

Our performance 2023



Deliver a high security of supply

Our role as transmission system operator (TSO) is to deliver a high grid availability, while securing electricity transmission to more than 43 million end-users in the Netherlands and a large part of Germany. We are committed to this critical task today and tomorrow, as well as during a period of major change in energy supply mix and high volatility in energy markets.

A secure and stable supply of electricity is an essential component of modern, developed economies. It powers economic growth, fuels industrial activity and technological innovation, supports essential infrastructure and public services, and underpins national security and international competitiveness.

TenneT has a reliable record of providing a stable and secure supply of electricity, with an onshore service level as high as 99.99993%. To keep the lights on at all times, we design, build, maintain and operate our high-voltage grid, transmitting electricity from where it is produced – which includes an increasingly high proportion of renewables – to where it is consumed. Our grid spans over 25,000 kilometres of high-voltage connections, both onshore and offshore, across borders, above (via overhead lines) and below ground (via underground cables).

To secure the supply of electricity, now and in the future, requires fundamental adjustments to the way we design and operate the grid, for example through new developments in electricity storage and demand-side

response. The goal of a sustainable energy future depends on the development of this new energy system. As such, through our critical work and infrastructure, we directly contribute to Europe's ambition to be the world's first climate-neutral continent by 2050.

At the same time as building the energy system of the future, we need to ensure our existing grid can cope with the rapid growth of renewable energy sources and the fast-rising demand for electricity as society progresses in the energy transition. Ongoing grid reinforcement, maintenance, and system operations developments are critical for this, particularly when it comes to relieving the growing congestion we see in our grid.

As such, TenneT faces an ongoing balancing act: securing the supply of electricity today and tomorrow, including relieving the pressure on the existing grid as it comes under more pressure, as well as driving the energy transition and doing so at an acceptable cost for society.

Our performance in 2023

Onshore grid availability

Performance	Target	Status	Trend
99.99993% NL: 99.99993%, DE: 99.99999% 2022: 99.99963% 2021: 99.99999%	99.99962%		Despite some outages we had, we were proud that our people were able to further improve our onshore grid availability.

Offshore grid availability

Performance	Target	Status	Trend
97.90% NL: 99.01% DE: 97.37% 2022: 94.08% 2021: 94.09%	95.07%		As we experienced fewer outages this year with our offshore assets, we also saw an improvement of our offshore grid availability this year, in comparison to last year.

Secure supply today

During 2023, our people worked hard to ensure a secure supply of electricity in our service areas, with as a result a high availability of 99.99993% for our onshore grid and 97.91% for our offshore grid. During 2023, TenneT implemented additional measures to prevent power outages, in a commitment agreed with the Dutch Authority for Consumers and Markets (ACM). Structural measures, such as improved security procedures, are designed to prevent future outages as much as possible.

Still, there were a few instances where we unfortunately experienced an outage, for example at our Breukelen substation in Q1 2023. This interruption occurred as a line was damaged and affected around 35,000 customers. Our colleagues worked hard to quickly resolve this matter and this outage was resolved after 12 minutes. Despite these outages, we are proud of the grid availability our people managed to secure.

After the energy crisis in 2022, the markets found more stability in 2023 and the pressure on energy system adequacy eased. Concerns that the war in Ukraine would impact energy system stability in winter 2022/23 were thereby mitigated.

However, although security of supply was less affected by geopolitical tensions and energy market disruption in 2023, after the winter period, grid congestion, particularly in the Netherlands, persisted this year and became more severe.

Tackling congestion in the Netherlands

As Europe strives to achieve its 2030 and 2050 climate targets, the increasing production of electricity from renewable energy sources, as well as the increasing electrification from industry, is so high that grid operators, including TenneT, cannot always provide sufficient capacity at the desired pace. On very windy or sunny days, too much renewable infeed can create congestion as there is insufficient transmission capacity to carry the amount of electricity being generated. In this case, we have to take operational measure to safeguard the grid. New customers will have to be placed in a queue until the grid is reinforced.

Similarly, on the demand side, congestion problems can occur when electricity cannot be transported to the demand location. This is why TSOs and DSOs have to put new customers on a waiting list until the necessary grid enforcements are ready.

In 2022-2023, the exponential growth in new grid connection requests from customers, as well as the growth in capacity of existing connections, was a particular cause of congestion. Customer requests are either for new grid connections – such as wind farms, solar parks, electric vehicle charging stations and battery storage facilities – or from customers that wish to enlarge their connection capacity, such as factories that are electrifying their production processes. Sometimes, customers (for various reasons) submit multiple grid connection applications, while only needing one connection, or request more capacity than they actually need.

Although TenneT anticipated higher electricity demand and has been rapidly expanding and strengthening its grids for over 13 years, grid congestion has still been partly unavoidable. In 2023, TenneT had to announce additional grid congestion areas, in almost all provinces in the Netherlands. We see this issue also becoming more severe for the DSOs, like Stedin, Alliander and Enexis.

To increase the transmission capacity in these areas and relieve and avoid congestion our main task is to expand and reinforce the grid. Over the next ten years, we are investing several billions in our onshore grid every year. But as these works often take several years to complete, we look for more short-term measures too. Congestion management studies, together with regional DSOs, help to identify additional available transmission capacity and measures to be taken to relieve congestion.

TenneT is increasingly working with local stakeholders, including government and municipalities, and DSOs to make targeted choices that relieve congestion where it is most necessary and use the existing grid capacity as efficiently as possible.

An example of this collaborative approach can be seen in a taskforce TenneT joined in 2021 with the Municipality of Amsterdam, Port of Amsterdam, and grid operator Liander. The task force has called for an integrated plan for all Amsterdam energy projects, with multidisciplinary collaboration and standardised processes to allow for faster completion of electricity infrastructure.

In cooperation with existing customers, we are also working on a measure called "rush hour avoidance", whereby customers are compensated for reducing their electricity production or consumption at peak times. A study into how many companies may be interested in this scheme was published in late 2023. The Dutch government may incentivise more customers to provide flexibility in this way, with new legislation being introduced that would require companies with demand exceeding 1MW to explain how they can participate in congestion management.

Another temporary solution to decrease the impact of congestion was adopted by ACM in 2023. This is designed to allow system operators to prioritise projects that solve or limit congestion in the grid, thereby deviating from the first-come-first-served principle. In addition, ACM aims to allow grid operators to give grid connection priority to projects with a social function, such as housing, security services, healthcare or schools.

Securing supply tomorrow

To support Europe's net zero climate targets, we have launched our Target Grid 2045 strategy, with the objective of having a future-proof electricity grid in place by 2045. This will be capable of supporting a sustainable economy, with a reliable and secure supply of green electricity for all users, from consumers to industry.

Flexibility is critical to meeting these challenges, not only related to more effective and efficient use of our assets, but also to boost our system operations and improve market design. There are three focus areas that will be essential for securing supply in the future by facilitating flexibility in demand and supply: grid reinforcement, developing system operations and market integration.

Flexibility

Flexibility is how TSOs refer to using on-demand energy sources to keep the grid secure and in balance at all times. At times of grid congestion, a TSO uses flexible power sources to activate redispatch. When there is not enough generation contributing to dynamic voltage control, flexible power sources are activated to compensate, such as synchronous generators. As such, flexibility installed in the system is essential for keeping the lights on 24 hours a day, 365 days a year.

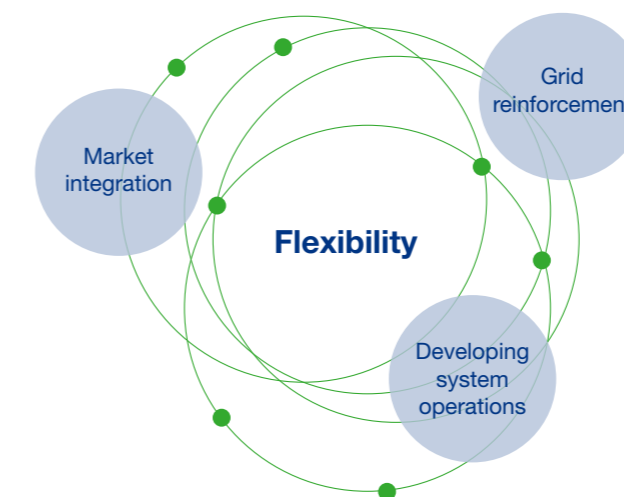
For this reason, TSOs are looking for new, diverse and reliable sources of flexibility. Solutions to store electricity in energy carriers, like battery energy storage systems and hydrogen, are an important area of focus, as are sources of distributed energy storage, such as electric vehicles and home batteries.

The increasing installation of mega-battery systems is a particularly promising source of flexibility, with estimates projecting that 9 GW of battery capacity will be needed (in strategic locations) in the Netherlands by 2030. This is equivalent to nine gas-power plants. In Target Grid we even anticipate 150 GW batteries to be connected to the German part of our grid and approximately 60 GW battery capacity in the Dutch part of our grid to be connected by 2050.

As connection applications for new battery facilities total more capacity than is needed, or are too concentrated in a certain location and thereby add to grid congestion, TenneT is working to advise on where they should be best located. For example near wind- or solar parks as well as where existing high voltage stations are already located. Location is an important factor, as it can increase or relieve pressure on the transmission system, making it critical for both security of supply and affordability. [A map on our website](#)

shows exactly in which province in the Netherlands we expect what battery capacity is needed for system stability by 2030. In this way, we hope that mega-batteries can become an important source of flexible power, planned in a way that reduces congestion and supports the electrical system across the country.

Our three focus areas



Grid reinforcement

The future energy system requires substantially more transmission capacity from the electricity grid, to enable the transmission of higher volumes of renewable power, over longer distances, and to accommodate for the electrification of society. Additionally, the increased system dynamics and need for flexibility in the future energy system require the strengthening and modernisation of the grid. This is the aim of grid reinforcement.

With many of our assets dating back to the previous century, and designed to serve a traditional energy system, substantial work is underway in the Netherlands and Germany to deliver these grid reinforcements (see also the chapter "Ensure a critical infrastructure for society").

A good example can be seen in the North Holland province, where we plan to expand our high-voltage grid, with the construction of a new 380 kV connection. This is urgently needed as North Holland is seeing a tremendous increase in electrification in the past years, and is also strategically important for connections to new wind farms in the North Sea.

In Germany, one of the main aims of the Westküstenleitung project is to strengthen the local grid for increasing amounts of renewables.

Construction and modernisation of substations also play an important role in grid reinforcement. In particular, we need new high-performance transformers to enable the integration of renewable energies via the distribution grid into the transmission grid. We are investing in new operating equipment that helps to stabilise the grid in the context of high renewable in-feed, including plans for new STATIC synchronous COMPensators (STATCOMs). These devices help to regulate voltage at the point of connection to the power grid.

Due to the high infeed of renewable energy sources, TenneT is experiencing periods with high voltage levels. To provide reactive power compensation and keep the system voltage within limits, TenneT recently signed a EUR 1.9 billion framework agreement, with Siemens Energy, Hitachi Energy, GE Grid and Royal SMIT to supply 110 compensation coils and 160 power transformers for use in the Netherlands and Germany.

Market integration

Market integration is key to creating a single and interconnected European electricity market. Having realised 17 interconnectors with grids from other TSOs, and also with our offshore portfolio, TenneT is ideally positioned to play a leading role in this development.

The creation of an integrated electricity grid in the North Sea is key to this European market. In 2023, important steps were taken towards this as TenneT joined the German Federal Ministry for Economic Affairs and Climate Action, along with other TSOs to present initial plans about the North Sea electricity grid.

The build-out of offshore hubs, configured with hybrid interconnectors into a meshed DC overlay grid, could eventually form the backbone of a North Sea renewable energy powerhouse for Europe. By connecting offshore wind farms and creating an interlinked offshore and onshore high-voltage grid we aim to ensure reduce greenhouse gas emissions, greater security of supply, increased spatial efficiency, and considerably reduced costs.

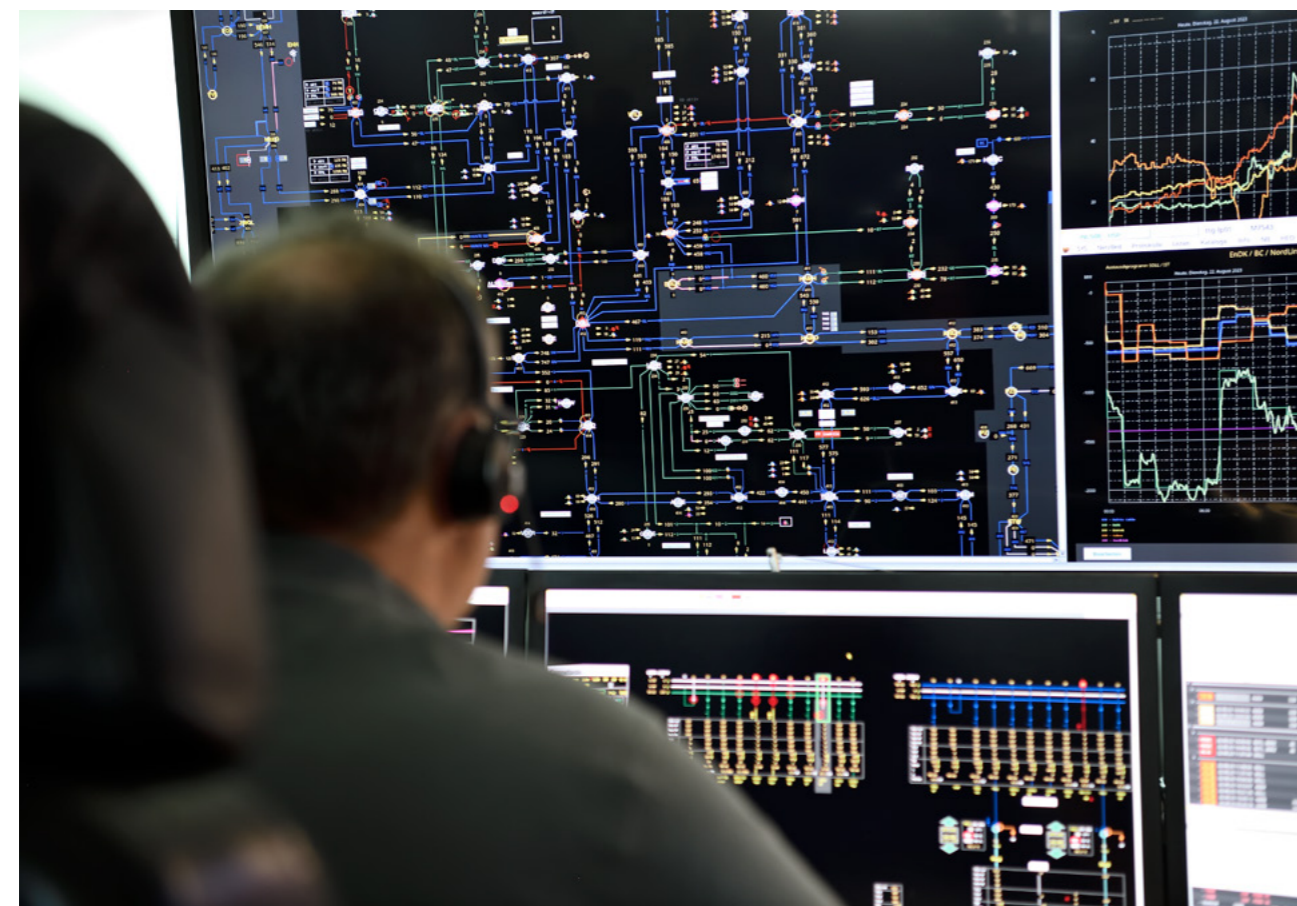
In 2023, TenneT and National Grid Ventures took an important first step towards an integrated North Sea grid with the announcement of a project to develop a multi-purpose interconnector between the UK and the Netherlands. Called LionLink, the project is referred to as a hybrid interconnector because it will connect the two countries via a Dutch offshore wind farm. With a capacity of 2 GW, LionLink will support decarbonisation and energy independence, and strengthen British, Dutch and European security of supply. The hybrid interconnector would be the first of its kind for the UK and the Netherlands. TenneT anticipates that over time more hybrid interconnectors such as this will link more North Sea wind farms and more North Sea countries.

Market design

In March 2023, the European Commission published a legislative proposal to reform the design of the European electricity market. In the targeted regulation, the EU aims at boosting renewable energy investments, improving protection for EU consumers and enhancing the competitiveness of EU industry. As the reform will lead to amendments of the Electricity Regulation, the Electricity Directive, and REMIT regulation, the legislative changes will

impact the whole energy sector, including the activities of TenneT and other TSOs. TenneT is actively contributing to the process through extensive stakeholder dialogue and providing feedback to the German and Dutch ministries of Economic Affairs on a regular basis. Changes will come into force in 2024, with changes expected to include reducing the cross-zonal gate closure time of the intraday market and improvements to the forward market.

In Germany, TenneT is actively contributing to the Climate-Neutral Electricity System Platform. This was designed to bring together stakeholders from politics, science, business and civil society in order to develop concrete proposals for an enhanced market design. TenneT is involved in working groups to build a future-proof vision of market design, focused on the funding of renewable energies in the long-term, the funding of controllable capacities, the expansion of flexibility options and incentives for investment. Incentives for investments in new hydrogen and gas power plants are being further developed in the new power plan strategy (Kraftwerksstrategie) launched by the German Ministry of Economic Affairs and Climate Action.



Developing system operations

As well as grid reinforcement and facilitating the electricity markets, we must also invest in new concepts for operating the grid, to operate a more dynamic system and making more efficient and optimised use of our system through new, including digital, solutions.

An important development to make our system operations resilient for years to come is the Control Room of the Future (CROF) programme. The CROF has the ambition to develop methodologies, processes and tools in order to guarantee excellence at system operations, including improved forecasts, dynamic security assessment, inertia monitoring, and topology optimisation. This essential project also helps us increase grid utilisation and automation, by making TenneT's grid control centres future-proof and equipped to manage our increasingly data-driven grid.

In 2023, an important first step was taken in the CROF project with the go-live of the first part of our new EMS/Scada system which we use to maintain balance in the grid. This replaces the old end-of-life EMS/Scada system.

We are working with other stakeholders in projects under the CROF umbrella. An example of this is an exploration into how artificial intelligence (AI) applications can enable and improve the tools. Another project under CROF is the creation of a "digital twin" of our grid infrastructure, allowing us to replicate the real-world system and its behaviour, including stability analysis of the grid with a high penetration of renewable energy sources.

To this end, our Control Room of the Future project plays a critical role. With this, we are making TenneT's grid control centres future-proof and equipped to manage our increasingly data-driven grid. The project will also help us to increase grid utilisation and automation (for more information see "Solve societal challenges with stakeholders and through partnerships").

Also in 2023, we took important steps in the Allocation 2.0 Programme. This aims to improve our electricity allocation system to facilitate a more future-proof energy market. Together with sector parties we work together to have more accurate, measured and timely data about the energy market.

System resilience

Our transmission grid is a critical infrastructure and the backbone of economic and social activity. As such, it requires maximum protection from risks and threats. This protection is not only essential to guarantee national security, but also to maintain the grid availability levels that our end-users expect from us.

Risks and threats can occur both gradually or suddenly, and derive from internal or external factors. Our ability to react and adapt to them is our organisational resilience. This resilience is not built through a single management system, but arises through the interaction of various management disciplines. TenneT considers information security, business continuity and crisis management as cornerstones that together create resilience.

Information security

European grid operators increasingly face security threats, particularly in the realm of physical threats and cybersecurity. This year, TenneT was involved in a data hack with one of our suppliers. This again stressed the need for constant vigilance and protection of our critical infrastructure (including our IT and OT networks). With an increasingly digitalised transmission grid, the risks of cyber threats grows proportionally. Therefore, digital security and risk management is a key aspect of every new project.

We work together with authorities on security and fulfil all legal requirements. In Germany, TenneT is certified according to the BNetzA IT security catalogue, based on the ISO 27001 security standard. We also apply this standard in the Netherlands to further develop our management system on security.

Business continuity

In addition to security threats we also take other factors into account to ensure system resilience, including risks related to climate-related events and other environmental conditions. TenneT cooperates with relevant stakeholders, including governmental institutions and DSOs, to assess the risks and potential impact of climate-related events on our assets. Such risks are also taken into account when designing new assets. More information about managing climate-related events can be found on page 109.

