

Annual Business Overview

Aiming at modernizing the corporate governance framework and capabilities, and advancing the green and low-carbon transition, CNPC restructured its business portfolio into four business groups, i.e. i) Oil, Gas & New Energies, ii) Refining, Chemicals, Marketing & New Materials, iii) Support & Services, and iv) Capital & Finance, highlighting business synergy, professional competence and industrial chain integration for domestic and overseas operations and promoting the establishment of a clean, low-carbon, safe, efficient and modern energy system.



Oil, Gas & New Energies

In 2021, taking advantage of the economic recovery and rebound in oil prices, the Company made great efforts in optimizing the business structure and achieved a spectrum of important results in E&P. Meanwhile, the Company's crude oil production increased steadily, the natural gas business expanded in terms of size and revenue, and the new energies business got a quick start.

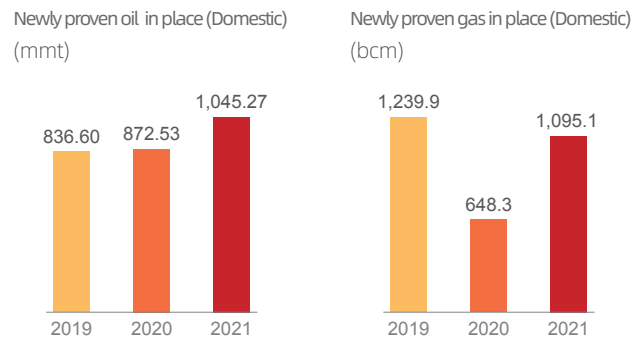
100-billion-cubic-meter natural gas plays. Domestically, newly proven oil in place totaled 1,045.27 million tons and newly proven gas in place stood at 1,095.1 billion cubic meters.

Domestic Exploration and Production

In 2021, the Company reported a number of major exploration discoveries with its oil and gas production (TOE) hitting a record high.

Exploration

Sticking to its resource strategy, the Company stepped up efforts in improving exploration efficiency, with a focus on marine carbonate rocks, deep/ultra-deep exploration and continental shale oil, while boosting risk exploration, preliminary prospecting and concentrated exploration in key areas such as Ordos, Junggar, Tarim, and Sichuan Basin etc. In 2021, the Company's E&P efforts led to five strategic breakthroughs and 15 major discoveries and proved 23 large-scale oil and gas plays, including eleven 100-million-ton crude plays and twelve



Reserves and Operating Data (Domestic)

	2019	2020	2021
Newly proven oil in place (mmt)	836.60	872.53	1,045.27
Newly proven gas in place (bcm)	1,239.9	648.3	1,095.1
2D seismic (kilometers)	11,478	7,852	7,264
3D seismic (square kilometers)	15,204	15,815	16,719
Exploratory wells	1,405	1,658	1,490
Preliminary prospecting wells	733	882	776
Appraisal wells	672	776	714

Major Discoveries and Achievements in 2021

Oil



High-yield oil flows were obtained from exploratory wells at the Fuman oilfield and the Tabei area in the Tarim Basin, the East Fukang Slope in the Junggar Basin and the Xinglong Structural Belt in the Bayan-Hetao Basin.

Natural Gas



Major natural gas exploration breakthroughs were made in the southern margin of the Junggar Basin, the Ordos Basin, and the Bozi-Dabei area of the Tarim Basin, leading to the discovery of a number of large gas reservoirs.

Shale Oil



The Jurassic shale oil exploration in the Sichuan Basin made a major breakthrough.

A one-billion-ton ultra-deep large hydrocarbon play was proved in the Tarim Oilfield

On June 4, 2021, four exploratory wells including Manshen No.2 and Manshen No.3 at the Fuman Oilfield in the Tarim Basin achieved a high output of more than 100 tons per day respectively, proving a super-rich fault zone with more than 200 million tons of estimated reserves. So far, the Fuman Oilfield has proved 34 fault zones from west to east, including Manshen and Yueman, with more than one billion tons of estimated reserves, making it the largest ultra-deep marine fault-controlled fracture-cavity carbonate reservoir in China.

Located on the south bank of the Tarim River in the hinterland of the Taklimakan Desert, and between two major hydrocarbon bearing areas in the Tarim Basin, i.e. Tazhong and Tabei, the Fuman Oilfield has a major oil-producing zone at a depth of about 8,000m below the surface. Ongoing R&D efforts targeting technical bottlenecks led to a major exploration breakthrough in ultra-deep marine carbonate rocks.

Oil and Gas Production

Domestically, the Company produced 103.11 million tons of crude oil and 137.8 billion cubic meters of natural gas in 2021, with an increase of 0.85 million tons and 7.2 billion cubic meters respectively YOY. The full-year production hit a record high at 212.90 million tons of oil equivalent, with an increase of 6.58 million tons YOY.

Development of Key Oil and Gas Fields

A range of effective measures were taken to ensure steady output growth in major domestic oil and gas fields. The oil and gas production of Changing Oilfield was on the rise and remained above 60 million tons of oil equivalent, with a year-on-year increase of over two million tons. Daqing Oilfield continued to maintain the crude output above 30 million tons. High-efficiency production from carbonate reservoirs in the Tarim Oilfield was achieved, with its oil and gas output staying above 30 million tons of oil equivalent. Southwest Oilfield saw steady growth in production as its shale gas and tight gas capacity expanded. Xinjiang Oilfield's crude output hit a record high. Liaohe Oilfield maintained stable production of above 10 million tons.

