Note

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Department Policy Studies

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Subject **Employment effects in Dutch gas and coal fired power generation**

Introduction

This note is the result of an analysis and a short survey among energy companies to identify the employment effects of power plant closures. Additional to effects in coal fired power plants, also gas fired plants are analysed. The results will be used for employment monitoring and projections.

Methodological notes

Economic activity and expenditures concerning gas- and coal fired power generation consist of three categories: investments in plants; operation and maintenance of plants; fuel supply. The note mainly focuses on employment effects on operation and maintenance. Furthermore, employment effects are usually split up in direct, indirect and induced employment. This is a partial fact finding analysis and survey on direct effects that can support more integral approaches.

Context description

Coal and gas fired power plants are large scale generating units, part of the generator portfolio of large international energy companies. Apart from staff employed directly with power production and generator maintenance, these companies include also wholesale and retail trading departments and overhead sections. Energy companies are capital intensive, the direct employment cost share in turnover is 10% (9% for EU28). Average wage levels in the power sector rank high, surpassed only by the financial sectors. Labour conditions in the Netherlands are established by a collective labour agreement[1].

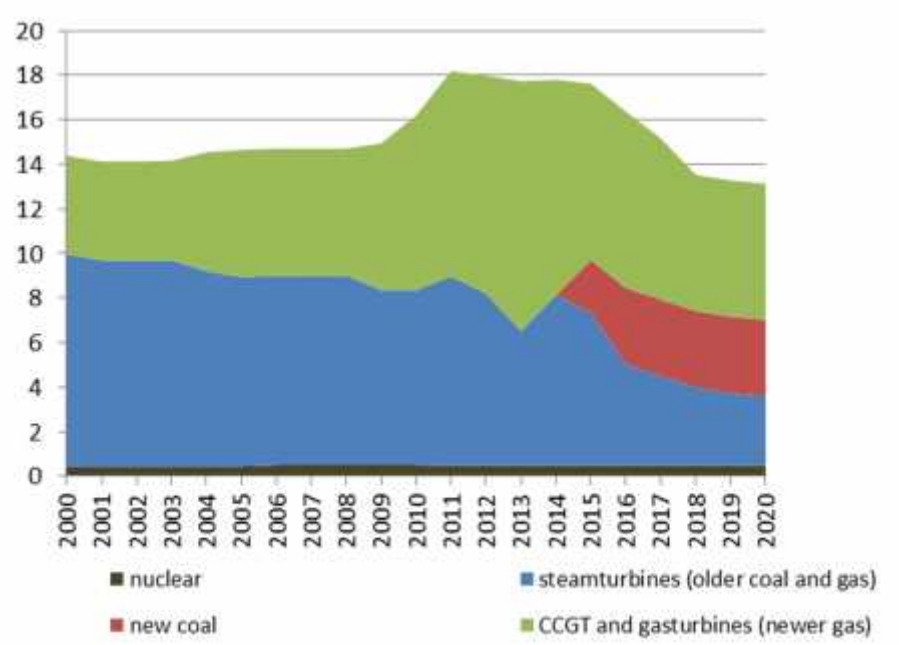
Current situation and developments

In the Netherlands, power generation is in a situation of overcapacity. This situation has been incurred by a series of investment decisions during 2000-2010 when larger power producers emerged as players in a liberalised market. The increased capacity during this period consisted only of gas fired plants, partly CHP. Figure 1 shows this increase in central capacity. These new units were efficient and flexible and the construction time was relatively short. However, due to high marginal costs, competition with coal fired power plants, both domestic and abroad, was fierce. So after 2005 plans for new capacity in the Netherlands also included coal fired power plants. The European emissions trading system appeared not to be a commercial threat for coal fired generation. In the first trading

[1] CAO productie en leveringsbedrijven 2015-2018

period (2005-2008), allowances were handed out free and the power sector benefitted from windfall profits (Sijm, 2008). Later, the ETS allowance price collapsed and even though allowances are now auctioned, this still made a positive business case for coal fired generation. As a consequence, lots of gas fired capacity has been mothballed or decommissioned since 2011. Still, at the same time, about 10 GW of new capacity was installed since 2010, of which 3.4 GW is coal fired, the rest gas fired, of which already some units are shut down.