Crisis management

We also prepare ourselves for situations where existing emergency measures are no longer sufficient. In those situations our crisis management organisation must decide on appropriate measures on an ad-hoc basis. To ensure our capability to manage this, we staff, onboard and extensively train our crisis management organisation throughout the year, and ensure the facilities needed to enable our crisis management personnel. We also exchange our knowledge and contribute to crisis exercises in our sector and on national and international level.

Together, these three elements are the foundations for how we ensure system resilience and the security of our system in general.

What could prevent us from reaching our goals?

Increasing congestion in areas of our high-voltage grid, and therefore limitations for connecting customers, is a growing risk to security of supply – particularly in the Netherlands, but also increasingly in Germany.

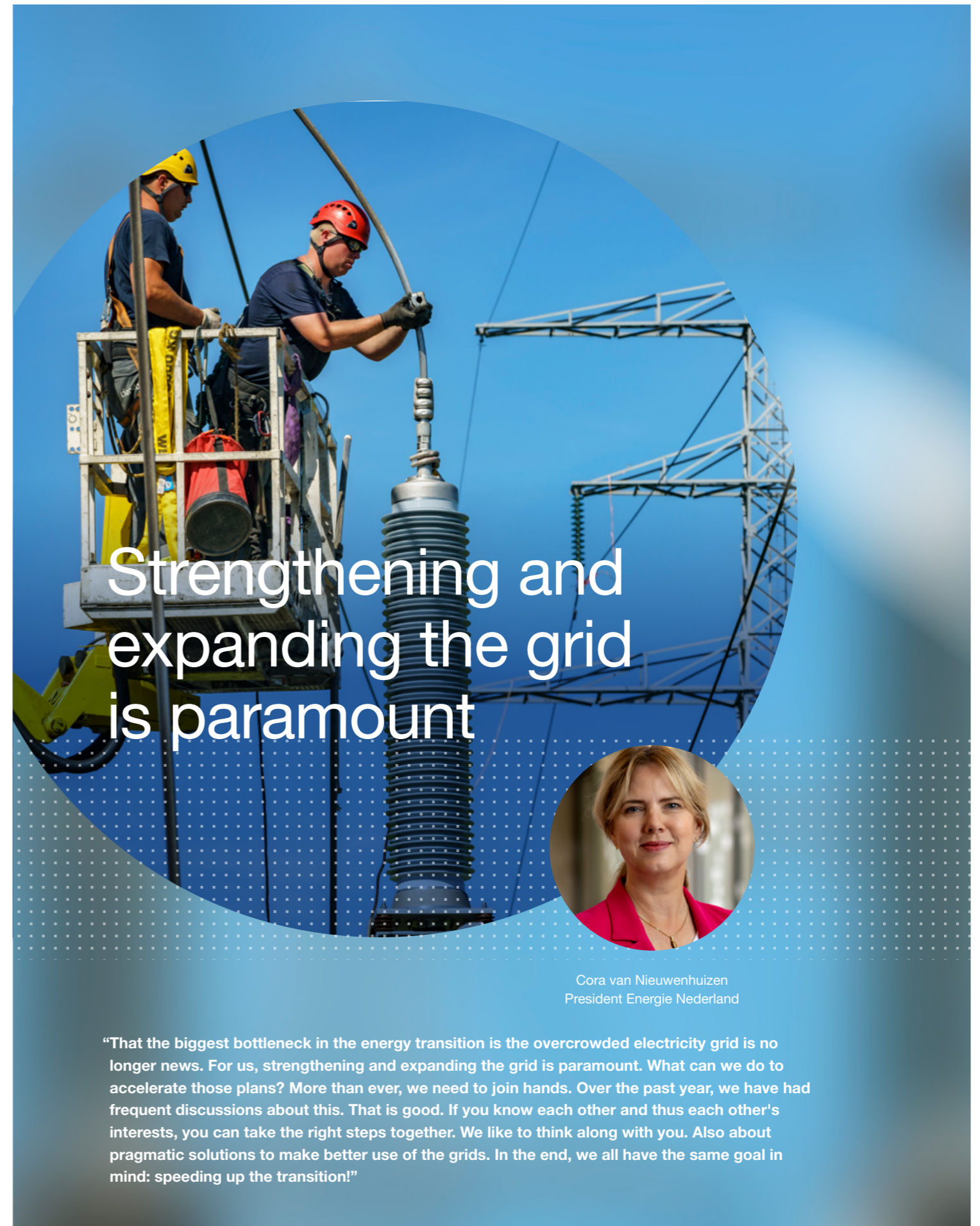
TenneT’s inability in some areas to connect customers to our grid in a timely manner, as is legally required, could not only result in disappointed customers but also in, for instance, damages and negative publications. One of the mitigation actions we take is to connect customers based on prioritisation instead of a first come first serve basis, as this would lead to a more efficient way of working and could help reduce the lead time with several months.

Another important risk regarding security of supply is asset or system failure, causing power losses. Power loss or interruption could also result from inadequate, delayed or unperformed maintenance of our assets, or an unbalanced prioritisation between new projects and maintenance. In this regard, optimisation of outage planning is key, alongside risk-based maintenance scoping and improved training.

Ancillary services options are another factor that could affect our plans. Our ability to execute ancillary services could be affected by limited availability of interconnected power in Europe or significant increases in traded power prices. Developing international market platforms with other TSOs and market parties will help to overcome this challenge.

As we are responsible for critical infrastructure, we are alert to the risk of cyber threats, resulting in unavailability of critical IT and OT systems, data loss, hardware failure and compliance risks. Equally important is the physical protection of our assets against sabotage, theft or hardware failure. By proactive compliance management, our security monitoring and monitoring of our incident response capabilities, we mitigate these risks where possible.

Major project delays are an ongoing risk. These can be caused by, for example, scope changes, delayed permitting procedures, environmental restrictions (such as with NO_x emissions), scarce resources and issues with recruiting suitable staff. Project delays could lead to penalty payments, higher project costs and reputational damage to TenneT. Increased standardised engineering and sourcing concepts – as is done with the 2GW Program – help to mitigate these risks, as does close collaboration with all project stakeholders and dialogue with regulators, ministries and government agencies as well as with TSOs and other market parties.



Strengthening and expanding the grid is paramount



Cora van Nieuwenhuizen
President Energie Nederland

“That the biggest bottleneck in the energy transition is the overcrowded electricity grid is no longer news. For us, strengthening and expanding the grid is paramount. What can we do to accelerate those plans? More than ever, we need to join hands. Over the past year, we have had frequent discussions about this. That is good. If you know each other and thus each other's interests, you can take the right steps together. We like to think along with you. Also about pragmatic solutions to make better use of the grids. In the end, we all have the same goal in mind: speeding up the transition!”

Ensure critical infrastructure for society

To secure supply now and in the future, we need to design, build, maintain and operate our critical infrastructure on land and at sea. TenneT is one of Europe’s largest investors in national and cross-border electricity transmission capacity, providing the grid that serves society’s growing need for electricity while also enabling the transition towards a climate-neutral energy system.

Introduction

The assets we build and maintain onshore and offshore form the critical infrastructure needed to power society, enabling economic and industrial growth and keeping essential services running. As we transition from a conventional and fossil fuel-based electricity system to a greener energy landscape, it is essential to invest in our grid to make it future-proof. Unlike the traditional energy system, where conveniently located conventional power plants generate electricity on demand, the energy system of the future will require us to balance numerous sources of renewable energy that have a more volatile and intermittent nature, carried over longer distances, while also delivering the reliable security of supply that society expects.

To meet these challenges and ensure we have a secure supply of electricity now and in the future, we need to strengthen, maintain and extend our energy infrastructure, while also designing a grid that can support society’s future energy needs. That is why we develop, on a biennial basis, our investment plans in the Netherlands and Netentwicklungsplan in Germany. In 2023 we published these investment plans. In Germany, we published them together with the other German TSOs and in the Netherlands, we shared our plans for the onshore and offshore grid investments. We notice that in both investment plans, the required investments are steeply increasing, and we concluded that we, next to come up with plans to execute the projects, we needed a different way of thinking. That is why we developed our Target Grid to provide a clear vision and map on how this future CO₂ free energy system should look like and what requirements it needs to meet to enable us and others in the energy landscape to work towards this goal in a (cost-) efficient manner.

In this way, electricity grids play an important role in achieving Europe’s ambition to be the world’s first climate-neutral continent by 2050. TenneT is using the experience and expertise we have gained in the past decades to build towards this future energy system.

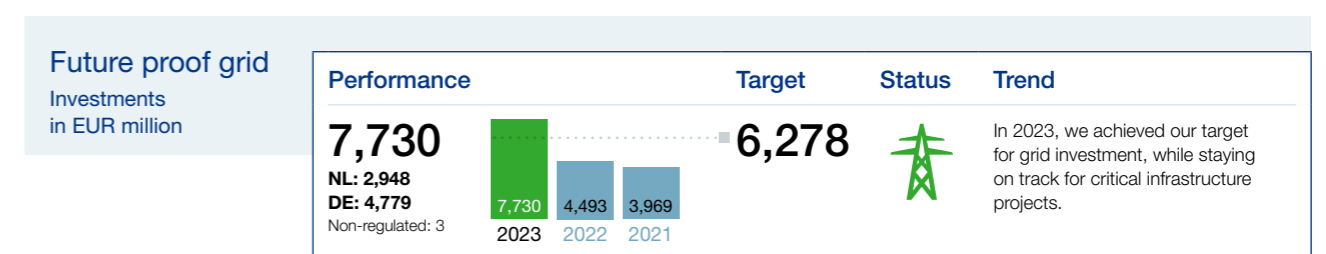
Our Target Grid 2045 strategy, which we presented in 2023, sets out our vision for the electricity grid we will need to have in place in 2045, and the approach for how we will get there. The objective is to have in 2045 an electricity grid that can support a sustainable economy, with a secure supply of green electricity to power consumers and industry. The first version of Target Grid, including the associated grid map for 2045, was presented to the Dutch Minister for Economic Affairs & Climate Policy, Rob Jetten in April.

With Target Grid, TenneT is proposing a DC grid onshore and offshore, served by DC electricity superhighways and energy hubs, alongside a significantly improved existing AC grid. This combination of energy hubs – connected by DC green energy superhighways – will ensure that renewable electricity can be transported over long distances from the North Sea to consumers and industry, and that the electricity grid remains reliable. We believe that our traditional way of acting does not longer hold – it is a way of working that isn’t futureproof. Strong partnerships with our important stakeholders are crucial to achieve the 2025 and 2030 targets and ultimately deliver our Target Grid.

As we are delivering more and more projects to drive the energy transition and shift into the next gear with concepts like the 2GW Program to contribute to Target Grid 2045, we are also impacted by challenges we need to overcome today. An example of this is the nitrogen impasse in the Netherlands which effects our projects for instance.

Furthermore, building and maintaining our assets also has adverse impacts. Our work to maintain, expand and strengthen our grid also affects local communities where our assets are planned and built, raising concerns around construction works or electromagnetic fields, for instance. In addition, we face challenges with respect to the supply chain, with careful action required to overcome resource scarcity.

Our performance in 2023



As such, we work in a highly challenging environment – on the one hand striving to provide the critical infrastructure in time that will help to achieve Europe’s goal to become the first climate-neutral continent. In a landscape where there is an increasing demand of customers that want to be connected, maintaining an ageing electricity grid that is expected to secure supply and at the same time also is expanded as it needs to be future-proof. Where we also carefully consider affordable costs of our activities.

Furthermore, we are engaging in stakeholder dialogue that addresses potential societal opposition to our work when it impacts nature, local communities, and economic constraints. In addition, we also face challenges with respect in the supply chain, related to resource scarcity. This can become a limiting factor, if we don’t act properly. This is why our decisions are always influenced by the balancing act of reliability, affordability, and sustainability.

Despite the challenges we face in realising our assets, we were determined in 2023 to continue full speed ahead with our investment portfolio. In this context, we made strong progress on our projects, as our investments significantly increased from EUR 4.5 billion in 2022 to nearly EUR 7.7 billion in 2023.

This step-up compared to previous years reflects our determination to press ahead with our critical work to drive the energy transition and ensure the improved availability of electricity for our customers.

We reached major project milestones during the year, both onshore and offshore (see sections to follow) and heavily invested in essential maintenance work. This progress was hard to achieve, given the challenges of the current landscape we operate in.

However, we are encouraged by growing political support for our work, as the urgency of delivering the energy transition in time for Europe’s climate goals has the attention of regulators and policy-makers. An example of this relates to stronger cooperation in the Netherlands with local energy boards and municipalities. In Germany, the introduction of new laws aim to speed up the permitting phase of our projects, which can often account for 70% of the time it takes to realise new infrastructure. Legal changes in Germany regarding permitting and licensing are expected to shorten the delivery of future long-distance DC green energy corridor projects for the energy transition by around two years.

Finalising the applications for all permits for our long-distance DC green energy corridors in Germany – SuedLink and SuedOstLink – in late 2023 was an important milestone in this regard. On both projects we started construction works.

However, with grid congestion and outstanding customer connection requests remaining an issue of great concern in the Netherlands, as well as restrictions imposed on our work due to limits on nitrogen emissions, we are aware that there are many challenges still to overcome. Much more needs to be done to strengthen and expand the grid for the growing electricity demands of society and the increasing share of renewables in the energy mix.

Maintenance

To be able to secure supply today and tomorrow, it is essential we not only expand our grid onshore and offshore, but that we also maintain our existing assets. Ongoing and extensive maintenance with the aim to extend the lifetime of our assets, ensures these deliver a full lifetime of service. Ultimately, the essence of maintenance is to keep equipment in a state where it can continue to perform its intended function.

In the multiple asset complexity of an electricity grid, maintenance also has the critical importance of reducing unplanned outages and thereby contributing to our critical task of security of supply. Furthermore, in a well-maintained grid where equipment is performing its intended function, there is the possibility for redundancy and therefore the opportunity to work on new projects. In this sense, maintenance provides an essential base foundation from which we can perform our daily activities, while also expanding and modernising the grid for tomorrow.

TenneT faces challenges in managing grid capacity in the context of the increasing infeed of renewable energy. An example of this relates to grid expansion and maintenance work without compromising security of supply. TenneT acknowledged this challenge and has done an extensive analysis. This showed that next to needing to optimise the work done in given planned outage timeslots, we also need to consider far-reaching measures (e.g. the earlier piloted 'live working', structural working in shifts, change regulation on allowed risks to be taken, etc.). TenneT has established a cross-unit vision and strategy to address this challenge and to turn it into an opportunity.

An important area of focus has been to accelerate the replacement of end-of-lifetime assets, which is contributing to improved grid availability and fewer unplanned outages. The maintenance team has also increased its output through efficiency-increasing measures, such as combining outage windows, integrating work to maximise use of resources, and using digital tools to improve planning. Another priority has been to focus on further improving efficiency in our maintenance work, maximise the output given limited resources. These efforts are particularly important as the demand and electricity load on our network continues to grow, reducing the possibility for outage windows and so constraining opportunities for maintenance. Addressing constraints on outage windows will be an important focus for the maintenance team as it continues to find ways to increase its output. To this end, we have introduced a new Outage Window Optimisation Project, designed to increase outage capabilities in the network, without sacrificing the pace of our work.

Standardisation of equipment and assets is also helping to accelerate the speed and efficiency of maintenance, making it easier and more efficient to fit and maintain assets that share common design and components. The modules can also be tested and configured in a controlled environment before installation.

We are following this 'plug and play' approach with our Bay Replacement programme, for example, which is currently concluding the proof-of-concept phase before going to full scale roll-out. The modular approach makes it faster and easier to replace substations in busy urban areas, such as in Alphen aan de Rijn, where the old 150 kV station was replaced by a new gas-insulated switchgear station.

Onshore

With the rapid electrification of society, the share of electricity in the energy mix is expected to grow from 20% today to 40-60% in 2050. To meet this increased demand, while also accommodating the growing in-feed of offshore wind power, we need to expand, strengthen and modernise our onshore grid. In fact, expanding and increasing the capacity of the onshore grid is just as important for the decarbonisation of our energy system as offshore grid development, because high-capacity connections are needed to transmit the green electricity onshore to end-users.

Investment in our onshore grid is also particularly urgent in the current context of growing grid congestion, as seen in several regions of the Netherlands (see chapter 'Deliver a high security of supply'). To mitigate this, extensive work is underway to strengthen the capacity of our existing network, with new connections, extensions, and upgrades to our network.

An example of this is our Better Use of Existing 380 kV programme ('Beter Benutten'), in which we are increasing the capacity of parts of the national 380 kV electricity transmission network. Better use means there is no new line, but that the capacity of an existing connection is expanded. This is done by replacing the existing conductors with new conductors. Greater capacity was most needed on the Lelystad-Ens and Diemen-Lelystad connections, making these the first to be adjusted. Other projects related to this programme that are planned to be commissioned over the next few years, consist of the sections between Ens and Zwolle and between Eindhoven and Maasbracht. With this work, we are aiming to build towards our vision of how the future setup of the electricity grid in the Netherlands should look like. We aim to upgrade the 380 kV ring in the Netherlands and create new transmission corridors where needed.

In Germany, we have a different approach, as electricity needs to be transmitted over greater distances. There, we are building an onshore meshed grid, where our DC (direct current) projects such as, SuedLink and SuedOstLink have a key role. The development of these long-distance DC corridors is an important part of our onshore strategy.

They will be a key factor in alleviating pressure on the onshore network, particularly in Germany where they will carry wind energy from the north to end-users in the south. These high-power long-distance DC connections will be an important part of our Target Grid 2045 strategy.

Progress on important onshore projects was made in 2023 in Germany and the Netherlands. The commissioning of a 61 km 380 kV partly underground connection from Ganderkesee to St. Hülfe marked the completion this large onshore project in Germany. Also, the completion in September of the 140 km Westküstenleitung (West Coastline) in Schleswig-Holstein between Brunsbüttel and the border with Denmark sees the addition of another major additional onshore north-south connection.

On the SuedLink project, work commenced in September 2023 with the start of the construction of a 5,200 meter tunnel under the Elbe River. And on the SuedOstLink project, we started construction of the converter in Isar and the first cable sections in 2023.

In the Netherlands, the recent delivery of the Noord-West 380 kV project, replacing a previous 220 kV connection between Eemshaven and Vierverlaten is helping to provide much-needed additional transport capacity in the Netherlands.

As well as performing line upgrades, we are also working to meet the need for more capacity with more substations, focusing on boosting regional hubs where customers are demanding the most connections. This includes the replacement of our Oosterhout substation in the southern part of the Netherlands.

Offshore

The North Sea has a potential for up to 300 GW of installed wind capacity – enough to cover the green energy needs of its bordering countries and to make a significant contribution to Europe's 2050 climate targets. The urgency of energy security has also accelerated Europe's ambitions for the North Sea as a future green energy powerhouse for Europe, bringing countries together to develop shared plans, as seen with the Ostend Declaration of April 2023.

This followed a previous convention in Esbjerg, where the signatory governments of Belgium, Germany, Denmark, and the Netherlands agreed to quadruple their offshore capacity by 2030 to at least 65 GW. The Ostend Declaration further

crystallised this commitment as also the energy ministers of France, Ireland, Luxembourg, Norway, and the United Kingdom set ambitious targets for offshore wind of 120 GW by 2030. TenneT alone is committed to connecting 40 GW of offshore wind in the Netherlands and Germany by 2030.

In November 2023, the governments of North Sea countries and the European Commissioner for Energy, Kadri Simson worked together in the North Sea Energy Cooperation, with the Netherlands as the chair in 2023. More detailed plans were agreed upon to support the aim of realising more than 300 GW of installed wind capacity in the North Sea in 2050. As a result of this meeting, an action agenda was agreed upon and handed over to the new chair for 2024, Denmark.

Our Target Grid 2045 vision is aligned with this massive investment plan for the North Sea. An interconnected DC overlay grid, linking multiple offshore wind farms from different countries, and connecting with onshore DC grids, is envisioned as the backbone of the North Sea powerhouse. The meshing of the DC grid at sea and on land, the interconnection of multiple offshore wind farms from different countries, and the integration of hydrogen electrolysis, will mean lower costs for customers, better utilisation of the electricity supply, and a more robust system.

