Planet

This section covers the topics of climate change, biodiversity and environmental protection.

Climate change

Climate change is one of the most pressing challenges of our time and affects not only global ecosystems, but also security of supply and the resilience of the energy sector. As the link between production and consumption, Swissgrid is not only affected by the effects of climate change and emits greenhouse gases itself, but is also actively shaping the paradigm shift towards a climate-friendly and resilient electricity supply. By ensuring stable and efficient grid operations, the resilience of its grid infrastructure and the needs-based expansion of the grid, Swissgrid is making a decisive contribution to a climate-friendly energy transformation. This commitment is not only one of the priorities of Swissgrid's sustainability strategy, but also part of its social, legal and business responsibility.

GRI 3-3

Ambition and goals

Swissgrid is committed to reducing greenhouse gas (GHG) emissions along its value chain in line with Switzerland's net-zero target. At the beginning of 2025, Swissgrid therefore set itself the goal of reducing its direct and indirect GHG emissions (Scope 1 and Scope 2) by 50% by 2030 and by 90% by 2040 compared to the base year 2023. Swissgrid will offset the remaining emissions through the use of negative emission technologies so that the net-zero target can be achieved from 2040. In addition, Swissgrid plans to define a reduction target for its Scope 3 GHG emissions in the 2025 financial year in line with scientific and legal

requirements. This will be based on the Scope 3 emissions reported in this section, which were comprehensively recorded for the first time for the 2024 financial year.

