Challenges and Opportunities for China's Oil and Gas Industry under the New Energy System

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Academy of Chinese Energy Strategy

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1. Introduction to the New Energy System

New Energy System

- First national energy plan titled "New system", aiming to initially establish a clean, low-carbon, safe, and efficient system by 2030.
- Core Framework: Security as premise | Economic viability as foundation | Tech innovation as guidance | Institutional reform as driver.



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1. Introduction to the New Energy System

System Framework and Key Tasks



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1. Introduction to the New Energy System

Quantitative Targets

- **Cleaner energy consumption**: The share of non-fossil energy in total energy consumption is targeted to increase **from 21.7% in 2025 to 25% by 2030.**
- **Power sector decarbonization**: The share of non-fossil energy in total electricity generation is targeted to rise **from 42.3% in 2025 to 50% by 2030.**
- **End-use electrification**: The share of electricity in final energy consumption is targeted to increase **from 30% in 2025 to 35% by 2030.**



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1. Introduction to the New Energy System

Spatial Layout

- **Base Layout:** Strategic fossil energy bases in the West; multi-energy synergy.
- **Regional Synergy:** Coordinate "West-to-West" utilization & "West-to-East" transmission; integrate energy with advanced manufacturing & AI computing.
- **Backbone Channels:** Optimize cross-regional networks (power, coal, oil, gas) for resource allocation & supply security.



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1. Introduction to the New Energy System

Spatial Layout

- **Investment Scale:** Total investment projected to exceed 20 Trillion RMB
- **Key Deployments:** Energy security investment (+ >10%), and Grid investment (+ >30%)
- **New Business Forms:** Investment in new energy storage, green power direct connection, integrated energy services, & computing-power synergy > 2 Trillion RMB



1. Introduction to the New Energy System

Targets of Oil&Gas Industry

- **Stable Supply:** Domestic oil & gas supply to reach 440 million tons of oil equivalent
- **Infrastructure Upgrade:** Long-distance pipelines extend to 220,000 km; gas storage > 13% of consumption
- **Green Transition:** Annual CO_2 injection via CCS/CCUS reaches 10 million tons; synergizing emission reduction & industrial growth





数据来源：中国能源统计年鉴；中国电气化年度发展报告2026,中国电力企业联合会

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1. Introduction to the New Energy System

Evolving of Oil&Gas Industry

- **Energy Security:** Reserve/production enhancement & infrastructure ensure self-sufficient supply for core demand
- **System Regulator:** Synergy with the new power system enhances supply flexibility
- **Transition Carrier:** Integration with new energy, CCUS, & green fuels expands industrial development space



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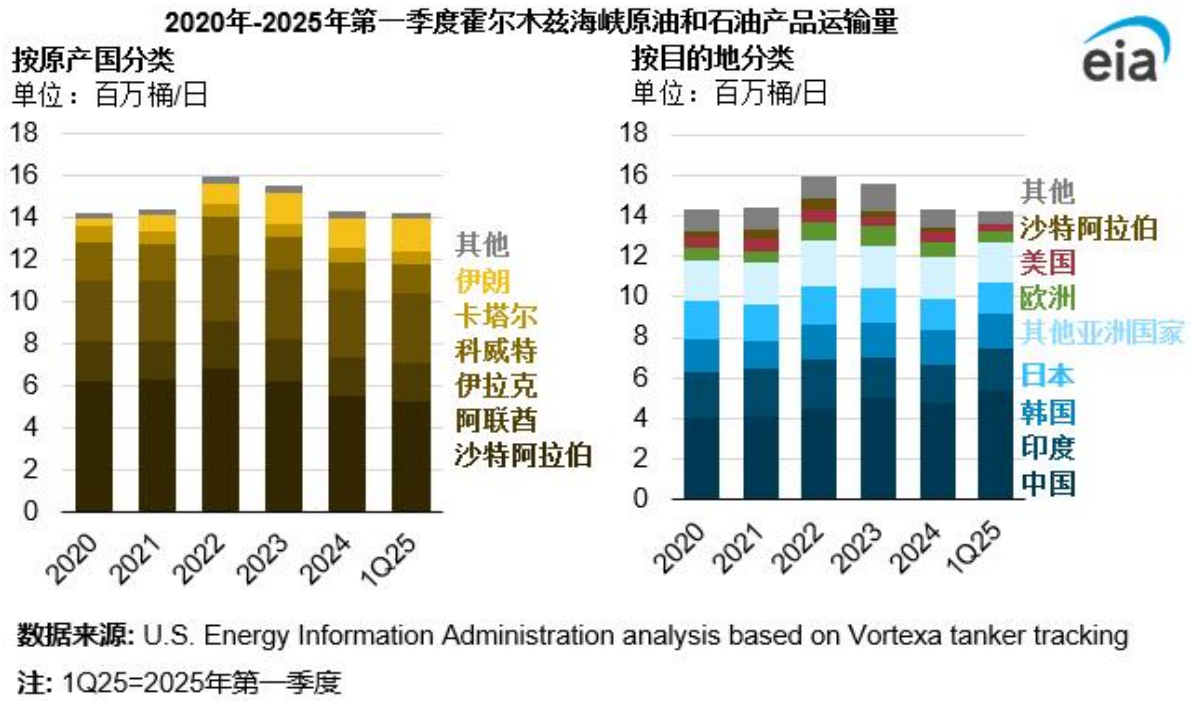
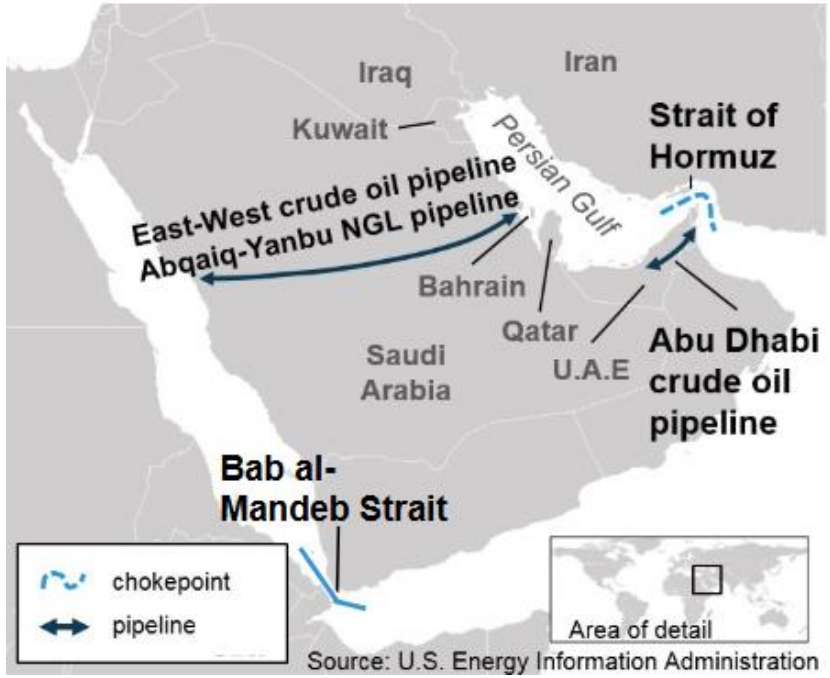
2. Challenges for the Oil and Gas Industry

Increasing Risks of Stable Supply

- **Geopolitical conflicts**: Middle East conflicts disrupt oil and gas production and trade
- **Supply risks**: Infrastructure damage and shipping restrictions increase global supply uncertainties

