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Spill-over effects of the German *Energiewende*

A plant-level analysis for the Dutch market

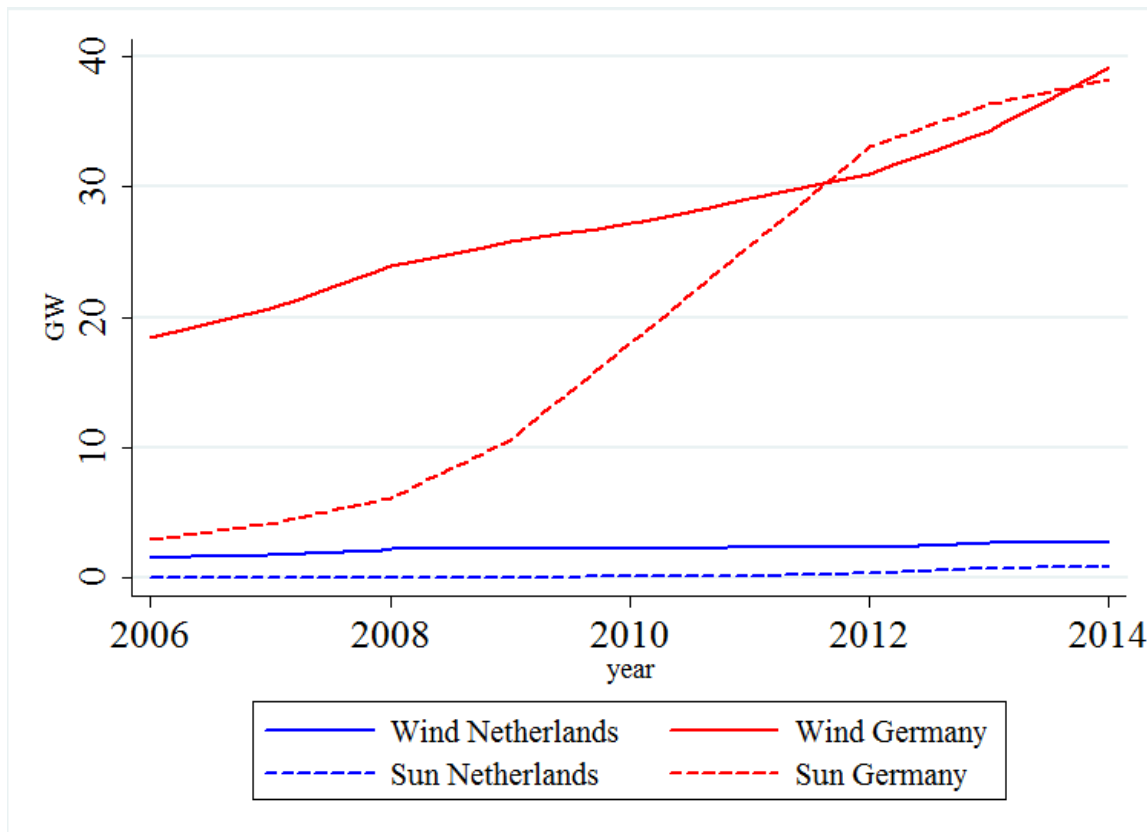
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Stockholm, 24 November 2015