GRI 3-3

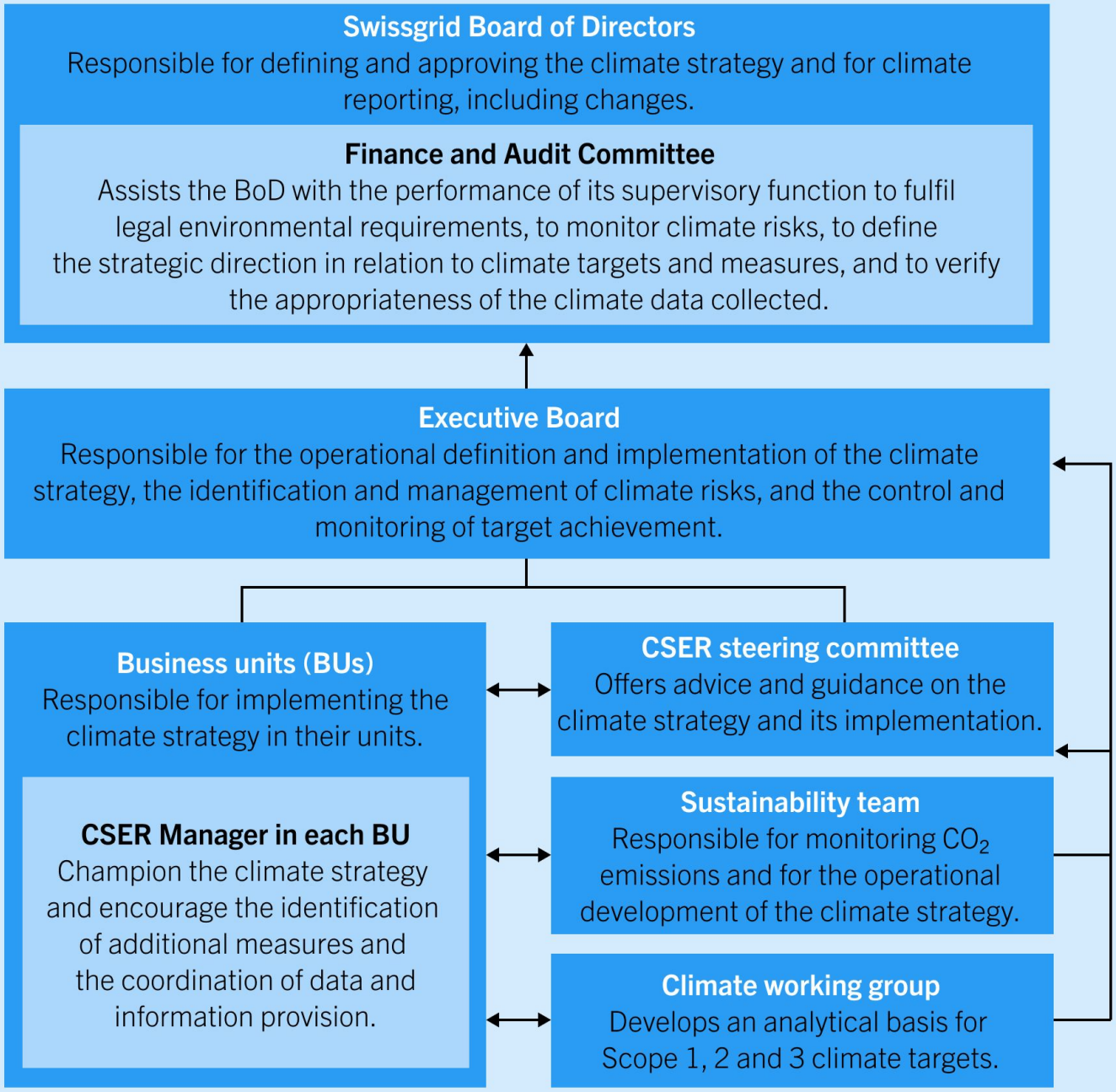
Management approach

Swissgrid's climate reporting complies with the provisions of the Swiss Code of Obligations and implements the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

Governance of climate-related risks and opportunities (TCFD Governance)

The responsibilities and supervisory functions with regard to climate-related impacts, risks and opportunities (climate issues), including the implementation of Swissgrid's climate strategy, are integrated into the corporate governance structure and shown in the following diagram.

Governance structure in the climate sector



Climate strategy: the Board of Directors is responsible for the long-term climate strategy and objectives, while the Executive Board is responsible for the operational design and implementation of the strategy. The Executive Board also ensures the regular verification of target achievement and the effectiveness of Swissgrid's climate strategy. Any necessary adjustments and control measures are developed by the cross-divisional CSER Committee for the attention of the Executive Board and are approved by the Board of Directors as required.

Risk and opportunity management: the Board of Directors is responsible for risk management and defines the risk strategy. Risk management is implemented by the CEO, who appoints a Head of ERM responsible for the management system. All relevant risks, including climate-related impacts, risks and opportunities, are assessed every six months as part of the ERM process and annually as part of the dual materiality analysis and submitted to the Executive Board and the Board of Directors for approval.

Strategic, operational and financial planning: all proposals to the Board of Directors and the Executive Board must include a qualitative assessment of the positive and/or negative impacts on the climate and the environment. This concerns investments, projects or operational implementation strategies. The costs of mitigation and adaptation measures must be submitted to the Executive Board and the Board of Directors for approval as part of the regular budget process. Swissgrid does not currently use an internal CO_2 price.

