerobic digestion process to be turned into bio-natural gas and organic fertilizer that can be used as a resource. The project has an annual output of 10.5 million cubic meters of bio-natural gas and 75000 tonnes of solid organic fertilizer.

Project Highlights

The project utilizes rice straw—notoriously challenging to treat via digestion—as an additional gas-generating material to sidestep the common headache of exorbitant straw procurement prices typically facing other similar projects. Such operating cost savings-yielding practices have ensured the commercial viability of biomass energy projects.

In addition to bio-natural gas and organic fertilizer, the company also developed efficient microbial inoculum, not only addressing pollution caused by organic wastes, but also enabling the utilization of straw and manure as an energy source of superior quality, thereby further enhancing and advancing the farming/breeding industrial cycle.

The technologies and R&D outcome of the pilot project has been fully endorsed by the leadership of Huai'an Municipal Party Committee and Municipal People's Congress, who encouraged the company to continue to act as a leading player in the agribusiness sector and to expand its operations further up the industrial chain.

Company Profile



Specializing in net zero and comprehensive utilization of bio-energy, CPCEP Bio-Energy boasts of integrated technological expertise and is committed to providing solutions to the concurrent digestion of a range of organic wastes through a synergistic approach encompassing advanced anaerobic digestion, functional organic fertilizer and microbial inoculum, gas upgrading, kitchen waste treatment and other technologies and automatic monitoring systems. The company has linked up the entire industrial chain of renewable energy through the liquid sunshine technology to enable coordinated application of renewable energy sources.

Project Outcome

Waste reduction: annual capacity of treating 350000 tonnes of livestock manure and 53600 tonnes of crop straw.

Green products:

Production of biogas: 10.5 million cubic meters of biogas produced annually will be supplied to the adjacent Huai'an Chemical Industrial Park as CNG, which particularly serves to mitigate the high energy prices and short supply in the winter months and potentially saves energy costs for end users to the tune of 10 million Renminbi Yuan per annum compared with pipeline natural gas.

Production of organic fertilizer: the project produces up to 75000 tonnes of solid organic fertilizer per annum. With the customized production of microbial inoculum based on local cultivation of specialty crops, it could potentially foster the local farming sector to pivot towards organic cultivation.

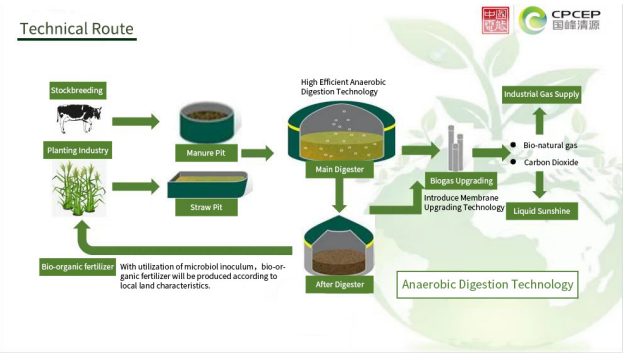
Reduction in greenhouse gas emissions: bio-natural gas can be used to substitute for about 12800 tonnes of standard coal, equivalent to reducing carbon emissions by 33000 tonnes. Additionally, the project is able to capture around 20000 tonnes of carbon dioxide per annum through the CCUS technology to supply raw materials to downstream industrial players.

Project Implementation

The Huai'an site marks the world's first bio-natural gas and eco-organic fertilizer project using rice straw and livestock manure as the main feedstock, developed by CPCEP with state-of-the-art technologies. The company has conducted thorough feasibility analyses of a range of anaerobic digestion technologies, including CSTR, PFR, UASB and USR. Ultimately decided to go with the CSTR option for its technological advancement and operational stability, in view of the complexity and diversity of raw materials and the mandatory requirements of energy saving and stable gas supply which especially in winter.

The finished project features a hybrid process of "multi-feedstock mixing and pretreatment + two-stage high-concentration medium temperature wet anaerobic digestion + biogas membrane upgrading + solid organic fertilizer production", integrating the CSTR digestion process from the Netherlands, the RA-X organic fertilizer production process from Japan and Germany's biogas membrane upgrading process, with the innovative addition of the BX-1 microbial inoculum technology from Japan.

