The Dutch Energy Transition: Shifting Topology and Fortunes

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Introduction

Dear readers and friends of EUCERS,

It is my great pleasure to welcome you to this latest edition of the EUCERS newsletter, in which we present you with two regionally focused articles that.

In the first article, Delft University's Caroline van Calcar and Daniel Scholten take a closer look at the Dutch energy transition.

In the second article, Maciej Hacaga, a PhD candidate at the War Studies University in Warsaw (Poland), outlines the difficulties Poland faces in decarbonising its energy matrix.

I cordially invite the readers to send me your assessment of the impact of these scenarios and discuss possible consequences for European energy and geo-politics.

Furthermore, the newsletter will inform you about the recent activities at EUCERS, including our latest strategy papers on Mexico's energy map and the impact of the Paris Agreement on European gas.

Thank you for your interest in EUCERS and for being part of our community.

Yours faithfully,
Thomas Fröhlich
EUCERS Newsletter Editor

In this Month's Edition:

ARTICLES

The Dutch Energy Transition: Shifting Topology and Fortunes

By Caroline van Calcar and Daniel Scholten

The discovery of natural gas in Slochteren in 1959 kick started a major transition in the Dutch energy sector. The move from coal mined in Limburg to natural gas extraction in Groningen had a huge impact on both provinces in particular and the Dutch energy sector in general. After the last of the twelve coal mines in Limburg was shut in 1969, half of the workforce in Limburg was left unemployed, considered unfit, or in early retirement (NOS 2014). Political leverage of Limburg on the overall energy policy also took a hit, considering coal-fired power plants located in other provinces were no longer dependent on coal from Limburg. In Groningen, natural gas created space for thousands of jobs and allowed the region to establish itself as an energy hub, economically, politically, and academically. Gas export revenues also became a welcome addition to the national treasury.

Caroline van Calcar is a master student in geoscience and remote sensing at TU Delft. She holds a bachelor's degree in systems engineering, policy analysis and management. Caroline is interested in the transition to sustainable energy, and also in monitoring climate change with a focus on the physics of the earth and atmosphere.

Daniel Scholten is Assistant Professor at the faculty of Technology, Policy and Management of Delft University of Technology. He specializes in the geopolitics of renewables and the governance of renewable energy systems. Daniel's PhD (TU Delft, 2012) analizes the organizational requirements of future energy systems at the TU Delft. He holds degrees in Political Science (Radboud University, 2003) and International and European Relations (University of Amsterdam, 2006, with distinction).

The increasing use of renewable energy sources is set to bring a similar shift in power and heat production topology. Renewable sources are far more abundant and geographically dispersed than todays' coal and gas installations and lend themselves more to decentral forms of generation. The question that remains is whether the economic and political implications of this transition will be as severe as those of the transition to natural gas. While we cannot discuss all relevant implications for the energy sector here, we will use electricity production from wind and solar to lift the tip of the veil.

Towards a Renewable Energy Landscape

The last two decades, approximately 87% of electricity in the Netherlands was generated domestically (Wezel 2015). Natural gas and coal account for about 70% and 30% of this production respectively. A quick look at the map of the Netherlands (Figure 1) tells us that the production of electricity from natural gas and coal is essentially located in Groningen and the Maasvlakte (Wikipedia 2018). In turn, the provinces of Groningen and Zuid-Holland hold prominent positions in the Dutch electricity sector.

Increasing pressure on coal, the dirtiest of fossil fuels, and depleting domestic natural gas reserves plus concerns about earthquakes in the Groningen region have recently swung the favor of the Ministry of Economic Affairs towards renewable energy sources such as solar, wind, and biomass (NOS 2016). For now, wind (onshore) and biomass (co-generation) have mostly accounted for the rising share of renewable energy sources in the electricity mix, currently at 5.6% (CBS 2015). In the future, solar PV and offshore wind hold great prospects for further growth, with the potential for wind and solar estimated at 42000 MW and 22-90 TWh per year respectively (PVL 2011). The targets are to increase the share of renewable energy to 14% in 2020 and 16% in 2023 according to the National Energy Agreement (SER 2013). More rigorous, the Provinces have set up ambitious structural visions to realize an energy neutral or sustainable society by 2050[1], depending on local potential and possibilities. If executed, even only half-way, renewable energy will change the topology of electricity production (and distribution).

Wind and solar electricity can be generated throughout the Netherlands. Nevertheless, wind speeds are most favorable near the coast and on the North Sea and wind farms require large open spaces. In turn, the Ministry of Infrastructure and Environment of the Netherlands has designated several areas onshore and in

[1] Flevoland is the most ambitious province with the aim to be already energy neutral in 2020 (Natuur en Milieufederatie Flevoland 2014).

the Dutch North Sea as locations for wind farms (Ministerie van Infrastructuur en Milieu & Ministerie van Economische Zaken 2014), though it remains to be seen in how far onshore projects will continue in the face of offshore competition. Solar radiation intensity is also strongest along the coastal areas, but its real potential depends on the availability of roof surface in urban areas and the space for solar farms in rural areas. For example, 62% of 800000 buildings in Noord-Holland appear suitable for solar power which provides opportunities for a fully renewable electricity supply by 2050 (Provincie Noord-Holland 2016). Government policy provides feed-in tariffs ('salderingsregeling'); realization is essentially left to the initiative of individual households, cooperatives, and businesses.

