

## The increased utilisation of natural gas

一个新的能源市场和中国国情

A new international energy market and the Chinese context

ENERGY EFFICIENCY, CLIMATE AND CHINA'S DEVELOPMENT STRATEGY  
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## Introduction

- China is a world leader in the development of many forms of renewable energy (hydro, nuclear, solar and wind), yet coal and oil dominate
  - Energy security is the core priority (能源安全是优先的)
1. Recent global increase in the supply of natural gas
    - i. Additional reserves of gas from traditional sources
    - ii. Potentially massive sources of unconventional gas (非传统天然气: shale, coal seam methane etc).
  2. Therefore a shift in the relative prices of oil, gas and coal
  3. Natural gas remains a carbon-based fossil fuel, but:
    - Cleaner burning with less pollutants, including lower carbon content than either oil and gas
    - Offers potential as a transition fuel (替代燃料) away from dominance of coal as a complementary energy source for intermittent renewable sources

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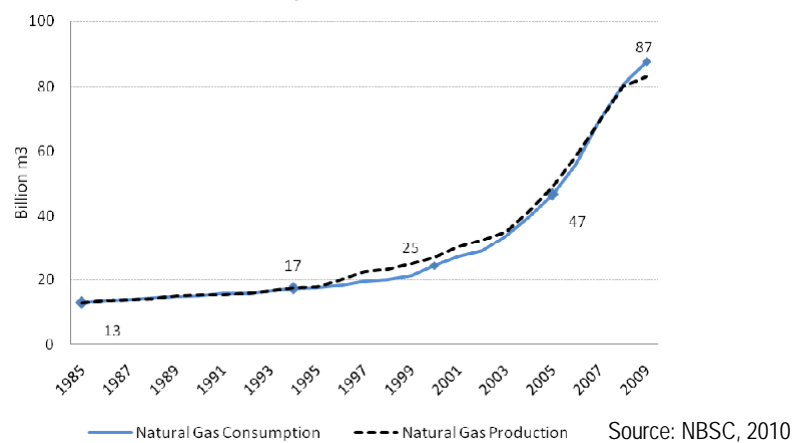
## Gas in China

- Until recently, development of gas remained slow in China
  - Domestic production dominated & included exports
- Distribution challenge exists
  - Supplies located in central and north-west
  - Demand driven by wealthier coastal provinces (almost half of demand) requiring energy security and cleaner fuel and supported by infrastructure, policy and pricing support.
- Despite strong growth in the domestic production and transmission of natural gas in China, demand continues to outpace supply.
- Imports in the form of pipeline and LNG imports playing an increasingly important role
  - Initial estimates of 50% import dependence by 2020
  - LNG imports grown 15% pa between 2001 and 2009

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## Gas in China

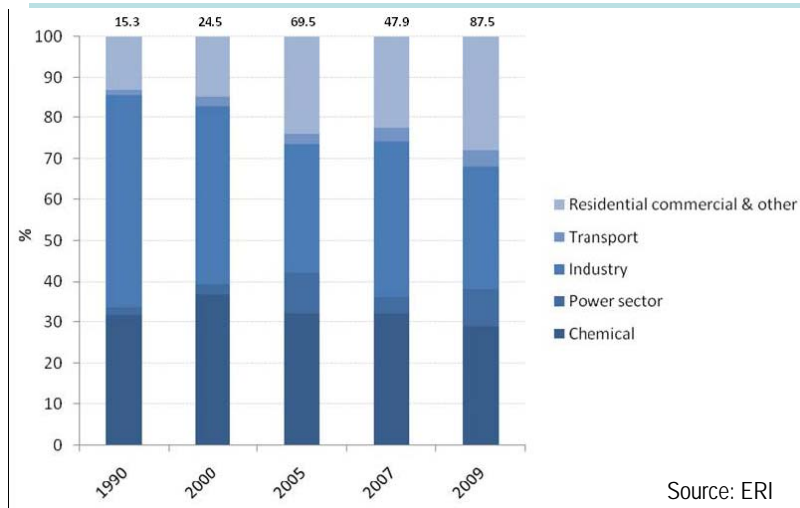
Total Natural Gas Consumption and Production, 1985-2009



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## Gas in China

China's natural gas consumption and structure, 1990-2009, bcm



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## Gas in China

- Natural gas is considered an important part of China's future energy mix in order to provide: greater energy security through diversification (能源多样化), achieve energy efficiency gains in industry, reduce urban air pollution and decrease the nation's carbon intensity
- Series of significant major investments in the supply, transmission, distribution and storage in recent years
- China matched its growing need for energy with a proactive overseas search for diverse energy supplies, including joint ventures, direct investments, acquisitions and resource-loan (资源贷款) deals for access to new oil and gas fields.
  - Turkmen west-east (西气东输) and north-south pipelines and dozens of new LNG port terminals and storage facilities.
  - imports or long-term supply contracts to import gas Australia, Indonesia, Malaysia, Qatar and Turkmenistan
  - initial agreements to buy gas from Russia, Papua New Guinea, Kazakhstan, Iran and Myanmar.