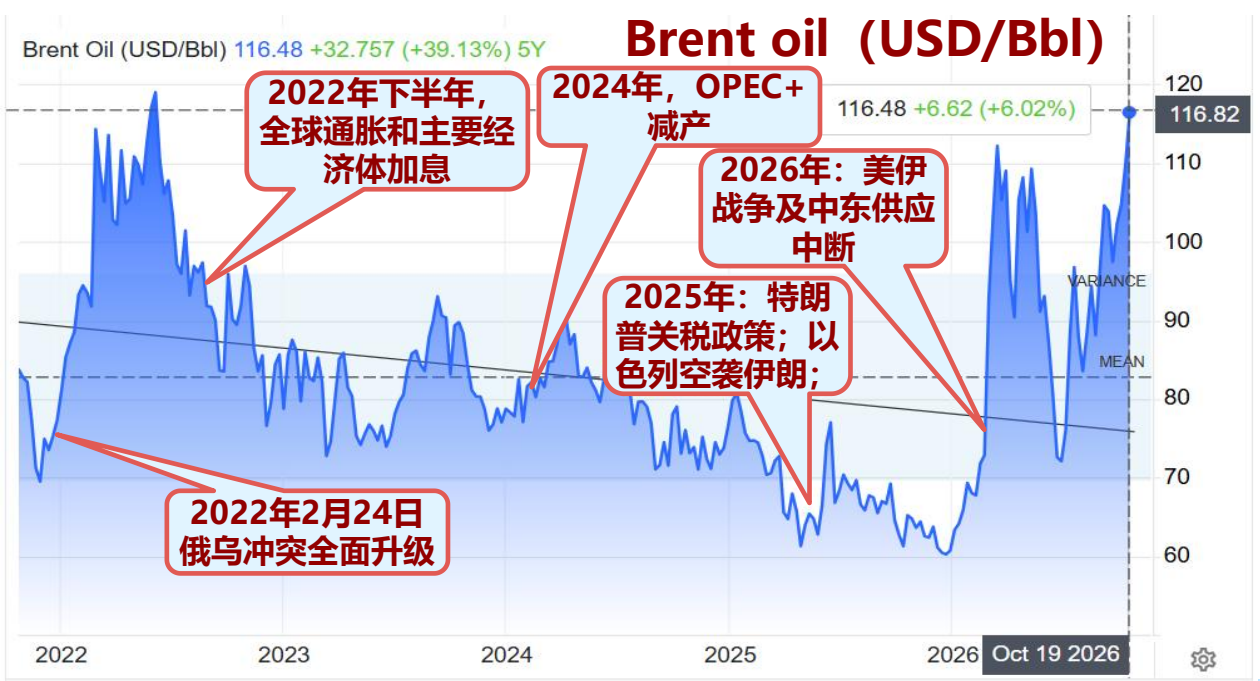


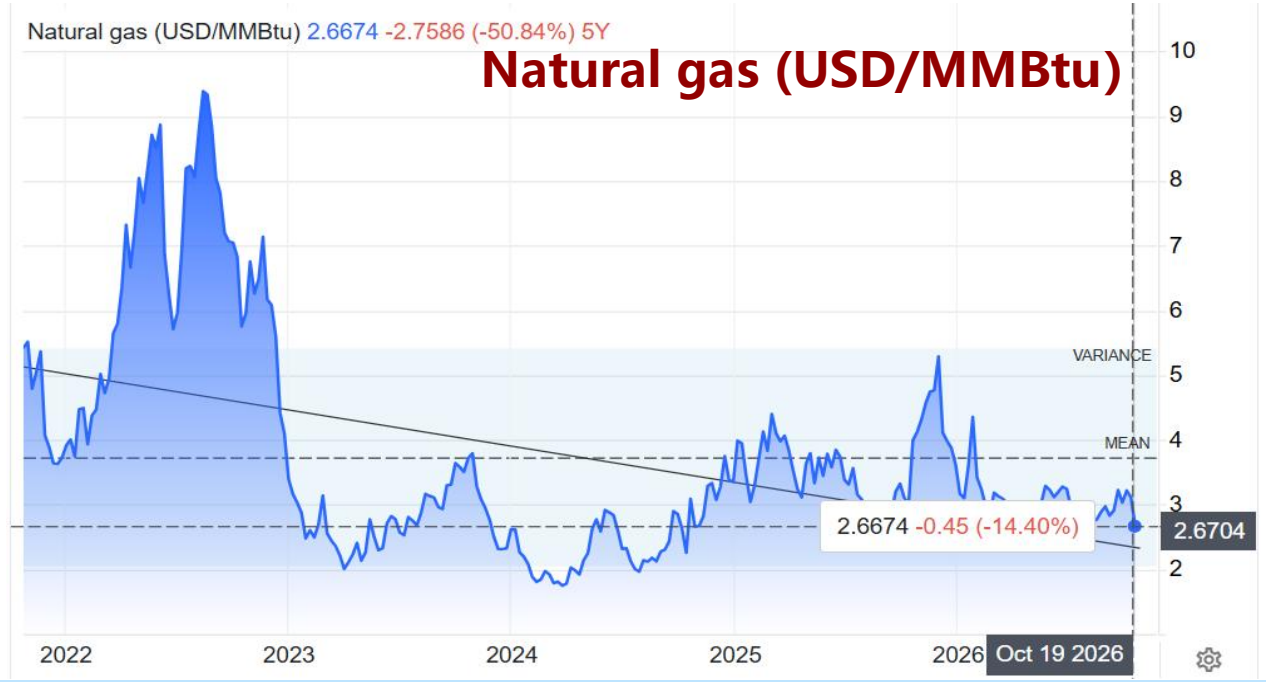


2. Challenges of the Oil and Gas Industry

Oil and Gas Price Fluctuations

- **Oil price volatility**: Brent crude fell from USD 99/bbl in 2022 to USD 68/bbl in 2025, before surging to USD 116.48/bbl in October 2026
- **Gas price volatility**: Natural gas prices surged in 2022 and declined during 2023–2025, but volatility persisted





数据来源：IMF布伦特原油年均价格数据（FRED）IEA, Gas Market Report, Q2-2026

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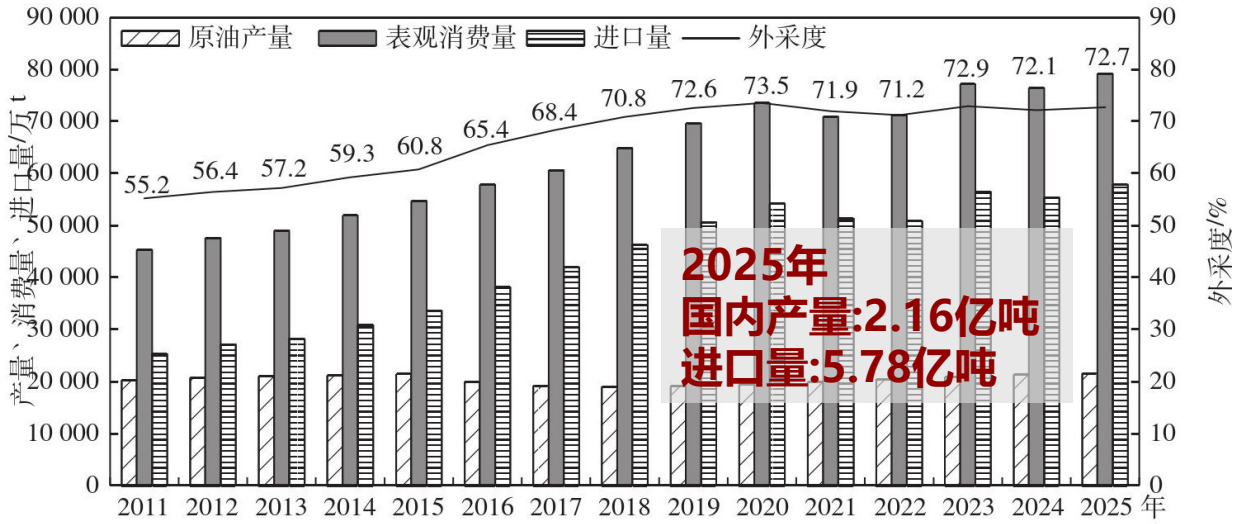
2. Challenges for the Oil and Gas Industry