GRI 201-2

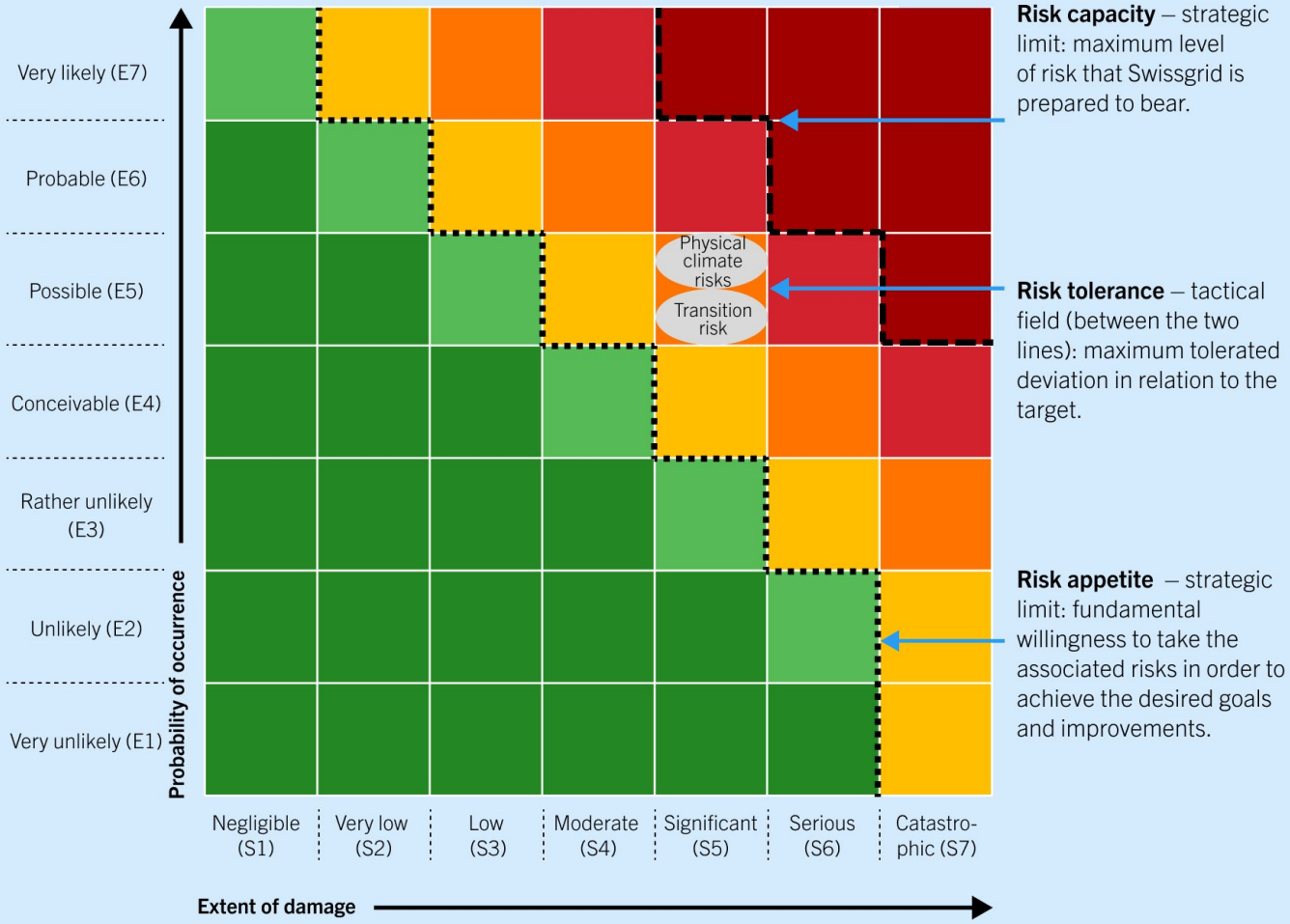
Procedure for identifying the impacts, risks and opportunities of climate change
Risk management system (TCFD Risk Management)
Swissgrid identifies and assesses climate issues as part of its ERM system and in the dual materiality analysis. The results are submitted in consolidated form to the FPA and the Board of Directors for discussion and approval.

Process for identifying and assessing climate-related risks in the ERM system: climate-related risks are identified and assessed from the company's perspective as part of the ERM process. Identified climate-related risks are assigned to a «risk owner», who is responsible for analysing the risk in detail. This includes describing the causes and consequences, assessing the impact on the corporate objectives (e.g. influence of climate-related natural hazards on security of supply), allocating the risk to one of the nine ERM categories (see «Sustainability at Swissgrid») and assessing the risk in terms of probability of occurrence and extent of damage. The assessment is carried out on the basis of one or more risk scenarios using standardised seven-point assessment scales. Overall, risk assessment is used to prioritise risks on the basis of their financial, strategic or operational materiality. As far as climate-related risks are concerned, the focus is primarily on the operational impact on the efficiency of the transmission grid.

The risk assessment also forms the basis for determining the risk strategy in line with the company's risk appetite. As part of the ERM process, the strategy and the associated risk management measures are defined by the risk owner, assigned to a «measure owner» and, depending on the assessment of the risk, include acceptance of the risk or measures to minimise, pass on or avoid the risk. The measure owner helps the risk owner to implement the risk strategy, which is reviewed and managed across different divisions as part of the ERM process.

The diagram «Aggregated climate-related risks according to the ERM process» shows the categorisation of the physical climate risks and transition risks that were identified and assessed as part of the company-wide ERM process in the 2024 financial year. The highest-rated risk is presented in each case: for physical climate risks, this is «damage to the grid infrastructure due to natural hazard events», which is categorised as a «high» business risk due to the considerable extent of damage and its potential probability of occurrence. The highest-rated transition risk is the «threat to system operation between forecast and real time» recorded in the ERM process, which is also categorised as a «high» business risk. This means that both climate-related risks are within the tactical risk tolerance range and are mitigated by means of suitable measures (see the «Overview of climate risks» and «Overview of transition risks» tables).