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## Gas in China

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- Major new supplies of natural gas emerged in recent years, especially unconventional gas
  - shale gas, deep gas, tight gas, deep geo-pressurised gas, coal bed (seam) methane (CBM) and methane hydrates locked in permafrost and the deep sea.
- China has the world's third-largest estimated reserves of unconventional gas, at 36.81 trillion cubic metres (tcm) with 6.34 tcm in so-called verified workable natural gas reserves and 161 bcm of proven reserves.
- Largest supply in coal-rich Shanxi Province
- Shale gas and CBM could supply about 15% of China's 2020 target of 200 bcm natural gas usage (Chen Aizhu, 2010)

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## International gas market

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- Global financial crisis and tightening financial conditions(紧张的财政状况)
  - Lull in demand(需求降低) & international investment in the area
  - Prior to global financial crisis, oil and gas prices were at parity, gas now trades 15% below oil prices
- Sustained decoupling (分开)of oil & gas prices? Why?
- Global economic downturn affecting gas markets in Europe, North America and NE Asia
  - Strong growth of unconventional gas resources, especially US shale gas (600 bcm=half of US gas supplies)
  - Expansion of gas infrastructure (liquefaction & regasification)
  - Diversity in LNG suppliers
    - 50% growth in liquefaction between 2009 and 2013

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## Implications of current energy market conditions

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- Sped up decoupling of natural gas and oil prices
- Surplus in gas supplies & emergence of regional markets
- At a time when coal prices increase and oil price remains high
- Downward pressure on LNG and pipeline contract prices (2010-2015: regionally dependent)
  - Chinese, Japanese and Korean customers can secure good price on long-term LNG contracts
  - Yet unclear how lower gas prices impact upon delayed investment in new fields and infrastructure
  - Also domestic obligations (要求) and pressure to supply local markets may affect global supply and prices

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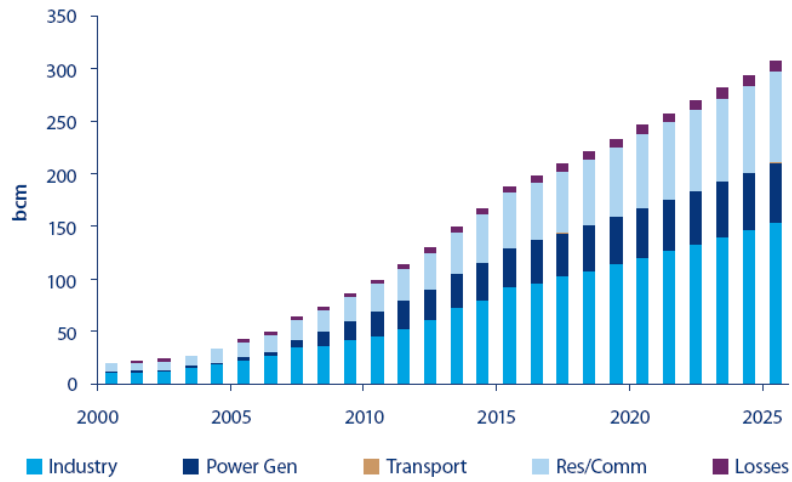
## Implications for China

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- Reassessment (再次评价) of the potential role of natural gas as a transition fuel
  - Improve energy security through diversity of supply
  - Potential base load (基荷) power generation: secure & reliable turn key
  - Complement to intermittent renewable energy supplies
  - An efficient and cleaner fuel source for residential and industrial use as well as distributed energy generation
- A new period of solid growth in terms of gas investment, exploration, production, transmission and utilisation
  - String of large-scale long-term gas supply agreements (more under negotiation).
  - Solid progress on key pipelines including Sichuan-Shanghai and 2nd West-East gas pipeline.
  - Progress in the development of South China Sea fields
  - Unconventional gas supplies

