



**TOP
DUTCH**

**Naturally leading
the transition**

DIGITAL INNOVATION

Join major digital leaders like Google, IBM and Phillips in the TopDutch region, where the unique mix of excellent digital infrastructure, research and education, mixed with an innovative and highly-skilled ecosystem, are accelerating the transition by making systems smarter.

The Dutch invented the CD and DVD, Wi-Fi, Bluetooth and Python. Today, we form a digitally savvy society, being highly educated, wealthy and enjoying excellent internet access. Our open and innovative culture invites us to develop and test new digital technologies. As a region filled with changemakers, we're radically rethinking products and processes to lead the forth (and fifth) industrial revolution. TopDutch offers the digital infrastructure, unique innovation and market field labs, networks, talent and an excellent test-market population for rapid market access and validation. Here, we accelerate the digital future.

- 1. Strong in data science, deep learning & AI**
- 2. Europe's leading test ground for autonomous systems**
- 3. Digitalizing key system transitions**
- 4. Digital society & ideal test-market**
- 5. Access to pioneering talent & skilled labor**
- 6. The natural choice for smart- and data-intensive business**

1. **FOUNDATIONAL RESEARCH & FACILITATING ENVIRONMENT FOR DEEPTECH**

Data science, deep learning & AI

The TopDutch region is dedicated to **becoming one of the smartest regions in the world**, collecting and processing absolutely astronomical amounts of data each day. We host a number of **leading research institutes**, and support science spin-off with business development programs, networks and financing.



- **TopDutch is home to ASTRON, the Netherlands Institute for Radio Astronomy, who are making discoveries in radio astronomy happen.** In the late 1960s ASTRON designed and built the Westerbork Synthesis Radio Telescope (WSRT) and in the 2000s the LOw Frequency ARray (LOFAR). Both are powerful radio telescopes used by hundreds of international astronomers. ASTRON is a leading partner in the Square Kilometre Array (SKA), the global endeavor to design an advanced international telescope with many partners worldwide. The ASTRON headquarters in the TopDutch region is a vibrant workplace and hub of expertise. ASTRON also hosts the ERIC JIVE (the Joint Institute for VLBI in Europe) and the NOVA Optical/IR group.
- **Solving large problems with High Performance Computing.** Besides ASTRON, companies such as Bytesnet and IBM, but also our University of Groningen, are leading in high performance computing systems that helps us to solve large problems in science, engineering and business.

Top-100 University of Groningen performs groundbreaking research in multi-disciplinary centers.

- **CogniGron, the Groningen Cognitive Systems and Materials Center.** Hosted by the University of Groningen, CogniGron develops materials-centered system paradigms for cognitive computing based on modelling and learning at all levels: from materials that can learn, to devices, circuits and algorithms. CogniGron brings together different scientific disciplines with the aim to develop a cognitive computer: A computer that functions like the human brain.
- **Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence.** The Bernoulli Institute's mission is to perform outstanding academic research and teaching in mathematics, computer science, and artificial intelligence, to maintain international leadership and foster these disciplines as a living body of knowledge, and to make it relevant to society in its broadest sense.

- **Data Science & Systems Complexity (DSSC).** The DSSC aims to understand and design complex systems and processes through massive data. DSSC brings together more than 70 researchers from disciplines with an immediate interest in the handling of big data and complexity (mathematics, statistics, computer science, artificial intelligence, engineering, astronomy, physics, bioinformatics).



Google Netherlands

Data science to leading applications with our big data research centers.

- **Groningen Engineering Business Center (GEBC)** connects research questions from the industry to the university's research and educational offer, closing the gap between knowledge institutions and business.
- **Groningen Digital Business Center (GDBC)** develops knowledge and adjusts its educational offer to young professionals for the digital economy.
- **Groningen Center for Digital Humanities (GCDH)** connects research in social sciences with computer and information sciences.
- **DataFryslân** supports organizations with big data analysis in a hypermodern datalab provided with the latest technologies.
- **The 'DASH' Data Science Center in Health** is a knowledge hub, community, and facilitator in the field of health data science, hosted in the University Medical Center Groningen. Its AI Think Tank and Machine Learning Lab supports the advancement of AI in research and clinical settings.

Collaborating with global top tech firms on Deep Learning endeavors. Our Center for Information Technology (CIT) works together with Google and Facebook on Deep Learning projects.