Stabilizing Production of Mature Fields

Focusing on mitigating decline rates and enhancing recovery efficiency, the action plan for stabilizing production of mature fields was implemented effectively to keep decline rates well controlled. In 2021, the natural decline rate of oilfields leveled off and the composite decline rate dropped by 0.65 percentage points year-on-year. The natural decline rate and composite decline rate of high-water-cut and high-recovery-percentage of recoverable reserves decreased from a year earlier; and those of reservoirs with low-recovery rate and low-recovery percentage were flat for the year.

Building up Production Capacity

Focusing on efficient oil and gas production, the Company leveraged technological progress to increase single well output and facilitated efficiency with management innovation. The year 2021 saw an addition of 11.85 million tons to the Company's crude capacity and an addition of 24.1 billion cubic meters to its natural gas capacity. The Fuman oilfield in the Tarim Basin completed a demonstration project of 2 Mt/a crude capacity

as the development activities picked up pace. Qingcheng, Changqing and Jimsar, Xinjiang saw a rapid ramp-up in the shale oil production. The key natural gas production ramp-up projects advanced steadily as new wells produced 11.3 billion cubic meters for the year.

Unconventional Hydrocarbons

In 2021, the Company continued to step up unconventional E&P by enhancing the prediction and evaluation of sweet spots, pilot development and demonstration of profit-based capacity building. Guidelines were formulated to boost the efficiency and profitability of unconventional hydrocarbon development.

Tight oil (shale oil): A 1Mt/a-shale oil demonstration project was completed at Longdong, Changqing Oilfield. A tight oil capacity-building demonstration area and a nitrogen flooding pilot test area progressed well at Daqing Oilfield. A national shale oil demonstration area started construction in Gulong, Daqing. The Company produced 3,904,000 tons of tight oil in 2021.

Tight gas: Changqing Oilfield was built as the largest tight gas production base in China. The E&P of tight gas accelerated at Southwest Oilfield and Jilin Oilfield etc. The Company produced 38.04 billion cubic meters of tight gas in 2021.

Shale gas: Deep shale gas development in Luzhou made a major breakthrough and the 10-bcm shale gas field in the southern Sichuan saw a rapid growth in production. The Company produced 12.86 billion cubic meters of shale gas in 2021.

CBM: The CBM business stayed on course, with a full-year output of 2.32 billion cubic meters. Focusing on the medium-to-high-rank CBM resources in Shanxi province, the secondary evaluation was conducted in the Qinshui Basin and Edong gas field, bringing in new breakthroughs in deep CBM exploration.

Foreign Cooperation in E&P in China

In 2021, CNPC's foreign cooperation E&P projects in China yielded a record-high amount of 11.94 million tons of oil equivalent, including 2.85 million tons of crude oil and 11.4 billion cubic meters of natural gas.

The Company deepened the cooperation with international partners, including Shell, TotalEnergies and Chevron etc., in E&P activities in China around low-permeability reservoirs, heavy

oil, shallow-water reservoirs, sour gas, high-temperature and high-pressure gas reservoirs, CBM, and tight gas. By the end of 2021, the Company had 29 E&P projects in operation with foreign partners.

These projects made steady headway in 2021. The Changqing Changbei Phase-I project remained stable as the Phase-II construction ramped up production capacity, producing more than 3 billion cubic meters for a 14th consecutive year. Fine management of gas reservoir was conducted in the Southwest Chuandongbei Project, seeing a new high in gas output. The natural gas production of the Changqing Sulige South Project increased year by year and the gas output of the Liaohai Haiyue Project grew for a third consecutive year.

Domestic oil and gas production

212.90

million tons of oil equivalent



Domestic crude production

103.11

million tons



Domestic natural gas production

137.8

billion cubic meters



Overseas Oil and Gas Operations

In 2021, the Company continued to bolster its capabilities to manage global operations especially in Central Asia-Russia, Middle East, Africa, Latin America, and Asia Pacific, and achieved major breakthroughs in E&P activities. The Company's overseas equity oil and gas outputs stabilized at 100 million tons of oil equivalent as new projects and joint ventures made new progress. By the end of 2021, the Company's global oil and gas operations covered 32 countries and regions around the world.

Oil and Gas Exploration

In 2021, the Company reported a number of major overseas discoveries. 1-billion-ton potential hydrocarbon reserves were discovered in Alam, Brazil and Yamal, Russia respectively; two 100-million-ton high-quality reserves and two 100-million-ton potential oil and gas reserves were discovered in Niger and Chad. Exploration activities in the Buzios project in Brazil, the PK project in Kazakhstan and the Block 5 project in Oman made significant progress.

Central Asia-Russia

The Company operated cooperation projects in Russia, Kazakhstan, Turkmenistan, Uzbekistan and other countries in the Central Asia-Russia region. Oil and gas cooperation in this region continues to deepen as the "Belt and Road" Initiative advances steadily. The three LNG trains of Yamal LNG in Russia maintained high-utilization, safe and stable operation and the fourth train went on stream in May. The Arctic LNG-2 was half way through construction. The surface works of Amu Darya Territory B East Phase II in Turkmenistan were completed and the surface works of Territory B West gas fields were nearly half way of the construction.

Middle East

The Company's business operations in the Middle East were expanding steadily as its investment portfolio and regional presence continued to be optimized. The Halfaya Gas Processing Plant in Iraq was half way through the construction. The UAE Onshore-Offshore Phase-II Project started construction.

