Experiences from the Netherlands regarding decarbonization & competitiveness

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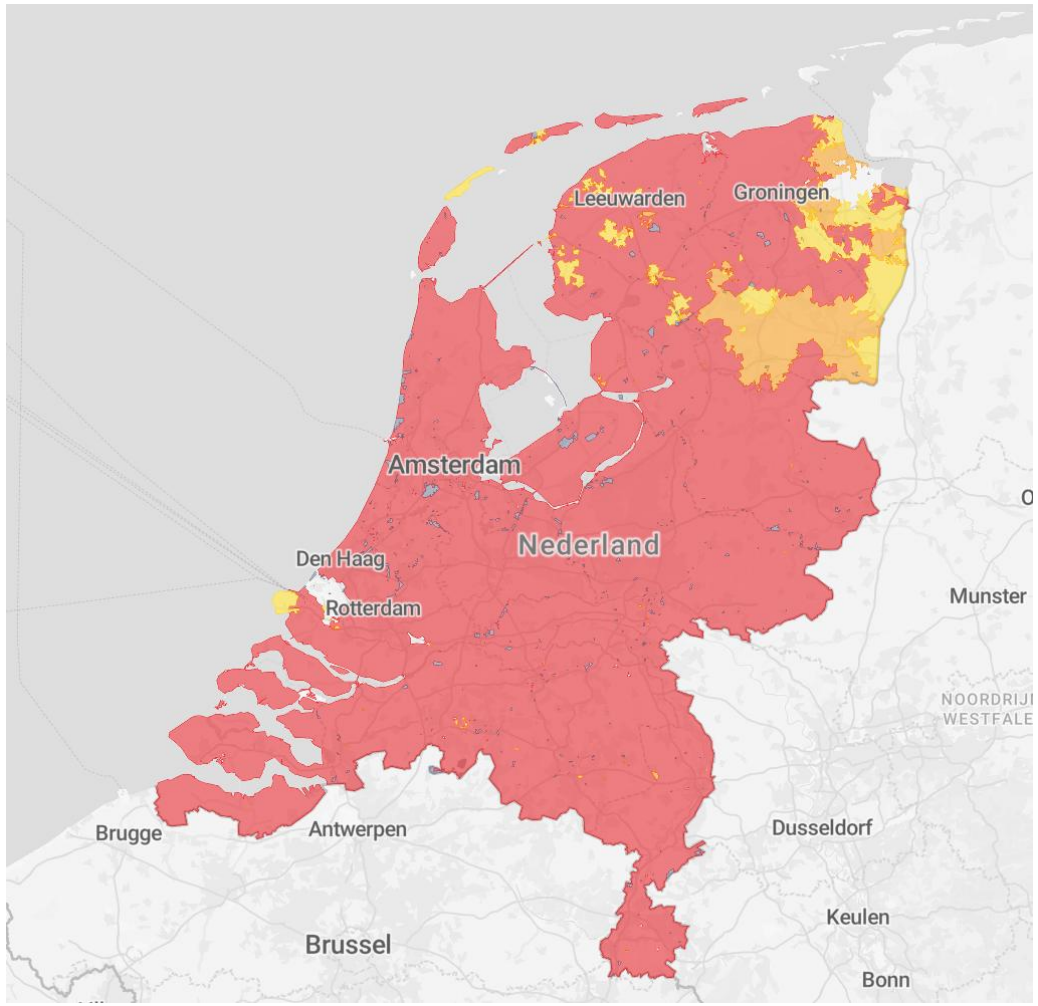
Grid congestion in the Netherlands is very severe (1/2)

