

Report on monitoring of reliability of supply 2005-2013

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1. Introduction

TenneT monitors the long-term reliability of supply each year at the request of the Minister of Economic Affairs. This year the monitoring and the associated data gathering took place for the second time on a statutory basis under Section 16, subsection 2 (f) of the Electricity Act, which assigns monitoring of reliability of delivery and supply to TenneT (under Section 4a, subsection 1 of the Electricity Act 1998). Monitoring took place twice before in previous years using data obtained through a voluntary exchange of information with members of the Production section of the trade organisation EnergieNed.

The purpose of monitoring is to provide an insight into the expected development of the domestic supply of and demand for electricity. We also examine the extent to which national capacity can cover national demand. Reliability of supply is not confined to the national borders. Therefore, as in previous years, we examined the extent to which foreign supply and the required international transmission capacity are available for the Dutch electricity system. This latter point is particularly important because export capacity from Germany to the Netherlands is under increasing pressure, mainly because of large transit flows resulting from high production surpluses in northern Germany.

As part of our monitoring we again performed analyses using two assessment methods: the original method and the Loss of Load Expectation (LOLE) method, which was introduced last year. Given the great importance of the monitoring we decided to introduce the second method to allow comparison with the results of the current method. Moreover, the LOLE method enables alignment with other countries that use similar methods (including Belgium and France). This may create an international basis for comparison. Chapter 5 of this report deals with this subject in greater detail.

To arrive at the best possible estimate of reliability of supply, it is extremely important to perform analyses of the complete interconnected system (i.e. the Netherlands together with systems in neighbouring countries). Estimates are currently compiled using the results of the UCTE 'system adequacy forecast' (see Chapter 6). The UCTE method provides a rough indication of how reliability of supply will develop. Therefore, TenneT has planned to carry out cross-border analyses with the assessment methods used by TenneT. This enables us to align to our own results and to those of neighbouring countries that use the same method. This year, we took an initial step in this direction by analysing the Belgian system. Our intention is to add more countries in the future so as to establish a high-quality assessment framework. In our next monitoring report we will provide information on these cross-border analyses.

2. Conclusions and recommendations

2.1 Conclusions

The results of this monitoring exercise indicate that in principle there will be a sufficient supply of electricity to meet national demand in the Netherlands up to and including 2013.

Throughout the surveyed period the Netherlands will remain dependent for its reliability of supply on supplies from other countries. This dependence will peak in 2007 and 2013. Compared to the existing situation, the dependence on imports will continue increasing up to and including 2007, but in the subsequent years there will be a marked turnaround. Up to and including 2010 the Netherlands' dependence on imports will decrease strongly as a result of investments in new production capacity. Dependence on imports will increase again in 2013, mainly due to conservation of approximately 1700 MW of production capacity.

The dependence on imports in 2007 can be regarded as a continuation of the present situation, i.e. there will be a slight growth of dependence on imports compared with 2006, principally because of the growth of demand. This does not need to present a problem, since sufficient reserve capacity still exists in neighbouring countries and the reliably available import capacity is sufficient. Moreover, the start-up of the NorNed cable in the second half of 2007 will create greater import possibilities.

It is fair to conclude that parties are responding to the increasingly tight market. For the period surveyed in our monitoring, for example, parties have stated that approximately 3600 MW of new large-scale thermal production capacity will be constructed. More than 2800 MW of this capacity will be built in the period up to and including 2010. It should be noted that the information provided for this monitoring report certainly does not need to represent the ceiling of newly built production capacity. The information provided for our 2006-2012 Capacity Plan included announcements of possible new construction projects providing an additional 1300 MW of capacity in the 2007-2010 period. A few parties have additionally announced through the press some potential projects that were not reported for the purposes of this monitoring report. It is possible these projects were not reported to TenneT because the investment plans are not yet sufficiently concrete.

As mentioned earlier, the results of the monitoring indicate that no structural problems need to be expected. Nevertheless, extreme situations may occur that our examination method does not cover, such as situations arising from cooling water restrictions in the summer (Phase 2) and gas supply problems during extremely cold winters. Our monitoring indicates that the electricity supply system will probably be less vulnerable to such situations in the future, because the larger part of the reported large-scale new production capacity will be built at coastal locations, where there are no cooling water

restrictions. What's more, some of the reported new capacity will not be gas-fired. This diversification of fuels is favourable to reliability of supply as it reduces dependence on gas and, by consequence, also the vulnerability of the system to gas supply restrictions in extremely cold periods.

We have concluded that the reliability of the monitoring can be increased if TenneT can obtain a better picture of current electricity consumption in the Netherlands. To date, the actual demand for electricity has been partially determined on the basis of provisional figures issued by Statistics Netherlands (CBS). We have to use provisional figures because the definitive ones are frequently not issued until much later. However, our monitoring revealed that the definitive figures can sometimes vary significantly from the provisional estimates. At the same time, data on electricity demand are crucial input for the monitoring. Therefore, it will be necessary to determine to what extent we can obtain a more accurate picture of actual demand.

2.2 Recommendations

The results of our monitoring give us no reason at this time to advise the government to take measures to assure future reliability of supply in the Netherlands.

3. Results

This Chapter presents the findings of our analyses of the reliability of supply. The findings of the assessment method we used indicate the extent to which national supply can meet national demand. The assessment method illustrates the result if a shortage of national supply must be compensated by imports. Other options for making up the shortfall on the supply side are making more investments in new capacity, delaying the decommissioning of existing capacity, and a more efficient maintenance planning. On the demand side, the potential shortage can be reduced through energy saving and demand response. As in the previous monitoring, we again examined two variants as regards the assumed unavailability of means of production. The basic variant is presented in Section 3.1, where we have adopted the unavailability data reported by producers for the purposes of this monitoring. Section 3.2 indicates the sensitivity of the outcomes to alternative assumptions about the unavailability of means of production. Section 3.3 sets out the results of the two examined variants in terms of utilisation of import capacity. Section 3.4 concludes with an overview of the reserve factors that can be derived from the data we used.