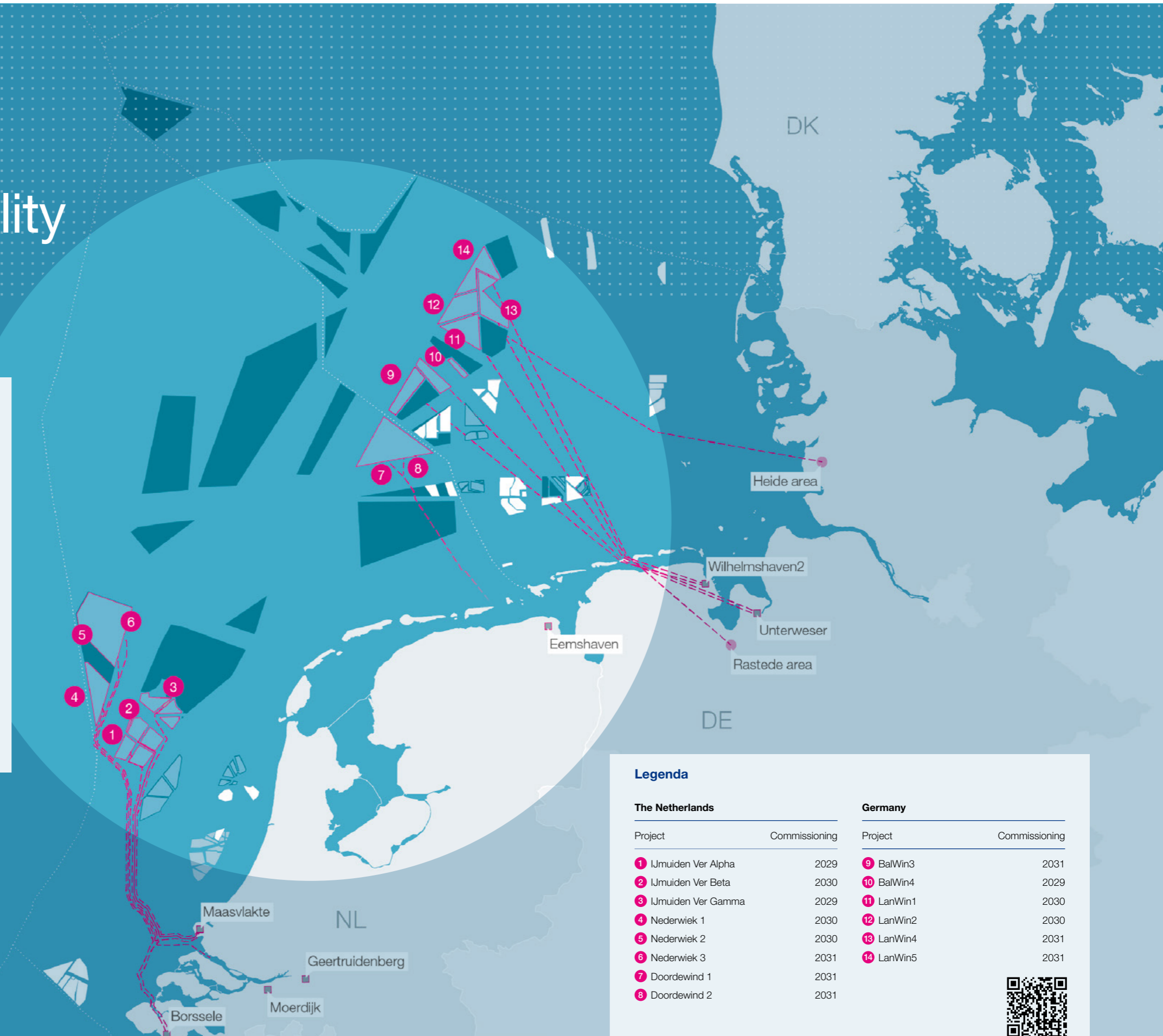
To realise our Target Grid vision, and in the face of increasing competition for scarce resources, we are working hard to ensure we can deliver on our promise. That is why our 2GW Program has led the way in creating a standardised approach to developing offshore grid connection systems. This will also be crucial to achieving the goal of a North Sea Powerhouse. A milestone in this journey was reached in April 2023, when TenneT and four partners officially signed framework agreements to build fourteen 2 GW HVDC offshore interconnections between 2028 and 2031 in Germany and the Netherlands, with a contract value of more than EUR 30 billion plus EUR 10 billion for the corresponding cables. Eight of the offshore links are in the Netherlands and six in Germany. This is Europe's largest ever tender for energy transition infrastructure.

As the 2GW Program is based on standardised technology that can be shared with other suppliers and offshore TSOs, it sets a blueprint that will stimulate economies of scale and greatly accelerate European progress to achieving offshore energy targets.

2GW Program: balancing between sustainability, reliability and affordability


With the increasing speed and pressure of the energy transition, our traditional ways of thinking and working are not sufficient anymore.

The 2GW Program is a prime example of this and a core element of our strategy to achieve the future energy grid in time. In this innovative project we have, together with our supply chain partners, developed a new 2 GW standard offshore grid connection. By doubling the transmission capacity, compared to the currently existing systems, we will have to build fewer platforms to transmit the same amount of electricity. This approach, will strongly reduce the workload, save time, money, and resources in the process and create solutions together with our suppliers by planning ahead. It is therefore also key in our efforts to maintain affordability of the energy transition and not add to unnecessary societal costs. In line with political climate targets to produce 300 GW offshore wind energy on the North Sea, TenneT will deliver 14 grid connection systems by 2031. The 2GW Program is hub-ready, as part of our Target Grid vision. Furthermore, it has a nature-inclusive design, which implies environmentally friendly measures are integrated in the offshore grid design, as a basic condition.



Legenda

The Netherlands		Germany	
Project	Commissioning	Project	Commissioning
1 Ijmuiden Ver Alpha	2029	9 BalWin3	2031
2 Ijmuiden Ver Beta	2030	10 BalWin4	2029
3 Ijmuiden Ver Gamma	2029	11 LanWin1	2030
4 Nederwiek 1	2030	12 LanWin2	2030
5 Nederwiek 2	2030	13 LanWin4	2031
6 Nederwiek 3	2031	14 LanWin5	2031
7 Doordewind 1	2031		
8 Doordewind 2	2031		



Other new offshore initiatives in 2023, were the announcement of LionLink (see 'Deliver a High Security of Supply') and the Delta Rhine Corridor (DRC). Where regarding LionLink, the opportunity is being investigated for offshore wind electricity from the North Sea transmitted via Nederwiek 3 between the UK shore and the Netherlands and for the DRC the aim is to create the opportunity to transmit electricity from the North Sea directly into the Dutch – German border region. These examples further demonstrate how our Target Grid 2045 is beginning to take shape, as we create and integrate a network of high-capacity offshore and onshore DC connections.

As part of our earlier commitments to realise offshore grid connection systems, we were pleased that we were able to commission three projects this year. In the Netherlands, we completed the Hollandse Kust (noord) project, our fifth and final 700 MW connection from the 2023 Dutch Offshore Wind Energy Roadmap. Furthermore, we were able to commission Hollandse Kust (west Alpha) in December 2023. In Germany, we were able to complete the DoWin6 project, delivering this 900 MW grid connection system.

All three projects were completed on time and within budget, with Hollandse Kust (west Alpha) even three months ahead of planning.

What could prevent us from reaching our goals?

The horizons of our work are long, requiring us to plan our work years – often decades – in advance. In this respect, uncertainties in assumptions, or errors in grid planning, pose risks to our progress as they could lead to an inadequate provision of grid extension projects. TenneT needs accurate assumptions for capacity, spatial planning (e.g. for gas power plants or electrolysers) or technology and innovation to accurately meet the demands and timescales of the energy transition.

For example, to plan the infrastructure required to realise the DC overlay grid and DC hub concept requires innovations in technology to provide equipment that have not yet been developed. We rely on a small number of specific suppliers to realise critical new technology for these concept-related projects to be executed as planned. In-depth studies and research by TenneT and her partners help us to mitigate against these risks and plan accurately for the future.

As we rely on the availability, resources and know-how of key partners to work with us on our critical infrastructure projects, we also face a risk if such partners experience business instability or financial difficulties. Partners who face liquidity issues resulting from unforeseen market disruptions, geopolitical constraints, operational interruptions, could become unavailable for work with TenneT, thereby delaying our critical project work. We also enter into long-term partnerships, with volume commitments, that encourage supplier investment and support business stability. To further protect the continuation of our work, we also ensure a diversification of contractors and perform regular credit checks and use of bank guarantees.

Further market risks can be posed by economic factors beyond our control, such as inflation, price fluctuations and resource scarcity. The strong increase in demand from TenneT and other TSOs contributes to a sellers' market environment, exposing TenneT to risks of abuse of market position, budget over-runs and disproportionate cost increases. Diversification of supply contracts helps protect TenneT against such risks, as well as the use of index-based price adjustment clauses in contracts to reflect market developments.

In a tightly regulated sector, TenneT relies on a predictable and stable legal and regulatory environment to plan our critical infrastructure investments and safeguard our financial health. In this regard, unpredictable changes to legislation and regulation pose challenges to our critical infrastructure investments. TenneT closely monitors information on legal changes and keeps the organisation fully informed of anticipated developments on regulatory and legal issues affecting our work.

During 2023, the nitrogen impasse in the Netherlands led to some major delays in projects to expand the electricity grid.

In TenneT's case, more than 13 projects are experiencing immediate delays (half of them by more than six months) and in the absence of a structural solution, almost 100 projects could face delays in the longer term. This could have a negative impact for existing and new end-users, as the investments are also meant to fix and prevent congestion on our Dutch grid. Grid operators in the Netherlands urged the government to develop solutions, like using the new European directive RED III which can speed up the permitting process for energy projects and furthermore to prioritise grid expansion projects in the nitrogen space allocation.

TenneT's offshore targets

Installed offshore capacity by TenneT

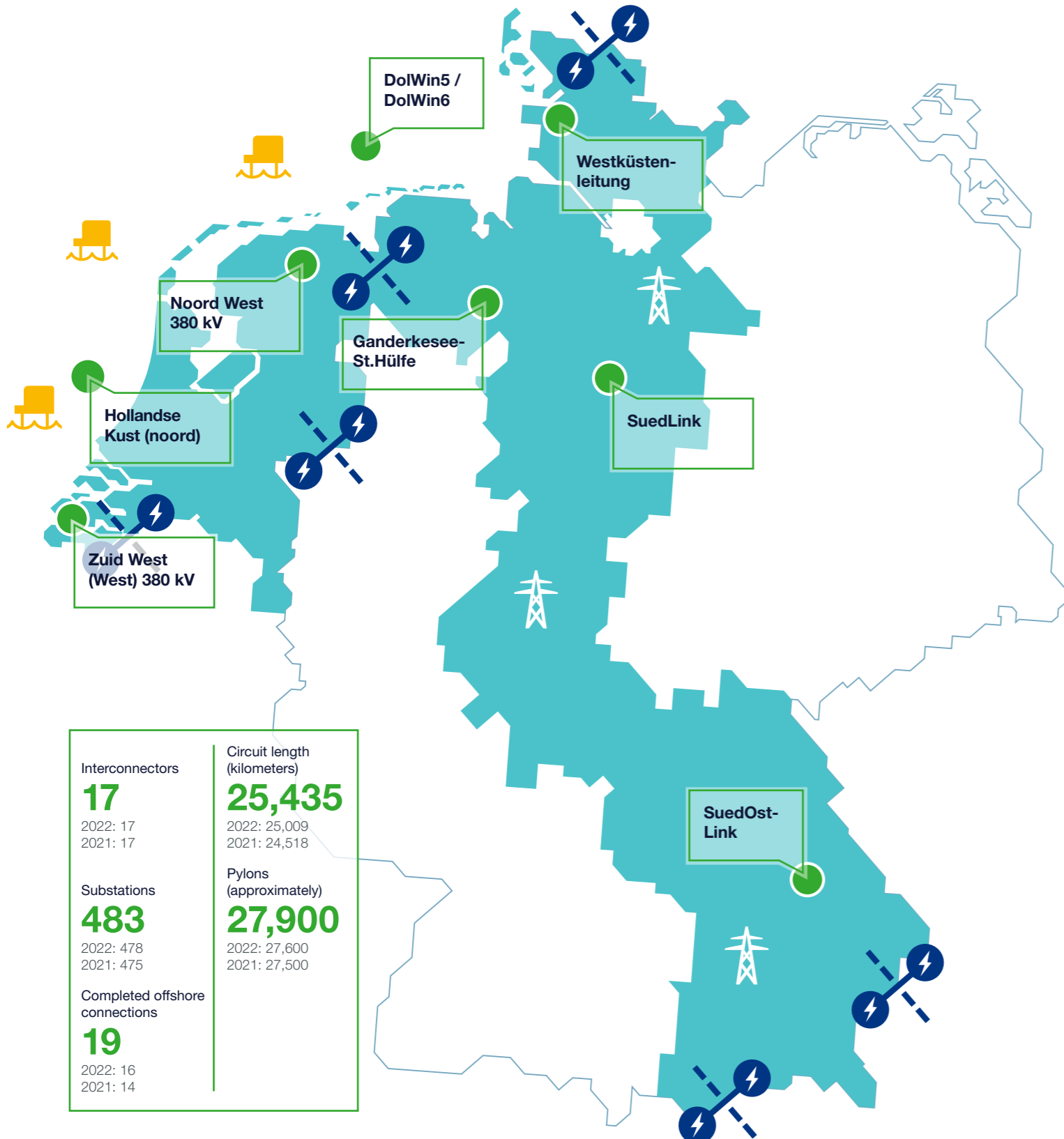
Gigawatt



* 1GW of older offshore wind farms in the Netherlands use a private connection to the onshore grid.

Grid Map 2023

In Germany and the Netherlands, onshore and offshore, we have been working hard to make progress on our projects to secure supply today and tomorrow and drive the energy transition. In our Grid map 2023, we highlight a selection of these projects.

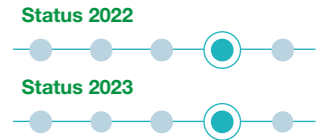


Investment approval process



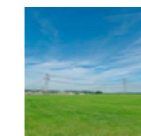
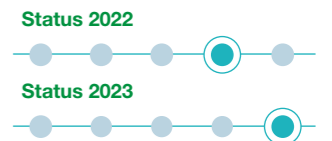
Zuid West (West) 380 kV

In 2023, two of the four circuits (the two existing circuits) of the section between Borssele – Willem Annapolder have been commissioned. For section two (Willem Annapolder – Rilland) a solution for the quality issues related to the foundations has been found and work has commenced regarding the repairs. With this a significant hurdle has been taken to be able to commission this section in the 2nd quarter of 2025 and without any 380 kV planned outages.



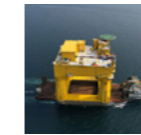
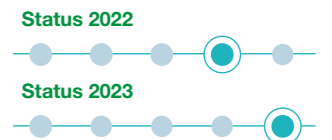
Hollandse Kust (noord)

Hollandse Kust (noord) is a 700 MW alternating current offshore grid connection. The connection connects to the high-voltage substation at Wijk aan Zee and was commissioned in 2023. With this the so-called 'roadmap 2023' was completed.



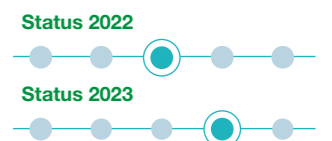
Noord West 380 kV

The project Eemshaven – Vierverlaten 380 has been completed in 2023 in line with planning. Shortly after completion the last works have started to finalize substation Vierverlaten and to decommission the old 220kV track between Robbenplaat and Vierverlaten.



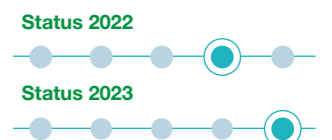
DoIWin5

A major milestone in 2023: After three years of construction, the offshore platform left the shipyard in Singapore in October and reached Haugesund (Norway) end of December. The final technical equipment will now be installed before transport and installation follow in this summer.



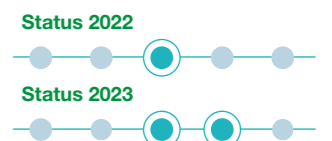
DoIWin6

DoIWin6 was officially handed over to TenneT in mid-September 2023 after several weeks of trial operation by the general contractor Siemens, which was responsible for the construction of the converter stations on land and at sea. The cables were already accepted by Nexans in December 2022, so the full grid connection is in operation.



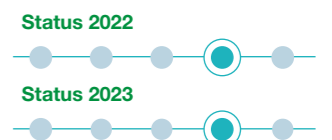
Ganderkesee - St. Hülfe

Ganderkesee - St. Hülfe closes a significant gap in the north-south transport of renewable energy. In August 2023, the transmission line was successfully put into operation. In future, 3.3 gigawatts of green electricity can be transported here, allowing the project to stabilise the regional and national electricity grid and saves significant redispatch costs.



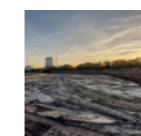
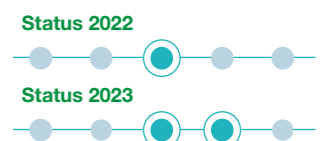
Westküstenleitung

The approximately 140-kilometer-long west coast line from Brunsbüttel to the Danish border went into operation on time in September 2023. The line collects electricity from renewable energies in Schleswig-Holstein in order to transport it towards the south of Germany. From 2025, the border-connection will also ensure improved electricity exchange with Denmark.



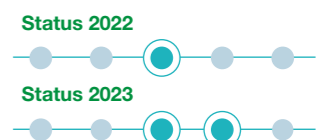
SuedLink

Good progress was made on the project in 2023. The planning approval documents were submitted to the regulator for all planning sections. With the start of construction at the Elbecrossing in the third quarter, the organisation is now heading into the construction phase.



SuedOstLink

After the first section D3b was successfully submitted to the regulator at the end of 2022. The planning approval documents for all sections were submitted by the 4th quarter. Construction also has started in December, and will continue to go "full speed ahead" in 2024.





We need speed when it comes to grid expansion



Christian Meyer
Niedersächsischer Minister für Umwelt,
Energie und Klimaschutz

“Several major successes were achieved in grid expansion in 2023. The important construction of the SuedLink to supply the south of Germany with climate-friendly renewable electricity and thus reduce curtailment costs finally began. Secondly, TenneT reached an exemplary agreement for the transmission and construction of the necessary power lines in dialogue with farmers. This new German speed is needed in expanding our grid. With the new Lower Saxony Climate Protection Act and the Energy Transition Task Force in Lower Saxony, as well as by increasing the number of staff in the approval authorities, we are accelerating the necessary grid expansion, the planned expansion of renewable energies and storage, and streamlining and digitalising procedures. In this way, we will achieve the climate targets together, create security of supply and good grids. Thank you for the excellent cooperation!”

Create a safe and inspiring workplace

As a company that powers society, we rely on our colleagues to help us fulfil this critical task. Our people are our most important asset and we are committed to their safety as well as providing an environment in which they can thrive.

Introduction

At TenneT, we build, maintain and operate critical infrastructure that powers society today, and support our journey towards a renewable energy future. However, these are not TenneT’s most important assets – our people are. They are our key strength, and it is their combined effort, teamwork and commitment that helps us achieve these crucial goals for society.

To realise our rapidly expanding portfolio of investments and build an energy system that can support a decarbonised economy, we need to ensure we provide a safe working environment for the people working for and with us. This is a key priority in our work, reflected in 2023 with the introduction of a new centralised Health Safety and Environment (HSE) structure (See ‘Safety’ below).

With safety as a pre-requisite for everything our people do in their work for TenneT, we work to ensure that we recruit and retain the talent we need to meet our growth objectives. To this end, it is essential that TenneT is an employer of choice in an increasingly competitive labour market, especially for technical talent.

While we have a net growth target of 850 FTEs every year, we need to recruit more people to account for outflow of employees, internal movements and parttime workers. To realise Target Grid, we anticipate that we will need to accommodate up to 10,000 internal and external employees by 2025.

Due to a shortage of technically-skilled talents, other companies in the energy supply chain also need to improve their recruitment efforts. Other TSOs, engineering firms, subcontractors, equipment manufacturers, consultants and a host of other specialists are also seeking to grow their workforce in a tight, candidate-driven market. As many of these employers are also helping to realise the energy transition and directly or indirectly working with TenneT in the supply chain, it is therefore also in our interests for them to attract the people they need.

In this tight market, it is essential that TenneT offers an inspiring place to work, where our people grow professionally and personally, feel safe and supported to be their authentic selves. This is why our strategic pillar ‘energise our people and organisation’ is so important.

