Ten-Year Network Development Plan 2020

TYNDP 2020 Highlights

August 2021 · Final version after ACER opinion

ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 42 member TSOs, representing 35 countries, are responsible for the **secure and coordinated operation** of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level** and the **optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires **sector integration** and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources.

ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

Our values

ENTSO-E acts in **solidarity** as a community of TSOs united by a shared **responsibility.**

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by **optimising social welfare** in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and **innovative responses to prepare for the future** and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with **transparency** and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contributions

ENTSO-E supports the cooperation among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its **legally mandated tasks**, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in the **implementation and monitoring** of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

TYNDP 2020
Highlights

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Ten-Year Network Development Plan 2020

To achieve zero emissions, the electricity transmission network will be at the centre

Europe has engaged on an ambitious path towards decarbonisation. The major change is the rapid replacement of fossil-fuel generation by renewable energy sources. Electrification is the most direct, effective and efficient way of reaching the decarbonisation objectives. This makes the electricity transmission network the backbone of the future energy system.

Europe will only reach its decarbonisation objective and the successful deployment of variable renewables if

1) the costs of transforming the system are kept as low as possible, by an appropriate set of investments enabling better market integration and leading to competitive power prices, and

2) the continuous secure access to electricity is guaranteed to all Europeans. Achieving this requires a coordinated, pan-European approach to electricity system planning: the Ten-Year Network Development Plan.

32%
of wind generation in 2030

45%
of wind generation in 2040

Global Ambition

32%
of RES
in electricity generation
in 2030

Global Ambition

18%
of solar generation
in 2040

Distributed Energy

CASE STORY

Fingrid and Svenska kraftnät: Third AC connection between Finland and Sweden*

Both Finland and Sweden have set ambitious targets to become carbon neutral by 2035 and by 2045, earlier than the EU target of 2050. The third AC connection between Finland and Sweden will increase transmission capacity between northern Finland and northern Sweden and is expected to support especially the development of RES generation.

Because the new link is routed through potential wind power areas, it supports existing wind power by enabling that generation to be distributed to more consumers and, additionally, it enables connecting new large wind power projects located along the route of the interconnection. In future, new wind farms can be connected by adding new substations with relatively low additional costs. Another significant benefit is the less congested access to Northern Scandinavian hydropower, a valuable source of balancing power which becomes increasingly critical to support the development of wind power. In the Nordic electricity markets, more RES generation equals lower CO_2 emissions. The possibility to utilise and export more hydro and wind power from Northern Scandinavia to Southern Finland and Baltic countries will decrease the overall emissions in the Baltic Sea Region. Moreover, it would strongly support the target to stop coal burning in Finland.

Both TSOs are currently finalising the study phase, which was supported with a grant from the European Commission (CEF Energy 2018-2 call). The construction phase will start by the beginning of 2021. The whole interconnection, which consists of almost 400 km single circuit overhead transmission line from Pyhänselkä in Finland to Messaure in Sweden, extensions to existing substations and new substation and series compensation stations, will be commissioned by the end of 2025.

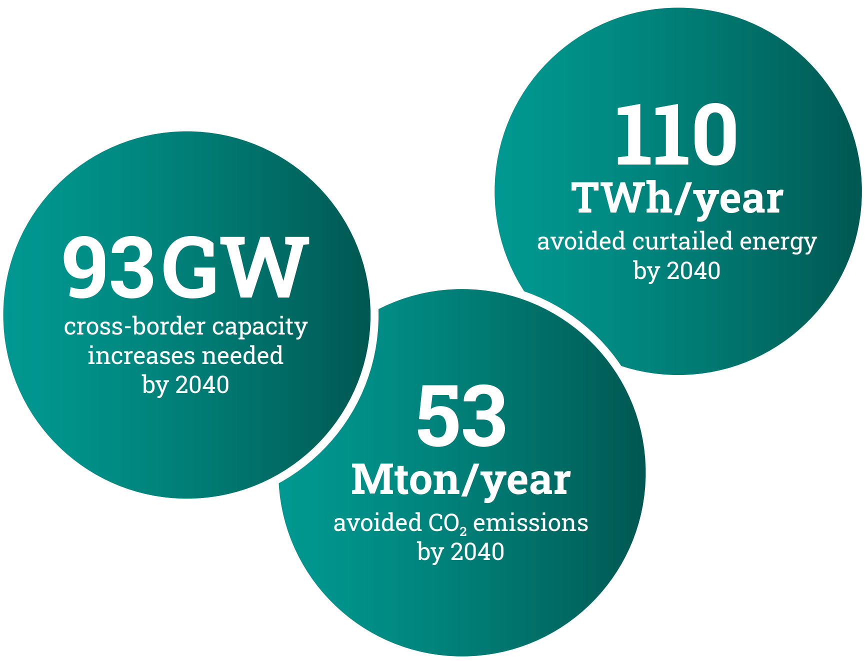
Third AC connection between Finland and Sweden will cross river Tornio on the border of the countries (Blomkartta/Fingrid).

* The texts and pictures of all case stories in this report were provided by project promoters.

93 GW of additional solutions for cross-border electricity exchange needed by 2040 to achieve the Paris Agreement

In addition to the 35 GW of cross-border transmission capacity reinforcements by 2025 that are already well-advanced, ENTSO-E's TYNDP 2020 System Needs study finds that 50 GW would be cost efficient between 2025 and 2030 and 43 additional GW by 2040. Investing 1.3 bn € / year between 2025 and 2030 translates into a decrease of generation costs of 4 bn € / year, while investing 3.4 bn € / year between 2025 and 2040 decreases generation costs by 10 bn € / year. Addressing system needs puts Europe on track to realize the Green Deal, with 110 TWh of curtailed energy saved and 53 Mtons of CO_2 emissions avoided each year until 2040.