Chapter 4 contains an explanation of the other import data we used. An explanation of the terms used in the report can be found in the glossary at the end of the report.

3.1 Main results of 2005-2013 monitoring (basic variant)

Figure 1 summarises the basic variant results of our 2005-2013 monitoring exercise. The grey line represents the calculated shortages in national supply in the years 2006, 2007, 2010 and 2013. A negative value indicates that there is no shortage and that the surplus may be exported. The same figure shows, by means of the blue line, the calculated actual shortages in the 2002-2005 period¹. The figure also indicates the import possibilities. The black lines indicate the maximum import possibilities that exist for variants with and without construction of a cable link with the United Kingdom.

¹ The calculated actual shortages in 2002 and 2003 are based on the monitoring reports published for 2002-2010 and 2003-2011, respectively. The calculated shortage in 2004 is not based on the 2004-2012 report. The results for 2004 were recalculated on account of a recent correction to the actual demand in 2004 made by Statistics Netherlands (CBS).

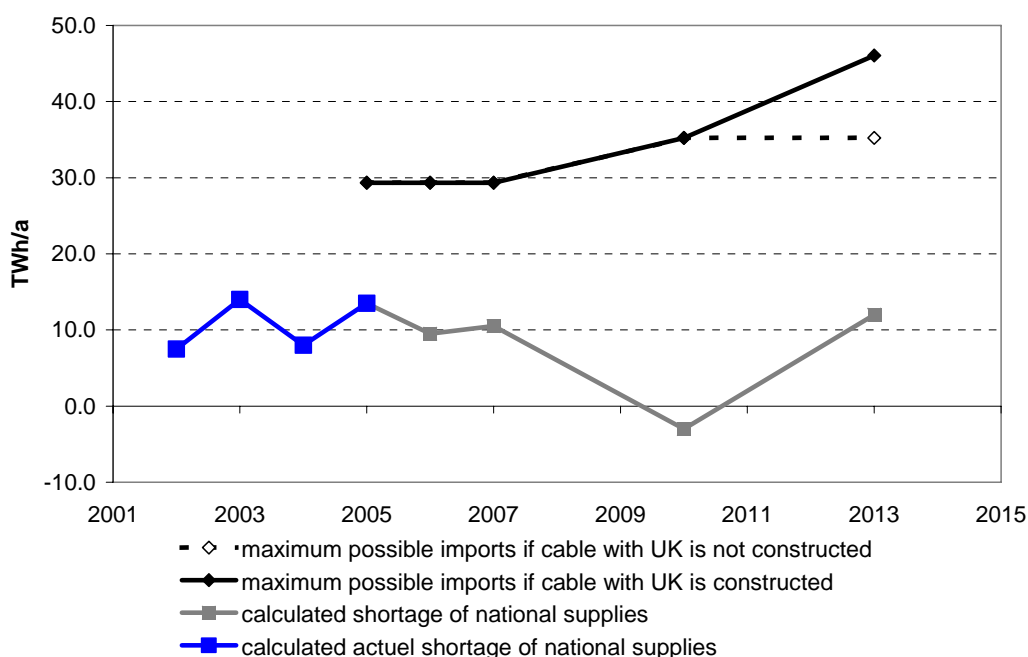


Figure 1: Calculated shortages and maximum possible imports 2005-2013 (basic variant)

By way of amplification of the calculations presented in the graph, Table 1 provides information about how the size of the national market and the national supply will develop. We have subdivided the national supply into operational and non-operational capacity. Non-operational capacity refers to conserved or 'mothballed' capacity. The operational capacity has been subdivided into commodity capacity, reserve capacity and renewables.

Table 1: Main results of 2005-2013 monitoring exercise, actual figures for 2002-2005 and forecasts for 2006-2013, including the unavailability of means of production (according to information provided by producers)

year	market TWh	non oper. capacity	operational capacity								shortage (imports) TWh
		total	total	commodity	reserve		renewables				
		GW	GW	GW	unavail. %	full-l.d.hrs h	contrib. TWh	GW	contrib. TWh		
2002	109.2	0.8	19.6	18.6	12.5	0.4	738	0.3	0.6	1.0	7.5
2003	109.6	0.5	20.2	18.6	16.0	0.6	1300	0.8	1.0	1.2	14.0
2004	112.9	0.4	21.0	19.3	14.5	0.6	560	0.3	1.1	1.6	8.0
2005	114.7	0.4	21.1	19.2	16.2	0.6	480	0.3	1.3	1.9	13.5
2006	117.8	0.4	21.3	19.2	11.6	0.7	649	0.4	1.5	2.3	9.5
2007	121.3	0.5	21.7	19.2	10.6	0.7	1041	0.8	1.7	2.9	10.5
2010	128.8	0.6	24.8	21.8	9.2	0.6	946	0.5	2.4	4.1	-3.0
2013	136.6	2.3	24.9	20.8	9.2	0.6	946	0.5	3.6	6.0	12.0

The results reveal a shortage of approximately 10 TWh in 2006 and 2007. In the subsequent years the shortage will decrease as a result of investments in new production capacity. Indeed, in 2010 a potential capacity of 3 TWh can be exported. At the end of the surveyed period, a shortage will again occur that will grow to approximately 12 TWh. More import capacity will be available by then, however. The results indicate that the shortages across the entire surveyed period will be less than the calculated actual shortages in 2003 and 2005. The shortages in these years came to approximately 14 TWh.