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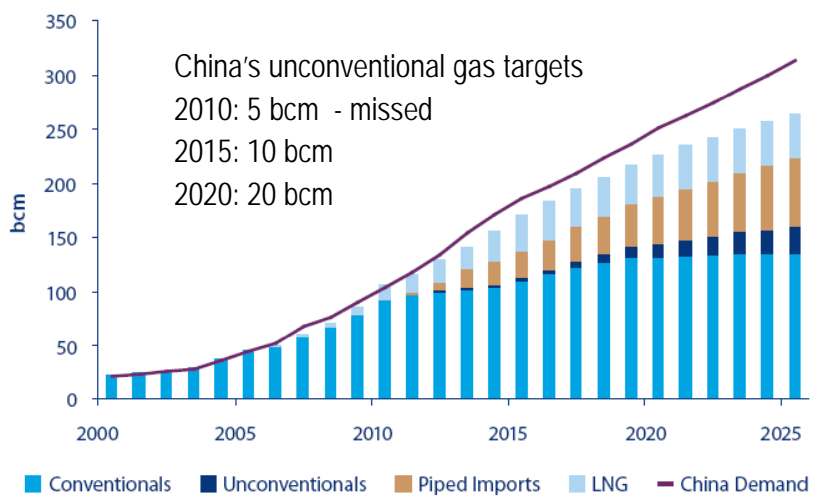
## China's projected gas demand by sector



Source: Wood Mackenzie, 2010, Race for supply

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## China's gas supply mix



Source: Wood Mackenzie, 2010, Race for supply

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## Benefits of unconventional gas

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- Potential of shale gas and coal seam methane to replace not only growing residential demand for oil in wealthier coastal cities but to provide a feasible (price & supply) and structural transition away from coal for industrial use (especially high value added production) and power generation whilst providing increased domestic energy security
- Shale gas and coal seam gas supplies can provide critical economy for coal dependent regions during structural adjustment period in transition to low carbon economy
- However, domestic unconventional gas supplies will develop gradually therefore critical to continue to investment in pipeline and LNG in a complementary and integrated manner.

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## Implementation challenges

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- Barriers to the development of CBM remain at the regional level where expansion compromised by significant regional variation in gas industry development
- Ongoing reforms needed to key market players
  - Removal of China United Coalbed Methane monopoly critical but further opening up of the sector may strengthen expansion
  - Involvement of coal industry in unconventional gas sector may reduced local resistance
- Pipeline access, investment and capacity constraints
- Weak knowledge and technical capacity
  - Project management and operation systems
  - Advanced technology partnerships, PetroChina & Shell purchase of Arrow Energy (March 2010)
- Additional social, economic & environmental concerns

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## Points for discussion

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### **Further industry, policy, market and pricing reforms required to the broader energy framework to facilitate expansion of gas market in China:**

- Acceleration of the shift towards regional or national gas markets;
- Strengthened state investment in natural gas partnerships and investments through new financing techniques;
- Gradually reduce subsidies from low value added and energy intensive uses of gas and shift towards residential and high value added industry especially use for CHP (combined heat and power);
- Setting natural gas utilisation targets within national five year plans;
- Inclusion of gas as medium-term transition fuel for shifting away from coal in New Energy Law to avoid local discriminatory policies or local resistance especially within a context of growing renewables;

Cont...

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## Points for discussion

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### **Continued... industry, policy, market and pricing reforms:**

- Prioritise localised recovery and utilisation of methane recovery from coal mines, manufactured gas from industrial or municipal waste and sewage and vented or flared gas;
- Site with renewable industries in strategic regions to support power grid;
- Replace older, less efficient and more polluting boilers, coal power plants;
- Increased support for distributed gas utilisation and power co-generation;
- Focus on supplementing peak-load power and reduce pressure on expanding coal-fired generation for increasing peak-load; and,
- Facilitate pricing and regulatory reforms to encourage pricing compensation for alleviating pressure during peak-demand periods.

Caveat: switch to gas remains dependent upon medium-term price stability through to 2020-2025

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## Points for discussion

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- Gas is unlikely to ever challenge the dominance of coal in China's energy mix, but it can play an important role in the country's attempt to reduce pollution, improve energy efficiency and facilitate the transition to a low carbon economy
- Key questions for discussion:
  - What major constraints remain for increasing natural gas use in China?
  - Which key policies are required to overcome these constraints?
  - How can they can be effectively implemented within China?

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## Contact details

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### Comparison of Air Pollutant Emissions from Various Energy Sources, kg

	Coal	Fuel Oil	Natural gas
CO2	6.2580	3.3320	2.1840
SO2	0.0506	0.0420	0.0002
NOX	0.0218	0.0069	0.0026

Source: Higashi, 2009