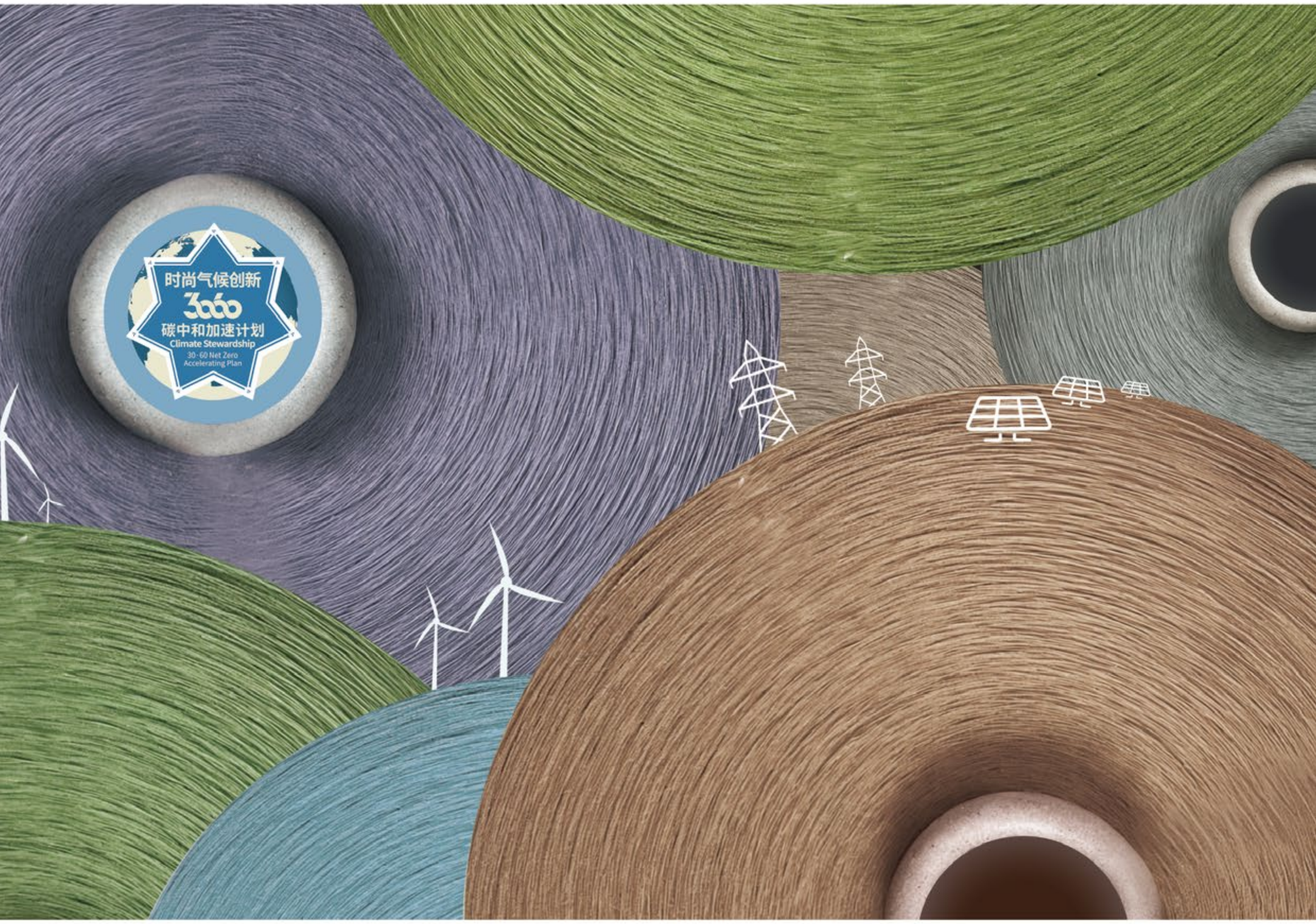
TACKLING CLIMATE CHANGE

FEASIBILITY STUDY ON RENEWABLE ENERGY INVESTMENT IN CHINA FOR TEXTILE INDUSTRY DECARBONISATION



REPORT FOR PUBLIC RELEASE

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SUPPORT BY

Glossary

Acronyms

ACRONYM	EQUIVALENCE
BAU	Business as usual
BESS	Battery energy storage system
CAPEX	Capital expenditure
CBP	Coal benchmark price
CNTAC	China National Textile and Apparel Council
COD	Commercial operation date
CSPG	China Southern Power Grid
C&I	Commercial and Industrial
DGPV	Distributed generation photovoltaics
ETS	Emissions trading system
EV	Electric vehicle
FYP	Five Year Plan
GDP	Gross Domestic Product
GEC	Green Electricity Certificate
GW	Gigawatt
IRR	Internal rate of return
kV	Kilovolt
LT	Long-term
MN/mn	Million
MSG	Minimum stable generation
MW	Megawatt
MWh	Megawatt-hour
M2LT	Medium to Long Term
NDRC	National Development and Reform Commission
NEA	National Energy Administration
NPV	Net present value

ACRONYM	EQUIVALENCE
NT	Near-term
OPEX	Operating expense
O&M	Operation and Maintenance
PPA	Power Purchase Agreement
PV	Photovoltaic
PX	Power exchange
p.a.	Per annum
RE	Renewable electricity / Renewable energy
RES	Renewable energy source
RPS	Renewable portfolio standard
SASAC	State-owned Assets Supervisory and AdministrationCommission
SGCC	State Grid Corporation of China
TWh	Terawatt-hour
T&D	Transmission and Distribution
WACC	Weighted average cost of capital

TACKLING CLIMATE CHANGE
Feasibility Study on Renewable Energy Investment in China for Textile Industry Decarbonisation

Agenda

01

Key Messages

Preface

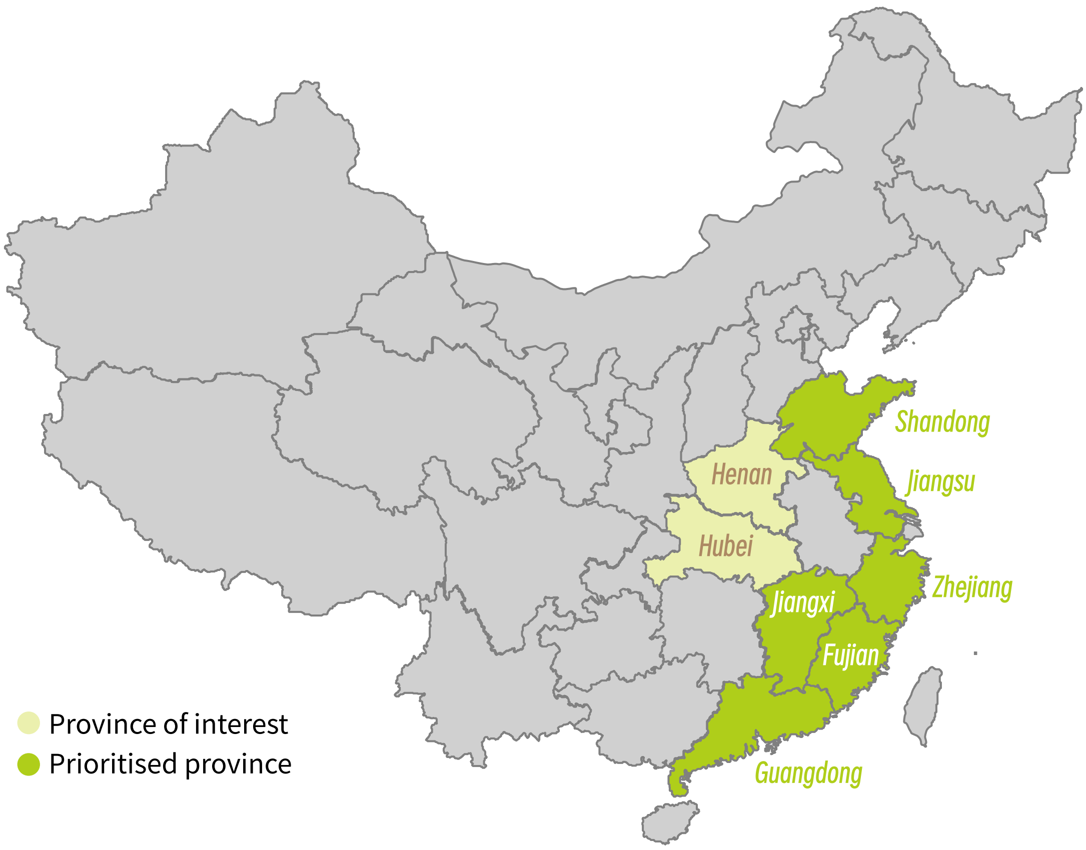
As global climate challenges intensify, reducing greenhouse gas emissions and actively addressing climate change have become an international consensus. In December 2018, at the 24th Conference of the Parties (COP24) to the UN Framework Convention on Climate Change, leading global fashion industry players jointly signed the Fashion Industry Charter for Climate Action (FICCA), committing to unified action aimed at achieving a 50% reduction in value chain greenhouse gas emissions by 2030 and significantly mitigating the sector's overall climate impact. According to World Resources Institute data citing IEA statistics, global textile and leather industry emissions reached approximately 299 million tonnes in 2019, accounting for 0.6% of global emissions, with energy consumption contributing 83% of the sector's GHG emissions.

As the world's central hub for textile and apparel production and consumption, China processes over 50% of global textile fibers. Consequently, the climate actions and progress of China's textile industry are pivotal to advancing global fashion's green transition. Within China, the textile sector contributes about 2% of national annual carbon emissions. From an energy structure perspective:

Coal-related emissions plummeted from 35% (2005) to just 3%	Electricity-driven emissions surged from 12% to 62% amid accelerating electrification

This shift demonstrates how China's comprehensive industrial electrification is transferring end-use decarbonization imperatives to the power supply side.

CNTAC's provinces of interest



Recent findings from China National Textile and Apparel Council (CNTAC)'s "30·60 Carbon Neutrality Acceleration Plan" reveal rapid green electricity adoption:

- 66% of manufacturers and 25% brands now use green electricity (2022)
- Green electricity's share in total electricity consumption rose from 1% (2020) to 8%
- Solar and hybrid projects generated 157 GWh, while green certificate purchases accounted for 92 GWh

Building on this momentum, CNTAC's Social Responsibility Office spearheads a critical initiative: developing renewable energy supply solutions to accelerate low-carbon transformation from the source. Consequently, FICCA China Working Group's 2023 Annual Meeting (Guangzhou) endorsed the "Centralized Renewable Energy Investment Feasibility Study" project. This research aims to:

1. Forecast renewable energy demand for China's textile carbon neutrality goals
2. Analyze implementation pathways aligned with global supply chain standards and domestic policy evolution
3. Assess feasibility and opportunities for green investments in renewable capacity expansion

As the founding supporting organization of the Fashion Industry Climate Action Charter and the Secretariat of the FICCA China Working Group, the China Textile Information Center officially launched this project in 2024. The project focuses on the five provinces (Shandong, Jiangsu, Guangdong, Fujian, and Zhejiang) that are the core of the foreign trade-oriented textile supply chain and three provinces (Henan, Hubei, and Jiangxi), studying the feasibility of textile enterprises directly investing in off-site renewable energy projects (i.e., directly obtaining green electricity) and focusing on evaluating the economy of this model in each province. At the same time, the project will preliminarily estimate the overall green electricity demand of major industrial clusters (provinces) in China's textile industry to support the subsequent pilot implementation. The specific research contents include:

Textile industry renewable energy application potential assessment:

Analyze the feasibility of applying renewable energy such as solar and wind energy in the textile production process, and evaluate its technical feasibility, cost-effectiveness, and potential environmental benefits.

Carbon neutrality implementation path development:

Based on the analysis of the current carbon emissions status of textile enterprises, propose feasible paths to achieve carbon neutrality, focusing on how to effectively reduce the carbon footprint through renewable energy investment.

Policy support and business model exploration:

Sort out the policy system of the Chinese government in the fields of green energy and carbon trading, and explore sustainable business models applicable to the textile industry.

Investment return and risk assessment:

Through data analysis, evaluate the economic returns, potential risks, and impacts of changes in the market environment of renewable energy investment, providing a reference basis for enterprise investment decisions.

Acknowledgments

This report, an interim result of the project, was funded through two phases: Phase I by the "Textile Industry Green Transformation Project"(jointly promoted by HSBC and WWF), and Phase II by Primark and the China Green Carbon Foundation.

The project is guided by CNTAC, managed by the China Textile Information Center(CTIC), with technical review assistance from Primark, and Afry as the technical support partner responsible for research analysis and report writing. Members of the FICCA China Working Group participated in content contribution, and 24 manufacturing enterprises provided sample analysis data.

Authorship Team

Hu Kehua	Deputy Director, CNTAC Social Responsibility Office; Director of Sustainability Stewardship , China Textile Information Center(CTIC)
Xu Jiawei	Regional Carbon Lead （China）, Primark
Zhang Tong	Vice President，China Textile Information Center(CTIC)
Zhang Wenya	Project Specialist, China Textile Information Center(CTIC)
Gao Peipei	Senior Consultant
Chen Ziqing	Manager, AFRY
Wang Zhiyao	Senior Consultant, AFRY
Huang Jingjing	Assistant Consultant, AFRY

We extend profound gratitude to the following individuals for their expertise and contributions:

Yuan Yuan	HSBC China Climate Change Director
Dan Roe	Climate Change Programme Senior Manage, Primark
Wang Jialin	Senior Environnemental Sustainability Manager, China & the Far East, Primark
Ren Wenwei	Shanghai Regional Director, WWF Beijing Office
Shentu Chuhong	Project Specialist (Shanghai), WWF Beijing Office
Wang Qian	Regional Program Director (Shanghai), WWF Beijing Office
SUN Zhen	Deputy Director General, Department of Climate Change, Ministry of Ecology and Environment, China

May QIU	Government & Public Affairs Director, Nike Sourcing Services (Guangzhou)
Cécile CHI	Specialist of Standard Development (Climate), Global Organic Textile Standard (GOTS)
Wenquan Zhang	Research Associate, Sustainable Transition Center-Energy Program, WRI China
Mofan ZHANG	Research Analyst, Sustainable Transition Center-Energy Program, WRI China
Andy CHEN	Supply Chain Environmental Project Manager, H&M China
Li Shuang	Sustainability Environmental Management SV, Fast Retailing Group
Uta Xia	Stakeholder Lead for Sustainability, Decathlon China
Tina WU	Senior Sustainability Manager, Nike Sports
Chen Zhongwei	Deputy Sustainability Director, Anta Sports
Andrew LI	Environmental Sustainability Manager, PUMA
Peng Peng	General Secretary, China New Energy Investment and Financing Alliance
Dai Yao	General Manager, Southern Power Grid Carbon Asset Company
Guo Boshan	Business Manager, Southern Power Grid Carbon Asset Company
Song Yu	Head of Power Market Asset Value Solutions, Envision Energy
Zhang Lijie	Enterprise Energy Solutions Manager, CLP Group
Qi Kang	Deputy General Manager, Shanghai Energy Conservation & Emission Reduction Center
Zhao Junfeng	Climate Change Director, Governance Solutions Group (GSG)
Wang Lin	China Director, Business for Social Responsibility (BSR)
Qiu Jun	Senior Sustainability Manager, Decathlon China
Chen Keer	Environmental Manager, C&A
Liu Wei	Director of Environment & Sustainability, Li-Ning
Cha Zhiye	Senior Compliance Manager (China), VF Corporation
Peter Yang	Senior Sustainability Manager, Zalando
Lü Xiao	Senior Sourcing Sustainability Manager, Adidas

Yang Hongwei	Head of Sustainability, Chenfeng Group
Liu Shuang	Sustainability Manager (North Asia), Lenzing Group
Huang Wenbin	Sustainability Director, Sateri
Que Miaofeng	Carbon Management Lead, Dali (China) Co., Ltd.
Zhang Zhenzhu	General Manager, Zhonglian Testing (Foshan)
Li Ruishan	General Administration Manager, Guangdong Advance Denim Co., Ltd.
Sun Xiaojuan	Laboratory Director, Guangdong Zhaotian Textile Technology
Liu Haiying	Head of Energy Management Center, Henan Xinxiang Chemical Fiber Co., Ltd.
Sun Yi	Director of CSR & Compliance, Shandong Luthai Textile Co., Ltd.
Jin Shuai	Technology Center Director, Shandong Ruyi Technology Group
Guo Kangyin	ESG Manager (Securities Dept.), Shengtai Intelligent Manufacturing Group
Yan Miaomiao	Manager, Henan Sunrise Knitting Co., Ltd.
Ping Fen	Section Chief of Enterprise Management, Zhejiang Xin'ao Textile Co., Ltd.
Pang Keli	Office Director, Joeone (Quanzhou) Co., Ltd.
Wang Pan	Manager of Technology Innovation Dept., K-BOXING (Shanghai)
Shen Huilong	General Manager of Jinjiang Production Division, Jinjiang K-BOXING Apparel Co., Ltd.
Jiang Xin	Administrative Director, Hubei Jinlong New Materials Co., Ltd.
Ni Lingli	Project Engineer, Hubei Fengshu Thread Co., Ltd.
Lü Wanwan	Product Development Manager, Shandong Dezhou Fuhua Eco-Technology Co., Ltd.
Guo Jinxi	Production Manager, Shandong Hongwei Textile Co., Ltd.
Zhang Na	Clerk, Wuhan Yufeng Down Products Co., Ltd.
Gao Feng	Energy Management Specialist, Jihua 3542 Textile Co., Ltd.
Sun Xiaojuan	Laboratory Director, Guangdong Foshan Zhixing Textile Co., Ltd.
Xi Bin	Managing Director, Guangdong Zhaotian Textile Technology
Gao Dongying	HR & Administration Specialist, Guangdong Zhaotian Textile Technology

Yang Zhengyong	Business Manager, Jiangxi Jingdong Industrial Co., Ltd.
Bi Jingling	Operations Manager, Beijing Smart Net-Zero Consulting Center

Special Thanks to Companies Contributors for Research Sample

Guangdong Advance Denim Co., Ltd.
Guangdong Foshan Zhixing Textile Co., Ltd.
Guangdong Zhaotian Textile Technology
Henan Xinxiang Chemical Fiber Co., Ltd.
Hubei Fengshu Thread Co., Ltd.
Hubei Jinlong New Materials Co., Ltd.
Jiangsu Changshu Morningray Fanga Linen Textile Co., Ltd.
Jiangsu Morningray (Jiangsu) Garment Co., Ltd. Changzhou Huacheng Garment Factory
Jiangsu Suzhou Meishanzi Garment Manufacturing Co., Ltd.
Jiangxi Jingdong Industrial Co., Ltd.
Shandong Aimer Health Technology Co., Ltd.
Shandong Dezhou Fuhua Eco-Technology Co., Ltd.
Shandong Hongwei Textile Co., Ltd.
Shandong Luthai Textile Co., Ltd.
Shandong Ruyi Hengcheng R&D New Materials Technology Co., Ltd.
Zhejiang Dali (China) Co., Ltd.
Zhejiang Ningbo Peacebird Apparel Manufacturing Co., Ltd.
Shengtai Intelligent Manufacturing Group Co., Ltd.
Zhejiang Xin'ao Textile Co., Ltd.
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Wuhan Yufeng Down Products Co., Ltd.
Henan Shengtai Knitting Co., Ltd.
Jinjiang K-BOXING Apparel Co., Ltd.
Jihua 3542 Textile Co., Ltd.

Introduction to major organizations

About China Textile Information Center (CTIC)

China Textile Information Center (CTIC) is a **public institution directly under the State-owned Assets Supervision and Administration Commission of the State Council (SASAC)** and serves as a **comprehensive industry service provider** for China's textile and apparel sector.

Since May 2005, under the guidance of China National Textile and Apparel Council (CNTAC), CTIC has supported industry-wide advancement of corporate social responsibility and sustainable development initiatives. Key milestones include:

2015: Launching the Sustainable Innovation Pioneer Project, focusing on three global sustainability governance priorities: climate change, biodiversity, and circular economy.

2017: Supporting CNTAC in initiating the "Climate Innovation 2030 Action" to enhance stakeholder collaboration for accelerating low-carbon transition.

2018: Becoming a **founding supporting organization** of **Fashion Industry Charter for Climate Action (FICCA)** under the auspices of **UN Climate Change**.

CTIC has established itself as an **active contributor** to sustainable development within global fashion supply chains, driving cross-border collaboration on environmental governance.

About Primark

Primark is an international fashion retailer employing more than 80,000 colleagues across 17 countries in Europe and the US. Founded in Ireland in 1969 under the Penneys brand, Primark aims to provide affordable choices for everyone, from great quality everyday essentials to stand-out style across women's, men's and kids, as well as beauty, homeware and accessories. With a focus on creating great retail experiences, Primark has 460 stores globally and continues to expand.

About HSBC China

HSBC was established in Hong Kong and Shanghai in 1865. Headquartered in London, the Group has a rich history of 160 years. As a leading international financial institution headquartered in the UK and the largest foreign bank in China, we are committed to acting as a bridge and helping strengthen economic and trade ties and connecting our clients in doing business globally. As of April 2025, HSBC China has 112 outlets (including 36 branches and 76 sub-branches) in 51 major cities in the Mainland.

HSBC China believes sustainability is the key to long-term success, endeavours to initiate and promote green finance policies, and is committed to supporting customers on resource conservation, environmental protection, and to promoting better consciousness of social responsibilities by applying credit and other financial instruments. In addition, HSBC China has a long-standing commitment to support the communities in which we operate, pursuing economic, environmental and social sustainability with practical actions.

Address

Yan Yan

Vice President of China National Textile and Apparel Council (CNTAC)

"

As the global textile industry accelerates its low-carbon transition, China – as the core force in the world's textile industrial chain – bears critical responsibility for driving green transformation. Achieving carbon neutrality goals requires industry-wide consensus and collaborative innovation in energy transition pathways. The release of this report marks a significant milestone in our journey toward this objective.

The scaled adoption of renewable energy serves as the central engine for industry decarbonization. We recognize that addressing regional complexities and institutional innovation challenges within China's green electricity market demands cross-institutional collaboration and localized implementation. This report pioneers a provincial-focused approach, systematically evaluating the feasibility of textile enterprises directly investing in renewable energy projects. It not only quantifies green electricity demand but also explores scalable business models – demonstrating the value of collective action.

