posco FUTURE M

Motivate Future Movement for a Better World

POSCO FUTURE M

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Overview

Heading Towards the Future of Materials

2030 Global Top Tier

in battery materials

Global Market Share

20%

Korea's ONLY maker of cathode·anode materials for batteries

industry first to establish joint venture with automaker, GM

Premium needle coke

- used for making anodes & electrodes
- high value-added tech only by **4 nations (KOR·CHN·US·JPN)**

ESG Grade A

MSCI (Morgan Stanley Capital International) (2023)

2021 S&P Global Platts

Global Metal Awards Rising Star Award

recognition on the global stage as a growth model

High-Purity H_2O_2 for Semiconductor-Use

removal of trace metals from 10ppb (parts per billion) to less than 1ppt (parts per trillion) for use in precision semiconductor processing

a/o 2022

SALES
4.759 trillion won

OPERATING PROFIT
36 billion won

a/o 2023.12

EMPLOYEES
2,835

History

To go toward carbon neutrality with green materials

BEGINNING
founded as solid partner within the steel industry

- 1963 · **Samhwa Hwasung Established**
  Refractory manufacturing
- **1971 · Founded as Pohang Industrial Furnace**
  Korea's leading refractory provider
- 1983 · **first R&D center established**
- 1994 · **R&D center established**

GROWTH
portfolio expansion via new high value-added operations

- 2010 · **renamed to POSCO Chemtech**
  entry into carbon materials market made from steelmaking by-products
- **2011 · Korea's 1st natural graphite anode**
  first step into battery materials
- 2012 · **POSCO MC Materials established**
  entry into needle coke market, for anodes and electrode bars
- 2019 · **Renamed to POSCO Chemical**
  merged with POSCO ESM(cathode) for more synergistic battery business
- 2020 · **P&O Chemical established**
  -producer of high-purity H_2O_2 / pitch for anode coating
  -portfolio diversification

LOOKING FORWARD
accelerated battery materials operations via investments home & abroad

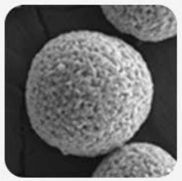
- **2021 · Acquired shares of China's Zhejiang P-H & Zhejiang H-P**
  -joint venture for cathodes & precursor
  -first overseas investment in batteries
- **Agreement with GM(General Motors) for joint venture in cathodes**
  industry first partnership with global automaker
- **2022 · Completion of Gwangyang Cathode Plant**
  World's largest cathode material plant
- **2023 · Cathode supply agreement with Sansung SDI and LG Energy Solution**
  first NCA supply to extend its portfolio(to Samsung SDI)
- **Renamed to POSCO FUTURE M**
  transition to Eco-Friendly Future Material Company

Business | Introduction

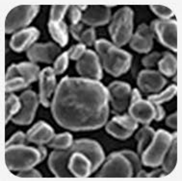
POSCO FUTURE M, Preparing for the Future of Materials

Battery materials

- **Goal to become global top tier supplier of core materials for batteries**
  - Korea's only simultaneous cathode·anode production
  - domestication of artificial graphite anodes
  - material value chain via global investment
  - R&D effort on next-gen materials and portfolio further extension(High-voltage mid-nickel /LFP CAM, all-solid-state battery materials, and silicon AAM, etc.)



cathode



anode

precursor

Advanced Chemical Materials

- **Production of carbon-based advanced materials**
  - utilize COG(Coke Oven Gas) by-product from steelmaking to produce chemical materials including coal tar & light oil
- **High value-added advanced materials**
  - **needle coke, pitch coke,** and **high-purity hydrogen peroxide(H2O2)** for **semiconductor-use**

carbon materials

carbon products

hydrogen peroxide (H2O2)

Basic Industrial Materials

- **Total refractory solutions**
  - production & engineering of refractories that maintain properties in high temperature environments inside various plants
- **High grade quicklime for steelmaking**
  - to improve steelmaking quality and productivity by detaching impurities
- **Global top manufacturing technologies**
  - refractory expertise & automated smart facilities