Rice straw and livestock manure are put to an anaerobic digestion process to produce biogas, which is refined to produce bio-natural gas and carbon dioxide; while the liquid digestate is fed back to the system for feed concentration, and the solid digestate is used for organic fertilizer production.



Before project implementation:

Farms built their own biogas treatment facilities. Their lack of expertise and overarching planning proved to impede sustainable operation and profitability. The self-made fertilizer from farmers' own composting meant inconsistent quality and potential hazards for soil, undermining the case for sustainable development of eco-friendly agriculture.

After project implementation:

Through the innovative model for collection, storage and transportation, the company teamed up with local governments to provide customized solutions tailored to local circumstances, facilitating the county-wide collection of organic waste.

State-of-the-art international technologies are utilized—the facility incorporates the CSTR digestion process from the Netherlands, bio-organic fertilizer production process and Germany's biogas membrane upgrading process as applicable—to not only prevent organic waste pollution, but also produce diversified low-carbon green products such as biogas, green organic fertilizer and microbial inoculum, catering to local requirements for building eco-friendly cities and the countryside of scenic values.

Project Impact & Sustainability

Compared with fossil energy, bio-natural gas has better environmental attributes, but the production cost is often too high due to the raw material limitation, and the single products of bio-natural gas and crude organic fertilizer often lead to poor project profitability. Through technical optimization and improvement of the enterprise, the project uses rice straw originally unsuitable for anaerobic digestion as raw material, and develops efficient microbial fertilizer at the same time, which makes up for the shortcomings of traditional biomass energy projects, provides a demonstration for the industry and has good reference significance.

-Digestion of multi-feedstock. How different raw materials react to the digestion process is taken into account for identifying the science-based ratio of an array of raw materials, optimizing the digestion performance of each raw material to maximize gas production.

-High-concentration anaerobic digestion. The digestion process is suitable for raw materials with a solid content ranging from 2-20%, and the process is highly adaptable.

-For poorly degradable raw materials, such as straw, a new pretreatment process is developed, which can improve the degradability of decomposition-resisting raw materials and increase biogas production.

-Overall design of heat exchange maximizes the recovery of residual heat, improves the efficiency of heat utilization, reduces energy consumption and operating costs.

-Full utilization of gas products. In addition to the conventional partial utilization of combustible methane, the reuse of carbon dioxide as a by-product is also made a reality.

-Industrialized high-efficiency organic fertilizer production process, where the main process steps are reinforced to accelerate the production while improving the quality consistency of organic fertilizer, enabling the production of basic organic fertilizer and microbial fertilizer lines in conjunction with the microbial inoculum technology.

By optimizing the technologies involved via the foregoing practices, the concerted "liquid sunshine" approach has mitigated the technological disadvantages and improved efficiency of similar endeavors, not only generating new energy from agricultural waste and supplying high value-added products for the upstream and downstream players while creating new local jobs, but also incorporating its own clean and carbon-reducing strengths with more green-committed sectors, where the existing high-concentration green carbon dioxide can be synthesized with green hydrogen to produce green methanol. These practices stand to contribute on a higher level to the state government's "dual-carbon" and rural revitalization objectives. Taking initiative in response to the National Energy Administration's "Action Plan for the Standardized Enhancement of Carbon Peaking and Net Zero", CPCEP Bio-Energy will set in motion the development of pertaining standards to maximize the potential of the sector.

Expert Comment

Biogas is among the crucial strategic initiatives of China's state government to counter climate change. As a first mover, CPCEP Bio-Energy has paved a way for fellow biogas-related businesses.