We are profoundly encouraged by the extensive and in-depth participation of upstream/downstream stakeholders and sincerely thank all partners for their dedicated engagement:

Our gratitude to **HSBC and WWF** (jointly implementing the "Textile Industry Green Transition Project") and **Primark and China Green Carbon Foundation** for funding support across two research phases, ensuring rigorous implementation;

Appreciation to **Primark** for providing technical review with global perspectives, effectively integrating international expertise with Chinese practices;

Recognition of **China Textile Information Center** for efficient coordination, **AFRY team** for professional analysis, and **FICCA China Working Group members** for cutting-edge insights.

This report proves that **by consolidating industry demand and sharing resources, we can transcend the capacity of any single company to establish a new green electricity supply model covering the entire industrial chain**. CNTAC will advance the translation of research findings into pilot projects, collaborating with brands, supply chain partners, and policymakers to accelerate scaled renewable energy adoption in textiles.

May this report become an "**Action Guide**" for industry green transformation, providing lasting momentum for deep decarbonization of textile value chains in China and globally!

"

Nick Farrar

Head of Environmental Sustainability, Primark

"At Primark, we are committed to halving carbon emissions across our value chain by 2030, and a key part of that ambition is supporting the transition to renewable energy in our supply chain. China is a vital sourcing region for Primark, and also a critical player in the global effort to decarbonise the textile and apparel sector. However, navigating the renewable energy landscape in China—with its regional complexities and evolving market mechanisms—requires collaboration, local expertise, and innovative thinking.

That's why partnerships like this are so important. Working with CNTAC and other industry stakeholders allows us to explore collective solutions that go beyond what any single brand could achieve alone. By sharing insights and combining demand, we can unlock new business models that support long-term access to renewable electricity for the textile industry. At Primark, we are committed to playing an active role in this journey whether through supporting feasibility studies like this one, collaborating on pilot projects, or helping to shape scalable solutions for the future."

Wang Ying

Head of Sustainability, HSBC Bank (China) Company Limited

"Tackling climate change is one of the most urgent and complex challenges facing humanity. We shall deliver the wholesale economic transformation at the speed and scale that is needed, while in tandem, address wider societal challenges to deliver inclusive economic growth and protect and restore nature and biodiversity. As one of the world's largest international banks – which has supported much of the world's industrial base for 160 years and is present in the regions and sectors where the most significant change is needed – HSBC is well placed to help support and finance the transformation.

Achieving net zero will require change in every sector of the economy. The radical change in the shape of many industries required by net zero cannot be achieved by any one organisation or part of the financial system alone. Our own ability to become a net zero bank by 2050 is dependent on the pace of decarbonisation in the real economy and on our customers'ability to transition their business models. Our customers are themselves dependent on the scaling of new technologies and on the policies that support this. For economies to decarbonise while still serving the social and economic needs of countries, businesses across all industrial sectors will need to find and invest in alternative technological solutions and business practices to lower their greenhouse gas emissions, and consumers will need to adopt the ensuing new solutions at scale.

Accordingly, we continue to work to strengthen our partnerships across the public and private sector to help drive action and develop industry practice. We seek to engage on policies, regulation and partnerships that support the transition and help to scale the new technologies, infrastructure and business models critical to net zero. We recognise that we need to be consistent in this advocacy by engaging with trade associations and working with the wider business community to help build collective calls for change.

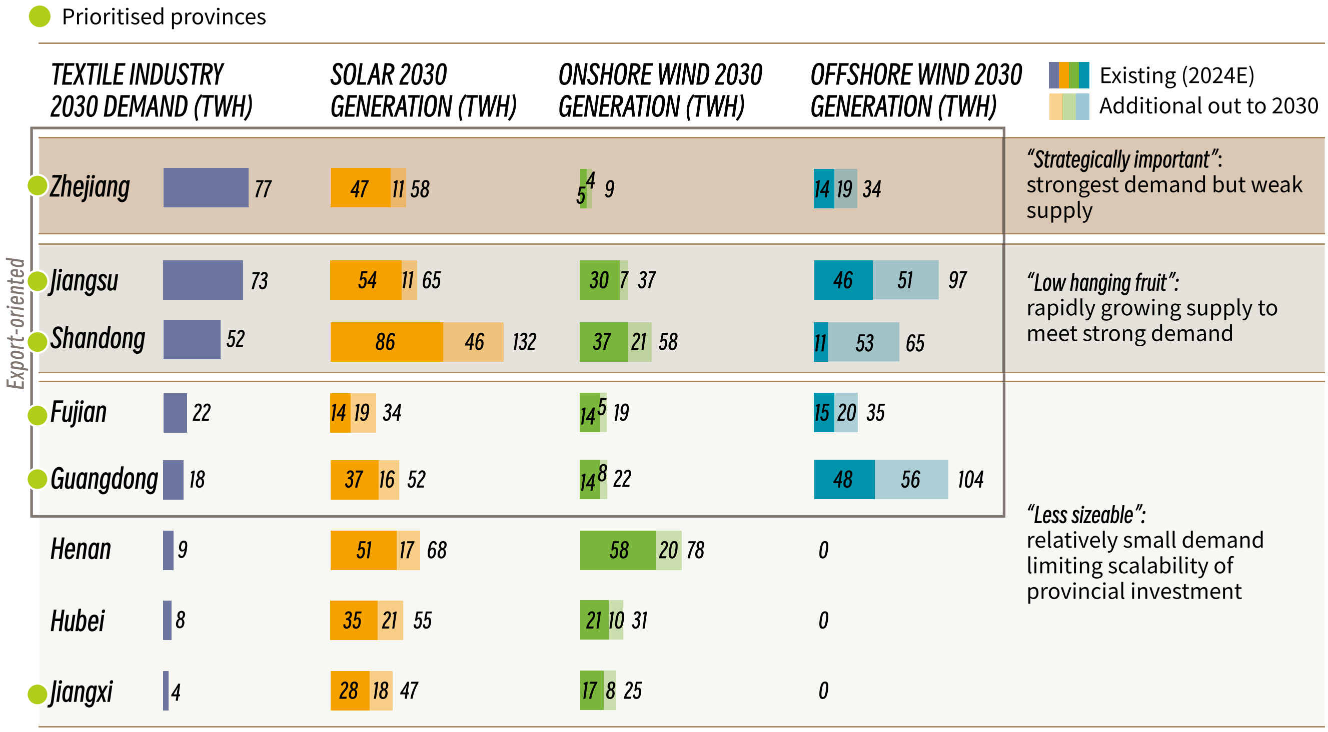
We have a track record of advocating for green development of China's textile industry through our philanthropy projects. For example, we spend $100 million over five years through our Climate Solutions Partnership, which aims to identify and remove barriers to scaling climate change solutions. Through the Climate Solutions Partnership we support a range of local NGOs and industrial associations, which focused focuses on piloting and scaling nature-based solutions, supporting climate innovation, and testing and rolling out renewable energy initiatives in Asia. We believe philanthropy plays a significant role in addressing climate change through the provision of funding for research, innovation, capacity building and the piloting, scaling and de-risking of climate action.

We value such partnership with the China National Textile And Apparel Council (CNTAC) and the opportunity to explore the feasibility of direct renewable energy investment for textile companies under our Climate Solutions Partnership programmes. This research has laid a solid foundation to inform more innovative renewable energy solutions that make better economic sense in the long term. Looking forward we will continue to support the development of an enabling environment for climate action and investment by working with CNTAC and wider stakeholders from the public sector, industry, civil society, etc. to help shape effective policies, regulations and standards, and to help develop insights and learning.

”

PRIORITISATION OF PROVINCES

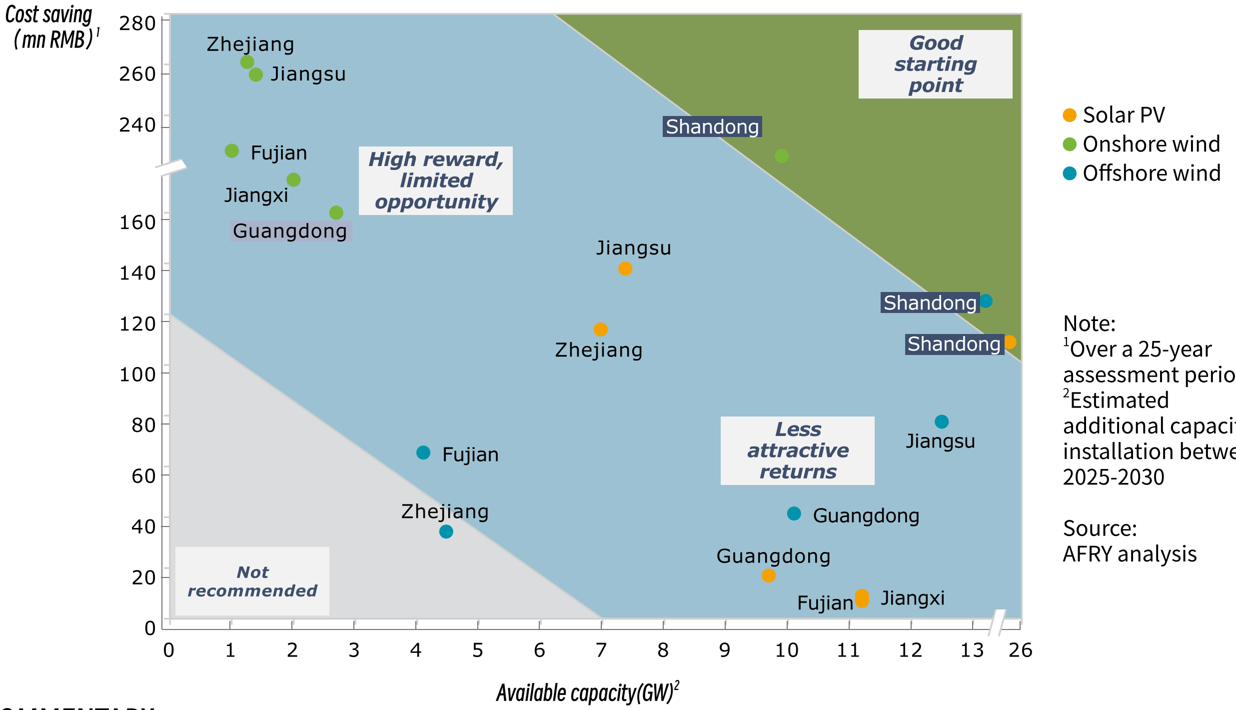
Jiangsu, Zhejiang, Guangdong, Shandong, Fujian, and Jiangxi were selected based on feedback from Phase 1 workshop participants



Source: AFRY analysis

Based on the market-wide factors listed below, the potential investor can make their decision while considering their own preference and capabilities

PRIORITISATION MATRIX



Note:
[1]Over a 25-year assessment period;
[2]Estimated additional capacity installation between 2025-2030

Source:
AFRY analysis

COMMENTARY

Considering available capacity to install and estimated cost saving, **solar PV and wind investments in Shandong are the most attractive due to good returns and abundant market opportunities.**

Meanwhile, **opportunistic pursuit in onshore wind investment across all other provinces** is recommended due to superior returns and correspondingly the most significant cost saving potential. But given limited resources for development during the 15th FYP period, we expect such opportunities to be limited.

Additionally, **solar PV investment in Jiangsu and Zhejiang holds promise** due to attractive cost saving potential as well as positive prospect for the growing market.

The above are recommended as a **starting point to pursue** a pilot case, though the specific investment decision will be subject to more granular **asset-specific analysis** / negotiation with the seller.

The other options have poor economics for the time being due to suboptimal renewable resources (e.g., solar PV in Guangdong and Fujian) or high investment costs (e.g., offshore wind in several provinces). On a case-by-case basis, opportunities may be considered if they prove to have greater yields / lower investment costs than market average.

As the solar PV investment option is paired with unbundled transfer of GECs, the investor is advised to assess whether it is aligned with the relevant compliance standard to understand the compliance risk.

02

Renewable Electricity Procurement in China

DRIVERS OF CORPORATE RE PROCUREMENT

RE procurement can help corporate achieve sustainability targets, meet regulatory requirements, and stabilise energy supply at potentially low cost

BUYER'S OBJECTIVES AND COMMERCIAL CONSIDERATIONS

There is an increasing trend of corporates setting voluntary targets for carbon emission reduction. RE procurement can help corporate consumers reduce their power consumption-related carbon footprint.

Renewables' lowering technology cost has brought levelised cost of electricity (LCOE) below that of thermal power, making RE a potentially more attractive source of power than thermal.

In several Chinese provinces, green power traded prices have already trended lower than that of grid-as-agent power prices.

Long-term planning for RE procurement can help energy users ensure security of energy supply and hedge against rising and volatile energy prices as well as changes in supply to meet their long-term energy need.

Energy users may be subject to regulatory requirements such as 'dual control' and Renewable Portfolio Standard (RPS), requiring a certain level of green electricity consumption.

Certain energy-intensive industries are already subject to such requirements (e.g., aluminium). The recent Energy Law has provided legal basis to mandate more expansive demand-side targets.

International schemes such as the Carbon Border Adjustment Mechanism (CBAM) also implicitly imposes regulatory requirement for imported goods with potential to expand to more products.

RE PROCUREMENT IN CHINA

RE100 recognises 5 broad procurement types, of which some are currently available in Chinese market...

Available in China
Unavailable in China

OPTION		DEFINITION	AVAILABILITY IN CHINA
01. Self-generation from own facilities (direct investment)		Corporate buyers invest in renewable projects, retain the associated environmental attribute, and claim use of renewable electricity.	Possible through investment into on-site or off-site projects
02. Direct procurement	2.1 Physical PPA	Large energy users can contract directly with renewable generators and/or involve a third-party retailer via a sleeved PPA; such PPAs typically are typically long-term contracts.	Possible through on-site PPA (such as rooftop solar contracts) or off-site generation via sleeved PPA to the facility
	2.2 Financial PPA	It is a purely financial transaction in which a corporate buyer assumes market risk related to the sale of a generator's electricity and receives energy attributes through a contract for difference. In exchange, the generator receives a fixed price cash flow.	N.A. Spot market development is limited in many provinces, which in turn limits the risk of price volatility
03. Contract with electricity supplier	3.1 Project-specific supply contract	The supplier procures from specified projects on behalf of the corporate buyer and holds the contracts. The corporate buyer can track the energy attribute through these project-specific contracts of the supplier's and other relevant certificates.	Possible under green power trading rules
	3.2 Retail supply contract	Electricity suppliers have "off-the-shelf"arrangements in which corporate buyers pay a "premium"for supply of renewable electricity and the sources of energy may be varied throughout a procurement contract.	

OPTION	DEFINITION	AVAILABILITY IN CHINA
04. Unbundled procurement of ACs	EACs can be procured separate from their underlying generation and the corporate’ s procurement of electricity for its operation.	Possible via China’ s GEC scheme
05. Passive procurement	Either default delivered RE from the grid, supported by EACs or default delivered RE from the grid in a market with at least a 95% renewable generation mix and where there is no mechanism for specifically allocating RE	N.A.

EAC: Energy attribute certificate, GEC: Green electricity certificate
Source: RE100 Technical Criteria, AFRY analysis

TRENDS AND BEST PRACTICE

On top of the credibility requirement by RE100, more leading corporates are now considering additionality and time-matching of their green energy

CREDIBLE CLAIM

Making a credible claim around RE use requires that the attribute underlying the RE be **traceable** and that it is **exclusively** owned by the end user. This is essential as physical electricity itself is indistinguishable in terms of generation sources once it's supplied to the grid.

RE100 is the internationally leading standard-setting body, the key mission of which is to set out criteria on how an RE use claim may be considered credible.

ADDITIONALITY

Additionality around RE describes the **additional generation capacity** that a corporate purchase may have brought to the system, without which this additional capacity would not have existed. In effect a corporate does so by de-risking RE projects.

In practice, additionality isn't binary but rather dependent on the specific ways a RE project is de-risked through corporate procurement. There is no regulation nor auditing of such claims.

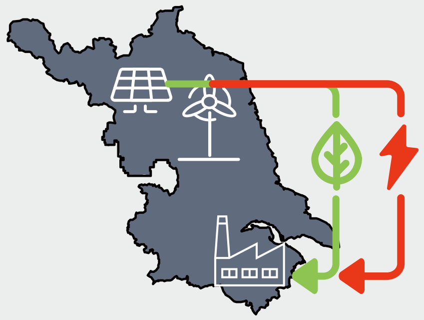
TIME-MATCHING

The physical attribute of an electricity grid dictates that the generation and consumption of **power must be balanced at all times**. In markets where it is feasible to sign physical PPAs, the onus of power balancing falls upon contracting parties. Where corporates aim to achieve 24/7 green power, it is important to match the RE generation with its demand in a time-specific manner.

PROCUREMENT OPTION COMPARISON

…though available options vary in availability and maturity across provinces

Direct investment

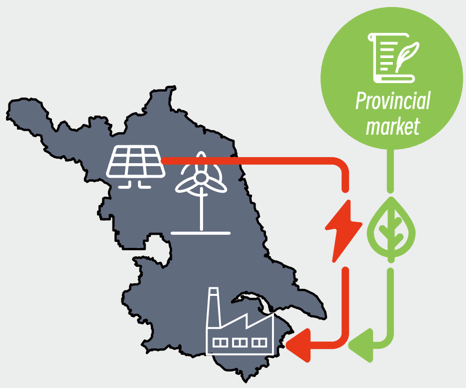


Leading solutions for those seeking highest level of credibility to meet long-term needs

- Long-term clean energy supply
- Access to energy at cost
- Highest level of credibility

- Land availability
- Project quota

Green power trading



Emerging practice, primarily traded on annual basis

- Regulatory green light for provincial trading
- Familiar with local market and market players

- Limited supply from domestic generation
- High demand for green electricity at local market
- Limited inter-provincial trading

Green certificates

Quick fix for corporates with limited experience in RE procurement

- Ease of procurement

- Credibility to be double checked against relevant compliance standard

DIRECT INVESTMENT COST COMPETITIVENESS

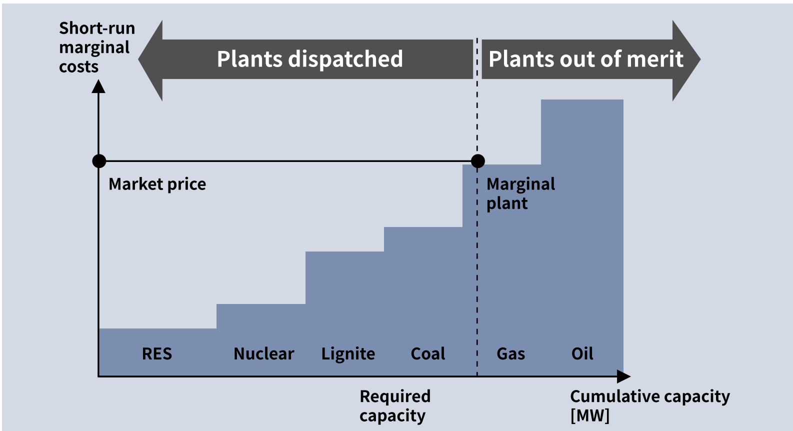
Direct investment can help corporate unlock access to renewable electricity at cost instead of market-driven pricing

HOW A RENEWABLE PRODUCER THINKS ABOUT THEIR REVENUES…

Price drivers

Fuel and commodity prices	Demand by sectors
Supply by power plants	Interconnectors

Merit-order dispatch



Wholesale electricity price captured by renewables

Source: AFRY analysis

RE direct investment is a relatively established way to enter the renewables market by holding equities in generation facilities.

It has potential to help investor cut overall costs to source renewable electricity since project owner is able to capture the levelised cost of electricity (LCOE) instead of the market price.

As project owner, there is strong position to secure long term energy supply.

Investors could transfer environmental attributes through either selling energy attribute certificates or entering into PPAs.

Offtakers and/or investors are advised to evaluate market, regulatory, basis risks, and put in place appropriate risks mitigation measures.

Room for savings

Levelised Cost of Electricity of merchant RE

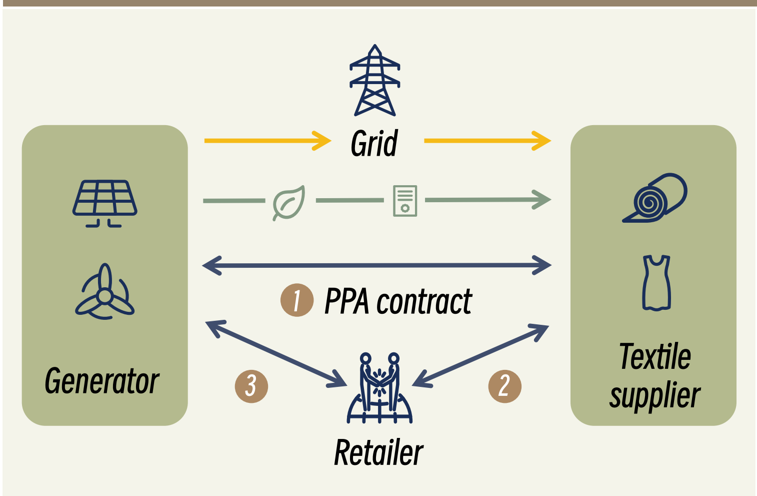
Source: AFRY analysis

TRANSFER OF ENVIRONMENTAL ATTRIBUTES

There are two main ways to transfer environmental attributes from invested RE projects to the textile industry end users

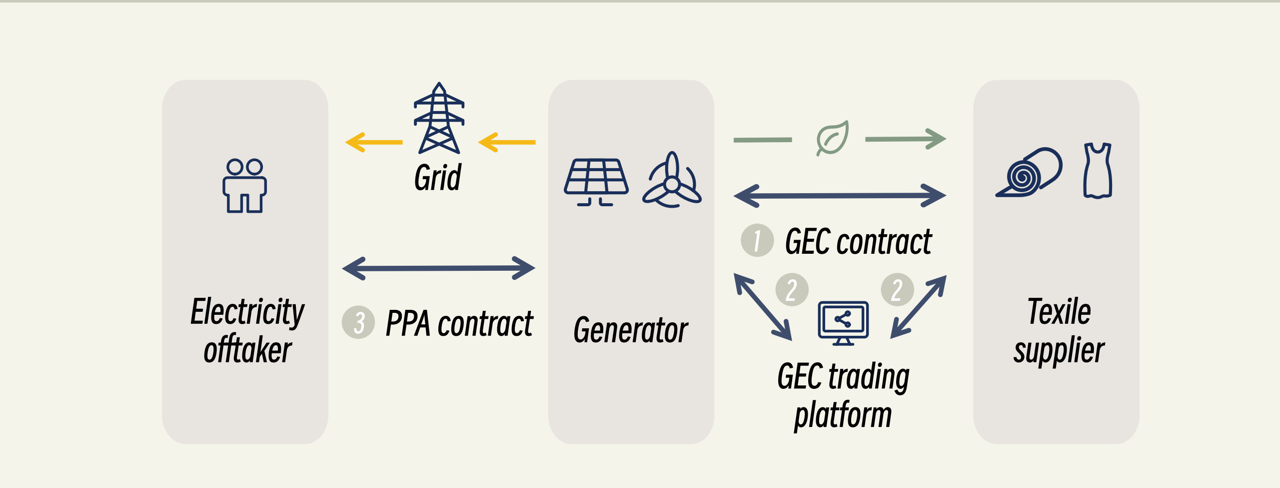
Contracting process *Electricity* *GEC*

Sleeved PPA



1. Consumer directly engages generator to sign PPA contract.
2. A retailer is involved to responsible for load management and balancing risks for user (and involved the tri-lateral PPA contract with the generator).
3. The retailer signs contract with generator to be responsible for off-take of the power from the project.