Africa

The Company's six oilfield surface works at Block H in Chad were put into operation in February. The second phase of the Niger project started construction. The FLNG vessel for the Area-4 deepwater floating liquefied natural gas (FLNG) project in Mozambique was completed in November and headed towards the operating site.

Latin America

The Company's Buzios project in Brazil started to produce oil; the first floating production storage and offloading (FPSO) unit at Mero 1 Block of the Libra project was near completion and the second FPSO unit was more than half way through the construction.

Asia-Pacific

The Company's projects in the Asia-Pacific region remained stable. The first phase of Arrow Energy's Surat Gas Project progressed well.

Oil and Gas Production

The Company stepped up efforts in coordinated planning and life cycle management under development programs to achieve steady growth in overseas oil and gas production. The Company's overseas equity production amounted to 101.39 million tons of oil equivalent in 2021, including 76.33 million tons of crude oil and 31.5 billion cubic meters of natural gas.

Pipeline Construction and Operation

The Company's overseas oil and gas pipelines maintained safe and stable operation, and its strategic routes in northwest and southwest delivered 20.87 million tons of crude oil and 51.44 billion cubic meters of natural gas throughout the year.

The pipeline projects under construction moved forward steadily. The agreement on construction and operation of the Niger-Benin Crude Pipeline took full effect as the pipeline construction went in full swing. The Kazakhstan Northwest Crude Pipeline Phase 2 Revamp Project was completed and put into operation. The No. 1 tunnel project for the Tajikistan Section of Central Asia-China Gas Pipeline-Line D was completed and tested for acceptance.

Refining and Chemicals

The production and operation of the Company's overseas refining and chemical projects remained stable, processing 34.07 million tons of crude oil throughout the year. The Shymkent refinery in Kazakhstan completed a triennial overhaul. The refineries in Africa bolstered marketing efforts as the refinery in Chad reported the best-ever performance indicators and the refinery in Niger used a coordinated approach to its production and marketing activities to drive up product sales.

Assets Optimization

The Company made many achievements in its overseas project development. The Company signed a major stake acquisition agreement and delivered a major project in Iraq and Brazil respectively while positive progress was made in oil and gas cooperation in the Middle East and Central Asia etc. The contracts for five projects in Kazakhstan and Indonesia were extended. The Company withdrew from three countries and made an exit from five projects/blocks as part of ongoing efforts to optimize its overseas assets portfolio, business structure and regional presence.



Zhalaroer Oilfield in Kazakhstan

Natural Gas Sales

In 2021, as the economy recovered and the shift to clean energy accelerated, the domestic market saw a surge in the demand for natural gas. Leveraging a market-oriented approach, the Company optimized the production and operation processes, boosted domestic reserves and production ramp-up and diversified overseas sources to achieve a strong growth in natural gas sales. The full-year domestic sales stood above 200 billion cubic meters for the first time and reached 205.6 billion cubic meters, up by 11.3% year-on-year.

Natural Gas Marketing

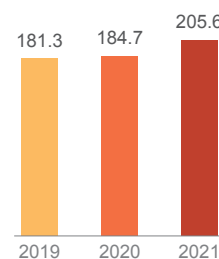
The Company achieved remarkable results in natural gas marketing through ongoing efforts in exploring the end-user market, forming strategic partnerships with key areas and large enterprises, improving the market-driven trading system, piloting natural gas-electricity-PV integration projects and promoting integration of natural gas and new energies. A number of urban gas projects were implemented in Xinjiang, Ningxia and Anhui, with a focus on provincial capitals and key cities. Marketing efforts targeting downstream urban gas end users were stepped up, adding about 1.48 million new end users throughout the year. The Company worked with business partners in Sichuan and other places in building service stations selling LNG and CNG. The urban gas-centered integrated energy business picked up the pace. By the end of 2021, about 11 projects went on stream with an installed capacity of 229 MW.

By the end of 2021, the Company's natural gas marketing network covered 31 provinces, municipalities and autonomous regions. The end-user sales volume totaled 46.4 billion cubic meters throughout the year, up by 11.2% from a year earlier.

LNG

The Company further expanded its peak shaving capacity, optimized the planning for LNG operations and reinforced the offshore gas corridor through the development of LNG infrastructure. The Jingtang LNG peak-shaving project and the Jiangsu LNG terminal phase-III project became operational, effectively

Domestic natural gas sales (bcm)



Jiangsu LNG Terminal

improving the peak-shaving capacity and the ability to cope with extreme weather conditions in the Beijing-Tianjin-Hebei and Yangtze River Delta regions.

By the end of 2021, the Company had two LNG terminals in Jiangsu and Tangshan, with a total annual gasification and loading volume of 16.51 billion cubic meters. In 2021, the Company had 16 LNG plants in operation, with a total LNG processing volume of 2.4 billion cubic meters.

Gas Storage Facilities

In 2021, the expansion of the existing gas storage facilities accelerated. Twenty-one gas storage wells were put into operation as planned after the capacity expansion; new projects, including the gas storage facilities of Jidong Oilfield and Liaohe Oilfield, progressed well to ensure sustained and fast-paced growth in the Company's storage and peak-shaving capabilities. The full-year gas injection stood at 12 billion cubic meters with a cumulative peak shaving capacity of 13.9 billion cubic meters.

New Energies

Making the green and low-carbon energy transition a top priority, the Company has included new energies in its core operations to facilitate the shift to an integrated energy company across oil, gas, thermal energy, electricity and hydrogen, promoting the integrated development of fossil energy and new energies, based on a three-step approach of "clean alternative, strategic replacement and green development".