The biggest downside of biogas preparation is the runaway prices of raw materials, limited assortment and upward price pressures of end products, rendering operations quite challenging. The case stands out by adopting anaerobic biomass technology with rice straw as raw material, which could potentially be applied to other straws in the event of a breakthrough, identifying a clear direction for potential technological advancement. Secondly, the case makes rational use of livestock manure to achieve the ideal carbon-to-nitrogen ratio, which is conducive to maximizing gas production. Thirdly, it avoids the profitability challenges facing limited assortment through product diversification. Fourthly, carbon capture is carried out in parallel with biogas production, further fostering emission reduction efforts. The analytics of the case on the problems and countermeasures in the biogas industry can be drawn upon by biogas makers in similar circumstances.

"Low-carbon" Project of Water Purification Plant

Everbright Water (Zibo) Co., Ltd.

Project Overview

At present, the actual annual sewage treatment capacity in China exceeds 70 billion tons, and its carbon emissions account for 1-2% of the total emissions. Sewage treatment plants play an important role in reducing pollutant emissions and protecting the ecological environment, but the current traditional sewage treatment technology needs to consume a large amount of electricity, add a large number of agents, which causes greenhouse gas emissions and secondary pollution problems while removing pollutants.

The Water Purification Plant - Branch 1 of Everbright Water (Zibo) Co., Ltd. is located in Zibo City, Shandong Province. It was built and put into operation in December 2020. The design capacity of daily sewage treatment is 250000 tons. The treatment process of "pretreatment + multi-stage AO biological reaction + efficient sedimentation + filtration + ozone catalytic oxidation + disinfection" is adopted. The main indicators of effluent COD, BOD5, ammonia nitrogen, total phosphorus, etc. are in accordance with the Surface Water Environmental Quality Standard (GB3838-2002) Class IV water quality. The project has integrated the concept of "green and low-carbon" into all aspects of engineering design, construction and operation, and formulated the overall scheme of "low-carbon operation + energy self-sufficiency + resource recycling". In 2021, the utilization of green electricity was 716 MWh, and the power consumption per ton of water decreased by about 4%, the drug consumption per ton of water decreased by about 10.44%, and the ecological water supply was about 7796 million tons. The project adopts measures such as nitrogen removal of sewage, solar power generation and tree planting, and the carbon offset is estimated to be 7056.21 tons of carbon dioxide equivalent in 2021.

straws in the Hua'an area. The agricultural wastes are put to a microbial anaerobic fermentation process to be turned into biogas and organic fertilizer that can be used as a resource. The facility has an annual output of 10.5 million cubic meters of biogas and 75000 tonnes of solid organic fertilizer.

Project Highlights

-In May 2022, the project was listed as the top ten environmental protection facilities opening units in Shandong Province.

-In April 2021, the project was awarded the title of "Energy Open Utilization Benchmark Sewage Plant" by the "Double Hundred Leaps" Sewage Treatment Benchmarking Alliance.



Company Profile



China Everbright Water Co., Ltd. is a main board listed company in Singapore and Hong Kong. It is the water operation platform of China Everbright Group, and covers business of raw water protection, water supply, municipal sewage treatment, industrial wastewater treatment, reclaimed water reuse, watershed treatment, sludge disposal and so on.

Everbright Water (Zibo) Co., Ltd. is a wholly-owned subsidiary of China Everbright Water Co., Ltd., which owns the Water Purification Plant - Branch 1, Branch 2 and Branch 3, with a daily sewage treatment capacity of 400000 tons. It is a large sewage treatment enterprise that mainly focuses sewage treatment, water environment treatment and comprehensive utilization of water resources in the basin, and integrates production and operation, scientific and technological research and development, and technical services.

Project Outcome

-Green power generation: On August 20, 2021, the distributed photovoltaic power station phase I project of the project was connected to the grid to generate electricity. By the end of 2021, the electricity generation is 716 MWh, and the annual electricity generation is expected to be 2360 MWh, accounting for about 10% of the annual electricity consumption of the whole plant, which is equivalent to 719.6 tons of standard coal equivalent can be saved every year.

-Energy saving and consumption reduction: In June 2021, the precision aeration and intelligent dosing system of the project was completed and put into operation. After comparative analysis before and after transformation, the energy consumption per ton of water decreased by about 4%, and the drug consumption per ton of water decreased by about 10.44%.

