



Ministerie van Klimaat en  
Groene Groei

荷兰气候政策和绿色增长部

## Congestion and instruments to incentivize local exchanges in electricity

荷兰的电网拥堵及激励地方电力交易  
的措施

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## Overview of Regulatory Environment

- > The electricity market in the Netherlands is **unbundled**: companies operating the electricity grids are separate from companies that trade, produce and sell electricity
- > The Netherlands has seven distribution grid operators (50-150 kV), one operator for the higher voltage grid on land (150-380 kV), one operator for the offshore grid and one operator connecting the Dutch electricity grid with the United Kingdom
- > All grid operators are legally owned by public entities (local or national governments)
- > Electricity is produced, bought, traded and sold on the private market by commercial companies. These companies are often owned by international companies, often owned by governments of other EU countries.
- > The electricity market is very competitive and customers can choose between many different suppliers
- > The Netherlands Electricity market is connected to markets in Norway, Belgium, Germany, the United Kingdom and Denmark via high-voltage transmission lines (interconnectors) and market parties trade freely between countries
- > *In principle, all grid operators must accommodate all connection and transport requests made by users and generators. There is no right to refuse. Grid operators can postpone requests while they work on expanding the grid.*

## 监管环境概况

- > 荷兰的电力市场是**非垄断式的**：电网运营公司与从事电力交易、生产和销售的公司是独立的。
- > 荷兰有七家配电网运营商（50-150 千伏）、一家陆上高压电网运营商（150-380 千伏）、一家海上电网运营商，以及一家连接荷兰与英国电网的运营商。
- > 所有电网运营商均由公共实体（地方或国家政府）合法拥有。
- > 电力由商业公司在市场上生产、购买、交易和销售。这些公司通常由国际公司拥有，通常由其他欧盟国家的政府拥有。
- > 电力市场竞争非常激烈，客户可以选择许多不同的供应商。
- > 荷兰电力市场通过高压输电线（互联线）与挪威、比利时、德国、英国和丹麦的市场相连接，市场参与者可以在国家之间自由交易。
- > 原则上，所有电网运营商必须满足电力用户和发电方提出的所有连接和运输要求，没有权利拒绝。电网运营商可以在扩大电网的同时推迟接电要求。



# The problem of grid congestion

- > The Netherlands faces increasing **problems with grid congestion**.
  - > This means the **capacity of the grid is often not sufficient** for transporting electricity from producers to users
  - > **Why** has this happened?
1. Increases in **renewable energy generation**:
    - To reach international and European climate- and energy goals, the Netherlands has subsidized the generation of renewable electricity. Renewable electricity has increased from 12% to 50+% between 2015 and 2024.
    - Specifically the amount of solar has increased very fast: from 1 TWh to 20+ TWh within the same time period.
    - New solar plants have been build mostly in rural areas, where historically grid capacity has been low (north, east and south of NL)
    - Thus many new investments are necessary to upgrade electricity infrastructure
  2. **Industry** switching from gas to electricity (electrification)
    - Because of higher gas prices (after start of the Russian-Ukraine conflict)
    - Because of a willingness or need to make production more sustainable
    - Unfortunately, existing industry is geographically distant from solar (generally west)
  3. **Electricity infrastructure expansion** is difficult
    - Permitting procedures slow down expansions
    - The Netherlands is very densely populated and there is always "competition" for use of (public) land