3.2 Sensitivity to unavailability of production units (standard variant)

The assumptions made in respect of the likely unavailability of means of production are important input for the calculation of the supply data. These assumptions greatly influence the findings. As was the case last year, we again noticed a major difference between the unavailability that actually occurred in the past and the unavailability forecast by producers: the producers' forecasts were significantly lower than the actually realised unavailability. This can be seen in Figure 2, which depicts the actual unavailability in 2003, 2004 and 2005 and the forecasts given by producers. The black line shows the historical average unavailability. Interestingly, the values reported by producers fall more and more below the historical actual values as the surveyed time line shifts further into the future, i.e. the forecast values are between 3.3 and 5.7 percentage points below the historical average, whereas the actual values in 2002, 2003 and 2005 are around the line of the historical average.

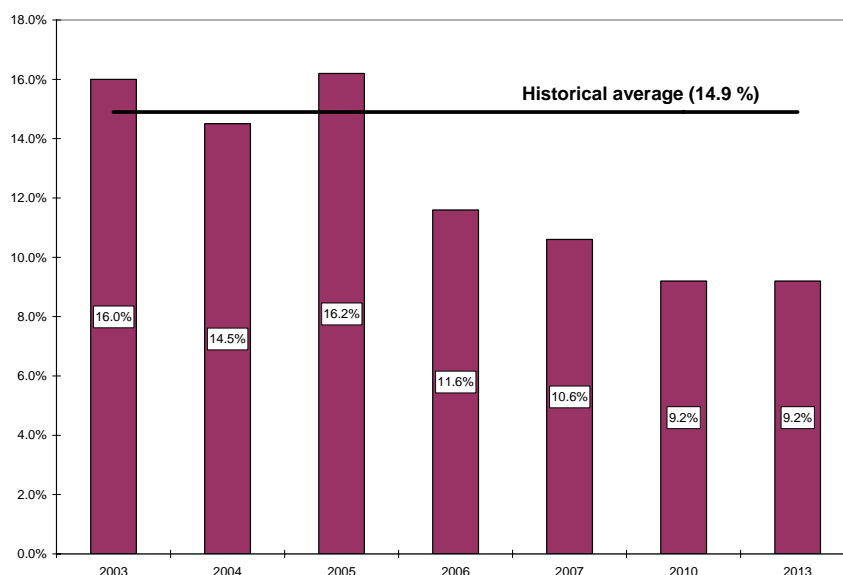


Figure 2: Unavailability of production units as a percentage of actual and estimated values

For that reason, we again performed for this monitoring report several analyses – in addition to the basic variant, with unavailability figures according to the information provided by the producers – in which we standardised the unavailability figures for all surveyed years at the historical value of 14.9%. In this ‘standard variant’, we also standardised the full-load hours for reserve capacity and renewables at 1000 and 1700 hours, respectively.

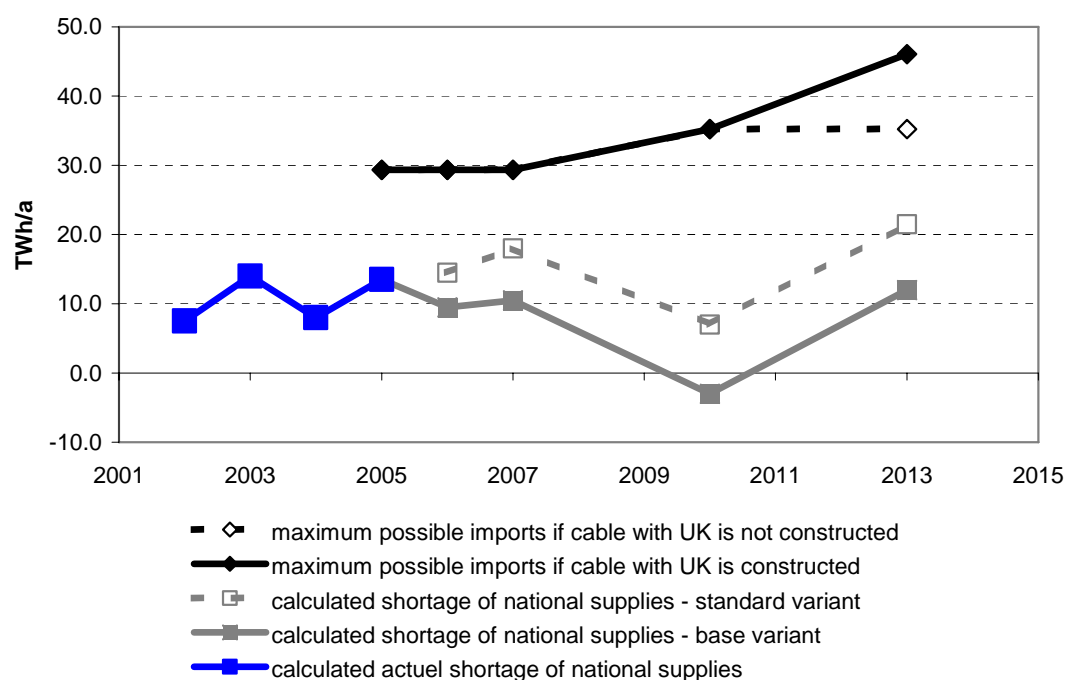


Figure 3: Calculated shortages and maximum possible imports 2005-2013 (basic variant and standard variant)

To supplement the main results presented earlier, the grey dotted line in Figure 3 shows the results of the variant with the availability data based on actual historical values. Table 2 shows in figures the results of the standard variant.