Investing in infrastructure will be key to support the economy in the post COVID era, where the goal of developing Europe towards a decarbonized economy is an opportunity not only to fulfil the ambitious European objectives, but also to support the European industry. Addressing the identified needs by 2040 would represent 45 bn € of investment, translating directly into jobs and growth.



CASE STORY

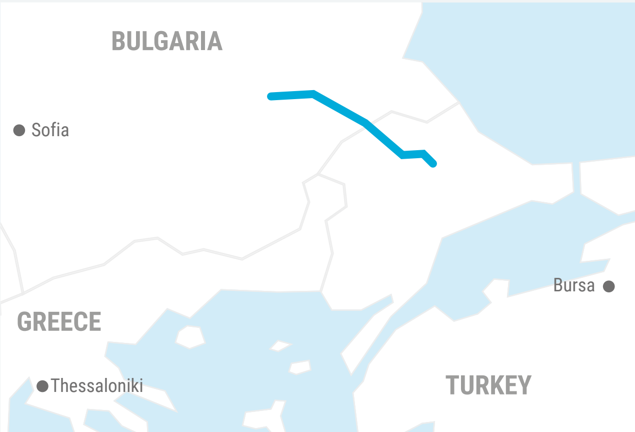
Nine future projects to address power system needs after 2035

For the first time in the TYNDP 2020, project promoters were given the opportunity to propose new projects that address some of the needs identified by ENTSO-E's Power System Needs study. Nine projects were proposed, all in the very long term with a commissioning date after 2035.

These include two projects on the Bulgaria-Turkey and Greece-Turkey borders, where the System needs study identified needs for capacity increase of 1,500 MW in 2030 and 2040. Two other projects address needs on the Greece-North Macedonia border, with either the refurbishment of an existing interconnector or the building of a new one expanding also to Bulgaria. A last project in South-Eastern Europe plans for new interconnectors between Lybia, Northern Greece and Albania.

Further North, another identified need that was not already addressed by an existing project is located on the Serbia-Hungary border. In the Baltic, a project proposes to connect Sweden to Latvia via the Island of Gotland to integrate further renewable generation, reduce the current level of curtailed energy and increase market integration in the Baltic Sea region. A last transmission project proposes to connect 700 MW of offshore wind in Ireland.

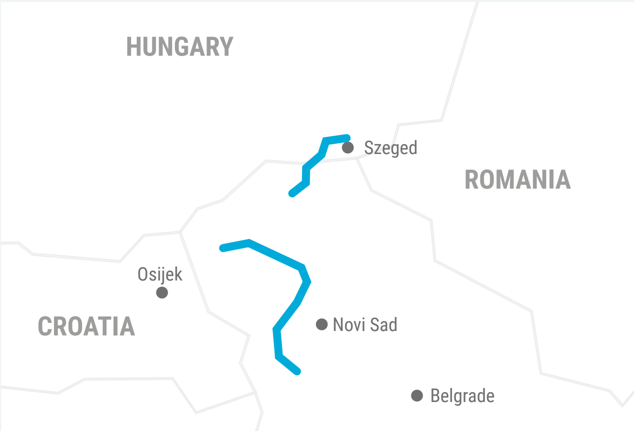
Finally, the only storage project proposed, the Online Grid Controller "PSKW-Rio" in Germany, answers the need to balance wide areas of the distribution grid and improve renewable energy grid feed-in, grid security and stability.



Bulgaria-Turkey project (EMS, TEIAS)

New AC 400kV interconnection line Greece-Turkey (Admie, TEIAS)

LaSGo link (Transmission Investment)



Pannonian Corridor (EMS, MAVIR)

Investing in infrastructure is key to achieving European climate targets, ensuring security of supply and market integration

The TYNDP 2020 assessed transmission and storage projects in a range of indicators, including how each project contributes to increasing Europe's socio-economic welfare, how it reduces emissions of CO_2 and of other greenhouse gases, how it increases security of supply, … Electricity infrastructure projects deliver all kinds of benefits, also in terms of system stability and flexibility. To interpret the TYNDP, one must consider the full framework of the planning analysis, in particular by juxtaposing the system needs identified in the 2030 and 2040 horizons with the cost-benefit analysis of specific projects. Only by considering the full framework can robust conclusions be drawn on the contribution of each individual project to a successful EU energy transition.

154
transmission projects
in TYNDP 2020 projects portfolio

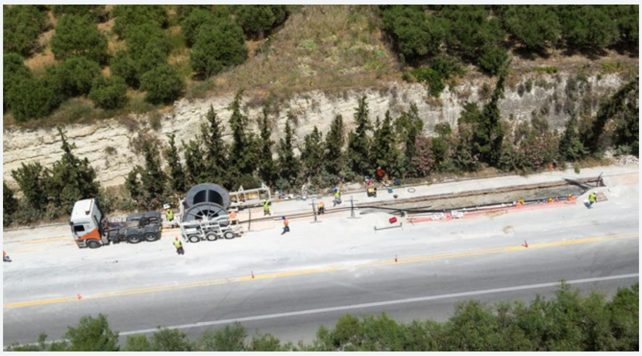
26
storage projects
in TYNDP 2020 projects portfolio, representing
485GWh
of storage capacity

CASE STORY

Crete Interconnector, North Sea Link and NordLink: 3 interconnectors facilitating renewables, lowering emissions and improving security of supply

The island of Crete represents a particular case from an energy point of view, due to its large size, rapid economic growth, remote location and large RES potential. In the last years the issue of security of supply has been only marginally satisfied, because several units of the electricity generation fleet of Crete had to be decommissioned or replaced, subject to environmental constraints, combined with the ageing of most of them. Furthermore, the high RES potential of Crete, far exceeding its energy needs, is not fully exploited, due to stability issues and technical constraints related to the island's electrical isolation. The **Crete Interconnector** will increase security of supply and improve stability issues for the electric system of the island, by its interconnection to the Greek mainland system. Additionally, it is expected to allow the progressive decommissioning of the polluting oil-fired units that currently supply the island and will allow the full exploitation of Crete's high RES potential.