refractories

quicklime

furnaces

Business

01 Battery Materials

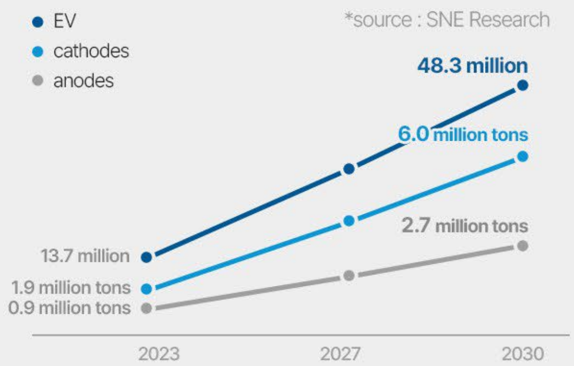
02 Advanced Chemical Materials

03 Basic Industrial Materials

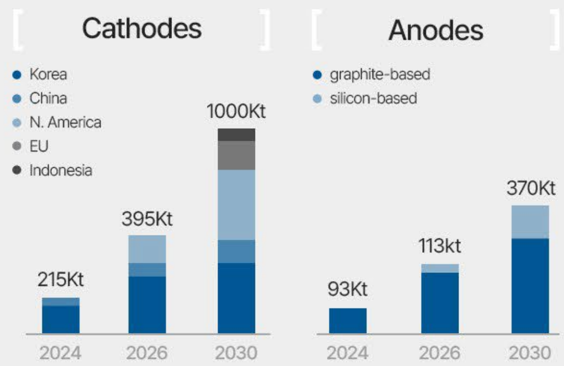
Leading the era of Carbon Neutrality

Growth of Green Mobility: **Rapidly increasing Demands of battery materials**

EV & BATTERY MATERIAL MARKET (FORECAST)



POSCO FUTURE M PRODUCTION CAPABILITIES



Becoming Global Top Tier Supplier by 2030 via Continued Expansion of Production Capabilities

Production capability expansion timeline

2024

+ Cathodes
- JV plant in Canada completed(30kt)
- Precursor production line completed(45kt)

– Anodes
- Pohang Plant completed (artificial, 18kt)

2025

+ Cathodes
- Pohang Plant completed(46kt)
- Gwangyang Plant completed(52.5kt)
- 2nd JV Plant in Canada completed(33kt)

– Anodes
- Sejong Plant completed (natural, 30kt)

2026

+ Cathodes
- 395kt global production ready

– Anodes
- 1st Si-C plant completed

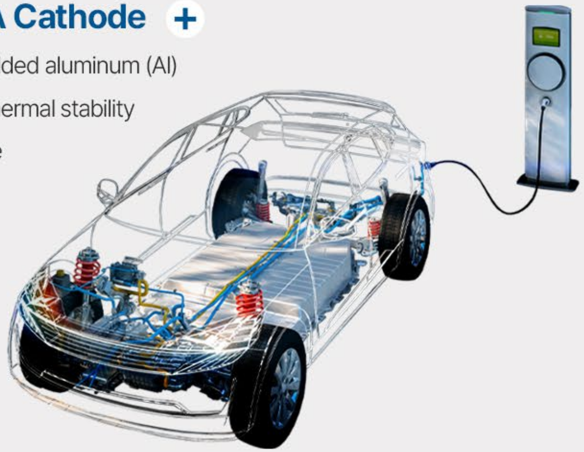
Business

Global Top Tier In the business

Pursuing technological edge in core battery materials

High Nickel NCMA Cathode +

- more nickel included w/ added aluminum (Al)
- High capacity, improved thermal stability
- up to 600Km driving range on single charge



– Low Expansion Anode

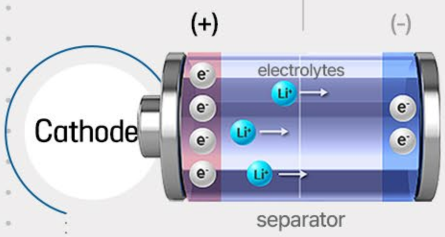
- improvement of charging speeds, safety, & battery life via combining the benefits of natural/artificial graphite anodes

– Artificial Graphite Anode

- made of needle coke
- rapid charging, prolonged battery life

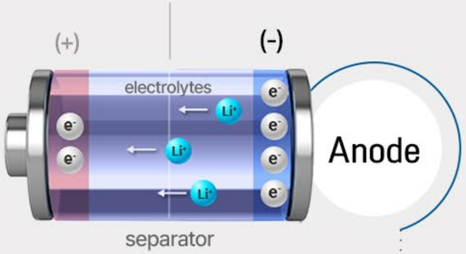
The Lithium Ion Battery

charge transfer of lithium ions(Li+) from positive (+) to negative (-)



- energy source that acts upon a lithium source
- determines avg. output and capacity of battery

