Overcapacity of electricity supply in the Netherlands:
An expensive 'pork cycle' in the making

Around the 1970's in the Netherlands, many gas- and coal-fired power plants have been built. Since the discussion about climate change started and prices of coal, gas and CO_2 started to rise, power companies have been forced to change their portfolio to cleaner electricity. Next to this we see new innovative companies in renewables like wind, solar and biomass.[1] This changing asset base in the Netherlands should bring more balance between so called grey and green electricity. But still the percentage of renewables in the power mix is quite small (9,7% in 2010[2]).
Besides the growth of production of renewable electricity, *demand* for electricity is also growing. Electricity usage will grow, when more and more electrical vehicles will be used, more heat pumps will be installed and air-conditioning usage increases. Next to the normal 1% yearly growth, expected power usage in 2018 in the Netherlands is estimated to be around 128,5 TWh. Therefore big electricity companies like RWE, Vattenfall, Electrabel and EON have resumed building new conventional (gas- en coal-fired) power plants. Not only are they building plants in the Netherlands (current conventional base around 25 GW and in construction about 16 GW[3]), also in our neighbouring countries more and more plants are being built. The recent nuclear disaster in Fukushima has a big impact on the portfolio of the European energy sector. In Germany the so-called *Atomausstieg* leads to the decommissioning of all nuclear plants (20 GW) by 2022 and therefore the development of more gas- and coal-fired plants. Also in Italy and Belgium the building of nuclear plants is postponed and Switzerland will not replace end of life nuclear power plants. In the Netherlands plans for building (at least) one new nuclear plant at Borssele are still ongoing.
In addition, with the extension of interconnection capacity between countries by the Transmission System Operators (TSO), electricity is no longer a national 'product'. The interconnection capacity of the Netherlands is about 4,2 GW (growing to 7,2 GW in 2018), which gives many possibilities for both import and export. This looks like a rosy picture for European energy companies, justifying the investments in conventional power systems in the Netherlands that are currently ongoing.

However will estimated demand equal supply? With the above growth of production to an installed capacity of around 186 TWh (41 GW) the answer is no. As is shown in the next table, 12,8 GW 'overcapacity' will be available for export in 2018.

	Usage [TWh]	Installed Base [GW]	Generation [TWh]	Available for export [TWh]	Available for export [GW]	Export Cap. [GW]	Surplus NL [GW]
2010	113,8	25,1	113,8			4,2	
2018	128,5	41,1	186,3	57,8	12,8	7,2	5,6
Generation per GW 2010:			4,53				
New capacity GW 2010 -2018:			16				

Switching off power plants is an option in case of overcapacity, but this is a very expensive solution. Power plants need start and stop time, during which they cannot

[1] Production in the Netherlands in 2010: 5.56 TWh biomass, 3.59 TWh wind, 0.09 TWh hydro and 0.007 TWh solar PV on a total annual production of around 100 TWh. Progressive yearly production numbers by TenneT
[2] CBS Statline 2010
[3] Report TenneT May 2011

supply electricity. Switching plants on and off also results in more maintenance and therefore more costs. Wind turbines are easier to switch off. However, in case the wind blows, using wind turbines for power production is obviously the least expensive and cleanest way. Ergo: if the wind blows, wind turbines should produce electricity and when overcapacity occurs, as little as possible of the conventional power plants should be used. When the power plants are producing overcapacity for the Dutch market, energy companies should be able to sell the electricity to our neighbouring countries. This drives the expansion of the high voltage power grid and the interconnection capacity, in which TenneT is already investing.
Storage of electricity (for example in lakes in Norway or Switzerland) is a good way to deal with daily capacity balancing, but only for trade purposes: store cheap electricity at off-peak hours and sell the stored electricity when prices are high. This is a good way to attain the required flexibility, but not useful to really deal with structural overcapacity. When the storages are fully filled, overcapacity is still present. Using this storage principle for daily balancing also consumes interconnection capacity, exporting power at off-peak hours and importing power again at peak-hours.

The conclusion is that the Netherlands will face a significant overcapacity when building power plants continues as planned. The expected surplus in 2018 is 186 minus 129 TWh = 57 TWh, equalling 12,8 GW of installed capacity.
Export capacity is max. 7,2 GW in 2018, assuming all capacity is actually available for export only, which is not the case. So probably far less than half the surplus could potentially be exported, assuming neighbouring countries really need our power, and NL power production cost is competitive, which is not guaranteed either (presently the Netherlands is still a net *importer* of power, indicating NL power costs are currently on average slightly higher than abroad).
When neighbouring countries ultimately would have a structural power shortage themselves (and how likely is this?), this shortage will probably not apply during the whole day and the whole year, but only say in winter time at peak hours. Only at these times export for reasons of absolute supply shortage will actually occur and in this situation production cost will be no issue. Export capacity of 7,2 GW assumes availability during 365 days and 24 hours, when in reality maybe only one third of this time the opportunity for net export really exits. The rest of the time the interconnection capacity is used for daily trading back and forth between countries.

Hence this leaves three choices:

1. Further increase interconnection capacity with a minimum of 5-6 GW, requiring an investment between 5 and 10 billion euro's. This 'social' investment only makes sense when export contracts can be closed to actually supply neighbouring countries (at peak-hours), or
2. Stimulate local consumption to grow with 58 TWH/y, obviously not a 'social responsible' option when a 20% *reduction* of energy use is needed in 2020 compared to 2010, or
3. Stop building, or decommission existing older power plants at an equivalent of around 8 GW.

Free markets are supposed to allocate capital and resources efficiently. A 'back-of-the-envelope' calculation shows that energy companies in the Netherlands are currently on a path that is not unlike that of the classic pig farmer. Forcing the TSO to follow them on this course, requiring a significant financial contribution of every end-user, seems not to be in the best public interest. Serious misallocation of capital will be the obvious consequence.