

Report Monitoring Security of Supply 2003-2011

June 3, 2004

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1. Introduction

This monitoring of the security of supply in the Dutch electricity market is executed yearly on request of the Minister of Economic Affairs; this year this happened for the second time. Again the members of the section Production of Energiened cooperated on a voluntary basis by providing the data specifically requested for this purpose from **TenneT**. Beginning next year the monitoring and the required data gathering will be performed on a legal basis.

2. Results

The assessment method used gives the measure to which domestic supply is capable of covering domestic demand. Insufficient coverage will show as a shortage in domestic supply. The assessment method illustrates the result if such shortage must be filled up with imports. Other options to fill up this shortage are more investments on the supply side of the market in new capacity, in delay of retirement of existing capacity, in more efficient unavailability planning. On the demand side energy saving will reduce this shortage. Figure 1 gives the results of the monitoring for the years 2004, 2005, 2008 and 2011.

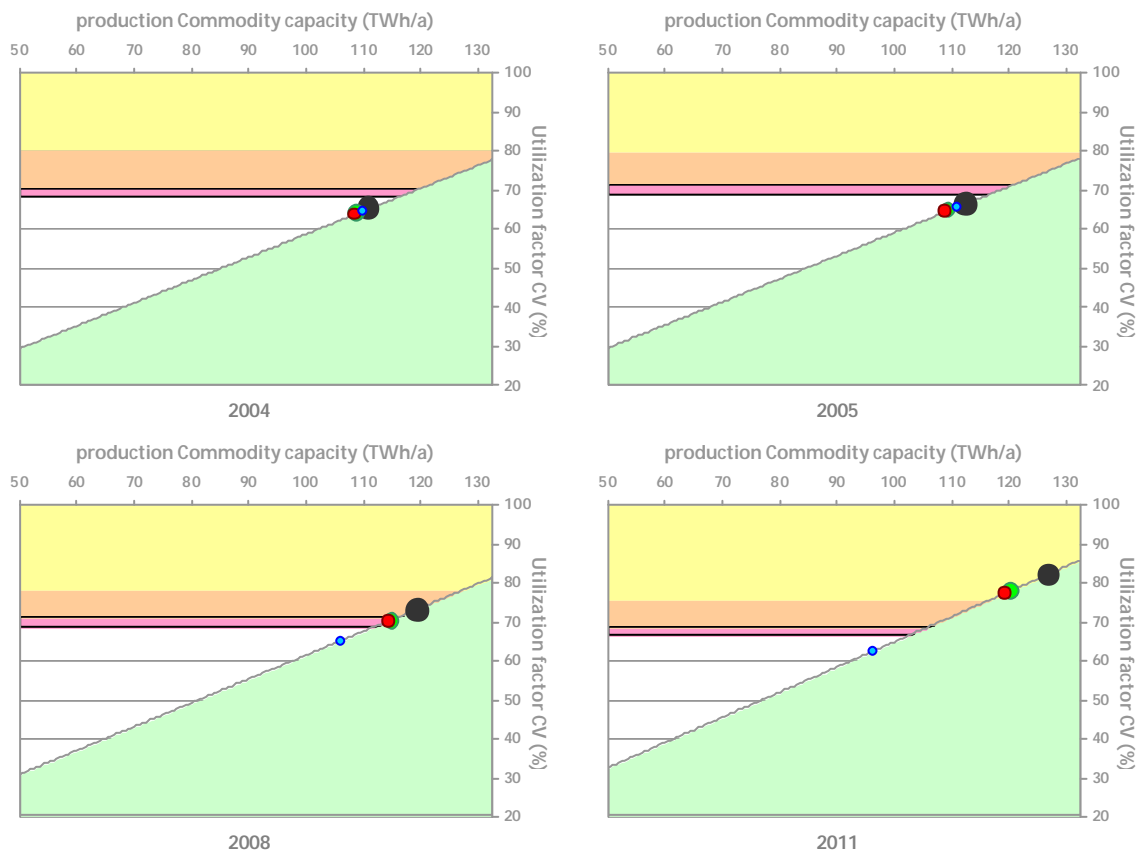


Figure 1: Monitoring results 2004-2011

Legend to Figure 1:

- resulting utilization factor of commodity capacity (CV) if this provides full cover for the market
- ditto, after reducing the market with the contribution of generation from flowing sources
- ditto, after reducing the market with the contribution of generation from flowing sources and reserve capacity
- maximum utilization factor CV at which just permanently all aspects of domestic load can be fulfilled
- commitment on CV from no-load
- commitment on CV from non-availability
- commitment on CV from UCTE requirements

The resulting utilization factor of the commodity capacity (red dot) is from 2008 on increasingly moving into an infeasible area: from 2008 domestic supply fails increasingly to cover domestic demand.