Hydrogen Energy

Tapping into the hydrogen energy business, the Company's high-purity hydrogen supply capacity in operation has reached 1,500 t/a. Eight hydrogen refueling stations (integrated energy service stations) have been completed, with a processing capacity of seven tons per day. So far, the Company's hydrogen production capacity has exceeded 2.6 Mt/a, and the 19 hydrogen purification projects being planned or under construction cover seven regions including Bohai Rim, Shaanxi-Gansu-Ningxia, South China, Southwest China, Xinjiang, Heilongjiang and Jilin.

Geothermal Energy

Since 2021, the Company has put into operation six geothermal heating projects in Xiong'an New Area, Tangshan and other places, increasing the coverage of geothermal heating by 9.6 million square meters. Currently, the Company has 16 clean heating projects in operation or under construction. The projects in operation are able to replace 350,000 tons of standard coal and reduce nearly one million tons of carbon dioxide emissions on an annual basis.

Wind and Solar Power Generation

In 2021, the Company received a 1.2 million-kilowatt approval for wind and solar power generation and added 0.24 million kilowatts to the existing installed wind and solar capacity. A 200 MW photovoltaic power plant in Yumen Oilfield was connected to the grid, marking the Company's first grid-connected PV project. When operating at full capacity, the project will generate approx. 400 million kWh per year, equivalent to 110,000 TCE and reducing 280,000 tons of carbon dioxide emissions. A 6.9 MW distributed photovoltaic power station was completed and put into operation in Yingdong, Qinghai Province.



Photovoltaic power generation project at Jilin Oilfield

Oilfield Services

In 2021, the Company's oilfield service business played an important role in adding reserves, increasing production and reducing costs by carrying out management innovation, improving quality and efficiency and coordinating production, operation and risk mitigation.

Geophysical Prospecting

In 2021, CNPC acquired data of 34,000 kilometers of 2D lines and 86,000 square kilometers of 3D profiles.

Focusing on key basins, the Company made a number of major discoveries by employing new technologies, new equipment and new software, and ramping up R&D efforts in new areas, new types of resources and risk exploration activities. The "broadband, wide azimuth and high density" seismic prospecting techniques were widely adopted, leading to a remarkable improvement in location conformity in large urban areas and complex mountainous scenarios, and a wide application of vibroseis.

Drilling

In 2021, the Company spudded 9,740 wells and completed 9,602 wells, with a total footage of 23.08 million meters.

IT-enabled drilling techniques and intelligent solutions were widely used and a three-year quality improvement action plan for oil, gas and water wells was launched to improve the quality and efficiency of drilling operations. The drilling speed was improved by 17.1% for five key types of wells.

Well Logging and Mud Logging

In 2021, the Company completed 89,152 well-times of well logging, up by 5.23% year-on-year.

A remote technical support center was set up to provide remote logging and support. The "logging kit" was upgraded to support time-consuming tasks in high-temperature and high-pressure scenarios. Through-pipe logging tools were successfully applied to solve logging problems with long horizontal sections and complex well conditions.



Offshore geophysical prospecting operations of BGP

The Company completed 10,151 instances of mud logging throughout the year, by deepening researches on integrated geo-steering solutions as well as leveraging hydrocarbon detection/real-time monitoring techniques.

Downhole Operations

In 2021, the Company completed 84,000 well-times of downhole operations, including 60,000 sections/intervals of fracturing.

In line with the “Four Improvements Program” (improvement in quality, speed, output, and efficiency), the unconventional SRV fracturing 2.0 was adopted to boost fracturing capabilities significantly. A number of high-yield oil and gas wells were identified in Xinjiang, Sichuan and Tarim fields as risk exploration and formation testing for deep and ultra-deep wells continued to improve. Service capabilities required for snubbing operations were strengthened and more than 1,200 new wells were successfully commissioned.

Offshore Engineering

In 2021, the Company spudded 94 offshore wells and completed 96 wells with a total drilling footage of 217,000 meters. About 271 well-times of cementing services were provided.

The Company deployed four offshore drilling rigs, four production test/production platforms and 17 vessels to serve three offshore oilfield projects in the Bohai Bay. In the international market, the Company was awarded the Kuwait offshore site survey project, which progressed steadily.

Oilfield Service Data

		2019	2020	2021
Geophysical prospecting	2D seismic data acquired (kilometers)	56,551	18,027	34,565
	3D seismic data acquired (square kilometers)	102,958	85,443	86,496
Drilling	Wells completed	11,571	9,350	9,602
	Drilling footage (million meters)	27.45	21.03	23.08
Well logging	Well logging operations (well-times)	105,746	84,721	89,152
Mud logging	Mud logging operations	13,175	10,011	10,151
Downhole operations	Downhole operations (well-times)	87,563	80,553	83,714
	Formation test (layers)	7,602	9,998	9,783
Offshore engineering	Offshore drilling footage (meters)	264,700	301,100	217,000

Refining, Chemicals, Marketing & New Materials

In 2021, the Company continued to reduce the output of refined products and ramp up that of chemicals as the transformation and upgrading in refining and chemicals business picked up pace. In 2021, CNPC processed 166.74 million tons of crude oil domestically, and produced 108.92 million tons of refined products and 6.713 million tons of ethylene. There was a marked increase in the production of new materials as the campaign for boosting new materials business kicked off. Based on in-depth market research and focusing on the three prongs of marketing, namely retailing, wholesales & direct sales, and non-fuel business, domestic sales of refined products reached 111.26 million tons.

