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The effectiveness of policies to transform a gas-exporting country into a gas-transit country: The case of The Netherlands ☆

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HIGHLIGHTS

- The Netherlands has been a major gas producer and exporter for decades.
- This country implemented a gas hub policy to deal with diminishing resources.
- We study the effects of this policy using hourly data over the period 2006–2013.
- Storage and trading became more important, but transit hardly grew.
- The investments in the gas hub did not have clear effects in the short term.

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ABSTRACT

The Netherlands has been a major European natural gas producer and exporter for many decades, but now faces the challenge to deal with diminishing resources. In response, the Dutch government initiated a gas-hub strategy, which is the policy to transform the gas industry from an export-oriented business into a transit-oriented business. This policy included a number of investments in the gas infrastructure as well as institutional reforms to enhance the liquidity of the gas market. We study the effects of this gas-hub policy. Using hourly data on the Dutch gas balance over the period 2006–2013, we find that gas storage and trading have become more important, but that the level of gas in transit in the Netherlands remained fairly constant. Consequently, the Dutch gas industry is still mainly oriented on domestic production and export of gas, while the Dutch gas hub (TTF) has become a key virtual trading place. The policy lesson from the Dutch experience is that implementing a gas-hub strategy requires significant investments in the gas infrastructure, while their effects do not necessarily become visible in the short run.

1. Introduction

Energy markets have been in transition for the past decade and will probably be so even more in the immediate future. Many natural resources are depleting and several scholars believe that the world's production of conventional oil will peak in the coming decades (Sorrel et al., 2010). Although gas reserves are estimated to be more lasting than oil, at least some of the gas-producing regions are anticipating the looming depletion of their gas reserves (Paltsev et al., 2011). When a country's production of gas decreases and eventually stops, it will lose both a secure form of energy supply and a source of income (Kruyt et al., 2009). In response, energy-supply security may be restored by importing gas or by using alternative energy sources, but both options may coincide with considerable costs (Stern, 2004). Probably more complex, however, is the transition to other suitable sources of profits and employment. Such transformations have been subject to debate in several countries. The United States found, through technological development, an alternative in shale gas production, while the United Kingdom has pivoted from being an exporting country into a net importer in 2006, which coincided with several expansions of their import and storage capacity (Stern, 2004; POST, 2004). This country now largely depends on imported gas, but with continuing high risks on shortfalls during cold days (Skea et al., 2012).

Another country that is facing the challenge to transform its energy industry is the Netherlands. This country has been a major European producer of gas for more than half a century, with a yearly

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production of around 80 billion cubic metre (bcm). Roughly 60 bcm is exported yearly, mainly to other European countries (IEA, 2014). The reserves of the country's largest field in the Northern Province Groningen[1] are expected to decrease at such a pace that within the next 10–15 years the Netherlands will be unable to meet national demand with its own gas production and, consequently, it will become a net gas importer (The Brattle Group, 2010; TNO, 2014). Hence, Dutch policy makers face the challenge of transforming the gas industry so that it can withstand the loss of income and the reduced security of gas supply. In an attempt to fulfil their aspirations, the Dutch government introduced a package of policy measures in 2006 that should turn the country into the gas hub of north-western Europe (Brattle Group, 2010). As the region's main transit and trading location, the Netherlands aims to import gas from different places in the world in order to distribute it to neighbouring European countries. Profits of this would come from adding flexibility to the flat flow of imports, i.e. by balancing the near constant flow of supply from imports with the more volatile demand for gas. The goals set in these plans require investments in network capacity, connections with neighbouring countries, storage facilities and trade facilities.

The case of the Netherlands is different from the UK in the sense that it is expected to remain an exporter for at least another decade. Contrary to the UK, where policy changes in the 1980s accelerated gas production at the fastest possible rate, the Netherlands has focused on extending their production into the future (Correljé and Odell, 2000). The Netherlands implemented the so-called small-fields policy which was meant to produce gas from the small gas fields (both onshore and offshore) as much as possible and to conserve the gas in the Groningen field as long as possible. The Groningen field is mainly used for delivering flexibility, both in the short term as seasonal (summer–winter periods). The ability of Groningen to act as a swing supplier, however, is expected to diminish in the near future. In addition, the increasing occurrence of earthquakes caused by the gas depletion in Groningen has triggered social pressure to reduce gas production from this field (Dutch Safety Board, 2015). As a result, the gas security is not immediately at risk in the Netherlands, but for flexibility other sources will increasingly be needed. Moreover, the Dutch government looks for economic benefits from the gas-hub strategy, now the Groningen field can no longer cover all peak production and, hence, will generate fewer revenues.