The country is practically fully blocked for new grid connection applications



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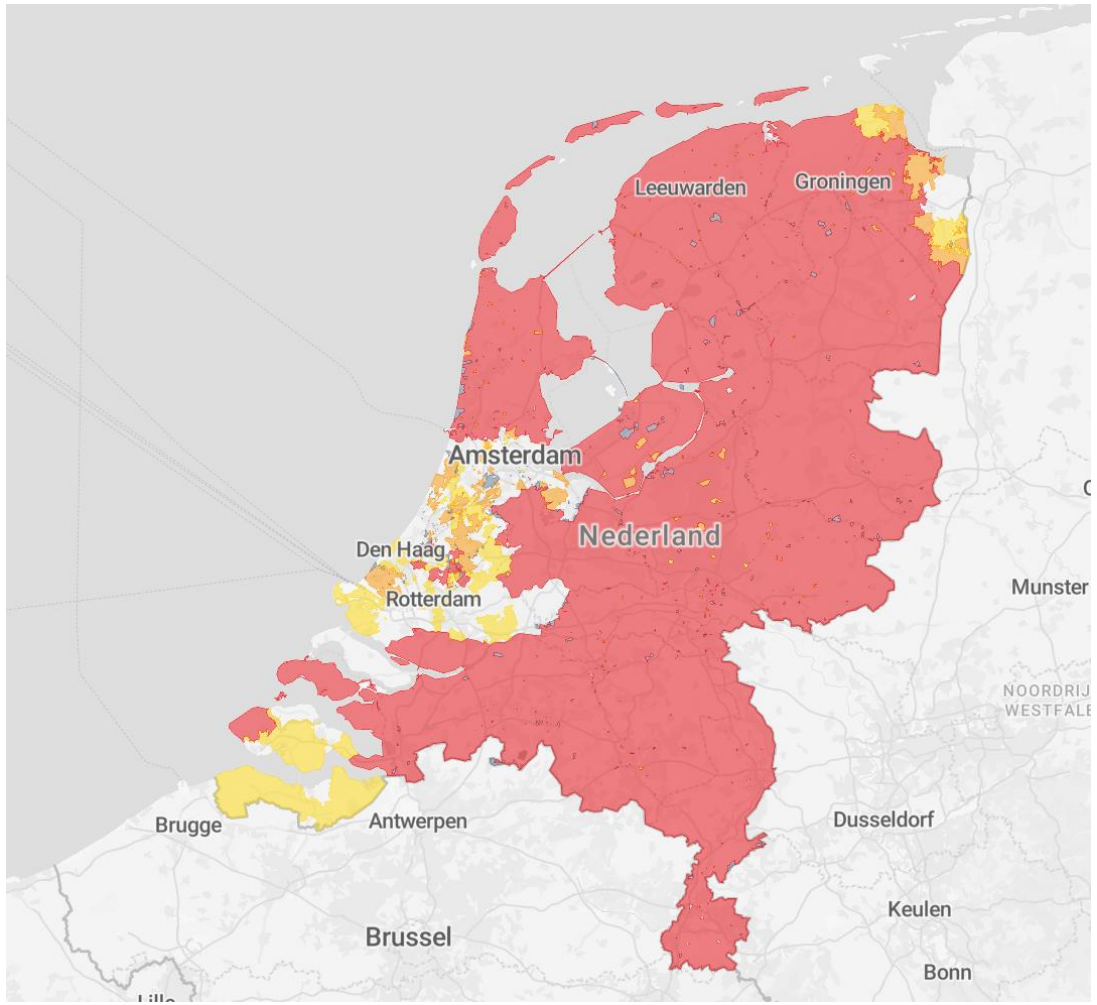