Unbundled GEC



1. Generator and textile supplier agree on GEC trading in terms of price and volume.
2. Contracting parties submit trading request to GEC trading platform for transfer of GEC.
3. Generator sign a separate power supply contract with another off-taker.

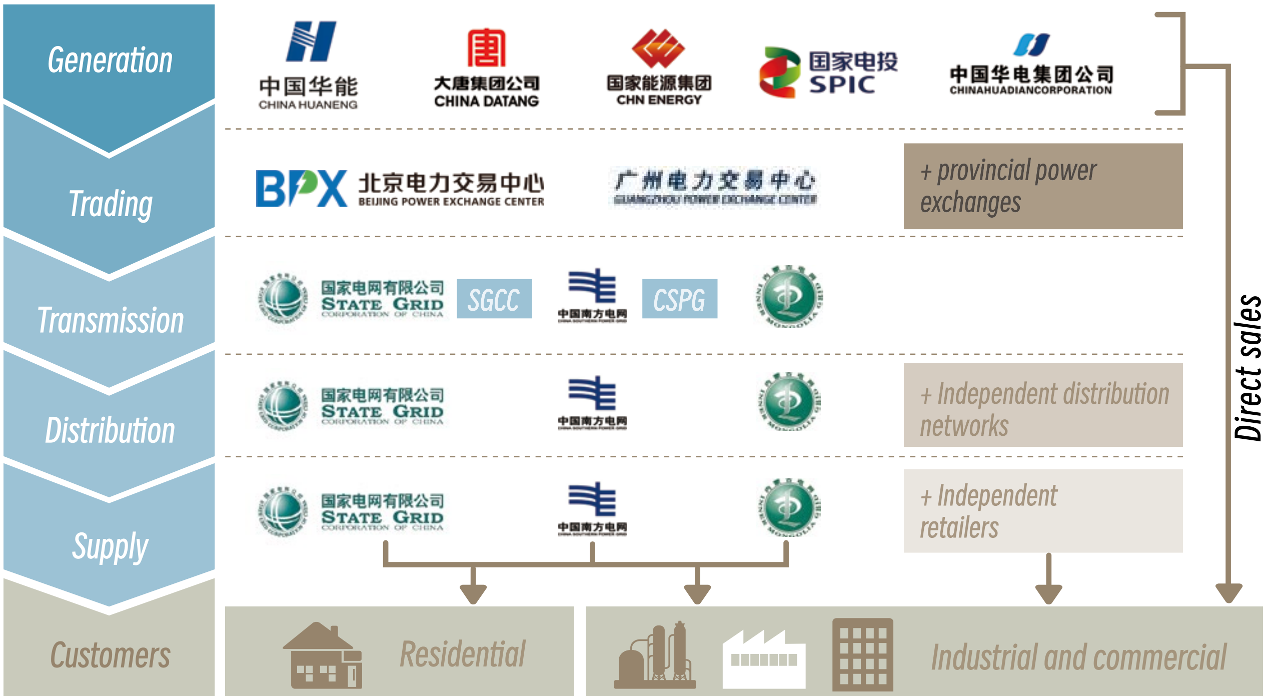
Source: AFRY analysis

03

Overview of Renewables Investment

Market reforms are disrupting the traditional pattern of single buyers acting as the agent of consumers in the electricity sector

MARKET STRUCTURE & KEY PLAYERS



Source: AFRY Analysis
Note: [1]State-owned Assets Supervisory and Administration Commission

The electricity market has traditionally been structured around two main single-buyers, State Grid Corporation of China (SGCC) and China Southern Power Grid (CSG).

These central buyers acted as agents for the demand side, purchasing electricity and then operating transmission and distribution (T&D) networks to deliver volumes to consumers at prices regulated by government agencies including NDRC and NEA.

The single buyers purchased electricity from generators, mostly owned by central-state owned entities, though some private firms would also own and operate generation assets. While state-owned generators are separate from the (state-owned) grids in operational terms, both are owned by the state, sitting under SASAC1.

Under a new programme of reforms initiated in 2015, the direct bilateral or auction trading of electricity between generators and commercial and industrial (C&I) consumers has become available. Alongside this, the sector has seen power exchanges established at the national and provincial level acting as Market Operators. Additionally, there has been increased competition on the supply side, totalling 5,941 registered retailers as of 2022.

From 2022 on, C&I consumers have also been required to participate in market trading, while for the time being residential and agricultural consumers remain captured by the vertically integrated grid companies.

PILLARS OF MARKET REFORM

The key pillars of market reform towards a fully competitive market across China will be···

MARKET COUPLING

A national power market integrating various provincial / regional grids through interconnectors is expected to merge, enabling greater efficiency of dispatching generation resources to meet demand across regions.

MARKET PARTICIPATION

Greater participation in market trading from both generation and energy use sides is expected as supply and demand fundamentals drive market clearing.

A phase-out of guaranteed hours / on-grid price for generators is expected.

MARKET PRICING

Electricity prices will be increasingly driven by supply and demand and move away from regulated prices.

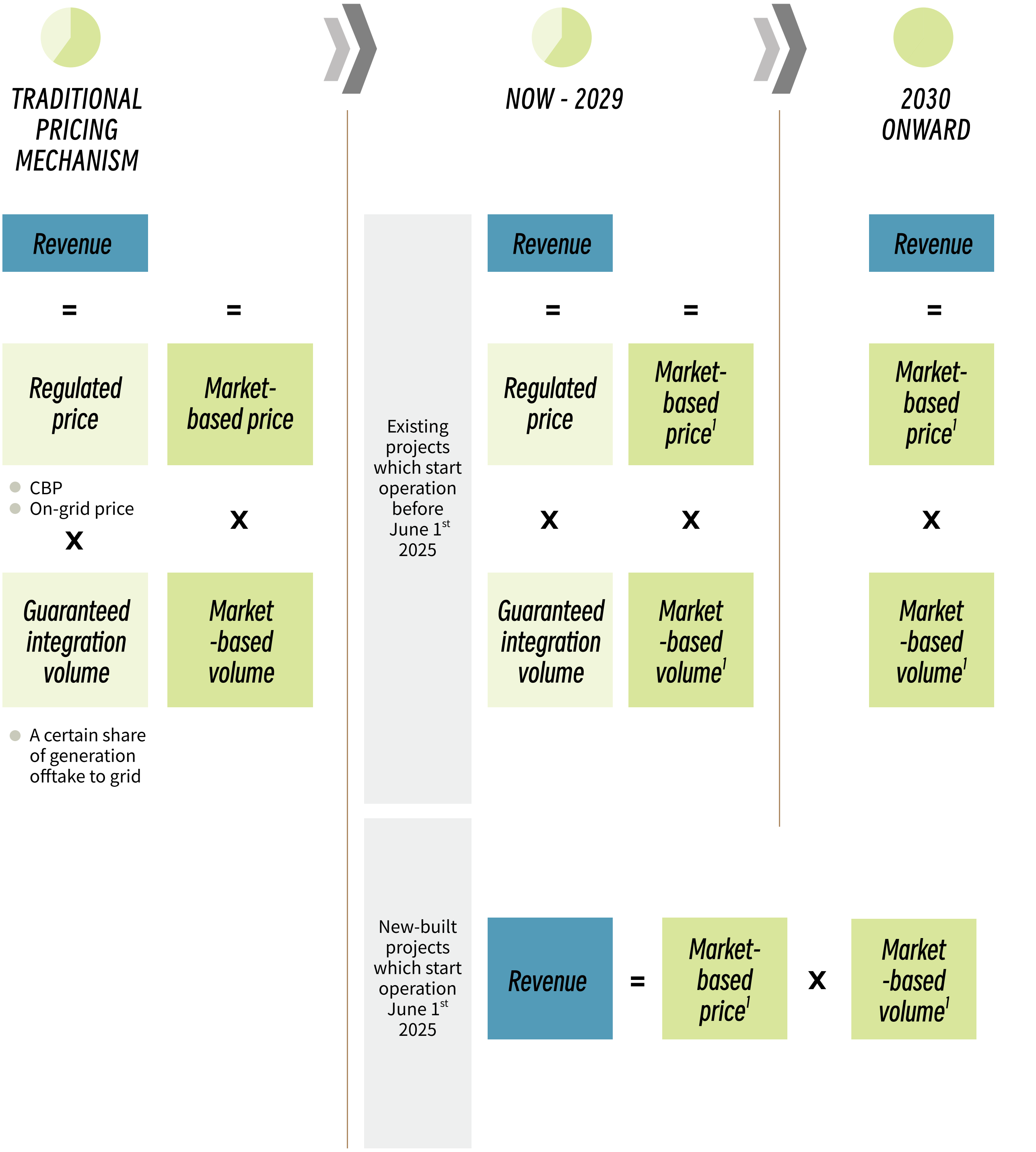
Regulatory price limits are expected to phase out or down to allow competitive pricing.

MARKET COMPETITION

Both power generation and supply sides will feature a greater degree of competition, as more market entrants (i.e., generators and retailers) enter into the market, disrupting the previously state-owned dominance in these sectors.

Source: AFRY analysis

Wind and solar PV will be increasingly reliant on the wholesale market



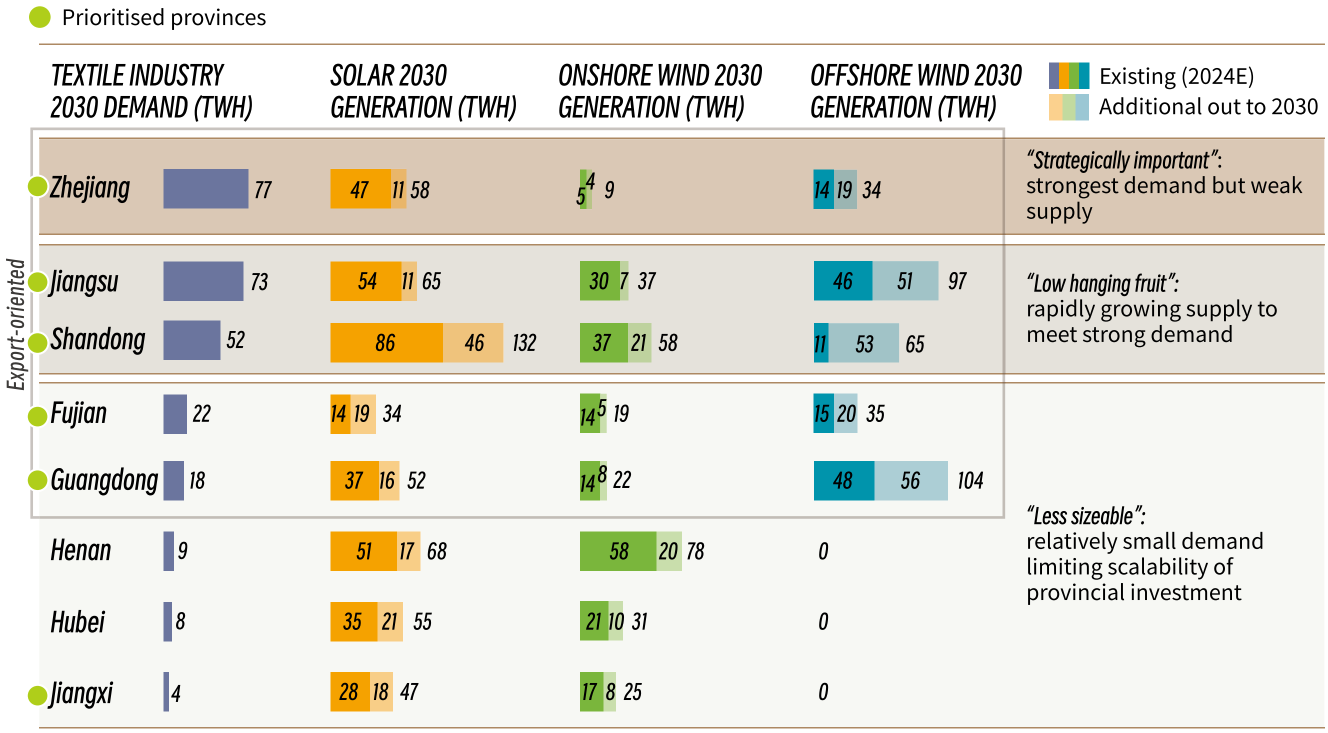
Source: Measures on Supervision of Renewables Full Guaranteed Offtake, NDRC (2024)
Notes: [1]Contract for Difference mechanism are available according to the new announced circular 136, however the detailed implementation plan is not announced yet and may vary significantly across provinces.

04

Analysis of Renewables Investment Options

PRIORITISATION OF PROVINCES

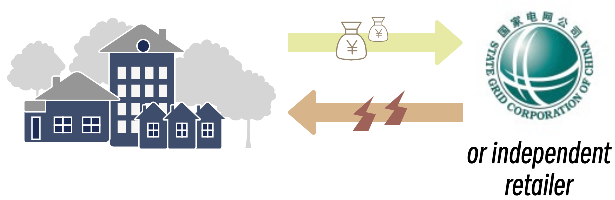
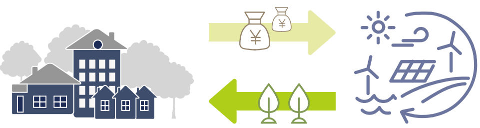
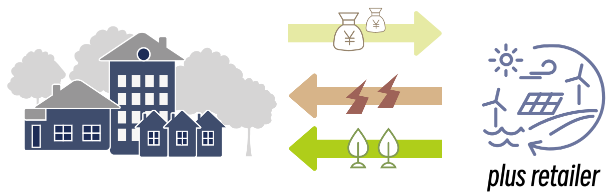
Jiangsu, Zhejiang, Guangdong, Shandong, Fujian, and Jiangxi were selected based on feedback from Phase 1 workshop participants



Source: AFRY analysis

BUSINESS MODELS

The cost saving potential of direct investment is linked with project profitability, and thus it is key to investigate cash flows of various options

OPTION	BUSINESS MODEL IN ILLUSTRATION	COST / REVENUE MECHANISM
Business As Usual		*Procurement volume* x *Wholesale electricity price*
Unbundled GECs	*BAU* + 	*BAU cost* + *Procurement volume* x *GEC price*
Renewable PPAs		*Procurement volume* x *NT: Wholesale price with green premium* / *LT: Renewables' captured price*
Direct Investment		*Initial outlay* + *Payback* + *PPA cost* *Initial outlay* + *Payback* + *BAU cost*

Note: NT = near-term; LT = long-term

MARKET OVERVIEW – JIANGSU

Less than 10% of the generated renewable energy in Jiangsu was traded in the market in 2023, though the share is expected to increase

KEY MESSAGE

Jiangsu, an eastern coastal province, features good wind resources and relatively lower solar resources. Although thermal generation dominates the generation mix, the past five years have seen significant expansion in wind and solar PV capacity driven by RPS target set in the 14th FYP. Solar capacity doubled in the past five years whereas wind capacity increased by about 50%.

Nuclear consistently accounts for 6-8% of overall generation mix in the past years, whereas solar PV and wind combined generates 12% of the electricity in 2023. Thermal generation accounts for just under 80% of the total generation.

As a demand center and a net electricity importer, Jiangsu is actively exploring clean energy import from Qinghai and/or Shaanxi's renewable energy base during the 14th FYP period, to meet local demand. Jiangsu will also look to bring additional 27 GW of renewables capacity online during the 15th FYP period to facilitate carbon peaking.

Under the current market arrangement, all renewable generators[1] enter the market by participating in green power trading, through a bilateral negotiated energy price with consideration of environment attribute price. The estimated renewable traded volume is ~95% of total renewable generation in 2023.

ROUTES TO MARKET FACT SHEET

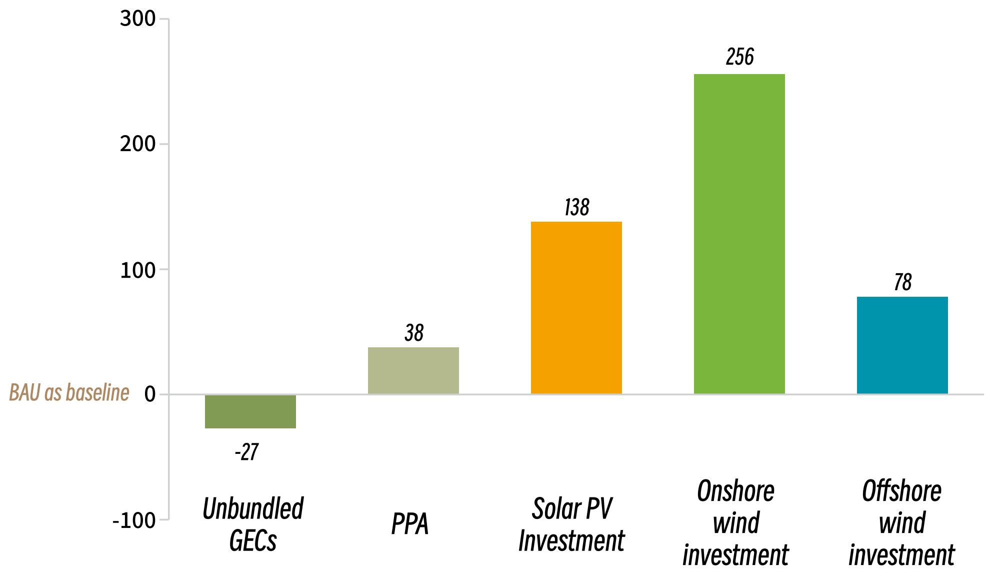
Market option	Pricing mechanism	Historical price
Green power trading	• Bilateral negotiated energy price+ environment attribute price	• 471.17 RMB/MWh in 2023 • 464.44 RMB/MWh in 2024
Grid offtake	• Fixed price at local CBP	• 391 RMB/MWh
	volume	**Share**
Total generation	64.2 TWh for utility-scale wind and solar in 2023	100%
Market traded	5.2 TWh – green power traded volume in 2023	8.1%
Grid offtake	59 TWh = total generation – market traded volume	91.9%

Note: [1]Wind and solar only.

KEY CONCLUSIONS – JIANGSU

Onshore wind investment in Jiangsu can help local energy users cut as much as one-fifth of power cost over a 25-year period

COST SAVINGS[1] RELATIVE TO BAU OVER 25 YEARS (RMB MN)



Note: Costs are discounted with an assumed rate of 5.1% as the weighted average cost of capital
Source: AFRY analysis

COMMENTARY

Relative to the BAU scenario where the energy user only purchases electricity, only in the case of purchasing unbundled GECs would additional costs incur.

The PPA option holds cost-saving potential, albeit a minor one relative to the other options and in terms of the share in overall cost (3%). In the near term, renewable PPAs still carry a green premium relative to wholesale electricity, though as the power market becomes further interconnected and liberalised, the low variable cost advantage of renewables will come through as a cheaper alternative compared to thermal power.

Onshore wind investment is estimated to cut as much as 20% of power procurement costs due to the superior expected returns. This is owing to strong local power demand and subsequently elevated power price capturable by onshore wind assets. However, due to limited land available to further develop onshore wind, the Jiangsu government has in recent years switched gears to promote offshore wind as well as distributed wind. Thus, the barrier of investing into onshore wind remains high.

Solar PV offers less attractive but still material benefits in cost reduction. Meanwhile, in addition to electrical energy revenue, offshore wind projects that meet relevant criteria can also participate in the CCER scheme to trade voluntary carbon credits for additional revenue, which can result in greater cost-saving advantages.

Renewables investment in Jiangsu may be exposed to market risks but benefit from strong power demand and well-established T&D infrastructure

High *Medium* *Low*

Risk	Description	Likelihood	Impact	Analysis and recommended mitigation action
Market price risk	The project may be exposed to lower future wholesale market prices upon expiry of grid guaranteed offtake at fixed coal benchmark price.			Jiangsu feature robust power demand, so the materiality of the risk is low. It is recommended to use long-term market price projections to support valuation of target asset.
Market design risk	The ongoing electricity market reform is faced with continued questions around fit-for-purpose market design such as capacity remuneration, ancillary services, etc. The route to a well-developed competitive market remains to be explored.			Renewable generators may be subject to additional revenues / costs in the short-term due to continued market design, though the materiality of the risk is low as the market design continues to improve following the Beneficiary Pays principle, and as the market mechanism enables generators'cost pass-through.
Offtaker risk	Under grid-parity contracts, the grid company may seek to push renewables out of expensive grid parity contracts and into the market or may try to benchmark prices relative to market outturn levels.			Renewable generators are very likely to be pushed into the market to seek their own offtaker, though the investor in this case would be the energy user itself, thus eliminating the risk.
Curtailment	Slow implementation of markets, continued overcapacity of coal, a sharp fall in demand, or insufficient T&D infrastructure, could lead to curtailment of renewable generation rising, which would dampen revenues.	Depending on technology		Jiangsu feature strong demand and well-established T&D infrastructure, and thus the curtailment risk is minimal.
Capture price annibalisation	As renewable deployment is getting faster, price captured on the power market has the risk to be eroded over time.	Depending on technology		Jiangsu feature ambitious solar PV installation target increasing the likelihood of cannibalisation, though owing the strong power demand and limited RE resources, the high wholesale electricity price is expected to bulwark solar PV's capture price.