-Carbon reduction: According to the calculation of Aecom Co., LTD., the project adopts measures such as sewage nitrogen removal, solar power generation system and tree planting, and the carbon offset in 2021 is 7056.21 tons of carbon dioxide equivalent.

-Pollutant emission reduction: In 2021, the project reduced COD emissions by 11493 tons, ammonia nitrogen emissions by 1408 tons, total phosphorus emissions by 149 tons, and total nitrogen emissions by 1211 tons.

-Ecological water supplement: The main indicators of effluent COD, BOD5, ammonia nitrogen and total phosphorus of the project are in accordance with the Surface Water Environmental Quality Standard (GB3838-2002) Class IV water quality, and the actual discharged water quality is better than the above standard. As the main ecological water source of the Zhulong River, a total of 7796 million tons of water was replenished in 2021, effectively improving the water environmental quality level of the Zhulong River.



Project Implementation

This project is a "low-carbon plant" committed by China Everbright Water Co., LTD. The concept of "green and low-carbon" runs through all links of engineering design, construction and operation. Through low-carbon process design, selection of efficient and energy-saving equipment, photovoltaic power generation, intelligent operation, collaborative resource utilization of sludge, sewage source heat pump, ecological water supplement, promotion of green and low-carbon office, advocating green life of employees and other measures, the project has achieved certain results in collaborative pollution reduction and carbon reduction.

In terms of sewage treatment process, the core unit of biological treatment has chosen multi-stage AO process. The multi-stage AO process has the characteristics of high sludge concentration, small pool capacity, multi-point water inflow, which can make full use of the carbon source of raw water. Combined with the intelligent dosing control system, the dosage of carbon source chemicals has been greatly reduced.

In terms of equipment automatic control, high-efficiency energy-saving equipment is selected and automatic control is implemented. The precise aeration automatic control system makes the gas water ratio of the multi-stage AO biological tank close to the theoretical gas water ratio, realizing gas supply on demand, precise aeration, energy conservation and consumption reduction, and at the same time, the biological system operation and water quality are more stable.

In terms of operation management, the project gives full play to the digital and intelligent advantages of the operation information management platform, and provides effective data support for equipment life-cycle management, operation analysis and decision-making through intelligent terminals, the Internet of Things, and big data analysis. Through the performance optimization driven by the big data of the precise aeration system and precise dosing system, the amount of reagent used is reduced, and the whole process is fine controlled. Through the intelligent patrol system, the key equipment and key patrol units of the sewage treatment plant are monitored all the time to achieve the early warning function, active regulation and enhance the stability of the sewage treatment system.



In terms of new energy development and utilization, the project has constructed a distributed photovoltaic power station. Phase I project was put into operation in August 2021, with an annual electricity generation of about 2360 MWh. Phase II photovoltaic power station project is expected to be put into operation in October 2022, and the electricity generation of the two phases of the photovoltaic power station accounts for 14% of the total electricity consumption; The effluent of the project is used as the ecological water supply source of the Zhulong River, which improves the water environment quality of the Zhulong river. At the same time, part of the effluent is reused as water for greening, production and landscape of the project, which can save a lot of tap water every year.

Next, the project plans to anaerobic digest the sludge generated in the sewage treatment process, and use the biogas generated to generate electricity, so as to achieve sludge reduction and the development and utilization of sludge resources; It is also planned to further develop resources and energy in sewage through the use of relevant green low-

carbon technologies such as sewage source heat pumps, so as to achieve the synergy of pollution reduction and carbon reduction, and strive to build a "zero-carbon factory".



The project also takes the "public opening of environmental protection facilities" activity as the carrier to build a bridge to communicate with the public and improve the awareness of environmental protection and low-carbon of the whole people. Since the opening of environmental protection facilities to the public in July 2021, the offline opening has received 408 people, and the "cloud opening" mode has been created, with more than 11000 online visitors.