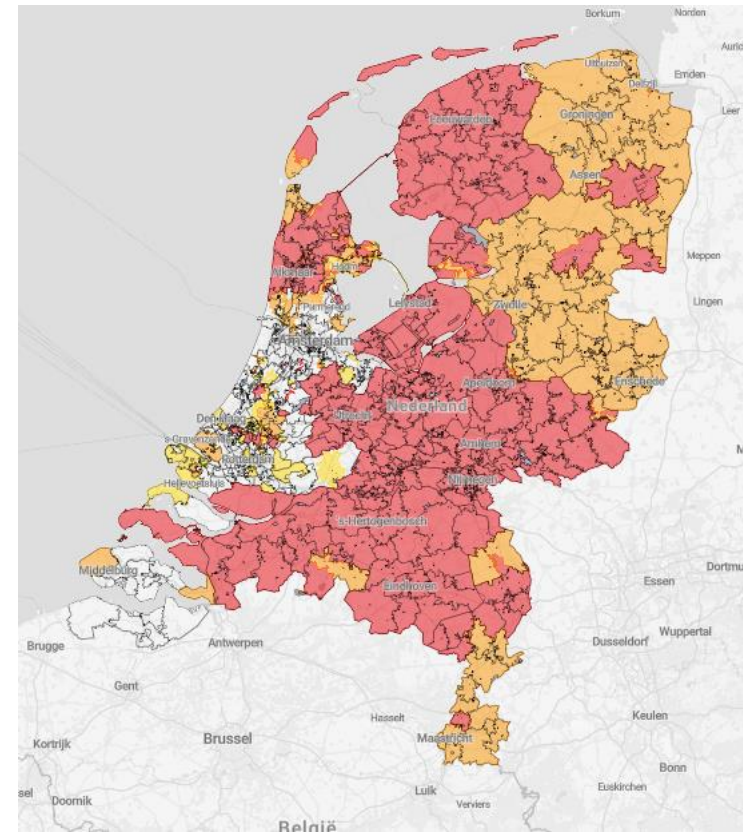
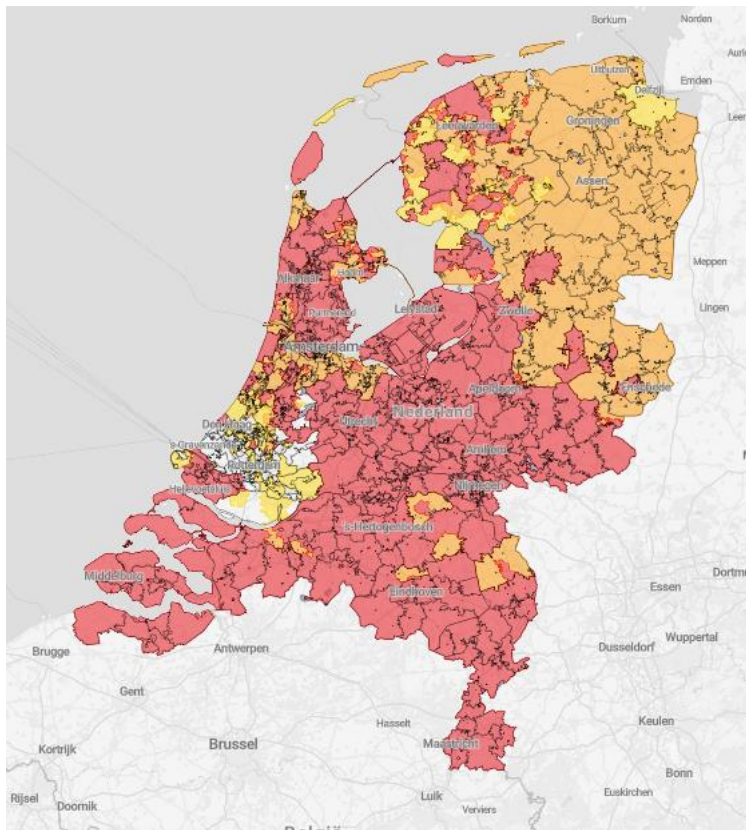
# 电网拥堵问题

- > 荷兰面临着日益严重的**电网拥堵问题**。
  - > 这意味着**电网容量往往不足以**将电力从生产者输送到用户手中
  - > **为什么会发生这种情况?**
1. **可再生能源发电的增加**:
    - 为了实现国际和欧洲的气候和能源目标，荷兰为可再生能源的生产提供补贴。从 2015 年到 2024 年，可再生能源发电的比例已从 12% 提高到 50% 以上。
    - 特别是太阳能发电量增长非常快：在同一时期内从 1 TWh 增加到 20TWh 以上。
    - 新建的太阳能发电厂大多建在农村地区，而这些地区的电网容量历来较低（荷兰北部、东部和南部）。
    - 因此，需要许多新的投资来升级电力基础设施。
  2. **工业从天然气转向电力（电气化）**
    - 因为天然气价格上涨（俄乌冲突开始后）
    - 出于将生产变得更可持续的意愿或需求
    - 但是，现有工业基地在地理上距离太阳能发电区（一般在西部）较远。
  3. **电力基础设施扩建困难重重**
    - 审批程序使扩展速度缓慢。
    - 荷兰人口稠密，使用（公共）土地时总是存在“竞争”。