Aggregated climate-related risks according to ERM methodology



Climate-related impacts and risks according to the materiality analysis: in addition to climate-related risks from Swissgrid's perspective, the climate-related impacts on people and the environment are identified and assessed as part of the dual materiality analysis. To this end, Swissgrid considers the effects along its impact chain, which include the company's direct and indirect GHG emissions (Scope 1 to 3), as well as the socio-economic effects of power outages caused by weather- and climate-related natural hazards. Swissgrid assesses the materiality of climate issues according to the following procedure:

- Identification and classification of climate-related risks (positive or negative, potential or actual).
- Categorisation of the timeframe of climate-related impacts.
- Definition of risk scenarios.
- Assessment of the impact (inside-out) according to its extent, scope, irreversibility and probability of occurrence on the basis of a five-point scale. To assess the extent of the impact, Swissgrid relies on the RCP scenarios (RCP 2.6, 4.5, 6.0 and 8.5) of the Intergovernmental Panel on Climate Change for categorising the risk of climate and weather-related power outages. Whether global warming remains above or below 2°C plays a decisive role in assessing the risk of damage to infrastructure due to climate-related natural hazards. As part of the materiality analysis, Swissgrid used RCP scenario 4.5, i.e. global warming above 2°C, as the main scenario for determining the external impact.
- Assessment of the materiality of climate risks to Swissgrid (outside-in) on the basis of the highest climate-related ERM risk.
- Assessment of climate-related opportunities for Swissgrid (outside-in) according to opportunity scenarios and the ERM methodology.

Asset-specific risk assessment: in the 2024 financial year, Swissgrid carried out an asset-specific risk assessment of all its routes as part of its asset performance management. To do so, the company calculated a Risk Criticality Index (RCI) for around 12,000 electricity pylons, taking three aspects into account:

- Criticality of the route, influenced by the relevance of the lines running along the route.
- Potential hazards emanating from the pylon in relation to people, infrastructure, transport routes and location.
- Hazard potential acting on the pylons with regard to climate and weather-related risks.

The risk assessment of climate and weather-related risks takes into account ice load, avalanches, permafrost, rockfall, landslides, flooding and wind exposure. The calculation of climate-related risks is based on national and cantonal hazard maps and/or models by federal research institutions that include a risk-specific hazard assessment (e.g. frequency, hazard levels, loads, exposure, etc.) and takes place per pylon.

Identified climate-related risks and opportunities (TCFD Strategy)

On the basis of the risk management system described above, Swissgrid has identified various physical climate risks and transition risks, and defined corresponding measures. The time horizon of the risks considered includes short-term risks and opportunities whose effects materialise within one year, medium-term risks with a time horizon of 2027 to 2030, and long-term risks until 2040.

Physical climate risks: the transmission grid is already affected by a large number of physical climate risks. These include the increase in extreme weather events, the thawing of the permafrost and the increase in rockfalls and landslides, which have a significant impact on the structural requirements and protection measures to ensure the resilience of Swissgrid's infrastructure. The following table gives an overview of the physical climate risks and their operational and financial impact on Swissgrid.

Due to Swissgrid's regulated business model, the costs of necessary climate-related adaptation measures to ensure resilient grid operation do not have a significant impact on Swissgrid's operating profit. Although the company has qualitatively identified the potential and actual financial impacts of climate-related risks and opportunities, and integrated them into the regular budget process, it has not quantified them in monetary terms separately from other operating and capital costs. Consequently, there is not yet a data basis for making a comprehensive and solid assessment of the financial impact of climate change on Swissgrid.