The last decade has seen a significant increase of wind and solar power all over Europe, and much more is expected in the years to come. Germany and the UK have both been frontrunners in this renewables-development. At the same time the Nordic system, due to climate changes, sees a trend with more extreme wet periods, leading to increased hydrological losses in wet years. When the wind blows and the sun shines a large potential for surplus of renewable energy is created, leading to lower electricity prices in Germany and UK than in Norway in certain hours. Energy will then be transported to Norway and hydropower can be conserved in the country's many hydropower reservoirs. On the opposite, when there is low production of wind and solar power in Germany or the UK, the need for power increases and the prices will be higher than in Norway. Norway will then export hydropower to Germany and the UK. Based on this, two new interconnectors, **NordLink** (Norway-Germany) and **North Sea Link** (Norway-UK), were planned, aiming to get more out of the resources on both sides of the interconnectors. TYNDP analyses show that these two interconnectors will contribute to a more efficient use of renewable energy, by reducing wind-curtailment or by lowering hydrological losses, and will lead in an average weather year to decreased CO_2 emissions of 1,6 million tons.



Construction of the Crete Interconnector (Admie)

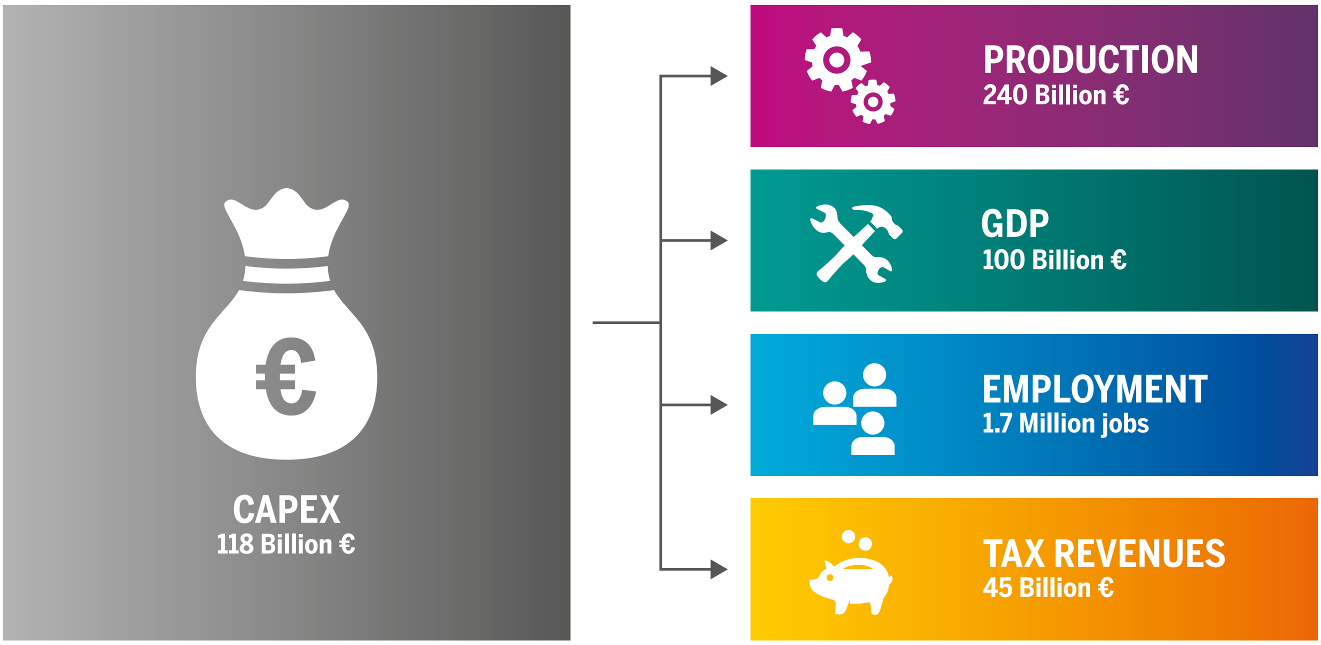
Investing in electricity infrastructure will contribute to the European economic recovery

As far as the progress of TYNDP projects in the TYNDP project portfolio allow companies to invest, this progress allows to stimulate the economy and therefore can help the post-pandemic European economy. For the first time, ENTSO-E has assessed the impact of TYNDP 2020 transmission and storage projects on the European Union economy, during the whole cycle of each project, including not only the awardee and direct tenderers of the investments but also the intermediate consumption as the buying of good and services realized by awardees and direct tenderers, and the final consumption derived from all salary incomes generated in all the steps.