Source: AFRY analysis

MARKET OVERVIEW – ZHEJIANG

Renewables can choose between being off-taken by the grid and trading in the local green power market

KEY MESSAGE

Zhejiang, situated in the East China grid region, is a major load centre with limited domestic generation capacity. Owing to limited land availability, the province has relied on thermal and nuclear for domestic generation and emphasised development of DGPV and offshore wind, while continuing to diversify its sources of power imports from across Anhui, Ningxia, Sichuan, Fujian, and so on.

Due to relatively favorable wind resources, strong demand for decarbonisation, and profitable business models in DGPV, total RE installed capacity saw an aggressive growth in the past three years, achieving Zhejiang's 14th FYP target ahead of schedule (for solar PV and total RE). Out to 2030, another 20 GW of solar PV and wind will be brought online, along with energy storage capacities, to meet growing demand and facilitate carbon peaking.

Renewables[1] for now can be fully offtaken by the grid at fixed price, though they have the flexibility to participate in the green power market for potentially greater gains.

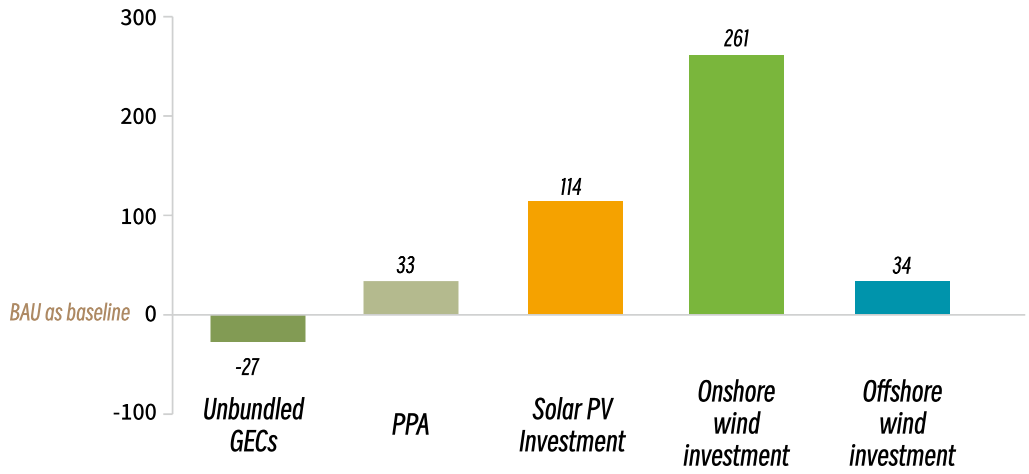
MARKET TRADE FACT SHEET

Market option	Pricing mechanism	Historical price
Green power trading	• Traded price + environmental attribute price	• 468 RMB/MWh for 2024 annual trading • 465 RMB/MWh for 2024 Q1 traded green power price
Grid offtake	• Fixed price at local CBP	• 415.3 RMB/MWh
	Volume	**Share**
Total generation	16.9 TWh for utility-scale wind and solar in 2023	100%
Market traded	8.2 TWh for wind and solar in 2023	48.5%
Grid offtake	8.7 TWh – calculated by total generation – traded volume	51.5%

Note: [1]Wind and solar only.

Onshore wind investment in Zhejiang can help local energy users cut as much as one-fifth of power cost over a 25-year period

COST SAVINGS[1] RELATIVE TO BAU OVER 25 YEARS (RMB MN)



Note: Costs are discounted with an assumed rate of 5.1% as the weighted average cost of capital
Source: AFRY analysis

COMMENTARY

Similar to the options in Jiangsu, the PPA option holds cost-saving potential, albeit a minor one relative to the other options and in terms of the share in overall cost (2.8%).

Onshore wind investment is estimated to achieve the greatest cost savings, reaching up 21% of power procurement costs. though limited land availability for further onshore wind development poses a barrier for significant scaling of investment.

Solar PV investment, though less attractive than onshore wind, nonetheless holds material cost saving potential. It is expected to help the energy user save 114 million RMB over the 25-year period. In Zhejiang, solar PV will continue to have room to grow in Zhejiang, representing as much as 7 GW of capacity addition by 2030, though the unbundled solution is associated with a long-term policy risk undermining its credibility of claims.

Due to high CAPEX investment costs, **offshore wind for the time being remains unprofitable and thus brings little cost reduction potential.** With the falling of offshore wind technology cost, offshore wind economics may still be improved going forward, as up to 4.5 GW is expected to be brought online by 2030.

Additionally, there has been observations in the market in Q3 2024 that energy-intensive companies are subject to mandatory GEC purchase quota to help meet the province's near-term dual control targets. This creates a level of near-term uncertainty in terms of possible doubling the procurement efforts for RE.

RISKS AND MITIGATION - ZHEJIANG

Zhejiang exhibits strong power demand and limited renewable resources, which makes the market risks relatively low

High *Medium* *Low*

Risk	Description	Likelihood	Impact	Analysis and recommended mitigation action
Market price risk	The project may be exposed to lower future wholesale market prices upon expiry of grid guaranteed offtake at fixed coal benchmark price.	High	Low	Zhejiang feature robust power demand, so the materiality of the risk is low. It is recommended to use long-term market price projections to support valuation of target asset.
Market design risk	The ongoing electricity market reform is faced with continued questions around fit-for-purpose market design such as capacity remuneration, ancillary services, etc. The route to a well-developed competitive market remains to be explored.	Medium	Low	Renewable generators may be subject to additional revenues / costs in the short-term due to continued market design, though the materiality of the risk is low as the market design continues to improve following the Beneficiary Pays principle, and as the market mechanism enables generators'cost pass-through.
Offtaker risk	Under grid-parity contracts, the grid company may seek to push renewables out of expensive grid parity contracts and into the market or may try to benchmark prices relative to market outturn levels.	High	Low	Renewable generators are very likely to be pushed into the market to seek their own offtaker, though the investor in this case would be the energy user itself, thus eliminating the risk.
Curtailment	Slow implementation of markets, continued overcapacity of coal, a sharp fall in demand, or insufficient T&D infrastructure, could lead to curtailment of renewable generation rising, which would dampen revenues.	Depending on technology		Zhejiang feature strong demand and well-established T&D infrastructure, and thus the curtailment risk is minimal.
Capture price annibalisation	As renewable deployment is getting faster, price captured on the power market has the risk to be eroded over time.	Depending on technology		Zhejiang feature ambitious solar PV installation target increasing the likelihood of cannibalisation, though owing the strong power demand and limited RE resources, the high wholesale electricity price is expected to bulwark solar PV's capture price.

Source: AFRY analysis

MARKET OVERVIEW – GUANGDONG

RES power can be off-taken by the grid at CBP or enter into local green power trading in Guangdong per prevailing market arrangements

KEY MESSAGE

Guangdong, a leading industrialised province in China, has a dynamic power market. Despite coal's dominance, government policies and burgeoning demand have favoured renewable development, with renewables[1] reaching 42 GW in 2023 quadrupling 2019 level.

During the 14th Five-Year Plan period, the local policy targets 20 GW of wind and solar PV respectively, with another 20 GW of wind and solar PV to be brought into the system by 2030 to facilitate Guangdong's carbon peaking. Guangdong has thus far been in steady progress reaching the solar PV target, while for wind, offshore development will be a key focus in coming years.

Renewables currently enter the market either through grid-offtake at local CBP, or they can voluntarily choose to participate in local green power trading. Either way, they are required to participate in the provincial spot market to enable the local market's efficient price discovery.

MARKET TRADE FACT SHEET

Market option	Pricing mechanism	Historical price
Voluntary participation in green power trading with deviation settled in spot market	• Bilateral negotiated energy price+ environment attribute price	• 2024 annual trading: 465.64 RMB/MWh for energy and 10.38 RMB/MWh for environmental attribute
Grid offtake with deviation settled in spot market	• Fixed price at local CBP	• 453 RMB/MWh
Deviation settlement in spot marke	• Centralised bidding and clear every 15-min interval with no price limit	• Day-ahead: 425 RMB/MWh • Real-time: 403 RMB/MWh

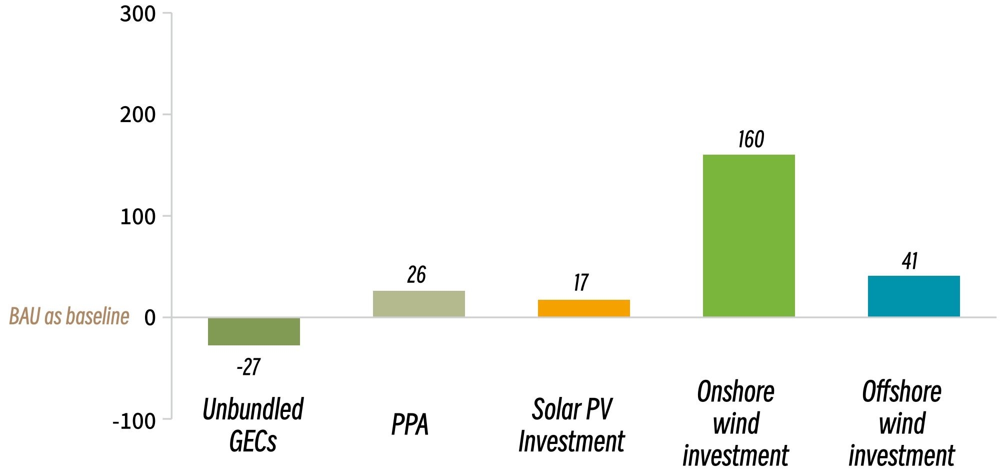
	Volume	Share
Total generation	38.9 TWh for utility-scale solar and wind in 2023	100%
Market traded	3.97 TWh for solar and wind in 2023	10.2%
Grid offtake	34.93 TWh = total generation – market traded volume	89.8%

Note: [1]Wind and solar PV only.

KEY CONCLUSIONS – GUANGDONG

Onshore wind investment in Guangdong can help local energy users save 15% of power cost over a 25-year period

COST SAVINGS[1] RELATIVE TO BAU OVER 25 YEARS (RMB MN)



Note: Costs are discounted with an assumed rate of 5.1% as the weighted average cost of capital
Source: AFRY analysis

COMMENTARY

The PPA option holds cost-saving potential, albeit a minor one relative to the other options and in terms of the share in overall cost (2.5%).

Onshore wind represents significantly greater cost saving potential, as it is estimated to cut as much as 15% of power procurement costs, due to similar reasons as in other provinces. Land resources for further onshore wind development, comparing to Jiangsu and Zhejiang, aren't as limited, with nearly 3 GW capacity additions expected before 2030, though it is still a smaller segment of growth relative to the other renewables.

Solar PV and offshore wind has significantly less attractive return than onshore wind, though for different reasons. Solar PV investment is unattractive owing to unfavourable solar resources in Guangdong, which significantly reduce solar utilisation hours and result in less generation volumes and revenue. Offshore wind investment is uncompetitive mainly attributed to higher installation costs (e.g. foundations in deep water and the laying of underwater cables) and subsequent O&M expense.

RISKS AND MITIGATION - GUANGDONG

Guangdong exhibits strong power demand and relies on the imports of clean energy from southern China, which makes investment risks relatively low

High *Medium* *Low*

Risk	Description	Likelihood	Impact	Analysis and recommended mitigation action
Market price risk	The project may be exposed to lower future wholesale market prices upon expiry of grid guaranteed offtake at fixed coal benchmark price.			Guangdong feature robust power demand, so the materiality of the risk is low. It is recommended to use long-term market price projections to support valuation of target asset.
Market design risk	The ongoing electricity market reform is faced with continued questions around fit-for-purpose market design such as capacity remuneration, ancillary services, etc. The route to a well-developed competitive market remains to be explored.			Renewable generators may be subject to additional revenues / costs in the short-term due to continued market design, though the materiality of the risk is low as the market design continues to improve following the Beneficiary Pays principle, and as the market mechanism enables generators'cost pass-through.
Offtaker risk	Under grid-parity contracts, the grid company may seek to push renewables out of expensive grid parity contracts and into the market or may try to benchmark prices relative to market outturn levels.			Renewable generators are very likely to be pushed into the market to seek their own offtaker, though the investor in this case would be the energy user itself, thus eliminating the risk.
Curtailment	Slow implementation of markets, continued overcapacity of coal, a sharp fall in demand, or insufficient T&D infrastructure, could lead to curtailment of renewable generation rising, which would dampen revenues.	Depending on technology		Guangdong feature strong demand and well-established T&D infrastructure, and thus the curtailment risk is minimal.
Capture price annibalisation	As renewable deployment is getting faster, price captured on the power market has the risk to be eroded over time.	Depending on technology		Guangdong feature ambitious solar PV installation target increasing the likelihood of cannibalisation, though owing the strong power demand and limited RE resources, the high wholesale electricity price is expected to bulwark solar PV's capture price.

Source: AFRY analysis

SHANDONG – MARKET OVERVIEW

Newly commissioned renewable projects will face increased market exposure as Shandong market erates liberalisation progress

KEY MESSAGE

Shandong, a leading industrialised province in China, has a dynamic power market. Despite coal's dominance, government policies and abundant solar resources favor renewable development, with renewables[1] accounting for around 18% of total generation in 2023.

During the 14th Five-Year Plan, policies remain consistent in promoting renewable energy, with targets set to achieve 100 GW of wind and solar PV capacity by 2025. Out to 2030, another 40 GW of wind and solar capacity, together with low-carbon baseload generators such as nuclear and flexibility resources such as pumped hydro and BESS, is expected to be introduced into the system to facilitate Shandong's carbon peaking.

For 2025 trading, newly commissioned renewables[1] can enter the market through two routes: (1) 100% through mid-to-long term market trading with settlements in the spot market; (2) 70% through grid off-take at CBP for wind or 85% for solar PV, while the remainder enters into market trading.

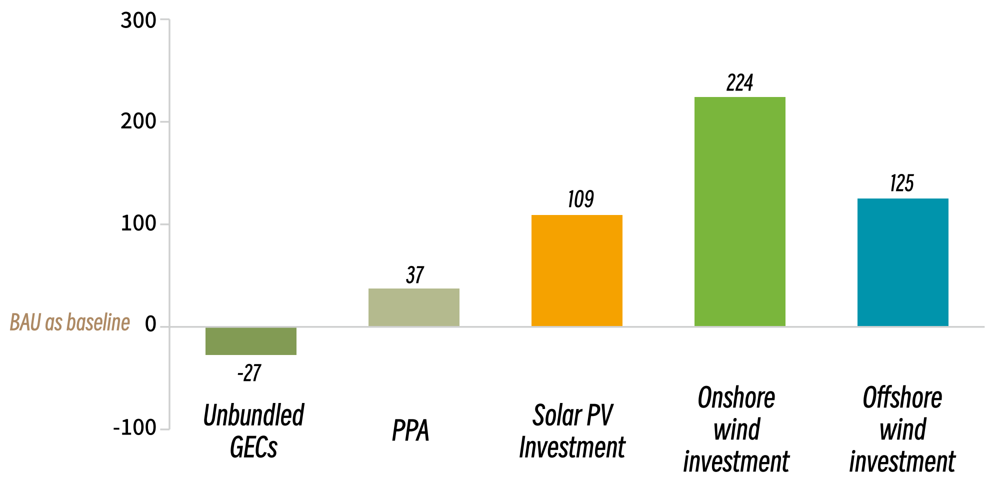
MARKET TRADE FACT SHEET

Option	Route	Pricing mechanism	Historical prices[2]
100% M2LT market trading with actual settlement in spot market	M2LT market	CBP ± 20% with time-segment pricing	• 2023 average: 371.05 RMB/MWh • 2024 1H average: 364.57 RMB/MWh
Existing plants: 90% grid offtake at CBP and 10% spot market settlement	Grid offtake	Fixed price at local CBP	• 394.9 RMB/MWh
	Spot market	Centralised bidding and clear every 15-min interval with price limit of -80 to 1300 RMB/MWh	• 2023 day-ahead: 348.92 RMB/MWh • 2023 real-time: 351.93 RMB/MWh • 2024 1H day-ahead: 308.16 RMB/MWh • 2024 1H real-time: 299.32 RMB/MWh
RE plants to reach COD in 2025: 70% grid for wind and 85% for solar PV; the remainder enters into market	Grid offtake	Fixed price at local CBP	• As above
	Market trade	Depending on generator's choice of route(s) to market	• As above

Note: [1]Wind and solar PV.
[2]Shandong's historical traded prices exclude capacity payment received by generators.
Source: Shandong PX, AFRY analysis

All investment options offer cost-saving potential, with onshore wind investment achieving the highest savings of as much as 18%

COST SAVINGS[1] RELATIVE TO BAU OVER 25 YEARS (RMB MN)



Note: Costs are discounted with an assumed rate of 5.1% as the weighted average cost of capital
Source: AFRY analysis

COMMENTARY

Relative to the BAU scenario where the energy user only purchases electricity, only in the case of purchasing unbundled GECs would additional costs incur.

The PPA option holds cost-saving potential, albeit a minor one relative to the other options and in terms of the share in overall cost (3%). In the near term, renewable PPAs still carry a green premium relative to wholesale electricity, though as the power market becomes further interconnected and liberalised, the low variable cost advantage of renewables will come through as a cheaper alternative compared to thermal power.

All three investment options offer substantial cost-saving potential, with **onshore wind investment expected to achieve the highest savings, up to 18% of power procurement costs.** This is due to a considerable electricity demand gap in Shandong driving up capture prices for onshore wind assets. However, limited availability of land for additional onshore wind development presents a challenge to scaling the investment significantly.

Solar PV offers less attractive but still material benefits in cost reduction, with an 9% saving compared to BAU. This results from solar PV's high utilisation hours in Shandong.

Shandong has abundant offshore wind resources and is well-suited for development, and it has great cost-saving potential. However, the market concentration of offshore wind project developments is higher than that of the other two options.

RISKS AND MITIGATION – SHANDONG

Renewables investment may be exposed to commercial, regulatory, and market risks, though the risk is minimal in Shandong

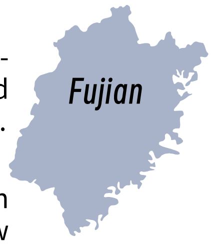
High *Medium* *Low*

Risk	Description	Likelihood	Impact	Analysis
Market price risk	The project may be exposed to lower future wholesale market prices upon expiry of grid guaranteed offtake at fixed coal benchmark price.			The market exposure in Shandong for new-built renewables —15% for solar PV and 30% for wind — leads to price volatility, though the downside risk is low due to Shandong's robust power demand continually propping up prices.
Market design risk	The ongoing electricity market reform is faced with continued questions around fit-for-purpose market design such as capacity remuneration, ancillary services, etc. The route to a well-developed competitive market remains to be explored.			Renewable generators may be subject to additional revenues / costs in the short-term due to continued market design, though the materiality of the risk is low as the market design continues to improve following the Beneficiary Pays principle.
Offtaker risk	Under grid-parity contracts, the grid company may seek to push renewables out of expensive grid parity contracts and into the market or may try to benchmark prices relative to market outturn levels.			Renewable generators are very likely to be pushed into the market to seek their own offtaker, though the investor in this case would be the energy user itself, thus eliminating the risk.
Curtailment	Slow implementation of markets, continued overcapacity of coal, a sharp fall in demand, or insufficient T&D infrastructure, could lead to curtailment of renewable generation rising, which would dampen revenues.	Depending on technology		Due to strong demand and well-established T&D infrastructure, the curtailment risk in Shandong is expected to be minimal, with extensive solar PV deployment making solar PV curtailment slightly higher than that of wind.
Capture price annibalisation	As renewable deployment is getting faster, price captured on the power market has the risk to be eroded over time.	Depending on technology		The capture ratio for onshore wind in Shandong starts at 95% but declines to 90% by 2030 due to increased competition from wind plants. The installed capacity is expected to reach saturation by the end of the modelling period, further reducing the capture ratio due to ongoing deployment and price cannibalisation.

Source: AFRY analysis

Renewables – and primarily wind – participate in market trading extensively in Fujian

KEY MESSAGE



Fujian, a coastal province on the Southeast of China, features a reasonably well-developed economy with robust industrial power demand. Given its limited indigenous energy resources, Fujian has traditionally been reliant on energy imports.

Given its energy security challenges, Fujian has emphasised increasing generation capacities during the 14th FYP period, with focus placed on nuclear (over 4 GW new capacity to be introduced), as well as a combination of coal, gas, and renewables-driven growth. During the 15th FYP period, Fujian will look to build 6 GW more renewables into the system.

Although Fujian's provincial grid is relatively independent, it is an important linkage between the State Grid region and the Southern Grid with a back-to-back project commissioned to improved inter-regional power balancing. There is also feasibility study ongoing regarding interconnection between Fujian and Jiangxi.

Renewables development in Fujian has thus far focused on wind, and wind generators have market exposure as significant share of generation is already required to enter into market trading. Renewables can also choose to participate in green power trading.