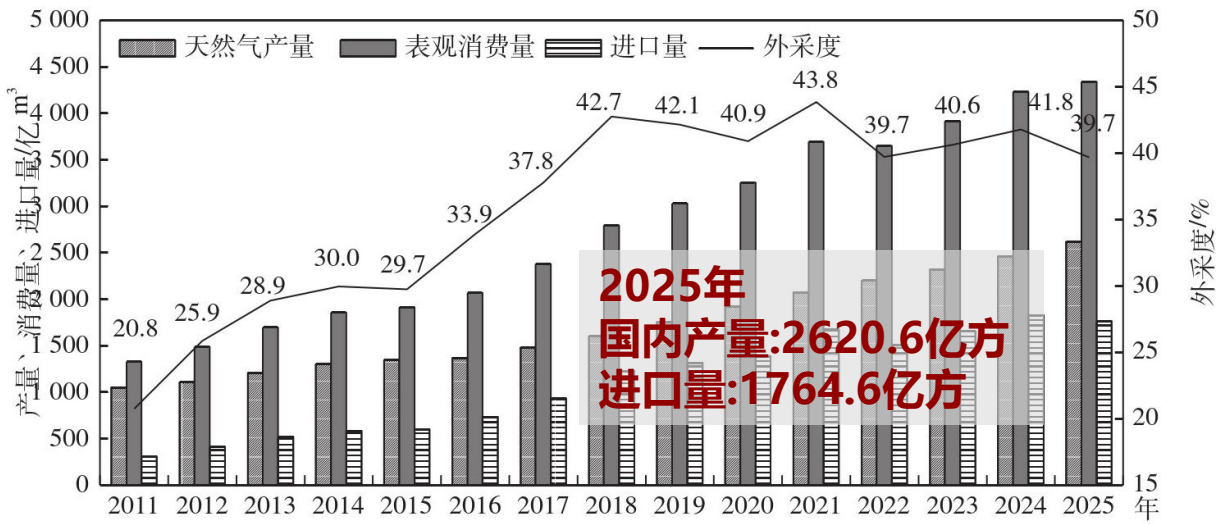
China's Oil and Gas Import Dependence

- **Import Dependence**: oil and gas import dependence reached 73% and 40% in 2025
- **Supply vulnerabilities**: Concentrated import sources and vulnerable transport routes increase exposure to external risks

National Crude Oil (2011–2025): Dynamics of Production, Imports, Apparent Consumption, and Import Dependency



National Natural Gas (2011–2025): Dynamics of Production, Imports, Apparent Consumption, and Import Dependency



文献参考：王彧嫣,郑志红,韩志强,等.2025年国内外油气资源形势分析及展望[J].中国矿业,2026,35(01):30-40.
数据来源：国家统计局、海关总署

2. Challenges for the Oil and Gas Industry

Shifting Toward Deeper, Unconventional, and Mature Resources

- **Deep and deepwater resources**: raises technical challenges
- **Unconventional resources**: relies on technological advances and economies of scale
- **Mature fields**: High water cuts, reservoir depletion, and natural decline increase pressure on production stability

Development of Deep and Ultra-deep Oil and Gas



Deepwater Oil and Gas Development



Unconventional Oil and Gas Development



Sustained Production of Mature Oilfields and Enhanced Oil Recovery (EOR)



Challenging Exploration & Development (high difficulty, high cost, long lead times)

Substantial Production Decline

信息来源：国家能源局

2. Challenges for the Oil and Gas Industry

End-Use Electrification Reshapes Oil and Gas Demand

- **Transport transition**: New energy vehicles is reducing conventional transport fuels
- **Industrial substitution**: Electrification and clean fuels are reshaping industrial energy
- **Demand shifts**: Oil consumption is approaching its peak, while natural gas and petrochemical feedstock demand are evolving differently





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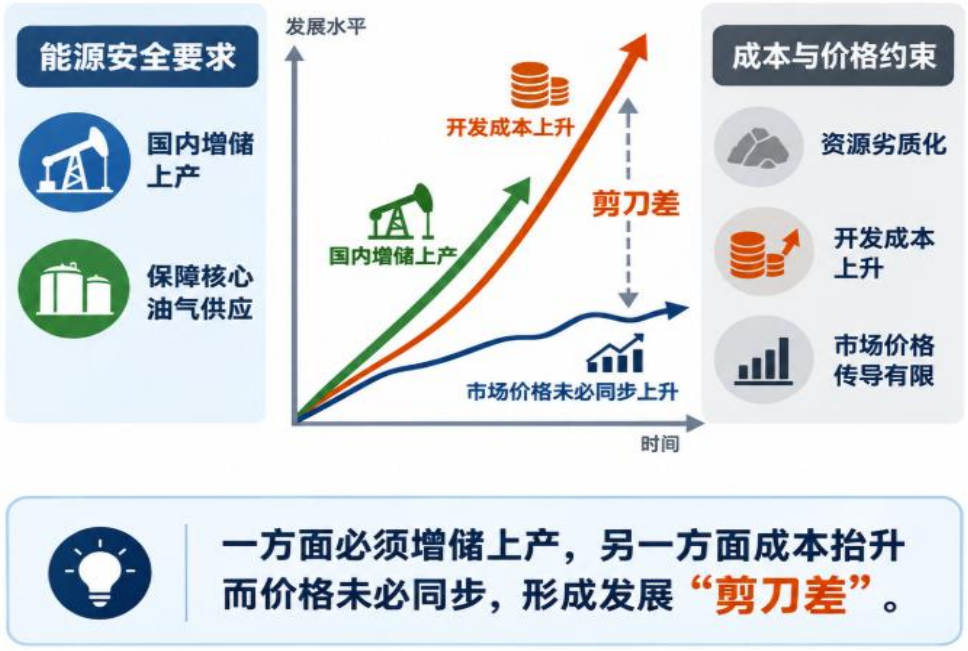
2. Challenges for the Oil and Gas Industry

Rising Costs and Price Volatility Are Constraining Oil and Gas Project Economics

- **Rising costs**: Deep, deepwater, and unconventional resources require greater capital and technological investment
- **Price volatility**: Oil and gas price fluctuations increase uncertainty over project returns
- **Economic pressure**: The contradiction of cost-benefit gap has become more obviously

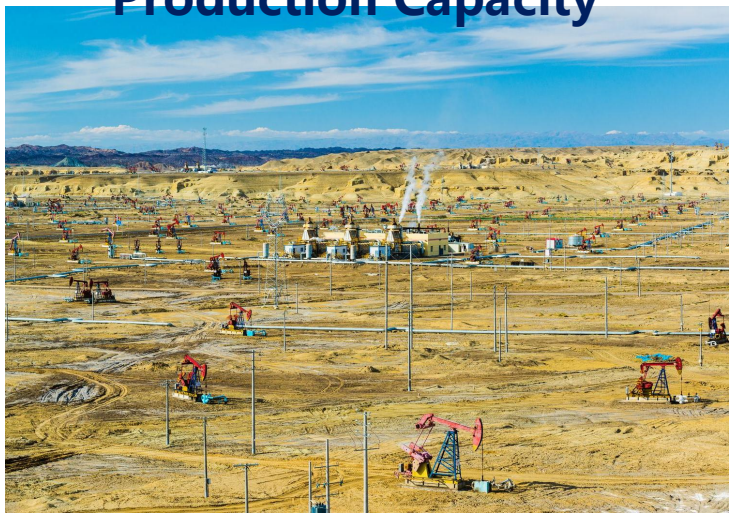
The "Scissors Differential"



Cost Pressures in the Development of Complex Oil and Gas Resources



Sustained Production of Mature Oilfields and Replacement of New Production Capacity