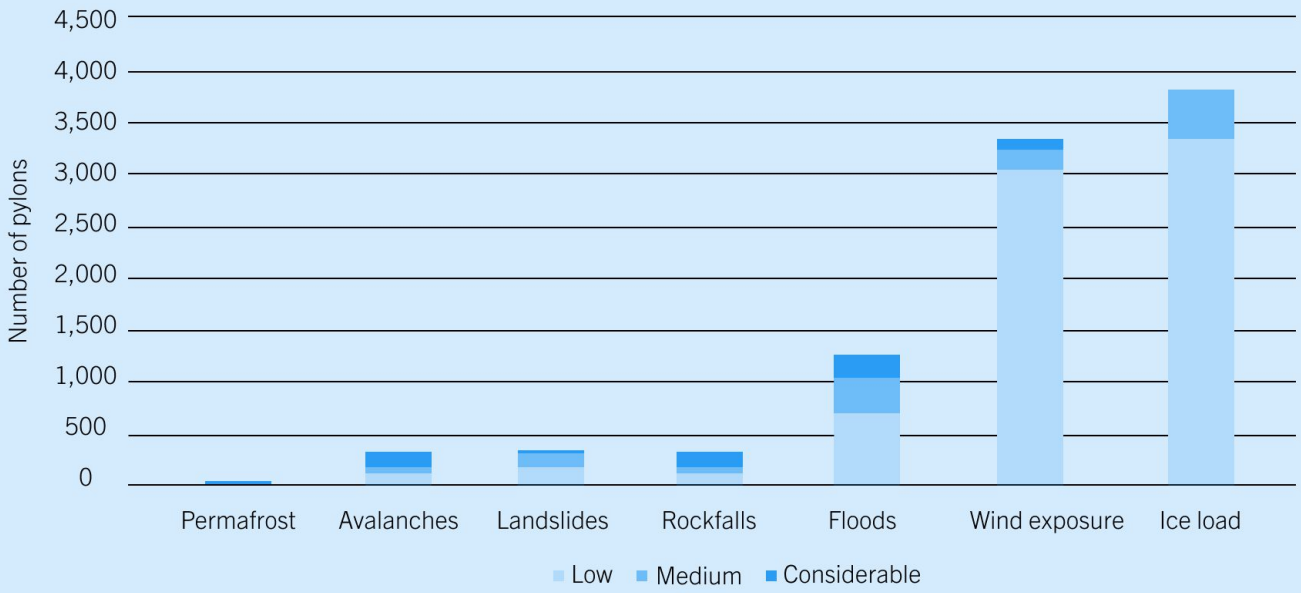
Overview of physical climate risks

		Risk	Potential operational impact	Adaptation measures	Timeframe	Classification	Potential financial impact
Physical climate risks	Acute	Increase in extreme weather events (e.g. storms and floods)	Damage to infrastructure with a potential impact on security of supply due to unexpected power outages	• Regular hazard assessment by means of updated hazard maps • Established processes in the area of business continuity management • Monitoring of lines, including the recording of weather data and its impact on the infrastructure	Short term	High	Additional costs due to repairs, reinforcements, relocations and/or maintenance work
	Chronic	Thawing of the permafrost	Influence on the stability of the 12 pylons located in permafrost areas	• Targeted monitoring of pylon stability due to changes in permafrost soils • Inclusion of risk in new planning	Long term	High	Additional costs due to relocations
		Increase in forest fires due to greater dryness	Threat to infrastructure from forest fires	• Targeted vegetation management • Specific use of operating facilities with increased fire resistance requirements	Short term	Moderate	Operating costs
		More rockfalls, landslides or avalanches	Damage to infrastructure (pylons and substations) with a potential impact on security of supply	• Regular hazard assessment by means of updated hazard maps • Selective erection of protective structures • Targeted real-time monitoring of pylons in landslide areas • Cooperation with cantons and municipalities for stabilisation measures (e.g. Brienz landslide slope relief tunnel)	Short to long term	High	Additional costs due to repairs, reinforcements, relocations and/or maintenance work
		Change in snow and ice loads and shift in snow limits	Change in the static engineering requirements for overhead lines and structures in alpine areas; impact on the accessibility of installations in winter	• Verifications and, if necessary, adaptation of static engineering requirements during the planning stage	Medium to long term	Moderate	Operating costs

Extent of the hazard potential due to physical climate risks: the evaluation of the climate and weather-

related hazard potential on routes as part of the RCI has shown that in terms of the number of pylons affected (i.e. extent of the risk), the greatest hazard potential (i.e. medium to considerable risk) is due to flooding (5% of pylons), ice load (4% of pylons), wind exposure (2.5% of pylons) and avalanches (2% of pylons).

Overview of the number of pylons affected by weather-related climate risks



Transition risks: in addition to physical climate risks, Swissgrid is also affected by the challenges of the transition to a climate-friendly future and the decarbonisation of the energy system. Examples of challenges include stricter legal requirements in the climate sector, technological and regulatory restrictions (e.g. the availability of alternative insulating gases at the highest voltage level or the use of photovoltaic plants to cover the company's own requirements), the increasing dependence of electricity generation on supply, and the rising expectations of society, politicians and investors in terms of climate protection. The transition risks and their operational and financial impact on Swissgrid are summarised in the following table. Their financial impact has not yet been quantified due to a lack of data.

