China Hongqiao Group – a Leading Global Aluminum Producer Moving from Heavy to Zero Carbon

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Abstract

Introducing China Hongqiao Group, from our aluminum beginning in 2001 to a leading global producer today. A journey started by our founder Zhang Shipping to utilise available electricity generated in the power station built to supply steam for the Weiqiao textiles production facilities. By 2015, aluminum smelting capacity had reached five million tonnes (Mt) and today we have 6.46 Mt licensed capacity under China's nationally approved aluminum production capacity of 45 Mt.

Over the course of the two decades of aluminum industry development, China Hongqiao has spread along the full aluminum value chain covering upstream, midstream, and downstream activities. This includes around 17 Mt of alumina capacity and an expanding footprint in the downstream sector. In addition, we are growing our involvement in the recycled aluminum space. We are operating a modern energy-efficient fleet of aluminum smelters with an average age of less than 10 years and amperage of 400 kA to 600 kA, with additional technically advanced 600 kA potlines being added with the capacity relocation to Yunnan.

Current work involves the most dramatic shift in the Hongqiao aluminum story, relocating aluminum capacity from Shandong to Yunnan Province . . . an energy and environmental game-changer, from coal to hydro energy. Our Yunnan Hongtai & Honghe projects are in line with government objectives to optimize aluminum industry through supply side management, and to promote green development.

The China Hongqiao business model includes the complementary elements of industrial clusters and the delivery of hot metal direct to customers. The industrial clusters business model is built on the foundations of strategic partners and close commercial links to customers.

China Hongqiao is continuing scientific research and technological investment in the field of lightweight aluminum applications – and the creation of higher value products. Weiqiao is now partnering with CITIC Foundation and the University of the Chinese Academy of Sciences in building an advanced industrial research Institute for Future Technology & Engineering. The goal is to build a platform for the integration of science, education, innovation, and production - and to promote industry-education integration and industrial innovation and to accelerate high-quality development.

China Hongqiao is working to advance a sustainable, environmentally responsible, and advanced technology aluminum industry, together with partners, customers, and other stakeholders, including national research institutions.

China Hongqiao Chairman Zhang Bo attaches great importance to environmental protection, energy conservation and sustainable development, with clean green production and higher value products as core business goals.

China has set goals of a carbon peak by 2030 and carbon neutralization by 2060 – and China Hongqiao is committed to meeting these national goals. A roadmap for achieving the twin carbon goals is in development and the presentation to ICSOBA will focus on the key issues facing the company and the key initiatives being taken to achieve carbon neutrality.

Keywords: China Hongqiao group, Efficient aluminum smelters, Sustainable aluminum industry, Technology innovation, Carbon neutrality goal.

1. Introducing China Hongqiao Group

China Hongqiao Group is incorporated in the Cayman Islands and was listed on the Hong Kong stock exchange (HKEX Code 1378) on 24 March 2011.

The main shareholder is Shiping Prosperity Private Trust Company (through its 100 % equity interest in China Hongqiao Holdings Limited) with 66.62 % of the total issued share capital (as at 31 December 2021). The next largest shareholding is controlled by CITIC Group Corporation and related companies. The China Hongqiao Group Chairman & CEO is Mr Zhang Bo. Further information is available from the annual and interim reports filed with the HKEX.

From our aluminum beginning in 2001 to a leading global producer today, this aluminum journey was started by our founder Zhang Shiping to utilise available electricity generated in the power station built to supply steam for the Weiqiao textiles production facilities. The aluminum activities expanded rapidly and were spun-off from the Weiqiao Pioneering textiles business to form China Hongqiao Group.

Over the course of the two decades of our aluminum industry development, China Hongqiao has spread along the full aluminum value chain covering upstream, midstream, and downstream activities. This includes around 17 Mt of alumina capacity and an expanding footprint in the downstream sector. In addition, we are growing our involvement in the recycled aluminum space. By 2015, aluminum smelting capacity had reached five million tonnes (Mt) and today we have 6.46 Mt licensed capacity under China's nationally approved aluminum production capacity of 45 Mt.

China Hongqiao is operating a modern energy-efficient fleet of aluminum smelters with an average age of less than 10 years and amperage of 400 kA to 600 kA, with additional technically advanced 600 kA potlines to be introduced with the second phase of the capacity relocation to Yunnan.