Our performance in 2023

Safe workforce
TRIR
(including contractors)

Performance	Target	Status	Trend
<p>4.5</p> <p>NL: 2.3 DE: 6.1</p>	<p>4.3</p>		<p>A positive development is that 2023 was a record-year of investments without fatalities and severe incidents. However, as we did not meet our TRIR target in 2023, we need to continue working hard to perform better and reach our Zero Harm ambition.</p>

Healthy workforce²
Absentee rate
Netherlands / Germany

Performance	Status	Trend
<p>NL 3.9 2022: NL 3.7, DE 4.1</p> <p>DE 3.4 2021: NL 3.1, DE 2.6</p>		<p>In the Netherlands, absenteeism increased in comparison to last year. Especially long-term absenteeism was on the rise, which is partly explained by a rise in mental health issues.</p>

Diverse workforce
* % female inflow of total inflow
** % non-Dutch / non-German hires

Performance	Target	Status	Trend
<p>32%* NL: 26% DE: 35% 2022: 33%, 2021: 31%</p>	2023: 30%		<p>In relation to a diverse workforce, we saw a steady inflow of non-Dutch / non-German employees, and met our target with regards to female inflow.</p>
<p>11%** NL: 11% DE: 11% 2022: 9%, 2021: 9%</p>	2023: 10%		

¹ In 2023, we concluded that the collected hours were more than our scope is. This has impact on the calculation of the ratio. The impact on the 2023 TRIR is projected on the 2022 TRIR. This resulted in a 2022 TRIR of 4.9 instead of 4.4, while the target was 4.5.
² Please note that we present the absentee rate between both countries separately as they are not fully comparable. For more information refer to our [Reporting Guidance](#) document.

Currently at TenneT, our workforce comprises 6,937 employees, working in the Netherlands (2,805) and Germany (4,132). In addition, we have 1,399 valued colleagues who are externally contracted to us, such as our contractors on site or colleagues working on a project basis. To deliver on the ambitious targets needed to achieve Europe's climate goals, we continued to grow, adding more than 884 additional FTEs to our workforce in 2023, compared to 735 in 2022. This was slightly above our target of 850 additional FTEs for the year.

Our ability to attract new people shows TenneT is maintaining its position as an attractive employer. Despite the tight labour market with many parties competing for the same talents, we still have managed to fill almost all open positions. The effort and improvements were possible due to a new Applicant Tracking Tool and process adjustments and the joint efforts between hiring managers and the Talent Acquisition team.

However, maintaining a net inflow of FTEs became harder in 2023 as more external contract workers left TenneT due to legislative restrictions on interim contracts, particularly in the Netherlands. Current law limits the term of interim contracts. As many of these contracts are coming to an end, we are seeing a larger attrition level than normal. Recruitment is also more challenging as an increasing number of employees make internal moves to new positions, requiring vacant positions to be filled.

As regards safety, we have taken substantial efforts throughout the last two years. We saw an decrease with the Total Recordable Injury Rate (TRIR) to 4.5, compared to a 4.9 rate in 2022, and did not meet our target. Following the fatal incidents that tragically occurred in 2022, we saw none in the course of 2023.

We also track our absentee rate on a quarterly basis, as a measure to track the health of our workforce. In Germany,

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we recorded an absentee rate of 3.4 (4.1 in 2022) and in the Netherlands a rate of 3.9 (3.7 in 2022). While we see a decreasing trend in short-term absenteeism with our employees, long-term absenteeism is increasing. This trend, particularly in the Netherlands, was partly explained by a rise in mental health issues among employees during 2023 and we will continue to monitor it closely (more on this in the section [Health & Safety](#)).

To ensure we grow as a diverse and inclusive organisation, we track the diversity of our workforce. With 11% of new employees being both non-Dutch and non-German, we met our targets. We also see developments in other areas of being an inclusive and diverse workforce. This includes, but is not limited to, areas such as gender diversity. In 2023, our female inflow accounted for 32% of new employees, slightly above our target of 30%.

Bring out the best in our people in an inclusive and safe environment

Health & Safety
The nature of our work carries risks, often involving working at height with high-voltage assets and with heavy lifting equipment and materials, onshore and offshore. Despite this, we must deliver a secure and stable renewable energy supply for society in a safe and responsible way. We want all people working for TenneT to come home safe every day and aim for zero harm in the workplace.

As the scale and speed of our work increases, we are exposed to more safety risk. However, our Zero Harm commitment means we need to double down on safety so that our risk doesn't grow in proportion with our output.

In 2023 we introduced a new organisational approach to safety, following a detailed analysis of our occupational health and safety procedures by the consultancy agency DNV. Based on this study, it was decided to build a more centralised, uniform and systematically applied approach to safety across all sites and locations where TenneT's employees and subcontractors work – whether it is offshore in Germany or on a construction site in the Netherlands. The clear aim is to have more structure and company-wide standardisation, ensuring everyone working for TenneT and our subcontractors speak the same safety language, executing their work in line with a set of safety protocols.

As a result, it was decided to centralise all of TenneT's safety management into a new Health Safety and Environment (HSE) organisation, headed by a dedicated HSE director. Around 130 people have been moved into this new unit. Established in July, the HSE unit's first task has

been to create a new Safety Management System. A crucial part of the new system is continuous improvement, meaning that any safety incident is analysed and learned from, with suitable system improvements identified and implemented.

The HSE team is also working to embed the TenneT safety approach with our sub-contractors, not only through regular meetings with leaders from our partners, but also embedding our safety requirements into our contracts, with follow-up meetings to ensure compliance.

In addition, a new system for embedding our Life-Saving Rules (LSRs) has been developed. These rules recognise the reality that a safety incident is often not an independent occurrence, but in most cases an accumulation of small decisions. LSRs are designed to stop those wrong decisions being taken.

At TenneT we also recognise that safety is not always physical – we must also care for the psychological safety of our employees. This is particularly important as in 2023 we saw an increase in long-term absenteeism, with mental health issues rising. Although this is a trend shared by many companies following the pandemic, we aim to fully understand the underlying causes of this trend and to ensure we address them. As such, psychological safety at work is an explicit aspect of our internal safety programmes and training, including the Safety Leadership Programme "Safety needs our energy". We are determined to ensure we provide our people with a safe environment where they feel confident to share their experiences with their team and manager so that suitable measures can be put in place to protect their psychological safety. This is a commitment that extends from our senior leadership team to team managers.

To get a better understanding of the workload and work-related stress of our employees, we also started to research the psychosocial workload (PSA) in 2023, in the Netherlands and in a pilot project in Germany. Results show that many of our colleagues experience a high workload and work-related stress, as well as that mental health problems contributing to nearly 50% of absenteeism. Acknowledging this, we will take measures to address the root causes, including leadership trainings and focussing more on mental health in our vitality programme.

Inclusion, diversity and equity (ID&E)

At TenneT we believe that a wide diversity of people, with different backgrounds, cultures and perspectives are essential for everything we do and thereby for overcoming the challenges of the energy transition. We want everyone

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at TenneT to feel welcome and accepted. We strongly feel that inclusion is a prerequisite for diversity to thrive, as diverse candidates will be more encouraged to join and grow in a company with an inclusive environment and culture. In addition to this, equity involves ensuring access to equal opportunities by aiming to eliminate structural and historical boundaries and inequalities which prevent the access to equal opportunities.

ID&E requires long-term efforts as unconscious and conscious biases need attention to take good decisions in recruiting, promoting and developing our employees. This is a constant learning process, where our employees are the most important input givers.

We are seeing the results of our efforts with an increasingly international employee base. In 2023, we have more than 70 different nationalities represented among our diverse employee population and 11% of our new hires were not of either Dutch or German nationality. We have also collaborated with the Refugee Talent Hub for several years, with the aim of hiring diverse technical talents who have come to the Netherlands or Germany as refugees from other countries. As well as temporary 'work experience' places, several of these newcomers have also become permanent employees with TenneT.

Diversity is visible in TenneT from entry level to the most senior members of our team. For example, our trainee groups are a diverse mix of participants from both the Netherlands and Germany, and other countries, with different educational backgrounds. To foster diverse thinking and knowledge, our trainees are encouraged to work cross-border during one of their assignments.

In preparation for upcoming legislation, such as the Corporate Sustainability Reporting Directive and the Dutch Corporate Governance Code, we investigated (via benchmarking with external parties and internal expert interviews) what steps to take for a renewed commitment to Inclusion, Diversity & Equity. An Inclusion, Diversity & Equity policy has been approved by the Executive Board and Supervisory Board in November. This policy aims to outline what ID&E responsibility means for TenneT and what commitments it will make across different ID&E areas.

As part of this policy, we have set several mid- and long-term targets to ensure inclusion, diversity, and equity within TenneT. For example, we aim to achieve 40% female representation for all senior leader positions (all Directors reporting to the Executive Board) by 2025. In 2023, 38%

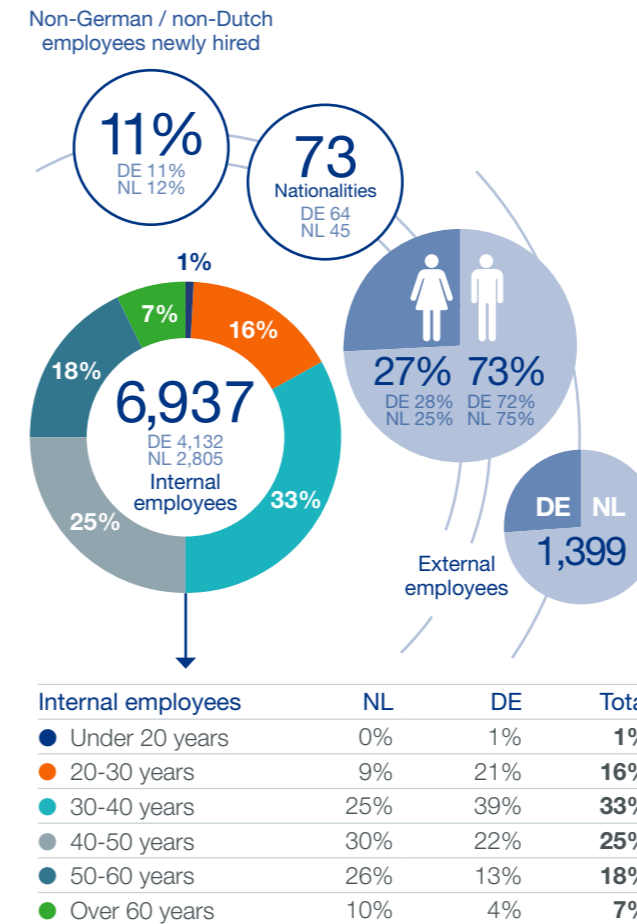
of these positions were filled by women. Next to this, we want to maintain an equal balance in our Executive and Supervisory Board by 2030, and have set a target of 12% non-Dutch / non-German inflow of new hires by 2026. To deliver on these targets, we will audit some of our internal human resource processes (such as recruitment) to ensure its alignment with this policy. To realise our diversity targets, our aim is to change by design: for leader positions, we aim that the slate of candidates includes at least one female candidate. In case a female candidate turns out not to be the best match, she will be considered for future leader-vacancies. In addition, we will revisit this group of leaders early 2024 to determine how diversity can be improved by design faster when building two national champions. Also for the Supervisory Board, TenneT continuously strives to maintain the desired gender balance in future appointments and in the meantime the company is mindful of other forms of diversity to include. Furthermore, we will crystallise which steps and actions, such as implementation of corporate talent management for key positions, need to be taken in 2024, to meet our ID&E targets. We will also monitor our progress towards these targets closely from next year.

We strive for equal pay for equal work. This is why in 2021, TenneT began its first investigation into a gender salary gap. The first results of this assessment indicate that a gender salary gap might exist in both the Netherlands and in Germany. Data limitations and historical factors create challenges for us to exactly determine all factors that have led to this situation, but we aim to take measures to address, close and prevent gender pay gaps where they occur.

We are pursuing several initiatives to strengthen a women-friendly workplace at all times. We implemented a reporting system to monitor equal application of rewards, benefits and career opportunities. We have invested to secure female safety gear (Personal Safety Equipment) and we have embedded an improved reporting channel for unequal treatment, including sexism and harassment.

Part of our efforts on ID&E relate to promoting gender diversity in the energy sector. Attracting more female talents is a strategic objective and essential if we are to recruit enough people to deliver on our strategic ambitions. In 2023, we held an open day as part of Girls' Day in March, inviting girls between 10 and 15 to come to our Information Centre to learn about the energy transition and how we ensure every home has a secure and stable supply of electricity. Initiatives like this encourage and inspire more girls and young women to study technical sciences and consider a career in our fast-growing sector.

Diversity at TenneT



Future-proof our organisation by recruiting the best talent

To reach our net growth target of 850 additional FTEs, we need to bring a lot more people into the organisation every year to carry out our investment projects. Recruitment remains a key challenge for TenneT, especially as we are seeking talent alongside other employers in our sector.

As such, we have to be smart in our recruiting, and ensure the strategy covers being an employer of choice, creating an environment where people thrive, grow and stay for a long time.

For example, we are using a new competency-based approach, meaning hiring people for their individual talent, interests and skills rather than solely for their experience. With the start in 2023, we are already starting to see the fruits of this new approach, such as being able to hire good candidates without a specific position currently but who we know will be a good fit for TenneT.

We are also engaging with talent earlier in their career and striving to remain in contact with them through "talent pools" in which we identify future potential recruits. To this end, education, and partnerships with academic institutions (such as the TU Delft, TU Eindhoven, Universities of Erlangen and Bayreuth, or RWTH Aachen), play an important role in our recruitment efforts. Another example of this approach is the Power Minor, a course on high-voltage power which we have been working on with the universities of applied sciences of The Hague, Amsterdam, Arnhem and Nijmegen.

Organise for our people to perform at their best and to work as one company

To meet the challenges ahead, and fulfil our strategic objectives, it is essential that everyone at TenneT feels able to perform at their best. The TenneT work culture and practices need to facilitate this. We invest in programmes and ongoing initiatives to protect our employees' physical and mental health, which in turn also helps to prevent unforeseen absenteeism and illness.

For our employees to perform at their best and contribute to the TenneT strategy, they need to feel well-informed and engaged. To better understand this, we introduced the first Pulse Check, a quarterly employee survey, in October 2023. First results show that the vast majority of our employees feel highly motivated to support TenneT achieve its strategic goals. However, they also indicate that clear communication and faster internal processes would benefit company success. The results were discussed more in detail between the Executive Board and Senior Leadership Team. We will continue to conduct these employee surveys on a quarterly basis, to be able to compare results over time.

Our long-standing Always Energy programme is an important way in which we help our people perform at their best by focusing on their health and wellbeing. This is an internal vitality programme, featuring workshops, training and events to ensure our people are energised and engaged, with a focus on: physical energy; mental and emotional energy; social energy and purpose/meaning. In 2023, we further raised awareness of Always Energy, and used the findings from employee studies about employees' physical and mental wellbeing to create a programme that is better tailored to our employees' needs. We see a strong Always Energy programme as a valuable and positive way to improve employees' wellbeing and address low engagement due to physical or mental health issues.

Furthermore, as a large employer with a diverse and international workforce, it is essential that we recognise the workplace, and attitudes to working norms, are changing. We are aware of new ways of working and the shifting expectations of jobseekers, to support their wellbeing, psychological safety and motivation. In this respect, 2023 was characterised by a structural shift towards hybrid working. Following the pandemic, when homeworking became the norm, we have adapted to set up a more structural response to changed working patterns. We have accommodated the growing demand for remote working, while also putting in place clear expectations for time spent in the office, for regular face-to-face team collaboration. In this way, a post-pandemic working trend has been managed into a new model of hybrid working across the organisation. This suits the needs of our people while also ensuring everyone at TenneT works together as a productive and energised team. This will stay an area of attention to ensure we follow TenneT's needs and accommodate our employees' wishes

What could prevent us from reaching our goals?

To realise our fast-growing investment portfolio and to achieve the goals of the energy transition, we need a net growth of 850 FTEs every year. However, we face ongoing difficulties to hire the required resources for our planned operations and projects due to very tight labour market conditions. At the same time, we see a higher number of our workforce leaving the company, as well as more of our employees reaching retirement age. The companies we partner with and rely on to realise our projects – such as international engineering and energy contractors – face the same challenges in recruitment and retention. The potential sale of our German activities to the German state, with the possibility of an organisational split, could have an adverse effect on recruitment and retention.

To mitigate these issues, we are prioritising recruitment efforts for the most mission-critical positions and collaborating closely with hiring managers to speed up the recruitment process and attract the right candidates. We are also focusing on improved workforce planning to predict where we need additional personnel most urgently.

The mental wellbeing and psychological safety of our employees is becoming a growing challenge, as our workload and (as a consequence) levels of personal stress, increase. We see growing long-term absenteeism resulting from mental health difficulties. To address these issues, we have undertaken a mental health survey and increased the involvement of company doctors in the treatment and follow-up of mental health problems. Increased training and coaching – such as e-learning on psychological safety – is also being increased as part of our Safety Needs our Energy programme.

As TenneT works in an intrinsically high-risk sector – with many of our people working at height, or on busy construction sites, with heavy and high-voltage equipment offshore and onshore – safety is of primary importance in everything we do. We are acutely aware that safety incidents and major occupational or industrial accidents (such as fire, explosion, helicopter crash, vessel collision, structural failure or release of toxic substances) could result in fatalities, severely impact the environment, damage our critical infrastructure and harm our reputation.

During 2023, TenneT increased its investment in safety, with the introduction of a new centralised HSE organisation. As part of our new HSE approach, including new safety management procedures and Executive Board-approved safety directives, we are stepping up our safety measures across TenneT. Safe work plans, workplace inspections, training and instruction, incident investigation and follow-up, are all part of the new safety culture.

Vacancies at TenneT

We are continuously looking for new colleagues. Check our Dutch and German vacancy websites for all jobs.



Dutch German

Support security of supply in Ukraine

Andreas Stach
TenneT

“To support security of supply in Ukraine, we are supporting our colleagues TSO Ukrenerg and DSO DTEK with technical equipment. The assistance is provided under the leadership of the Ukraine Support Task Force (USTF), which is part of non-governmental organisation ‘Energy Community’. We are donating technical equipment that has already been used but is still in a very good condition, such as emergency generators, high voltage equipment and a mobile switchgear. With this, we hope to provide humanitarian support.”

Create value to transition to a climate-neutral economy

As a key player in the energy transition, we are working to connect society to green electricity by developing a reliable, affordable and future-proof grid. The main impact we have as a company is driving the energy transition to support Europe's goal to become the first climate-neutral continent by 2050. We aim to do this by leading as a green and responsible grid operator. We strive to reduce the environmental impact of our operations and minimise our carbon emissions, our impact on the natural environment and the materials we need to build, operate and maintain our grid.

Introduction

The world's dependency on natural resources is reaching its limit. The combined threat of climate change, the impact it has on the environment and resource scarcity requires us to transition to alternative ways of doing our business to continue to provide value for society, without damage to our climate or our natural environment.

As a European TSO, TenneT creates value for society by developing the assets, knowledge and innovations to build a reliable and affordable future-proof grid that supports the EU's net zero ambitions. We are pleased that with the realisation of our investments in a future-proof energy system, we are enabling progress in the energy transition and helping mitigate climate change. Around 50% of the electricity consumption in Germany and the Netherlands came from renewable sources in 2023.

However, as we expand and reinforce our grid, we are conscious that we also have a negative impact on the natural environment. Procuring and producing the materials needed to build our assets on land and at sea, operating the assets to ensure a reliable energy system and effectively managing the emissions which result from our own operations all have an impact on the environment amongst other things. And as the energy transition is a global challenge involving a wide array of other parties from the energy sector and associated supply chain, our sector's demand on resources and impact on nature is growing all the time.

At the same time, the expectations from our stakeholders – such as governments in the areas we serve – are increasing, demanding more effort to combat climate change and limit the environmental impacts on the world around us.

As well as contributing to societal objectives by driving the energy transition, TenneT can create additional value by leading as a green and responsible grid operator. We have set firm emission reduction goals for 2030 and are working hard to reduce emissions throughout our supply chain (see 'Climate' section below). We have also introduced a new circularity strategy, improving the sustainable impact we can have with the use of our scarce resources, such as copper (see 'Circularity' section). These and other efforts to protect the environment are becoming more embedded in the design of our assets.

