

Annual Report

Year in review

Despite the ongoing uncertainties caused by the coronavirus pandemic, Swissgrid was able to press ahead with its core business in 2021: secure grid operations, maintenance and modernisation of the transmission grid. In addition, Swissgrid used the past reporting year to continue developing innovative solutions. The failure of the framework agreement nevertheless makes cooperation with Europe even more challenging.

Swissgrid is responsible for one of the most critical infrastructures in Switzerland. To ensure the smooth operation of the transmission grid in the second year of the pandemic, it was crucial for Swissgrid to continue to protect the health of employees. Its processes worked perfectly.

The changing energy system also places new demands on grid operators. Its growing complexity and the decentralisation of electricity generation require new and networked approaches. The development and implementation of such solutions was a focus for Swissgrid in the year under review: the Austrian grid operator APG was acquired as a new partner for the Equigy crowd balancing platform. This platform, which Swissgrid founded with TenneT and Terna in 2020, takes advantage of blockchain technology to make it easier to bundle and control small, flexible energy resources and to use them to stabilise the grid. In the second quarter of the year, Swissgrid also launched a pilot project with ewz to test how these resources can be integrated as efficiently as possible.

Digital solutions are opening up interesting opportunities within the company as well. In 2021 Swissgrid gained experience in the application of data science and artificial intelligence and, among other things, carried out a pilot project to predict feed-ins and feed-outs in the transmission grid. Swissgrid has recognised the potential of this novel approach and intends to use it to optimise forecasts and decision-making in market and grid operations going forward.

Picture gallery: Innovation projects at a glance

More efficiency in maintaining and expanding the grid infrastructure

Swissgrid uses digital technologies not only for grid operations, but also for modernising and maintaining the grid infrastructure: computer-generated 3D visualisations help Swissgrid to plan grid expansion measures. In cooperation with ETH Zurich, the company has developed the «3D Decision Support System», which analyses and maps all the factors relevant to planning line routes, such as environmental protection, regional planning and technology. The 3D models help decision-makers, lead to more transparency and simplify communication with the affected stakeholders. The software is already being used in grid projects between Flumenthal and Froloo and between Innertkirchen and Mettlen.

To inspect its pylons, last year Swissgrid tested drones with embedded sensors that scan the pylons for

corrosion analysis. The automated process is more efficient and safer because it does not require any physical controls and the lines do not have to be switched off. Swissgrid is investigating how augmented reality (AR) can be used for inspecting substations in the future. In a pilot project with the ETH spin-off Rimon Technologies GmbH, the Mettlen substation was modelled in 3D and integrated into AR glasses along with information about the inspection process. The application provides the inspector with an image of the substation overlaid with additional images, information and film sequences.

Thanks to technological developments such as «Dynamic Line Rating», Swissgrid is able to better exploit the existing grid infrastructure. Radio sensors mounted directly on the conductors continuously determine the intensity of current, temperature, angle of inclination and acceleration. The maximum electricity volume that can flow through the conductors can be flexibly determined on the basis of this real-time data, combined with local weather forecasts,. Up to now, three static seasonal limits were specified for each line.

All these efforts are part of Swissgrid's strategy to use digitalisation to increase efficiency and effectiveness in the management of its infrastructure and plants. The goal is to constantly increase the quality and availability of the infrastructure.

Preparing for the dangers of digitalisation

Digitalisation brings not only opportunities, but also risks. Nowadays, grid operators must be ready for increasingly complex attacks on their IT infrastructure. For this reason, Swissgrid made additional investments in security in 2021: firstly, the company is strengthening its defence mechanisms against cyber-attacks, and secondly, preparations are being made for potential disturbances. Consequently, plans and processes are in place to restore the affected IT systems in a timely manner while continuing to carry out the company's core mission.

Swissgrid pursues an integral approach to security that encompasses other domains in addition to information security: health & safety, operational, physical security and business continuity management. In 2021, Swissgrid introduced the Safety Culture Ladder (SCL), an assessment method that can be used to measure and strengthen general safety awareness within the company. Service providers for whom occupational safety plays a key role must also introduce the SCL method in the future. A positive safety culture is essential to enable Swissgrid to fulfil its mission: secure operation of the Swiss transmission grid.