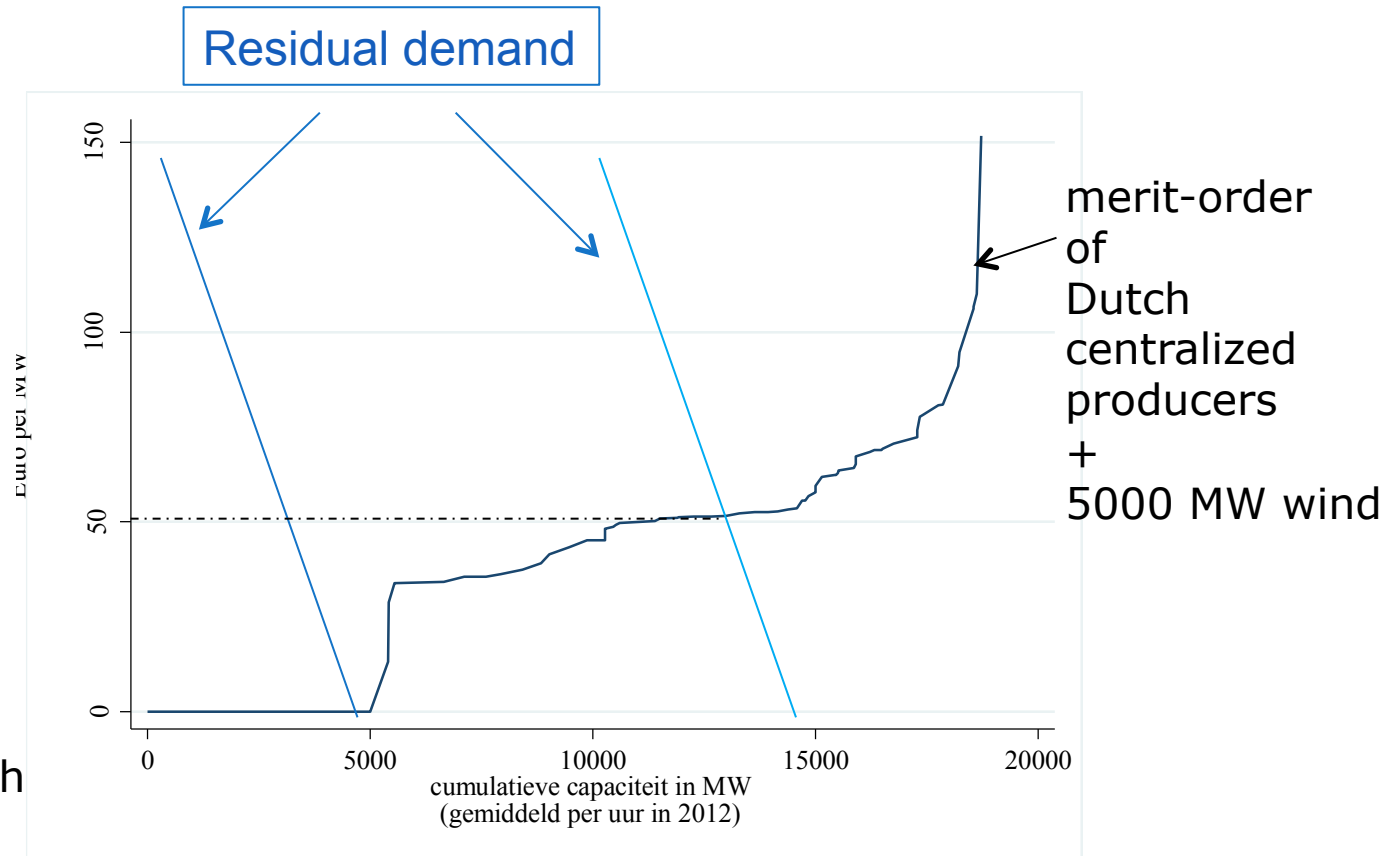
The German *Energiewende* vs the Dutch '*energietransitie*'



Source: German transmission system operators Amprion, 50 Hertz, Tennet and Transnet BW and the Royal Dutch Meteorological Institute. Data is freely accessible on their websites.



What happens if more renewable capacity is installed?



Consequences:

- > lower power price and less coverage of fixed costs
- > less hours of dispatch



Dutch market is closely connected to the neighbouring markets



cross-border capacity with

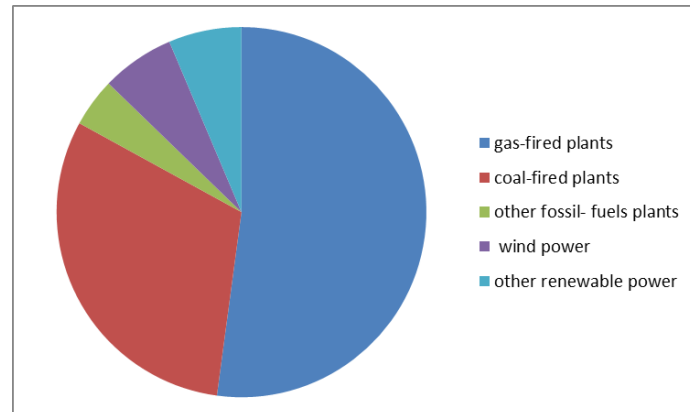
- Germany: about 3,500 MW
- Norway: 700 MW
- UK: 1,100 MW
- Belgium: about 1,500 MW

aggregated installed capacity in Netherland:

- centralized: about 20,000 MW
- decentralized: about 12,000 MW

Dutch production portfolio (2014)

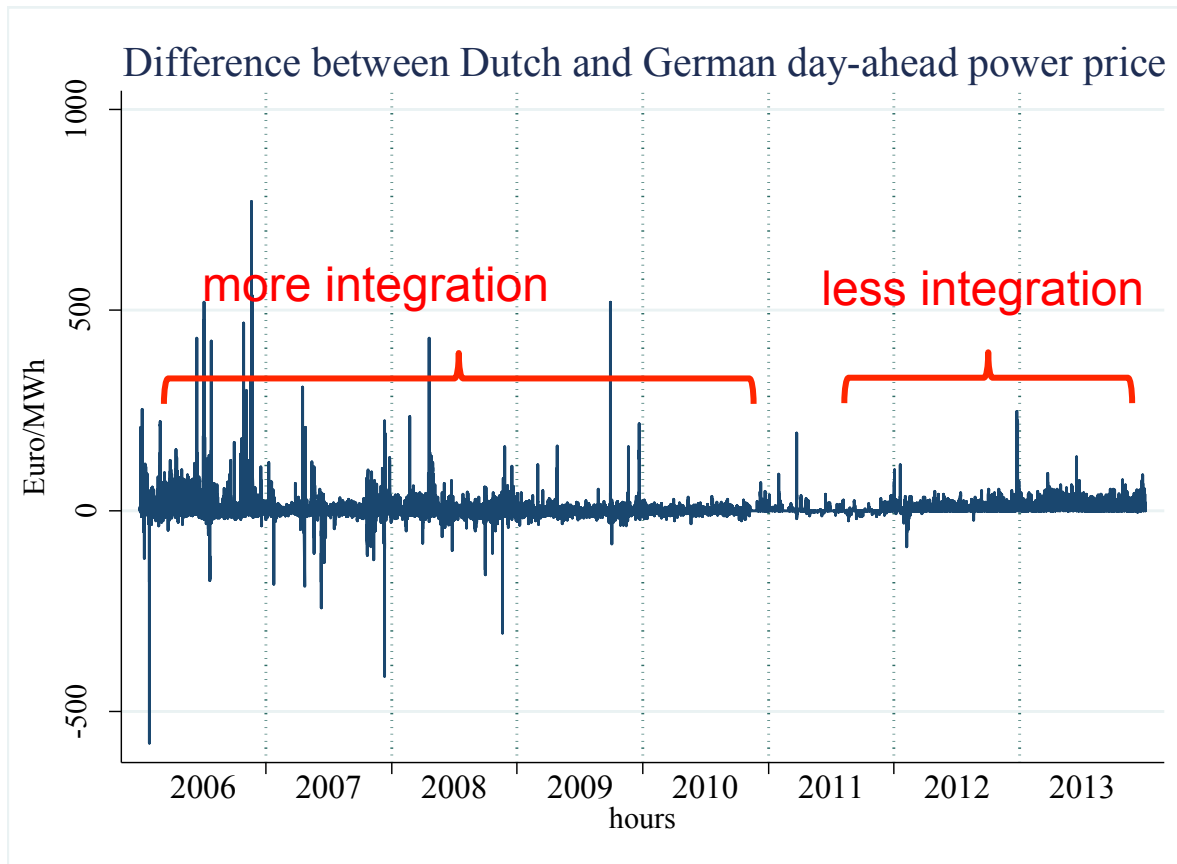
- gas: 55%
- coal: 30%
- other (nuclear, renewables): 15%





Dutch and German electricity market:

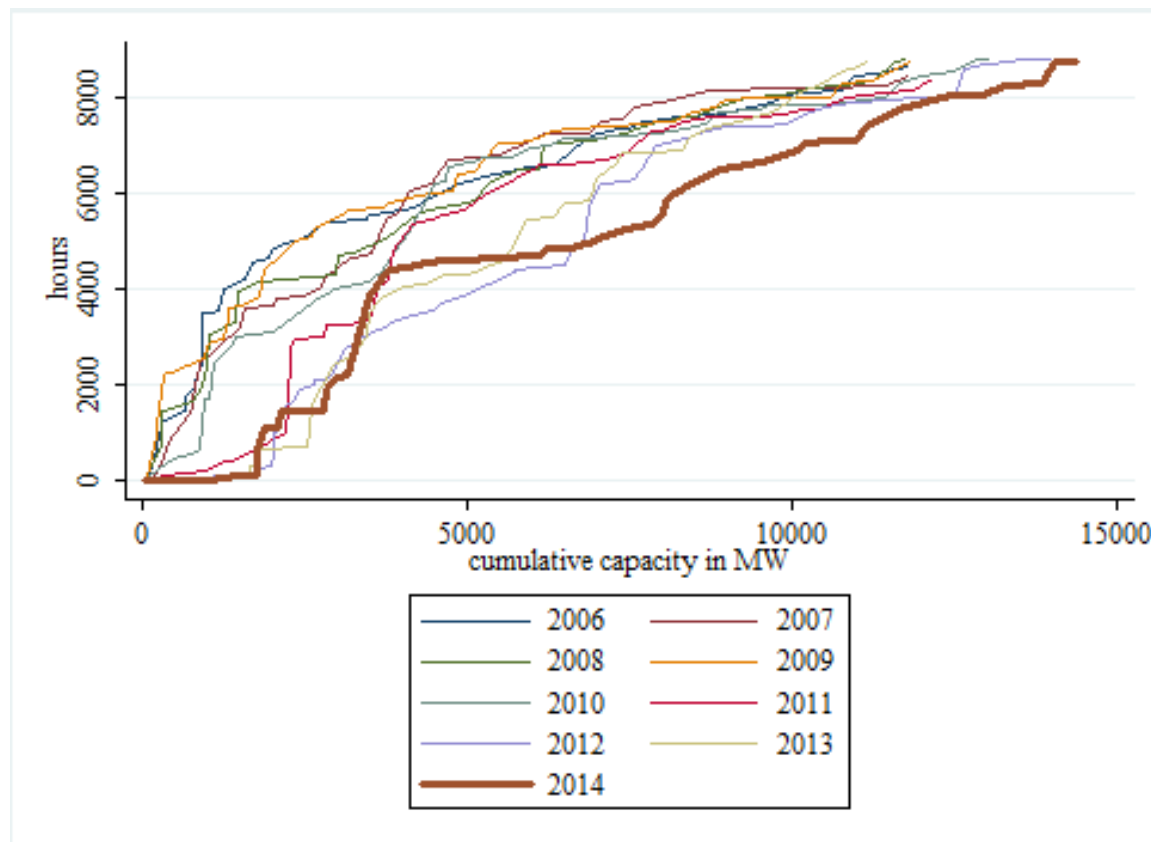
- up to 2010 more integration
- most recent years: less integration





What happened in the Dutch market?