- **The AI Hub Noord-Nederland works with policymakers, knowledge institutes and TopDutch businesses** working in our energy, life sciences & health, agrifood, mobility, built environment, maritime, technical industry and education sectors to make the TopDutch region a leading European testing ground for AI.

Their aim is to develop innovative applications of artificial intelligence via a portfolio of high impact public-private partnership projects, using a 'chain approach' that embeds deep technologies into our system transitions.



- **As one of seven regional partners in the Netherlands AI Coalition**, AI Hub Noord-Nederland are accelerating the innovative economic and societal impact of our AI ecosystem via 5 key building blocks:

- 1. Data sharing:** Setting-up and implementing a national data-sharing approach.
- 2. Human Capital:** Developing, attracting and retaining AI talent, and upskilling the labor market to work with AI.
- 3. People-orientated AI:** Involving end-users from the start in an ethical and inclusive approach.
- 4. Research and Innovation:** Connecting the Dutch AI knowledge and innovation chain in a coordinated program.
- 5. Start-ups and scale-ups:** Stimulating and supporting new AI-driven companies.

2.

Smart Industry

EUROPE'S LEADING TEST GROUND FOR AUTONOMOUS SYSTEMS

With a technologically-ready workforce and ambitious businesses, our key industries are digitalizing at warp speed. Fueled by EDIH Northern Netherlands, we are Europe's leading testing ground for autonomous systems.

• **Home to European Digital Innovation Hub Northern Netherlands.** On the way to a strong digital Europe, the network of European Digital Innovation Hubs (EDIH's) will play a crucial role to accelerate economic growth and wellbeing in the regions. EDIH Northern Netherlands has developed – through a consortium of academic, governmental and business partners – a program of support that will accelerate digitalization in our key industries, and establish the TopDutch region as Europe's leading testing ground for autonomous systems.

EDIH Northern Netherlands will accelerate knowledge and applications of autonomous systems in four key system transitions the TopDutch region is leading:

- **Smart Agro:** Applying breakthrough technologies to optimize the food, bio-based and circular value chains of the future.
- **Factory of the future:** Developing intelligent, connected and customized production processes for intelligent, connected and customized products.
- **Life Sciences and Health:** Giving our citizens more healthy years by predicting and preventing more illnesses, and building less invasive treatments for what's left.
- **Built environment and Mobility:** Making the spaces where we live, work, and how we travel across them, greener, smarter and more efficient



- **EDIH Northern Netherlands supports TopDutch-based companies** to accelerate their digitalization via a comprehensive package of measures:

- **A Smart Factory Accelerator** that provides companies that are (or will be) active in the world of autonomous systems with structural support in digitalization.

- **A 'Test Before Invest network'** that gives companies low-threshold access to test and demo facilities and thus enables them to digitalize faster. EDIH-NN will achieve this through a new cluster of approximately 20 organizations in the TopDutch region which will focus on applications of autonomous systems in their own field, and together, via the EDIH network, will showcase themselves as a European test lab.

- **An Entrepreneurs' Desk** where companies can go with fundamental, action-orientated or application-orientated questions about digitalization.

- **A skills program for companies** related to digital technologies that are prioritized within Digital Europe: Cyber Security, Artificial Intelligence and High Performance Computing.

- **Smart Makers Academy** regrouping and supplementing existing training programs, tailoring them for individual students' learning paths and launching pilot education around autonomous systems.

- **Additional financial services** to strengthen the financial feasibility of digitalization plans.

Automation & control

High Performance Computing

Cyber Security

Human Machine Interaction

TopDutch technology portfolio

Vision technology

Robotics & hardware

Communication technology & 5G

Data analytics, machine learning & Artificial Intelligence

Knowledge providers:



DEP technology clusters:



HPC cluster

1. Project management

2. Test before invest

3. Skills & training



Autonomous systems

4. Support to find investors

5. Innovation ecosystem & network

6. Communication & dissemination



Smart Agro



Factory of the Future



Life Science & Health



Built environment, utilities & mobility

A sustainable economy

How TopDutch is leading system transitions with autonomous systems.

Our unique culture of collaboration shares knowledge and facilities for high-tech solutions.