Very high availability of the Swiss transmission grid

In the year under review, Swissgrid ensured the extremely high availability of its grid infrastructure: the transmission grid did not cause a single supply disruption. However, two major incidents were recorded in the European interconnected grid in 2021: in the early afternoon of 8 January 2021, the grid frequency briefly dropped to 49,745 hertz. This was caused by the automatic disconnection of a 400 kV busbar in the Ernestinovo substation in Croatia, leading to a cascade of trips on other lines in Croatia, Hungary, Bosnia-Herzegovina and Serbia and ultimately to a grid separation in the continental European synchronous zone. As Coordination Centre South, Swissgrid coordinated the synchronisation of the grids, which was completed within one hour thanks to excellent cooperation between the grid operators. On 24 July 2021, there was another grid disconnection in continental Europe – between the Iberian Peninsula and the border region of Perpignan in France. The disturbance had no effect on Switzerland and was also resolved within one hour.

The integration of the new KOSTT control area into continental European processes, headed by

Swissgrid as Coordination Centre South in 2021, has helped to increase grid security in Europe. The control block, consisting of the zones in Kosovo and Albania, is now included in processes including schedule management and real-time monitoring.

In order to be able to cope with the growing demands on system operations, Swissgrid is setting priorities not only at European level, but also within the company: with the «System Operations» vision, Swissgrid aims to boost personnel in this area, standardise and optimise processes and promote digitalisation.

Progress on «Strategic Grid 2025» construction projects

It is not only system operations that must function smoothly to achieve reliable operation of the transmission grid, but also the infrastructure. Grid expansion and upgrades progressed rapidly in 2021.

Swissgrid reached milestones in important grid projects in the Swiss Alps. Most of the pylons for the line between Chamoson and Chippis have been erected, and the drilling of a tunnel for the underground cable connection of the line between the La Bâtiaz substation and Le Verney in Martigny has been completed. In 2021, Swissgrid also began construction of the last section of the extra-high-voltage line between Mörel-Filet and Ulrichen. Part of the new connection has already been in operation since 2019. In the canton of Graubünden, Swissgrid is replacing and reinforcing the pylons on the line between Pradella and La Punt.

Picture gallery: Milestones in grid projects

The implementation of «Strategic Grid 2025» will safeguard the transportation of energy from the power plants in the Alps to the consumption regions, strengthen the connection to the European grid and eliminate existing bottlenecks in the grid. Grid planning also involves the expansion and upgrade of substations and transformers. In 2021, Swissgrid commissioned the new gas-insulated switchgear in Innertkirchen. Construction also started on the new building in Ernen. The new substation will replace the old plant in Fiesch and prevent the line from crossing the valley, which will relieve the burden on residential areas. Swissgrid temporarily put the new transformer in the Mühleberg substation into operation for test purposes in 2021. Combined with the voltage step-up of the line between Bassecourt and Mühleberg, this will allow Swissgrid to increase the import capability and thus ensure long-term reliability of supply in central Switzerland.

Grid projects in protracted proceedings

Before a grid project can go ahead, it must go through the federal approval and authorisation process, which can take around 15 years, or often even longer. Swissgrid is committed to ensuring that the modernisation of the grid can be accelerated via efficient authorisation procedures.

Several projects are currently undergoing the sectoral plan or planning approval procedure. In 2021, Swissgrid submitted applications to the Swiss Federal Office of Energy regarding the sectoral plan procedures for the lines between Marmorera and Tinizong and between Innertkirchen and Mettlen. As far as the planning approval procedure is concerned, Swissgrid is awaiting the construction permit for grid projects between Airolo and Lavorgo, between Chippis and Mörel and between Bickigen and Chippis, among others. Legal proceedings will follow if objections are lodged against these projects. Proceedings were completed in 2021 for the important project between Bassecourt and Mühleberg. The Federal Supreme Court confirmed the voltage step-up and rejected all the objections raised.

The connection between Airolo and Mettlen is a pioneering project. Swissgrid will dismantle the existing connection over the Gotthard Pass and route it as a cable line through the new road tunnel. This bundling of infrastructures will allow an overhead line to be dismantled over a length of 23 kilometres consisting of more than 60 pylons. The project is currently in the planning phase.