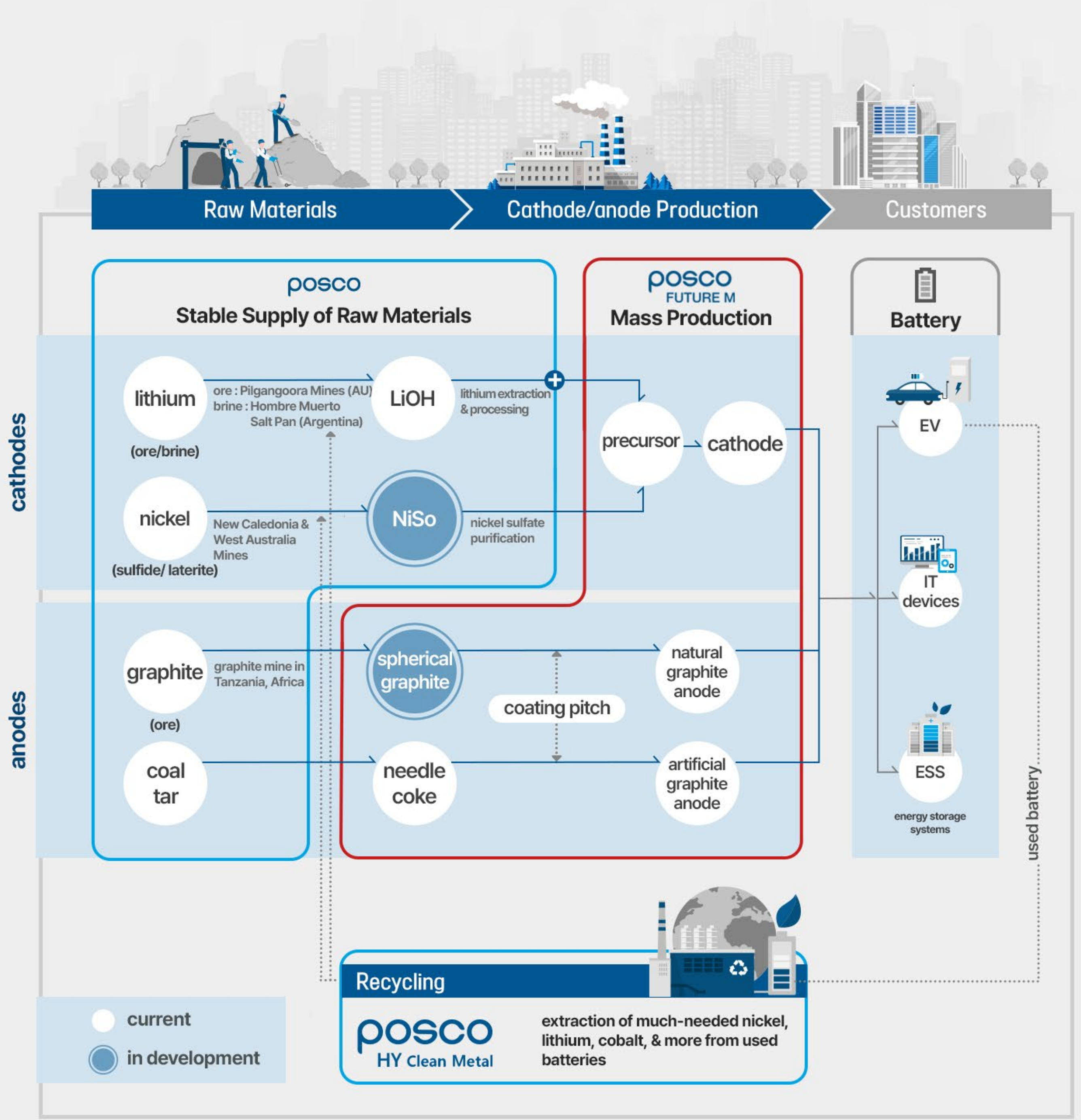
discharge transfer of lithium ions(Li+) from negative (-) to positive (+)



- stored lithium ions are released via external circuit to create an electric current
- determines charging speed & battery life

Business

Total Value Chain of Enegery Materials



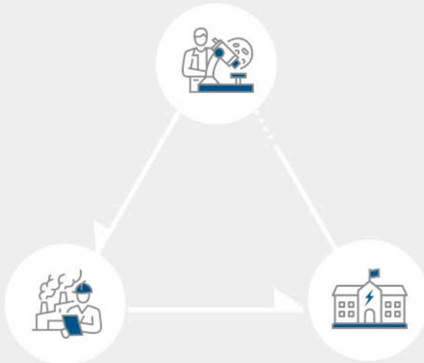
Global Leadership in Technologies

Key competence in next-gen tech leadership : Integrated R&D capabilities within POSCO Group