Generation

Source: Capaciteitskaart elektriciteitsnet | Totaal - Afname

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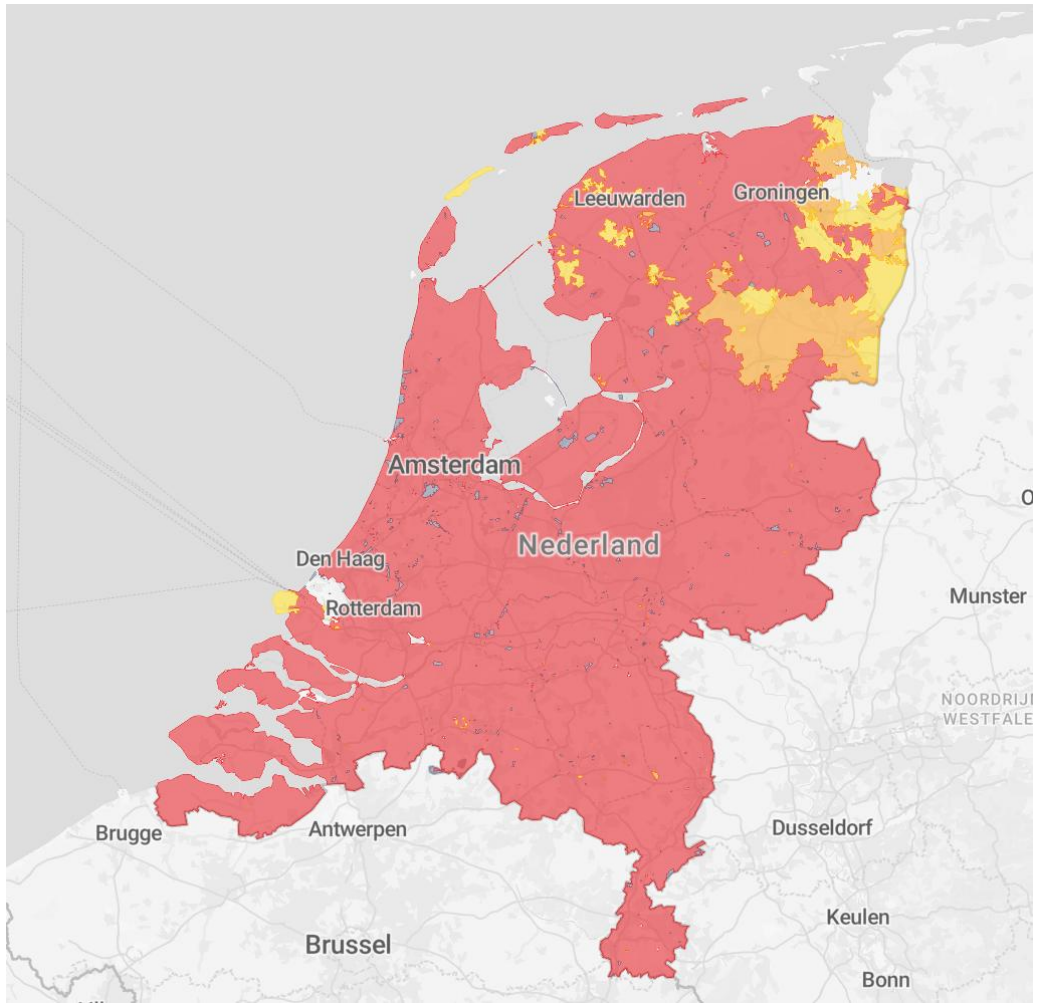

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Latest TSO update - June 2025 :

Power grid expansion plans delayed by years in large parts of Netherlands

The expansion of the high-voltage power grid in the provinces of Gelderland, Utrecht, and the Flevopolder has been ***delayed by at least four, but maybe six years***, grid manager TenneT announced.