Overview of transition risks

		Risk	Potential operational impact	Measures	Timeframe	Classification	Potential financial impact
Transition risks	Legal and political	New regulatory requirements for the use of sulphur hexafluoride (SF6)	Impact on the planning and maintenance of operating facilities with SF6, including risks in terms of the availability of alternatives, cost increases and time horizons	• Measures to reduce SF6 emissions (see the «Measures» section) • Roadmap for the use of alternative insulating gases	Medium and long term	Moderate	Higher procurement costs
		Narrow regulatory scope for reducing GHG emissions	Effects on the type of emission reduction measures that can be used by Swissgrid	• Regular dialogue with the regulatory authority • Regular review of Swissgrid's climate strategy	Short to long term	Moderate	Opportunity costs associated with a lack of alternatives and the financial impact of no tariff reimbursement
		Lengthy procedures for the approval of grid projects	Slow expansion and modernisation of the grid with potential delays in the integration of renewable energy sources Economic and social impact of delays and potential impact on Swissgrid's reputation	• Transparent information and involvement of affected population groups • Commitment to more efficient approval processes to speed up grid renovation and expansion	Short to long term	High	Additional operational and legal expenses and costs due to delays
	Technological	Increasingly volatile electricity generation due to the growing proportion of renewable energies	More demanding planning and greater vulnerability / higher risks for grid stability	• Strategic measures related to «Grid transfer capacity» • Long-term planning for several years, «Strategic Grid 2040», and implementation of Swissgrid's voltage maintenance concept • Improvement of forecasts, including corresponding data processing and decision-making bases (e.g. via mathematical algorithms) • Closer cooperation and coordination with grid operators in Europe and Switzerland	Short to long term	Moderate	Costs of additional measures for voltage maintenance, investments in innovation and digitalisation, operational planning costs
	Market and reputation	Increasing requirements in terms of sustainability reporting and target-setting on issues including the climate	Further development of sustainability reporting standards (Swiss, EU and ESG rating agencies) placing increasing demands on Swissgrid's data and information management	• Optimisation of data collection processes • External and internal «health checks» on the maturity of non-financial reporting • Development of an internal control system for non-financial reporting • Exchange of experience and cooperation with industry partners and affected companies	Short to medium term	Low	Potential financial impact on capital procurement and Swissgrid's operating expenses

Climate-related risks along the supply chain: climate-related risks also affect Swissgrid's supply chain. These include, in particular:

- Interruptions, delays or price fluctuations in the delivery of critical grid components due to extreme natural events and/or transition risks.
- Influence of climate-related hazards on the safety of service providers carrying out construction and repair work.
- Availability of climate-friendly alternatives.
- Reputational risks due to insufficient ambition or compliance of direct suppliers with climate-related regulations and expectations.

Swissgrid uses risk-based measures to mitigate material risks along its value chain as part of its sustainable procurement approach (see the «Sustainable supply chain» section).

Climate-related opportunities: the climate-related transition to a decarbonised supply of electricity is opening up new fields of action for Swissgrid. These include the industry-wide need to invest in grid-related innovation and digitalisation, the increasing availability and use of new and sustainable technologies for grid stability (see the «Energy transition» section) and the decarbonisation of electricity generation in Switzerland and Europe. This last trend has an impact on the ambition and feasibility of Swissgrid's climate targets: due to the exogenous decarbonisation of the transported electricity mix, Swissgrid's internal modelling shows that emissions caused by active power losses could be reduced by up to 58% by 2040.

Overview of climate-related opportunities

		Opportunity	Potential operational impact	Measures	Timeframe	Classification	Potential financial impact

Climate-related opportunities	Resource and energy efficiency	Availability of products and buildings with higher energy efficiency	Lower active power losses and own consumption at plants and bases	• Energy efficiency criteria for the procurement of products	Short to medium term	Moderate	Lower energy costs Lower costs for compensation of active power losses
		Availability of recycling over the product life cycle	Higher proportion of recycled raw materials used for procured products and disposal	• Recycling criteria for the procurement and disposal of products	Short to medium term	Moderate	Lower procurement and disposal costs
	Products and services	Availability of innovative products and flexible solutions for grid stability	Additional tools for balancing out fluctuations in the transmission grid	• «Equigy» crowd balancing platform (www.equigy.com) • Innovative measures and projects for the digitalisation and automation of grid operations • PV4Balancing project	Medium to long-term	High	Positive impact on the costs of control energy
		Availability of products with a lower CO_2 footprint	Positive impact on Swissgrid's greenhouse gas emissions (all scopes)	• CO_2 criteria in the procurement of products • Performance of life cycle assessments when selecting variants at the planning stage	Medium to long-term	High	Potentially lower costs for the reduction of CO_2 emissions
	Market	Decarbonisation of electricity generation	Positive impact on Swissgrid's Scope 2 greenhouse gas emissions and on active power losses in particular	• Swissgrid's climate strategy, taking into account decarbonisation scenarios	Medium to long-term	High	Lower costs of the compensation of active power losses with certified CO_2-free electricity

Climate scenarios and their inclusion in strategic, operational and financial planning (TCFD Strategy)
Swissgrid takes into account the identified impacts, risks and opportunities of climate change in its strategic, financial and operational planning from a short, medium and long-term perspective (see tables showing the overview of physical climate risks, transition risks and opportunities). The costs of climate-related mitigation and adaptation measures are submitted to the Executive Board and the Board of Directors as part of the regular budget process and grid planning. Swissgrid has also carried out a qualitative climate scenario analysis for the period up to 2040 to strategically classify and align its adaptation measures.