FUTURE TECHNOLOGY RESEARCH INSTITUTE*/RIST

PILOT STUDY AND RESEARCH

*Groupe's control tower of newly growing businesses, established in 2022



POSCO FUTURE M energy materials R&D center

commercialization

partner-focused researching capability

POSTECH

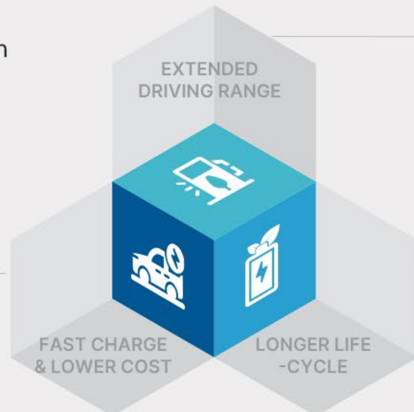
industry-academia synergy

fostering researching talent

EV BATTERY MEGA TRENDS

511 battery related patents & registrations and other intellectual property(IP) along with

continued tech development leading mega-trends



Higher Capacities for Extended Distances

- all-solid-state battery materials (lithium metal anode materials)
- silicon(Si) anodes

Faster Charging & Lowered Costs

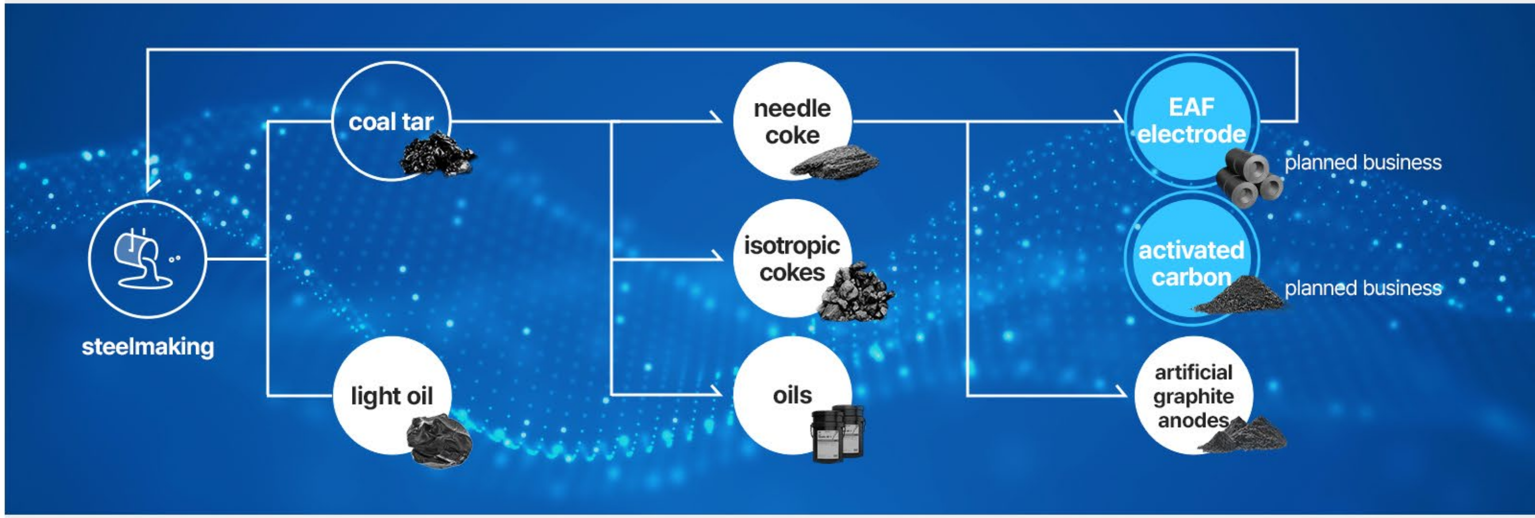
- LFP cathodes
- cobalt-free (Co-free) cathodes
- low expansion natural graphite anodes

Prolonged Battery Life

- high nickel NCMA cathodes (Single crystal)
- long-life artificial graphite anodes

Extending the Chemical Value Chain

Chemical Value Chain Expansion



High Value-Added Carbon Materials & Raw Materials

Premium Needle Cokes

- technology used in artificial graphite anodes & electrode bars available only in **4 countries (KOR·CHN·US·JPN)**
- successful domestication via POSCO MC Materials subsidiary,improving Korea's carbon materials industry