Figure 1: Active central conventional capacity GW (source ECN MONIT)



Three factors dominate the current situation:

- Shifts in conventional power generation. Gas fired units throughout EU are marginalized in the merit order because of high gas prices vs. low coal prices, in combination with the low EU ETS price. The uptake of shale gas in the US lead to a surplus of coal and reduced coal prices worldwide. Furthermore, the Fukushima incident and closure of nuclear power plants lead to an increase in gas demand in Japan and an increase in global gas prices. The economic downturn around 2010 aggravated the marginalisation of gas because decreased power demand enhanced competition, thus reducing base load prices.
- Emerging renewable power production. Upcoming renewable generation did not yet deter power companies from investing in conventional capacity up to 2010. Because renewable power is intermittent, they reasoned that conventional capacity was still necessary as back up capacity. However, increasing intermittent production, largely from Germany, has lowered average power prices and worsened the revenues from conventional production.
- Policy pressures on coal fired generation. The environmentally controversial position of coal fired generation has lead to closure of five older power plants (built in 1981-1989) according to the Energy Agreement (2013). For these plants, closure was due but possibly has now occured sooner than planned. Currently, closure of other coal fired generators is subject to public debate. This includes two plants of the middle generation (built in 1994-1995) as well as three new sites (built in 2014-2016).

The direct employment effects of conventional gas fired power plant closure are therefore partly caused by fossil fuel market induced capacity adjustments. Another part is caused by the overcapacity commissioned after 2005 causing accelerated modernisation. So the energy transition initiated by emerging renewable generation and the Energy Agreement are not the sole cause of job losses in conventional generation.

Direct employment related to power generation

De scope of employment related to conventional power generation includes direct operations staff, maintenance staff, energy company overhead and maintenance outsourcing. The coal supply chain on Dutch territory is dealt with below. From the gas plant interviews and the coal report (Hendriks 2016), full time equivalent labour years were derived, dependent on age, size and fuel type of the plants.

The increased capacity since 2010 of 10 GW has delivered 1300-1500 full time equivalent (fte) structural direct jobs in operation, maintenance and overhead. In the same period, 2300-2800 fte of direct jobs were lost with closures and mothballing of 10 GW capacity as well. Modern, often larger units require fewer staff per unit of capacity. With the earlier closure of the five older coal fired power plants, a loss off about 2600 direct labour years over 2016-2021 is estimated. This is equal to about 3% of the expected net employment gains from the Energy Agreement (ECN 2016). From plant specific reporting on the staff involved, and including factors for maintenance and overhead, the annual direct fte involved would be 900-1000 for these five units[2]. The number of direct fte involved in the decommissioning of gas fired capacity is estimated at 1400-1800 fte.

From the interviews on gas fired capacity and the report on the coal chain employment, employment factors are derived. In table 1 these are summarized, based on data of 18 sites. The differences found between gas and coal, and between old and new plants are substantial[3].

Table 1: Employment ratio's for Dutch power generation, full time equivalents per GW capacity

	Direct fte/GW, but excluding maintenance	
	Coal fired	Gas fired
Max value	272	173
Min value	116	40
Average new >2000	143	63
Average old <=2000	232	133

The results are excluding maintenance, since data on maintenance could not be accurately and consistently gathered per unit. Maintenance includes substantial but not permanent technical activities required for the production units. These are organised in various ways among companies, plants or clusters of plants. They occur at planned intervals, requiring short or longer periods of stand still. Average maintenance employment, either outsourced or performed by maintenance crews of the owner company are estimated to be 50% of the employment for permanent operation and overhead.

[2] So the estimated average lost lifetime of these five units is about 3 years

[3] But consistent with literature on international plant data

For the calculation of direct employment of power generation, the figures from the table can be multiplied by 1.5.

Fuel supply chain employment

The coal chain report (Hendriks, 2016) gives an inventory of indirect employment effects in the fuel supply chain for power generation. Coal and wood pellet transport, transhipment and storage are expected to contribute to employment. Grid based gas supply is expected not to have a discernable employment effect when gas fired power generators are built or decommisioned.

Employment in coal supply includes mainly transhipment from deep sea harbours to a terminal directly near the power plant. Mining and maritime shipping does not involve Dutch employment. For transhipment directly from deep sea harbours to power plants, 36 direct fte/GW[4] is calculated. For one power plant, additional inland shipping and handling is required. This requires an additional 45 fte/GW. At longer distances from deep sea harbours, this additional fte input may be larger.

Other indirect employment

The coal chain report also mentions the waste chain, consisting of transport and disposal of ashes, involving 21 fte/GW. This may also be regarded as input activity for the building materials industry. Other indirect employment, mainly purchased services by the energy sector and the coal supply sector are not taken into account.

Summary

- FTE factors per GW power production have been derived from bottom up plant and company data.
- Substantial differences are found between coal and gas fired plants, and between old and new plants. Therefore, in conventional power generation, technological progress and labour productivity improvement can cause substantial employment effects.
- Loss of operation and maintenance jobs due to closure of conventional power plants is limited compared to the total job increases related to the energy transition.
- In the Netherlands, the earlier closure of five older units pursuant the 2013 Energy Agreement represented less than half of the conventional power generation job losses due to decommissioning and mothballing since 2010.

[4] Based on average of 43% efficiency and 6500 running hours

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