MARKET TRADE FACT SHEET

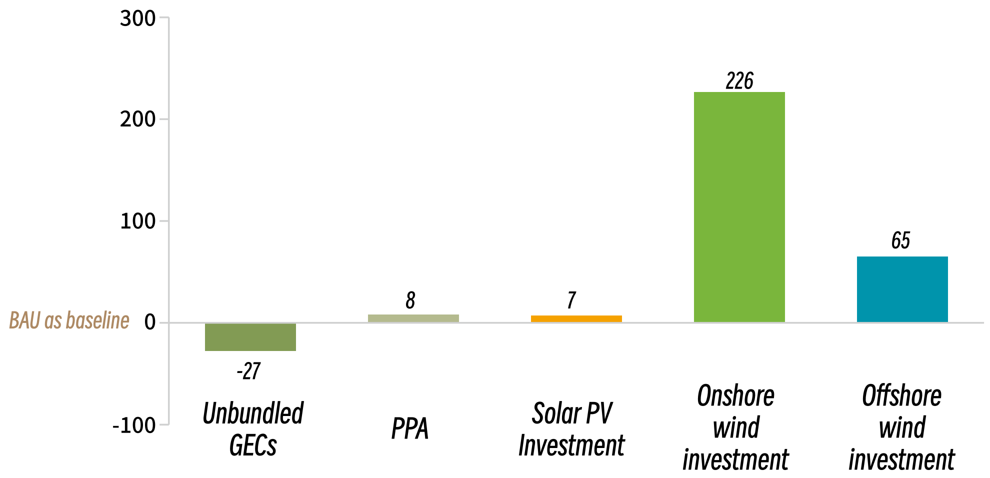
Route	Pricing mechanism	Historical prices
M2LT trading	±20% of CBP	2023 market traded average: 443.7 RMB/MWh
Green power trading	Bilateral negotiated price + environmental attribute price	2023 settlement price: 482.5 RMB/MWh
Grid offtake	Fixed price at local CBP	393.2 RMB/MWh
	Volume	**Share**
On grid generation	21.8 TWh for wind and utility-scale solar PV in 2023, including 21.3 TWh for wind and 0.5 TWh for utility-scale solar PV	100%
Traded volume	21 TWh traded volume forecast for 2023 market trading[1], incl. 0.8 TWh of green power actually traded	96%
Grid offtake volume	0.8 TWh – calculated by on-grid generation – traded volume	4%

Note: [1]Forecast traded volume for utility-scale wind has come down significantly for 2024 and 2025, and thus the 2023 data may not be representative
Source: Fujian DRC, Fujian PX, AFRY analysis

KEY CONCLUSIONS – FUJIAN

Onshore wind investment in Fujian can help local energy users cut as much as a quarter of power cost over a 25-year period

COST SAVINGS[1] RELATIVE TO BAU OVER 25 YEARS (RMB MN)



Note: Costs are discounted with an assumed rate of 5.1% as the weighted average cost of capital
Source: AFRY analysis

COMMENTARY

Relative to the BAU scenario where the energy user only purchases electricity, only in the case of purchasing unbundled GECs would additional costs incur.

The PPA option holds cost-saving potential, albeit a minor one relative to the other options and in terms of the share in overall cost (1%). In the near term, renewable PPAs still carry a green premium relative to wholesale electricity, though as the power market becomes further interconnected and liberalised, the low variable cost advantage of renewables will come through as a cheaper alternative compared to thermal power.

Onshore wind investment is estimated to cut as much as 23% - or nearly a quarter - of power procurement costs due to the superior expected returns. This is owing to strong local power demand and subsequently elevated power price capturable by onshore wind assets.

Benefitting from attractive offshore wind resource potential, Fujian's **offshore wind investment** is expected to help the energy user **cut 7% of cost, or 65 million RMB savings** over a 25-year period.

In comparison, **solar PV investment is less attractive** due to Fujian's limited solar irradiation potential.

RISKS AND MITIGATION – FUJIAN

Renewables investment may be exposed to commercial, regulatory, and market risks, though the risk is minimal in Fujian

High *Medium* *Low*

Risk	Description	Likelihood	Impact	Analysis
Market price risk	The project may be exposed to lower future wholesale market prices upon expiry of grid guaranteed offtake at fixed coal benchmark price.	High	Low	Fujian features relatively tight supply as it is looking to improve domestic energy security by bringing greater nuclear capacity online, and as a result the price risk is relatively low, especially in the long term. Prior to 2030, there is downward pressure on power prices as renewables are being brought online as well as due to the falling coal price.
Market design risk	The electricity market reform is faced with questions around fit-for-purpose design (e.g., capacity remuneration, ancillary services). Route to a competitive market remains to be explored.	Medium	Low	Fujian is one of the initial spot market pilots and has begun long-period trial operation with settlement since Nov. 2024. The market design currently adopts system marginal pricing and may shift towards nodal pricing in the future, creating a level of uncertainty around the cost of congestion to generators.
Offtaker risk	Under grid-parity contracts, the grid company may seek to push renewables out of expensive grid parity contracts and into the market or may try to benchmark prices relative to market outturn levels.	High	Low	Renewable generators are very likely to be pushed into the market to seek their own offtaker, though the investor in this case would be the energy user itself, thus eliminating the risk.
Curtailment	Slow implementation of markets, continued overcapacity of coal, a sharp fall in demand, or insufficient T&D infrastructure, could lead to curtailment of renewable generation rising, which would dampen revenues.	Depending on technology		Due to Fujian's current supply / demand imbalance, the near-term risk of curtailment is minimal. In the long term, as renewables continue to be rolled out thus increasing competition during the same generation periods, curtailment during low-demand periods is expected to rise but no higher than 3% for wind and 6% for solar PV between 2025 and 2060.
Capture price annibalisation	As renewable deployment is getting faster, price captured on the power market has the risk to be eroded over time.	Depending on technology		The capture ratio for onshore wind in Shandong starts at 95% but declines to 90% by 2030 due to increased competition from wind plants. The installed capacity is expected to reach saturation by the end of the modelling period, further reducing the capture ratio due to ongoing deployment and price cannibalisation.

Source: AFRY analysis

JIANGXI – MARKET OVERVIEW

Renewables has limited market-based volume but with potential to secure premium from environmental attributes via green power trading

KEY MESSAGE

Jiangxi, a province located in southeastern China, has challenges in energy self-sufficiency. Despite of thermal dominance contributing to 80% of electricity generation, insufficient coal outputs together with limited oil and gas resources are expected to increase Jiangxi's dependence on external energy supply, as demand continues to grow.

During 14th FYP period, transmission network expansion has been the top priority of energy development. With successive commissioning of two UHV lines connected with Hunan and Hubei in 2022 and 2024 respectively, Jiangxi's total power import capacity has reached 11.2 GW.

Meanwhile, policies remain consistent on renewable development. However, due to moderate renewable resources, conservative policy targets were set to add 16 GW of solar PV and 2 GW of wind capacity by 2025.

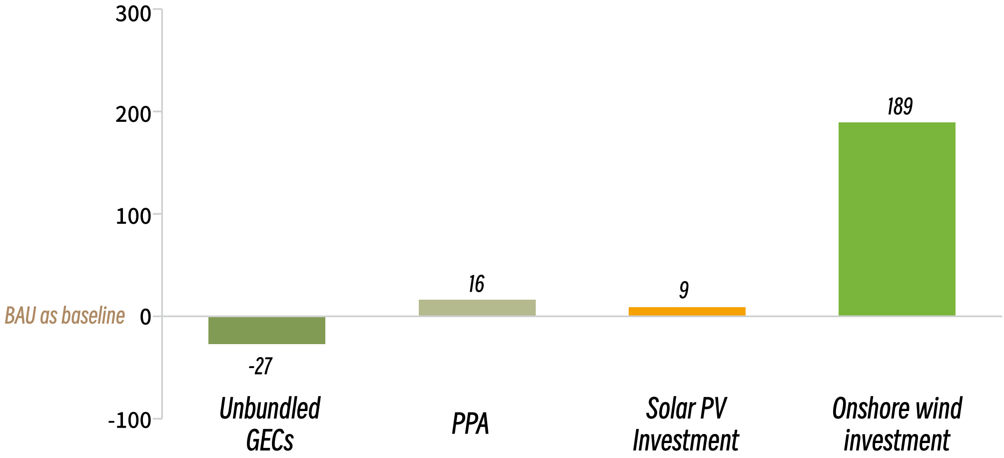
Currently, renewables can participate in green power trading on a voluntary basis, while the majority of the generation remains under grid offtake.

MARKET TRADE FACT SHEET

Route	Pricing mechanism	Historical price
Green power trading	Bilateral negotiated price + environmental attribute price	2023 1H price: 497.17 RMB/MWh
Grid offtake	Fixed price at local CBP	414.3 RMB/MWh
	volume	**Share**
On grid generation	18.4 TWh for wind and utility solar PV in 2023	100%
Traded volume	0.014 TWh through green power trading in 2023 based on publicly available information	0.08%
Grid offtake volume	18.386 TWh – calculated by on-grid generation – traded volume	99.92%

Onshore wind investment as the most attractive option offers 15% cost saving due to favorable generation profile and high captured price

COST SAVINGS[1] RELATIVE TO BAU OVER 25 YEARS (RMB MN)



Note: Costs are discounted with an assumed rate of 5.1% as the weighted average cost of capital
Source: AFRY analysis

COMMENTARY

Relative to the BAU scenario where the energy user only purchases electricity, only in the case of purchasing unbundled GECs would additional costs incur.

The PPA option holds cost-saving potential, albeit a minor one relative to the other options and in terms of the share in overall cost (1.5%). In the near term, renewable PPA is not competitive as additional cost is required for flexible services. As the market becomes more liberalised with growing renewable penetration, the cost-saving potential of renewable PPA is expected to emerge as opposed to BAU Scenario.

Investing in onshore wind is estimated to reduce power procurement costs by over 17%, driven by superior expected returns. This is primarily due to higher capacity factors enabled by wind's favorable generation profile. Furthermore, Jiangxi’ s steady power demand will support elevated power prices to be captured by wind generation. This combination creates a doubling effect, making onshore wind an attractive option, while requiring approximately 10 years to achieve payback.

Solar PV investment faces challenges such as lower utilisation hours and price cannibalisation during peak generation periods. These factors can negatively impact project economics in the short term. However, given the typical evaluation period of 25 years, solar PV investment has sufficient time to achieve payback. Beyond this point, the investment transitions from being a pure expense to generating financial returns.

RISKS AND MITIGATION – JIANGXI

Renewables investment may be exposed to commercial, regulatory, and market risks, though the risk remain largely minimal in Jiangxi

High *Medium* *Low*

Risk	Description	Likelihood	Impact	Analysis
Market price risk	The project may be exposed to lower future wholesale market prices upon expiry of grid guaranteed offtake at fixed coal benchmark price.			Jiangxi has a diversified energy system; particularly, the share of solar PV stands out among different renewable sources. In the near term, the project has the potential of exposure to lower wholesale price as the result of price cannibalisation during solar generating period. In long term, the risk is relatively low thanks to a positive outlook on demand growth as well as a more balanced, merchant-driven growth prospect for renewables.
Market design risk	The electricity market reform is faced with questions around fit-for-purpose design (e.g., capacity remuneration, ancillary services). Route to a competitive market remains to be explored.			Jiangxi is the first province to complete a settlement trial operation as part of non-spot market pilots. However, the pace of spot market development has since slowed. The detailed market arrangements remain unclear, leading to uncertain risks.
Offtaker risk	Under grid-parity contracts, the grid company may seek to push renewables out of expensive grid parity contracts and into the market or may try to benchmark prices relative to market outturn levels.			Renewable generators are very likely to be pushed into the market to seek their own offtakers, though the investor in this case would be the energy user itself, thus eliminating the risk.
Curtailment	Slow implementation of markets, continued overcapacity of coal, a sharp fall in demand, or insufficient T&D infrastructure, could lead to curtailment of renewable generation rising, which would dampen revenues.	Depending on technology		In the near term, curtailment risk for wind and solar PV is minimal due to strong demand in Jiangxi. In the long term, solar PV curtailment is expected to rise, peaking at 7.8% due to the rapid capacity expansion while onshore wind is projected to have a lower peak curtailment rate of 4.5%, supported by its more favorable generation curve relative to demand profile.
Capture price annibalisation	As renewable deployment is getting faster, price captured on the power market has the risk to be eroded over time.	Depending on technology		Jiangxi is set to develop significant wind capacity due to its abundant resources. However, increasing competition will drive price cannibalisation, causing the wind capture rate to decline steadily to 65% by 2060. In contrast, solar PV, with earlier resource exploitation, is expected to bottom out at a 55% capture rate by 2045.

Source: AFRY analysis

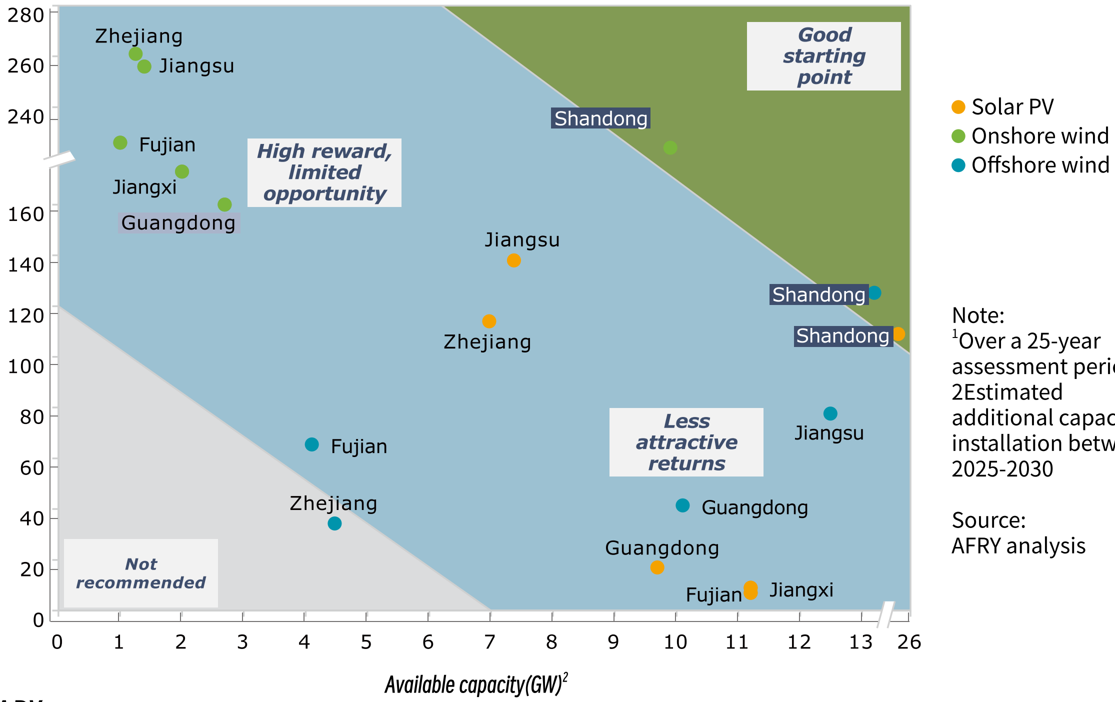
05

Recommendations

PILOT PRIORITISATION

Based on the market-wide factors listed below, the potential investor can make their decision while considering their own preference and capabilities

PRIORITISATION MATRIX Cost saving（mn RMB）[1]



Note:
[1]Over a 25-year assessment period; 2Estimated additional capacity installation between 2025-2030

Source:
AFRY analysis

COMMENTARY

Considering available capacity to install and estimated cost saving, **solar PV and wind investments in Shandong are the most attractive due to good returns and abundant market opportunities.**

Meanwhile, **opportunistic pursuit in onshore wind investment across all other provinces** is recommended due to superior returns and correspondingly the most significant cost saving potential. But given limited resources for development during the 15th FYP period, we expect such opportunities to be limited.

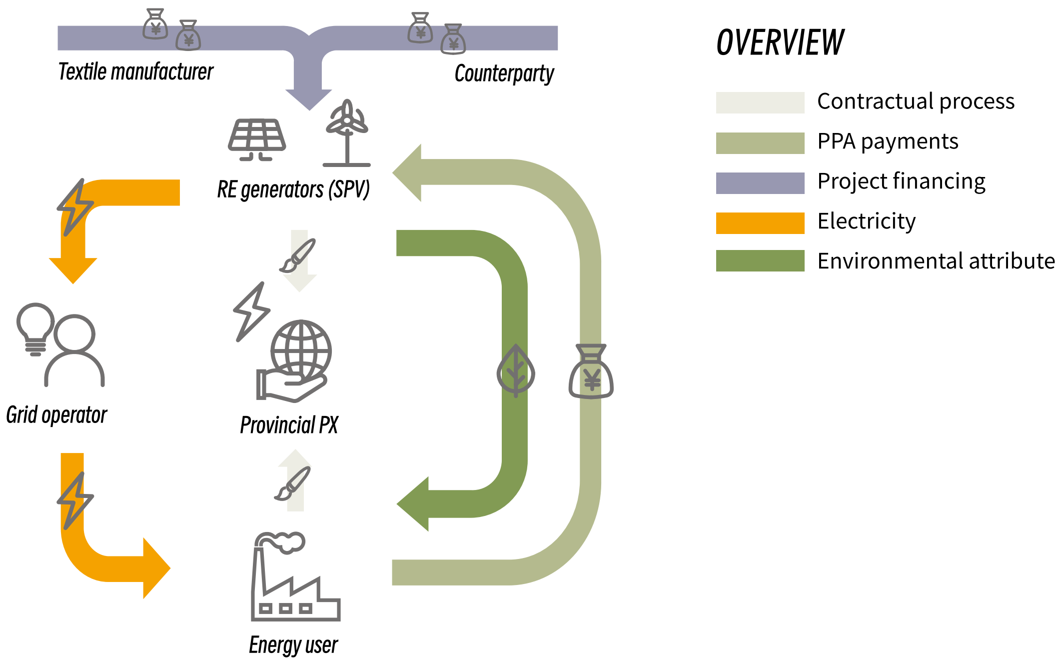
Additionally, **solar PV investment in Jiangsu and Zhejiang holds promise** due to attractive cost saving potential as well as positive prospect for the growing market.

The above are recommended as a **starting point to pursue** a pilot case, though the specific investment decision will be subject to more granular **asset-specific analysis** / negotiation with the seller.

The other options have poor economics for the time being due to suboptimal renewable resources (e.g., solar PV in Guangdong and Fujian) or high investment costs (e.g., offshore wind in several provinces). On a case-by-case basis, opportunities may be considered if they prove to have greater yields / lower investment costs than market average.

As the solar PV investment option is paired with unbundled transfer of GECs, the investor is advised to assess whether it is aligned with the relevant compliance standard to understand the compliance risk.

A textile manufacturer may consider partnering with a JV partner to shoulder project development-related risks



SUMMARY OF SOLUTION

- A (or several) textile manufacturer enters joint venture with a counterparty to invest in renewables in the target province. A Special Purpose Vehicle (SPV) is formed to develop and operate the asset.
- The manufacturer either procures the outputs from SPV through PPAs executed in the green power marketplace or received unbundled GECs generated from the asset. If the former, the SPV is responsible for delivering electricity with bundled attribute to the offtaker.
- Surplus generation outputs, if any, may be sold to the grid / market, along with unbundled EACs issued for sale.

UPSIDES

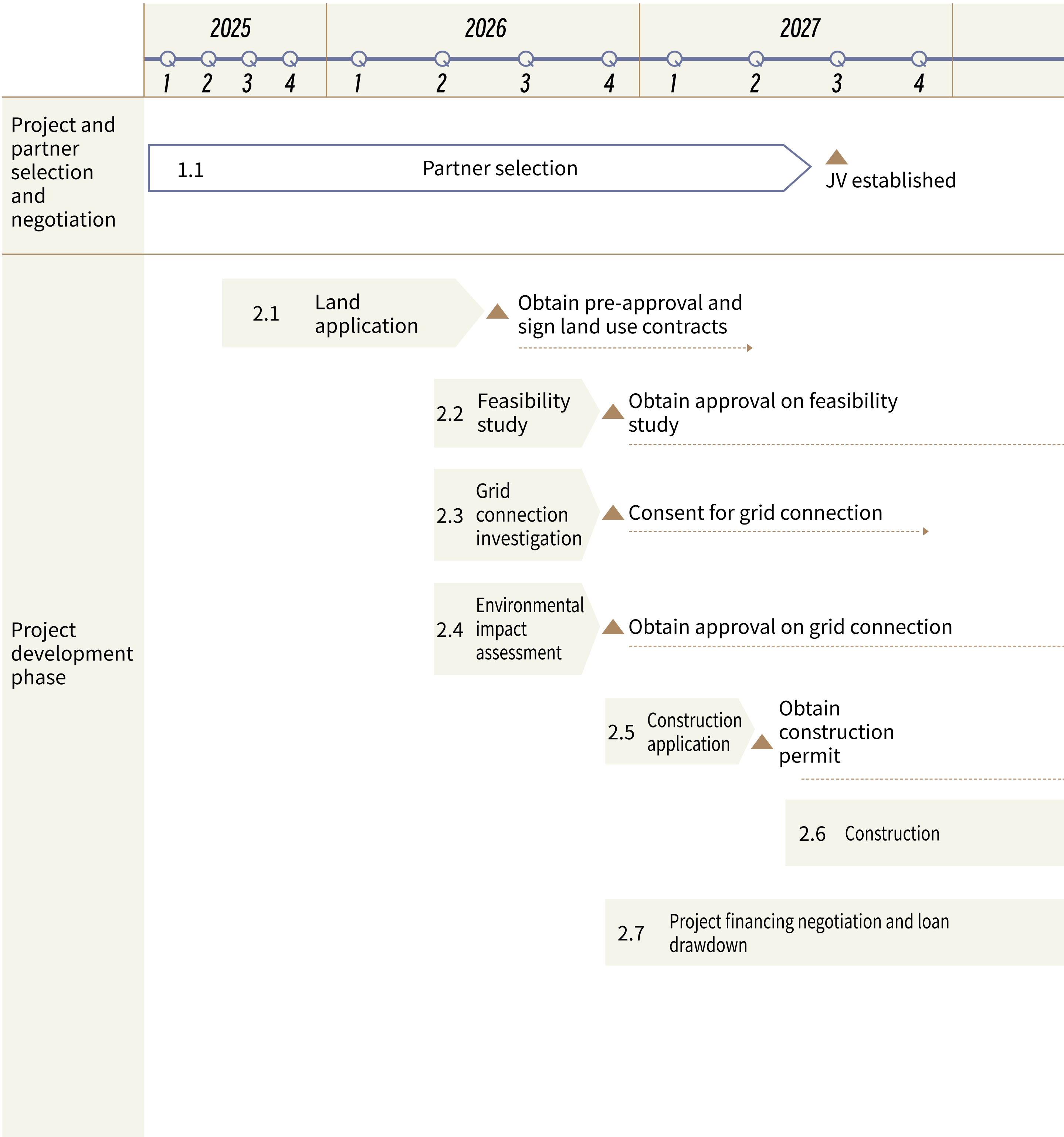
- Long-term access to clean energy, mitigating volatility of future energy prices and uncertain supplies.
- Low-cost of energy as the energy user receives dividend from investment, effectively acquiring energy at cost of production.
- Highest level of credibility.