If the shortfall of domestic supply is filled up with imports, this leads to Table 1. For an explanation of the terms used see the glossary. Figure 2 illustrates the development of the shortage in domestic supply.

Table 1: Monitoring results 2003-2011

| year | market TWh | commodity capacity | | reserve capacity | | | non operational installed GW | capacity from flowing sources | | shortfall (import) TWh | utilization factor CV % |
|------|---------------|----------------------|---------|----------------------|-------------------|--------------------------|---------------------------------------|----------------------------------|--------------------------|------------------------------|-------------------------------|
| | | in- stalled GW | NA % | in- stalled GW | full load h | con- tribution TWh | | installed GW | con- tribution TWh | | |
| 2003 | 109.6 | 18.6 | 16.0 | 0.6 | 1300 | 0.8 | 0.5 | 1.0 | 1.2 | 14.0 | 57.5 |
| 2004 | 110.9 | 19.4 | 9.8 | 0.6 | 400 | 0.3 | 0.4 | 1.2 | 1.9 | 0.0 | 63.8 |
| 2005 | 112.6 | 19.3 | 8.5 | 0.7 | 800 | 0.6 | 0.4 | 1.6 | 3.2 | 0.0 | 64.2 |
| 2008 | 119.5 | 18.7 | 7.2 | 0.5 | 1100 | 0.6 | 2.3 | 2.3 | 4.5 | 8.5 | 64.7 |
| 2011 | 126.8 | 17.7 | 7.1 | 1.3 | 800 | 1.1 | 2.4 | 3.3 | 6.5 | 23.0 | 62.0 |

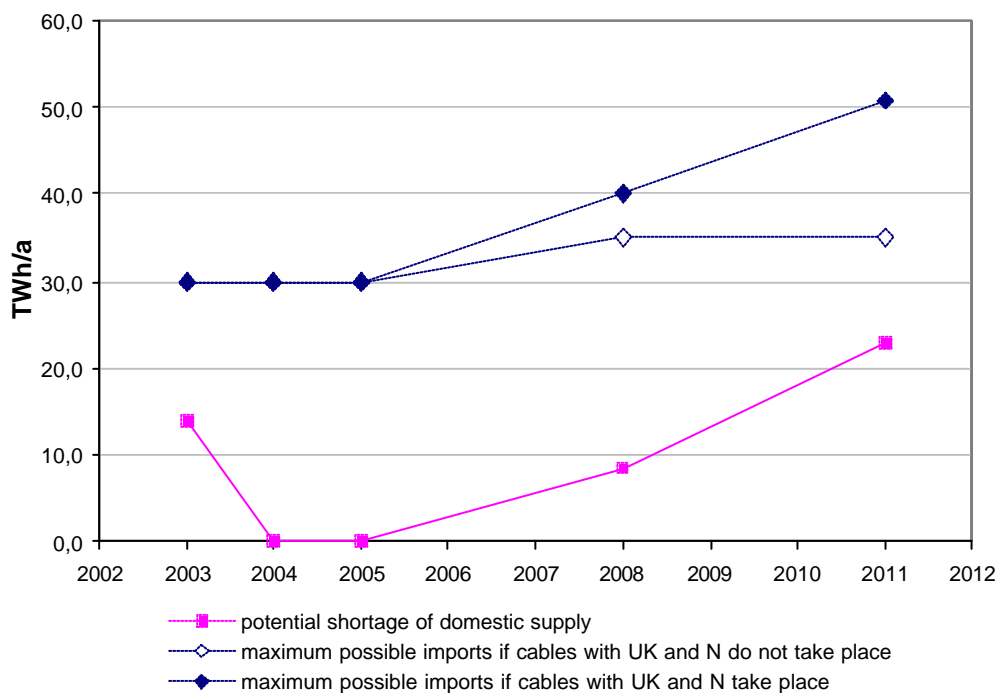


Figure 2: Potential shortage and maximum possible imports 2003-2011

Table 1 and Figure 2 show what this means in terms of demand on available import capacity.