The results show that during the construction and commissioning of the projects in the TYNDP project portfolio:

- 1,7 Million jobs could be ensured
- Close to 240,000 M€ could be mobilized in production, understood as the accounting value of payments of the project promoters and their suppliers
- The European Union GDP could increase by about 100,000 M€
- And the public administration revenues through taxes collection could reach about 45,000 M€

These values refer only to the European Union countries, and the goods and services generated in European Union countries, while imports from outside EU27 in or out the European continent are not considered.



Impact of TYNDP 2020 project portfolio in the European Union

A successful energy transition will require a multitude of technological solutions

To be successful, the energy transition will require a multitude of solutions coming from all energy professionals and users. The TYNDP 2020 scenarios already assume some of these will be in place. As an example, the National Trends scenario assume increases of battery capacity in Europe by 60 GW, of Demand Side Response by 10 GW and of Power-to-Gas by 3.5 GW from 2025 to 2040.

The TYNDP, and especially the System Needs study, looks at how electricity infrastructure can contribute. Even though the findings are expressed in terms on cross-border capacity increase, they can be extrapolated to identify other technological solutions solving interconnection barriers on either side of a border (including demand response, generation, storage, power to gas, etc.). Solutions to address internal bottlenecks in some countries will also be needed.

In future, infrastructure planning will require to go even further, with a truly multi-sectorial approach, considering electricity assets but also gas, transport and heat. Smart sector integration will enhance flexibility across various energy sectors and allow a development towards a more energy- and cost-efficient energy system. ENTSO-E's roadmap for the development of multi-sectorial planning towards 2030 (MSPS) is meant to serve as a starting point.

29 GW
demand-side response in 2040
National Trends

61 GW
of battery capacity in Europe in 2040
National Trends

CASE STORY

Assessing alternative solutions

The French TSO RTE investigated in its 2019 national development plan the cost-effectiveness of various solutions to tackle occasional and structural constraints, including power-to-gas, battery storage, limitation of wind generation via active network management controllers, compared to reinforcements of the transmission network. While limitation of production paired with dynamic line rating proved to be the most cost-efficient solution in case of occasional grid constraints, for structural constraints economic analyses show that reinforcing the network remains, for the moment, the most economical solution in general case (see figure). In the mid- to long-term, battery storage and power-to-gas could be additional solutions provided that specific conditions are met in terms of where they are located (near renewable energy production sites) and how they are used. The possible decrease of the cost of the batteries and the evolution of their benefits from other services could also increase their competitiveness and interest for congestion management.

In 2021, RTE will carry out experimental calls for tenders that put in competition market assets offering flexibility services – such as battery storage - with network reinforcement projects. This experimentation will focus on regional network congestions and on some cases where batteries are most likely to be competitive as early as today: thus, batteries mainly used for frequency containment reserves could get additional revenues by providing a congestion management service, and associated grid reinforcements could be postponed or even avoided.

Smart sector integration will link energy carriers and sectors – The transmission network will be key to decarbonise European economies

In the future, the energy system will need to be more integrated and dynamic between all the value chains, linking the specific energy resources to the end-sectors. This is paramount to facilitate full decarbonisation while ensuring security of supply and limiting the costs of the energy transition. The various energy carriers (electricity, heat & cooling, solid, liquid and gas fuels) will be linked and converted to provide the most efficient and carbon neutral services.

A common element of all future energy scenarios is that electricity will become the leading energy carrier (up to 65 %) and that the European electricity grid will function as the backbone of the decarbonization of all energy sectors. Electricity is a major building block of a climate-neutral energy system as renewables will be key energy sources due to their maturity and intrinsic efficiency advantage. Already in 2020, renewable energies cover 32 % of electricity demand in the EU-28 but only 18 % of final energy demand. Sector integration will impact infrastructure planning, firstly because Power to X will have a direct impact on grid expansion, and secondly because infrastructure planning for the future power system will require a multi-sectorial approach.