Refining and Chemicals

The Company continued to hold down the utilization of refining facilities, raise the utilization of chemical plants and optimize the product portfolio, leading to new breakthroughs in the transformation and upgrading of the refining and chemicals business. The output of jet fuel, lube base oil and paraffin increased by 12%, 14% and 13% respectively, and the yield of refined products decreased by 1.7 percentage points year-on-year.

Refining and Chemicals Operating Data (Domestic)

	2019	2020	2021
Crude runs (mmt)	168.44	160.02	166.74
Utilization rate of refining units (%)	84.1	82.3	81.6
Refined product output (mmt)	119.13	107.23	108.92
Gasoline output	50.44	46.28	49.39
Kerosene output	14.02	10.23	11.29
Diesel output	54.68	50.72	48.25
Lube oil output (mmt)	1.63	1.58	1.89
Ethylene output (mmt)	5.86	6.35	6.71
Synthetic resin output (mmt)	9.58	10.29	10.90
Synthetic fiber output (mmt)	0.04	0.03	0.02
Synthetic rubber output (mmt)	0.91	1.00	1.04
Urea output (mmt)	1.21	2.16	2.42
Synthetic ammonia output (mmt)	1.32	1.86	2.00

Two national ethane-to-ethylene demonstration projects were completed

In August 2021, Lanzhou Petrochemical's Changqing Ethane-to-ethylene Project of 800 Kt/a began to produce up-to-standard ethylene products. In the same month, Dushanzi Petrochemical's Tarim Ethane-to-ethylene project was successfully commissioned at first try.

Both included as national demonstration projects, these two use CNPC's proprietary technology, i.e. ethylene production via ethane cracking, and exhibit world-leading technical and economic indicators such as ethylene yield and energy consumption.

Highlighting a green and low carbon design, both projects employ state-of-the-art new technologies such as flue gas denitrification, catalytic oxidation for treatment of spent caustic, ultrafiltration + reverse osmosis, and evaporative crystallization to minimize emissions of carbon dioxide and nitrogen oxides, etc.

Construction and Operation of Large Refining & Chemical Bases

As the Company continues to improve the operational stability of its refining and chemical plants, 99.7% of facilities maintained stable operation throughout the year. By the end of 2021, the Company has in total eight large integrated refining-petrochemical complexes and thirteen 10 Mt/a refineries in China.

A number of key petrochemical projects made significant headway. Using CNPC's proprietary technology for ethylene production via cracking of ethane, two ethane-to-ethylene projects in Changqing and Tarim were set up and running smoothly with world-leading technical and economic indicators. Several projects, including the 300 Kt/a-polypropylene plant of Liaoyang Petrochemical. The first batch of alkylation projects of Dalian Petrochemical and Dagang Petrochemical were put into production. Jinzhou Petrochemical's residual hydrogenation unit and Jinxi Petrochemical's continuous catalytic reforming unit were completed and delivered. The integrated refining and petrochemical project of Guangdong Petrochemical and the ABS project of Jilin Petrochemical (Jieyang) picked up pace.

Optimization of Product Portfolio

The product portfolio of refining and chemical operations continued to optimize, aiming to increase the output of high-end and high-value products. In 2021, the Company's yield of refined products was 65.3%, with a year-on-year decrease of 1.7 percentage points. The output of propylene, aromatics and other lucrative products increased steadily. 20 of the 28 key technical and economic indicators of the Company's refineries were better than that of 2020.

In response to the sulfur limit requirement of the International Maritime Organization (IMO), the Company ramped up R&D and production of low-sulfur marine fuels and produced 4.07 million tons of low-sulfur marine fuels throughout the year.

The R&D and production of new chemicals and specialty chemicals gained momentum and the efforts to reduce the output of refined products and ramp up that of chemicals made remarkable headway. The output of ethylene, synthetic resin, synthetic rubber, chemical fertilizers and other products grew steadily. 83 types of

new chemical products were developed throughout the year, with a total output of up to 374,000 tons.

Development and Application of New Materials

In 2021, the Company boosted new materials business based on its 14th Five-Year Plan for New Materials Business Development, focusing on 26 new materials in seven categories, so as to form signature products with a competitive edge. The annual production of new materials was 547,000 tons. Jinzhou Petrochemical began mass production of electrode coke and specialty coke as anode material; Dushanzi Petrochemical's 60,000 t/a solution-polymerized styrene-butadiene project was completed and delivered; a number of joint venture projects for polycarbonate, polyoxymethylene, and carbon fiber, etc. advanced smoothly. In December, PetroChina Shanghai New Materials Research Institute was established to provide strong support for the development of new materials business.

R&D Breakthrough in High-performance Rubber Materials

Functionalized solution-polymerized styrene-butadiene rubber is a 3rd-generation SSBR (solution-polymerized styrene-butadiene rubber). As an ideal material for high-performance and eco-friendly tires, functionalized SSBR has become a research hotspot in synthetic rubber for excellent profile in wet traction, skid resistance, abrasion resistance, and rolling resistance.

The Company worked with Dalian University of Technology and Tongji University to develop the technology for the functionalization of SSBR. In May 2021, The Company began to produce the new functionalized SSBR product (SSBR72612F) and it passed the 72-hour performance acceptance test. The start of commercial production of functionalized SSBR of the Company marks a new breakthrough in the domestic high-performance rubber sector.