Through our nature, climate and circularity ambitions, we aim to shape what we believe is necessary for a responsible growth path, while supporting Europe's goal to become the first climate-neutral continent in 2050.




Climate

We follow a threefold approach with regard to our impact on climate:

- We aim to reduce our direct and indirect emissions.
- We green the emissions from our own operations as a TSO where reduction measures don't apply.
- As a last resort, we seek compensation for the emissions which we absolutely cannot reduce or green.

In line with the Science Based Targets initiative, which we committed to in 2021, we are determined to contribute to the goals of the Paris Agreement. The targets we set in 2021 include ambitious emission-reduction goals for 2030 (measured against a 2019 baseline) which aim to cut our direct emissions in scope 1 and indirect emissions in scope 2 by 95% and our indirect emissions (scope 3) from purchased goods and services and capital goods in our supply chain by 30%. These targets have been determined in addition to our 2025 climate-reduction targets. The majority of scope 1 and 2 emissions are from grid losses – the electricity lost during transmission across our network – and from emissions from the insulating gas SF₆, energy

Our performance in 2023

	Performance	Target	Status	Trend
Climate	CO ₂ footprint of our grid losses, substations, offices and mobility (net emission in tonnes of CO ₂)	Climate neutral in 2025 ¹		A slight decrease of our gross carbon footprint as a result of less SF ₆ leakages and less grid losses compared to 2022. Partnerships are in place to further develop SF ₆ free alternatives. Our Net carbon footprint remains at the same level as prior year, as a result of the inability to fully green German grid losses. This remains the main challenge to meet our 2025 target.
Circularity	<ul style="list-style-type: none"> • Potential recovery of assets • Circular inflow • Circular outflow 	Increase the potential recovery of our assets and make our materials inflow and outflow more circular		In 2023, we developed our first Circular Economy strategy, as a more integrated approach was deemed suitable. While we are effectively increasing our efforts to improve our circular performance, data availability remains a major challenge.
Nature	<ul style="list-style-type: none"> • (Net) impact on nature • Environmental incidents 	Net zero impact on nature in 2025		We recorded more environmental incidents and just a slightly better performance on oil leakages in 2023. To limit our negative impact, active steps such as installation of bird diverters on our overhead lines and replacement strategy for our most leakage prone cable circuits have been executed. Our positive nature measures are being scaled up.

¹ To be fully climate neutral (SF₆ emissions, grid losses, energy use offices, stations and mobility of our employees) in 2025.

use at our offices and our stations, and the vehicles we own and operate. During 2023 we also made significant progress in our efforts to measure and address our scope 3 emissions, which are the indirect emissions that arise in our supply chain, as a result of what we purchase and contract. This means we are including scope 3 emissions in our reporting for the first time.

The largest impact that TenneT has in terms of climate action is to enable the switch from a fossil fuel-driven economy to a climate-neutral economy by connecting renewable energy sources and transmitting the produced electricity. We define our key impact metric in this area as the equivalent number of households that in theory would have been able to receive 100% green electricity. It is important to realise that the majority of the electricity consumption comes from industry. We estimate that by the end of 2023 we enabled the theoretical equivalent of more than 14.3 million households to receive green electricity

(14.1 in 2022). These climate figures are not just achieved by our own operations, but also by our partners in the value chain, such as electricity generation companies and distribution system operators (DSOs). By working together, we were able to help avoid 18.0 million tonnes of CO₂ in 2023, compared to 17.2 million tonnes in 2022.

Scope 1 (Direct own emissions)

SF₆

TenneT needs to use special insulating and fire-extinguishing protection for our high-voltage stations and distribution systems. Sulphur hexafluoride (SF₆) is widely used by TSOs as a highly effective insulating gas in switching installations. However, it is also a greenhouse gas, with one unit equivalent to over 23,500 units of CO₂. We conduct permanent monitoring of our assets to detect leaks and swiftly report them to the appropriate internal reporting mechanisms. While SF₆ leakages currently only account for around 1% of our carbon footprint, we still aim to mitigate

Carbon footprint information

	2023 (gross)		2023 Total	2023 (net)		2023 Total
	DE	NL		DE	NL	
Scope 1 GHG emissions						
Total Scope 1 GHG emissions (tCO ₂ e)			22,982			14,130
Sulfurhexafluoride (SF ₆) leakages	1,957	12,737	14,694	1,957	12,737	12,873*
Lease vehicles	3,743	3,152	6,895	3,743	3,152	1,346*
Gas consumption	809	583	1,392	0	0	0
Scope 2 GHG emissions						
Total Scope 2 GHG emissions (tCO ₂ e) <i>location based</i>			2,569,478			1,501,971
Grid losses	1,749,522	719,030	2,468,552	1,501,971	0	1,501,971
Electricity use stations	86,874	9,101	95,974	0	0	0
Electricity use offices	1,518	3,433	4,951	0	0	0
Total Scope 2 GHG emissions (tCO ₂ e) <i>market based</i>			3,588,715			2,307,310
Grid losses	2,768,759	719,030	3,487,789	2,307,310	0	2,307,310
Electricity use stations	86,874	9,101	95,974	0	0	0
Electricity use offices	1,518	3,433	4,951	0	0	0
Significant scope 3 GHG emissions						
Total Significant scope 3 GHG emissions			700,984			700,984
Business travelling	2,791	2,650	5,541	2,791	2,650	5,441
Offshore transport			5,543			5,543
Purchased goods and capital goods			690,000			690,000
Total GHG emissions location based			3,293,444			2,224,545
Total GHG emissions market based			4,312,681			3,029,884
Target 2030	Scope 1 and scope 2: 95% reduction, scope 3: 30% reduction compared to base year 2019					
% Greened of our carbon footprint location based	33%					
% Greened of our carbon footprint market based	30%					

* part of our emissions are compensated with CO₂ certificates

its impact as much as possible. We are working to find sustainable alternatives to SF₆ that provide similar safety properties without harmful emissions.

In doing so, we use our internal carbon price of EUR 150 per tonne to evaluate alternatives to SF₆ in our tenders. By 2025, we aim for a third of TenneT's switchgear - those that use a significant amount of the gas - to be SF₆-free, followed by another third in 2030. In this regard, we made good progress in 2023 on this, with 61% of the assets installed this year was SF₆-free regarding our 110/150 kV assets and 23% of the 220/380 kV assets installed in 2023.

Since alternatives to SF₆ are a key bottleneck as mentioned above in line with our long-term strategy, we invest in joint partnerships and market stimulation through innovative partnerships. One such partnership is the research and development of a hybrid GIS SF₆-free solution. In Germany, we have ordered the world's first completely SF₆-free 420 kV gas-insulated metal-clad switchgear (GIS), which is being developed and to be built at the Erzhausen substation (Lower Saxony) by 2024 and is part of the Wahle-Mecklar AC grid expansion project.

Our 380 kV station Maasbracht in the Netherlands is one of TenneT's largest. When the time came for the station to undergo renovation, two suppliers were selected to provide an SF₆-free solution in the gas-insulated lines (GILs). By using a natural alternative to SF₆, the 'global warming potential' (GWP) of the insulation gas in the GILs is significantly lower compared to over 23,500 for SF₆. As TenneT gradually switches to using natural gases for insulation in new electrical switchgear, moving to alternatives for SF₆ has its own challenges since the majority of currently available alternatives still have a significant global warming potential. Though this is lower than that of SF₆, it still contains a fluronitrile compound.

As TenneT, our long-term strategy is to use gases for installations which have insulating properties with a Global Warming Potential (GWP) less than 1, when at least two market parties are able to offer this. New regulations such as those related to the Fluoriated (F-) gas and per- and polyfluoroalkyl substances (PFAS) also influence our decisions in making our long-term strategy a reality. The use of PFAS in solid, liquid, and gaseous components of grid equipment is determined by manufacturers to ensure the

needed requirements for its performance and reliability. TenneT is committed to protecting the public and workforce wherever risks stemming from PFAS are identified. We have emphasised this to the concerned authoritative body.

The pressure to find alternatives to SF₆ is becoming more acute, as our project portfolio increases and we face restricted available outage time and space needed to perform maintenance and replacement work. Our delivery of alternatives must match the speed of the energy transition without losing focus on safety and reliability.

Gas consumption

Gas usage for heating our offices and stations is also part of our scope 1 emissions. To ensure we are meeting our 2025 climate neutral goals regarding our offices and stations, we have greened our gas consumption via guarantees of origin and (/or) green gas contracts or compensated them.

Lease vehicles

The mobility of our employees, whether travelling to and from the office or out in the field, is part of our CO₂ emissions and is an area we are addressing with carbon-reducing policies. For example, we aim for a fully electric lease car fleet by 2025, replacing the current use of hybrids. This year, we made progress on this as per December 2023 around 43% of our current fleet was electric compared to approximately 39% at the beginning of the year.

Scope 2 (Indirect emissions from generation of purchased energy)

To align with the criteria set by the Science Based Targets initiative, as of this year we will make use of the so-called 'market-based approach', which means that our emissions are based on the emission factor per contracted source.

Grid losses

As we transport electricity, in growing amounts even, through our network, it's unavoidable that some of it will be lost. Known as grid losses, these are measured as the difference between the electricity fed into the grid and the electricity delivered. Grid losses depend, among other things, on the current, voltage and the distance that electricity is transmitted. We cannot prevent grid losses from occurring; they are an inevitable part of electricity transmission over high distances. Currently, grid losses account for around 75% of TenneT's carbon footprint (scope 1, 2 and 3, based on a location-based approach. When applying a market-based approach, this would be around 80%).

A MWh lost can no longer be used to power an electric vehicle or to keep the lights on. The emissions related to that MWh fall within TenneT's scope of responsibility. The impact of our grid losses on the environment has always been determined by the local electricity grid mix: the average emissions per MWh are considered to be the environmental impact of that grid loss. When all purchased electricity related to these grid losses would have been purchased from climate-neutral electricity sources, that would mitigate our carbon impact from grid losses as well. As we are bound by law to purchase against the lowest possible price at a certain moment in time, this is not possible to mitigate during the year when grid losses occur. That is why purchasing guarantees of origin equal to the amount of electricity lost is our way of greening our grid losses. We are currently limited by German regulation in purchasing guarantees of origin (GoO), which is why we procure GoO's corresponding to a monetary limit of the German grid losses at a group level. For 2023, we will green 100% of grid losses in the Netherlands and 14% of the grid losses in Germany. This relates to the location-based calculation of our scope 2 emissions. When applying the market-based approach, this would be approximately 17%.

Over the past years, TenneT has been actively pushing the debate on greening of grid losses in Germany. This has resulted in more awareness, but so far no policy change yet. That makes that the greening of grid losses on the German side comes fully to the account of TenneT and TenneT has decided (already for many years) to do this in a balanced way - with a budget cap. Since we foresee no policy change in 2025, it is likely we will not meet our own climate-neutral ambition in 2025.

Every year, specific tenders are drafted to procure the certificates corresponding to the estimated volume of our grid losses. The final step for greening of grid losses is the cancellation of the certificates. These certificates are then cancelled in that year to attribute it to the volume of grid losses greened. These cancelled guarantees of origin are then accounted for in our carbon footprint calculations and reported. However, when comparing the cancelled certificates with the actual energy consumption it became clear that lesser certificates were cancelled for the year 2019. The certificates were bought but not cancelled. Our intention in 2019 was to green our grid losses. Unintentionally, we failed to cancel the certificates and in line with our sustainability ambition and to meet our stakeholder expectations, we took a step to correct this despite a significant increase in costs. We will purchase and cancel the certificates in accordance to the corresponding volume of 2019.

Electricity use in stations and offices

Similar to gas usage, the electricity use in our offices and substations has an impact on our carbon footprint which we mitigate by purchasing green electricity. For our substations, we use solar panels, insulation measures and LED lighting where possible. We have installed solar panels on our land stations at Hollandse Kust (noord) and also intend to install them for the land stations used in our 2GW Program. We will use the generated electricity for our own consumption. We have also installed solar panels on some of our substations in Germany.

Scope 3 (Indirect emissions in TenneT's value chain)

Purchased goods and services / capital goods and services

Alongside the emissions that are emitted as a result of our owned and operated controlled resources, we also report the emissions that are emitted in our value chain – scope 3 emissions. As part of the Science Based Targets we formulated, our biggest scope 3 impact is from the purchased and capital goods and services related to our projects. To gain sufficient and accurate insights and take action to reduce these emissions, we need to work together with our supply chain partners. In 2023, we were able to gain preliminary insights into our scope 3 emissions related to purchased goods and capital goods and services. Based on these calculations we estimate that these are around 690 kilotonnes of CO₂ equivalents – approximately 27% of our total CO₂ emissions. Due to the increase of our project portfolio in the upcoming years, we expect the share of our scope 3 emissions to rise to even more than 50% of our total CO₂ emissions.

To better understand and address the scope 3 carbon emissions arising from our supply chain, we are working on a 'Decarbonising the Supply Chain' project. We aim to gain more insight into the carbon footprint of our purchased and capital goods and services. Life cycle assessments (LCAs) provide insights into the life cycles of our assets, revealing the biggest carbon emission contributors along our supply chains.

Our first findings specifically indicate that the biggest contribution to our scope 3 emissions lies in the upstream production of materials, such as steel, copper, aluminium, concrete and plastics. The transport of assets to our project sites and the installation of these assets also play a significant role. Based on these insights, we have started this year in twelve asset categories, which were identified to be among the strongest contributors to our scope 3 emissions, to develop and implement sustainable sourcing strategies together with our partners. Switching material supply to low-carbon alternatives, incentivising suppliers to

increase the use of green energy in production, transport and installation and identifying possibilities to increase circularity in our supply chains are examples of potential measures identified in these sustainable sourcing strategies.

We are increasingly considering sustainability to a greater extent in our supply chain. Next to LCAs, we use tools such as the Environmental Cost Indicator (ECI) to incentivise our suppliers to measure and reduce the environmental impact of the products and services we buy from them. By giving the environmental saving a monetary value through the ECI, we can also gather more data on our environmental impacts, as suppliers are encouraged to provide more transparency on their product lifecycle emissions in our tendering process. Furthermore, we have offshore framework agreements in place that require all our suppliers to submit a sustainability management plan to show how they understand and manage their carbon footprint.

We can expect scope 3 emissions to become a greater challenge as our project portfolio increases, and quickly. We have set targets to reduce our emissions in this scope by 30% by 2030, but TenneT projects take a long time to develop and often include multi-year contracts, such as our 2GW project framework agreements. In order to reach our targets in the stated timeframe, we need to think ahead and make choices now that will support them in the future.

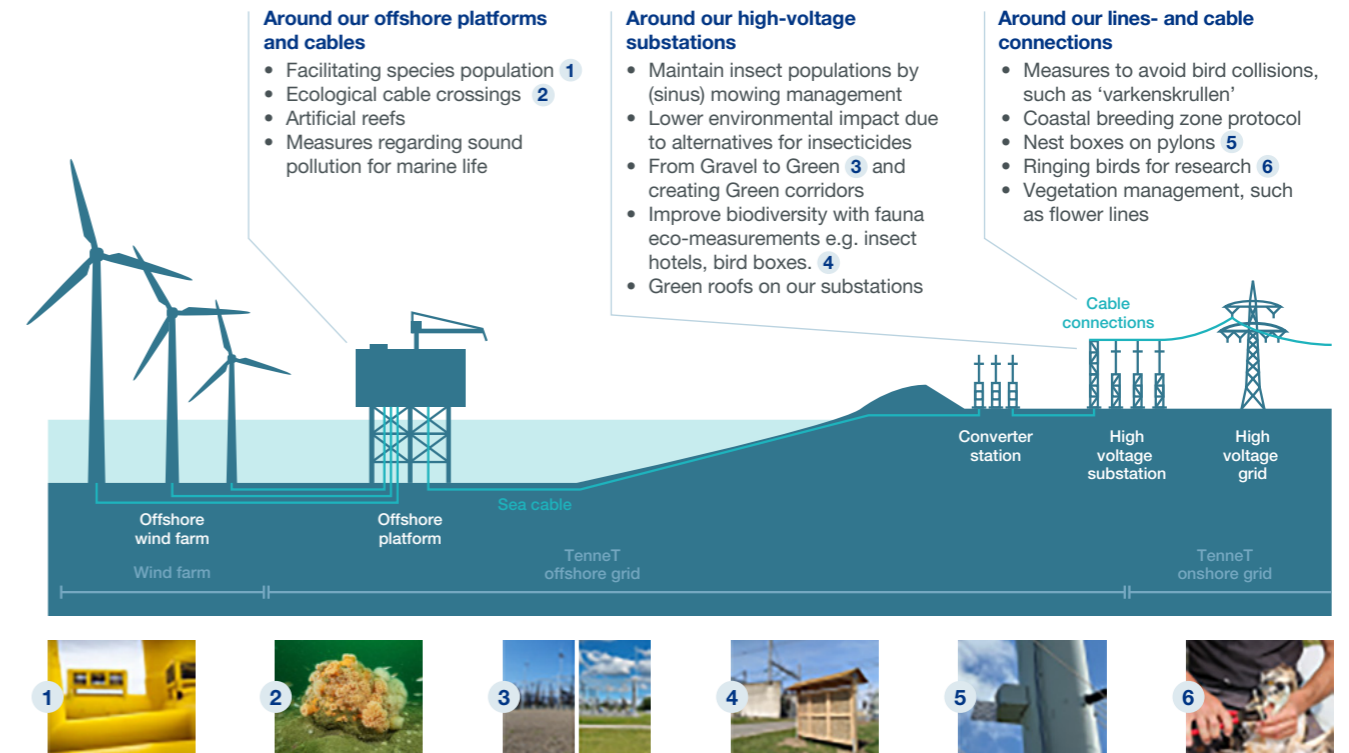
Mobility as a result of our own activities

With respect to the smaller sources of scope 3 emissions, we continue to improve our policies on mobility, motivating employees to make more environmentally friendly choices in the way they travel for work. We integrate our Mobility Vision with our hybrid and flexible working, so that employees can choose the means to do their job in the best way possible.

A partnership with the German rail operator Deutsche Bahn is one of the green mobility initiatives we have taken, encouraging employees to travel by train for climate-neutral journeys, as well as a bike-leasing scheme for our employees in the Netherlands and Germany.

As we grow our operations, with more employees and more projects, we want to avoid our emissions also going up. That is why we set absolute carbon emission (science based) targets. With a growing project portfolio and a growing workforce, this is not an easy challenge. However, we believe this approach will enable us to make better choices.

Nature measures



As a result, we were able to green 33% of our overall carbon footprint. If we would have used the same scope as last year (as in 2023, we updated the scope of our carbon footprint regarding our purchased and capital goods and services in scope 3), we would have greened 41% of our overall carbon footprint. This would have been an increase of 6% compared to prior year (35% in 2022), but we record the same percentage this year due to this scope change. Please note that these percentages are based on a location-based calculation. When using a market based approach, this would be respectively 30% and 36%.

TenneT's sustainable Revolving Credit Facility: linking climate performance to finance

To make progress against our climate ambitions even more visible, we have linked our financing costs to our climate performance. Secure access to finance is essential to ensure that we maintain the pace of our investment portfolio. An example of this is our EUR 3.3 billion sustainable Revolving Credit Facility (RCF), which is linked to sustainability performance indicators and targets. In practice this means that, depending on the realisation of our climate-related KPIs, a discount is applied to the interest margin of the RCF. This is related to the green percentage of energy use of our stations (100% in 2023 vs 100% in 2022) and our offices (100% in 2023 vs 100%

* not assured

in 2022). It is also linked to the net carbon impact of mobility per employee against the total number of employees (1.0 in 2023 compared to 1.4 in 2022) and the net carbon footprint of leaked SF₆ gas divided by theoretical CO₂ impact of banked SF₆ (0.11% in 2023 compared to 0.15% in 2022). To reduce our CO₂ footprint, we compensated for a part of our leaked SF₆ and mobility through carbon offsets of renewable energy and solar cooktop projects in India. Also, we have agreed upon targets to realise a reduction of our scope 1 and scope 2 emissions compared to the base year of 2019, which was a 26%* reduction when comparing 2023 with 2019 (based on a location-based approach).

