



Achieving sustained change in energy structure

Presentation to the Conference Abrupt Change in China's Energy Path:
Implications for China, Australia and the Global Climate
26 June 2014

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Achieving sustained change in energy structure in China

Some published targets and progress to date

Expressing the targets in numbers

Achieving higher use of clean energy fuels – supply and demand issues

- Natural gas
- Hydro, wind and solar
- Nuclear

Reducing coal and oil use

- Closing down old, inefficient plants and vehicles
- New transport and industrial technologies
- Changing the nature of urbanisation

Some key issues

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Some published targets

Director-General of Development Research Center of State Council (Feb 2014):

- Coal share of energy consumption from 66.6% in 2012 to 60% in 2020 and to less than 50% by 2030
- Renewables share (including nuclear) from 9.4% in 2012 to 15% in 2020 and to 25% in 2030
- Natural gas share from 5.2% in 2012 to 10% in 2020 and 15% in 2030

Some higher short run targets in NDRC statement on 17 May:

- Natural gas share to 'over 9% (excluding gas from coal gasification)' by 2017
- Renewables share of 13% by 2017

Considerable progress has already been made in shifting energy structure, but these represent a substantial acceleration

To examine feasibility create one scenario broadly consistent with these targets.

Annual growth rate in total energy consumption in China, by fuel type, various periods 2003-13 (%)

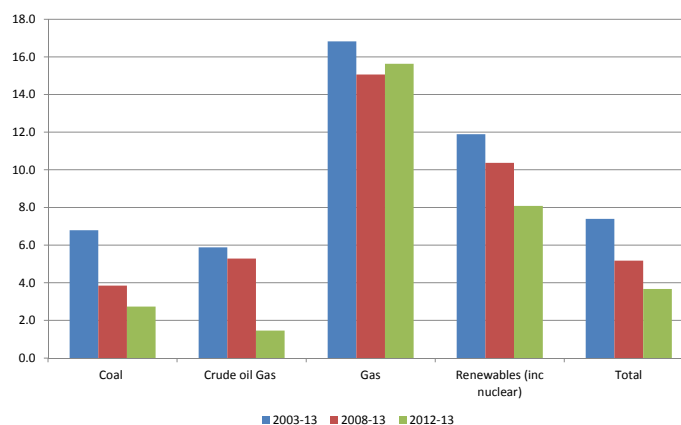


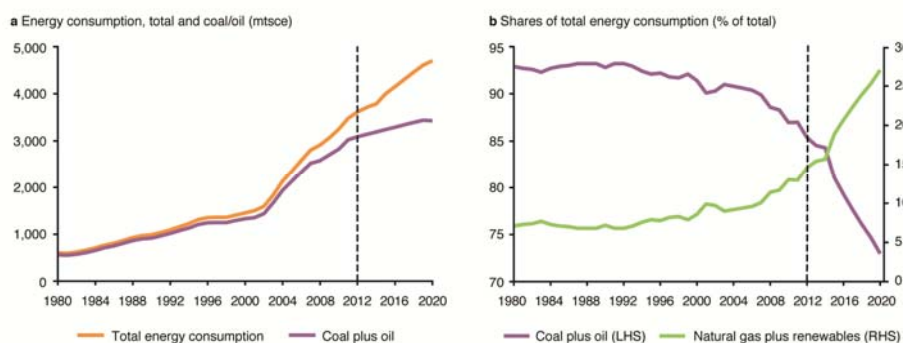
Table 1 Energy consumption by fuel source, China, 1990-2012 (actual) and 2012-20 (scenario), million tonnes of standard coal equivalent and %

	Coal	Crude oil	Natural gas	Renewables	Total	Memorandum item – Natural gas (bcm)
1990	752	164	21	50	987	16
2000	1,007	323	32	93	1,455	24
2005	1,671	467	61	160	2,360	46
2010	2,210	616	142	280	3,249	106
2012	2,409	680	188	340	3,617	141
Scenario						
2015	2,580	664	300	456	4,000	226
2020	2,820	615	565	700	4,700	425
Target						
2030	2616	545	930	1364	5455	700
Average annual percentage change (%)						
2000-12	7.5	6.4	15.9	11.4	7.9	15.9
2012-20	2.0	-1.4	14.7	9.5	3.3	14.7
2020-30	-0.7	-1.1	5.1	6.8	1.5	5.1

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Figure 2 Energy consumption by fuel type, China, 1980-2012 (actual) and 2012-20 (scenario)



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Source: Sheehan, P., Cheng, E., English, A. and Sun, F. 2014, 'China's response to the air pollution shock', *Nature Climate Change*, vol. 4, pp. 306-309.