DOWNSIDES & MITIGATION

- Significant CAPEX as the upfront cost.
- As more players seek to develop RE projects in the local markets, it may be competitive to secure available land capacity quota.
- There will be a learning curve for a textile industry player to enter renewables development and operation, although **this risk could be mitigated by delegation to a qualified counterparty in the JV.**

INDICATIVE IMPLEMENTATION TIMELINE

Anticipate 1+ year of project development and ~1 year of construction before the asset can begin supplying green power



2028				2029				2030				2031				2032			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Project can be considered to have additionality if partner / project is selected before construction kicks off

Feasibility study, grid connection investigation and environmental impact assessment can be carried out at the same time. Please note that the approved documents on feasibility study, EIA, and grid connection are the MOST important preconditions for the construction permit application.

JV partner(s) actions

Energy user actions

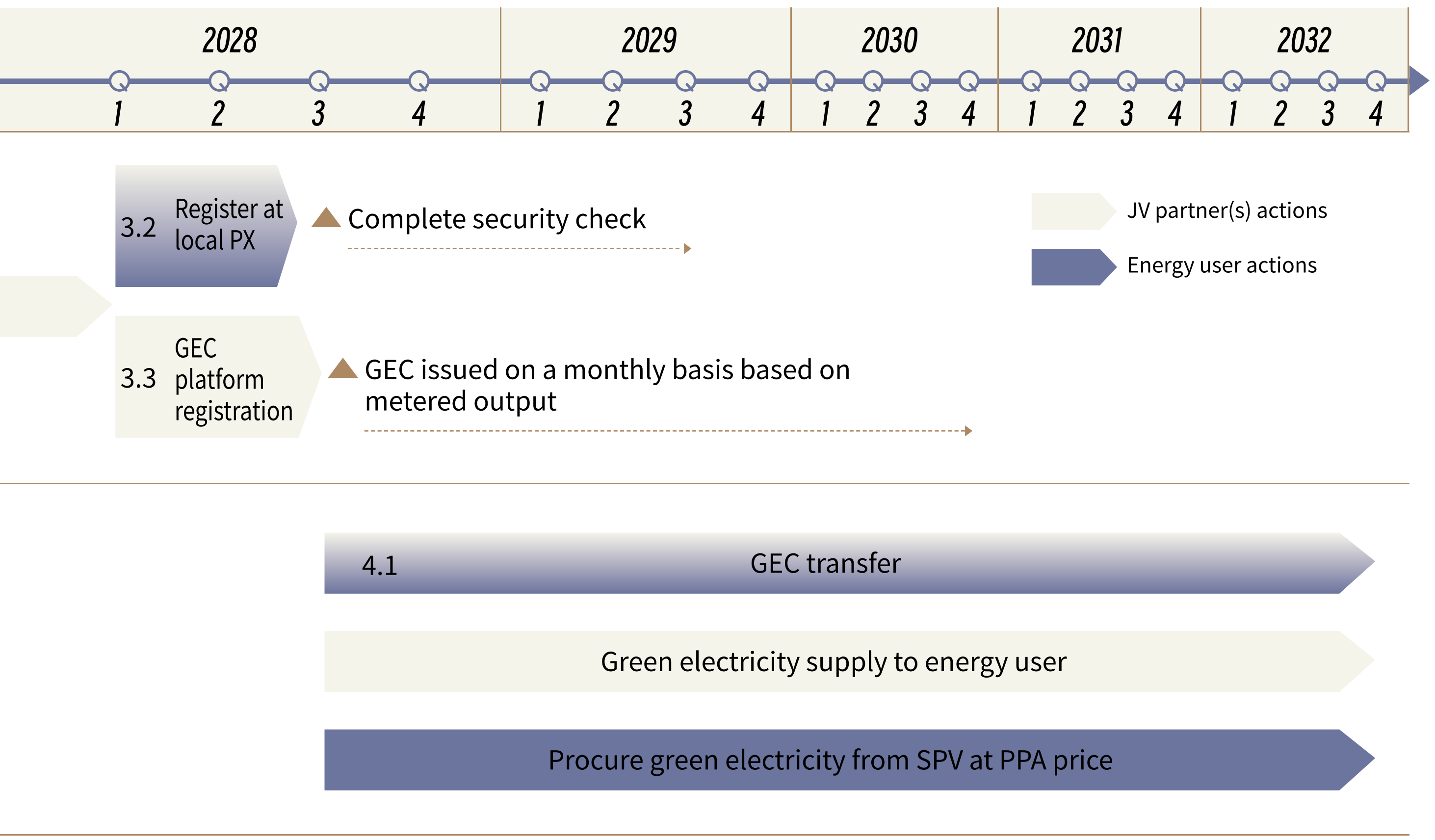
Complete construction and pass acceptance test

Complete loan drawdown

Continued below

	2025				2026				2027			
	1	2	3	4	1	2	3	4	1	2	3	4
Local authorities engagement and applications	3.1 Engagement with local authorities											
Electricity procurement / supply and GEC transfer												

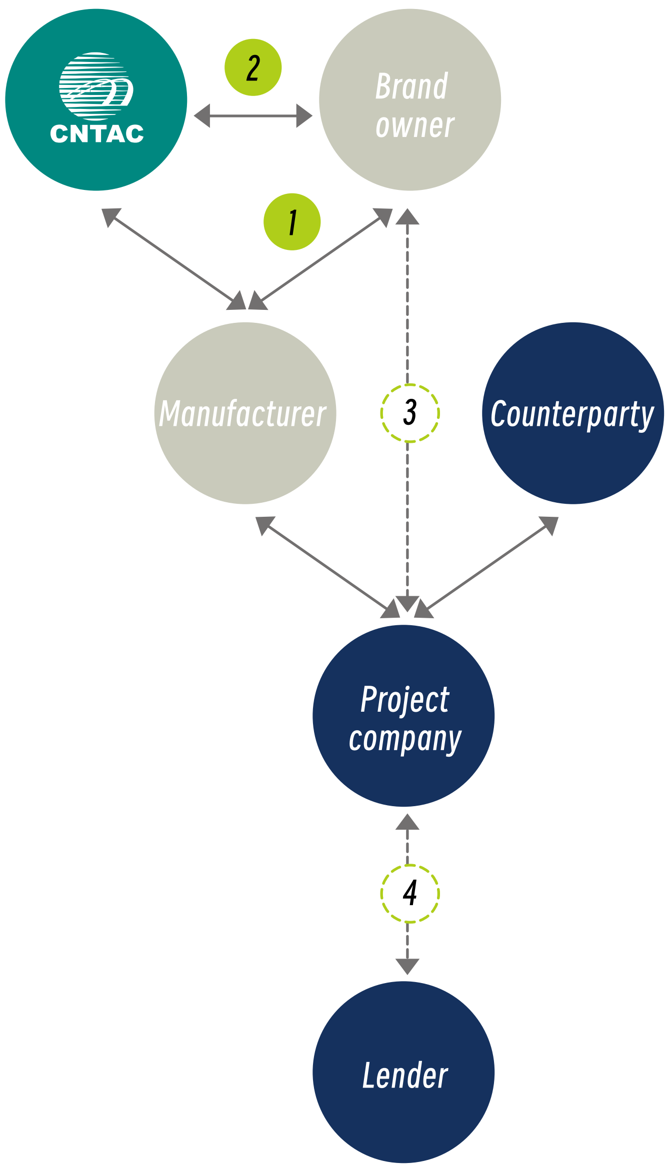
Note: Exactly timeline of project development is subject to a degree of uncertainty and the above diagram is for illustrative purpose only of a typical timeline.
Source: Expert interviews; AFRY analysis


2028
1 2 3 4
2029
1 2 3 4
2030
1 2 3 4
2031
1 2 3 4
2032
1 2 3 4
3.2 Register at local PX
Complete security check
JV partner(s) actions
Energy user actions
3.3 GEC platform registration
GEC issued on a monthly basis based on metered output
4.1 GEC transfer
Green electricity supply to energy user
Procure green electricity from SPV at PPA price

BRAND OWNERS'ROLE

Brand owners can play a variety of roles to facilitate the pilot direct investment case

STAKEHOLDER ENGAGEMENT



COMMENTARY

1

Brand owners should proactively engage its suppliers towards greater RE use by a) setting RE targets; b) hosting workshops to develop business case on suppliers'side; c) collecting energy consumption data to track progress

2

Brand owners should work collaboratively with CNTAC to provide feedback on specific suppliers to engage for the direct investment pilot case in priority province(s)

3

Leading brands may consider becoming part of the joint investment

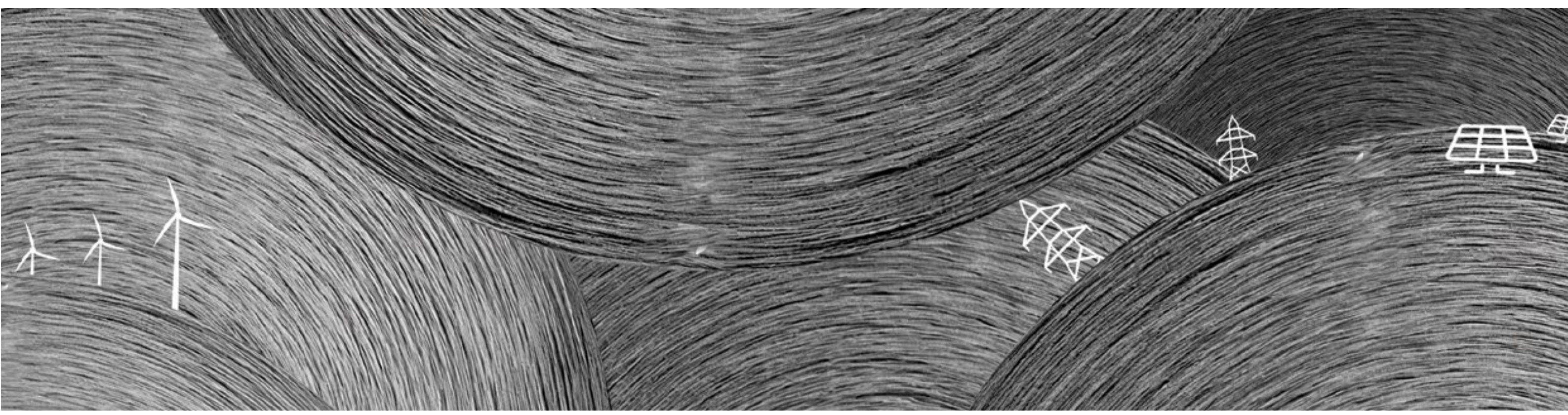
4

Leading brands may consider working collaboratively with financial institutions to provide green financing solutions to the potential project company

Source: AFRY analysis

Appendix I

Approach and Key Assumptions



OVERVIEW OF CONFIGURATIONS

Assess various RE procurement approaches as benchmark to evaluate attractiveness of the direct investment option

USER PROFILE

Based on survey results collected by CNTAC amongst 23 companies in targeted provinces, using the following parameters set up the below power consumption profile of an illustrative energy user.

Voltage level:

Light industry C&I power user with a voltage level of 10kV, following the one-part energy tariff scheme

Annual power consumption:

118,800 MWh

Procurement start date:

January 1st 2027 / 2028

Time period of spendings / investment returns assessed:

25 years

EVALUATED CAPACITY (MW)

Province	Zhejiang	Jiangsu	Fujian	Shandong	Guangdong	Jiangxi
Solar PV	108	100	112	96	120	118
Onshore wind	55	55	43	60	61	57
Offshore wind	42	40	30	35	35	N.A.

Note: [1]Historical utilisation hours between 2018 and 2022 were used to estimate renewable technologies'forecast generation volume.
Source: CNTAC, AFRY analysis

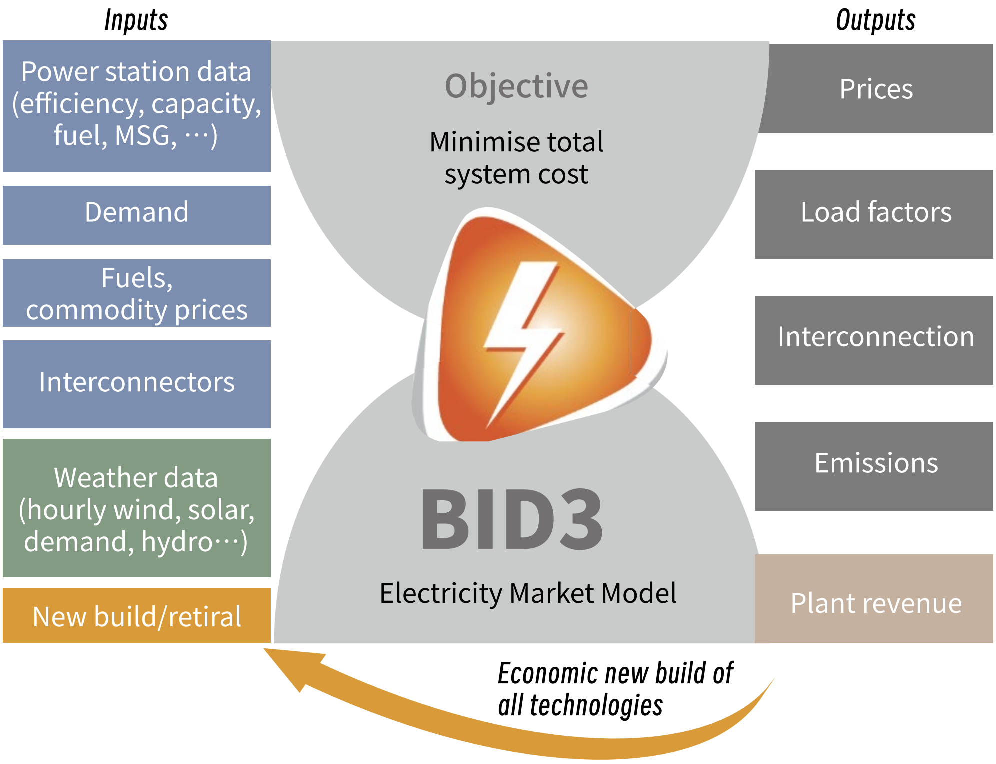
KEY ASSUMPTIONS

Topic		Assumption	Source
Market	Reference case – power price	Wholesale electricity price projections	AFRY (see modelling approach below)
	PPA case – power price	Before 2030: wholesale electricity price projections, adjusted for the prevailing green power premium level. After 2030: renewables capture price projections	AFRY, provincial PX
	Investment cases – power price	Before 2030: a mix of on-grid tariff and wholesale price projections subject to prevailing market arrangements. After 2030: renewables capture price projections	AFRY, provincial PX
	GEC price	14 RMB/MWh flat based on average traded price in 1Q 2024	Beijing PX
	CCER price	Following Carbon price projections	AFRY (see modelling approach below)
Technical	Capacity degradation	0.4% p.a.	AFRY's interview with experienced project developer
	per regulations at the time of report drafting	**10% of renewables installed capacity per prevailing regulations**	NEA
	Utilisation hours	2018 – 2022 average at provincial level	NEA
	CAPEX (incl. equipment, installation, land, transport cost, **grid connection cost**, etc.)	Solar: 2.97 RMB/W Onshore wind: 5.86 RMB/W Offshore wind: 14.43 RMB/W	China Photovoltaic Industry Association; International Renewable Energy Agency; AFRY research
	OPEX (incl. O&M, insurance, BESS capacity rental fee, etc.)	Solar O&M: 0.035 RMB/W Onshore wind O&M: 0.045 RMB/W Offshore wind O&M: 0.131 RMB/W **BESS capacity rental: 165 RMB/kWh**	China Photovoltaic Industry Association; Datang Corp; Yangming Energy; China Energy Storage Network

Topic		Assumption	Source
Tax	Corporate income tax	25%	State Council
	Value added tax	13%	State Council
Post-tax WACC		5.1%	AFRY

An economic dispatch model called BID3 is used to simulate wholesale electricity in a fully liberalised market with efficient dispatch

OVERVIEW OF BID3



COMMENTARY

Wholesale electricity price projections are determined using our electricity market model, BID3, for China and are the end result of the complex interaction of a number of key price drivers.

BID3 is an economic dispatch model that simulates the hourly generation of all power stations on the system, taking into account fuel prices and operational constraints such as the cost of starting a plant.

It models renewable sources of generation such as hydro, reflecting the option value of water, and intermittent sources of generation, such as wind and solar using detailed and consistent historical wind speed and solar radiation.

In our analysis we examine wholesale electricity market projections using weather patterns from five historical years (2014-2018). This gives a deep level of insight into risks and opportunities for power generation and storage technologies as a results the complex impacts of weather patterns on electricity markets.

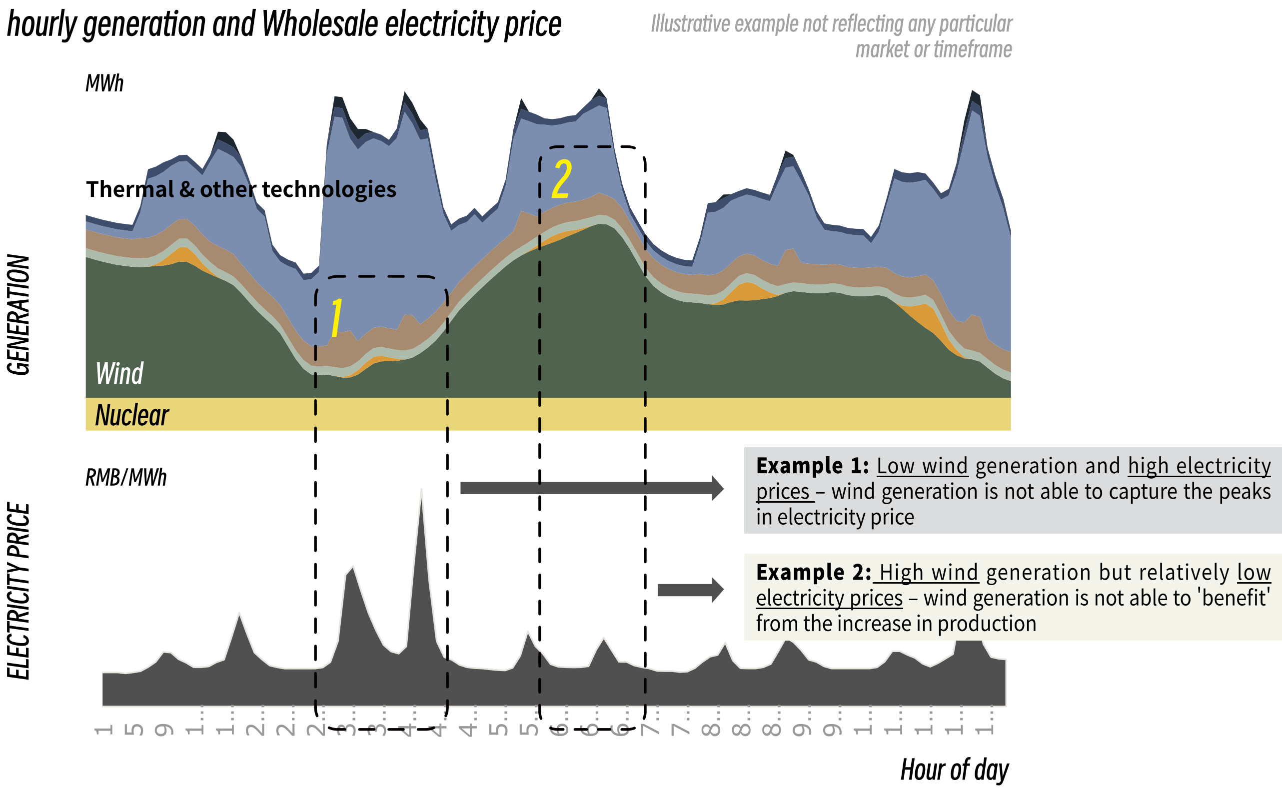
WHOLESALE ELECTRICITY PRICE – SCENARIO FRAMEWORK

BID3 China scenarios capture the uncertainties among economic growth and decarbonistion ambitions

Scenario	Description	Economic Growth[1]	Technology Costs	Decarbonisation	Transport
High	**Strong economic growth** which increases commodity price and creates high technology costs. More ambitious rollout of emerging technologies for low carbon generation, and compliance with 2060 net zero target.	Strong **2.9%** per annum	High end of current estimates, with a less rapid decline	High decarbonisation ambition (incl. net zero 2060)	High uptake of electric vehicles and early electrification
Central	Chinese **economy grows at a steady pace** and there is a steady improvement in new generation technologies. **Government incentives** (Five-Year Plans and long-term development plans) are in place to facilitate renewable and low carbon technologies. 2060 net zero targets are met in alignment with the decarbonisation ambition in China.	Moderate **1.9%** per annum	Central starting point, with a moderate rate of decline	Ambition in line with current expectations (incl. net zero 2060)	Central uptake, with moderate deployment rates
Low	**Poor economic growth** and investment focused on low risk technologies mean that there is limited change in the way electricity is generated compared to today and growth in low carbon generation is modest. **Less ambition in decarbonisation** delays the net zero target in 2060.	Weak **1.0%** per annum	Low end of current estimates, with a more rapid decline	Lower ambition (90% reduction of peak emission but fail to meet net zero in 2060)	Lower uptake, with less rapid deployment and delayed electrification

Note: [1]CAGR between 2025 and 2060 Source: AFRY BID3 2024 scenarios

Renewable capture prices are determined by the relationship between renewable generation and wholesale electricity price – at an hourly level



What are renewable capture prices?

Prices captured by intermittent renewable generators, refer to the average wholesale electricity market price a generator is able to earn **taking account of the time over which it generates.**

Why are they important?