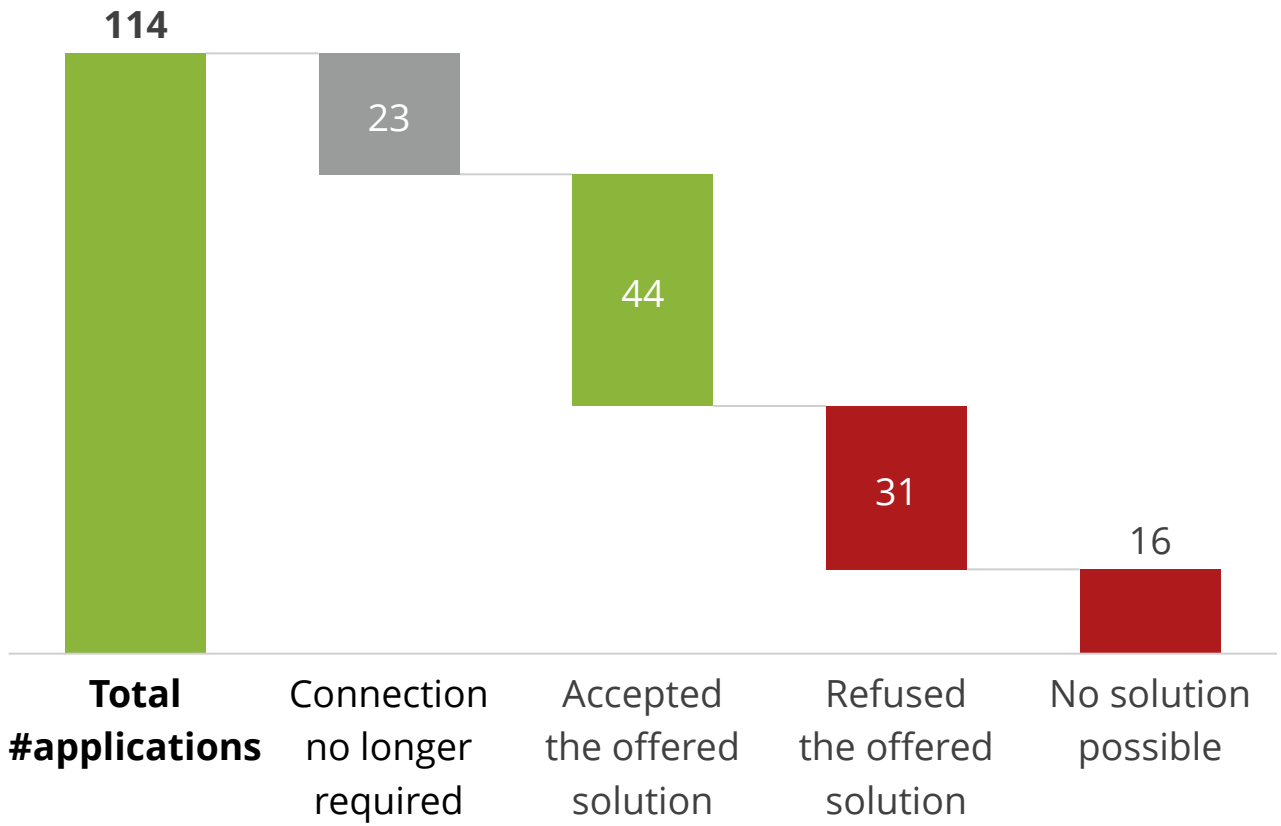
This means that large energy consumers like shops, businesses, and schools will have to wait longer for a new or stronger connection.

TenneT planned the expansion for **2029**. Now, the grid operator expects it to happen in **2033 at the earliest** and **2035** if there are more setbacks.

Congestion management | First results: we are learning

Efforts to try offer flexible contracts that are acceptable to our customers

Case study: Results for 1 substation (and its connection queue)



FIRST LEARNINGS:

There is a need to make our approach & product offering more customer-centric

Customer feedback:

- **Costs**: investments required to offer flexibility in the load are too large
- **Complexity**: solution is too complicated for the customer
- **Contract**: refusal to accept a liability (damages) clause in the contract
- **Baseload**: preference for 24/7 'firm' capacity
- **Uncertainty:** no estimates regarding the amount of 'curtailment' that is expected

Source: Gebiedsgerichte Aanpak | Beter Benutten Net | December 2025

Some thoughts (and current actions) on how to best resolve grid congestion challenges

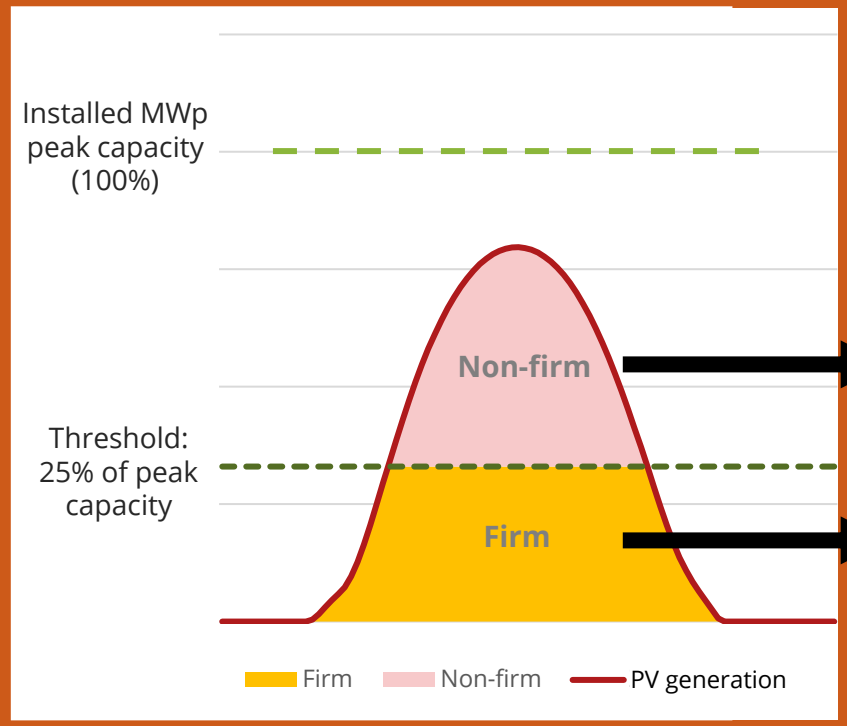
Firstly: facilitate grid expansion (building out the grid, as quickly as possible)