45 %
direct electrification in 2040
Distributed Energy

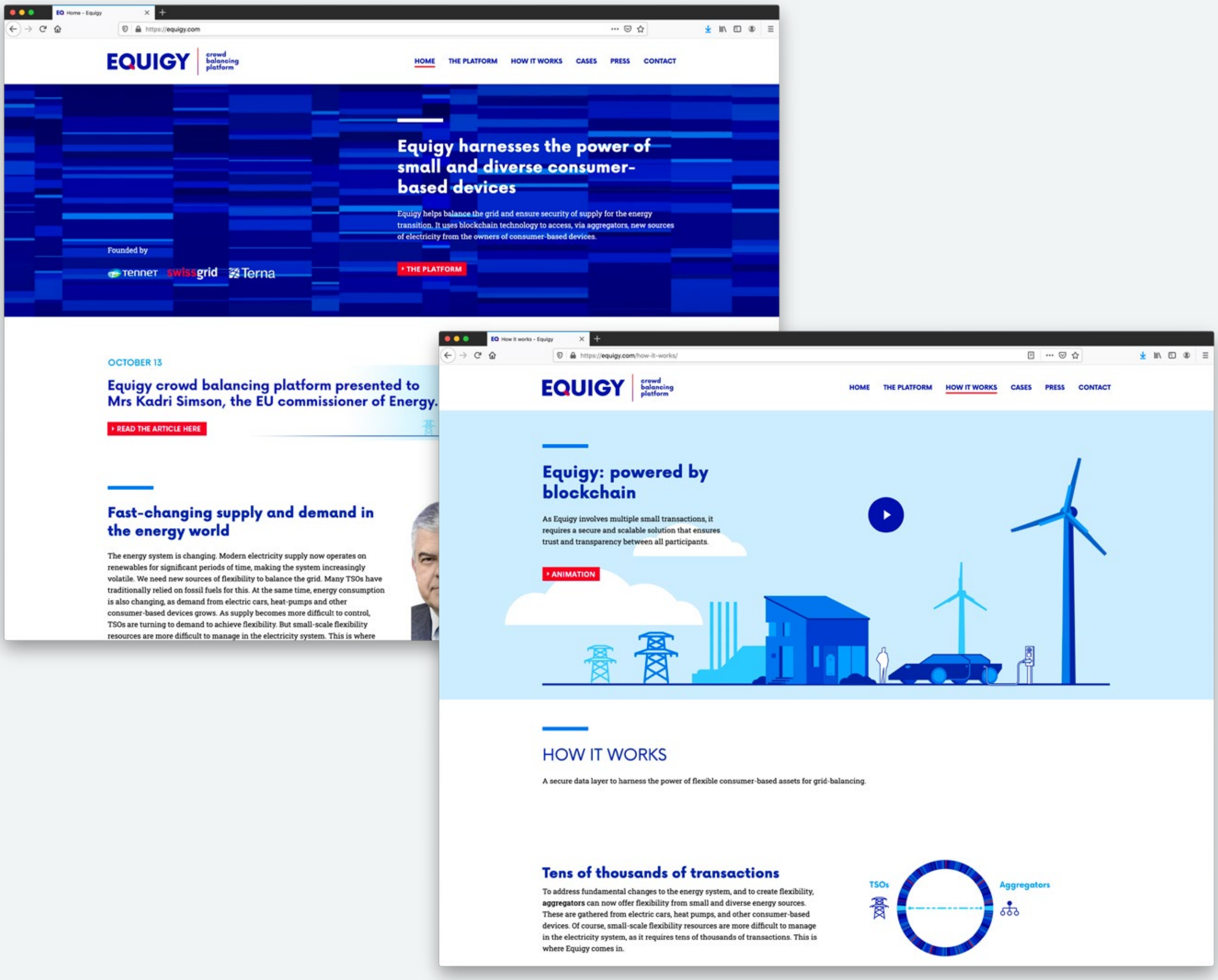
301 GW
of Power to Gas in 2040
Distributed Energy

CASE STORY

Equigy, a joint cross-sector initiative of TenneT, Swissgrid and Terna

An example of concrete project aiming at integrating different energy sectors at European level is the collaboration between TenneT, Swissgrid and Terna on the development of Equigy, a new blockchain-based platform that will incorporate small and distributed consumer-based resources into the electricity grid-balancing process. The platform will enable owners of small-scale assets, such as electric vehicles, distributed storage and heat pumps, to optimise their interaction with the grid and earn money in the process.

Equigy will link such distributed energy resources with the energy markets where flexibility is exchanged (so-called Ancillary Services Markets), by involving aggregators and Original Equipment Manufacturers. It represents a cross-industry effort aimed at setting a new European standard for the flexibility markets, combining the driving force of commercial players with TSO's "third party" leadership role. This framework is seen as the most viable collective approach among other such initiatives in Europe. It offers standardisation, a common approach from TSOs with neutral governance, and the opportunity for scale-up, pushing the green-energy transition forward.



The new blockchain-based platform Equigy: A collaboration between TenneT, Swissgrid and Terna

Offshore Development is one of the basic pillars of the European Green Deal, well-coordinated actions from politics, industry and TSOs will accelerate deployment

Holistic planning and coordinated development of on- and offshore transmission systems are needed to ensure timely development, low costs for end consumers, and electricity systems that are both technically sound and environmentally friendly. A modular and stepwise development, combining various technologies and grid designs is necessary to achieve an integrated European maritime transmission network including pooled assets such as hybrid projects. Several innovative cost- and environmental footprint-reduction measures have already been identified (e. g. standardisations, hubs, hybrid projects, multi-use platforms) and implemented by TSOs.

The TYNDP supports the planning of the future offshore grid by assessing the benefits of various projects all over Europe, including offshore interconnectors but also innovative projects such as the North Sea Wind Power Hub, or offshore storage solutions such as iLand.

43
offshore projects
in the TYNDP 2020, representing
65 GW
of additional capacity by 2035

