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Natural gas pricing reform in China: Getting closer to a market system?

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HIGHLIGHTS

- China's reform of natural gas pricing is in effect nationwide from 2013.
- Prices are now connected to international fuel oil and liquid petroleum gas prices.
- The reform benefits domestic producers and importers of natural gas.
- There are still price distortions between industrial and residential sector.
- The reform needs to create a system where both supply and demand are considered.

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ABSTRACT

Recent policy in China targets an increase in the contribution of natural gas to the nation's energy supply. Historically, China's natural gas prices have been highly regulated with a goal to protect consumers. The old pricing regime failed to provide enough incentives for natural gas suppliers, which often resulted in natural gas shortage. A new gas pricing reform was tested in Guangdong and Guangxi provinces in 2011, and introduced nationwide in 2013. The reform is aimed at creating a more market-based pricing mechanism. We show that a substantial progress toward a better predictability and transparency of prices has been made. The prices are now more connected with the international fuel oil and liquid petroleum gas prices. The government's approach for a temporary two-tier pricing when some volumes are still traded at old prices reduced a potential opposition during the new regime implementation. Some limitations of the natural gas pricing remain as it created biased incentives for producers and favors large natural gas suppliers. The pricing reform at its current stage falls short of establishing a complete market mechanism driven by an interaction of supply and demand of natural gas in China.

1. Introduction

One of the recent key energy policy objectives in China is increasing the contribution of natural gas in the energy mix (NEA, 2014). This objective is driven primarily by lower emissions of carbon dioxide and air pollutants from natural gas in comparison to coal, which is currently China's main energy source. Natural gas in 2013 accounted for approximately 6% of the total China's energy consumption (NBS, 2014a).[1] According to China's *National Energy Strategy Action Plan* released in 2014, the natural gas share in China's primary energy supply is planned to exceed 10% by 2020 (NEA, 2014). To achieve this substantial increase, China has reformed its natural g.as pricing, as highly-regulated and non-transparent prices have been limiting factors for expanding the supply of natural gas.

The goal of this paper is to assess the recent developments in China's natural gas price reform, which was introduced nationwide in 2013. Before the reform, the wholesale gas prices were set on a cost-plus approach and price differentials were distinguished by end users, with residential users paying lower prices than industrial users (IEA, 2012). Such a cost-plus approach was developed when China's uses were covered by domestic sources of natural gas and the existing suppliers were compensated for the cost of production. After 2010, China's volumes of imported natural gas were increasing due to construction of pipelines from Central Asia and LNG terminals on the East coast. With regulated

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[1] Energy statistics is organized differently in different agencies. For example, International Energy Agency (IEA) also counts traditional biomass use in the total energy use in China (IEA, 2014), while agencies in China usually do not include it. As a result, shares of natural gas in total energy use are larger when biomass is not counted.

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domestic price at low levels, importers of natural gas were losing money as the contract prices for China's imported natural gas were higher than the regulated prices. The old pricing approach also failed to provide incentives for an expansion of domestic natural gas supply, both conventional and unconventional.[2] At the same time, China's government was promoting an increase in natural gas use. As a result, China's gas supply failed to keep pace with the surging demand and in some places shortage of gas occurred (IEA, 2012).

To deal with the imbalance of demand and supply, the Chinese government launched a set of policies to encourage domestic and imported gas supply expansion, and promote efficient gas use, including the nationwide natural gas pricing reform program. The gas pricing reform was introduced in Guangdong and Guangxi provinces in 2011 and was implemented nationwide in 2013. The primary rationale for the pricing reform is that natural gas prices should be determined ultimately in the market (NDRC, 2013). A key element of the new approach is a connection to imported oil and gas prices, as the price of gas is set by the formula that includes a weighted average of the imported fuel oil price and liquefied petroleum gas (LPG) price. These international fuel prices are market-driven and because fuel oil and LPG are close substitutes for natural gas, the formula provides a link to market forces. The new regime has been exercised for three years. Our paper addresses the impacts of the reform and its success in achievement of its policy objectives.

2. Methods

The pricing reform is analyzed as follows. We begin with an overview of the natural gas market in China focusing on the existing and prospective supply and consumption by sector. This overview sets the stage for the analysis, identifying the latest developments in natural gas sector in China. Then we provide an analysis of the old pricing regime and the main dimensions of the pricing reform. We underline the shortcomings of the approaches. China's government documents the new price formula and the resulting natural gas prices by provinces, but they do not provide full information. We perform a price simulation based on the available data to compare with the natural gas prices listed by the government. We then analyze the impact of the pricing reform on natural gas producers, distribution companies and end users. Based on our analysis we discuss the major limitations of the current reform and offer some suggestions for the future reform directions.