Nature

While our work driving the energy transition contributes to a long-term positive impact on reducing carbon emissions and harm to nature from climate change, TenneT's activities also have a negative impact, as we build, maintain and operate our assets in the natural environment. By leading as a green grid operator, we aim to reduce our negative impacts - such as on biodiversity and the possible environmental impact related to building, maintaining and operating our assets (e.g. oil leakages) – while maximising our positive impacts. TenneT's goal is to reduce our net impact on nature to zero.

To make progress on our biodiversity ambitions, we include details on nature commitments in our investment plans. Currently, for each proposed investment, a 'Commitment to Nature' paragraph details a description of the anticipated impact on nature, the measures to mitigate, and the opportunities for positive impacts. In 2023, 100% of our investment plans contained such a section.

To take action to reduce our impacts on nature, we carefully track the number of environmental incidents, such as leakages of SF₆ gas, oil leakages from our assets, and other occurrences. In 2023, we recorded 190 environmental incidents (compared to 97 in 2022). As the amount of investments and the activities needed to drive the energy transition increases, the number of instances that this could happen also increases. However still this increase of environmental incidents is something that we are displeased with. We notice that a key driver for this increase relates to bentonite releases in our offshore activities. Bentonite is a type of natural sodium clay. The fact that we see improvements in the reporting of these incidents is a positive step. Next to this, we recorded 2,698 litres of oil leaked from cables in 2023, which is a slight decrease compared to the 2,762 litres reported in 2022. For both the environmental incidents as well as the oil leakages from cables, we consider every incident that occurs one too many and we are aiming to learn from the root causes of these incidents. An example of this is that we are aiming to optimise our average repair time for oil leakages from cables. We are monitoring how many days on average this takes to repair and aim to reduce this on a daily basis.

Since the introduction of this metric, we primarily focused on the Dutch oil cables as this required the most of our attention and in Germany we predominantly do not make use of these types of cables. We do have these types of cables in Germany as well, which was confirmed in 2023. Based on our current insights, this is significantly a smaller amount of cables than in the Netherlands (approximately 6 kilometres of cable). We are currently updating our reporting to have them appropriately included in this metric. As these types of cables have oil pressure meters which are connected to our systems, we are not aware of any oil leakages from cables from our German activities. In 2023, we began oil pressure sensing to gain more and quicker insights into potential oil leakages to reduce our negative impact. We launched a pilot for two 150 kV lines in Area West, which provides real time data on the status of our assets.

We also launched an inspiration guide for nature-inclusive building. Its purpose is to provide a toolbox to make nature-inclusive building the standard approach.

The impact we have or aim to create relates to where our assets are located when building, maintaining or operating them. This is mainly around our offshore platforms and cables, around our high-voltage substations and around our lines and cable connections. Taking into account the biodiversity around these areas is an important part of our sustainability ambitions.

Biodiversity measures around our onshore assets

Examples of how we make our policies regarding the biodiversity around our assets on land actionable are by working together with other infrastructure parties in the Netherlands to increase biodiversity in collective areas through the 'main ecological infrastructure'. Furthermore, we also embed these focus areas in policies on how we should carry out our maintenance and construction work, to ensure that we comply with nature conservation laws.

TenneT promotes sustainability at substations by applying green measures. Gravel areas near substations will be transformed into green spaces, provided our operations can continue. The revised Programme of Requirements (PoR) allows for alternative gravel solutions with grass and flower mixtures based on soil types. Some results so far include our Vijfhuizen and Meeden stations for instance.

Considering our direct impact on nature and wildlife, we try to reduce danger to bird life (and damage to our assets) by working with the right partners to identify high-risk bird spots and to implement preventive and animal-friendly bird barrier measures. We also work to protect nature in the immediate vicinity of our assets. Examples include making our lines better visible for birds by hanging up plastic curls (so-called 'varkenskrullen'). Also, on the Maasvlakte in the Netherlands, TenneT has started a pilot project to keep breeding gulls away from critical parts of the high-voltage substation. Lasers will be tested over the next few years to see if the birds will permanently avoid the high-voltage installations for breeding purposes. If the pilot is successful, it is expected that the lasers will be used on a larger scale at our high-voltage facilities.

Watch our pilot on the Maasvlakte on [vimeo](#).

Some species of nesting birds, such as peregrine falcons and kestrels, often nest in and around our assets. These can be found breeding at our facilities in Krimpen, Maasvlakte, Diemen and Vijfhuizen. To protect the birds and our assets, we are taking measures to prevent new nests in the installations before the start of the next breeding season. Furthermore, regarding our 150kV overhead line trajectory between Dodewaard and Ede, close to Wageningen, TenneT conducted a pilot with drones to hang wire markers for birds - a first in the Netherlands.

Usually, TenneT works with helicopters or cranes and climbers are used to install wire markings. Using a drone is both more environmentally friendly and cost-efficient, as it does not require heavy machinery on land or helicopters to fly.

Biodiversity measures around our offshore assets

Examples of how we address this around our offshore assets are related to the concept of 'Nature-Inclusive Design' (NID). Here, projects are part of TenneT's efforts to reduce the environmental impact of expanding the offshore grid. Several projects have already integrated eco-friendly designs and ecological measures, such as fish enclosures and ecological landscaping measures.

An example of how we apply Nature Inclusive Design, relates to the Hollandse Kust (zuid) project. For this project, where we realised this offshore grid connection system, we have laid cables from the platform to the coast near the Maasvlakte. To protect the cables at crossings with oil or gas pipelines, for example, a protective top layer of stone was laid over the cables. The first results of our marine life survey around these sea cable crossings found a source of biodiversity around these crossings with about 48 different species. This research will be continued to analyse the differences between different types of stones and their effect on biodiversity. Another example relates to another offshore grid connection system, Hollandse Kust (west Alpha). Together with one of our contractors, we placed artificial reefs near this asset.

Circularity

TenneT depends on large amounts of different materials to operate, reinforce and expand our grid to facilitate the energy transition. The extraction, refining, use and disposal of these materials is one of the key drivers of the negative environmental and societal impacts we have as a TSO. Additionally, increasing global use of these materials, as well as recent crises and geopolitical tensions, have led to increased scarcity of and competition for these materials.

This has resulted in considerable risks for our business through supply chain disruptions, increasing material prices and price volatility as well as longer delivery lead times. Shifting from a linear to a circular use of materials is therefore of vital importance for us to connect everyone with a brighter energy future and to lead as a green grid operator. We believe that the shift to a circular economy is possible and that TenneT can make a significant contribution by increasing circularity within our activities and by promoting circularity with our partners.

To address this ambition in a targeted way, we developed our first Circular Economy Strategy in 2023. With this strategy, we want to take the next steps in our journey towards a circular way of working and update our previous approach. Through a broad involvement of different business units, we have developed a common understanding of circularity for TenneT, a mission statement, a circular economy framework as well as targeted KPIs to measure our performance. Our mission is to optimise the use of materials and reduce our dependency on virgin materials. We want to do so by embedding circular design, circular procurement and circular recovery in our activities and by focusing on a number of key materials and assets. We start implementing this strategy by measuring and increasing the circularity of our copper inflow, as well as the circularity of our material outflow.

To measure and improve the circularity of our material inflow, we are increasingly implementing circularity requirements in our tenders and our procurement strategies. One important step we have implemented over the years is to request our suppliers to fill out 'raw material passports' and conduct LCAs for their products. These give information about the quantities and sources of materials, to what extent they can be recovered at end-of-life, and their resulting environmental impact.

As well as improving insights, sustainability criteria can also stimulate innovation. For example, our use of the Environmental Cost Indicator in tenders provides an incentive for our suppliers to find ways to increase the circularity of their products. For instance, a response from one of our tenders has opened the way for us to have power transformers using 100% recycled copper in the future. To completely close and even shrink the materials loop, we're investigating how copper from obsolete TenneT transformers could be used to create new ones. In 2023 we had a total copper inflow of around 5,100 tonnes, 36% being circular.

As we expand our grid with material-intensive assets such as cables, transformers, substations, offshore platforms, steel towers and overhead lines, the competition for materials increases. As such, all players in the energy industry need to think of how they can achieve their energy transition goals, by optimising their use of materials, stimulating circularity, and minimising waste.

Many of the impacts described in this chapter are a part of our most material impacts. This is where we will also report more extensively on, in light of meeting the Corporate Sustainability Reporting Directive (CSRD) requirements. TenneT will need to comply to this legislation as of 2024. An example of this is how we have started to further improve our internal waste reporting processes throughout the different parts of the organisation. We have laid out clear definitions, requirements and processes for waste reporting and are currently investigating possibilities to further digitalise waste management and reporting processes. This will ultimately enable us to measure and increase the circularity of our material outflow in a much more effective and targeted way. In 2023, 75 - 90% of our material outflow was recovered. More information on our progress in complying with upcoming CSRD legislation can be found in the 'About this report' section.

What could prevent us from reaching our goals?

As our activities and operations grow in the coming years, it is expected that our impact on carbon emissions will grow simultaneously. While we try to reduce our footprint, it remains a challenge to balance our growth with a lower footprint.

Grid losses are a major contributor to our carbon emissions – accounting for 75%. Unfortunately, the nature of power transmission makes grid losses inevitable. By using more aluminium instead of copper as a conductor in our power lines, we can reduce our usage of resources that are scarcer than others. However, this has the effect of higher grid losses as aluminium is a less effective conductor.

Furthermore, as our network grows onshore and offshore and by using more long-distance high-voltage connections, grid losses could grow proportionally higher. With the right technology developing the grid of the future, we will strive to reduce our carbon emissions.

Regarding SF₆ leakages, which currently accounts for less than 1% of our climate footprint, we are working hard to reduce our use of this insulating gas. Therefore, we continue to work with our partners in both Germany and the Netherlands to find and implement sustainable solutions. We are also taking technical measures to prevent or reduce the loss and leakage of other environmentally harmful contaminants, such as oil and other gases and liquids. Mitigation measures such as extra containment beneath transformers and oil-water dividers can help reduce the risk of harm to biodiversity around our operations. We also perform regular monitoring of our asset condition, through maintenance and procedural control.

Resource circularity will become increasingly important in the years ahead. The scarcity of materials and the reduced usage of oil puts pressure on alternative resources. To this end, we are changing our tender procedure to include stricter circularity requirements, for example by asking suppliers to provide evidence of the percentage of their materials that are recyclable and recycled with 'raw material passports'. We are also intensifying our use of LCAs, which allow us to calculate the lifetime environmental impact of products used in each project over their lifetime.





With this pilot, a solution to the nitrogen constraints is coming into sight



Henri van der Kamp
Managing director Van Gelder Group

“The key to making construction sites more sustainable lies in solving the logistical problem of sustainably charging heavy equipment on site. Thanks to the unique controlled horizontal drilling pilot that Van Gelder carried out for and with TenneT near a Natura-2000 area in Brabant, we are a step further in solving this puzzle. Not only was this pilot the first time a fully electric 235-tonne drilling rig was deployed in the Netherlands. It was also the first time that the electricity required for drilling was generated sustainably. With this pilot project, a solution to the nitrogen constraints in the expansion of energy infrastructure is really coming into sight.”

Safeguard sustainable financial performance

The urgency of the energy transition is increasing as European governments strive to achieve 2030 and 2050 climate targets. However, the cost of decarbonising the energy system is also rising, intensifying the debate about affordability. As one of the largest investors in the energy transition in Europe, TenneT is creating long-term value for society, while also safeguarding our financial health and delivering a return on capital that meets the expectations of our capital providers.

Introduction

As a leading electricity transmission system operator in Europe, TenneT is deeply rooted in society. We serve people in the areas where we operate by securing supply of electricity while at the same time supporting the societal needs of decarbonisation and helping to realise the energy transition at an acceptable cost.

In order to provide long-term services, safeguarding our financial health is of paramount importance. Designing, building, maintaining, and operating a future-proof grid comes at a cost which businesses and ultimately end-consumers carry via the payment of grid fees and levies in their respective energy bills.

TenneT takes its responsibility to society very serious. The choices we make have a financial impact and are therefore considered carefully when we balance affordability with reliability and sustainability. Securing supply today and tomorrow, especially at the high level of availability our end-users expect in the Netherlands and in Germany, requires substantial investments.

To support a renewables-based future energy system, we must expand and renew the onshore and offshore grid, while also maintaining our existing assets and taking measures to balance the grid, among others, through the procurement and use of ancillary services.

Over the past two years, in the wake of the energy crisis when gas prices soared following Russia’s invasion of Ukraine, the cost of the energy transition has increased. In addition to higher infrastructural costs, society also faces the higher transitional cost of congestion management as the energy system becomes increasingly electrified. This is partly caused by the move towards net zero and partly by a desire to strengthen energy security in the European member states.

As a result, the affordability of the energy transition is becoming a widely debated political topic.

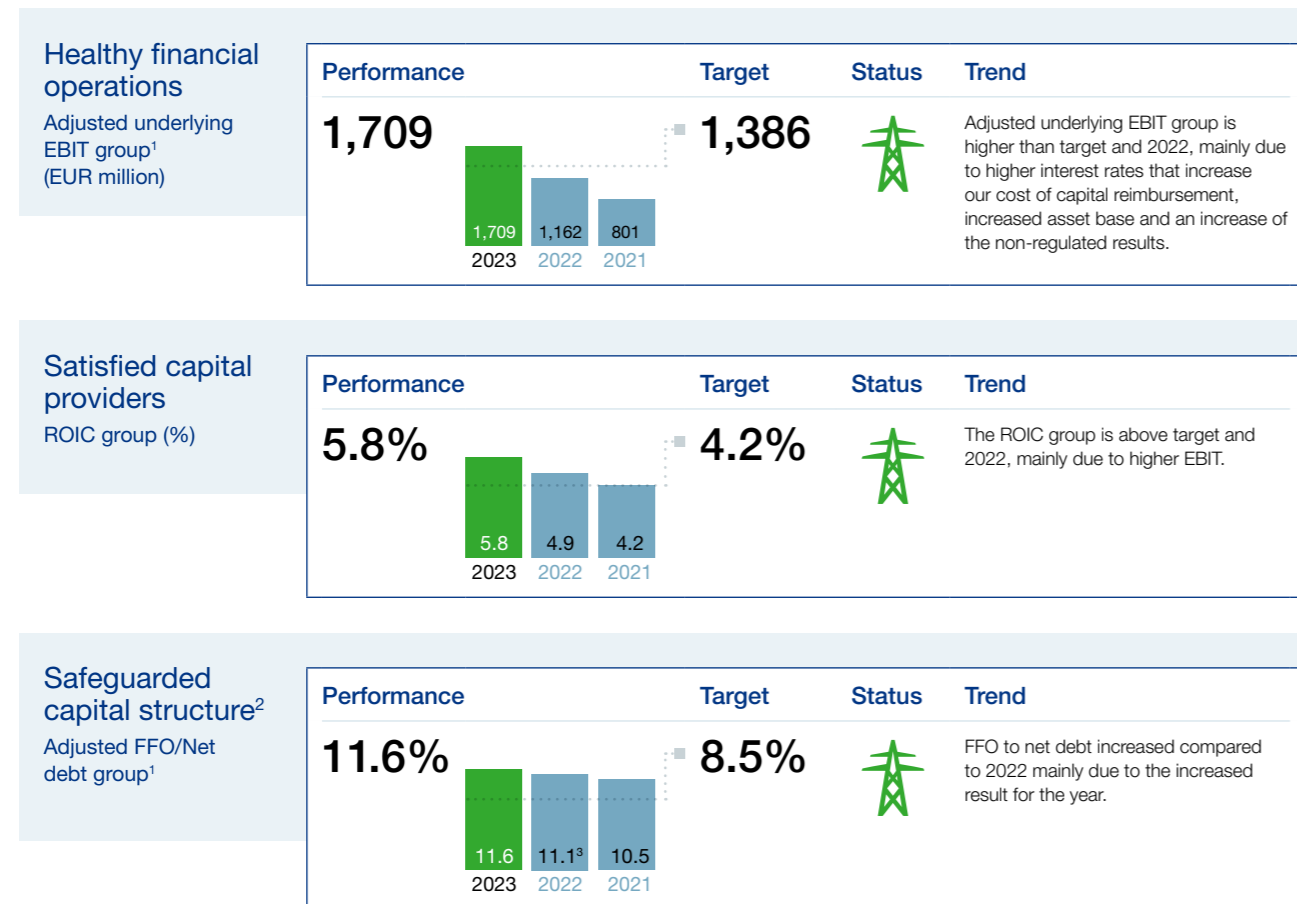
Although Europe’s political climate targets seem far away, in terms of grid development, they are close on the horizon. To build a futureproof energy system that can support a sustainable economy by 2045, we need to maintain the momentum of our investments.

With carefully managed energy system planning, the investments set out in our Target Grid 2045 give economies more time to adjust to green investment and the energy transition and will create a future-proof backbone for a fully decarbonised energy system. As such, TenneT’s investments in reinforcing, expanding and modernising the grid are not just about affordability today. They are about long-term affordability and security of supply for society in the future.

Financial solidity of our company is a prerequisite to be able to invest in the energy transition. Therefore, our mission to safeguard our financial health remains unchanged. We do this by delivering a return in line with what our capital providers expect, as well as by raising the required external financing. The latter is supported by our financial policy to maintain a senior unsecured credit rating of at least A3/A-. TenneT does not seek short-term profits; in principle, we invest for periods of several decades. However, we do aim for adequate and sustainable returns on our investments, as this ensures to sustainably maintain and operate our grid and enables us to make the necessary investments in the energy transition going forward.

In 2023 TenneT implemented SAP S4/HANA as new enterprise resource planning system after a preparation by many colleagues over the past two years. While TenneT initially experienced some technical implementation issues, the system run reliably and relatively stable at year-end 2023 and enabled us to prepare the financial close with it for the first time. The first components of a new application for managing German levies were also put into operation.

Our performance in 2023



¹ Reference is made to next page.

² Reference is made to Note 19 of the financial statements.

³ Adjusted from 9.7% to 11.1% due to changed definition of debt.

This application will be used to manage the electricity revenue cap in Germany for which TenneT is one of four trustees assigned by energy law. The aforementioned implementations were challenging, yet successful and had an impact on internal control and changed processes.

Underlying revenues and EBIT

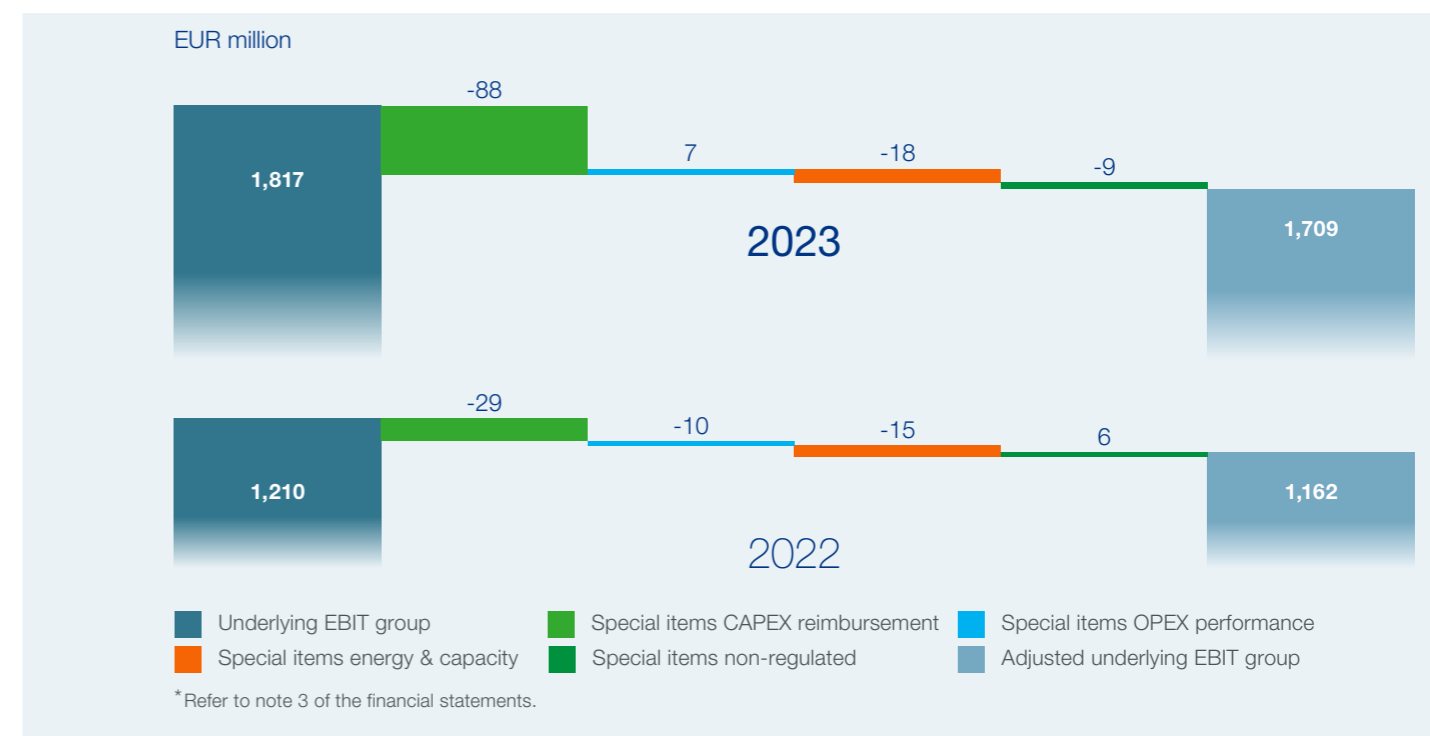
Underlying revenue decreased by EUR 618 million to EUR 9,222 million.