Coal Tar raw material for advanced materials including needle cokes & pitch for anodes

Light Oil benzene-based industrial material

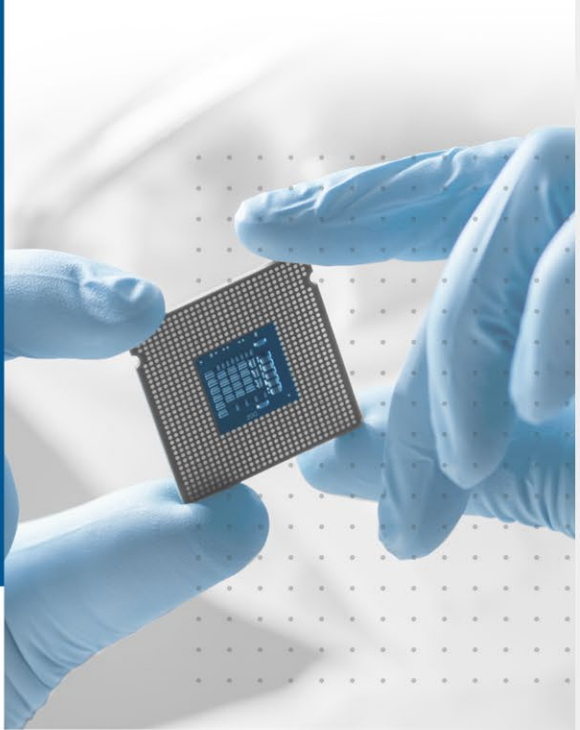
EAF electrode

- Made of melting steel scraps and is an eco-friendly means of steel production
- Planning for mass production at UHP (Ultra High Power) grade

Activated Carbon

- Carbon material that maximizes its porous surface area for optimal absorption of harmful substances
- Development of activated carbon for use in desulfurization/air purification/water treatment from heavy tar & artificial graphite anode by-products
- Planning for mass production

Diversifying product portfolio with high value chemical materials

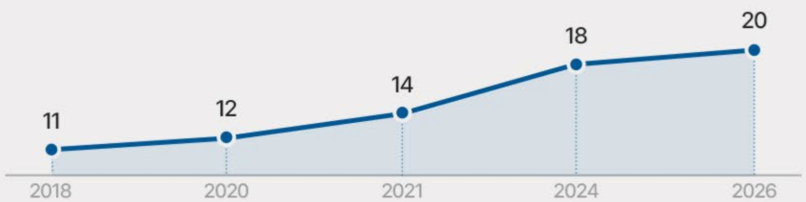


Expand high-value chemical business backed by in-house carbon material supply

High-Purity Peroxide Production

- Korea's first to refine COG and utilize extracted hydrogen as a base for high-purity hydrogen peroxide(H_2O_2) production
- used for cleaning etchings on semiconductors & displays, to create high added-value
- expected annual production capacity: 50K tons

Demand for High-Purity H_2O_2 for Semiconductor Use
(unit:10Kt)



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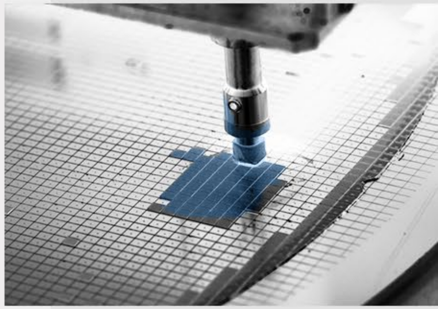
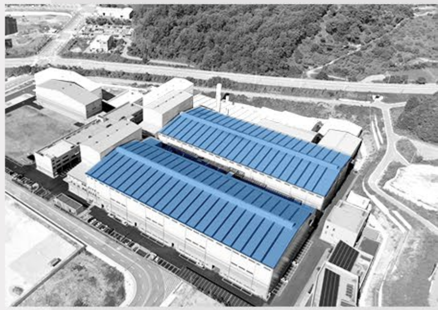
source: industry



Coating Pitch

- used as surface coating on anode material to improve charging/discharging efficiency and prolong service life, prevents anode swelling
- Korea's only internalized high-softening point pitch production technologies
- core material for high-capacity batteries & next gen silicon anodes
- Annual production capacity of 15k tons



Business

Becomeing an Industry Standard with the World's Best Partner

Total Refractory solution provider as a partner **of the world-best steelmaker, POSCO**