Uncontrollable renewable technologies generate intermittently throughout the day and their output typically varies across seasons. Depending on the relationship between the generation profile and the underlying market price, renewable generators could capture income streams **above, at, or below the baseload prices.**

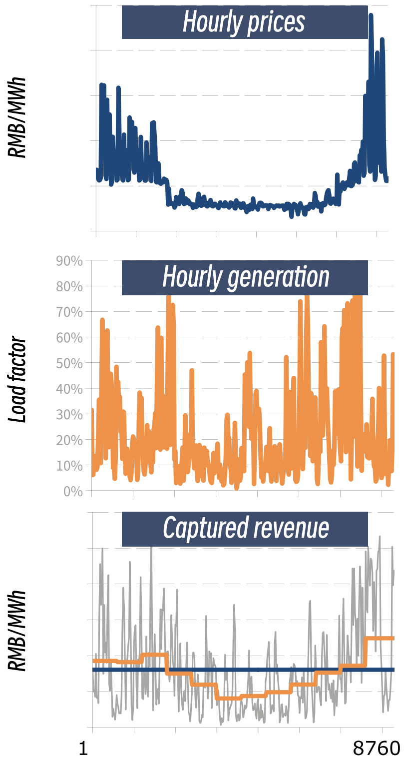
What is capture rate?

Capture rate is defined as the capture price divided by the average baseload price.

RENEWABLES CAPTURE PRICES AND CAPTURE RATES

The correlation between renewable generation and wholesale prices from 5 different weather years is used to calculate capture prices

i Calculate capture prices for the projected year



Illustrative

Hourly resolution

Wholesale prices for each projected year, for each of the 5 weather years

Load factor profiles for 5 weather years

Annual resolution

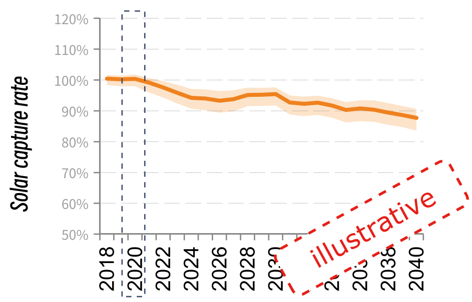
Annual capture price =
sum of hourly revenue/
sum of hourly generation

Capture price presented as a ratio to the baseload price

ii Combine weather years to give an annual capture rate

1. Repeat Step 1 for each of the 5 weather years;
2. Average the annual capture rate for each of the 5 historic weather years:
   - each weather year has an equal weighting;
   - we take the mean capture rate as our projected rate

iii Repeat procedure for all projected years



Note: Illustrative data based on a region with high peak winter demand.

OVERVIEW OF BID3 CHINA ELECTRICITY MARKET MODEL

The BID3 model is updated using research and expert view-based inputs that drive China electricity price projections

FUEL & CARBON PRICES

Fuel and commodity prices down into provincial level including:

- Coal prices
- Other fuel prices (gas, oil, lignite…)
- Carbon prices (national ETS)

TECHNOLOGY COSTS

Power plant **investment data** including:

- CAPEX and OPEX
- Build time/ Financial lifetime/ Hurdle rates

ELECTRICITY DEMAND

Power demand projections for China split into two categories:

- Base demand (Primary, secondary, Tertiary and residential sectors)
    - Sectoral GDP
    - Sectoral energy intensity
    - Population growth
- EV demand

Due to different growth rates, demand splitting enables us to capture the impact of electrification of transport on hourly demand shape

GENERATION CAPACITY MIX

Power plants data (efficiency, capacity, fuel type, minimum stable generation etc) covering:

- All existing plants in China
- Power plants under construction
- Power plants in planning stages
- Projected new-build and retirals from economics[1]

Multiple **historic weather patterns** determine hourly renewable generation and electricity demand profiles throughout the year.

Interconnector data (capacity, losses, type, ramping capability etc) covering all existing interconnectors and under construction or planning.

Note:[1] This is both an input to the model and an output, which is iterated on as we build our internally consistent scenarios

DEMAND MODELLING

Electricity demand is modeled split by different sectors, also capturing the demand characteristics for electric vehicles

MODELLING APPROACH

There are two main tranches of annual electricity demand in our Chinese modelling including residual 'economically sensitive'demand (e.g., primary, secondary, tertiary, and residential demand), as well as electric vehicles which comes from our Electric Vehicle (EV) model.

At the provincial level, electricity demand is modelled using our econometric demand model which considers the sectorial evolution of GDP for each province in China, as well as the evolution of power consumption efficiency based on historical performance and internationally benchmarked expectation of future improvement.

Annual demand is disaggregated into hourly values via a series of demand profiles that consider historical weather patterns and demand flexibility (in the case of EVs).

In addition to this, we also model the rollout of electric vehicles across the country based on the growth in vehicle ownership and the replacement of existing vehicles over time. Electric vehicle projections also consider the average distances driven in each province to build a view of future electricity demand for EVs.

DATA SOURCES FOR KEY DRIVERS

Key driver	Data source
GDP	OECD for top-down GDP projections
Energy intensity	Historical: Analysis of provincial GDP and NBS demand data Projection: Energy intensity per GDP projected by CNPC
EV growth	UN growth rate on population; IEA projection on EV growth; Historical passenger vehicles statistics for each province
Population	UN growth rate on population
Hourly demand	Constructed profiles from temperature regressions and sample data

Existing plant capacities and new capacity additions from policies and economic buildout for all generation technologies in China are considered

Categories	Data source	Key technical parameters	Source
Thermal Plants	• Coal: Ultra-supercritical, supercritical, subcritical and lignite • Gas: CCGT, OCGT and small CHP • Oil: Steamed oil • Nuclear • Bioenergy: Biomass, biogas and waste • Hydrogen: H2 CCGT and H2 OCGT • Carbon capture and storage (CCS): Coal with CCS and biomass with CCS • Electrolysis	• Plant types • Thermal efficiency • Rated capacity • Fuel types, emission factor • Minimum stable generation • Must-run for CHP (Heat load) • CCS capture rate	NDRC, GlobalData, various public sources, CEC, China Power Yearbook, NEA, NBS cross checked with Global Energy Monitor
Renewables	• Solar: Utility-scale, DG PV and CSP • Wind: Onshore and offshore wind	• Plant types • Efficiency • Rated capacity • Generation profile	NDRC, GlobalData, various public sources, CEC, China Power Yearbook, NEA, NBS, MERRA2 (Hourly profile)
Hydro	• Reservoir hydro • Run-of-river hydro	• Rated capacity • Regulated/ • irregulated inflow profile • Storage level	NDRC, GlobalData, various public sources, CEC, China Power Yearbook, NEA, NBS
Storages	• Battery: 2/4/6 hour duration • Pumped storage	• Rated capacity • Round-trip efficiency • Arbitrage duration Minimum • generation or pumping	NDRC, GlobalData, various public sources, China Energy Storage Alliance
Interconnection	• Inter-provincial and cross-border transmission lines • DC and AC lines • Ultra-high voltage and high voltage levels	• Rated capacity • Line loss • Ramping	SGCC, GlobalData, various public sources

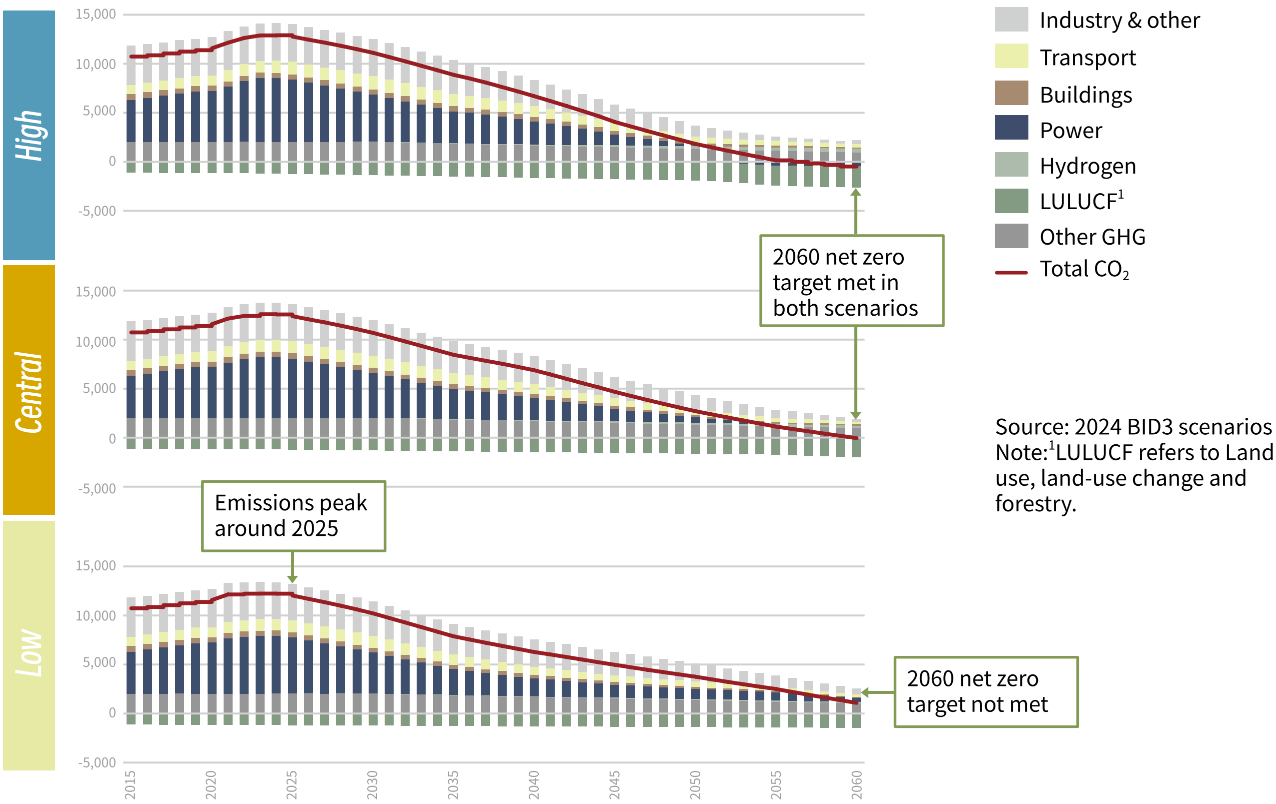
To meet the scale of the Chinese decarbonisation ambitions in scenarios, key trends begin to emerge across the sectors

Sector	Power	Buildings	Industry	Transport
Decarbonisation drivers	• Closure of old thermal plant • Increasing renewables, nuclear and battery storage • Some hydrogen generation (potentially) • Some residual CHP in Low scenario	• Phase-out of legacy fuels for heating buildings such as oil heating • Increase in the uptake of gas and electricity for end use • Some gas district heating & hydrogen heat (limited)	• Phase out of coal for industrial heating • Increase in the uptake of gas, electricity and gradually H2 for end use • Deployment of CCS for coal and gas post-2040	• Passenger transport electrifies • Road freight converts to mostly hydrogen • Aviation and shipping still use oil with some biofuels.
Residual emissions	No residual emissions – in some cases slightly negative depending on CCS-Biomass implementation	Some residual emissions from gas	Some residual oil & gas, particularly for petrochemicals	Residual emissions from oil products for aviation/ shipping

Residual emissions are expunged through Land Use, Land Use Change and Forestry

To meet the scale of the Chinese decarbonisation ambitions in scenarios, key trends begin to emerge across the sectors

DECARBONISATION SCENARIOS (MTCO$_2$/YEAR)



Source: 2024 BID3 scenarios
Note:[1]LULUCF refers to Land use, land-use change and forestry.

SCENARIO DESCRIPTIONS

Throughout the 2020s, emissions are relatively flat as increasing demand is offset by rapid deployment in renewables across all scenarios.

In all scenarios, emissions peak in the mid 2020s as decarbonisation ambitions across all sectors begin to deliver.

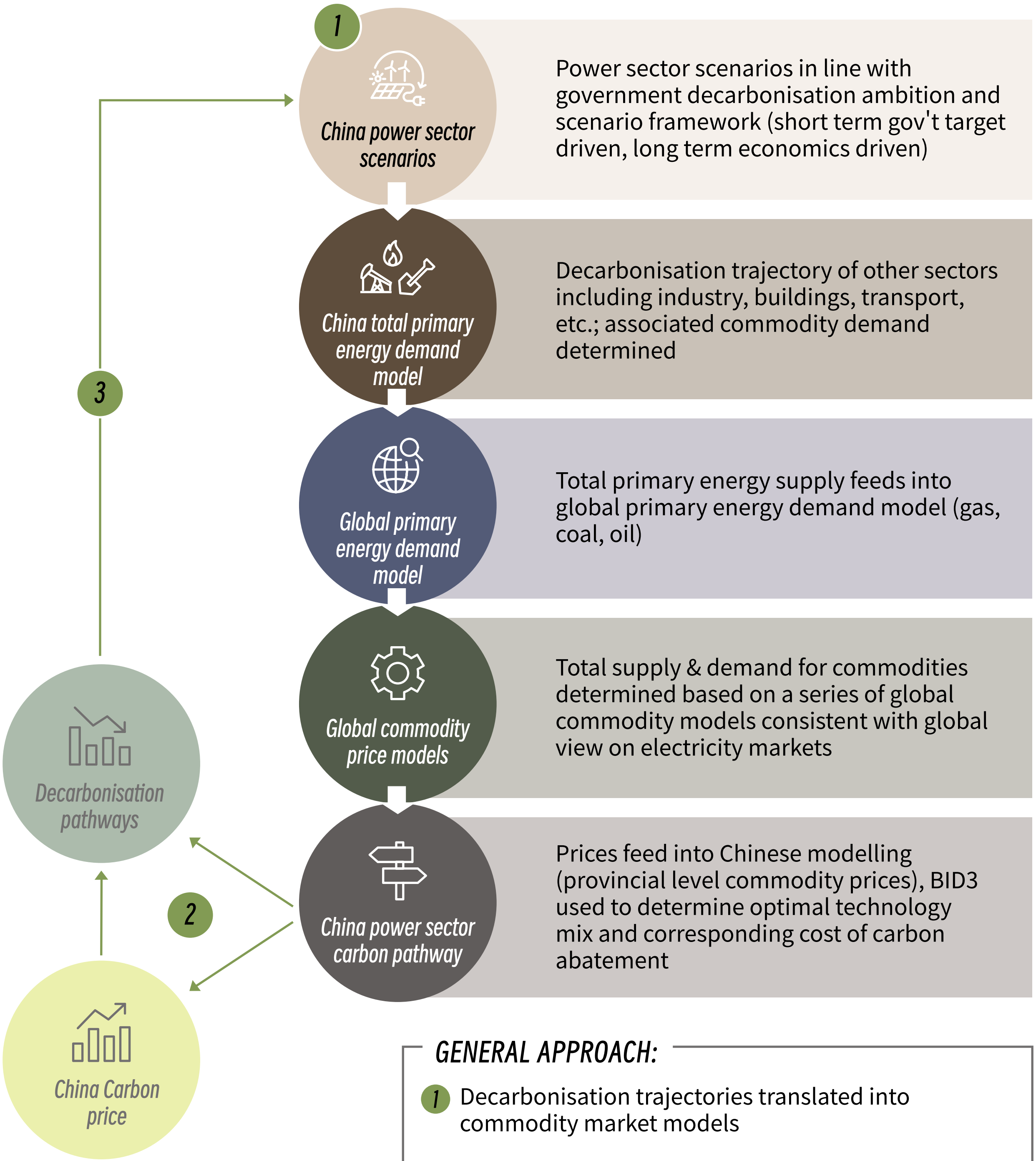
In the **High** scenario, a rapid decline in power sector emissions due to increasing renewables drives decarbonisation initially. Strong decarbonisation ambition results in net zero targets being hit in 2060. Due to strong economic demand in this scenario, additional LULUCF1 (relative to the Central) is required to meet decarbonisation targets.

The **Central** scenario follows a similar trajectory to the High scenario with a marginally slower pace of decarbonisation, particularly in the power sector.

In the **Low** scenario lower decarbonisation ambition in this scenario results in missed 2060 net zero targets.

CARBON PRICE MODELLING

Carbon prices are an output of our modelling, and are derived based on the marginal cost of carbon abatement to meet desired decarbonisation pathways



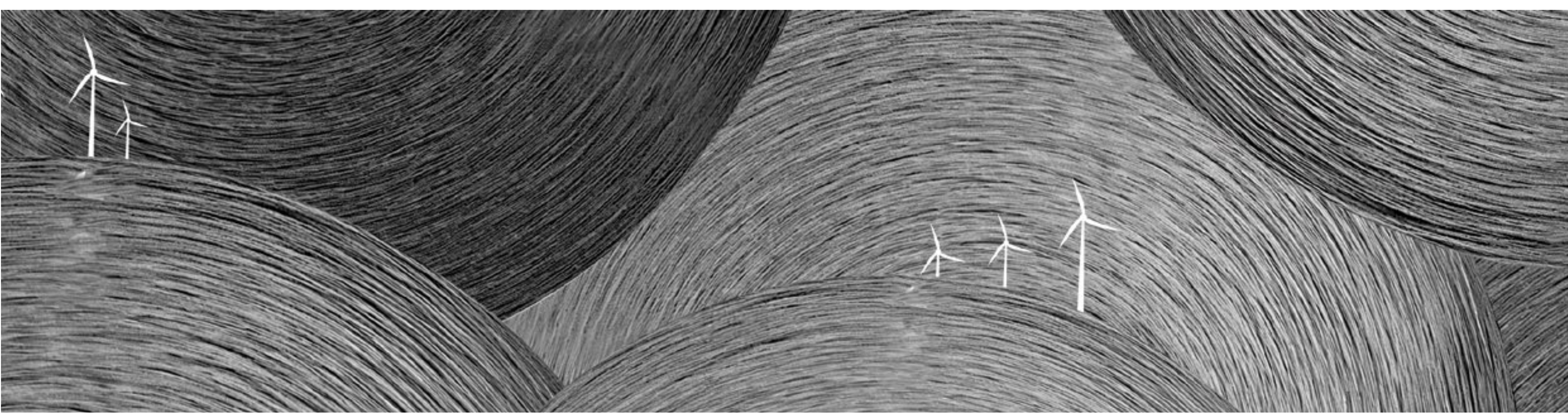
GENERAL APPROACH:

1. Decarbonisation trajectories translated into commodity market models
2. Cost of meeting decarbonisation trajectories in China determines required carbon price to meet trajectory
3. Decarbonisation pathway feeds back through models

Notes: [1]In China, the marginal unit of abatement is assumed to occur in the power sector given targeted government support for hard-to-abate sectors, which limits the impact of these high abatement cost activities on the carbon market.

Appendix II

Surveyed Companies' Power Use Data



POWER CONSUMPTION THRESHOLD

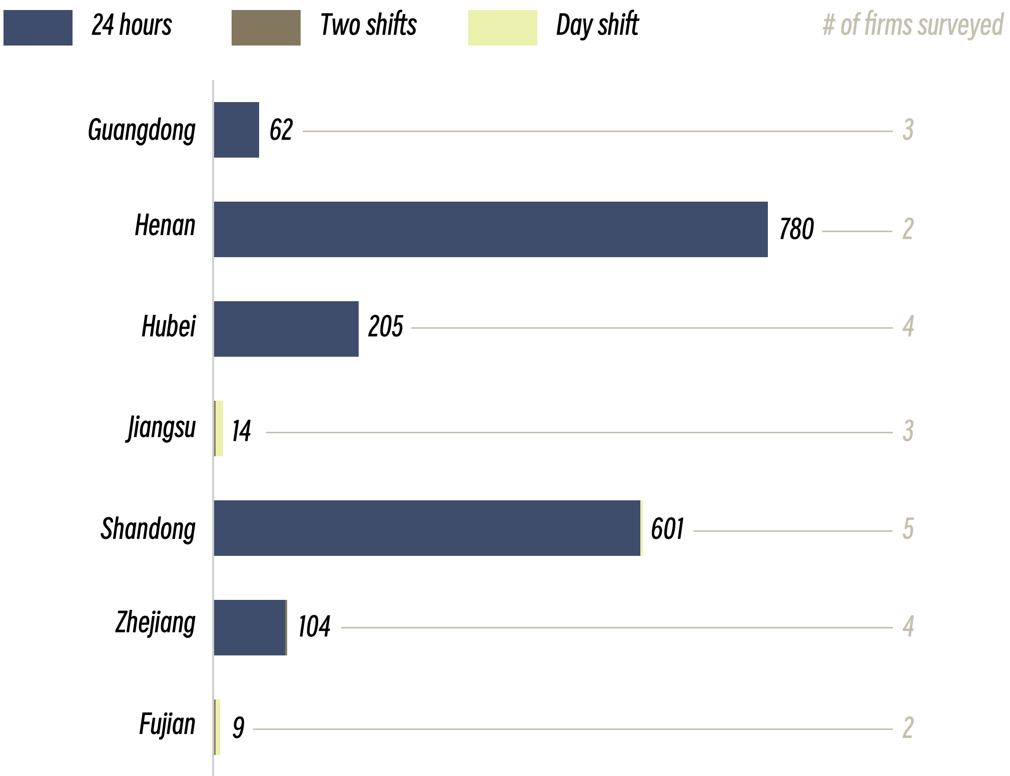
Based on surveyed firms'estimated power use for 2024, it is recommended to consider 50 MW utility-scale RE as a threshold for direct investment

Province / Firm	Estimated 2024 power consumption (kWh)	Equivalent solar capacity (MW)	Equivalent wind capacity (MW)
Fujian-2	3,255,200	3	1
Fujian-1	6,050,000	6	2
Guangdong-3	120,000	0	0
Guangdong-1	23,568,307	24	12
Guangdong-2	37,867,173	38	19
Henan-2	120,000,000	115	67
Henan-1	660,007,000	634	369
Hubei-3	35,500	0	0
Hubei-2	30,000,000	27	15
Hubei-4	52,500,000	48	25
Hubei-1	122,000,990	111	59
Jiangsu-1	3,300,000	3	2
Jiangsu-2	4,590,000	4	2
Jiangsu-3	6,000,000	5	3
Shandong-1	350,000	0	0
Shandong-5	3,800,000	3	2
Shandong-2	87,000,000	70	44
Shandong-3	210,000,000	169	106
Shandong-4	300,000,000	242	151
Zhejiang-2	2,800,000	3	1
Zhejiang-1	11,000,000	10	5
Zhejiang-3	20,000,000	18	9
Zhejiang-4	70,000,000	64	32

Note: Sample from Jiangxi is considered anomaly and excluded from this analysis
Source: CNTAC; AFRY analysis

Textile manufacturing typically follows 24-hour production with a flat power load curve

TYPICAL WAYS OF PRODUCTION BY SURVEYED FIRMS (GWH)



Source: CNTAC survey; AFRY analysis

COMMENTARY

Of the 24 companies surveyed, as many as 16 of those – representing 99% of the total planned electricity consumption volume in 2024 – follow 24-hour production.