The lower costs for ancillary services in 2023 compared to 2022 resulted in lower underlying revenues, since those costs will be settled through future tariffs, or are directly offset by auction receipts. This decrease in revenues is partly offset by the increased regulatory reimbursements due to rising interest rates. Furthermore, revenue increased due to ongoing investments, resulting in a growing regulatory asset base and higher onshore and offshore revenues.

The underlying operating result (EBIT) increased by EUR 607 million to EUR 1,817 million. The increase of EBIT is partly caused by higher compensation in tariffs as a result of increased regulatory reimbursement due to higher interest rates. Higher interest rates are vice versa resulting in increased finance expenses which are not part of EBIT. Other factors driving higher EBIT in 2023 were the strongly grown investment volumes which led to an increase in the reimbursement of capital costs as well as higher results from our non-regulated joint venture, BritNed.

Another significant factor was The Trade and Industry Appeals Tribunal ('College van Beroep voor het bedrijfsleven') court ruling on Transmission System Operator Method Decision, issued in July 2023. This granted a higher revenue entitlement for TenneT for the current regulatory period, resulting in an aperiodic one-off effect in the 2023 results (see 'Contribute to achieve a reliable and predictable regulatory framework which supports our financial strategy').

Underlying EBIT group*



For the TSO Netherlands segment, EBIT amounted to EUR 548 million (2022: EUR 312 million) and for the TSO Germany segment to EUR 1,141 million (2022: EUR 791 million) during this period. For our non-regulated businesses EBIT amounted in 2023 to EUR 128 million (2022: EUR 107 million).

The adjusted underlying EBIT increased from EUR 1,162 million in 2022 to EUR 1,709 million in 2023.

Ancillary services costs

Ancillary services are the costs TenneT must incur, in particular, to compensate for grid losses, to maintain the energy balance in the grid, and to pay for alternative routes for the electricity when grid sections are congested or unavailable due to grid expansions. As ancillary services require TenneT to procure electricity, these costs are directly affected by electricity market prices. From 2021 to 2022, Europe suffered a double supply shock, both in gas and electricity generation. In 2021, gas prices rose due to a combination of factors, including an increase in global demand for energy as the world economy recovered from the COVID-19 pandemic and unfavourable weather hampering renewable and hydro generation. In 2022, the Russian invasion of Ukraine further led to a significant increase in energy prices, leading to higher costs for consumers and businesses alike, including TenneT.

Following mild weather, societal savings of fossil fuels, a diversification of gas supplies including LNG to Europe, and increased solar and wind output energy prices dropped significantly and the energy markets became less volatile in 2023. As such, our ancillary services costs decreased from EUR 6,439 million in 2022, to EUR 5,065 million in 2023.

IFRS results

As mentioned in the section Future Forward, the German activities are no longer continued per 31 December 2023. In this section are however, the IFRS results including the German activities, as also disclosed in note 3 of the consolidated financial statements, 'Segment information'.

Underlying financial information is based on International Financial Reporting Standards (IFRS) as adopted by the European Union, plus the principle of recognising regulatory assets and liabilities for all of our regulated activities. This implies that amounts resulting from past events, and which are allowed to be received or are required to be returned through future tariffs, are recorded as an asset or liability, respectively.

TenneT's Executive Board believes that the presentation of underlying financial information provides additional relevant insight in the actual financial position, financial performance, and as such economic reality. By comparison, the

consolidated financial statements are prepared based on IFRS. Based on prevailing opinion on IFRS, it is not allowed to recognise amounts to be received or are required to be returned through future tariffs.

Our IFRS revenue increased by EUR 999 million to EUR 9,298 million. IFRS revenues mainly increased due to increased reimbursement of expected costs for ancillary services costs and higher regulatory tariffs. IFRS EBIT increased mainly due the increased revenues, decreased actual costs for ancillary services and increased result of our non-regulated joint venture BritNed, compared to 2022.

Investments and raising the necessary funding

In order to maintain our A-/A3 credit ratings and to realise our investment portfolio, TenneT's financial policy is to realise a ratio of long-term average funds from operations (FFO)/Net debt (based on adjusted 'underlying' financial information) of at least 8.5% (with individual years of at least 8.0%). This is in line with the (most strict) requirement to maintain an A-/A3 credit rating as formulated by the international rating agencies S&P and Moody's. TenneT's large investment programme will put pressure on the FFO/Net debt ratio. Therefore, TenneT is exploring together with its shareholder the Dutch state a potential sale of its German operations to KfW/German State. A second parameter we focus on is ensuring that our regulated returns on invested capital (ROIC) are higher than our weighted average cost of capital (WACC). Both of these aims were met in 2023.

The investments significantly increased to EUR 7.7 billion, which is mainly related to our 2GW Program, where framework agreements and contracts were awarded to create fourteen 2GW connections. This is the largest investment in a single year in the European energy transition. During 2023 we also met other key milestones in our investment programme, such as the completion of the Hollandse Kust (noord) and Hollandse Kust (west Alpha) grid connections. In Germany, 2023 saw the completion of DolWin6, the West Coast Line and the start of construction of SuedLink.

To realise investments such as these and build a grid that is future-proof, it is essential that TenneT maintains a broad and sustainable access to financing readily available and at the right cost.

Part of those funds come from equity and the majority from borrowings. In June 2023 TenneT received a contribution from our Shareholder of EUR 1.6 billion. Given the conditions precedent, the contribution is classified as current financial liability instead of equity.

As regards debt, TenneT secured a sustainability-linked term facility loan agreement of EUR 8 billion with a tenor of 2.5 years, also in May 2023. The facility is the largest sustainability-linked term loan ever. The facility was undrawn as of 31 December 2023. In 2024, TenneT and the Dutch state have made arrangements regarding a temporary shareholder loan facility of EUR 25 billion, safeguarding our planned investments in the Netherlands and Germany for 2024 and 2025. The loan facility, which will be granted at market conditions, is subject to a customary parliamentary approval process, which is currently in progress.

Our financial strategy is focused on maintaining our credit rating at a minimum of A-/A3 and generating returns on investment in accordance with our risk profile. Our A- credit rating from S&P and our A3 rating from Moody's were again confirmed this year. Also, our ESG evaluations were reaffirmed by external rating agencies. For example, S&P again classified us as 'strong' with a score of 86/100 and Sustainalytics indicated that TenneT is classified as a 'low risk' company, which indicates our exposure to industry-specific ESG risks and the manner in which these risks are managed.

The adjusted FFO/Net debt ratio increased from 11.1% as of 31 December 2022 to 11.6% as of 31 December 2023. The increase is mainly caused by the increased result for the year. In the integrated annual report 2022, TenneT has reported the FFO/Net debt ratio including (adjusted net debt) and excluding regulatory receivables (net debt), like 'to be settled in tariffs'. As of 2023, TenneT only reports the FFO/Net debt ratio including 'to be settled in tariffs' because this is the ratio TenneT steers on. The comparative figures have been adjusted accordingly and the FFO/Net debt ratio increased from 9.6% to 11.1%.

Contribute to achieve a reliable and predictable regulatory framework which supports our financial strategy

Stable, reliable, transparent and predictable regulation plays a critical role in our investments and operations, helping to enable security of supply, while also fostering and incentivising innovation and progress. Regulation also provides the framework we need to attract equity and debt

capital for future investments in grid expansion, replacement and maintenance. On top of that, regulation also serves to maintain affordability of grid fees and energy prices towards industrial customers and end-consumers.

As the nature of our business and the scale of the energy challenge require us to think decades ahead to determine how and where to invest, we need to rely on a regulatory framework with a long-term focus. While regulatory periods are established for much shorter timeframes of typically five years or less, the underlying methodologies should provide a stable long-term regulatory framework in both the Netherlands and Germany. Grid operators need this solid regulatory foundation to earn a risk-adjusted rate of return on their investments, plus operational and ancillary costs.

Developments in Europe

From a European perspective, the European Network of Transmission System Operators for Electricity (ENTSO-E) organised the high-level grid forum: 'Future of our Grids – Accelerating Europe's Energy Transition'. This event was organised at the request of the European Commission (EC), recognising the crucial importance of electricity grids for the energy transition. The forum provided a platform for TenneT to convey regulatory viewpoints in the context of innovations and investments required for the energy transition, as well as the need for TSOs to receive a proper return on equity. In the EC's new Electricity Market Design package, it is explicitly stated that grid tariffs should be used to boost an optimised use of the grid, as they are seen as incentives for innovation and the use of flexibilities. The EC agreed on the need for a broader choice of investment instruments together.

Despite the satisfactory result, TenneT has an overarching regulatory challenge given the backward-looking approach of the incentive regulation in times of massive growth. Following general price trends and partly very tight markets, TenneT, like many other companies is facing rising OPEX (e.g. higher maintenance, personnel and IT-costs) in the its current regulatory period. In order to keep OPEX growth at an efficient level, cost development has to be in sync with the allowed revenues for OPEX. If and when this can temporarily not be reached, adequate countermeasures will be evaluated and launched to achieve at least a balanced OPEX result in the long-term.

The Netherlands

As part of the Action Plan Net congestion (LAN), the TenneT tariff revision (time of use) to support flexibility was endorsed by market parties, the Dutch Ministry of Economic Affairs & Climate Policy and the ACM. This means TenneT will implement a revised tariff structure with more incentives for users to apply grid-friendly behaviour.

TenneT's tariffs increase on average by 125% for Extra-High Voltage (EHV) and 80% for High Voltage (HV) in 2024. This increase was foreseen by TenneT and communicated well in advance to market parties, the Ministry of Economic Affairs & Climate Policy and the ACM in May 2023. TenneT's early and clear communication was well received by market parties.

In the Netherlands, the ACM concluded that TenneT has successfully complied with its commitments to make improvements designed to prevent power outages as much as possible. The ACM required TenneT to do this following an investigation into a power outage in the city of Eindhoven in 2018. As such the case is legally closed. The ACM however indicated that they wish to continue the dialogue on this topic on a semi-annually basis and asked TenneT to bring forward actions to further improve on security settings in our stations.

During 2023, TenneT appealed against the 7th Method Decision for the regulatory period 2022-2026 in the Netherlands, which had a significant financial impact. Appeals resulted in the ACM's benchmark scores for measuring efficiency being lifted to 100% and revisions made to the determination of weighted average cost of capital (WACC).

Germany

TenneT and the other German TSOs presented the provisional offshore grid levy 2024 to the BNetzA in October. Considering preliminary planned/actual cost deviations of former years, TenneT will include EUR 1.7 billion for the 2024 offshore grid levy which is consistent with 2023. After several statement letters, TenneT reached a final result which is mutually satisfactory for both TenneT and the regulator.

Grid fees and our impact on household electricity bills

Designing, building, maintaining, and operating a futureproof grid comes at a cost which households and companies and power plants for their electricity consumption contribute to via the payment of grid fees. Having assessed our impact on the electricity invoice (retail of electricity; taxes, charges and levies; grid fees) of an average household in the Netherlands and in Germany, our share in Germany was around 4.3% in 2023 (2022: 4.8%). The impact with respect to the electricity bill on households in the Netherlands is estimated to be approximately 8.7% in 2023 (2022: 9.1%). The share in Germany is decreased compared to 2022 due to the federal grant to reduce the grid fees. In the Netherlands the share decreased as a result of the fact that the other items of the electricity bill increased more than our part.

In December 2023 it has been decided that the four German TSOs will not receive another federal grant for 2024. Due to the ruling by the Federal Constitutional Court on 15 November 2023 regarding the second supplementary budget for 2021, the Economic Stabilisation Fund (ESF) was also indirectly classified as unconstitutional and is therefore no longer available as a source of refinancing for the 2024 grant. As a consequence, the nationally unified TSOs are now forced to adjust the grid fees for 2024, resulting in more than a doubling compared to 2023.

The share of TenneT's impact on household electricity bills will increase in the Netherlands and in Germany in the coming years, as the costs for the energy transition rise amid increasingly ambitious climate goals.

The final 2024 revenue cap for onshore has decreased by EUR -3.4 billion (-44%) to EUR 4.4 billion compared to the final 2023 revenue cap. The decrease is due to lower expected costs for congestion management (EUR -3.9 billion). Nevertheless, the costs for ancillary services remain at a high level, as a consequence of high congestion managements costs following the Russian war against Ukraine and rising energy cost.

In light of this development, the TSOs have been in discussion with the Ministry of Economic Affairs and Climate Action (BMWK) and the BNetzA with regard to a grant for the grid fees 2024. This follows an agreement made in 2022 that the German government would compensate for the higher grid fees that TenneT and other TSOs said they must charge in 2023 to reflect escalating wholesale power prices and ancillary services costs, such as redispatch. With grid fees accounting for around 4.3% of domestic energy bills and around 0.9% for industrial customers, the government's compensation helps to absorb the TSOs' cost increases.

What could prevent us from reaching our goals?

TenneT is the key driver of the energy transition, with investments increasing to at least EUR 10 billion per year in maintaining, operating and modernising the electricity grid in the areas we serve. With the growth of our asset base and our organisation, also our operating costs are increasing. Furthermore our operating costs are increasing, due to external factors such as inflation and market scarcities.

Exceeding the regulatory reimbursement of our operating costs results into a lower EBIT. Although partially inevitable due to our rapid growth in combination with a set reimbursement per regulatory period, we aim to reduce this OPEX gap as much as possible. We closely monitor our key OPEX drivers and set budgets balancing growth and potential for cost reductions as well as efficiencies. Furthermore, we are conducting cost analysis of the separation of our business in Germany, if implemented.

As the financial health of TenneT relies on our ability to attract the financing we need to realise our investments, and thereby fulfil our societal role, we need to balance the risks associated with our ability to raise additional equity while keeping our credit rating stable. The possible sale of TenneT's German operation to the German state is a possible action to mitigate this risk.

Thinking beyond national borders. For a secure and stable electricity supply



Klaus Müller
President of the Bundesnetzagentur
(Federal Network Agency), Germany

“Energy generation is changing. Just twenty years ago, wind and hydro power hardly played a role. Today, renewables account for about half of all Germany's electricity generation. Our electricity grids are more stable than ever. Since 2006, when generation was still dominated by fossil fuel, interruptions to our electricity supply have almost halved. Our future supply of energy must be secure, affordable and, above all, climate-friendly. That is the goal – not only in Germany, but in the whole of Europe. How to reach this goal is largely undisputed, too: carry on expanding renewable energy and the networks to transport the energy at a fast pace. To do this, we need low barriers and swift approval procedures. Building infrastructure means thinking well ahead into the future. And thinking beyond national borders. We are all connected to one other by power lines and cables and our policies should connect us all as well. The dialogue between our countries in Europe needs to be even closer in future, as security and stability depend on us creating networks together. The Bundesnetzagentur is doing everything it can to drive expansion forward, with the energy sector, policymakers and consumers firmly in its sights.”

Solve societal challenges with stakeholders and through partnerships

As a key player in the energy transition, TenneT is working in partnerships with a wide range of stakeholders and organisations with the aim to find the best solutions that will achieve a green and futureproof energy system. These partnerships are not only needed to harness the technologies and sustainable solutions required for the Target Grid 2045, but also to secure the people and financing we need to get there.

Introduction

The ambition for Europe to be the world's first climate-neutral continent by 2050, and to lower carbon emissions by 55% in 2030, has consequences for the whole of society. TenneT is among many players in the sectors of energy, engineering, finance, technology, academia, politics and beyond which are tasked with making this ambition a reality. TenneT's role is to design and build an electricity grid that is climate-neutral and can meet the future needs of a decarbonised economy, while maintaining a high security of supply and remaining financially healthy.

It's a huge task, and one that we are moving ahead with at full speed to achieve. The EU's dates for decarbonation may seem far away, but when it comes to planning, developing and building the needed high-voltage electricity infrastructure (onshore and offshore), 2030 is already tomorrow, 2040 is next week, 2050 is next month. In Germany, the government plans to reach net zero even earlier, by 2045.

This is why we take 2045 as the date by when we need to operate a future-proof, reliable and cost-efficient grid that can support a full sustainable energy system. This is the basis of our Target Grid 2045 strategy, giving us a clear roadmap of the infrastructure we will need to have in place by 2045, and the approach for how we will get there. This is not just about growing our infrastructure – the Target Grid 2045 will require smart solutions, innovative technology and the power of multiple partnerships. No single player can achieve the goals of the energy transition alone – that is why we work together with many stakeholders, collaborating across all of our strategic pillars.

This includes partnerships that will help to ensure security of supply, as the future grid that will rely on renewable energy sources that are by nature more volatile and intermittent, with innovations needed to maintain balance between electricity supply and demand and to provide new sources of flexibility. We also seek partnerships that drive the energy transition, as we need to build a grid that is reliable, affordable and sustainable for society, with TenneT leading as a green grid operator. More partnerships are required to ensure TenneT has enough people to achieve our fast-growing investment portfolio, improving our ability to recruit and retain increasingly scarce talent in a competitive market and to ensure our people are energised and motivated. And finally, we need to work with other important stakeholders to safeguard TenneT's financial health, as we cannot achieve our objectives without raising the necessary external financing and delivering a return in line with what our capital providers expect.

Our performance in 2023

To accelerate our plans for Target Grid 2045, while also improving the performance of our existing grid, finding the right solutions and the right partners to cooperate with are an important part of TenneT's strategy, with a large number promising and successful projects underway and planned.

We enter into partnerships to address key challenges TenneT faces in building, maintaining and operating a futureproof grid. These include working with governments and local authorities to tackle grid congestion. We also work closely with suppliers of new DC technology, as their innovations will allow us to build an integrated onshore and offshore renewables-based grid. We also face the challenge of driving the energy transition while minimising our negative impacts on the environment. For this, we partner with other infrastructure players on measures to protect nature and we co-ordinate with suppliers to find new emission-free solutions for our construction work.

Our partnerships with academic institutions and long-term framework agreements with suppliers help to ensure we have the talent we need to deliver on our goals, not only within TenneT but also in our supply chain. And to meet the challenges of affordability in the context of the rising cost of the energy transition, we work closely with regulators, relationship banks and investors to ensure we can work in a sustainable regulatory framework and we have access to the financing we need.

Partnerships to secure supply, today and tomorrow

In 2023, we were able to secure supply 99.99993% of the time. This level of grid availability is not a given – it is the result of the hard work of many colleagues and other partners every day. To ensure we are able to secure supply in the future as well, requires thinking and planning ahead, which we have brought together in the concept of the Target Grid 2045 strategy.

Society is already experiencing the effects of the energy transition on the electricity grid, as rapidly increasing demand for electricity and the higher in-feed of renewables places more demand on electricity transmission. To make sure we can facilitate this demand, and connect the growing in-feed of renewables, we need to expand, strengthen and modernise our onshore and offshore grid, providing a green energy backbone for a more sustainable Europe.

We already see some of the effects of when we are unable to succeed, with congestion in many regions of the Netherlands in 2023. Also in Germany, the situation could become more challenging if we do not maintain, strengthen and extend our grid to facilitate a higher infeed of renewables and connect this to where the electricity is consumed.

In this context, we are active in partnerships with many different stakeholders to tackle congestion in areas of our grid. Our work with the Energy Boards in the Netherlands, is an example of the partnerships we have with governments and other parties such as DSOs to address congestion in specific areas.