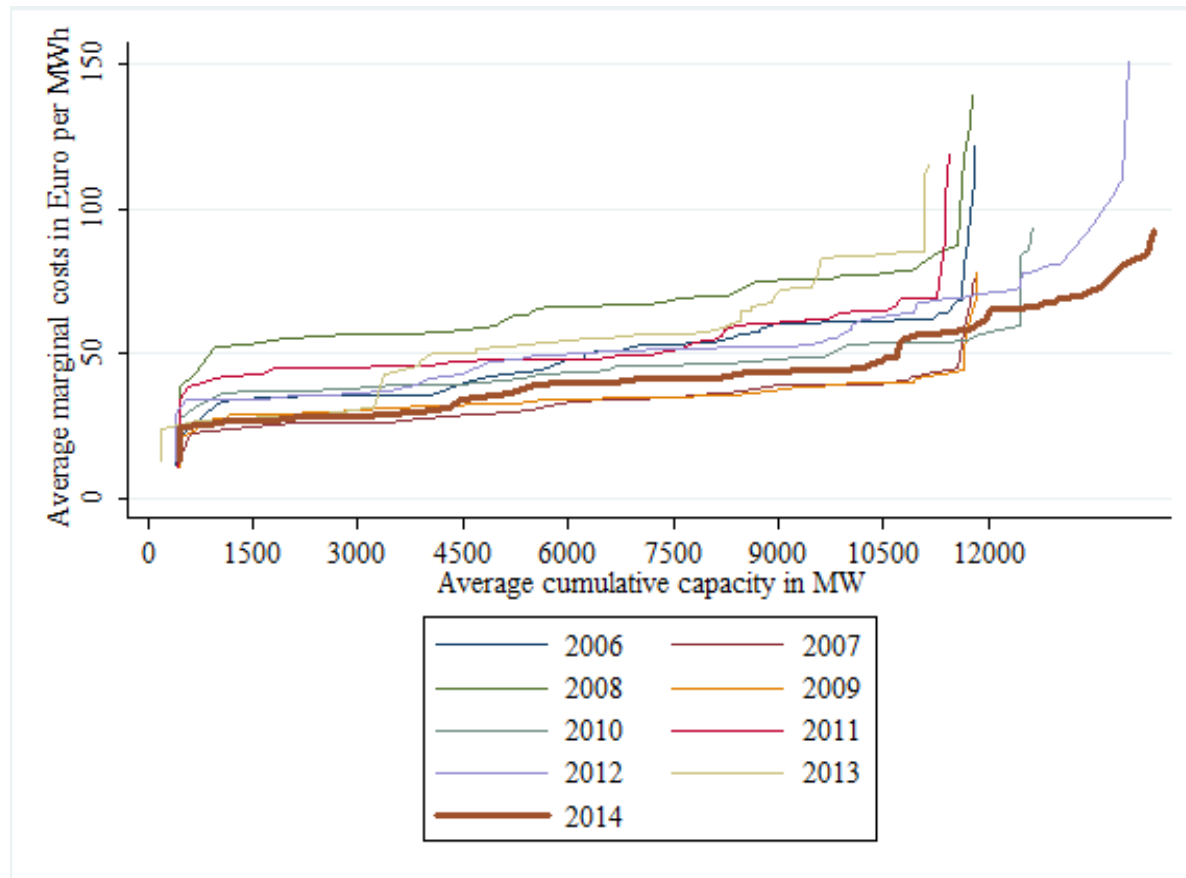
Since 2011 a strong decrease in the utilisation of power plants





Merit order changed strongly in Dutch market

more capacity, changing cost levels, but fairly flat merit order





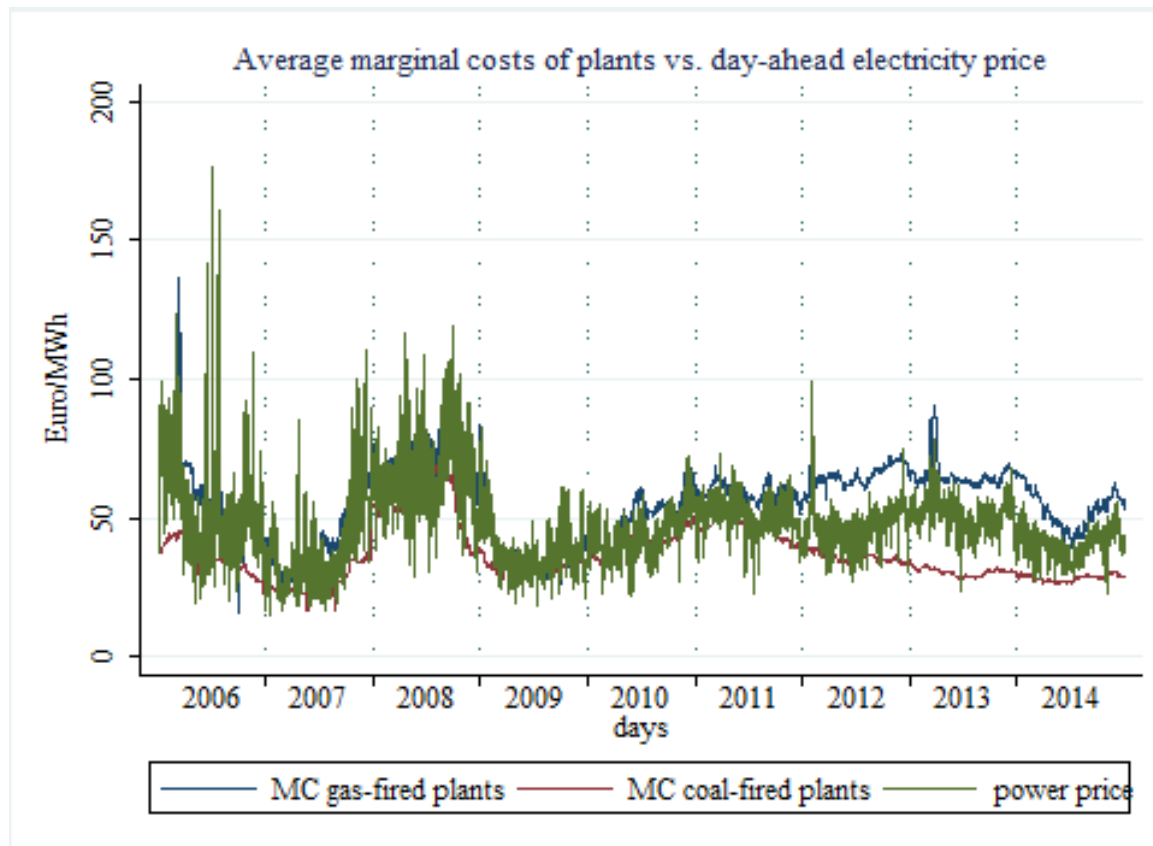
Dutch power producers strongly depend on relative prices of gas, coal and CO₂