Marketing and Sales

In 2021, the Company stepped up its marketing efforts in targeting institutional customers and crossover marketing campaigns. Marketing strategies were flexibly adjusted and the marketing network was optimized, in a bid to improve the quality and efficiency of marketing operations.

Refined Products

In 2021, amid the resurgence of COVID-19, and frequent strikes of floods, blizzards and other natural disasters, the approach of fine marketing was adopted by fully leveraging the Company's integrated strengths across the industry chain as well as improving the coordination between production and sales. Multi-tiered and classified account management was enhanced and pilot programs for electronic refueling cards and apps were launched. The Company also responded actively to the regional and temporary diesel shortage in the fourth quarter to ensure market supply, and improve quality and profitability. The full-year domestic sales of refined products reached 111.26 million tons.

Marketing Network

With an aim to become a top service provider of oil, gas, hydrogen, electricity and non-fuel products at home and abroad, the Company continued to optimize its investment portfolio and business priorities in line with changes in the vehicle fuel demand. The marketing operations were undergoing transformation and upgrading towards hydrogen energy, photovoltaics and charging stations to provide new services. Throughout the year, the Company developed a total of 300 service stations and put into operations 305 service stations, 8 hydrogen refueling stations and 66 battery swap or recharging

stations became operational. As of the end of 2021, the Company has a total of 22,684 service stations in operation across the country.

The Service Station 3.0 program was pushed forward, highlighting digital transformation, differentiated marketing, and fine management to create an intelligent and user-oriented digital service platform. Smart refueling stations, smart supply chain, and the scenarios of the "people-cars-life" ecosystem continued to take shape at accelerated pace. Mobile payment services via WeChat, Alipay, and CNPC Youtu platform were launched. Digital currency payment was piloted in Shenzhen, Guangdong, Xiong'an, Hebei and other places.

According to the report of the 2021 China Brand Power IndexSM (C-BPI) released by the renowned brand rating and consulting company Chnbrand, CNPC ranked the first among China's fuel retailers for the fifth consecutive year.

Non-fuel Business

The Company consolidated its third-party partner resources like centralized procurement suppliers to provide the service package of "products + services + fuels", so as to further integrate the marketing of fuel and non-fuel products. Car services such as car wash were boosted to promote both fueling and other related services. Leveraging more than 7,000 service stations in villages and small towns, the Company joined hands with relevant companies to create a new business model of "fertilizers + agricultural materials and equipment + finance + agricultural products" to serve the rural areas with tailored approaches. Pilot projects were launched to promote own-brand products, poverty alleviation products and specialty products through private service stations. The sales revenue from non-fuel business totaled RMB 27.3 billion in 2021, including RMB 24.9 billion from convenience stores.

CNPC's first comprehensive energy station went into operation in Beijing

On September 30, 2021, CNPC Jinlong Comprehensive Energy Service Station opened in Yanqing, Beijing. The service station offers oil fueling, gas fueling, hydrogen fueling, charging, and convenience store services that enable a one-stop energy access covering oil, gas, hydrogen, electricity and non-fuel products.

Hydrogen fueling: the station served the hydrogen vehicles used in Beijing Winter Olympic Games with a daily capacity of 1,500 kilograms. Oil fueling: the station provides intelligent services such as smart fueling payment based on license plates, smart monitoring, as well as intelligent light control through

technologies such as IoT, AI-enabled video algorithm, smart inventory and electronic price tags etc. Charging: the station has three 120-kilowatt double chargers and six parking spaces, allowing an electric car to complete charging in 15 minutes. LNG fueling: the station is equipped with a 30-cubic-meter skid-mounted LNG fueling unit with a storage capacity of 11 tons. Non-fuel products: the convenience store has three sections, which are for immersive shopping, uSmile fresh brewed coffee, and entertainment respectively, offering more than 100 kinds of own-brand products in 10 categories.

International Trade

In 2021, based on resources and markets at home and abroad, the Company enhanced integrated global operations and improved its global marketing network to build up international marketing capabilities and boost marketing of equity oil and gas overseas. The Company adjusted plans for refined product exports, expanded overseas markets for refining and chemical products, made preemptive analysis of the market, and took a proactive approach to secure gas imports for winter in advance, to ensure domestic energy demand. The Company's three international operation hubs in Asia, Europe and the Americas continued to improve operation management and boost the ability to operate across regions, markets and product lines. The Company completed a trade volume of 490 million tons and sales revenue of USD 230.4 billion for 2021.

Crude Trading

The Company achieved high-quality development with improving volume and profitability in its crude trading business by optimizing the allocation of resources, establishing an efficient, flexible and stable supply and distribution system, and boosting comprehensive strength in resource acquisition, market development, cross-regional coordination, crude futures/paper trading, etc.

Refined Products Trading

Market trends at home and abroad were watched closely and market-oriented changes to the export plans of refined products were made in a flexible manner. Marketing efforts in emerging markets were stepped up to make new breakthroughs in refined products trading in Pakistan, Mexico, India, the Netherlands and

other places. Biodiesel business of the Company continued to expand, and ranked among the top three in Europe. The Company actively participated in futures trading in domestic futures exchanges and ranked among the top in terms of the delivery of bonded fuel oil contracts.

Natural Gas Trading

Based on analysis of international natural gas markets, the timing and structure of gas imports were optimized in response to changes in demand and supply conditions to ensure the stability in the Company's natural gas industry chain. Global LNG trade operations were strengthened as steady progress was made in the construction of the Company's own LNG fleet. The Company also tapped into carbon trading.