- **Innovation Cluster Drachten**, is a group of high-tech companies in the TopDutch region that co-create solutions for future challenges at the cutting edge of technology. They focus on the 'Big 5 of high-tech': metal 3D printing, remote sensing and big data, robotics, visual intelligence and renewable propulsion. They use the latest technology and, if needed, develop it themselves.

The cluster's R&D departments work together in a unique way and, instead of competing with each other, support and reinforce each other. Together, they create more than 50 innovative products a year worldwide.

These products contribute to society in the areas of safety, simplifying the operation of complex systems, providing access to data that improve food quality, and tailoring them to individual consumer needs.



Technologies Added shared smart factory

- **Home to Technologies Added**, the first shared smart factory in the world, introducing a new formula for the manufacturing industry. Whether you are a start-up or an established firm that wants to set-up production in Europe fast, preferably tomorrow, discover Technologies Added today. Technologies Added currently hosts the production of 10 companies, in the field of flexible manufacturing and smart products.

3. DIGITALIZING KEY SYSTEM TRANSITIONS

CleanTech, HealthTech, WaterTech & AgriFood

We believe that to create a more sustainable society, both economically and socially, we need to do things differently. We need key, system-level transitions. And, in TopDutch, we're accelerating those transitions by making systems smarter.

Crossing-over with our green chemistry and energy ecosystems, we're leading the sustainable transitions with CleanTech.

- **Cross-over with Green Chemistry.** We use computational modeling for predicting optimal bacterial engineering models, speeding up optimization and upscaling of these new biotechnical processes to produce chemicals for agricultural, biomaterials, flavors, fragrances and biofuels. We also use big data to optimize processes in our chemical plants.
- **Cross-over with Energy.** Cross-linked with our energy industry, we set up data labs to test energy products and services for households (EnergySense). We use big data to make our energy-intensive processes more efficient and develop new energy technologies, applications and processes together with the New Energy Coalition in various research projects.

The AI Hub Northern Netherlands are building a roadmap for AI in the energy transition. This roadmap allows to identify knowledge gaps in this sector as well as knowledge institutes in the AI domain in the Northern Netherlands. By bringing the two sides together we will accelerate the energy transition through efficiency gains and smarter energy systems.

Our island of Ameland is one of the two 'pilot islands' in the European Union's IANOS research program. We are contributing to integrated solutions for decarbonization and smartification of islands by developing a reliable and sustainable smart grid, integrated with a Virtual Power Plant (VPP) based on artificial intelligence.

Crossing-over with our life sciences & health ecosystem, we're leading the transition to healthy ageing with HealthTech.

- **Cross-over with Life Sciences & Health.** Cross-linked with our life sciences & health industry, we have set up big data labs such as dHealthLab and DASH (data science in health) for developing and testing smarter health care and healthy ageing solutions.

TopDutch's e-health cluster is leveraging our region's expertise in big data, AI, and sensor technology to create applications that improve patient experience, outcomes and efficiency.

Crossing-over with our WaterTech and AgriFood ecosystems, we're leading the food and water system transitions.

- **Cross-over with WaterTech.** Cross-linked with our WaterTech innovation chain, we develop highly specialized water technologies and sensor technologies for industry 4.0.
- **Cross-over with AgriFood.** Cross-linked with our AgriFood industry, we develop new technologies such as soil sensor systems, smart dairy farming technologies and technologies that perform calibration measurements to optimize the performance of our cultivation and greenhouses for more sustainable farming.

4. Technological readiness **DIGITAL SOCIETY & IDEAL TEST MARKET**

Our digital-savvy society keeps learning and updating their skill-sets. The Dutch culture encourages innovation and technological adoption, making the Dutch population an ideal test market.



- **Digital Literacy in a Digital Society.** Digitalization, datafication, robotization, big data, blockchain and artificial intelligence, to name a few trends, require an expanding digital literacy curriculum for our society to understand and work with these new technologies. Our Noorden Digitaal Coalition of partners collaborate to facilitate, share knowledge and educate citizens of the TopDutch region with the aim of realizing a 'spiral of innovation'.

- **Cyber Resilience for a Safe Digital Society.** Several cyber cooperatives in the Northern Netherlands have joined forces to develop cyber resilience in all the region's companies, government organizations and society.