Table 2: demand on available import capacity from potential shortage in domestic supply

| year | available import capacity | | | | | shortfall | demand |
|------|---------------------------|-------------------|--------|-------|-------|-----------|--------|
| | Belgium/ Germany | United Kingdom | Norway | total | total | | |
| | GW | | | | TWh | | |
| 2003 | 3.6 | 0.0 | 0.0 | 3.6 | 30.0 | 14.0 | 47 |
| 2004 | 3.6 | 0.0 | 0.0 | 3.6 | 30.0 | 0.0 | 0 |
| 2005 | 3.6 | 0.0 | 0.0 | 3.6 | 30.0 | 0.0 | 0 |
| 2008 | 4.2 | 0.0 | 0.6 | 4.8 | 40.0 | 8.5 | 21 |
| 2011 | 4.2 | 1.3 | 0.6 | 6.1 | 50.8 | 23.0 | 45 |

Also shown is the variant in which all reserve capacity and non-operational capacity are promoted to commodity capacity with unavailability equal to the given commodity capacity. In that case no shortage shows for any of the eight years.

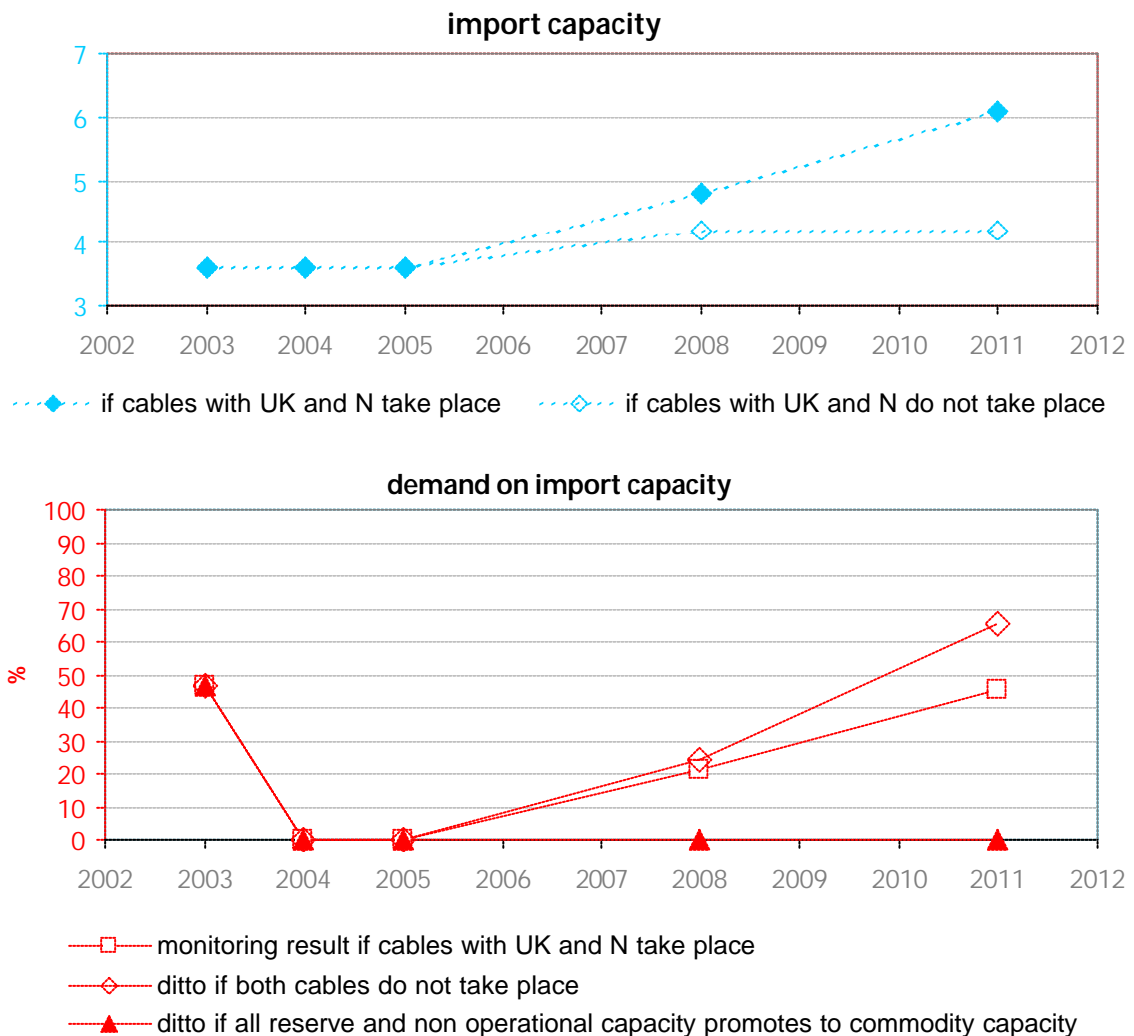


Figure 1: minimum required demand on import capacity 2003-2011 (red dotted line with triangles shows result if all the reported reserve capacity and the non-operational capacity becomes commodity capacity with unavailability equal to the reported commodity capacity)

From 2008 there is a minimum required demand (from the market) on import capacity which increases potentially thereafter. During the whole monitoring period the available import capacity is sufficient.

Table 3 gives an overview of reserve factors that can be deduced from the used data.

Table 3: reserve factors

| year | commodity capacity [GW] | reserve capacity [GW] | flow sources [GW] | Sep contracts imports (OEPS) [GW] | import capacity [GW] | peak demand [GW] | reserve factor | | | | |
|------|----------------------------|--------------------------|----------------------|--------------------------------------|-------------------------|---------------------|----------------|-------------|-------------|-------------|-------------|
| | | | | | | | 1) | 2) | 3) | 4) | 5) |
| 2003 | 18.6 | 0.6 | 1.0 | 0.9 | 3.6 | 16.3 | 1.23 | 1.19 | 1.29 | 1.24 | 1.41 |