Table 2: Main results of 2005-2013 monitoring exercise, forecasts for 2006-2013 with standardised unavailability of means of production based on actual historical values

year	market TWh	non oper. capacity		operational capacity							shortage (imports) TWh
		total	total	total	commodity unavail. %	reserve		renewables			
						GW	GW	GW	full-ld.hrs h	contrib. TWh	
2006	117.8	0.4	21.3	19.2	14.9	0.7	1000	0.7	1.5	2.5	14.5
2007	121.3	0.5	21.7	19.2	14.9	0.7	1000	0.7	1.7	2.9	18.0
2010	128.8	0.6	24.8	21.8	14.9	0.6	1000	0.6	2.4	4.1	7.0
2013	136.6	2.3	24.9	20.8	14.9	0.6	1000	0.6	3.6	6.1	21.5

As was to be expected, greater shortages occur in the standard variant than in the basic variant, due to the higher assumed unavailability of means of production. The shortage in 2006 comes to 14.5 TWh. This is slightly higher than the calculated historical shortages in 2003 and 2005. In contrast with the basic variant, the national shortage in 2007 will rise slightly in this scenario, i.e. an increase in the shortage to 18 TWh. Subsequently, there will be a decrease, as in the basic variant: in 2010 the shortage will be reduced to 7 TWh. In 2013, the shortage will rise to reach a value of 21.5 TWh. Figure 3 shows that, over the entire surveyed period, the available import capacity will be sufficient in all variants. Moreover, there will be further increase in import potential in the second half of 2007 because of the start-up of the NorNed cable. To ensure a prudent approach, however, we have included the effects of the NorNed cable in Figure 3 for the first time in 2010.

3.3 Utilisation of import capacity in basic variant and standard variant

The results presented above show that the Netherlands will be dependent on supplies from other countries for its reliability of supply, except in 2010 (in the basic variant). This section illustrates this dependence on imports in more detail, in terms of utilisation of the available import capacity. Figure 4 shows the basic principles we applied with regard to the import capacity available under normal circumstances.

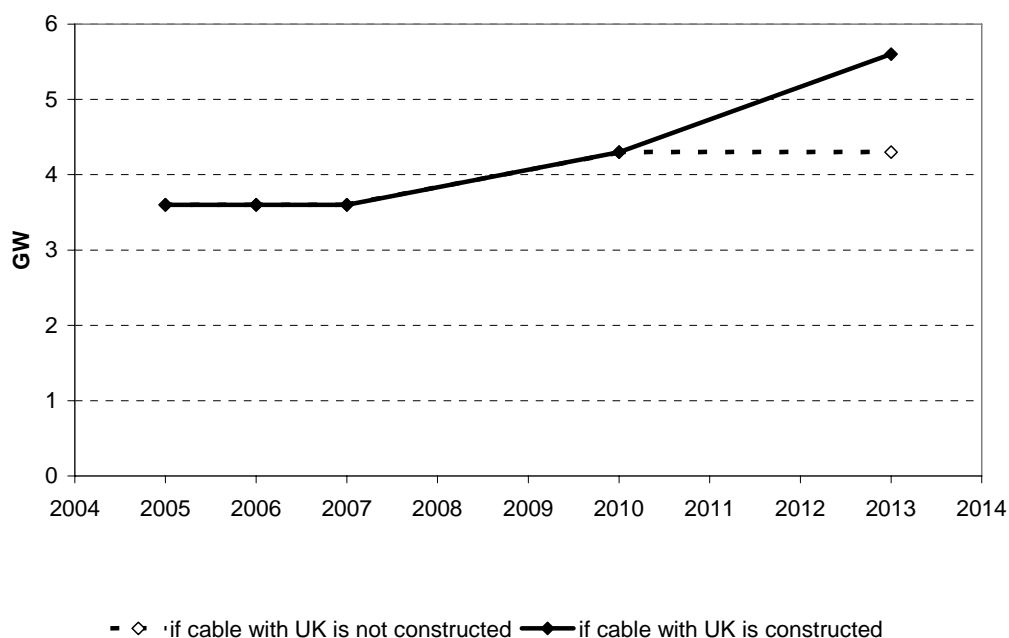


Figure 4: Nominally available import capacity

Up to and including 2007, the cross-border transmission capacity will consist only of capacity from Germany and Belgium (nominally totalling 3600 MW). The cable to Norway with a nominal capacity of 700 MW is expected to come into operation in the second half of 2007. For that reason, we have not factored it in until the 2010 reference year. For 2013 we examined two variants regarding the available import capacity, namely a variant with and without construction of the cable link to the United Kingdom (with a capacity of 1320 MW).

Table 3: Available import capacity and utilisation for potential shortages in national supplies

jaar	available import capacity											shortage		utilisation		
	Belgium / Germany				Norway			United Kingdom			total		base var. TWh	stand.var. TWh	base var. %	stand.var. %
	GW ¹⁾	NB ²⁾	ER ³⁾	TWh	GW ¹⁾	NB ²⁾	TWh	GW ¹⁾	NB ²⁾	TWh	GW ¹⁾	TWh				
2005	3.6	0.5%	4.6%	29.9							3.6	29.9	13.5	13.5	45%	45%
2006	3.6	0.5%	6.5%	29.3							3.6	29.3	9.5	14.5	32%	49%
2007	3.6	0.5%	6.5%	29.3							3.6	29.3	10.5	18.0	36%	61%
2010	3.6	0.5%	6.5%	29.3	0.7	4.1%	5.9				4.3	35.2	-3.0	7.0	-9%	20%
2013	3.6	0.5%	6.5%	29.3	0.7	4.1%	5.9	1.3	5.0%	10.8	5.6	46.0	12.0	21.5	26%	47%

¹⁾ nominally available, without reductions for unavailability or ER
²⁾ unavailability because of overhauls and failures
³⁾ reduction because of uncertain export capacity from Belgium/Germany

Table 3 provides an overview of the available nominal import capacity for the different interconnections and the maximum possible energy imports for each year of calculation. The table further states, for the basic variant and for the standard variant, the minimum necessary utilisation of the available imports. We have factored in a 6.5% reduction on account of possibly uncertain export capacity from Belgium and Germany.