We were the birthplace of HackerOne, an ethical hacker 'unicorn', now headquartered in Silicon Valley with their dev. team located in our city of Groningen.

- **The Netherlands ranks forth on the Network Readiness Index 2022**, from the Portulans Institute and the University of Oxford's Saïd Business School. We're leading the transition to a digital society, with number one rankings in the adoption of emerging technologies, internet access in schools, and mobile apps development..
- **The Netherlands ranks number five on the 2022 Global Innovation Index**, published by the World Intellectual Property Organization (WIPO). We excel on this index with a top 3 ranking in terms of our business environment, finance for start-ups and scale-ups, and intangible asset intensity.

#1 Adoption of emerging technologies



#2 Intangible asset intensity



#3 Finance for start-ups and scale-ups

5. ACCESS TO PIONEERING TALENT AND SKILLED LABOR

Scientific and entrepreneurial talent

TopDutch is the region of talent, home to an ever-increasing number of both scientific and entrepreneurial talent.

HackerOne was founded in the TopDutch region and is now the largest cyber security firm of its kind



Access to talent

- **The Northern Netherlands is a nucleus for higher education**, with more than 75,000 students. The Netherlands has the second-best higher education system in Europe.
- **The TopDutch region offers over 60 IT-related education courses.** From research university level to vocational level.
- **The TopDutch region hosts transformative and integrative research programs encouraging and attracting pioneering talent**, such as CogniGron, GEBC, GDBC, GCDH and DSSC (see point 1).
- **The Northern Netherlands IT Academy offers traineeships and training to students of every education level**, having trained over 3,200 talents since launching in 2014.