Short term actions	• **Improving congestion management**	improving products & approach, building new capabilities (forecasting curtailment etc), enhancing market
	• **Introducing Time-Of-Use grid tariffs**	for large customers, as well as households
	• **Adjusting risk-appetite**	applying less conservative methods
Longer term…	• **More fundamental changes in how we manage & utilize the grid**	ensuring we use all flexibility there is either via market or regulation
	• **"Normative" legislation on flexibility**	e.g. smart charging, curtailment, participation requirements, etc
	• **More focus on hybrid options for customers (electricity/gas) and ensuring flexibility in heat demand**	Heat storage, hybrid heat pumps, or E-boiler/gas-boiler hybridization

Example: Firm/non-firm concept for solar PV

Grid capacity that is partly firm and strikes a balance between TSO/DSO and renewables generation projects needs

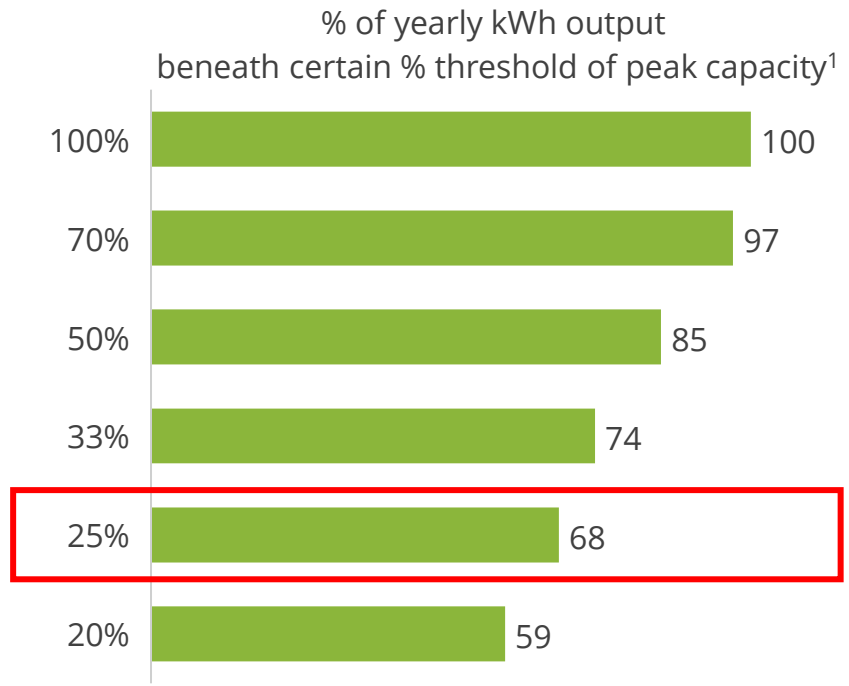
Firm/non-firm concept (firm up to 25% of peak capacity (MWp), non-firm above)



~30% of yearly kWh output can be put onto the grid if real-time situation allows

~70% of yearly kWh output can be put onto the grid at all times

Concept based on fact that most of energy output (in kWh) of PV generation sits in 'bottom part' of the curve over the full year



1 The exact amount depends on DC:AC optimalisation as well as orientation (south-facing or east-west, etc). Figures in this case are based on south-facing production facility with DC:AC optimalisation of 1 : 0,85. In the meantime, many large PV projects utilize a larger DC:AC overbuild ratio and also opt for east-west configuration rather than south, to optimize value of PV output. Such adjustments will ensure that a higher % of yearly kWh output falls into the 'firm' segment and will align with this concept to provide more certainty for the business case.

Questions?

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