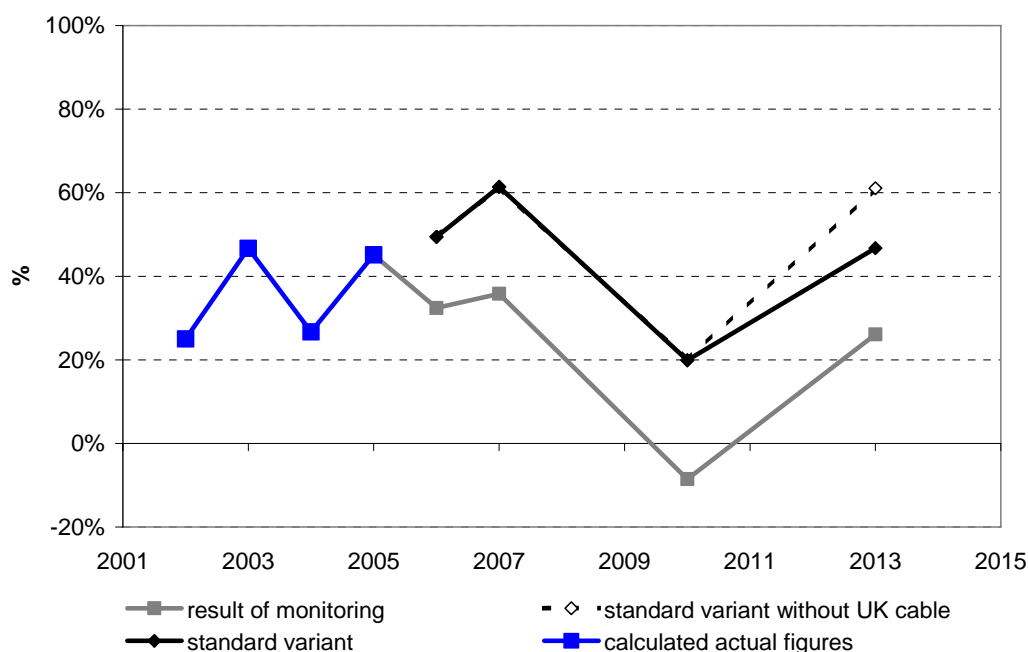


Figure 5: Minimum necessary utilisation of import capacity for different variants

The minimum necessary utilisation of import capacity can be seen in Figure 5. The figure also shows the historical calculated minimum utilisation. It reveals that the highest utilisation (61%) occurs in the standard variant in 2007. The same percentage also occurs in the standard variant in 2013 if the cable to the United Kingdom does not go ahead.

3.4 Reserve factors

As in our previous reports, we have estimated the reserve factors. Table 4 provides an overview of the reserve factors that can be derived from the data we used. The peak demand used in the calculations for the 2005-2013 period was determined using the maximum simultaneous national grid load in 2006, as stated in the Capacity Plan for 2006-2012. Peak demands in the previous years were determined on the basis of earlier Capacity Plans.

From the reserve factors we can discern the same trend as in the findings based on import dependence and according to the LOLE method, namely an increasingly tight market in the 2005-2007 period. This will be followed by a significant increase of reserves in 2010 and a sizeable reduction of the reserve margin in 2013.

Table 4: Reserve factors 2002-2013

jaar	non-operational capacity	total operational capacity	capacity from renewables	nominal import capacity	peak demand	reserve factor		
	GW	GW	GW	GW		1)	2)	3)
2006	0.4	21.3	1.5	3.6	18.1	1.18	1.11	1.31
2007	0.5	21.7	1.7	3.6	18.6	1.16	1.09	1.28
2010	0.6	24.8	2.4	4.3	19.8	1.25	1.15	1.37
2013	2.3	24.9	3.6	5.6	21.0	1.19	1.05	1.32

¹⁾ without imports, renewables count for 100%, non-operational capacity counts for 0%

²⁾ without imports, renewables count for 20%, non-operational capacity counts for 0%

³⁾ import capacity counts for 100%, renewables count for 20%, non-operational capacity counts for 0%

4. Notes on used data

This monitoring exercise and report are based on the following data:

- data obtained from members of the Production section of EnergieNed concerning national means of production under their management (generally speaking these data concern provisional plans);
- data obtained from producers known to EnerQ and Certiq. As was the case last year, we requested data for this monitoring exercise from all producers with units of 5 MW and larger, insofar as known to TenneT. Our aim in doing this is to increase the degree of coverage and make less use of our own estimates so as to enhance the quality and reliability of the analysis. Among other means, we used the address databases of EnerQ and Certiq to approach this new group of producers;
- data obtained from the 'Green Revolution' reference scenario set out in the Capacity Plan 2006-2012 concerning other national means of production, growth of the size of the national market and the period after 2007, and transmission capacity on cross-border connections;
- figures with regard to actual national demand obtained from CBS (Statistics Netherlands);
- figures for the growth of the demand for electricity in 2006 and 2007 obtained from CPB (Netherlands Bureau for Economic Policy Analysis).