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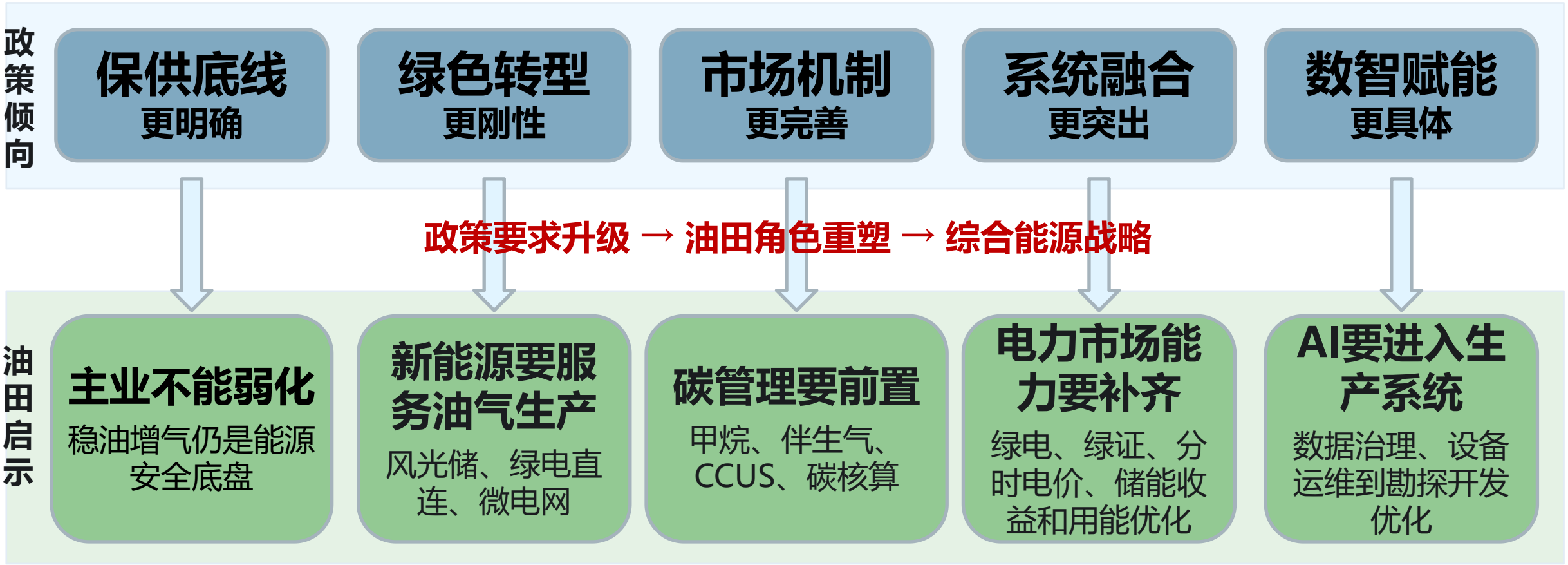
3. Opportunities for the Oil and Gas Industry

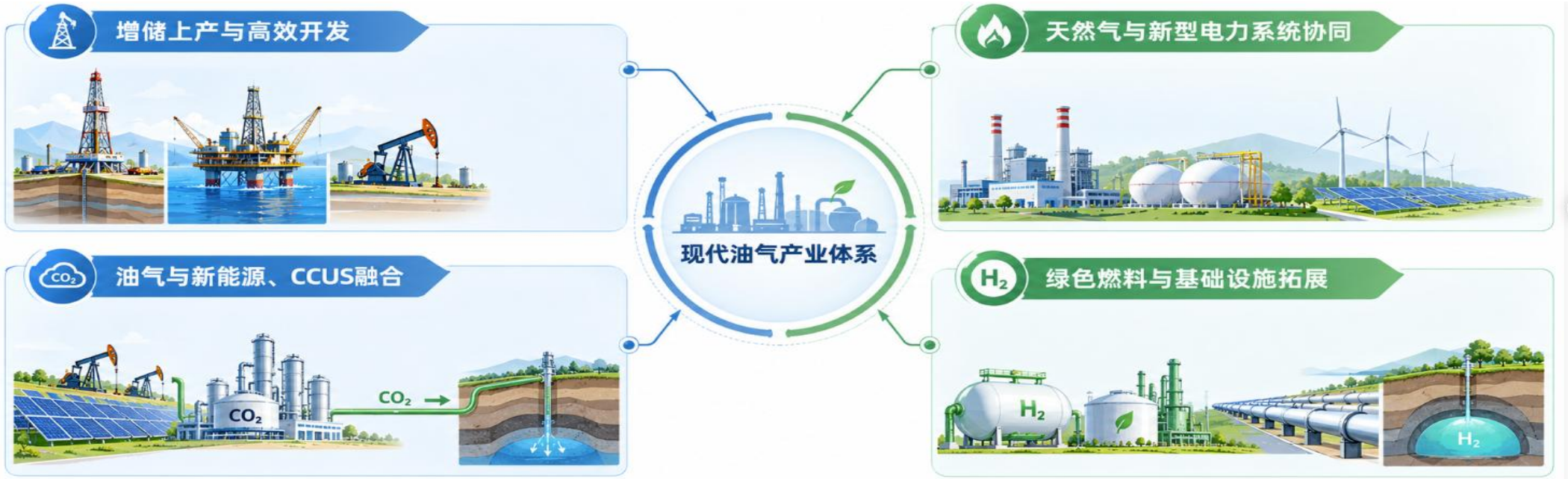
- **Energy policies increasingly emphasize supply security, low-carbon transition, market mechanisms, system integration, and digitalization.**



3. Opportunities for the Oil and Gas Industry

Synergistic Development of Security & Green Integration in Oil & Gas Industry

- **Core Business:** Reserve/production enhancement & efficient development remain foundational
- **Integrated Development:** Synergy with new energy, gas power, & CCUS creates new space for upgrading
- **Functional Expansion**: Green fuels & multi-energy storage/transport extend infrastructure value



数据来源：《石油天然气发展“十五五”规划》

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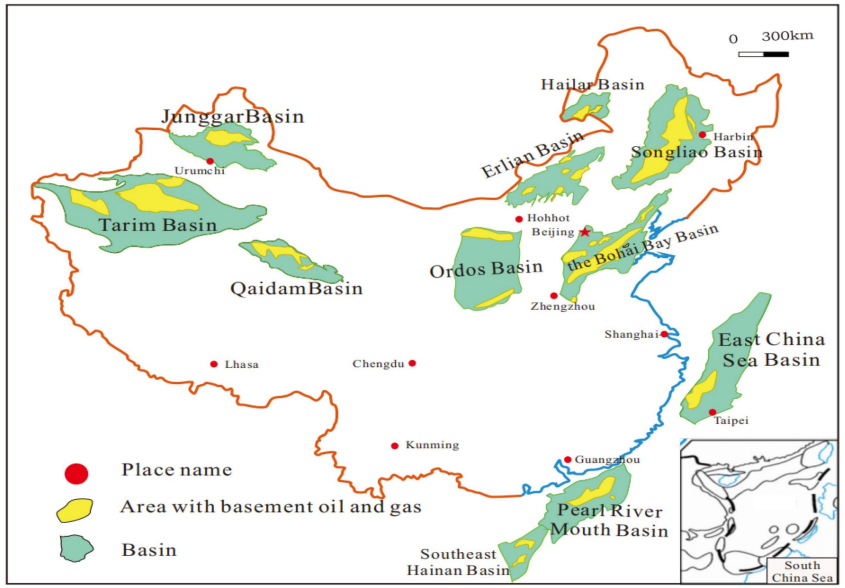
3. Opportunities for the Oil and Gas Industry

Stronger Reserve Replacement Creates New Opportunities for Oil and Gas Development

- **Exploration Breakthroughs:** "7-Year Action Plan" discovered 17 100-million-ton oilfields & 34 100-billion-m³ gas fields
- **Reserve Replacement:** Technical recoverable reserve replacement ratios for oil & gas >1.1 and >2.2, ensuring sustained growth
- **Strategic Continuity:** New "10-Year Action Plan" drives deep-earth, deepwater, unconventional, & mature oilfield development

National Oil and Gas Production Trends (2018–2025)





Distribution of Major Oil and Gas Reservoirs in China

On October 21, the National Energy Administration (NEA) convened a conference on medium- and long-term oil and gas reserve and production enhancement, outlining key tasks for the "Ten-Year Action Plan" on exploration and development.