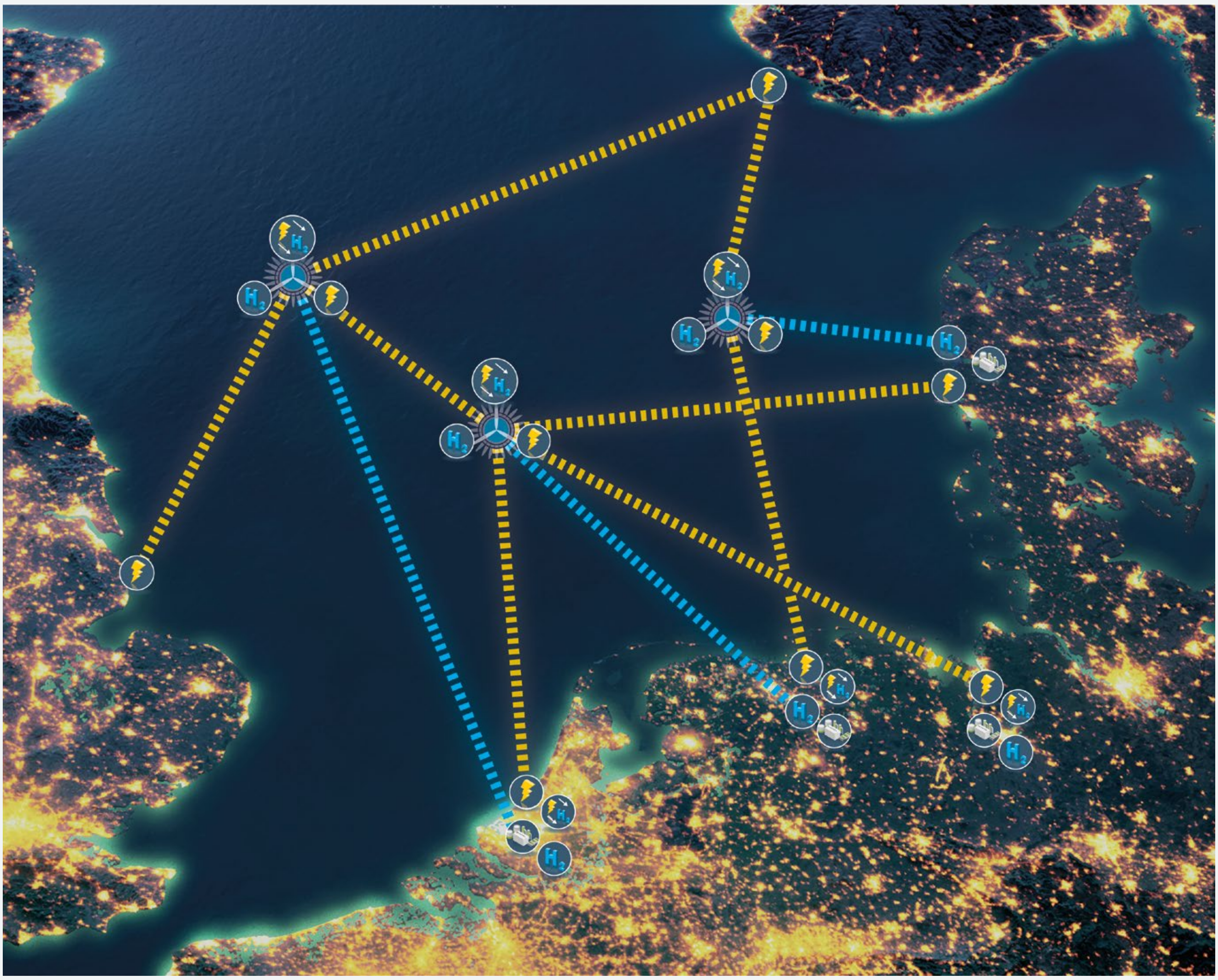
131 GW
offshore wind in 2040
National Trends

CASE STORY

The North Sea Wind Power Hub, an innovative concept to enable large-scale offshore wind energy deployment in the North Sea

When offshore wind energy is produced at a larger scale, it needs to be transported to deep inland locations, across country borders. The increased peak generation capacity of renewable energy sources will, at times, significantly exceed demand. Successful integration of offshore wind requires cross sector integration including other energy carriers (hydrogen, heat, etc.) to provide the required flexibility. A large scale roll-out of offshore wind farms in the North Sea requires an international approach to spatial planning to secure benefits of scale, reduce cost and increase deployment rates.

The North Sea Wind Power Hub proposed a modular Hub-and-Spoke concept to enable large-scale offshore wind energy deployment in the North Sea. Central to the vision is the construction of modular hubs in the North Sea with interconnectors to bordering North Sea countries and sector coupling through power-to-hydrogen conversion. An internationally coordinated roll-out of offshore wind energy, supported by one or more Hub-and-Spoke projects, is technically feasible, reduces system cost and provides long term security of supply.



The North Sea Wind Power Hub, a joint project of Energinet, Gasunie and TenneT

Public acceptance of infrastructure is the main challenge for implementing projects

One key element often generating delays and expensive redesigning of projects is their local acceptability. ENTSO-E believes that this question is more than ever a central part of project design, to ensure that projects limit and compensate their environmental or other local impacts in coordination with local authorities and associations. For example, it is common for TSOs to involve local communities in the definition of the best route for the project.

Timely infrastructure development ensures overall costs to be at the lowest possible level. Consumers win on both sides, as local groups see the direct benefits of the new infrastructure for their communities, while development costs are kept down by avoiding costly delays eventually paid by the consumer.

17%
of transmission investments were delayed since TYNDP 2018

39
projects that were in permitting phase in 2018 are still in permitting phase in 2020

CASE STORY

Ekhyddan-Nybro-Hemsjo: A Project of common interest significantly delayed due to permitting issues

Started in 2014, the project is a 400 kV single circuit overhead line in southern Sweden. The primary driver for the project is to ensure long term safe operation of the NordBalt (SE-LT) 700 MW interconnector which in turn is key for a clean and secure energy supply in the Baltic states. The project is a project of common European interest (PCI). The recent development of offshore wind power has created another driver as the project would also enable the connection of large volumes of new offshore wind power in southern Sweden.

A public consultation on alternative locations was held at the very start of the project in 2014, followed by a second public consultation with a suggested location and technical solution and several completing consultations following adjustments had been made to the suggested location. The project has not however yet been granted permitting and discussions are still ongoing on the exact location of the project, on the possible use of high-voltage AC underground cable instead of overhead lines for part of the project and on the scope of the environmental impact assessment performed by the TSO Svenska kraftnat. From the point of view of the TSO, the PCI-label granted seems to have had only a limited effect on the processing time of the permitting procedure. However, the application by the Swedish NRA of a new public consultation process is expected to facilitate a more constructive dialogue in the future.