Table 5 presents an overview of the development of installed capacity. As regards the construction of new large-scale thermal production capacity, we have factored in only the new construction plans reported by the producers for the purposes of this monitoring. It should be noted that these plans do not necessarily account for all the new production capacity that will be built. The information provided for our 2006-2012 Capacity Plan included announcements of possible new construction projects providing an additional 1300 MW of capacity in the 2007-2010 period. A few parties have additionally announced through the press some potential projects that were not reported for the purposes of this monitoring report. It is possible these projects were not reported to TenneT because the investment plans are not yet sufficiently concrete.

The information provided reveals that the larger part of the reported large-scale construction of new capacity will be realised on the coast. This is favourable for the reliability of supply because coastal locations are usually not subject to cooling water restrictions. We noticed that some of the reported new capacity will not be gas-fired. This diversification of fuels is again favourable for the reliability of supply, because it reduces dependence on gas and, by consequence, the vulnerability of the system to gas supply restrictions in extremely cold periods.

Table 5: Development of installed capacity

year	non oper. capacity	operational capacity			evolution					
	total GW	total GW	renewables GW	tot. excl. renew. GW	large scale thermal			small s.th.	renew.	total
					new GW	decomis- sioned GW	balance GW	balance GW	balance GW	balance GW
2005	0.4	21.1	1.3	19.8						
2006	0.4	21.3	1.5	19.8	0.1	0.0	0.1	0.0	0.2	0.3
2007	0.5	21.7	1.7	20.0	0.3	0.1	0.2	0.0	0.2	0.4
2010	0.6	24.8	2.4	22.3	2.5	0.1	2.4	-0.1	0.7	3.1
2013	2.3	24.9	3.6	21.3	0.8	1.7	-0.9	-0.1	1.1	0.1

The data provided (see Table 5) yield the following points of attention:

- there is an increase in the planned construction of new commodity capacity. For the entire period surveyed for this monitoring exercise, for example, parties reported approximately 3600 MW of new large-scale thermal production capacity. Of this capacity, more than 2800 MW will be realised in the period up to and including 2010;
- at the end of the surveyed period (2013), approximately 1700 MW of large-scale production capacity will be conserved;
- the degree of cover provided by production units for which producers provided data directly to TenneT has increased slightly by approximately 0.4 GW to 17.5 GW. As a result, the degree of cover in 2005 amounts to 83%. The greater degree of cover is the result of requesting data from a larger group of producers (also see above).

The following points are important with regard to the development of the size of the national market (also see Table 6):

- to date, the actual demand for electricity has been determined in part on the basis of provisional figures issued by CBS (Statistics Netherlands). We have to use provisional figures because the definitive figures are frequently not available until much later. However, this monitoring shows that the definitive figures can sometimes vary significantly from the provisional estimates. For the actual market size we assumed in 2004 for the purpose of our 2004-2012 monitoring exercise, for example, we had to apply an upwards correction of approximately 2.1 TWh. This adjustment was necessitated by a substantial difference between the first CBS estimate of demand (published in the beginning of 2005) and the final CBS figures (issued after publication of the monitoring report in 2005). It can be concluded that the reliability of monitoring can be further enhanced if TenneT can obtain a better picture of current electricity consumption in the Netherlands. The extent to which this possible will require further examination;
- actual growth in 2005 (based on the initial CBS estimate) is approximately 0.5% higher than assumed for the purposes of last year's monitoring exercise;
- the size of the national market in 2006 and 2007 is based on CPB's most recent expectations of GDP growth in those years (issued in April 2006). Growth in those years is therefore higher, both in relation to the 2% increase assumed in the 'Green Revolution' reference scenario set out in the Capacity Plan 2006-2012 and in relation to our previous monitoring report.

Table 6: Assumptions concerning market size

Year	MONITORING 2003-2011		MONITORING 2004-2012		MONITORING 2005-2013	
	Growth of cons. [%]	Demand [TWh]	Growth of cons. [%]	Demand [TWh]	Growth of cons. [%]	Demand [TWh]
2003	1.09%	109.6	1.32%	109.8	1.32%	109.8
2004	1.25%	110.9	0.92%	110.8	2.83%	112.9
2005	1.50%	112.6	1.00%	111.9	1.53%	114.7
2006	2.00%	114.9	2.25%	114.5	2.75%	117.8
2007	2.00%	117.1	2.00%	116.7	3.00%	121.3
2008	2.00%	119.5	2.00%	119.1	2.00%	123.8
2009	2.00%	121.9	2.00%	121.5	2.00%	126.2
2010	2.00%	124.3	2.00%	123.9	2.00%	128.8
2011	2.00%	126.8	2.00%	126.4	2.00%	131.3
2012	2.00%	129.3	2.00%	128.9	2.00%	134.0
2013	2.00%	131.9	2.00%	131.5	2.00%	136.7

actual consumption/demand (definite CBS figures)
actual consumption/demand (initial CBS estimate)
forecast consumption/demand (based on CPB forecast)

Our views regarding the expected availability of cross-border transmission capacity for imports from Belgium and Germany have not changed compared with the 2004-2012 monitoring report². Therefore, we have again assumed an average maximum available capacity of 3350 MW up to the end of the surveyed period. The cable to Norway, with a nominal capacity of 700 MW, is expected to go into service in the second half of 2007. For that reason, we have factored it in for the first time in the 2010 reference year. The expected increase in import capacity resulting from the cable link to the United Kingdom is conditional, as no final decision has yet been taken on this connection. A positive decision means that the cable link to the UK is likely to be put into service after 2010.