# Grid congestion in the Netherlands

## 荷兰电网拥堵问题





# Solutions

- › **Grid expansion** is the long term solution. However, this will take **a lot of time**
- › In the meantime, we are creating **instruments that incentivize generators and users** to make more **efficient use of the existing grid**
- › These are instruments that reward generators and users when they **match supply and demand locally**, so the grid does not become congested

# 解决方案

- › 长期解决方案是**扩大电网**。然而，这需要**大量时间**
- › 与此同时，我们正在创造**各种工具**，**激励发电商和用户更有效地利用现有电网**
- › 当发电商和用户在**当地实现供需匹配**时，这些工具会对发电商和用户进行奖励，从而避免电网拥堵



# Instruments

## Individual solutions

- > **Capacity Restricting Contracts:** Contracts that require generators to lower their peak generation in return for a financial compensation
  - Example: Solar asset (partially) turns off their panels by request of the TSO when grid congestion occurs
- > **Non-firm transport rights:** contract that limit the right to feed in electricity to certain moments during the day, week or month, avoiding the peak moments in the grid
  - Example: A small production unit doesn't get grid access between 4pm and 9pm, they bridge the gap by adjusting their production processes (and not using the grid) and/ or including a small battery
- > **Time of Use network tariffs:** network tariffs to stimulate grid users to change their profile to the non-peak moments
  - Example: A grid user pays a lower network tariff for grid use in the first half of the afternoon, when less transport capacity is required from the grid (due to less overall demand and higher local supply), stimulating grid users to shift their demand to cheaper hours

# 措施

## 个性化解决方案

- > **签订容量限制合同:** 该合同要求发电方在高峰时段降低发电量以换取经济补偿
  - 示例: 当电网出现拥堵时, 太阳能发电应输电系统运营商的要求部分关闭。
- > **非固定输电权:** 该合同将输电权限制在一天、一周或一个月中的特定时段, 避开电网的高峰时段。
  - 示例: 一小型生产单元在下午4点至9点之间无法接入电网, 他们通过调整生产过程 (不使用电网) 和/或使用小型电池来填补这一电力缺口。
- > **分时电价:** 该电价鼓励电网用户将用电模式调整到非高峰时段
  - 示例: 电网用户在下午前半部分使用电网时支付较低的电网费, 此时对电网的输送能力要求较低 (因为总体需求较低, 而本地供应较高), 从而刺激电网用户将需求转移到费用较低的时段





# Instruments

# 措施

## Group solutions

- › Group Capacity Restricting Contracts: Contracts that ask a group of generators to lower their peak generation in return of a financial compensation, the group can decide who follows the request
  - Example: a group of generators (for example a small wind farm and three locations of solar on rooftops) in the same grid area get a shared request to lower combined production, based on mutual agreements the wind farm or solar panels shut down
- › Group Transport Agreement: a group of grid users get a shared right to a contracted maximum capacity and together how, when and who has the right to use the transport capacity
  - Example: a group of companies (generators and off-takers) contract one shared volume of transport capacity based on actual individual grid use profiles; by optimizing their profiles, companies can increase their required transport capacity without the need for others to scale down their required transport capacity

## 集体解决方案

- › **集体容量限制合同**：该合同要求一组发电商降低其峰值发电量，以换取财务补偿。具体的执行方由该发电商组决定。
- › **示例**：在同一电网区域内的一组发电商（例如一个小型风电场和三个屋顶太阳能发电）收到一个共同请求，要求降低整体发电量。根据相互协议，关闭风电场或太阳能发电。
- › **集体输电协议**：一组电网用户共同获得协议的最大输电容量权，并共同决定如何、何时以及谁有权使用这一输电容量。
- › **示例**：一组公司（发电方和购电方）根据各自的电网使用情况，签订一个共享的输电容量合同。在优化使用情况后，各公司可以增加所需的输电容量，而无需减少其他公司其所需的输电容量。