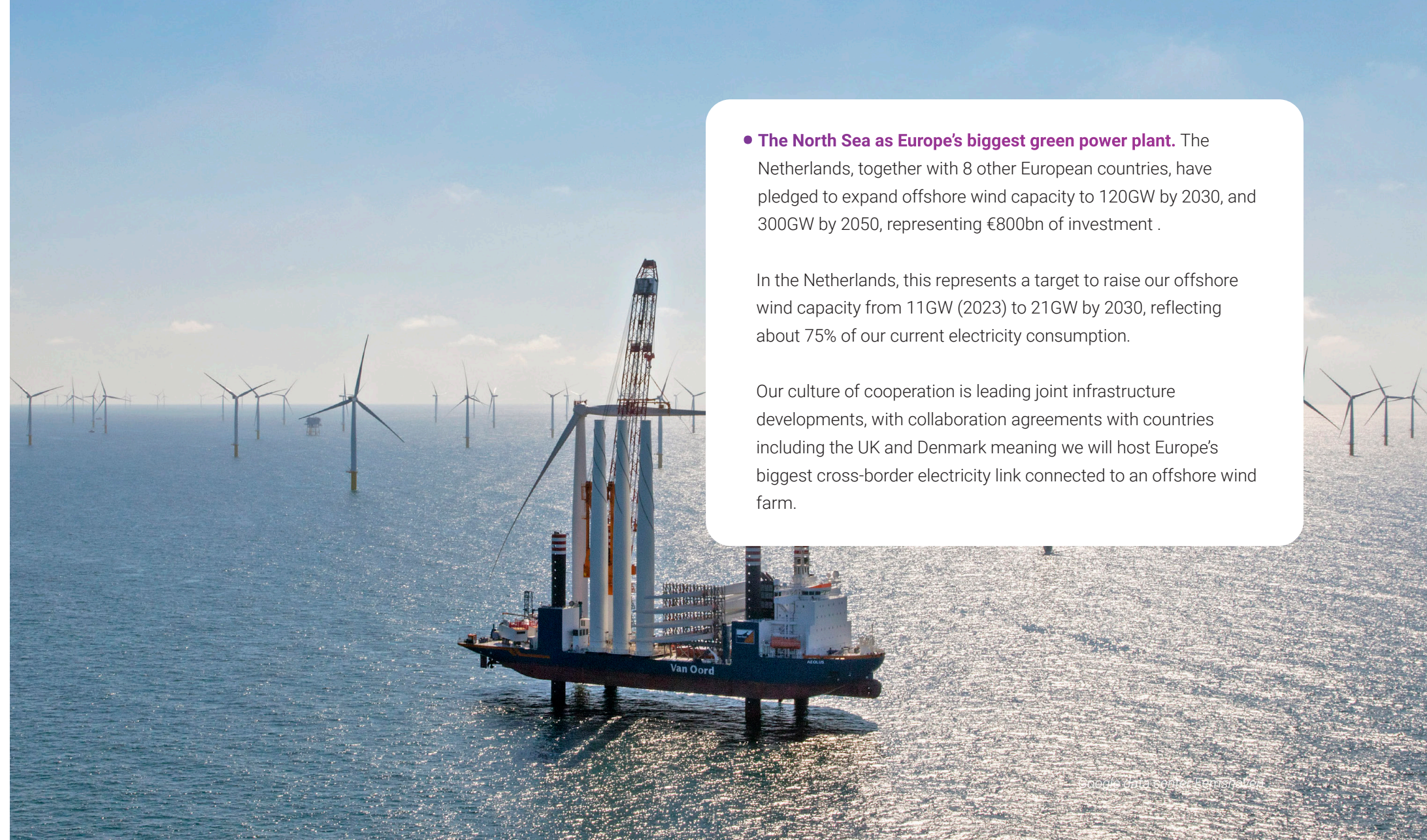
Access to skilled labor

- **The TopDutch region is home to 60,000 IT-skilled people-** over a wide age range- 35% of whom have over 10 years of working experience in this field.
- **Nearly 100,000 of our residents have technical competences**, with over half of them having more than 10 years of experience working in a technical job.

6. THE NATURAL CHOICE FOR SMART AND DATA-INTENSIVE BUSINESS

Scientific and entrepreneurial talent

With a reliable and flexible green grid, the best digital infrastructure and the fastest business-development and facility set-up, TopDutch is the natural choice for smart and data-intensive businesses.



• **The North Sea as Europe's biggest green power plant.** The Netherlands, together with 8 other European countries, have pledged to expand offshore wind capacity to 120GW by 2030, and 300GW by 2050, representing €800bn of investment .

In the Netherlands, this represents a target to raise our offshore wind capacity from 11GW (2023) to 21GW by 2030, reflecting about 75% of our current electricity consumption.

Our culture of cooperation is leading joint infrastructure developments, with collaboration agreements with countries including the UK and Denmark meaning we will host Europe's biggest cross-border electricity link connected to an offshore wind farm.



• **The TopDutch region as a leading green powerhouse, and our coastline as a key energy port.** The TopDutch region has a long history of energy production, and we have no intention of slowing down. Among the approximately 2,500 MWs of wind projects currently operational in the Northern Netherlands is Gemini 1 - one of the largest offshore wind parks in Europe – producing sustainable energy for 800,000 houses.

We're scaling-up fast. We will generate 12.2 TWh of on-shore wind and solar power by 2030. In addition to the existing 600 MW production capacity in wind parks off the TopDutch coast, we have plans for another three sites totaling 4,700 MW.

With over half of the Dutch energy supply and one third of the European energy supply coming from the North Sea in a matter of years, our location presents large-scale energy storage and hydrogen production and storage potential on TopDutch's extensive coastline.

• **From the Northern Netherlands to the world: TopDutch as the Netherlands' 'wall socket'.** With TopDutch as the key energy port, the Dutch high voltage grid transports electricity through 24,500km of pipeline at 110Kv and higher, and connects across borders and seas to Germany, Belgium, Denmark, the United Kingdom and Norway.