Chemicals Trading

As market exploration for chemicals exports advanced actively, new breakthroughs were made in the export of many chemical products such as polypropylene and solid wax. Chemical fiber raw materials and light hydrocarbons gained momentum, yielding an increase in both volume and profitability.

Maritime Shipping

Maritime shipping operations continued to optimize and consolidate, improving the global business layout and IT application to build up shipping service capabilities in the forms of voyage charter, time charter and contract of affreightment (COA) etc.



A LNG carrier heading towards the LNG terminal in east Guangdong

Support & Services

In 2021, the Company leveraged its expertise and lean management to improve the quality and market competitiveness of its service businesses, i.e. Engineering & Construction, Equipment Manufacturing and Research & Consulting, highlighting the essential role of technological innovation and boosting the Company's high-quality development.

Engineering & Construction

The Company continued to enhance its professional services and value-creating capabilities by improving the coordinated project management mechanism for key projects and pushing ahead with standardized design, large-scale procurement, factory prefabrication, modular construction, information management and digital delivery. By the end of 2021, the Company performed 75 major projects in surface engineering, refining & petrochemicals, and storage & transportation in the oil and gas field at home and abroad. China Petroleum Engineering Corporation ranked No. 4 on the ENR's Top 10 Global Oil and Gas Contractors list, and No.33 on the ENR's Top 250 Global Contractors (measured by revenue generated globally) in 2021, up one place from a year ago respectively.

Oil and Gas Field Surface Engineering

The ethane recovery project in Tarim Oilfield was successfully put into operation. The first and second facilities at the Amur Gas Processing Plant in Russia were delivered as scheduled. The Bab Field upgrading project in the UAE, the Halfaya Gas Processing Plant in Iraq and the surface project for the Contract Territory B west gas fields in Bagtiyarlyk progressed smoothly, and the integration project of the Niger Oilfield Phase II started.

Storage & Transportation

A number of projects were completed and are up and running, including the peak shaving project for the Tangshan LNG Terminal, the expansion of the Jiangsu LNG Terminal, the supporting pipeline for the East Guangdong LNG Project and the Thailand Ratchaburi Natural Gas Pipeline etc. Projects that are under construction include the south section of the Eastern Russia-China Natural Gas Pipeline, the Shenzhen LNG Peak Shaving Station, the Tianjin Nangang LNG Storage Project, the Wenzhou LNG Storage & Peak Shaving Center, and the Tangshan LNG Distribution Pipeline etc. Gas storage projects advanced steadily. The gas storage facilities at Suqiao, Hebei reached the designed capacity and the salt cavern gas storage projects at Chuzhou and Huai'an, Jiangsu progressed as planned.



The crude oil terminal construction site of the refining-petrochemical integration project at Guangdong Petrochemical

Refining & Chemicals Engineering

The ethane-to-ethylene projects at Changqing and Tarim oilfields and the 100 Kt/a EVA plant at Sinochem Quanzhou became operational. The integration project of Guangdong Petrochemical picked up pace. The Dushanzi Tianli High & New Tech's 200 Kt/a EVA project, Jingzhou Petrochemical supply-side restructuring project, and the Jinxi Petrochemical supply-side restructuring were going well. The overhaul and maintenance projects at Dagang Petrochemical, Jilin Petrochemical and Fushun Petrochemical were completed.

New Energies & New Materials

Leveraging its technological strengths and engineering capabilities, the Company explored actively the market of new energies and new materials. The 200 MW photovoltaic power generation demonstration project in Yumen Oilfield was connected to the grid and became operational. The by-product hydrogen purification project Phase I of North China Petrochemical came on stream. New materials projects were launched, including the 60 Kt/a e-SBR EPC project of Dushanzi Petrochemical and the Shengtong Juyuan polycarbonate project in Henan province.

Overseas Market Development

The Company achieved good results in optimizing its global market layout and exploring the overseas markets, including the contracts for the Zubair Mishrif Degassing Station Expansion Project in Iraq, the first contract with the Italian energy company Eni that aimed at the high-end market. The contract with Botswana Water Utilities for the Phase 2 and 3 of the procurement and construction of the water pipeline from Mamacia to Gaborone network marked CNPC's debut in Botswana. In addition, we signed the contract for the Niger-Benin Crude Oil Distribution Pipeline Project (Niger section + Benin section), the FEED +EPC contract for six Contract Territory B west gas fields in Bagtیارlyk, Turkmenistan, the contract with Thai state-controlled oil company PTT for the No.7 Gas Plant EPC Project, the contract with PT Pertamina for the East Java LPG Refrigerated Terminal Development - Onshore Terminal and Jetty EPC Project, and the contract with ADNOC Onshore for the Bu Hasa Oilfield EPC project in UAE. All these achievements helped bolster the foundation of cooperation among nations along the "Belt & Road".

Petroleum Equipment Manufacturing

The Company's equipment manufacturing business remained focused on technology, quality, service and the market. Remarkable results were achieved in terms of productivity and financial gains, as transformation and upgrading picked up pace, lean management deepened, and continuous improvement was made in automation, information management, digitalization, and intelligent operation. The Company's supply chain and marketing network continued to grow with overseas branches in Central Asia, Latin America, the Middle East, Africa, Asia Pacific and other key international oil and gas production regions. By the end of 2021, the Company sold petroleum equipment to more than 80 countries and regions around the world.