The China Hongqiao business model includes the complementary elements of industrial clusters and the delivery of hot metal direct to customers. The industrial clusters business model is built on the foundations of strategic partners and close commercial links to customers. In 2021, China Hongqiao produced 5.633 Mt of electrolytic (primary) aluminum. While the majority of the output is supplied to customers in adjacent industrial parks and industry clusters, we also produced 0.672 Mt of aluminum fabricated products.

Current work involves the most dramatic shift in the Hongqiao aluminum story, relocating aluminum capacity from Shandong to Yunnan Province, an energy and environmental game-changer, from coal to hydro energy.

The Yunnan Hongtai 2.03 Mt & Yunnan Honghe 1.93 Mt projects are in line with government objectives to optimize aluminum industry through supply side management, and to promote green development. When these projects are completed, over 60 % of China Hongqiao's aluminum

smelting capacity will have been transferred from Shandong Province to Yunnan Province – from coal-based electricity to hydro-electricity.

The Group has a number of direct activities, partnerships, joint ventures and cooperation agreements. The Group is deeply involved in innovation, research and development with a number of research bodies and universities.

China Hongqiao is continuing scientific research and technological investment in the field of lightweight aluminum applications – and the creation of higher value products.
Weiqiao is now partnering with CITIC Foundation and the University of the Chinese Academy of Sciences in building an advanced industrial research Institute for Future Technology & Engineering. The goal is to build a platform for the integration of science, education, innovation, and production - and to promote industry-education integration and industrial innovation and to accelerate high-quality development.

2. The Environmental Challenges

China Hongqiao Chairman & CEO Zhang Bo attaches great importance to environmental protection, energy conservation and sustainable development, with clean green production and higher value products as core business goals.
China has set goals of a carbon peak by 2030 and carbon neutralization by 2060 – and China Hongqiao is committed to meeting these national goals. A roadmap for achieving the twin carbon goals has been developed and was made public in June. This presentation will focus on the key issues facing the company and the key initiatives being taken to achieve carbon neutrality.

3. Carbon Neutrality Goals and Action Report "A journey of a thousand miles starts beneath one's feet." - a Chinese Saying.

Responding to the September 2020 announcement by President Xi Jinping that China will strive to peak carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060, Weiqiao Pioneering Group Chairman and Chairman/CEO of China Hongqiao Group Zhang Bo said “We will strive to peak carbon emissions before 2025 and to achieve net-zero emissions in Scope 1 and 2 before 2055. As a pioneer in decarbonization, our textile sector strives to peak carbon emissions in 2023 and achieve net-zero emissions in Scope 1 and 2 before 2049.”

Speaking at the 3rd Qingdao Multinationals Summit in Qingdao in June 2022, Weiqiao Pioneering Chairman and Chairman/CEO of China Hongqiao Group, Zhang Bo said “Weiqiao is determined to achieve its carbon neutrality goals and elevate climate-compatible productivity. We also pledge to make good use of our influence along the industrial chain, inviting all partners and friends to join our decarbonization efforts and pursue green and low-carbon development.”

“To realize our commitments, Weiqiao has already developed our roadmap and timetable. Transforming the energy structure, boosting technological innovation, developing circular economy, launching eco-friendly brands, and putting forward a low-carbon agenda across industries and regions are all among our 10 initiatives to keep our carbon neutrality efforts on track.”

4. The Carbon Task

The Group will adhere to the general principle of "prioritize direct carbon reduction and take carbon removal and carbon offsets as auxiliary measures" in the course of achieving carbon neutrality.

Given that the combustion of fossil fuels dominates our carbon emissions, we will take energy transition as the first step and phase out fossil fuels via greater share of renewables. Next comes product upgrading focused on the circular economy and downstream processing based on which product portfolios with lower carbon intensity will be further promoted. We will also pay close attention to operational efficiency enhancement and cutting-edge technologies that could jointly drive our carbon reduction to the next level. Lastly, carbon removal and carbon offsets may be deployed upon need for the realization of carbon neutrality. Going forward, we will continue to refine our carbon neutrality action plan based on the state-of-the-art scientific research and the advancement of scientific findings.