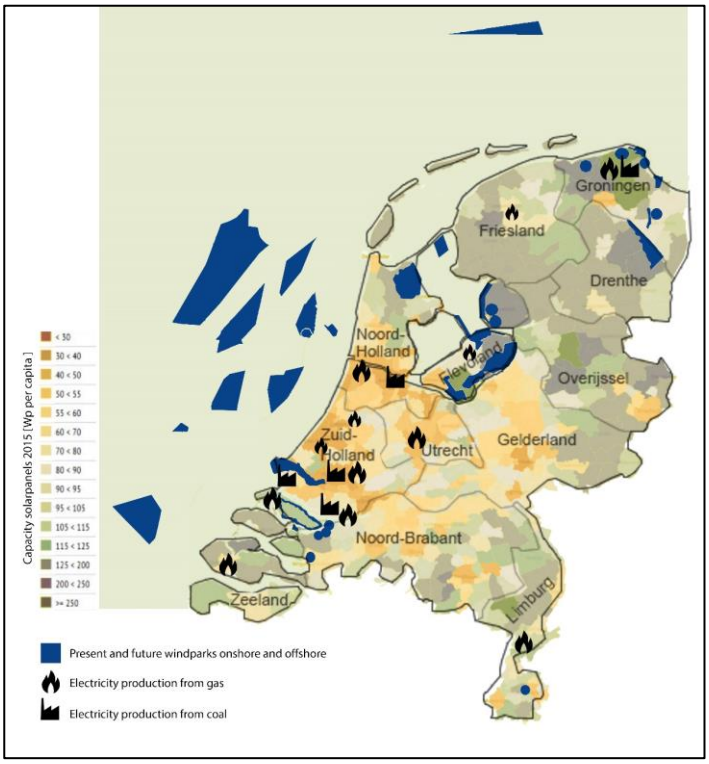

Figure 1: Map of The Netherlands including present and future wind parks (Ministerie van Infrastructuur en Milieu & Ministerie van Economische Zaken, 2014), current electricity production from gas and coal (Wikipedia, 2018) and the current capacity from solar panels (Segelaar 2015).

Shifting Economic and Political Fortunes

The transition to renewable energy implies a major overhaul of the Dutch energy map. Electricity generation moves from the key facilities in Groningen and the Maasvlakte to a more diverse set of provinces and producers, though this deconcentrating differs between wind and solar. Regarding wind, the coastal provinces dominate; Groningen and Zuid-Holland (Maasvlakte) maintain a strong position in the electricity sector, harboring both onshore and offshore potential, while Flevoland (onshore), Noord-Holland (offshore and onshore) and Zeeland (offshore and onshore) represent new production sites. Production stays dominated by big companies considering the scale of wind parks and expertise needed for offshore activities. Solar PV based generation implies a much more widely dispersed pattern as households, cooperatives, and companies become the producers in urban areas, next to a few solar farms in more rural areas. Solar markets will hence be shaped by a broader variety of actors than wind. Considering the mid-west of the Netherlands, the Randstad area is the most urbanized, most solar related activity is likely to take place there.

Employment only partly shifts along with production. Wind turbines and solar panels need to be built and maintained, but not constantly operated like power plants that require continuous resource input. This has two effects. First, a settled labor force is not required, as know-how, materials, skilled labor, and semi-finished products can be attracted from anywhere during the construction and maintenance of wind turbines and PV panels. Consequently, employment is geographically decoupled from production, i.e. more decentralized. Nevertheless, the use of harbors for offshore activities will attract activity there thus coastal provinces may hence be expected to gain more than the rest. Second, employment opportunities in the private sector are likely to drop. Self-provision via PV panels foregoes the need for a dedicated workforce to generate power. Then again, it could be that ancillary services for wind and solar are larger than those for power plants; storage technologies to handle intermittency are a case in point.

Concerning revenues, much remains unclear. Provinces earn money via permitting, taxing used space and dividends from regional network companies of which they hold shares. Installing new turbines and solar farms gives opportunities to generate revenues, but less traffic over the regional grid once households and businesses have partly become self-sufficient diminishes them. It seems hence that provinces with onshore wind parks that deliver electricity to consumers via the regional grid are most certain to retain revenues (Flevoland and Groningen).

Different Transition, Different Implications

The transition from coal to gas had a large impact on a few locations. In contrast, the transition from fossil fuels to renewables will have a smaller impact across many provinces. The decentralization of electricity generation levels the political leverage provinces have over national energy policy, though some coastal provinces, mostly Flevoland, Zuid-Holland, Noord-Holland still have a more prominent position than those inland, such as Limburg, Noord-Brabant, Gelderland, though biomass could boost the latter's position. Employment decouples from generation geographically, though offshore wind ambitions are likely to strengthen coastal provinces' position, and become less as solar PV self-provision shifts emphasis from big companies to households and businesses. The national government and the provinces should be aware of these changes and prepare for them. Back in the 1960s, governmental institutions such as Statistics Netherlands were purposefully located in Limburg to compensate for job losses there. Such policy might not be necessary now, as the speed of the energy transition is much lower, but situating storage facilities, other contributory energy services, and new heat infrastructure installations in provinces with fewer wind opportunities could be a way of compensating these areas.

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