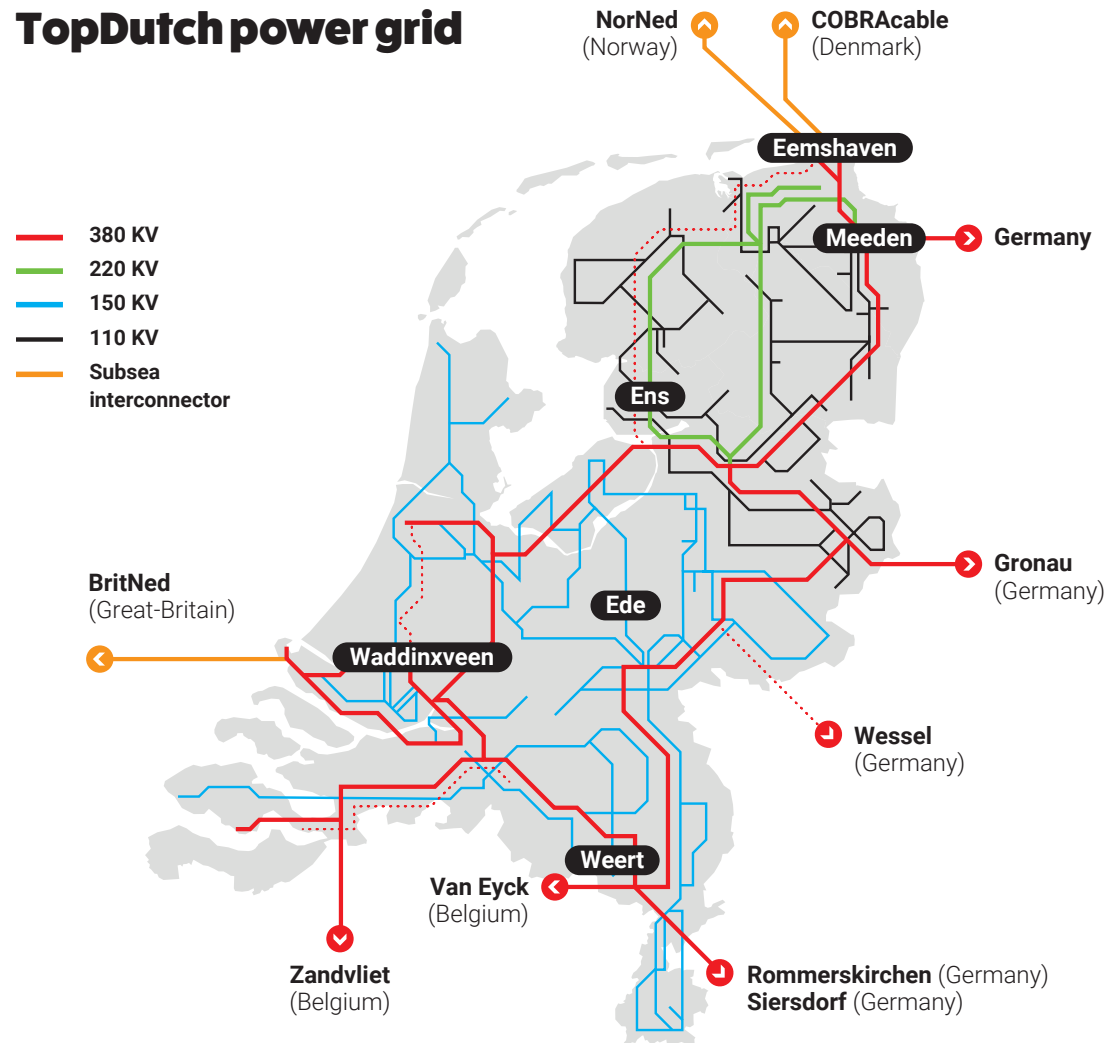
The Netherlands has one of the most reliable grids in the world, with an average uptime of 99.994% over the past five years. The TopDutch region's excellent connections makes our reliability even higher.

Energyport Eemshaven is a 8,000 MW power point and balancing hub located on one of our seaports. Here, we host three large power stations and a floating LNG terminal, alongside converter stations connected to the NorNed and COBRACable undersea electricity cables.