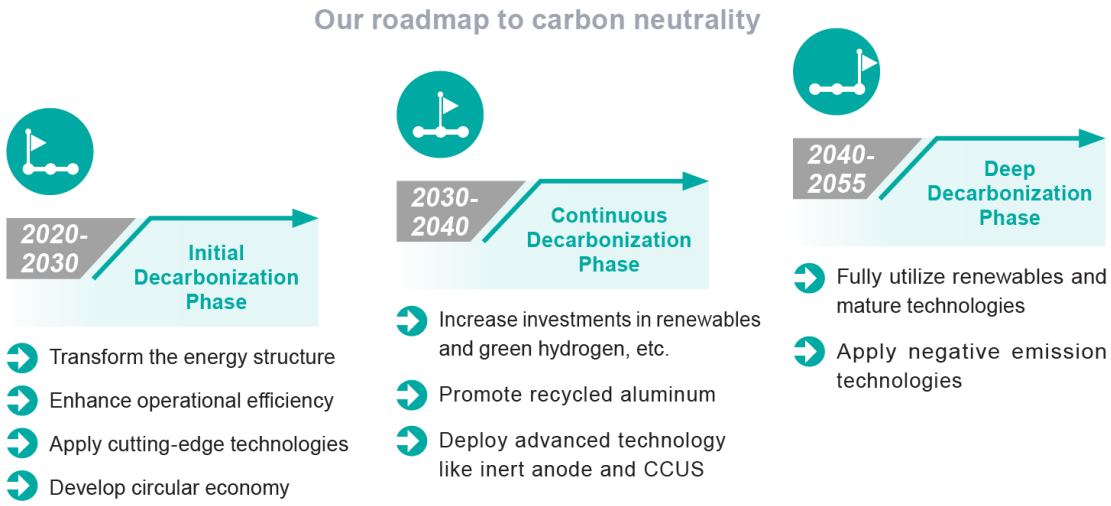

Figure 1. Hongqiao Group roadmap to carbon neutrality.

The three phases of the Group's Strategy Implementation Roadmap to carbon neutrality:

From 2020 to 2030, we embark on the Initial Decarbonization Phase. We will start with rigorous energy transition given the high proportion of fossil fuels in our energy mix. Capacity relocation of electrolytic aluminum to the integrated aluminum and hydropower production base, combined with direct investments in wind and solar power, will fundamentally transform our energy structure in Shandong and Yunnan, turning the energy mix from brown to green. Additional focus will also be placed on upgrading processing technologies in textile and aluminum production, and we intend to further our exploration in circular economy with an emphasis on recycled aluminum.

From 2030 to 2040, we get into the Continuous Decarbonization Phase. Within this stage, forefront renewable energy options like green hydrogen and cutting-edge processing technologies like inert anode will become technically and commercially viable. We will launch three initiatives to consolidate the achievements reached in last period. To begin with, we will further invest in wind and solar power while deploying technically mature renewables like green hydrogen. Next, we intend to further evolve downstream offerings by launching low-carbon-intensity products like recycled aluminum and actively extending to downstream processing. Last but not least, we intend to apply advanced processing technologies like inert anode, besides which we will pilot negative emission technologies like carbon capture, utilization and storage (CCUS) to lay a solid foundation for carbon neutrality.

From 2040 to 2055, we enter the Deep Decarbonization phase. Over and above focusing renewables and cutting-edge technologies in the first two phases, in this new phase we will pay greater attention to the abatement of emissions hard to tackle. We will deploy critical negative

emission technologies like CCUS to offset the most challenging carbon emissions and achieve carbon neutrality eventually.

To achieve carbon neutrality in 2055, energy transition will contribute 55-70 % to the total reduction, circular economy and downstream integration will bring down 10-25 %, operational efficiency enhancement and technological innovation will abate another 15-20 %, and negative emission technologies deployment will serve as an auxiliary measure to reduce the remaining 3-5 % of carbon emissions.