Scenario 1: net-zero target pathway (1.5°C – 2°C pathway)

Scenario assumption: the energy transition is implemented in line with the net-zero target pathway and the Federal Government's Energy Strategy 2050. According to the «ZERO Basis» scenario of Energy Perspectives 2050+, the proportion of electricity generation from new renewable energy sources will increase to 36% by 2040, while the proportion of nuclear power plants will fall to zero from 2034. Global GHG emissions are therefore reduced in line with the net-zero target pathway in this scenario.

Inclusion of the scenario in strategic and operational planning: grid-related support of the Federal Government's Energy Strategy 2050 and the efficient management of the effects of the energy transition on grid stability are core elements of Swissgrid's Strategy 2027. The company is meeting the challenges of the increasing volatility of electricity being fed in to the grid from renewable energies and unplanned electricity flows by making long-term investments in improved system controllability and resilience. In particular, these include investments in the digitalisation of system operation, as well as in the development and integration of new platforms for the use of decentralised flexibility. Additional information can be found in the «Energy transition» section. Swissgrid's long-term grid development plan, the «Strategic Grid 2040», represents another core strategic element in support of the energy transition in Switzerland. The «Strategic Grid 2040» identifies and plans the optimisation and enhancement requirements of the Swiss transmission grid for the target year 2040. Swissgrid completed the planning of the Strategic Grid in the summer of 2024 and submitted the final report, including the planned grid construction projects, to ElCom for a review of its relevance and appropriateness.

Inclusion of the scenario in variable remuneration: achieving the climate targets in line with the net-zero target pathway is one of the strategic priorities of Swissgrid's CSER commitment. The importance of climate issues is also reflected in the variable remuneration of the Executive Board and Swissgrid's specialist and management staff. As part of its corporate objectives for 2024, Swissgrid defined climate-related milestones with a direct impact on the amount of the variable salary component – which apply regardless of the climate scenario. They include key performance indicators on the reduction of GHG emissions, the application of criteria for the sustainable procurement of products, and the development of sourcing strategies such as the reduction of GHG emissions and the approval of the climate strategy for Scope 1 and Scope 2 GHG emissions as part of Swissgrid's CSER concept. In total, these three key performance indicators account for 10% of the variable remuneration of the Executive Board and management staff that is linked to the corporate objectives.

The Board of Directors' fees are fixed, irrespective of corporate targets.

Scenario 2: Moderate decarbonisation and greater need for adaptation (2°C – 3°C pathway)

Scenario assumption: the transition to renewable energies and the reduction of global GHG emissions is progressing more slowly in this scenario than in the net-zero target pathway (scenario 1). In the medium term (from 2030), this will lead to an increasing need for adaptation to ensure the resilience of the grid infrastructure due to an increase in climate-related natural hazards (see climate risk overview tables).

Inclusion of the scenario in asset management and monitoring: Swissgrid already plans, builds and operates its grid infrastructure on the basis of risk-based asset performance data. The risk factors taken into account include weather and climate-related natural hazards. In particular, potential natural hazards are considered during planning and operation on the basis of the Swiss hazard maps and the risk assessment of installations. Based on the results, real-time monitoring instruments are used and/or adaptation measures (e.g. protective structures) are introduced. In addition to geological measurement data, another example of an innovative real-time monitoring tool is «Pylonian», which uses Internet of Things (IoT) sensors on electricity pylons to constantly measure changes in potentially dangerous environmental influences over the entire life cycle of the electricity pylon. Additional information can be found on the Swissgrid website under Pylonian: monitoring electricity pylons using IoT sensors. As shown in the «Overview of physical climate risks» table, the increase in climate-related natural hazards in this scenario leads to additional costs due to repairs, enhancements, relocations and/or maintenance work to ensure the resilience of the grid infrastructure.