Significant management of the existing grid

Professional maintenance and constant renewal of the grid infrastructure is essential to ensure the smooth functioning of the transmission grid. In 2021, for example, Swissgrid replaced insulators and conductors on the line between Lavorgo and Musignano in Italy, which is more than 50 kilometres long. Close coordination with neighbouring countries is important for this type of cross-border project as it involves switching off the line, which is a measure that has to be included in European grid operation planning. In order to be able to reduce shutdowns of this kind in the future, in the course of 2021 Swissgrid tested live renovation work – specifically the replacement of insulators on a pylon in Wimmis. The pilot test went flawlessly, and Swissgrid will now go on to evaluate further applications.

Swissgrid also carried out numerous repairs in 2021. These included more than 200 tasks such as mast base renovation, the application of corrosion protection and the replacement of components. Another example is the replacement of two pylons on the line between Fionnay and Riddes, which had slipped slightly according to geological data. Swissgrid works closely with technical experts to assess natural hazards and to take the necessary countermeasures.

In order to be able to meet the increasing need for investment in the grid infrastructure, in 2021 Swissgrid continued to press ahead with the optimisation of processes, as decided in 2018. This includes, among other things, the strengthening of areas such as portfolio planning, grid construction projects, and protection and station control technology.

Kick-off for the grid of the future

In addition to managing the current infrastructure, long-term planning is essential to allow Swissgrid to cope with the changing demands that will be placed on the grid in the future. In 2021, the Swiss Federal Office of Energy presented the «Scenario Framework Switzerland» (SZR CH), which sets out various scenarios concerning the future development of utility power generation and consumption, storage and cross-border capacities. The Federal Council will approve the SZR CH in 2022 following a consultation process. In parallel, the distribution grid operators are regionalising the national specifications. Swissgrid is preparing its «Strategic Grid 2040» on the basis of the SZR CH and the regionalised data, and coordinating with the distribution grid and European transmission system operators. Publication will take place in 2024, following a review by the Swiss Federal Electricity Commission ElCom.

Contracts as the basis for good cooperation

Swissgrid works closely with its partners in the industry not only for grid planning, but also for market and grid operation. This cooperation is laid down in various contracts, which are updated and adapted at regular intervals. In 2021 Swissgrid and the industry in general revised and signed contracts for automatic start-up and island operation capability.

Following the signing of the «Synchronous Area Framework Agreement» (SAFA), the new framework agreement regarding operation of the continental European interconnected grid, in 2021 Swissgrid started implementing the observability area and drafting the corresponding standard contract. The aim of the observability area is to establish data exchange for grid operational planning and management

with the distribution grid operators and to increase operational reliability as a result.

SAFA also has an influence on the framework agreements for system services, which started being updated in the past reporting year. In particular, however, the revision concerns the technical and operational requirements that must be met for participation in the European control energy platforms MARI and PICASSO, which will be launched in 2022. Access to these platforms is particularly important for system security, as it will allow Swissgrid to access a larger supply of short-term control reserves.

Exclusion of Switzerland – Swissgrid’s commitment to new solutions

Due to the lack of an electricity agreement, Swissgrid’s participation in control energy platforms such as MARI and PICASSO is under severe threat, as is its participation in the TERRE platform, which it has been involved in since autumn 2020.

In 2021, the EU Commission and regulators asked the transmission system operators involved to exclude Swissgrid from these platforms. Pressure also grew to no longer allow Swissgrid to participate in the imbalance netting platform IGCC. Swissgrid has filed an action for annulment with the Court of Justice of the European Union against the exclusion from some of the existing and planned control energy platforms demanded by the EU Commission. The aim of the lawsuit is to protect Swissgrid’s rights to participate in the platforms and to obtain legal certainty regarding responsibility for the consequences of its exclusion.

The lack of a political solution between Switzerland and the EU not only affects participation in the platforms relevant to control reserves, but also Switzerland’s involvement in other important European processes. For example, Switzerland is not part of the capacity calculation regions or coupled electricity markets. This means that Switzerland’s grid elements are not sufficiently taken into account in the calculation of capacities for transnational electricity trade. This increases the risk of unplanned electricity flows. Thanks to the signing of the SAFA agreement, however, Swissgrid can now not only implement the observability area, but also negotiate agreements with the transmission system operators in the «Italy North» and «CORE» capacity calculation regions. This means that from now on, Swissgrid will be involved in cross-border capacity calculation methods, as well as in redispatch and security coordination processes, but remains excluded from market coupling. Swissgrid concluded an agreement with the transmission system operators in the «Italy North» region in 2021. Negotiations with the «CORE» region are much more complex, as many more transmission system operators are involved, some with less close ties to Switzerland.