3. Results

3.1. Overview of the natural gas system in China

The government of China regards the expansion of natural gas use as a critical component of shifting away from coal-dominated energy structure, necessitated by interest in tackling air pollution problems and reducing carbon emissions. China's natural gas consumption climbed from 46.4 billion cubic meters (bcm) in 2005 to 167.6 bcm in 2013 with an average annual growth rate of 17.4% (CNPC, 2014).[3] As shown in Fig. 1, the natural gas share in China's primary energy supply increased from 2.6% in 2005 to 5.8% in 2013 (NBS, 2014a)[4]. The natural gas contribution to China's

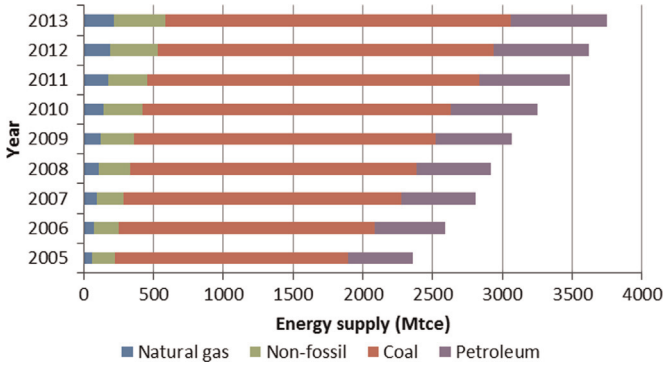

Fig. 1. Natural gas in China's total energy supply (Mtce). Data source: NBS (2014a).

energy supply is well below coal and oil, which were approximately 66% and 18%, respectively, in 2013 (also depicted in Fig. 1). It is also lower than the global average of 23.7% in 2013 (BP, 2014). According to China's national energy program during the Twelfth Five Year Plan, a goal for China's natural gas consumption is 230 bcm by 2015, which would account for 7.5% of the total primary energy consumption (NDRC, 2012). It would mean more than quadrupling of natural gas use in ten years from 2005.

Prior to 2006, China's natural gas supply had come from domestic production sources (Fig. 2). Since then, imports have grown rapidly, especially since 2010, when the Central Asia–China pipeline started operations. By 2013 approximately 31% of annual natural gas consumption came from imports (CNPC, 2014). The Myanmar–China pipeline and the liquefied natural gas (LNG) receiving terminals in Guangdong, Hebei, and Tianjin started operation in 2013, significantly expanding China's gas import capacity. In 2013, 54% of China's gas imports were delivered through the Central Asia and Myanmar pipelines, with the rest coming from LNG (CNPC, 2014).

In 2013 China's domestic gas production contributed 115 bcm, or approximately 69% of the total gas supply (Fig. 3). Conventional gas production accounts for about 97% of domestic production. The three top gas basins – Tarim, Ordos, and Sichuan – currently play a dominant role in China's domestic gas supply, accounting for over 90% of China's total domestic gas production. China's current unconventional gas production capacity is rather limited. The total unconventional gas production was 3.3 bcm or 1.95% of China's domestic gas supply in 2013, of which coal bed methane (CBM), shale gas, and coal to gas constituted 1.77%, 0.06% and 0.12%, respectively. According to BP (2014), China's natural gas proven reserves are 3272 bcm. This number does not include more speculative conventional and unconventional resources that we discuss later.

As for imports, the current (2014) import pipeline capacity is 30 bcm for the combined two lines of the Central Asia–China pipeline and 12 bcm for the Myanmar–China pipeline. Construction of a third line of the Central Asia–China pipeline was mostly completed in 2014 and a capacity of 55 bcm for the combined three lines is expected to be operational by the end of 2015. All three lines originate in Turkmenistan, and pass through Uzbekistan and Kazakhstan. The first two lines get natural gas from Turkmenistan, while for the third line some additional gas from Uzbekistan (10 bcm) and Kazakhstan (current amounts are not specified, a potential expansion to Kazakhstan gas fields on the Caspian Sea would create another sizeable source of supply) is contracted as well. The pipelines are connected to China's West–East gas pipeline that goes from its western border and pass through China all the way to Shanghai.

A fourth line (with a capacity of 30 bcm) of the Central Asia–China pipeline is under construction with an expected completion

[2] Unconventional natural gas resources include shale gas, tight gas, and coal-bed methane.

[3] Data from different sources are slightly different. For example, BP reports 46.8 bcm for 2005 and 161.6 bcm for 2013 (BP, 2014).

[4] China usually reports its statistics in million tons of coal equivalence (mtce). 1 mtce = 0.786 bcm.