数据来源：《中国油气勘探开发发展报告（2026）》

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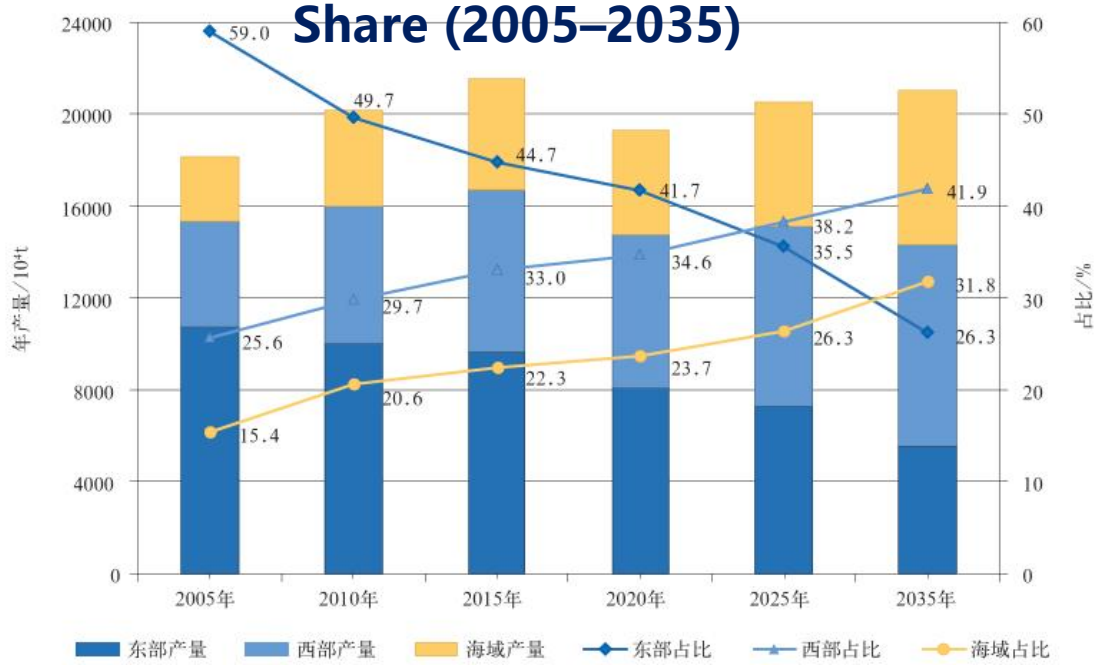
3. Opportunities for the Oil and Gas Industry

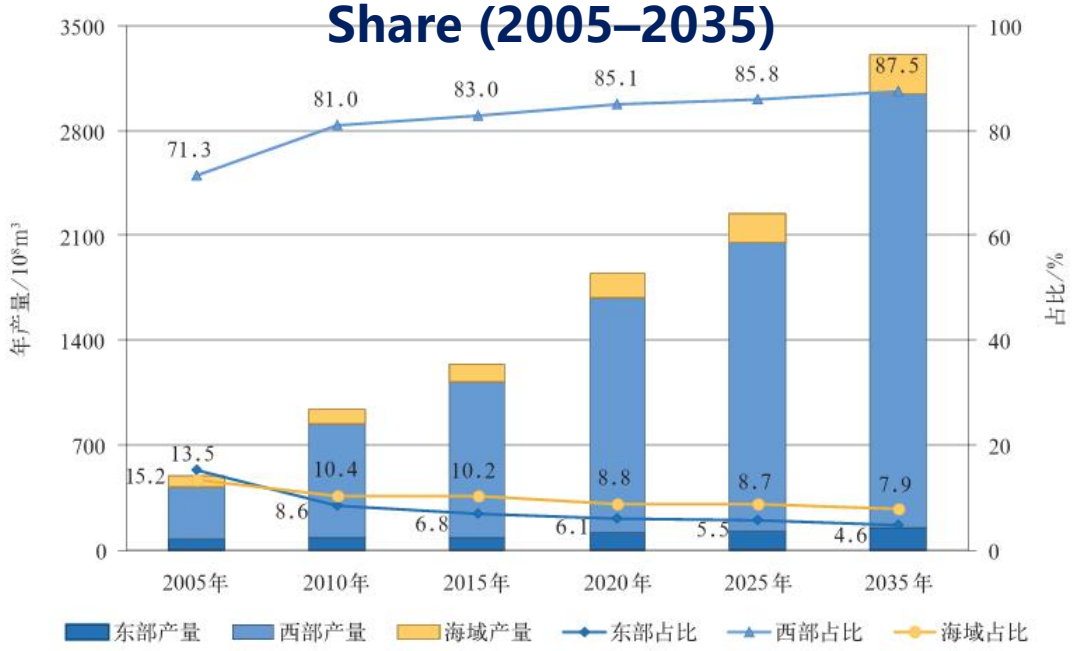
Stronger Reserve Replacement Creates New Opportunities for Oil and Gas Development

- By 2035, western China is projected to contribute **approximately 60% of new oil reserves and over 80% of new gas reserves**.
- Offshore shares of new oil and gas reserves are projected to rise from **18.8% and 8.6% in 2020 to 19.3% and 12.2% by 2035**.

China's Regional Oil Production and Share (2005–2035)



China's Regional Natural Gas Production and Share (2005–2035)



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3. Opportunities for the Oil and Gas Industry

High-Quality Upgrade: "Two Deeps, One Unconventional, One Mature"

- **Deep Earth & Deepwater:** Key future replacement domains for resources
- **Unconventional:** Shale oil/gas & CBM reach 22% of newly proven reserves; strong potential
- **Mature Fields:** EOR & production stabilization tech upgrades offer long-term market space

1. 进军“万米深地”，实现超深层油气大突破



2. 挺进“千米深水”，推动海洋油气加快发展



3. 攻坚“纳米孔隙”，快速提升页岩油气产量



4. 建设“百年油田”，筑牢老油田压舱石地位



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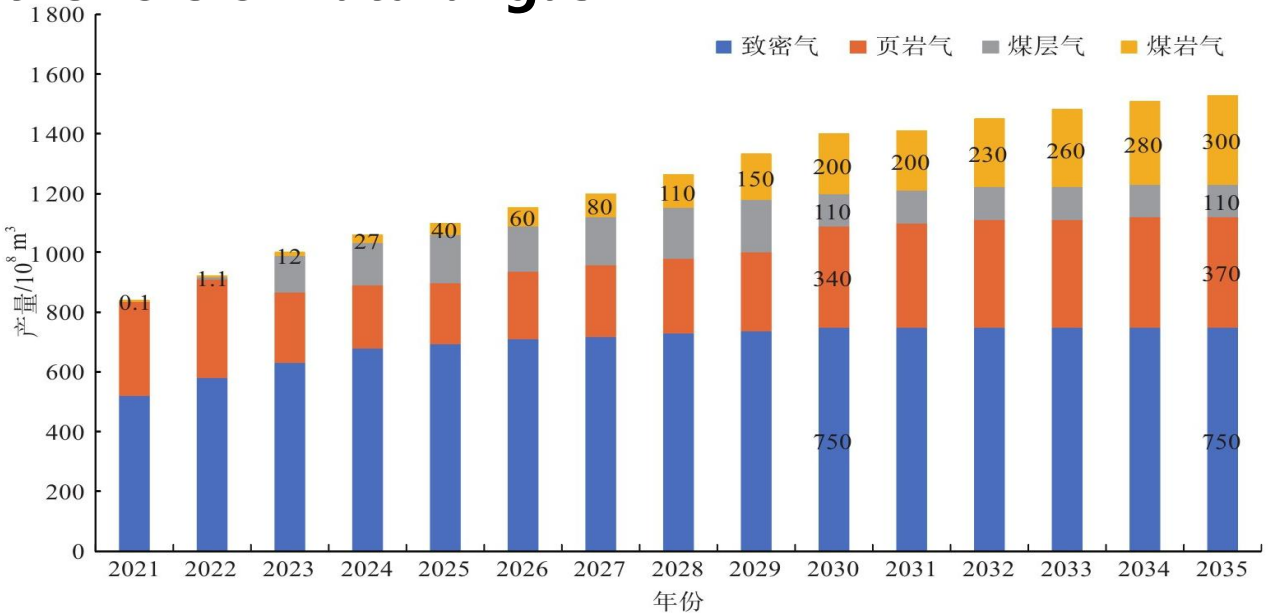
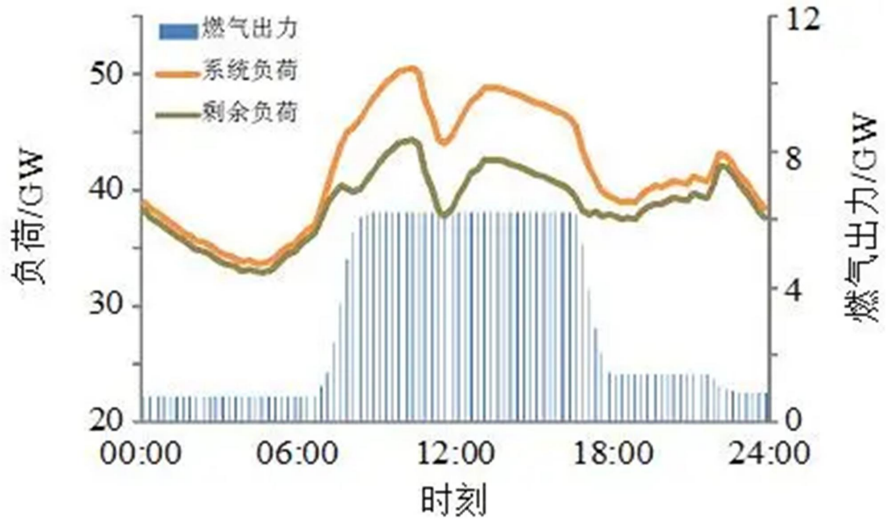
3. Opportunities for the Oil and Gas Industry