A project similar to the proposed Ekhyddan-Nybro-Hemsjo project, currently in permitting (left) and approximative route of the Ekhyddan-Nybro-Hemsjo project (right) (Svenska kraftnät)

EU support to electricity infrastructure is necessary

Regulation (EC) 714/2009 and Regulation (EU) 347/2013 specify that the TYNDP should help identify those infrastructure projects that are key to the EU achieving its climate and energy objectives. Such projects, known as European projects of common interest (PCI), are selected among the TYNDP overall list of transmission and storage projects.

Every two years, the European Commission utilises the information in the latest TYNDP as part of its selection and adoption of a new biannual list of PCIs. From the moment a TYNDP project becomes a PCI it may benefit from favourable treatment, such as access to a European coordinator.

Simplifying and speeding up permitting processes is one of the most important ways in which the TEN-E Regulation can support the concrete delivery of infrastructure required for decarbonising the energy system. However, while the PCI status supports the financing of the project by giving it access to CEF funding, its impact on the length of the permitting process is not always tangible.

58
PCI projects
in TYNDP 2020
(4th PCI list)

CASE STORY

Kaunertal Extension Project

TIWAG-Tiroler Wasserkraft AG is one of Austria's leading hydropower companies and has been providing its flexibility facilities for national and cross border needs since 1927. In accordance with the state of the art for future-oriented, highly energy- and resource-efficient hydropower designs, the Kaunertal extension project as a 1015-MW-investment is a functional unit consisting of several facilities for the provision of any ancillary services, flexibility in all time frames (from seconds to seasonal), black start capability and islanding operation. The pumped storage part of the project has PCI-status since the 2015 PCI list. However, while the permit application was already submitted in 2012, commissioning is not expected until 2034 due to unreasonably long permitting procedures.

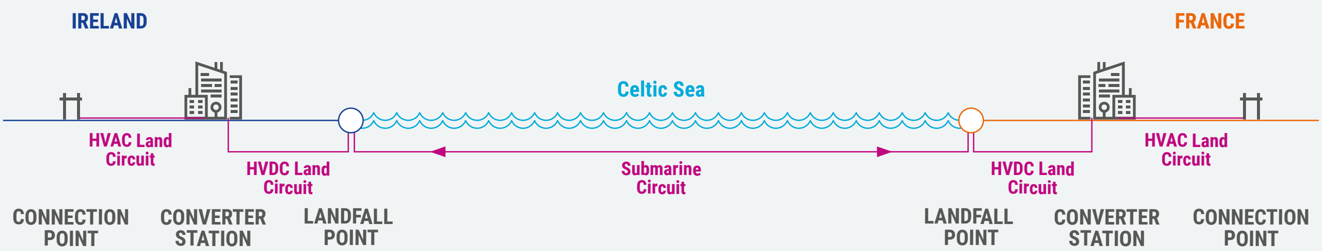
Traditionally, hydropower has a very good standing in Tyrolean public and a strong stakeholder involvement has always been one of TIWAG's success factors. Experience shows, that – as a rule – only internationally organized NGOs or economically oriented interested parties express reservations against the project, which leads to substantial delays in the permitting procedure. TIWAG is constantly striving to provide up-to-date and transparent information on the energy transition in general and on the respective project in particular through personal contacts, project websites, information events, printed materials and information centers. Based on best practice and in order to obtain a neutral analysis of the stakeholder's perspectives on the project, TIWAG has successfully completed the IHA sustainability assessment with best results.

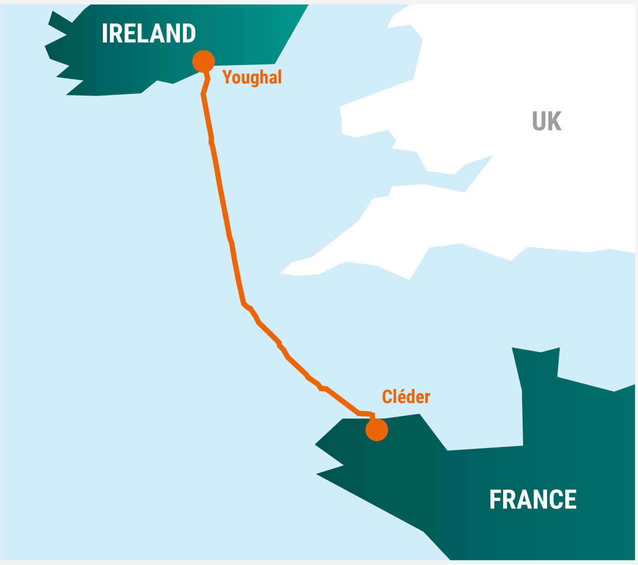
CASE STORY

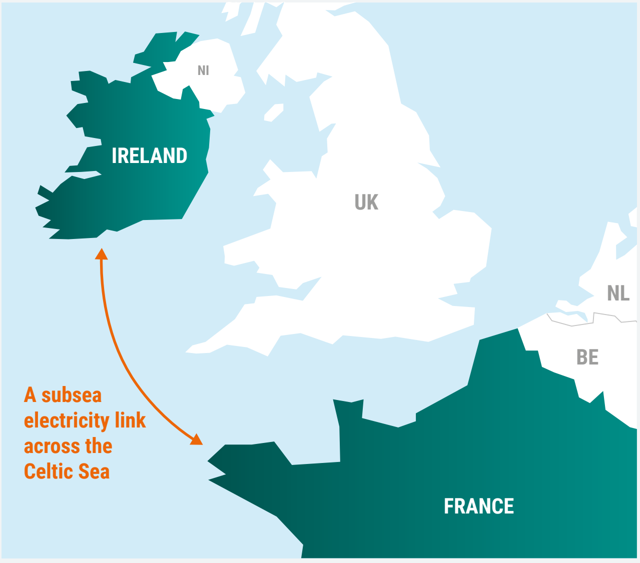
Celtic Interconnector: EU financial assistance key to project implementation