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Achieving higher use of clean energy fuels – supply and demand issues

Demand side issues:

- Potential for rapid growth in the demand for gas and renewable energy sources in areas such as power generation, CHP systems, industry, transport and residential use

Supply side issues:

- Capacity for continued rapid expansion of supply, at higher volumes, in
 - Natural gas
 - Hydro, wind and solar
 - Nuclear

Natural gas supplies to China – a sweet spot?

China is well placed to expand gas usage, both through domestic production and by taking advantage of the transformation of the world gas market resulting from the explosion of shale gas in USA and increased production of LNG in Australia and elsewhere.

The chart shows China's actual and planned gas infrastructure, with a central pipeline structure linking the major markets to domestic gas fields, to providers of gas in East and Central Asia and to a growing network of LNG import terminals along the coast.

Figure 4 Natural gas infrastructure in China



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Source: Sheehan, P., Cheng, E., English, A. and Sun, F. 2014, 'China's response to the air pollution shock', *Nature Climate Change*, vol. 4, pp. 306-309.

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Natural gas supplies to China – a sweet spot?

China's conventional gas production should continue to rise: especially in tight gas, although large scale production from its substantial reserves of non-conventional gas – shale gas and coal-bed methane – may only occur after 2020.

From 2015 China can draw on increased supplies of imported gas:

- pipeline imports from countries such as Turkmenistan and Russia
- LNG imports from Australia, Russia and Qatar.

These imports should be at acceptable prices, as global supply options increase and as USA exports of LNG impact on traded gas prices in East Asia.

This conjunction of factors provides China with the opportunity to rapidly expand the use of gas, to meet the targets outlined.

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Growing the supply of renewable and nuclear energy

Strong growth continues in China in the four components of renewables – solar, wind, hydro and nuclear – and particularly wind and solar power.

In 2013 installed wind capacity grew by 24.5% and solar capacity more than trebled.

Hydro power capacity is rising strongly, by 12.3% in 2013.

Approval of new nuclear plants was suspended in early 2011 after the Fukushima accident, but recommenced in October 2012. After no growth in 2012 installed nuclear capacity rose by 16.2% in 2013.

A recent review concludes that, provided specific issues such as grid connection and congestion are addressed, China can readily achieve or exceed its renewable energy targets.

Reducing coal and oil use

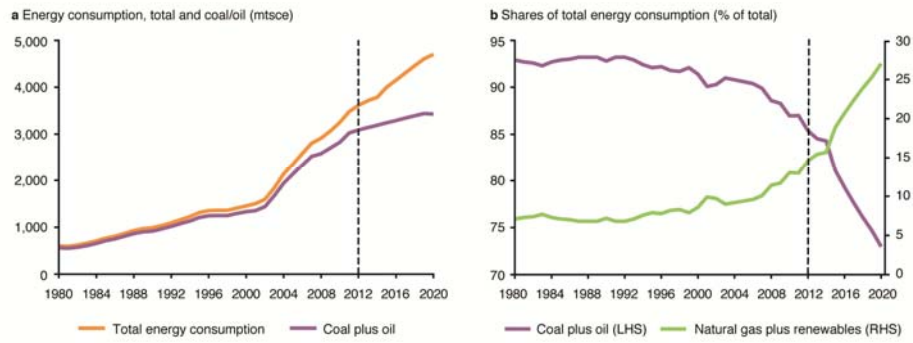
It is one thing to facilitate rapidly growing supply and potential demand for gas, renewable and nuclear fuel sources, but quite another to wean a massive economy from its reliance on coal and oil.

This will involve, inter alia,

- Closing down old, inefficient plants and vehicles
- Addressing the vested interests that stand behind the older fuels, industries and technologies
- Rapidly introducing new transport and industrial technologies
- Changing the nature of urbanisation

These challenges are all being addressed, and my colleagues today will comment further on them.

Figure 2 Energy consumption by fuel type, China, 1980-2012 (actual) and 2012-20 (scenario)



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Source: Sheehan, P., Cheng, E., English, A. and Sun, F. 2014, 'China's response to the air pollution shock', *Nature Climate Change*, vol. 4, pp. 306-309.

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