We also tackle grid congestion with partnerships that boost grid utilisation, helping us to maximise the use of our existing assets. This reduces the need to constantly expand our grid, and thereby benefits society by allowing us to drive the energy transition faster, with improved affordability and security of supply.

Examples of important partnerships in 2023 that help us address this challenge include our **Open Innovation Programme**, which is focused on solutions to optimise grid usage, thereby helping us to connect more customers to the transmission and distribution grids. As a result of this programme, a partnership with N-SIDE was formed that pitched a solution related to the challenge on how to make optimal use of the transport capacity and connection points to the electricity grid.

As well as overcoming the challenge of congestion, we also use partnerships to ensure our grid is future proof to secure supply today and tomorrow. In this respect, our partnerships are focused on grid expansion, market facilitation, system operations developments and flexibility.

As our Target Grid 2045 strategy also envisions a meshed onshore and offshore DC grid, linked by high-voltage DC (HVDC) corridors, and multi-terminal DC hubs, we need partnerships that help us overcome technological challenges, as many of the solutions needed to realise this vision do not yet exist.

A good example of a partnership that is focused on the development of this new HVDC technology, and thereby helps to enable the development of our 2045 Target Grid, is our **InterOPERA** programme. The InterOPERA consortium brings together a team of HVDC manufacturers, TSOs, sector associations and a technical university. This collaboration is designed to ensure that the HVDC technologies used in the future meshed onshore and offshore DC grid use standardised and inter-operable technologies that can be supplied by multiple vendors (as opposed to closed, proprietary systems). This will help TenneT to tender and procure its first multi-vendor HVDC system (and its building blocks) ensuring interoperability by design, while limiting technical risks.

To tackle the challenge of a future grid that is more dependent on renewable sources and securing supply not only today but also tomorrow, especially that of an increasing share of offshore wind generation, an important partnership is our **FUTURESYSTEM** project. Here, together with the Technical University of Delft, TenneT is investigating the risk of an unstable electricity system. The project findings will form the basis for new operational principles for both offshore and onshore multi-energy hubs.

Another important development to make our system operations resilient for years to come is our **Control Room of the Future (CROF)** programme. With this, we are making TenneT's grid control centres future-proof and equipped to manage our increasingly data-driven grid. The project will also help us to increase grid utilisation and automation. The CROF programme includes projects where TenneT is partnering up with external stakeholders to enable the acceleration of energy transition and tackle the social challenges. An example of this relates to Power Grid Boost, where TenneT focusses on mid-term long-term congestion management. Here, we are working together with other stakeholders such as educational institutes and several other Dutch DSOs.

In the end, we need flexibility to ensure we can balance supply and demand of electricity in a changing energy landscape. The concept of flexibility relates to how TSOs make use of energy sources to call for the required capacity when needed and switch off capacity when there is access. This is necessary to balance the grid at all times. An important topic in this is to have data available for society to enable them to make the right choices at the right time to support us in this by using excess electricity when this is the case. That is why we are working in partnerships with other stakeholders like TSOs and others like technology companies to provide these insights and data.

Examples of these are to the Nationaal Energie Dashboard in the Netherlands and the CO₂-Monitor in Germany. We also started the **energy data-X** in Q4 2023, which is focused on secure and sovereign data exchange amongst energy partners. In addition, new developments on the Equigy partnership, a crowd balancing platform which enables consumers to contribute to balancing the grid via smaller flexibility devices such as home batteries and electric vehicles. Through this partnership, 2 gigawatts were made available this year to make use of in the aFFR capacity.

Next to this, German heat pumps were also enabled to be connected to this platform. These partnerships help us to balance the grid in a more volatile and intermittent electricity system addition, new developments on the Equigy partnership, a crowd balancing platform which enables consumers to contribute to balancing the grid via smaller flexibility devices such as home batteries and electric vehicles. Through this partnership, 2 gigawatts were made available this year to make use of in the aFFR capacity. Next to this, German heat pumps were also enabled to be

connected to this platform. These partnerships help us to balance the grid in a more volatile and intermittent electricity system.

Partnerships to drive the energy transition

As a TSO, we face the ongoing challenge of ensuring we make progress in driving the energy transition, while also minimising our negative impacts on the environment. As we work towards Target Grid 2045, we want to build a grid that will ensure reliable, affordable and sustainable access for society. That is why we try to lead as a green grid operator, contributing to a future greener energy system. To be able to meet the milestones in Target Grid 2045, we need to focus on the requirements of a future and greener energy landscape and work together with stakeholders and in partnerships to make progress. In the case of the nitrogen challenge in the Netherlands, we need to work with partners to address key challenges that are stopping our work.

Examples of collaborations that support our aim to lead as a green grid operator include our work with Van Gelder, as we pilot our **first emission-free drilling** for underground cable installation, at a site near Breda. The drilling rig was powered by green electricity, with no nitrogen or CO₂ emissions. In October, our CEO Manon van Beek signed the covenant 'Schoon en Emissieloos Bouwen' (Clean and Emission-Free Construction) on behalf of TenneT to partner up with other (construction) partners in this initiative. Innovative solutions like this could provide solutions to help us overcome the nitrogen impasse in the Netherlands, which is a challenge as we strive to realise our projects on time. Our participation in the **Groene Netten** (Green Nets) collaboration, between eight major infrastructure players in the Netherlands, is also helping to ensure a sustainable transition to a climate-neutral economy. The partners, including Gasunie, KPN, ProRail, Dutch DSOs and Rijkswaterstaat are working together on projects that advance important sustainability issues, such as circularity and biodiversity.

Another challenge to our efforts to minimise our impact on the environment is the use of SF₆ insulating gas in our switching installations. As a harmful greenhouse gas, we realise the need to replace SF₆ gas with more sustainable alternatives that provide similar safety properties without harmful emissions. We are working closely with industry partners to explore and test SF₆ alternatives in our assets, for example with our new Hybrid Gas Insulated Switchgear partnership. Here, we are working with Siemens and Hitachi-ABB to provide a SF₆-free solution in the gas-insulated lines (see 'Create value to transition to a climate-neutral economy'.)

In addition, we also aim to collaborate with our suppliers and contractors to reduce emissions upstream in our supply chain. That is why we are working on our **'Decarbonising the supply chain'** project. An example of how we are working together with the entire industry is in a new international Joint Industry Project, to develop common standards for measuring and evaluating sustainability in power transformers. The aim is to develop a standard so that there is transparent comparability. Only in this way is a fair benchmark possible in the industry regarding the approach, measurement and comparison of sustainability in our assets. More on the project 'Decarbonising the supply chain' is described in the chapter '[Create value to transition to a climate-neutral economy](#)'.

In the end, the main impact we have on the planet by driving the energy transition and realising a Target Grid is by avoiding carbon emissions and facilitating a climate-neutral economy. We need new technologies and concepts to rethink the way we currently look at energy generation, transmission and consumption. One of the ways we are working on this relates to our partnership with Dutch DSOs and the gas grid operator Gasunie (as part of a working group organised with Netbeheer Nederland) to conduct studies on the optimal energy infrastructure required in the Netherlands between 2030 and 2050. The revised **Integrale Infrastructuurverkenning 2030-2050 (II3050)** was published in 2023, providing insight into what is needed for the transition to a sustainable energy supply, through a fundamental redesign of the energy system and extensive stakeholder co-operation.

Partnerships to energise our people & create a sustainable workplace

Due to the growing ambitions to accelerate the energy transition, TenneT's workload is rapidly increasing. We currently need to grow by around 850 FTE each year, eventually aiming to be able to accommodate a workforce of up to 10,000 internal and external employees by 2025. However, we're doing so in a challenging labour market, with a scarcity of new talent due to intense competition for personnel. As the energy transition is a global endeavour, we are one of many employers – not only other TSOs, but also other energy companies and contractors – who all need to scale up to deliver new projects. In this regard, TenneT does not only need to ensure it can recruit and retain the people it needs, but that our suppliers in the wider supply chain also have the personnel to deliver the work we need to achieve the Target Grid 2045.

To remain a competitive employer and attract new talent, our aim is to be an energising and sustainable workplace. This also relates to our efforts to create an inclusive and diverse workplace where people from all types of different backgrounds can thrive. These challenges require different ways of thinking, new collaborations and partnerships.

In the first place, it requires creating a safe and inspiring workplace where our people feel energised. This is what our people and leadership aim to do day in and day out. We also try to facilitate this in other ways, for instance via supporting and working together with the Johan Cruyff foundation. Here we provide means by giving back to society and enabling underprivileged children to do sports and exercise. At the same time, we offer our colleagues the ability to participate in sports events, such as the annual Johan Cruyff run, which are amongst other events part of our internal vitality programme, 'Always Energy'. More information on this is included in the '[Create a safe and inspiring workplace](#)' chapter.

Next to this, it requires attracting sufficient talent to deliver on the energy transition and being able to realise the target grid. **Academic partnerships** are a good way to educate, inspire and engage with new talent, not only supporting institutions to attract more young people into technical and engineering courses, but also forging pathways for that talent to grow their skills and careers at TenneT. We have academic partnerships with a wide range of academic and research centres, such as the University of Erlangen and Bayreuth, RWTH Aachen, TU Delft and TU Eindhoven. We are also working with the HAN University of Applied Sciences in Arnhem, with which we have extended our collaboration for another four years. To foster more specific education and qualifications tailored to our sector, we have also helped introduce the Power Minor, through collaboration with the universities of applied sciences of The Hague, Amsterdam, Arnhem and Nijmegen.

To grow, our workforce must also become more diverse, with inclusion as a pre-requisite for employee wellbeing. To this end, our ongoing work with initiatives like the **Refugee Talent Hub** is playing an important role in attracting new talent and reflecting our Inclusion and Diversity commitment.

And finally, partnerships play an important part in ensuring we have the right and sufficient resources and capacity available within the wider energy supply chain, as this is essential for us to drive the energy transition and realise the Target Grid. Our cooperation with key suppliers in the 2GW Program shows this in action, as the multi-year, large-scale contracts awarded for this work will help to attract more people into our sector with greater job security.

Partnerships to safeguard our financial health

In our journey to realise our Target Grid 2045 and enable carbon-neutral energy for society, we need to stay financially secure and healthy. Maintaining a stable regulatory framework and ensuring favourable conditions for raising external financing are essential for us to maintain our investments that drive the energy transition. These investments are expected to increase to EUR 160 billion in the coming ten years. This means working together with stakeholders that can provide us the option to finance future projects, and doing so with better conditions that help us deliver on our strategic ambitions and maintain affordability for society.

An important element in ensuring that we are able to safeguard our financial health is to work together with our stakeholders to contribute to a reliable and predictable regulatory framework that supports our financial health. That is why we engage in dialogues with our regulators and other market parties to discuss our strategy, the role of regulation and our need for financing to drive the energy transition. In 2023, for example, we engaged with the European Network of Transmission System Operators (ENTSO-E) in a high-level grid forum: "Future of our Grids – Accelerating Europe's Energy Transition". At this event, organised at the request of the European Commission TenneT communicated regulatory points of view regarding effective and cost-efficient solutions and the need for a proper return on equity for TSOs in a future energy system. The shortage of qualified human resources for TSOs, industrial partners and governmental authorities, was another major point of discussion. The EC agreed on the need for a broader choice of investment instruments together.

To finance the expansion of offshore grid connections, TenneT co-operates with external co-investors such as KfW-IPEX, Copenhagen Infrastructure Partners (CIP) and Chubu Electric Power. Via separate legal entities the co-investors contribute equity and receive financial

participation rights in return. Their contribution helps to ensure adequate financial ratios. Furthermore, their participation strengthens TenneT's interest in a reliable and stable regulatory framework as co-investors interests have been communicated to policymakers and regulators.

To secure a solid financing and ensure that we can drive the energy transition in an affordable way, we maintain strong relationships with our shareholder, the Dutch state, and with the banks that participate in TenneT's Revolving Credit Facility (RCF) – ABN AMRO, BNP Paribas, Commerzbank, Deutsche Bank, HSBC, ING, NatWest, Rabobank, Santander, UniCredit and SMBC. The term facility agreement of EUR 8 billion, secured during 2023, was crucial for our financing needs, as we did not raise funds through a Green Bond issue this year. The fact that the majority of our relationship banks also participated in this term facility agreement, show the strength of our long-term relationships. Through these partnerships, we are able to secure our financing (see Safeguard sustainable financial performance chapter).

What could prevent us from reaching our goals?

To be able to drive the energy transition and deliver on our purpose, for instance to achieve the Target Grid, societal acceptance is essential in keeping pace. Building new assets has an impact on the local communities who live in close proximity to our assets. For instance, one could look into the decision TenneT has to make between building overhead lines versus underground cabling. While the acceptance by local communities is higher for using underground cabling due to less visible impact on the landscape and perceived as additional safety (i.e. regarding high voltage lines and electromagnetic fields), this might impact not only the reliability but also affordability. It is more difficult to maintain an underground cable than an overhead line and hence it is more costly too.

Due to the current growing electrification predominantly in the Netherlands (i.e. Gelderland, Flevoland, Utrecht or Rotterdam), we face the increasing risk of congestion. For certain areas, the number of requests to be connected to our grid is significantly higher than we can cater for within reasonable time, or our local grid capacity is used to its maximum capacity such that there is no additional bandwidth left to connect new customers. Not being able to connect these customers, either large companies or consumers in general could result into negative media exposure and reputational damage. TenneT is currently

improving the approach how to connect new customers most efficiently, while balancing the issue of congestion management. One of the mitigation strategies is to step away from the 'first come first serve' principle, and instead take into account overall system effectiveness and efficiency.

Societal acceptance of the climate ambition is not only affected by the political landscape, but also by the speed of delivery and the financial cost of it. A high ambition to deliver on a green society, which a focus on electrification, could result into higher-than-average costs to realise these projects. Cost of materials and services are increasing due to unavailability, the conflict on our continent is still ongoing and with other conflicts in the world also, the energy price has not lowered to the price level before the year 2022. These higher costs related to the green ambition and delivering under these circumstances are in the end paid by society and could lead to lower acceptance by lower-income households and therefore affect our reputation.

Furthermore, a changing political environment can create uncertainty and slow our progress towards our ambition. Political change can also affect changing rules, regulations, or the regulatory environment in general. While this could be seen as a risk, it could also become an opportunity for us. It could be a catalyst when legislation and regulation are supportive of innovation, working together on (cross-border) partnerships and incentivising solutions for future challenges.

From all perspectives it is clear that our linear way of acting does no longer hold – it is a way of working that is simply unsustainable on the long run. Strong partnerships with our important stakeholders are crucial to achieve the 2025 and 2030 targets and ultimately deliver our Target Grid. Getting there will involve collaboration and negotiation but the destination of a clean energy future is shared by all. We aim to ensure we are a partner of choice to help solve these important societal challenges, to drive progress and to be part of the solution.



Certainty about availability of green power is crucial



Nienke Homan, chairperson VNCI
(Royal Association of the Dutch Chemical Industry)

“The transition to a sustainable economy is literally and figuratively leading to "system stress". Chemical companies, large and small, with far-reaching plans for sustainability, faced the limitations of the power grid. Both now and in the future. Certainty about availability and affordability of green power, among other things, is crucial for confidence that sustainability can be achieved in the Netherlands. In this, I am happy with TenneT as a partner that is willing to take responsibility for its own ever-changing role in a rapidly changing and demanding energy system.”

Statements of the Executive Board

The Executive Board is responsible for designing and operating TenneT's risk management and internal control system, and for reviewing its effectiveness.

Statement of responsibility

The Executive Board is responsible for designing and operating TenneT's risk management and internal control system, and for reviewing its effectiveness.

The risk management and internal control system consists of the following elements:

- The enterprise risk management system aimed to identify, analyse, define mitigating measures and monitor the development of risks relevant to TenneT;
- The internal control framework aimed to manage and control critical processes, including control self-assessments to document the effectiveness of control processes;
- Business plans and quarterly reports with information on financial and non-financial objectives and their achievement;
- Internal audits of key processes and follow-up on audit findings with relevant management;
- Actions based on recommendations made in the external auditor's management letter;
- An upwardly cascading internal Letter of Representation (LOR) process, resulting in a company-wide LOR signed by the Executive Board;
- A compliance management system that enables TenneT to demonstrate its compliance with relevant laws- and regulations, industry codes and standards, as well as its commitment to good corporate governance, best practices, ethics and stakeholder expectations among others risk of internal fraud, bribery or corruption.

The Executive Board periodically reviews and analyses the strategic, operational, financial and compliance risks to which TenneT is exposed. It also regularly assesses the design and effectiveness of the risk management and internal control system. The results of these assessments are shared with the Audit, Risk & Compliance Committee, acting as a committee of Supervisory Board, the Supervisory Board itself and the external auditor.

The risk management and internal control system does not provide absolute assurance that all corporate objectives will be fully achieved, nor does it give full assurance that material errors, losses, fraud or violations of laws and regulations will not occur in the operational processes and/or the financial reporting.

Taking the above into account, the Executive Board is of the opinion that TenneT's risk management and internal control system provides reasonable assurance that TenneT's financial reporting does not contain any errors of material significance and that the risk management and internal control system has operated effectively in the year under review.

In control statement

We confirm that, to the best of our knowledge, the financial statements for the period 1 January to 31 December 2023 have been prepared in accordance with IFRS as adopted by the EU, and with Part 9 of Book 2 of the Dutch Civil Code; that the disclosures in the financial statements are a true and fair view of TenneT's assets, liabilities, financial position and results as a whole; and that the disclosures in the Integrated Annual Report give a true and fair review of TenneT's financial performance, results and position, together with a description of the most significant risks and uncertainties the company faces. Furthermore, we confirm that to the best of our knowledge, the Group has adequate resources to remain in operation during the next 12 months and consequently the financial statements have been prepared on a going concern basis.

Arnhem, 4 March 2024

M.J.J. van Beek
T.C. Meyerjürgens
M.C. Abbenhuis
A.C.H. Freitag

The Executive Board



Manon van Beek

Chair Executive Board / Chief Executive Officer

53, Dutch (f)

Initial appointment:
1 September 2018

Expiry second term:
31 August 2026

Other positions qualitate qua:

- Chair Aufsichtsrat TenneT TSO GmbH
- Member Board TenneT Verwaltungs GmbH
- General Member Board of German-Dutch Chamber of Commerce DNHK
- Council of the Thinktank Agora Energiewende

Other positions:

- Chair Board Refugee Talent Hub Foundation
- Member Supervisory Board of the Delft University of Technology



Tim Meyerjürgens

Member Executive Board / Chief Operating Officer

48, German (m)

Initial appointment:
1 March 2019

Expiry first term:
29 February 2024*

Other positions qualitate qua:

- Member Board TenneT TSO B.V.
- Member Board TenneT TSO GmbH
- Member Board TenneT Verwaltungs GmbH
- Member Board TenneT Offshore GmbH
- Chair Supervisory Board of GreenneT
- Member Executive Board WAB (Wind Energy Association Bremerhaven)
- Member Advisory Board Offshore Wind Energy MBA
- Member Board of Trustees German Offshore Wind Energy Foundation
- Member Advisory Board Federal Association of Wind Farms Offshore
- Member Board of Directors FGH (Forschungsgemeinschaft für Elektrische Anlagen und Stromwirtschaft e. V.)
- Member Board of Trustees FGE (Forschungsgesellschaft Energie e. V.)
- Member of the German National Committee of CIGRE
- Member Board of Directors FiE (Forschungsstelle für Energiewirtschaft e.V.)
- Member Board of Directors of VBEW (Verband der Bayerischen Energie und Wasserwirtschaft)

* Tim Meyerjürgens is reappointed for a second term till 29 February 2028



Maarten Abbenhuis

Member Executive Board / Chief Operating Officer

50, Dutch (m)

Initial appointment:
1 January 2021

Expiry first term:
31 December 2024

Other positions qualitate qua:

- Member Board TenneT TSO B.V.
- Member Board TenneT TSO GmbH
- Member Board Netbeheer Nederland

Other positions:

- Supervisory Board member of Royal Swinkels Family Brewers N.V.



Arina Freitag

Member Executive Board / Chief Financial Officer

53, German (f)

Initial appointment:
1 January 2022

Expiry first term:
31 December 2025

Other positions qualitate qua:

- Member Board TenneT TSO B.V.
- Member Board TenneT TSO GmbH
- Member of the Board of TenneT Offshore GmbH
- Member Supervisory Board of GreenneT
- Member Board Flexcess GmbH