This paper analyses the development of the Dutch gas hub since its initiation in 2006 by analysing how the Dutch gas balance has changed over time in response to a number of policy measures. The main question addressed in this paper is to what extent the Dutch gas market has changed from a domestic-supply driven market into a transit market. We will first set out the key characteristics of the Dutch gas market, including the most important steps taken and the investments made towards the gas hub over the past eight years (Section 2.1). Next we define the indicators we have developed to measure the development of the hub (Section 2.2). In Section 3, we apply these indicators on hourly data on the Dutch gas balance. In Section 4, we discuss our findings regarding the impact of investments and other policy measures directed at the Dutch gas hub. In Section 5, finally, we elaborate on these conclusions from a policy perspective.

2. Methods

2.1 The Dutch gas market

2.1. The Dutch gas balance

The role of the Netherlands on the European gas market is about to change, as it has done several times over the past decades. After the discovery of the massive natural gas reserves in Groningen in 1959, the Dutch quickly became Western Europe's leading gas supplier, with a market share of over 50% in the early 70s (Correljé and Odell, 2000). The role of the Groningen field is extraordinary because of its giant size and geophysical characteristics making it suitable to serve as a swing supplier. The field can provide both long-term and short-term flexibility against relatively low marginal costs. Consequently, it is not only a crucial factor for a secure gas supply, but it also able to generate significant profits by selling gas when the market is tight and, hence, prices are relatively high.

The contribution of the gas production to the Dutch GDP increased to approximately 8% in 1985 and decreased afterwards to the current 3%, which is equal to about 16 billion euro per year (Rossem and van Swertz, 2010). The annual revenues for the Dutch government from the depletion of gas fields are about 10 billion euros, which is about 5% of its total revenues. Over a period of 50 years, the Dutch government earned over €210 billion. The country, however, failed to maintain its leading position on the European gas markets due to policy measures that constrained production in Groningen and gave incentives to competitors to enter energy markets in Europe (Correljé and Odell, 2000). Blurred visions on level of scarcity of gas and political desires to secure domestic demand with national gas reserves led to several economically sub-optimal choices (Correljé, 1998; Mulder and Zwart, 2006). In the 1980s, the expectation was that the gas production in the Netherlands would quickly diminish and policy measures were required as a response (Evans, 1981). Although later attempts to further penetrate the European energy markets and regain the market share of the old days were unsuccessful, the Netherlands remained a dominant player in Western Europe thanks to the Groningen field.

The contribution of Groningen and other sources of gas to the Dutch market are depicted by Fig. 1, which represents the so-called "gas balance". The bottom of this figure shows the fairly flat imports and production from small gas fields (both onshore and offshore), while the Groningen field as well as the extraction from storages cover the peaks in demand. The seasonality in demand mainly comes from domestic residential consumers as well as export, indicating that the Groningen field is mainly used to supply seasonal flexibility, i.e. to meet both domestic and foreign demand during winters. From Fig. 2, it appears that storages are increasingly used for providing seasonal flexibility as well, besides more short-term flexibility. This figure also shows that linepack is the third source of flexibility, which is the ability of the transport network to deal with short-term imbalances between injection and extraction (Van Dinther and Mulder, 2013). It appears that the magnitude of the source exceeds the contribution of storages a number of years ago, but the latter has increased strongly in the recent past.

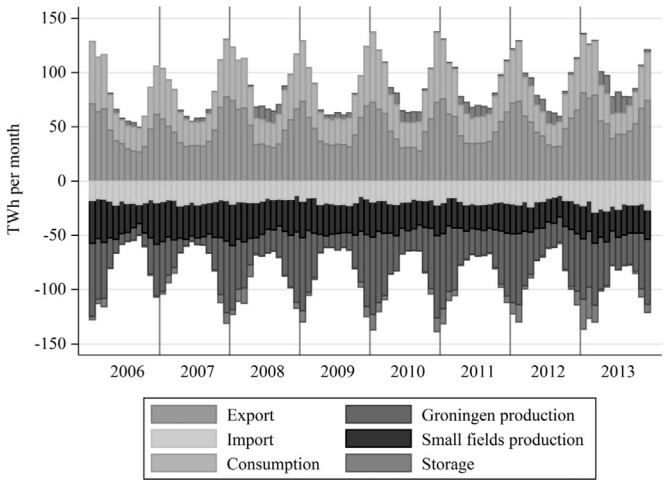

Fig. 1. Gas balance of the Netherlands, 2006–2013 (per month).
Source: ACM/GTS.

[1] Throughout this article we refer to the Netherlands' largest gas field by "the Groningen field" or simply "Groningen".