The transition to "manufacturing + service" and "product + service" made headway and input to service operations was stepped up to extend the value chain and enhance market competitiveness. Baoji Petroleum Steel Pipe Co., Ltd., a subsidiary of CNPC, was recognized by the Ministry of Industry and Information Technology as one of the third batch of National Service-oriented Manufacturing Model Enterprises. Baoji Oilfield Machinery Co., Ltd. was awarded a Service-oriented Model Enterprise in Shaanxi Province.

With a focus on E&P in shale gas and shale oil, the Company doubled efforts in research and development of core technologies and key equipment. New breakthroughs were made in key equipment solutions such as HMI-enabled one-touch 7,000-meter drilling rig, 5000HP/7000HP electric fracturing skid, ultra-high strength CT150 coiled tubing, and high-pressure gas injection compressor etc., with some of these products up to world-class.

The Company has set up overseas offices in many countries and regions around the world, underscoring the importance of international market development and cooperation. In 2021, the Company opened up three new markets, i.e. the DR Congo, Vietnam and Togo. The "product + service" business model facilitated market breakthroughs in many countries and regions. The Asian large-diameter steel pipe manufacturing project was successfully completed in Kazakhstan, the Australian line pipe project was successfully signed. The Company's compressor products entered high-end market and were installed in the gas processing plant in Tanzania. A long-term service agreement for electric pumps was recently signed in Niger, keeping the Company's share in Niger's electric pump market.

Capital & Finance

The Company has a complete set of financial licenses, with business operations covering in-house banking, financial leasing, trust, insurance, insurance brokerage, securities, etc. In 2021, the Company optimized its business structure and made capital and finance one of its four business groups, aiming to shore up brand building for petroleum-finance services and support the Company's high-quality development.

Using the Company's professional platform, capital & finance business implemented the "dual-driver" approach to market services and industry-finance integration. In line with the trends of industry finance, efforts were made to strengthen the alignment of financial services with production needs and collaboration between financial institutions and tap into green finance and new energies business, in a bid to expand external markets and enhance market competitiveness and brand influence. CNPC Capital made it to the 2021 Top 100 Listed Companies in China and received again the Top 100 Chinese Enterprises Award and China Ethical Enterprise Award. In 2021, Kunlun Capital, an industrial capital investment company founded with an investment of RMB 10 billion, was established successfully and have set up its first green and low-carbon innovation fund.

Capital Management

Financial functions such as cash concentration, settlement, fund monitoring and financial services are performed through China Petroleum Finance Company, a subsidiary of the Company, to support the centralized capital management and the effective utilization of funds. China Petroleum Finance Company continued to improve the quality of its financial products and customer service capabilities by introducing four innovative products, i.e. Green Sales Loan, Forex Easy Loan, Cross-border Connect and Oil Product Discounts. Credit services for the industry chain buyers were successfully launched, as part of the efforts to expand the scope of financial services and support the high-quality development of the oil and gas operations.

Banking

Bank of Kunlun, a subsidiary of CNPC, further clarified the roadmap towards its strategic goals and remained committed to the industry finance business. The focus was on business expansion along the industry chain, with a substantial year-on-year increase in both the amount of lending and loan balances of its industry finance business. Online products such as Gas Easy Loan, Oil Easy Loan and CNPC E-Connect were developed and launched to introduce an integrated marketing mechanism and tap into the downstream finance market.

Trust

Kunlun Trust, a subsidiary of CNPC, pushed ahead with the shift to business innovation, offered a wider range of investment instruments

and explored business models in green and low-carbon operations, new energies, new materials and new technologies etc. to further enhance its business portfolio. ABS (asset-backed securities), ABN (asset-backed notes) and non-financial management services displayed a strong momentum with optimized processes and incentives, pushing the size of securities assets to nearly RMB 30 billion.

Financial Leasing

In 2021, Kunlun Financial Leasing, a subsidiary of CNPC, was deeply engaged in the oil and gas market along the industry chain with full-year lending amounting to RMB 13.716 billion, up 18% from a year ago. The total earnings of Kunlun Financial Leasing since its inception exceeded RMB 10 billion, marking a historical milestone for its business growth.

Insurance

The captive insurance business broadened the coverage of property insurance policies. Overseas captive insurance arrangements now cover 54 projects in 23 countries after adding five new projects, including the Niger-Benin Pipeline. Generali China Life Insurance tapped into 17 new industry finance projects throughout the year, seeing a sustained growth in insurance premiums. Based on a more sophisticated risk management system, Generali China Insurance reported more than RMB 1 billion in premium income for the year, staying profitable for three consecutive years.

Insurance Brokerage

Kunlun Insurance Brokerage Company, a subsidiary of CNPC, won the bid for the insurance brokerage project of the China Oil & Gas Pipeline Network Corporation and became its chief insurance broker.

Kunlun Capital boosts CNPC's strategic shift

On June 28, 2021, CNPC Kunlun Capital Co., Ltd. was established in Beijing. Kunlun Capital focuses on strategic emerging industries such as new energies, new materials, energy conservation and environmental protection, and high-end intelligent manufacturing. Meanwhile, the integration of the innovation chain with the industrial chain will be enhanced through equity investment. The aim is to facilitate CNPC's efforts to increase the share of new energies business, accelerate the development and utilization of new materials, commercialize technological achievements, facilitate the incubation process of new business models, and help to implement the three-step strategic approach, i.e. "clean alternatives, strategic replacement and green development".