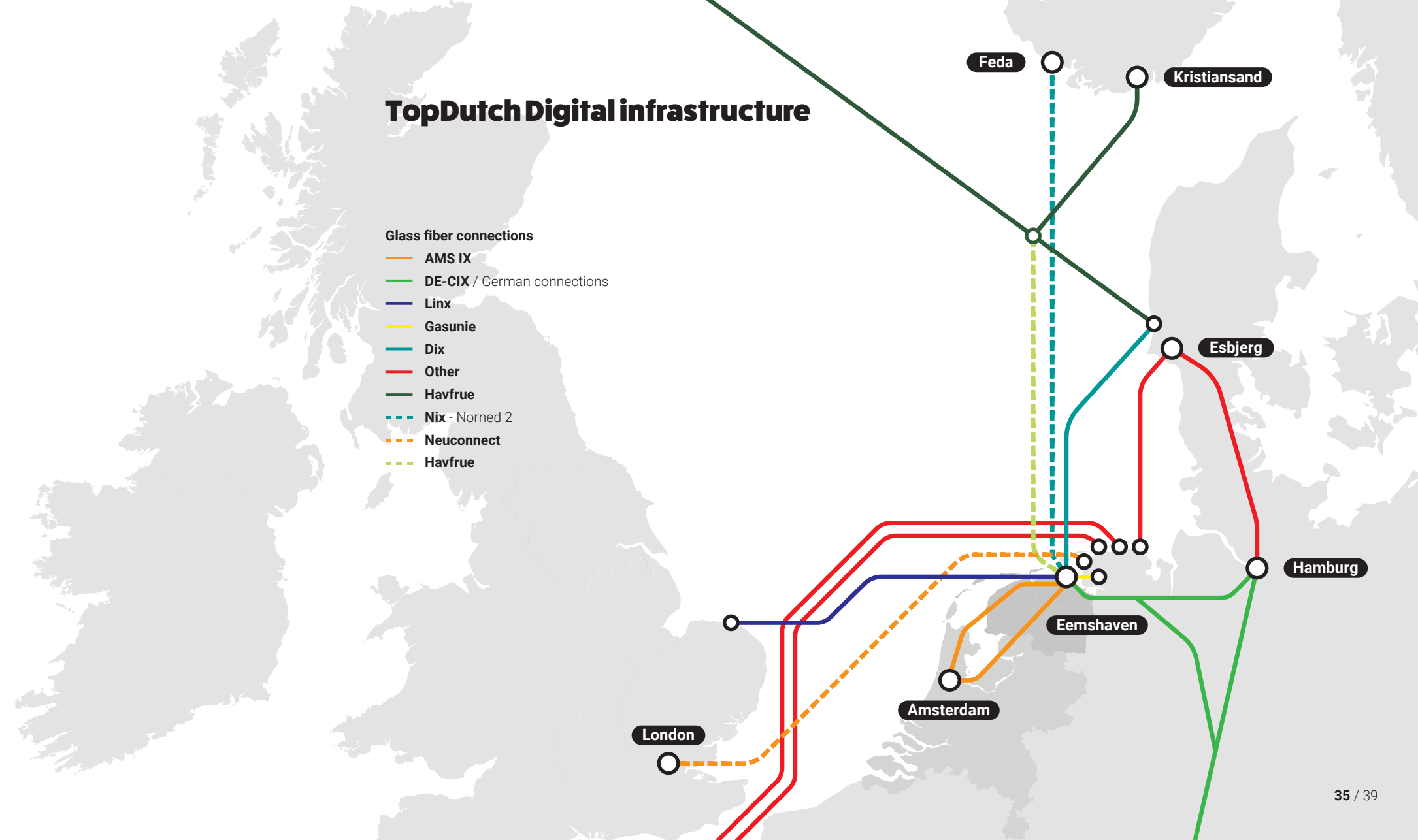
• **Ideal location for data centers.** Besides a rapidly expanding production capacity of green energy, the TopDutch region offers large green field sites available for industry and data centers, and an ideal climate for cooling.

• **Google was first.** Google opened its first data center in the TopDutch region in 2016. A year later Google announced its plans for a first expansion, and in summer 2019 Google announced a second expansion. Investments now total over 2 billion euros. The TopDutch data center is Google's first data center to run entirely on green energy.

TopDutch power grid



TopDutch Digital infrastructure





Top Dutch e-commerce site Frank has grown so rapidly it was named in Deloitte's Fast 50 five times in a row

- **We have the fastest business development in Europe.**

The Northern Netherlands offers some of the most attractive establishment procedures for new companies in Europe:

- **It takes only 4 days to register your business**, one week to open bank accounts and insurance, and two weeks to release your VAT Number.
- **Companies who need to establish their own facilities, require only 17 to 26 weeks from application to the start of construction** - a process that takes more than 25 weeks in Spain, 40 weeks in the Czech Republic and 30 weeks in Hungary.
- **We provide a dedicated team** to comprehensively and smoothly guide you through the business foundation process.



Are you interested in exploring what your business possibilities could be? Connect with **Wubbo Everts**, our **Digital Innovation expert**.

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JOIN TOPDUTCH

Want to find out more about how the TopDutch region is naturally leading the transition, or view the digital edition? Head over to our website www.topdutch.com

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