Changes in fuel prices have changed relative positions of plants in the merit order

many gas-fired plants are not in the money anymore



Source: ACM; see my paper in the The Energy Journal, 36(2): 1-28 for a description of data and methodology.



Explaining the Dutch day-ahead electricity price

	Log(APX)	2006/2010	2011/2014	2006/2014
	constant	-2.9***	2.2***	-0.5***
	log(D _{t-1})	0.7***	0.2***	0.5***
competition	log(RSI)	-0.2***	-0.1***	-0.2***
fuel prices	P _{coal} / P _{gas}	-0.2***	0.02	-0.2***
	d.log(P _{CO2 t-1})	0.01	-0.1	0.004
	RTR	0.04	-0.01	0.02
Dutch wind	log(W _{NL})	-0.01***	-0.01***	-0.01***
German wind	log(W _{GW_{GER}})	-0.05***	-0.02***	-0.03***
cross-border capacity	log(W _{GW_{GER}}) * D _{CBC}	0.02	0.02***	0.01***
German sunshine	S _{GER}	-0.03	-0.05***	-0.06***
cross-border capacity	S _{GER} * D _{CBC}	0.02	0.04***	0.04***
	AR(1)	0.8***	0.8***	0.8***
	AR(2)	-0.05***	-0.1***	-0.06***
	AR(24)	0.1***	0.1***	0.1***
	R ² adjusted	0.84	0.84	0.84
	DW statistic	1.99	1.96	1.98



Explaining the utilisation of Dutch power plants

fuel prices

German wind

cross-border capacity

German sunshine

cross-border capacity

Utilisation of plants (production/capacity)	Coal-fired plants		Gas-fired plants	
	2006-2010	2011-2014	2006-2010	2011-2014
constant	0.77***	0.99***	0.46***	0.31***
$P_{\text{coal}} / P_{\text{gas}}$	-0.01*	-0.39***	0.001	0.09**
$d.P_{\text{CO}_2}$	0.001**	0.003	0.002***	0.001
W_{NL}	-0.000002	-0.000006***	-0.000002	-0.000008***
$W_{\text{GW}_{\text{GER}}}$	-0.001	-0.002***	-0.00002	-0.001***
$W_{\text{GW}_{\text{GER}}} * D_{\text{CBC}}$	-0.0002	-0.00004	0.00007	-0.0002***
S_{GER}	0.01	-0.01**	-0.003	-0.001
$S_{\text{GER}} * D_{\text{CBC}}$	0.01	0.001	0.001	-0.001
AR(1)	1.21***	1.21***	1.30***	1.39***
AR(2)	-0.27***	-0.28***	-0.34***	-0.43***
AR(24)	0.03***	0.03***	0.02***	0.02***
R ² adjusted	0.97	0.95	0.98	0.98
DW statistic	1.97	2.0	2.02	2.0



Conclusions

- > Despite the huge changes in the German electricity market and the large connections between the German and the Dutch market, the Dutch **electricity price** is hardly affected by the German Energiewende (related to the *flat merit order*)
 - this effect is even mitigated in case of full utilisation of the cross-border capacity
- > The dramatic changes in the **utilisation of the Dutch power plants** are strongly related to the changes in the prices of gas and coal
 - despite the policy objective of realising a energy transition, the share of coal-fired production is increasing