The Celtic Interconnector project aims to create an electrical interconnection between France and Ireland to allow the exchange of electricity between the two countries. The connection will link the electricity substation located in Knockraha (in East Cork, Ireland) to the substation in La Martyre (Finistère). Recognized as a Project of Common Interest (PCI) by the European Union since 2013, the Celtic Interconnector project responds to European challenges regarding energy transition and addresses climate change by facilitating progress towards a low-carbon electricity mix. It will contribute to more secure, more sustainable and better priced electricity.

In 2019, the French and Irish regulators considered that the significant benefits and the non-monetised positive externalities that the project brings to the European Union beyond France and Ireland as well as the extensive contribution of the Celtic Interconnector project to the objectives of the European Union energy infrastructure policy justify a substantial EU funding from the Connecting Europe Facility (CEF). The CEF is an EU funding instrument eligible to Projects of Common Interest in order to support targeted infrastructure investment at European level. Should such EU financial assistance not have been achieved, the regulators' agreement on the investment request might have been reconsidered and the project promoters might have been prevented to enter into the final phases to complete the project. Following the regulators' decision, RTE and EirGrid submitted in June an application for funding under the Commission's 2019 Connecting Europe Facility (CEF) Energy Programme. On October 2, 2019, the European Commission announced that it decided to provide €530 million of funding to the Celtic Interconnector project. On December 3, 2019, RTE, EirGrid and INEA signed the related funding agreement, allowing the project promoters to enter into the final phases to complete the project.







Co-financed by the Connecting Europe Facility of the European Union

Innovative technologies and sector integration: the TYNDP must evolve with the power system

The future power system will need more and more projects using innovative technologies, cross-sector projects, or hybrid projects. Recent editions of the TYNDP have seen an increase in innovative projects, such as electrochemical storage projects or hybrid offshore hubs combining offshore wind generation and transmission. For the first time, the TYNDP 2020 performed the cost-benefit analysis of a pilot cross-sector project, "HYPE".

Future editions of the TYNDP will have a cross-sector approach. ENTSO-E's **Multi-Sectorial Planning Roadmap** of July 2020 will serve as an umbrella for infrastructure planning activities, to ensure coordination and consistency between pictures of possible futures developed by different sectors. It will be the starting point for system and sector development plans and focus on even more comprehensive and consolidated scenarios compared to today's joint scenarios of ENTSO-E and ENTSOG. The MSPS also identifies needs for dual or multiple-sector assessment of infrastructure projects, via a screening process. Projects that have relevant interactions with other sectors, or that compete with projects of other sectors addressing the same needs, will be compared through a transparent cost-benefit analysis. Implementation of the Roadmap will begin in the TYNDP 2022 and continue in future editions.

4
compressed air energy storage projects in TYNDP 2020

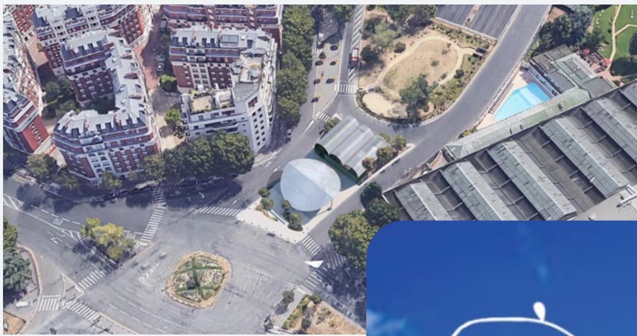
3
electrochemical storage projects in TYNDP 2020

CASE STORY

HYPE, TYNDP 2020 pilot cross-sector project

The HYPE fleet is the first fleet of zero emission taxis based on fuel cell technology in the world, operated in Paris and in Île-de-France region. It was launched in 2015 as part of COP21, in partnership with Air Liquide. Today, hype taxi fleet has reached a hundred vehicles and secured funding for an additional 500 fuel cell electric vehicles (FCEVs). In parallel, three small scale hydrogen refueling stations have been developed. The project consists in the scaling of the current hydrogen infrastructure to support the penetration of fuel cell electric vehicles, especially taxis, in Paris urban node with the aim to achieve 50,000 FCEVs in the next decade. The target infrastructure is articulated around a network of about 10 semi-centralised hydrogen production units each including 20 to 50 MW of electrolysis connected to the transmission grid and operating on renewable energy, and 100 to 500 MWh of stationary storage capacity in a gaseous form.

The vehicles represent a mobile capacity of electricity storage of 10 GWh and a re-electrification potential of 5 GW (100 kW per vehicle). Vehicles will be equipped with a “moving-e” feature which concept is currently being proven. The overall infrastructure will be dynamically operated, offering flexibility to the grid operators.



A small scale hydrogen production unit and its hydrogen refuelling station, in the heart of Paris (Porte de St Cloud) (HySetCo)

The start of a FCEV taxi fleet

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Stephan Österbauer	APG

Working Group Scenario Building
Drafting Team Cost-Benefit Analysis
Working Group Data & Models
System Studies Correspondents
Long-Term Adequacy Correspondents
Editors Team

Design
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ENTSO-E
Rue de Spa 8 . 1000 Brussels . Belgium