Refractories

Refractory Production

- high quality refractory products based on its own technologies
- total customer services based on extensive refractory portfolio with customers domestic & abroad for customized Trouble Zero solutions

Magnesia Clinker
magnesium extracted from the sea is used to produce refractory materials

Shaped Refractories
brick shaped and used in building industrial furnaces & plants

Unshaped Refractories
powdered and castable for various construction applications

Functional Refractories
improves steel strength during milling process

Refractory Engineering

- total solutions for industrial plant refractories
- current projects in Vietnam, Taiwan, Mexico, Ghana, Iran, Brazil, UAE, Bahrain, Saudi Arabia and Nigeria, etc.

steel plant

nonferrous metals·cement plant

energy plant

petrochemical plant

Quicklime

- used in steelmaking, core material that determines productivity & quality of steel products
- quicklime for various applications, supplied to Pohang and Gwangyang Steelworks

limestone (or dolomite) baked at temperatures above **900°C**

Korea's largest annual production of **2400Kt**

steel making

chemicals

ESG

Sustainability to Share with Future Generations & the Whole World

Environment

Transition to renewable energy based on enhancing climate change response governance and transparent information disclosure

Strengthening low-carbon management system on the foundation of the declaration of carbon neutrality by 2050 and its roadmap

- Carbon reduction strategy and execution reviewed by CEO-led internal council

Disclosure of carbon emissions information from a product lifecycle perspective including proactive response to Scope 3 regulations

Diversification of procurement portfolios for renewable energy transition

- Soloar power self-generation utilizing factory space, purchasing Renewable Energy Certificates(RECs), and participating in large-scale offshore wind-power projects

Transforming Industrial Byproducts into High Value-Added Materials, Establishing Cyclical Economies via Recycling

Resource Circulation Certifications Plant

- magnesia factory, quicklime, anode factories 1&2 certified for graphite by-product recirculation

CFP(Carbon Footprint) **certifications for low carbon product** (to be acquired)

EPD KOREA www.epd.or.kr

Acquired EPD (Environmental Product Declaration) **both on Cathode and Anode Materials**

ESG

Sustainability to Share with Future Generations & the Whole World

Social

Published Responsible Minerals Report for the first time in 2021

designated 238 locations in 28 countries as Conflict Affected and High Risk Area for supply managment

expand battery resources (lithium, nickel, manganese, graphite,...) away from conflict materials

preparing blockchain-based management system for tracing whole process from resource mining to end-users

ESG SUPPORT TO SME PARTNERS

ESG standards assessment, management consulting, and other systematic support

Corporation/Citizen Participation
Purchase Benefits
ESG Support for SME Partners

BENEFIT SHARING

government designated for drilling machine developed together with partners

Shared Growth with Suppliers in Safety-Health Management

PROCESS

- Evaluation ··· ▼
- Impovement ··· ▼
- Monitoring ··· ▼
- After-evalution ··· ▼

Governance

- establishment of BOD affiliated committees for **transparent & effective decision-making**
- increased the ratio of outside directors within BOD to strengthen expertise & diversity

BOD
- outside directors candidate committee
- audit committee

Network

POSCO FUTURE M's growth vision extends all the way to the global market

South Korea

- HQ in Pohang
- Gwangyang Office
- Seoul Office
- Gwangyang Cathode Plant
- Gumi Cathode Plant
- Pohang Cathode Plant
- Sejong Anode Plant 1
- Sejong Anode Plant 2
- Pohang Anode Plant

North America

- **POSCO FUTURE M CANADA**
- **Ultium CAM**

China

- **ZPR Headquarters**
  Zhangjiagang Pohang Stainless Steel Co., Ltd
  (张家港浦项耐火材料有限公司)
- **QZNT**
  Qingdao Zhongshuo New Energy Technology Co., Ltd.
  (青岛众硕新能源科技有限公司)
- **ZPHE** Cathode JV
  Zhejiang POSCO-HUAYOU New Energy Co., Ltd.
  (浙江浦项华友新能源材料有限公司)
- **ZHPE** Precursor JV
  Zhejiang HUAYOU-POSCO New Energy Co., Ltd.
  (浙江华友浦项新能源材料有限公司)

Indonesia

- **PT.KPFM**
  KRAKATAU POSCO FUTURE M CALCINATION
- **PT.KPDC**
  KRAKATAU POS-CHEM DONG-SUH CHEMICAL
- **PT.IPCR**
  INDONESIA POS-CHEMTECH CHOSUN RE

Affiliates

- **POSCO MC MATERIALS**
- **P&O CHEMICAL**