| 2004 | 19.4 | 0.6 | 1.2 | 0.9 | 3.6 | 16.6 | 1.28 | 1.23 | 1.34 | 1.28 | 1.44 |
| 2005 | 19.3 | 0.7 | 1.6 | 0.8 | 3.6 | 16.8 | 1.29 | 1.21 | 1.33 | 1.26 | 1.43 |
| 2008 | 18.7 | 0.5 | 2.3 | 0.8 | 4.8 | 17.8 | 1.20 | 1.10 | 1.25 | 1.15 | 1.37 |
| 2011 | 17.7 | 1.3 | 3.3 | 0.0 | 6.1 | 18.9 | 1.18 | 1.04 | 1.18 | 1.04 | 1.36 |

1) no import, flow sources included in full, non-operational capacity not included

2) no import, flow sources included for 20%, non-operational capacity not included

3) incl. SEP import contracts, flow sources included in full, non-operational capacity not included

4) incl. SEP import contracts, flow sources included for 20%, non-operational capacity not included, most corresponding to "old" reserve factor from Sep E-plan

5) incl. 100% import capacity, flow sources included for 20%, non-operational capacity not included

Table 3 shows a reserve factor staying above the 2003 level until 2005 and decreasing from then on¹.

3. Notes to the data used

This monitoring and reporting occurs on the basis of data from:

- the members of the section Production of Energiened on the generating capacity they manage (in general these are prospects under reservation)
- the draft base case scenario of the Capacity-plan 2005-2011 on other domestic generating capacity, domestic demand, and transmission capacity on cross border interconnectors.

On data supplied by the members of the Production section of Energiened it can be observed in comparison to the previous monitoring that:

- the response this year was more laborious for some members
- an increase in intentional new build of commodity capacity was reported
- less/late shift from commodity capacity to reserve capacity was reported
- a substantial increase in intentional mothballing of existing commodity capacity is reported and non-operational capacity is restricted to mothballed capacity: non-reparable capacity is no longer reported, not even as non-operational installed capacity.