Project Impact & Sustainability

The project has achieved the milestone of transformation from traditional sewage treatment to green low-carbon development. Next, it will further develop the resources and energy in sewage, turn the sewage treatment plant into a resource and energy recovery plant, solidly change the unsustainable development mode of traditional sewage treatment industry "high quality water based on high energy consumption and high material consumption". The exploration of the low-carbon plant model of the project will serve as a good example for other sewage treatment plants in green transformation.

Expert Comment

The case has incorporated the green low-carbon concept throughout the construction and operation efforts from the get-go, taking multi-pronged approaches to optimize its production process to reduce overall carbon emission while building distributed photovoltaic power station, implementing eco-friendly water replenishment measures, considering the coordinated utilization of sludge as a resource, and adopting such measures as intelligent operation management, green low-carbon office space and public low-carbon awareness raising. In addition to effectively reducing carbon emissions through a concerted approach, the case demonstrated a clear pathway towards low-carbon transformations, yielding marked tentative results on the emission reduction front, with the potential of serving as a "boilerplate" for net-zero roadmaps and emission-reducing options for industry peers.

"Grandblue Model" Promotes Quality, Green and Low-Carbon Development of Cities

Grandblue Environment Co., Ltd.

Project Overview

Located in Foshan and developed by Grandblue based on concepts of the whole chain, intension, and collaboration, the Nanhai Solid Waste Treatment and Environmental Protection Industrial Park (referred by the industrial park) has achieved comprehensive disposal of domestic waste, kitchen waste, sludge, hazardous industrial waste, and other waste. The developed "Grandblue Model" was praised as an effective solution to cities besieged by waste, which has realized the reduction and resource utilization of the harmless urban solid waste disposal, and effectively reduced the CO₂ emission caused by urban solid waste. With outstanding achievements in energy saving and carbon reduction, clean production, waste resource recycling, and the digitally intelligent transformation of solid waste disposal, it has become an influential platform for low-carbon and green environmental protection education, helping to achieve the "peak carbon and carbon neutrality" goals.

In 2021, the industrial park reduced about 700000 tons of carbon emissions through deep resource utilization of all kinds of garbage and a series of energy-saving and carbon reduction measures. At the same time, it also drove intelligent production management and control through the "brain of waste-free cities." Thus, overall planning was achieved, covering the entire cycle through intelligent data awareness and whole-process visual tracking and supervision of all kinds of urban solid waste from generation, classification, collection and transportation to disposal.

At present, the "Grandblue Model" has been successfully replicated in Xiaogan, Kaiping, Raoping, Jinjiang, Anxi, Jianyang, Hui 'an, and other cities after having been modified to cater to region-specific requirements, promoting quality urban green and low-carbon development.

Project Highlights

-Selected as the only case in the large achievement exhibition that "endeavored to move forward in the past five years" in the industry recommended by the Publicity Department of the Central Committee.

-Rated as the 2022 "Top Ten Environmental Protection Facilities Open to Public in China".

-Awarded the title of "2021 Typical Carbon Neutrality Case" at the Green Economy Forum jointly held by People's Daily Online, All-China Federation of Environmental Protection, and the Publicity and Education Center of the Ministry of Ecology and Environment.

-Rated as the first batch of "Advanced Projects for Synergistic Efficiency in Pollution and Carbon Emission Reduction in Environmental Protection Industry in Guangdong Province" by Guangdong Association of Environmental Protection Industry.

-Awarded the honorary titles of National Ecological Environment Science Popularization Base, National Science Popularization Education Base, and so on.

Company Profile



Grandblue Environment Co., Ltd. is a state-owned listed company focused on the environmental service industry (stock symbol: 600323). It is one of the Top 20 environmental enterprises in China, one of the top 10 waste incineration power generation enterprises in China, as well as one of the top 10 influential enterprises in solid waste treatment in China for eight consecutive years. With the mission of "Realizing Harmony Between Humans and Nature", the company adheres to the concept of social responsibility of being a "good steward of the city, good model of the industry and good neighbor of the community", actively develops a solid waste disposal model by leveraging the entire industry chain of comprehensive integration from the source to the terminal, and is committed to realizing the vision of "Serve 100 Cities Within 10 Years and Strive to Be the Most Trusted Eco-Environmental Service Company". Grandblue has provided environmental services for 35 cities in 16 provinces and regions such as Guangdong, Guangxi, Fujian and Hubei.