Natural Gas Supply Growth Is Enhancing Its Role in the Energy Transition

- **Supply growth**: China's natural gas production reached 262.1 billion m³ in 2025, up 101.8 billion m³ from 2018
- **Unconventional gas**: Its share of total production increased from 32.5% to 42%
- **System value**: Gas-fired power flexibility, storage, and industrial fuel substitution expand the role of natural gas



Medium- to Long-term Production Forecast of Unconventional Natural Gas in China (by Type)



Peak-shaving Role of Natural Gas Power Generation

数据来源：国家统计局、贾承造,等. 世界石油工业；《中国天然气发展报告2026》

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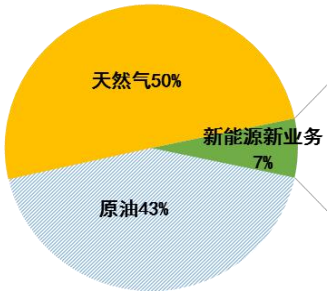
3. Opportunities for the Oil and Gas Industry

Integrated Development of Oil/Gas and New Energy Unlocks Value of Existing Assets

- **Resource Complementarity:** Land, wind, solar & geothermal resources in oil/gas blocks enable new energy development
- **Application Advantages:** Production loads provide stable energy demand
- **Value Expansion:** Green power substitution, waste heat utilization & integrated energy services form new growth points

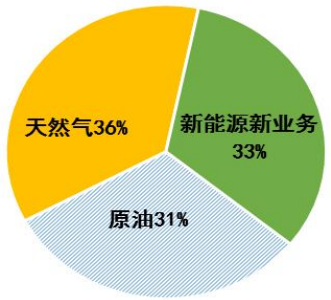
2021–2025 清洁替代阶段

- 2025年新能源产能比重达到7%



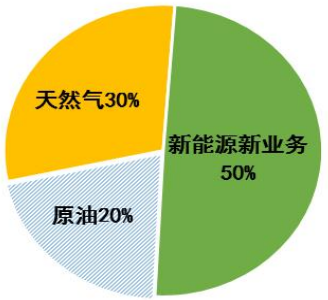
2026–2035 战略接替阶段

- 2035年实现新能源、石油、天然气三分天下格局，基本实现热电氢对油气业务的战略接替

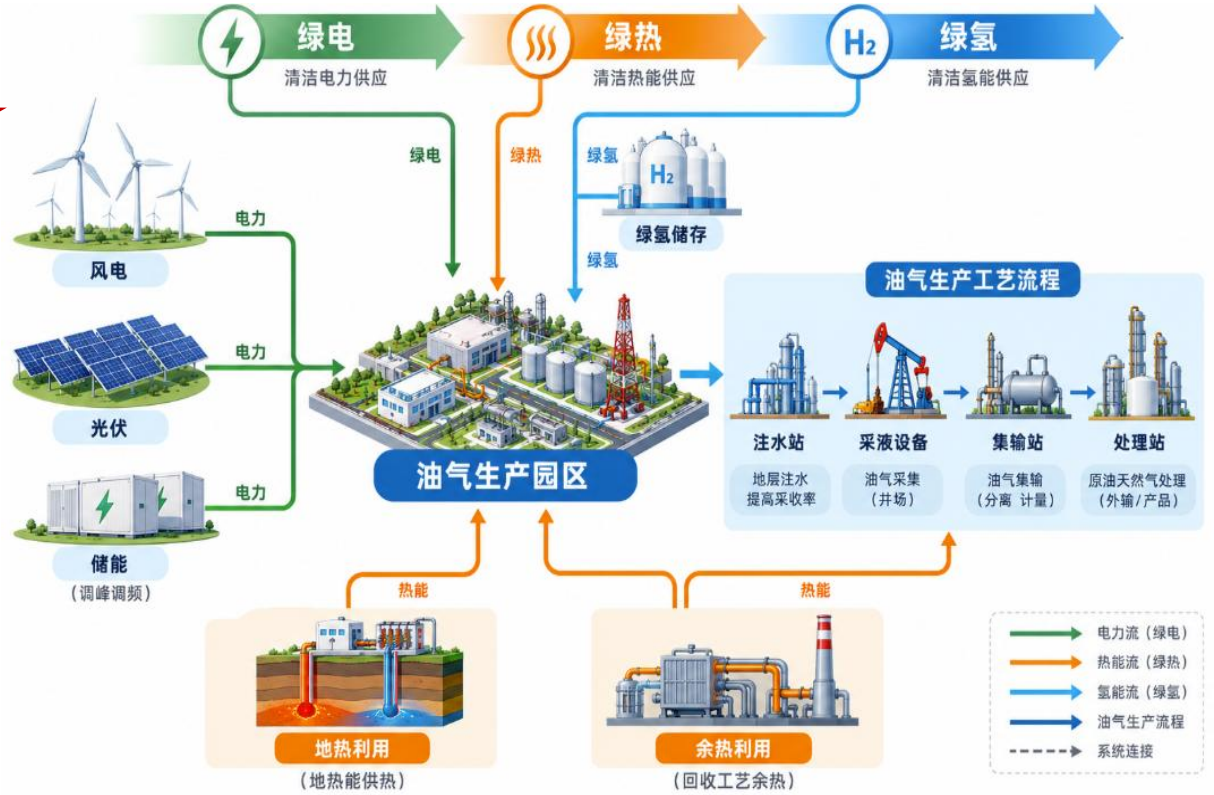


2031–2035 绿色转型阶段

- 2050年热电氢能源占比50%左右，实现绿色低碳转型发展



中石油“三步走”发展战略



数据来源：邹才能，石油勘探与开发，2026

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3. Opportunities for the Oil and Gas Industry

CCUS-EOR Deployment Is Expanding Toward Commercial-Scale Applications

- **Deployment progress: In 2025, China operated 90 CCUS projects, with annual CO_2 injection exceeding 3.8 Mt and cumulative injection approaching 20 Mt.**
- **2030 target: Annual CO_2 injection through CCS/CCUS is targeted to reach 10 Mt.**