² See the report on monitoring of reliability of supply 2004-2012, Annex 1.

5. Loss of Load Expectation (LOLE) method

We announced in the 2004-2012 monitoring report that we planned to use an alternative method to check the adequacy of the Dutch electricity production system in the future, in order to support the present method. The alternative assessment method is the so-called LOLE method (Loss of Load Expectation). This chapter summarises the results of the LOLE calculations and compares them to the results of the method currently used.

LOLE methods are probabilistic in nature. The principle is based on determining the probability that the available production capacity is insufficient to meet the total demand. By performing this calculation for numerous moments across a surveyed horizon, LOLE models can generate expected values for the amount of time within the horizon that production capacity will be insufficient to match demand. This is called the Loss of Load Expectation or LOLE for short. If the surveyed horizon is one year, for example, the LOLE value could be expressed as, say, one day per year. This is equivalent to 24 hours per year, or 0.27% of the time.

Our most important considerations for introducing the LOLE method were:

- Using the LOLE method enables us to verify the outcomes of the method we currently use. We need to have this option because of the great importance of monitoring the long-term reliability of supply.
- The LOLE method provides a basis for international comparisons. LOLE methods are used worldwide as an indicator of the adequacy of systems. Using similar methods also makes it easier to carry out joint system adequacy analyses together with other countries in the interconnected system.

5.1 Comparison of model results

Using the LOLE method we performed calculations using the same basic input. For the variant without imports and with the availability of means of production based on the historical average, we compared the results of the existing assessment method (degree of dependence on imports) with the results of the LOLE model (expected value for the number of hours per year that national demand will exceed national supply). Figure 6 shows the results of this comparison.

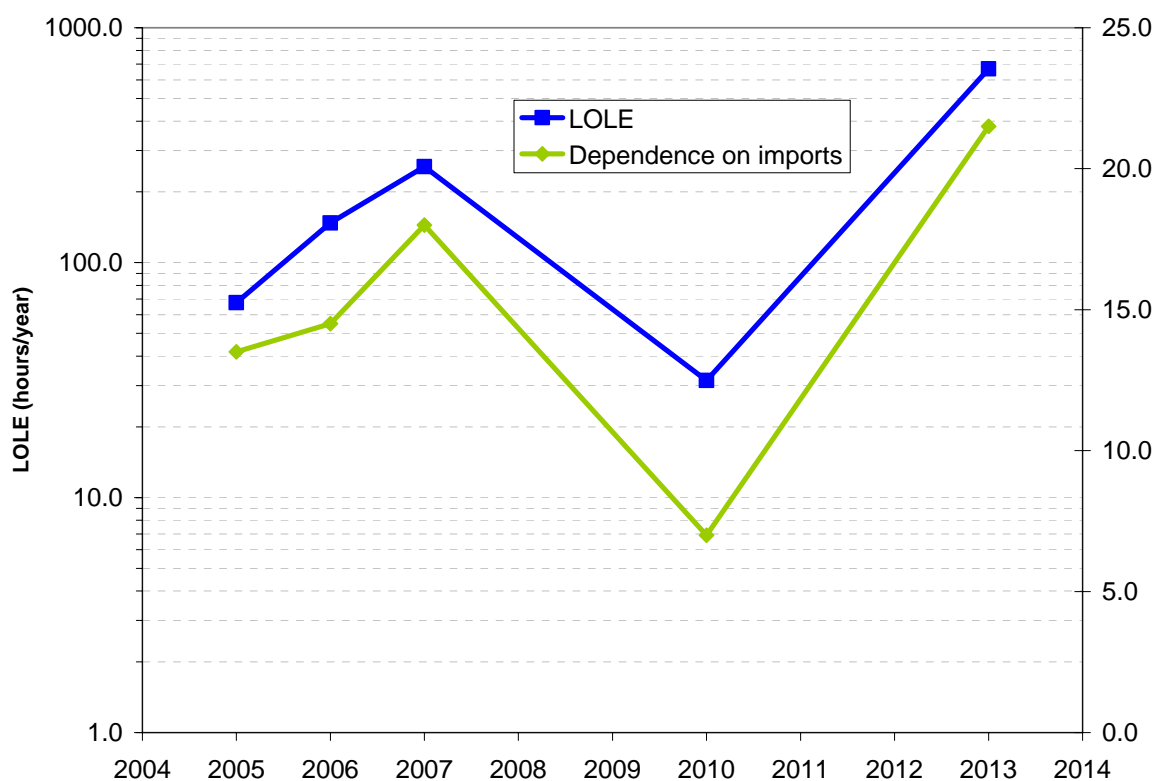


Figure 6: Comparison of results of existing assessment method with LOLE model, standard variant

It can be concluded that the two models produce a similar outcome. We also compared the results with other calculation variants and we consistently obtained similar outcomes.

6. Vulnerability of reliability of supply due to dependence on imports

The analyses show that the Netherlands depends on supplies from other countries for its reliability of supply. Dependence on imports is acceptable in principle, provided that we can rely on sufficient reserve capacity being available under all circumstances in our neighbouring markets to meet the national demand, together with the Dutch production capacity. Additionally, the various transmission grids and their interconnectors must provide sufficient capacity for the required transmission volume.

In order to estimate the extent to which the reliability of supply in the Netherlands is vulnerable due to dependence on imports, it is particularly important to know how much import capacity and reserve production capacity is reliably available in our neighbouring countries.

Production surpluses in the northern German grid mean that less and less of the nominally available capacity on the interconnectors with Germany and Belgium can be regarded as reliable import capacity. We took this into account when calculating the import capacity. For all the surveyed years, there is sufficient reliable import capacity to make up for the national shortage by means of imports. Consequently, the available reserves in our neighbouring countries are the decisive factor when it comes to determining the degree of vulnerability of the Netherlands due to dependence on imports. The UCTE System Adequacy Forecast is the best source of information that is currently available on the reserves present in the European system.