On data from the draft base case scenario of the Capacityplan 2005-2011 the following changes are of interest compared to the previous monitoring:

- lower domestic demand (base case scenario = CPB scenario) as a result of:
 - lower increase on a longer term (now 2%, was 2.6%)
 - a lower starting value (2003 now 109.5 TWh, was 110.7 TWh)

¹ In the Electricity Plan 1989-1998, the saving on production capacity as a function of installed wind capacity is valued at between 13% (at 1500 MW wind capacity) and 20% (at 500 MW wind capacity). For the sake of simplicity, 20% is used here, as an illustration. In UCTE (see [4], p. 34), a value of on average 25% is currently used

- for peak demand in 2003 the same demand was assumed as in the previous monitoring, being the maximum synchronous national grid load as reported in the Capacityplan 2003-2009, and for the following years an increase equal to the energy grow was taken (2004: 1.25%; 2005: 1.5%; thereafter 2.0%)
- there is an increase in installed capacity from streaming sources
- there is an increase of other commodity capacity (at other producers than the members of the Production section of Energiened)
- for the interconnections with Belgium and Germany a maximum available capacity of virtually always 3600 and sometimes 3850 MW is now assumed until the end of 2006. On the condition of operational phase shifters in Belgium 4200 MW can probably be made available to the market on these interconnectors from 2007. Further development of this capacity to eventually 4700 MW depends on the development of the international transmission infrastructure and the use possibilities for the market. The other expected increase in import capacity from cable interconnections with United Kingdom and Norway is conditional because definite decisions still follow. With positive decisions the cable connection to Norway is expected to start operation in 2008 while for the cable connection to the United Kingdom this is after 2009.

4. Notes to the result and comparison with the previous monitoring

Comparing this monitoring with the previous one (Monitoring Security of Supply 2002-2010) it strikes that the realized unavailability of commodity capacity over 2003 is substantially higher than estimated. One of the reasons for this is among others the effects of the accident in the Amer 9 in the fourth quarter. For 2003 this resulted in a higher contribution from reserve capacity and more domestic shortage than estimated in the Monitoring 2002-2010. This shortage has been filled up with imports without problems.

All information together leads to the picture that for the first coming years (2004-2005) supply from domestic generating capacity is sufficient to fulfil all aspects of the expected domestic demand. Based on the data used in this Monitoring 2003-2011, without additional investments by the market, from 2008 domestic supply will increasingly fall short in fulfilling all aspects of domestic demand, although to a lesser extent as expected in the Monitoring 2002-2010.

The following options are open to the market to fill up this shortfall:

- reconsideration on mothballing of existing commodity capacity
- new build of commodity capacity
- import, because this is then required this results in an increasing import dependency.

If only import is opted for, the estimated available interconnection capacity is in principle capable of transporting this volume.

Until now the government has set no standard on the level of foreign supply dependency she finds acceptable. Besides, security of supply depends on domestic suppliers. Regulatory supervision is set up to prevent that this does not lead to misuse of market power.

5. Security of supply vulnerable with import dependency?

Dependency from foreign supply will increase substantially on the long term at unchanged demand development and without additional investments by the market. Being dependent from import is in principle acceptable if it can be trusted that in all circumstances sufficient reserve capacity in the surrounding markets together with domestic generating capacity exists to supply domestic demand. Besides the different transmission networks with their interconnections must have sufficient capacity to enable the necessary transports.

Because it is known about and from our surrounding countries [1,2,3] that security of supply can there on term also not be guaranteed without imports, an analysis is carried out based on UCTE data of the possible effects of this on the security of supply in the Netherlands. The largest effect occurs with extreme cold periods because of then rapidly increasing application of electric heating, especially in France and also but to a much lesser extent in the Netherlands and surrounding countries.

Conclusion of the analysis is as follows:

Under the assumption of a UCTE published temperature dependency of peak demand (1%/°C for the whole of UCTE) chances are 1 in 7 winters in 2008 and 1 in 4 winters in 2011 that excluding commercial load shedding capacity all operational reserves in the Netherlands, Germany, France and Belgium together will reduce to zero. In that case Netherlands, Belgium, France and Germany together become dependent on external imports if and as soon as there is more than average unavailability of production due to break downs, maintenance, lack of wind or water. Internal bottlenecks in the German and Belgian networks then build a genuine danger for the imports which the Netherlands then requires from countries outside the involved area.