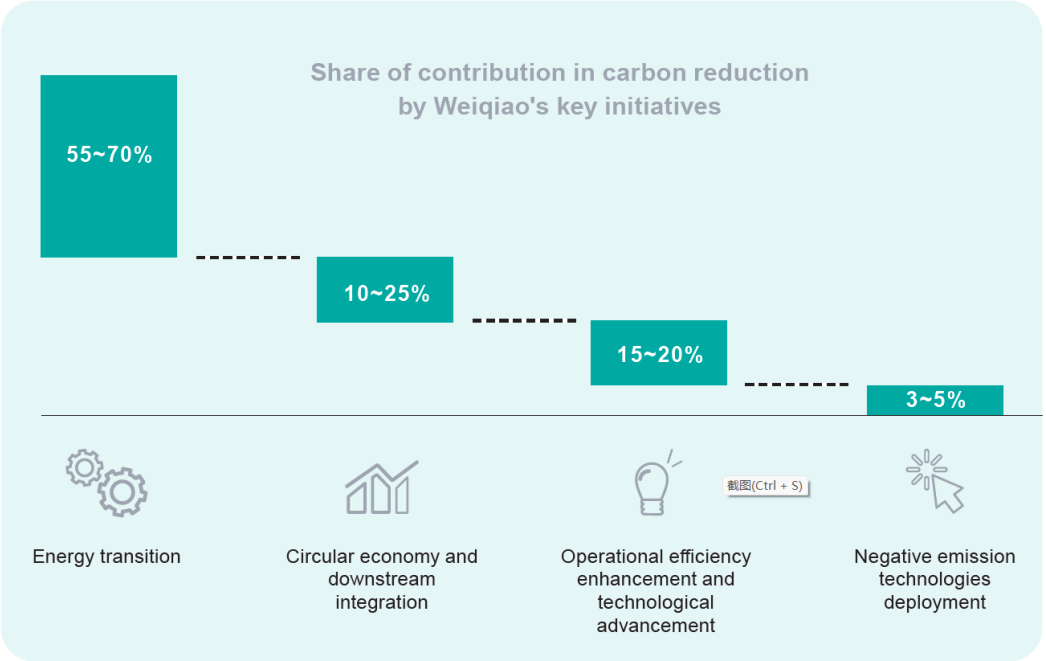

Figure 2. Share of contribution in carbon reduction by Weiqiao's key initiatives.

5. The 10 Carbon Reduction Initiatives

Carbon reduction will be a system overhaul that requires transformational efforts. Based on the profound insights over global decarbonization practices as well as considering both our own and industrial circumstances, we have laid out 10 initiatives that fall into three categories:

- business transitions as strategic actions
- operational transitions as necessary moves, and
- organizational transitions and social impact as a critical pillar.

Figure 3. The 10 carbon reduction initiatives launched by Weiqiao.

Case Study: The Green and Low-carbon Demonstration Industrial Park in Honghe, Yunnan Province

In December 2021, the contract of developing the Green and Low-Carbon Demonstration Industrial Park was officially signed in Kunming, Yunnan Province. The project is jointly built by Honghe Prefecture People's Government, Luxi County People's Government and Weiqiao, covering an area of about 8,000 mu (5.33 square kilometers). Through the coordinated layout of "wind, solar, hydropower, storage, and forests" and investment in carbon reduction projects, the park will build a world-leading industrial park with an annual capacity of 1.93 million tonnes of aluminum with low carbon footprint.

The Green Aluminum Industrial Park in Wenshan, Yunnan Province

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, officially started to be put into production. The project has a planned area of about 30,000 mu (20 square kilometers), mainly utilizing the rich hydropower resources and clean energies in Wenshan Prefecture.

Figure 4. Aerial view of the industrial park in Wenshan, Yunnan Province.

Case Study: Direct investment in renewable electricity generation systems

Weiqiao strives to make full use of the rooftops of textile and aluminum factories in various production sites. We have fully installed distributed photovoltaic power generation systems with a total installed capacity of 300 MW, mainly located in Zouping National Economic & Technological Development Zone, Binzhou Economic & Technological Development Zone, Weiqiao Town, Beihai, Xinyang and Boxing. Relevant power systems have been fully on-grid since November 2021.

Figure 5. Aerial view of the solar photovoltaic systems on the rooftop of Weiqiao's factories.

6. The Circular Economy – The Growing Importance of Recycled Aluminum

Recycled aluminum is the focal point of circular economy in the aluminum sector. In May 2020, Weiqiao's aluminum alloy recycling project, with an annual output of 100,000 tonnes, was officially put into production as a pilot for circular economy.