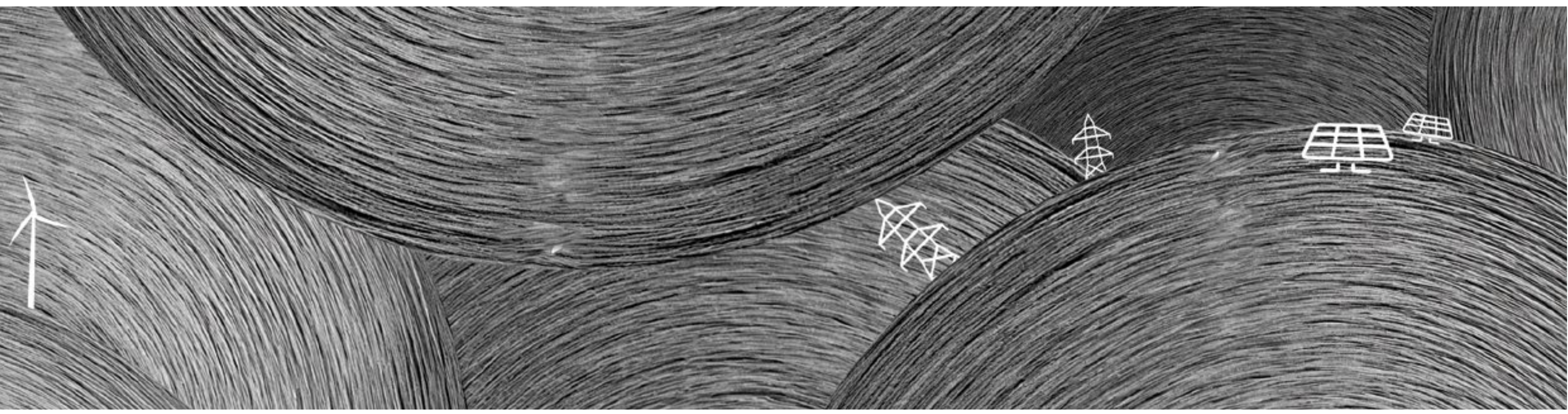
Of the companies producing on a 24-hour basis, most reported that their hourly electricity consumption typically remains stable, as the production machineries are constantly running throughout the day. No company has reported that they adjust hours of production based on the time-of-use power tariff, which gives heavier weighting to the electricity price during periods of high demand.

Amongst these companies, only two reported a historical average capacity utilisation rate that is lower than 80% (based on 2021-2023 data).

10 companies in total indicated that they have an RE procurement target, of which 3 located in Jiangsu, Shandong, and Zhejiang respectively aim to reach 100% by 2030.

Appendix III

Financial Returns Assessment Results



INVESTMENT OPTIONS – JIANGSU

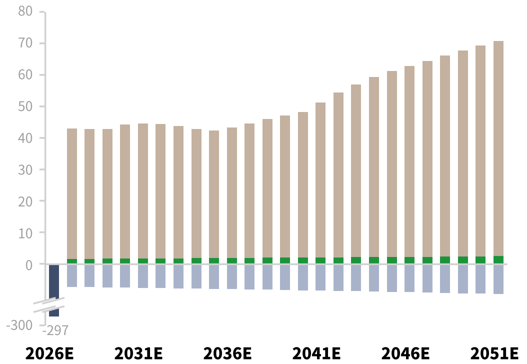
Onshore wind investment stands out with promise to achieve 11% IRR, which is equivalent to 218 million RMB net return

Results based on Central For reference only

FREE CASH FLOW OF INVESTMENT OPTIONS (RMB MN)

CAPEX OPEX Power revenue GEC revenue

100 MW solar PV

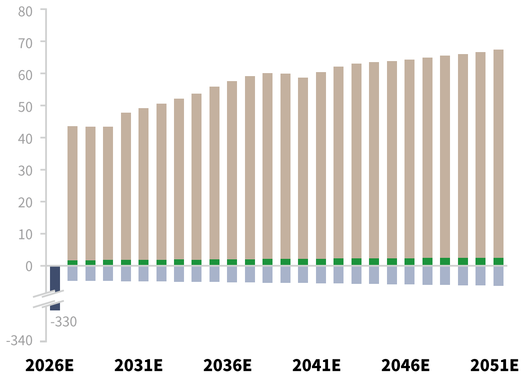


Internal Rate of Return: 7.5 – 13.8%

Net Present Value[1]: RMB 67 - 352 million

Payback Period[2]: 9.0 – 12.6 years

55 MW onshore wind

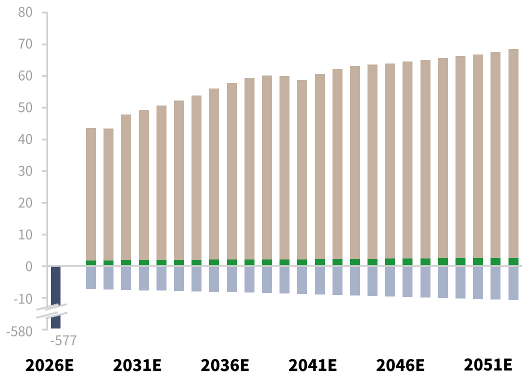


Internal Rate of Return: 8.8 – 13.6%

Net Present Value: RMB 126 - 368 million

Payback Period[2]: 8.9 – 11.4 years

40 MW offshore wind



Internal Rate of Return: 3.8 – 8.3%

Net Present Value: RMB (64) – 204 million

Payback Period[2]: 12.6 – 17.3 years

Note: [1]Cash flow is discounted with an assumed rate of 5.1% as the weighted average cost of capital
[2]nominal cash flow for calculation of payback period
[3]Range provided for IRR, NPV and payback period calculation is based on sensitivity analyses with assumptions from High and Low scenarios
Source: AFRY analysis

INVESTMENT OPTIONS – ZHEJIANG

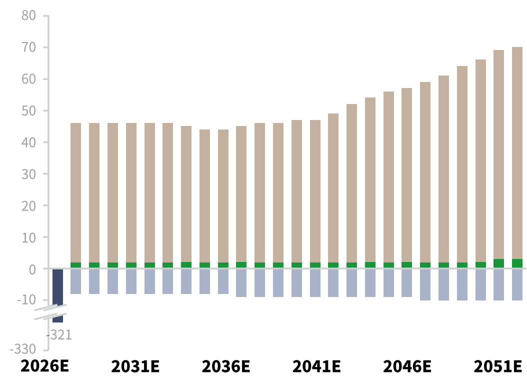
Onshore wind investment stands out with promise to achieve 11.6% IRR, which is equivalent to 228 mn RMB net return

Results based on Central For reference only

FREE CASH FLOW OF INVESTMENT OPTIONS (RMB MN)

CAPEX OPEX Power revenue GEC revenue

108 MW solar PV

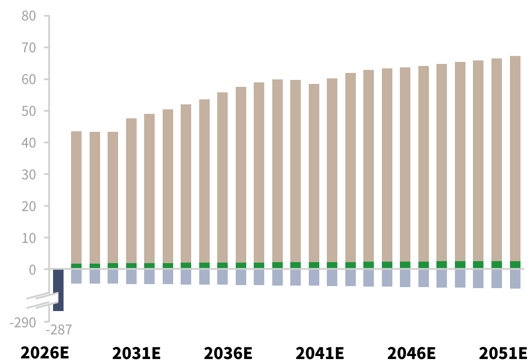


Internal Rate of Return: 6.4 – 12.5%

Net Present Value1: RMB 37 - 293 million

Payback Period[2]: 9.3 – 13.3 years

55 MW onshore wind

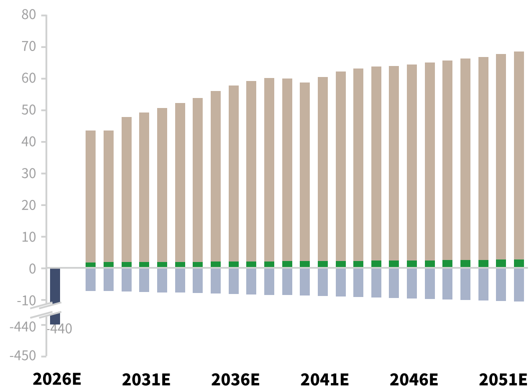


Internal Rate of Return: 9.0 – 14.5%

Net Present Value: RMB 122 - 394 million

Payback Period[2]: 8.4 – 11.0 years

42 MW offshore wind



Internal Rate of Return: 2.7 – 7.8%

Net Present Value: RMB (121) - 183 million

Payback Period[2]: 13.1 – 19.0 years

Note: [1]Cash flow is discounted with an assumed rate of 5.1% as the weighted average cost of capital
[2]nominal cash flow for calculation of payback period
[3]Range provided for IRR, NPV and payback period calculation is based on sensitivity analyses with assumptions from High and Low scenarios
Source: AFRY analysis

INVESTMENT OPTIONS – GUANGDONG

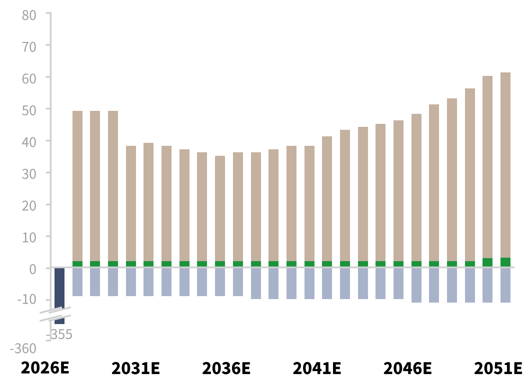
Onshore wind investment stands out with promise to achieve 8.7% IRR, which is equivalent to 134 mn RMB net return

Results based on Central For reference only

FREE CASH FLOW OF INVESTMENT OPTIONS (RMB MN)

CAPEX OPEX Power revenue GEC revenue

120 MW solar PV

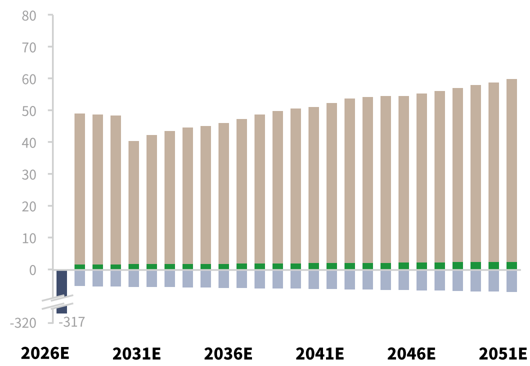


Internal Rate of Return: 4.2 – 9.3%

Net Present Value1: RMB (26) – 163 million

Payback Period2: 11.4 – 16.0 years

61 MW onshore wind

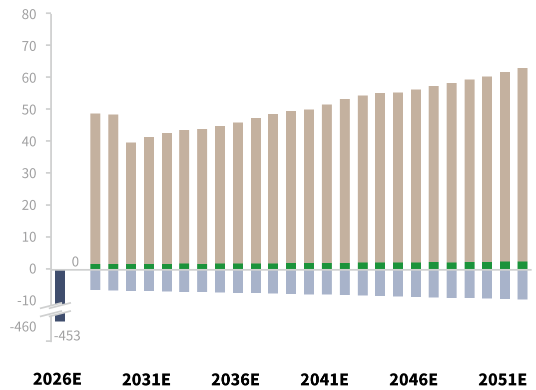


Internal Rate of Return: 6.5 – 10.7%

Net Present Value: RMB 47 – 228 million

Payback Period[2]: 10.3 – 13.2 years

35 MW offshore wind



Internal Rate of Return: 3.1 – 7.5%

Net Present Value: RMB (90) – 130 million

Payback Period[2]: 13.5 – 18.6 years

Note: [1]Cash flow is discounted with an assumed rate of 5.1% as the weighted average cost of capital
[2]nominal cash flow for calculation of payback period
[3]Range provided for IRR, NPV and payback period calculation is based on sensitivity analyses with assumptions from High and Low scenarios
Source: AFRY analysis

INVESTMENT OPTIONS – SHANDONG

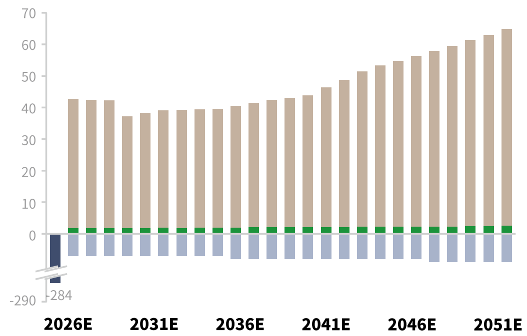
Onshore wind investment captures a 9.8% IRR, which has the highest NPV of 186mn RMB among the three options

Results based on Central For reference only

FREE CASH FLOW OF INVESTMENT OPTIONS (RMB MN)

CAPEX OPEX Power revenue GEC revenue

96 MW solar PV

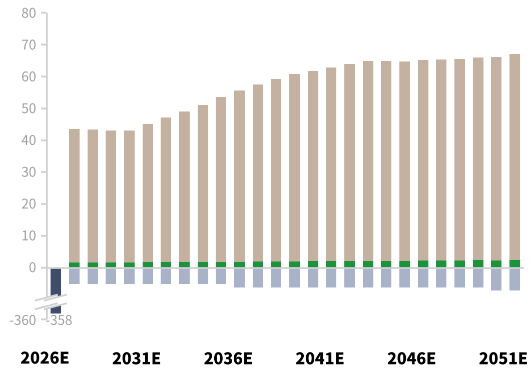


Internal Rate of Return: 7.0 – 12.3%

Net Present Value1: RMB 50 - 248 million

Payback Period²: 9.5 – 13.3 years

60 MW onshore wind

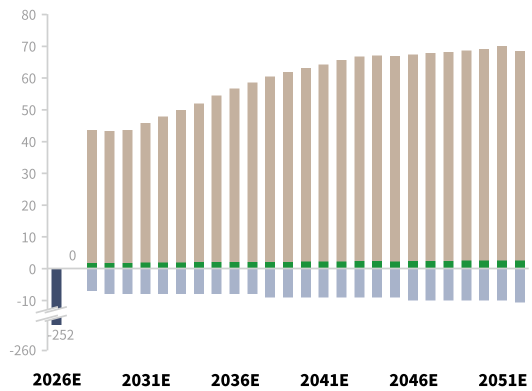


Internal Rate of Return: 7.4 – 12.1%

Net Present Value: RMB 83 - 314 million

Payback Period²: 9.7 – 12.8 years

35 MW offshore wind



Internal Rate of Return: 4.5 – 9.1%

Net Present Value: RMB (30) - 230 million

Payback Period²: 12.1 – 16.7 years

Note: [1]Cash flow is discounted with an assumed rate of 5.1% as the weighted average cost of capital
[2]nominal cash flow for calculation of payback period
[3]Range provided for IRR, NPV and payback period calculation is based on sensitivity analyses with assumptions from High and Low scenarios
Source: AFRY analysis

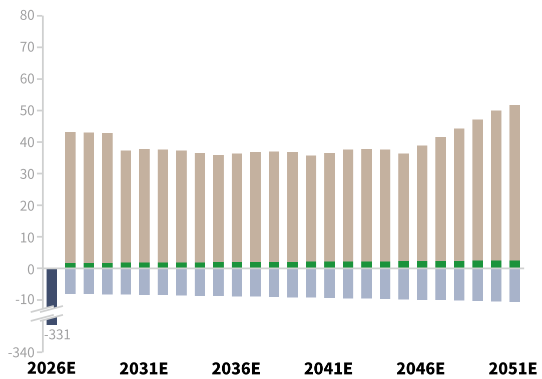
Onshore wind investment stands out with promise to achieve 12.6% IRR, which is equivalent to 218 million RMB net return

Results based on Central For reference only

FREE CASH FLOW OF INVESTMENT OPTIONS (RMB MN)

CAPEX OPEX Power revenue GEC revenue

112 MW solar PV

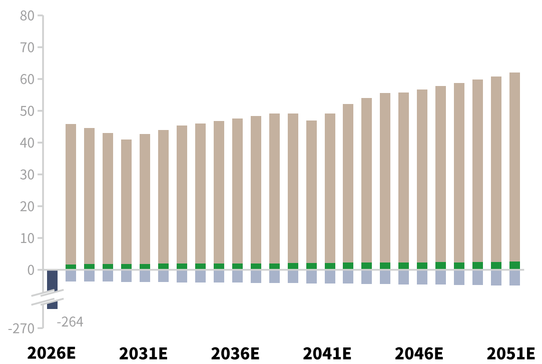


Internal Rate of Return: 4.6 – 8.9%

Net Present Value1: RMB (12) - 134 million

Payback Period²: 11.5 – 14.8 years

44 MW onshore wind

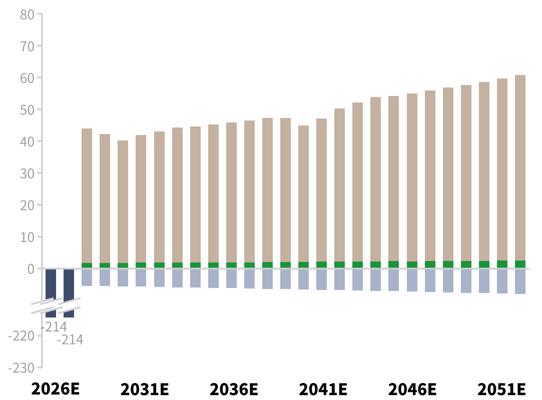


Internal Rate of Return: 10.4 – 15.2%

Net Present Value: RMB 147 - 336 million

Payback Period²: 7.8 – 10.2 years

30 MW offshore wind



Internal Rate of Return: 4.8 – 8.7%

Net Present Value: RMB (11) - 173 million

Payback Period²: 12.6 – 16.0 years

Note: [1]Cash flow is discounted with an assumed rate of 5.1% as the weighted average cost of capital
[2]nominal cash flow for calculation of payback period
[3]Range provided for IRR, NPV and payback period calculation is based on sensitivity analyses with assumptions from High and Low scenarios
Source: AFRY analysis

INVESTMENT OPTIONS – JIANGXI

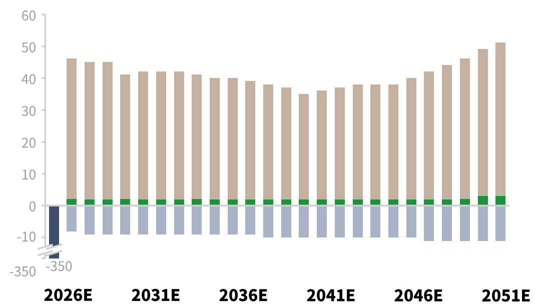
High load factor allows onshore wind investment to capture 10% IRR which is more favorable relative to solar PV investment

Results based on Central For reference only

FREE CASH FLOW OF INVESTMENT OPTIONS (RMB MN)

CAPEX OPEX Power revenue GEC revenue

118 MW solar PV

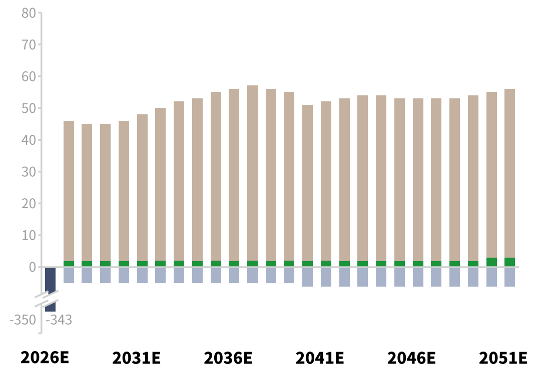


Internal Rate of Return: 3.1 – 9.8%

Net Present Value1: RMB (52) - 179 million

Payback Period[2]: 10.6 – 17.7 years

57 MW onshore wind



Internal Rate of Return: 7.5 – 12.4%

Net Present Value: RMB 76 - 292 million

Payback Period[2]: 9.1 – 12.2 years

Note: [1]Cash flow is discounted with an assumed rate of 5.1% as the weighted average cost of capital
[2]nominal cash flow for calculation of payback period
[3]Range provided for IRR, NPV and payback period calculation is based on sensitivity analyses with assumptions from High and Low scenarios
Source: AFRY analysis

POSTSCRIPT

During the implementation period of the "Green Innovation Transformation Project for the Textile Industry (2021–2025)," the project catalyzed approximately USD 560 million in green investment and financing among member enterprises of the "30·60 Carbon Neutrality Acceleration Initiative"—including USD 410 million in green investment and USD 150 million in green financing. The installed photovoltaic capacity reached around 0.51 GW, contributing to a cumulative emission reduction of 6.11 million tonnes of CO_2. A rough estimate indicates that the textile industry is expected to reduce emissions by approximately 50 million tonnes by 2025 compared to 2022.

According to this study, the textile industry is projected to achieve a total installed photovoltaic capacity of 27.6 GW by 2030, generating an additional RMB 96.8 billion in green investment and reducing CO_2 emissions by 23 million tonnes. By 2050, photovoltaic capacity is expected to reach 58.6 GW, leading to an additional RMB 336.5 billion in green investment and a CO_2 reduction of 141 million tonnes.

We hope that major brands and leading enterprises across the textile value chain will make reference to and utilize the findings of this study, and jointly leverage the industry's strength in collaborative climate action. For exchange and cooperation, please contact:

China Textile Information Center(CTIC)

sdg@cntac.org.cn

时尚气候创新

3060

碳中和加速计划

Climate Stewardship

30·60 Net Zero

Accelerating Plan