Project Outcome

-Grandblue's Nanhai Solid Waste Treatment and Environmental Protection Industrial Park has reduced nearly 700000 tons of carbon emissions and 100% reused wastewater with zero discharge in 2021 by collaborative disposal and resource utilization of domestic waste, sludge, kitchen waste, industrial waste, and solid waste. The industrial park disposed of 1.67 million tons of domestic waste through incineration, compressed and transferred 1.47 million tons of domestic waste, dried and disposed of 160000 tons of sludge, disposed of 140000 tons of kitchen waste, disposed of 90000 tons of hazardous waste, generated a total of more than 800 million kWh of electricity with biogas from waste incineration and kitchen waste, equivalent to the demand of daily domestic electricity for 600000 people and produced 4298 tons of biodiesel by purifying kitchen waste grease. Certain indicators of emissions from waste incineration were better than those in EU 2010 standard.

-The industrial park continued to implement green production. Through efficiency improvement of boiler heating surfaces, conductivity promotion of circulating water, a technical transformation of the sprinkler system for carrier gas heat exchangers, the transformation of hot water circulating pumps, replacement of the new industrial water system, modification of changing the type of vibration slag hoists, and other energy-saving transformation projects, it has further advanced low-carbon and energy conservation, pollution emission reduction, and resource depletion.

-The industrial park completed 960000 tons of VCU trading of carbon emission reductions and 72000 tons of CCER trading in 2021.

-Grandblue conducted characteristic low-carbon and environmental protection education and community activities such as garbage sorting, opening to the public, environmental protection classes, tree planting, and so on. In 2021, there were a total of 1572 community activities in the industrial park. Up to now, more than 100000 visitors have been received. These activities let the concept of "Green, low-carbon and environmental protection" grow stronger and make increasing people become participants and contributors to building a beautiful China.



Project Implementation

Under the "peak carbon and carbon neutrality" goals, cities develop with the low-carbon economy mode. The purpose of building "waste-free cities" is to promote the minimum production of solid waste, full utilization of resources, and safe disposal. The "peak carbon and carbon neutrality" goals and "waste-free cities" unified the optimal utilization of energy and resources, low-carbon development, green development, and circular development in urban construction. With the aim to construct waste-free cities, Grandblue built the intensive and collaborative disposal of the whole chain for urban solid waste in the industrial park and pioneered in a management mode with seamless convergence from the source to the terminal of domestic waste.

1. Remarkable success in active measures to reduce carbon emissions. By building a special promotion organization for carbon management, comprehensively planning carbon emission reduction, conducting technical research and transformation for greenhouse gas emission reduction, streamlining production links, and continuously leveraging the advantages of industrial chains, Grandblue Environment Co., Ltd. has implemented carbon reduction actions. Based on available statistics, in 2021, the industrial park disposed of 1.67 million tons of domestic waste incineration, compressed and transferred 1.47 million tons of domestic waste, dried and disposed of 160000 tons of sludge, disposed of 140000 tons of kitchen waste, disposed of 90000 tons of hazardous waste, generated a total of more than 800 million kWh of electricity with biogas from waste incineration and kitchen waste, and produced 4298 tons of biodiesel by purifying kitchen waste grease. A total of nearly 700000 tons of carbon was reduced in the year. In the future, biogas generated from kitchen waste in the industrial park can be used to produce hydrogen. It is expected to further reduce carbon by nearly 50000 tons per year. Besides, Grandblue first built the "Carbon Reduction Alliance of Guangdong-Hong Kong-Macao Greater Bay Area" with several pioneer enterprises in Guangdong Province in 2021, driving more industries, enterprises, organizations, and institutions to participate in carbon reduction actions.