In order to improve the efficiency and automation of scrap metal recycling and to overcome the current difficulties in China in failing to produce high quality recycled aluminum, Weiqiao has collaborated with Scholz, the largest vehicle dismantling and metal recycling company in Germany, to introduce state-of-the-art scrapped vehicle dismantling technology and recycled aluminum production technology, so that China can achieve non-downgrade use of recycled aluminum and the aluminum industry to achieve green recycling.

The project uses first-class metal crushing and sorting processes which has a recycling rate of 97 % for scrapped vehicles, exceeding current European standards. In addition, the automation

level of metal sorting is also at an advanced international level. The project is expected to raise the level of recycled aluminum conservation in China, and greatly enhance the economic value of recycled aluminum, which will serve as a leading demonstration for the development of the recycled aluminum industry in China.

The Sino-German Hongshun Recycling Technology Industrial Park

The Sino-German Hongshun Recycling Technology Project is a recycling industrial park jointly constructed by Weiqiao and Scholz Recycling GmbH. With an investment of 1.5 billion yuan and a coverage of 523.9 mu (0.35 square kilometers), it is estimated that the project could dismantle and dispose 100 000 scrapped motor vehicles a year, and the annual processing scale of recycled aluminum will reach 500 000 tonnes. At the same time, a project that could recycle 30 000 tonnes of lithium battery for electric vehicles has been launched. The industrial park is expected to cut down carbon emissions by an average of 1.9 million tonnes per year after completion.

7. Eco-friendly brands

We have now successfully registered two green aluminum trademarks.

- HQALight, the trademark for low-carbon primary aluminum, represents products mostly produced in production bases in Yunnan Province.
- HQALoop, the trademark for low-carbon recycled aluminum, represents products primarily produced by Weiqiao's recycled aluminum business sector. In the future, the two trademarks will be launched as brands for green, hydropower-based aluminum and recycled aluminum, respectively.

Figure 6. Trademarks for low-carbon primary aluminum and low-carbon recycled aluminum.

8. Growing Downstream Aluminum Processing

Weiqiao's lightweight sector was launched in August 2019. Weiqiao's expansion into the lightweight sector is an attempt to practice high-quality development along the industrial value chain.

After nearly three years of development, a systematic business layout has been formed with the four core industrial bases in Zouping, Binzhou, East China and Central China. The planned production capacity includes 3 million units of forgings, 17 million units of castings, 200 000 tonnes of extruded products, 50 000 tonnes of plates, 500 000 sets of stamping, 1 million sets of body and assembly parts, and a total production capacity of 30 000 cubic meters of aluminum foam.

We will strengthen cooperation with domestic and foreign research institutions and leading producers and give full play to the advantages of our complete industry chain from liquid

aluminum (hot metal) to vehicle assembly. We strive to build the largest lightweight production base in China that integrates R&D, testing, and manufacturing.

We aim to take an ambitious step forward, planning a broader presence in the realm of lightweight materials. Our diversified expansion will have automotive application and aluminum products as the foundation, and include high-end extension of current aluminum processing parts, the expansion of non-aluminum materials such as carbon fiber that are highly synergistic with aluminum assembly parts, and the extension to integrated solutions of design and services based on aluminum components and vehicle assembly.

Figure 7. The Weiqiao Lightweight Base.

9. Conclusions

This paper and accompanying presentation aims to introduce China Hongqiao Group as one of the leading global aluminum producers and the current goals and objectives being pursued by the Group's management led by Chairman/CEO Zhang Bo, with a corporate priority on carbon neutrality and a sustainable future:

"Using China's climate goals as a framework, we have been proactive in accelerating our green transition and exploring the path towards a sustainable future. We have found our way, which is to achieve high-quality and sustainable development through decarbonization and innovation, and to contribute to the harmonious coexistence between economy and ecology.

We understand that green and low-carbon development matters a lot. It matters to the future of the community with a shared future for mankind and relates to the ecological protection of countries and regions. It increasingly shapes how competitiveness is defined in the manufacturing industry and among companies. And it drives innovation within companies and in the industry.
We are determined to achieve our carbon neutrality goals and elevate climate-compatible productivity. We also pledge to make good use of our influence along the industrial chain, inviting all partners and friends to join our decarbonization efforts and pursue green and low-carbon development. Let us join hands to ensure a greener, better and more sustainable future!"