The most recent UCTE System Adequacy Forecast³ concludes, for the 'cautious scenario A', that sufficient reserves will be present in the system up to and including 2010. The forecast concludes that supplementary investments will be necessary in the period that follows. The main conclusions of the UCTE report include:

- (1) Over the period 2006-2008, the reliability of the UCTE system seems not to be at risk.***
- (2) In 2010, foreseen power plants commissioning helps to cover part of the load increase. However, the remaining capacity continues to decrease, but is still significantly higher than what is considered as a reasonable security margin.***
- (3) In scenario A confirmed investment decisions seem sufficient, at UCTE level, to allow a reasonable level of adequacy from now on to 2010. Nevertheless, security will be at risk after 2013-2014 if further investments are not decided in due time; the reliability of the UCTE system cannot be considered achieved at this time horizon.***

³ UCTE System Adequacy Forecast 2006-2011 (December 2005); see <http://www.ucte.org/>

The above conclusions apply to the entire UCTE system. The Energy Forum Group recently performed analyses using the UCTE method for a group of countries consisting of the Netherlands, Germany, Belgium, Luxembourg and France. The analysis shows that the reliability of supply will not be at risk up to and including 2008. From 2009 onwards, however, situations may occur where the reserve margin will be insufficient, making this group of countries jointly dependent on external imports. Precisely in those years the Netherlands will see an increase in the installed volume of production capacity.

This conclusion supports TenneT's analyses in previous monitoring reports. Those reports also concluded that in the medium term the Netherlands, Belgium, France and Germany will jointly be dependent on external imports if and when an above-average unavailability of the means of production occurs due to faults, overhauls or lack of wind or hydropower. At that time the internal bottlenecks in the German and Belgian grids will pose a real danger to the imports that the Netherlands will need from countries from outside the aforementioned group.

6.1 Cross-border analyses

The UCTE method provides a rough indication of the reliability of supply. There is room for improvement in the UCTE method in the following and other respects:

- One-year modelling period
The UCTE method examines two moments per year. It would be better to examine more, preferably all hours.
- Modelling of uncertainties
Taking account of uncertainties in the correct manner is important in order to form an impression of the reliability of supply in an electricity system. Important uncertainties include the load, the amount of wind, the unforeseen unavailability of power stations (failures), and the hydropower conditions.
- Modelling of the market
Better allowance could be made for the reactions of the demand and supply sides to market prices.
- Limitations in the transmission grid
These limitations could be better integrated into the model.

To improve the model it is important to possess a reliable and consistent data set. The Energy Forum Support Group 2 is taking steps to enable an exchange of information in the near future between a group of countries consisting of the Netherlands, Belgium, Germany, Luxembourg and France. Using their own methods, these countries will be able to perform analyses that cover their own electricity systems and those of neighbouring ones.

Due to the rough nature of the UCTE method, TenneT has decided to perform its own cross-border analyses. This will allow alignment to our own results and to those of neighbouring countries that use

the same method. These analyses will enable examination of the extent to which synergy effects are attainable for the reliability of supply, i.e. by regarding the various Western European systems as a single market. These synergy effects are likely to occur both on the demand side and on the supply side. A certain synergy may be expected on the supply side because, for example, a failure of a means of production can be compensated by reserves present in the systems of other countries. On the demand side, there is likely to be a certain lack of synchronicity in the various systems as regards the occurrence of high demand.

An initial step was taken this year by carrying out an analysis of the Belgian system for the first time. Our intention is to add more countries in the coming years so as to create a high-quality monitoring framework. We will report on these cross-border analyses in our next monitoring report.

Glossary

<i>Commodity capacity</i>	The installed and controllable national production capacity that according to reported information is likely to have 2000 or more running hours (controllable means the capacity can be switched on as and when desired).
<i>Commodity capacity usage factor</i>	The expected production (based on the results of the assessment method used) generated from commodity capacity as a proportion of the production at 8760 full-load hours.
<i>Contribution</i>	The contribution made by production capacity towards meeting market demand.
<i>Free space</i>	The annual average potential production of commodity capacity that is not utilised as a result of unavailability, no-load, the market and UCTE obligations.
<i>Full-load hours</i>	The quotient of the annual production and capacity of a unit.
<i>Renewables</i>	Installed national production capacity based on wind and solar.
<i>Market</i>	Size of national electricity consumption, including grid losses.
<i>Modelled imports (necessary)</i>	The shortage of supply from commodity capacity necessary to cover market demand permanently before gate closure (resulting in watertight electricity programmes)
<i>Modelled imports (sufficient)</i>	The shortage of supply from commodity capacity sufficient to continue meeting market demand permanently even after gate closure (resulting in ability to fulfil electricity programmes or maintain the balance)
<i>No-load</i>	The complement to the annual demand for capacity in relation to the 95 percentile value of the annual demand for capacity.
<i>Non-availability</i>	The sum of foreseen and unforeseen unavailability, expressed as a percentage.
<i>Non-operational capacity</i>	The installed and controllable national production capacity that is defective and/or has been conserved.
<i>Reserve capacity</i>	The installed and controllable national production capacity that is likely to have fewer than 2000 running hours, according to information provided by producers.
<i>Running hours</i>	The number of hours per year that a unit is in operation.
<i>UCTE obligations</i>	The operational reserve capacity that the Netherlands is required to maintain under UCTE agreements (mandatory primary and secondary reserves).