The Clean Energy Package resulted in changes in the coordination of pan-European grid operations in 2021. New grid operation regions, referred to as System Operation Regions (SOR), were defined. Due to the lack of an electricity agreement, Swissgrid is excluded from these SOR, but can at least participate as an observer thanks to a cooperation agreement. Regional coordination centres will be established for the SOR in the future, formed from former security coordination bodies such as Coreso and TSCNET. As a current shareholder of TSCNET, Swissgrid is currently endeavouring to find a way to continue to play a role in shaping TSCNET.

Challenges increase sharply in the medium term

Despite Swissgrid’s efforts to reduce the risks to Swiss grid security, the challenges facing the company will increase sharply by 2025. For example, the transmission system operators in continental Europe must implement the EU’s requirements to make 70% of cross-border capacity available for electricity trading by this date. Similarly, the EU plans to merge the two «Italy North» and «CORE» capacity

calculation regions by 2025 and to extend the coupled electricity market to these regions.

This will have serious consequences for Switzerland: it has not yet been clarified whether the load flows between EU and non-EU states may be taken into account in the capacity calculations once the 70% rule has been fully implemented. If this proves not to be the case, Switzerland's neighbours could be forced to restrict their border capacities towards Switzerland. This would be particularly problematic in winter, as Switzerland imports up to 40% of its electricity consumption at this time of year. Swissgrid is also expecting higher volatility in the electricity market and thus an increase in unplanned electricity flows through Switzerland.

Swissgrid remains committed to finding a way to work with its European partners on a technical level. However, agreements between transmission system operators are not an adequate substitute for an electricity agreement. This is because this type of contract must be approved by the EU authorities. Swissgrid considers that a purely technical, intergovernmental agreement would make sense as an interim solution. This would ensure that Switzerland is included in European platforms and processes, leading to a reduction in unplanned flows and thus to higher or at least constant border capacities. However, an electricity agreement is the only way to create a stable framework for long-term cooperation with the EU and thus a high level of reliability of supply in Switzerland.

International cooperation on sustainability

Despite these challenges, Swissgrid is constantly initiating projects with transmission system operators in Europe. In 2021, the company launched an initiative with Amprion, APG, Elia, RED, RTE, TenneT and Terna that aims to contribute to the decarbonisation of the energy supply system. By mid-2021, a position paper had been published on how greenhouse gas emissions can be reduced in the companies themselves on the one hand, and in their value chains on the other.

Swissgrid intends to anchor the principle of sustainability even more firmly within the company. In the past reporting year, the company had already decided to gear its procurement system towards sustainability. As far as ecology is concerned, the creation of small structures under pylons was promoted in cooperation with nature conservation organisations. Swissgrid also implements numerous measures for its employees: the company was again awarded the «Fair Compensation» certificate, for example. At the same time, Swissgrid has become a member of profawo to help employees to achieve a good work-life balance. In 2021, the management successfully completed a 18-month development programme in leadership and management, which was organised in cooperation with the University of St. Gallen.

Completion of the grid takeover by Swissgrid

In the past reporting year, Swissgrid completed the grid takeover required by the Electricity Supply Act. Since 2013, the assets of the extra-high-voltage grid have been gradually transferred from the former owners to Swissgrid. The value of the individual assets could not be conclusively determined on the relevant transaction dates, as the associated proceedings were still pending between the owners and EICOM. EICOM issued a ruling on the final regulatory values at the beginning of 2021. This resulted in an increase of CHF 126 million in Swissgrid's non-current assets.

In order to compensate the former owners for the higher value of the assets, Swissgrid placed several bonds with a total volume of CHF 360 million on the capital market in 2021. Some of the proceeds from the bonds were used to partially refinance convertible bonds and to finance ongoing investments.

Swissgrid will continue to access the capital market in future.