This conclusion is based on data from the UCTE Adequacy Forecast 2004-2010 [4] and historical observations on average 24 hours temperatures in Maastricht from 1906 (source: KNMI). The result is extremely sensitive to the value of temperature dependency of peak demand and thus also for possible demand response or other dynamic effects of the market. A reliable value for the temperature dependency of peak demand could not be found. Estimates vary between 0.4% and 2%. For the event mentioned in the conclusion a significant chance of occurrence could no longer be determined at a value of less than 0.7%.

A special point of interest is that in the capacity planning of the natural gas supply a certain amount of electricity imports is assumed. It is known that the dimensioning of the Dutch natural gas supply system is dominated by conditions during cold periods. In such cold periods in the future extra gas demand could arise because of reduction or cancellation of electricity imports. It is therefore important to communicate this possible extra gas demand which is needed for the security of supply of the electricity production in the future with the bodies who are responsible for the capacity planning of natural gas production and transport.

6. Advice

The results of this monitoring based on the currently available data do at this moment not give us any reason to advise the government to take measures for the future security of supply in the Netherlands.

From the results it follows that until 2011 in the Netherlands sufficient supply is possible to provide for the domestic demand. Moreover this and next year's result show no dependency on imports. Dependency on imports shows up in 2008 and the years following: the Netherlands then must also rely on foreign supply for adequacy, at least if additional investments in new generation capacity stay away.

Because of the international interconnected electricity networks security of supply in our surrounding countries is strongly interrelated and determining security of supply in the Netherlands. Therefore **TenneT** heartily supports the Minister's initiative to come to MoU's with the governments in our surrounding countries. A joint assessment of security of supply, optimisation of available international transmission capacity and non-discriminatory cancellation of exports are crucial conditions for the further development of a liberalized and stable market and with that for the international security of supply.

Glossary

Contribution

Contribution to market demand from production capacity

CV

Commodity capacity, i.e. domestic installed and controllable production capacity stated to have 2,000 or more (expected) operating hours. 'Controllable' means that this can be utilised as required.

Operating hours

The number of hours per year that a unit is operational

CV use factor

Expected CV production, based on the results of the assessment method, as a proportion of production at 8760 full load hours

Market

Scale of domestic electricity consumption, including network losses

Modelled imports

- Necessary

Shortfall of CV supply for permanent coverage of market demand before gate closure (leads to a balanced set of E-programmes)

- Sufficient

Shortfall of CV supply for permanent coverage of market demand after gate closure (leads to the ability to comply with E-Programmes or maintain the balance)

NA

Non-availability: total anticipated and unanticipated non-availability in percentage terms

Non-operational capacity

Domestic installed and controllable production capacity that is defective and/or reserved

No-load

Complement of capacity demand relating to the 95 percentile value of year-on-year capacity demand

Reserve capacity

Domestic installed and controllable production capacity stated to have fewer than 2000 (expected) operating hours

Flow sources

Domestic installed production capacity on flow sources basis (wind, solar energy)

UCTE requirements

Required permanent operating reserve to be maintained by the Netherlands pursuant to UCTE agreements (required primary and secondary reserve)

Full load hours

The ratio of production on an annual basis to the capacity of a unit

Free room

Potential average annual production of the commodity capacity on which no demands are made as a result of non-availability, no-load, market and UCTE commitments.

Bibliography

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- [2] "Bericht des Bundesministeriums für Wirtschaft und Arbeit an den Deutschen Bundestag über die energiewirtschaftlichen und wettbewerblichen Wirkungen der Verbändevereinbarungen (Monitoring-Bericht)" (August 31, 2003), see <http://www.bmwa.bund.de/bmwa/generator/Navigation/Service/bestellservice,did=23954.html>
- [3] ELIA, "Ontwikkelingsplan 2003-2010" (September 2003), see http://www.elia.be/nederlands/pdf/PlanFEDnl_def.pdf
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