齐鲁石化—胜利油田百万吨级CCUS
国内首个百万吨级CCUS全产业链示范基地
规模：年注入100万吨



吉林油田CCUS-EOR
亚洲最大的CCUS国家级示范工程
老油田转型的样本
规模：年注入80万吨



新疆油田CCUS
已评出十亿吨级适合CO_2 驱的已开发油藏地质储量
规模：年注入180万吨



Source-sink Matching Large-scale Demonstration

数据来源：国家能源局发布的《中国油气勘探开发发展报告（2026）》

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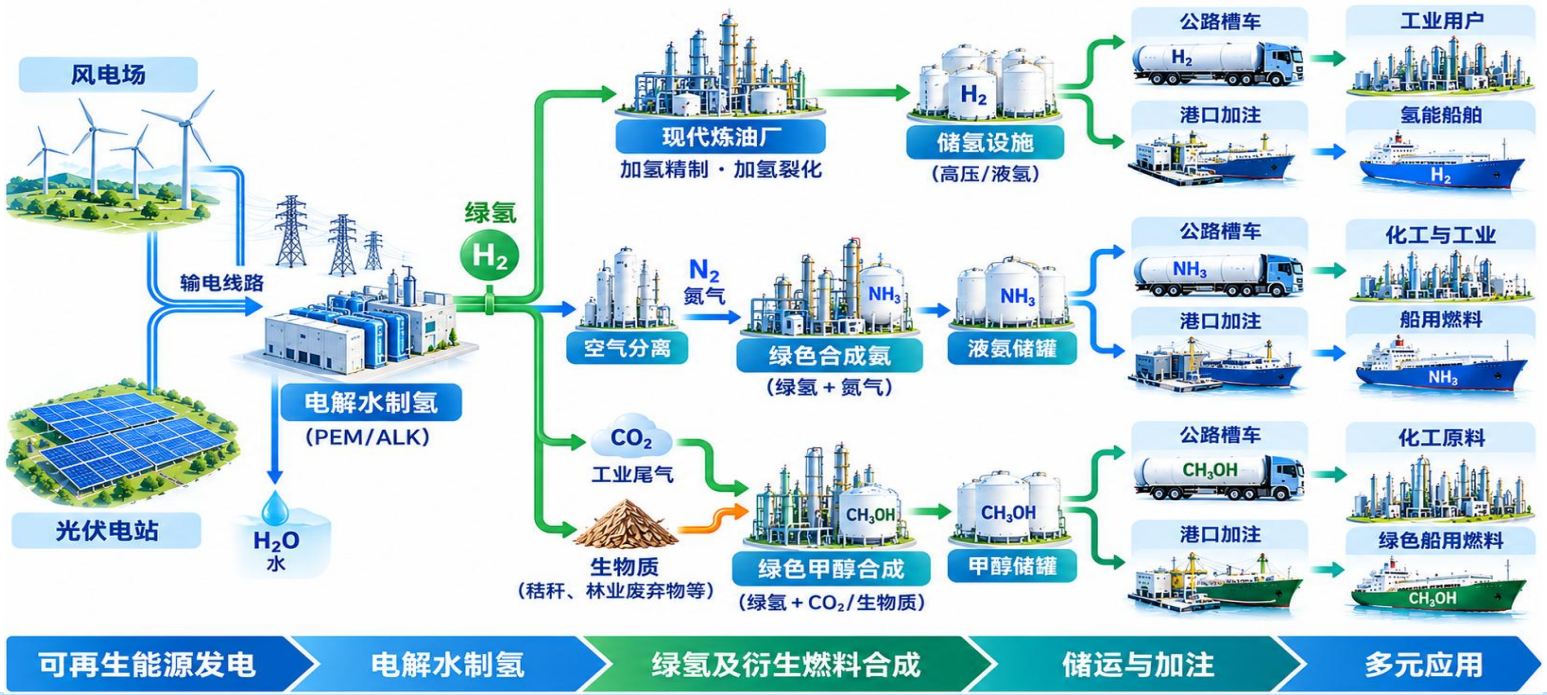
3. Opportunities for the Oil and Gas Industry

Integration of Hydrogen & Green Fuels into Oil/Gas Value Chain

- **Green Substitution**: Green H_2 replaces fossil-based H_2 for low-carbon refining & chemicals
- **Industrial Coupling**: Synergy with CO_2 & biomass to expand green methanol & ammonia production
- **Business Extension**: Leverage existing networks to expand hydrogen-based fuels & energy services



中国石化新疆库车绿氢炼化项目
全球首个万吨级光伏绿氢示范项目
光伏制氢直接供应塔河炼化
规模：年产绿氢能力2万吨



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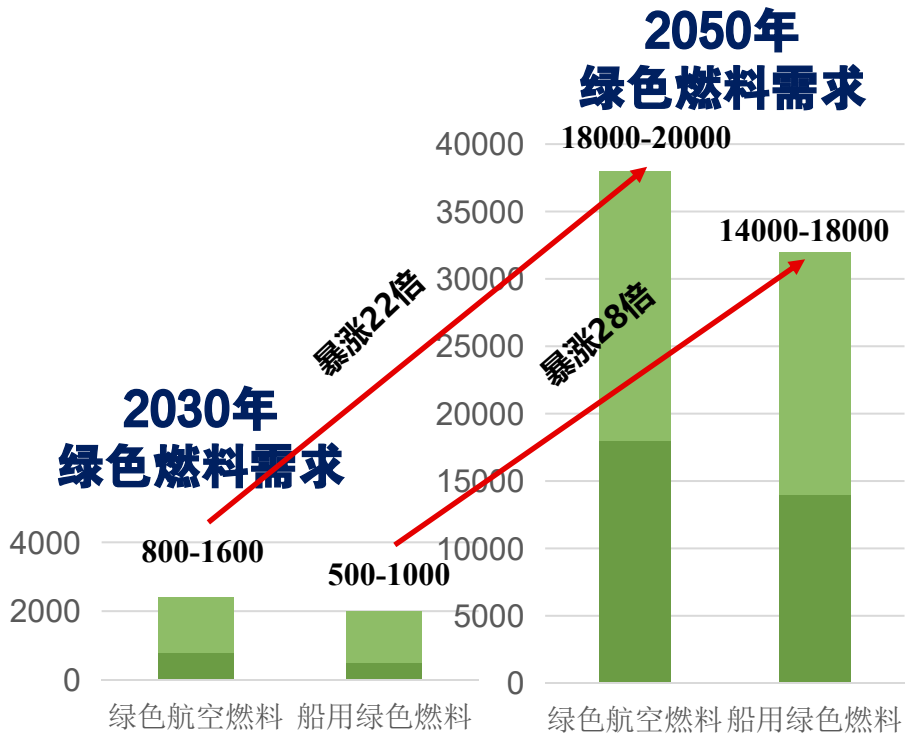
3. Opportunities for the Oil and Gas Industry

Scaling Up of Hydrogen & Green Fuels from Demonstration to Commercialization

- **Green H_2 Expansion:** Operational & under-construction capacity > 1.4 million tons/year (by June 2026)
- **Industry Take-off:** Green methanol & ammonia capacity reached 380,000 & 700,000 tons/year (2025)





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规模：年产绿色甲醇145万吨



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3. Opportunities for the Oil and Gas Industry

Oil and Gas Infrastructure Expansion Creates New Multi-Energy Opportunities

- **Infrastructure targets**: By 2030, pipelines are targeted to reach 220,000 km and LNG receiving capacity 200 Mt/year.
- **Functional diversification**: Pipelines and storage facilities are expanding toward hydrogen, green fuels, and multi-energy applications.
- **Multimodal integration**: Pipeline, port, rail, and road networks create opportunities for integrated energy logistics.