2. A model of comprehensive integration and collaborative disposal from the source to the terminal helps reduce urban solid waste and utilize resources, construct "waste-free cities", and fulfill "peak carbon and carbon neutrality" goals. Intensive and collaborative projects in the industrial park encompass a waste classification and transfer system with a daily transfer capacity of 4900 tons of domestic waste, a waste-to-energy power plant with a daily disposal capacity of 4500 tons of domestic waste, a sludge drying and disposal plant with a daily disposal capacity of 450 tons, a kitchen waste disposal plant with a daily disposal capacity of 300 tons, and the Foshan Green Industry Service Center project with an annual disposal capacity of 91500 tons of industrial hazardous waste. Solid waste disposal projects in the industrial park have achieved highly collaborative disposal and energy-sharing. Electric energy generated by domestic waste incineration is transferred to the industrial park as cost-efficient energy; steam exhaust heat is used for sludge drying, hazardous waste disposal, and kitchen waste oil extraction to reduce production costs; odor generated by the sludge and the kitchen plants is pumped into the incinerator via the negative pressure system, completely solving the odor problem and facilitates combustion; and biogas residues after the disposal of kitchen waste and sludge after drying, are mixed and combusted with domestic waste. The ammonia

from the treatment of aluminum ash in hazardous industrial waste is used for flue gas denitrification in the waste incineration project, and the hydrogen produced is supplied to the incineration workshop of the green industry service center, for energy saving and carbon emission reduction.

3. Digital and intelligent operation improves the quality and efficiency of solid waste disposal. The industrial park introduced cloud computing, big data, and other new technologies into all links of production and application, built full-link data, intelligent algorithm models, artificial intelligence algorithm models of optimized waste incineration and power generation process, and created the first AI "Digital brain" in the environmental governance industry. The stability of the waste incineration process can be improved by up to 23%. For the entire industry chain, Grandblue has explored building the "brain of waste-free cities", fully integrated management data and the cloud data, implemented interconnection of all kinds of solid waste information, created a platform with whole-cycle intelligent data awareness of solid waste and whole-process visual tracking and supervision, so as to improve economic and social benefits of environmental governance, and help the carbon emission reduction.

Project Impact & Sustainability

Grandblue has rich experience in systemic solid waste governance. Many practical cases in the early planning, design, construction, and operation management of environmental protection facilities were highly recognized by the government and industry.

At present, with the advantages of comprehensive integration and collaborative disposal of solid waste, the "Grandblue Model" has been modified and replicated in Xiaogan, Kaiping, Raoping, Jinjiang, Anxi, Jianyang, Hui 'an, and other provinces and regions, promoting the construction of "waste-free cities" in regions and transformation of urban green development.

Based on requirements for the construction of "waste-free cities", the "brain of waste-free cities" covering the whole chain of solid waste governance has fully integrated management data and the cloud data and implemented interconnection of all kinds of solid waste information. Provided with whole-cycle intelligent data awareness of solid waste and whole-process visual tracking and supervision, it is a platform that can be promoted and replicated. It has enhanced the digital business management capability of solid waste disposal projects, improved economic and social benefits of environmental governance, and advanced synergistic efficiency in pollution and carbon emission reduction in regions.

Expert Comment

Grandblue sets a good example by integrating urban solid waste treatment facilities with intelligent control, maintaining and boosting the urban living environment, while reducing carbon emissions through resource recycling.

ACKNOWLEDGEMENT

We thank Shanghai Minhang District Qingyue Environment Protection Information Technology Service Centre and SEE Foundation for the support they provided in collecting the cases.

DISCLAIMER

Information and data in this collection are provided by case enterprises. C Team and Center for Environmental Education and Communications of Ministry of Ecology and Environment(CEEC) compile and partially translate the cases, and experts provide recommendations and comments. C Team, CEEC and experts are not responsible for the accuracy of the information and data in the cases.

For further information, please contact ccca@cteam.org or 86 10 62561869.



CHINA CORPORATE CLIMATE ACTION

中国企业气候行动

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 green financial resources for enterprises.

You may scan the QR codes and
subscribe the WeChat official accounts