数据来源：国家统计局、海关总署

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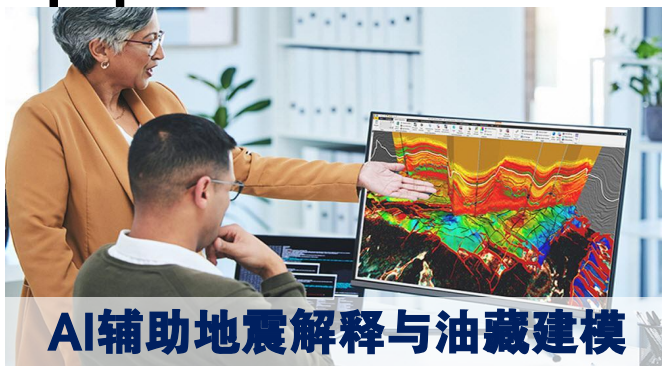
3. Opportunities for the Oil and Gas Industry

AI Penetration Across the Entire Oil & Gas Value Chain

- **Policy-Driven:** "15th Five-Year Plan" promotes deep AI integration; accelerating smart oilfields & pipeline networks
- **Scenario Expansion:** Rapid deployment in smart exploration, drilling/fracturing optimization, & pipeline simulation
- **Tech Integration:** Synergy of large models, digital twins, & smart equipment drives intelligent upgrading

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智慧油田生产监测与运行控制

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Achievements of My Research Group

Intelligent planning and decision-making Optimization



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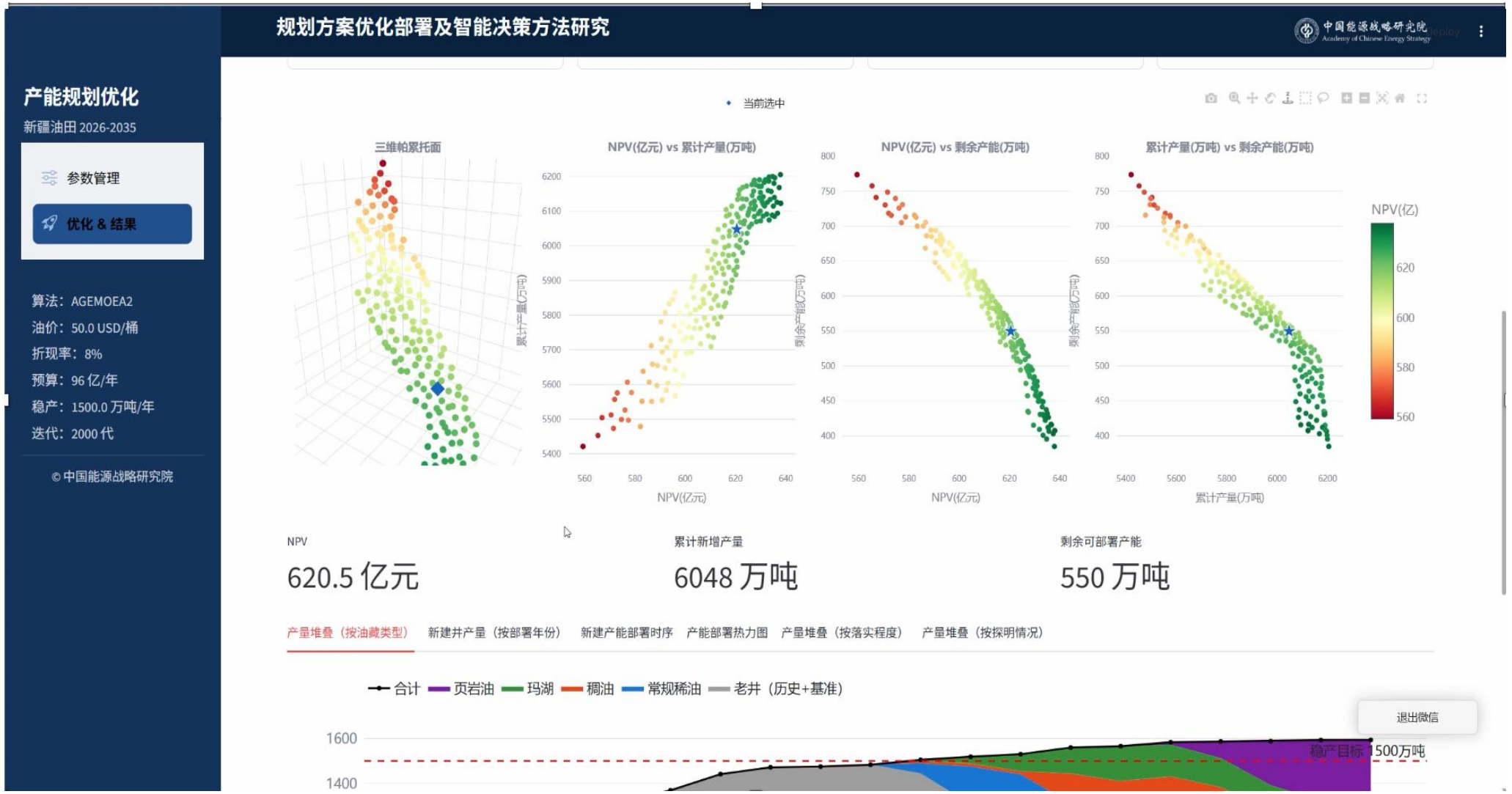
Intelligent planning and decision-making Optimization



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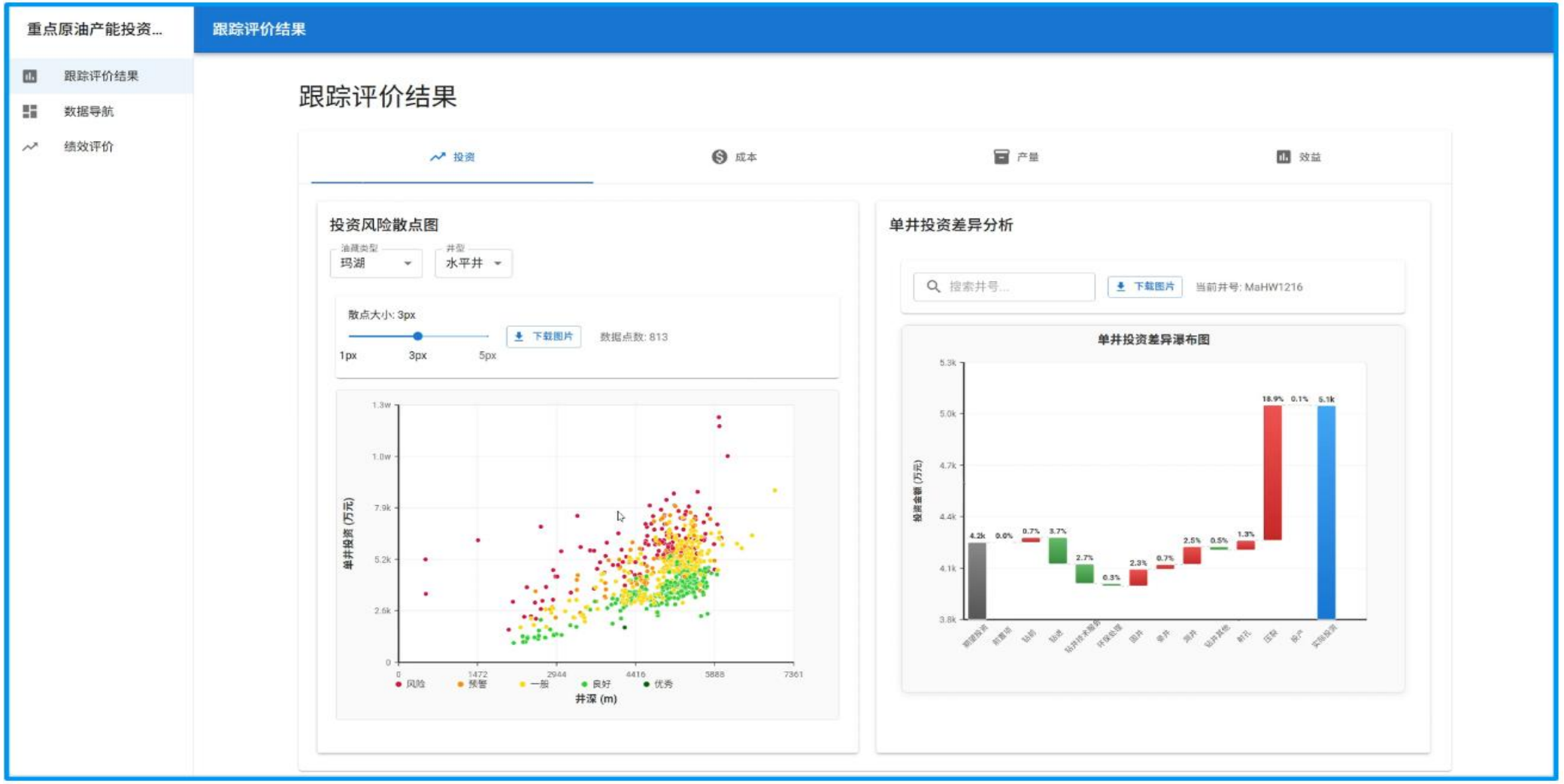

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定价：69.80元

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