Scenario 3: High emissions and exponential need for adaptation (> 3°C pathway)

Scenario assumption: the global concentration of greenhouse gases continues to rise in this scenario, leading to global warming well above 2°C (corresponds to IPCCC scenarios RCP 6.0 and RCP 8.5). As a result, there is a significant increase in extreme weather events.

Inclusion of the scenario in the risk assessment: Swissgrid considers scenario 3 as part of the risk scenario assessment in its materiality analysis. According to the analysis, the risk of recurring potential impacts on grid-related security of supply is rising due to the increase in extreme weather events. More investment would then be needed in adaptation measures in the planning and operation of the grid infrastructure in order to ensure the long-term resilience of the transmission grid. Swissgrid plans to enhance the climate scenario analysis, including a change in accordance with IPCCC scenarios RCP 6.0 and 8.5, over the next two to three years.

Greenhouse gas balance, measures and key figures (TCFD Metrics and Targets)

Swissgrid has set itself the goal of reducing its GHG emissions along the value chain in line with the net-zero target. This is based on a regular, comprehensive survey of GHG emissions, supplemented by specific key figures for the most important emission sources.

GRI 305-1, 305-2, 305-3, 305-4, 305-5

Greenhouse gas balance and emission intensity

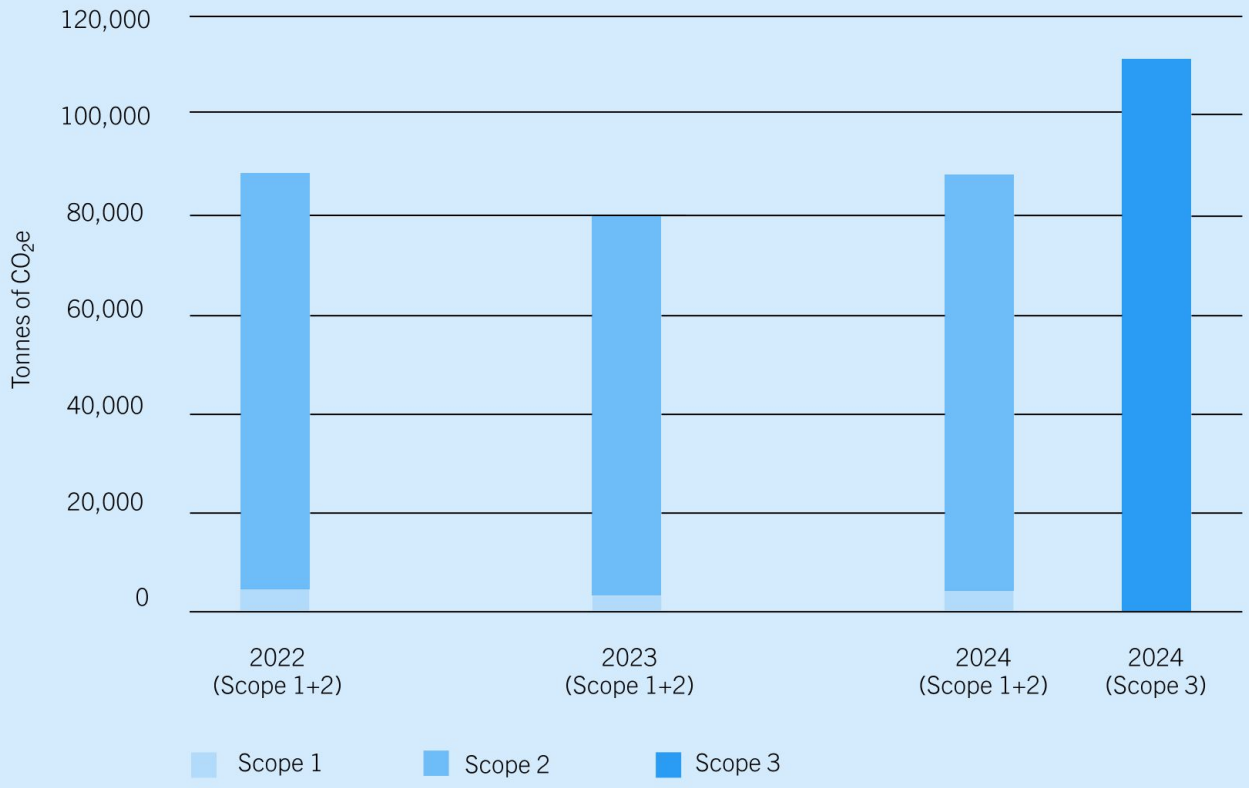
Swissgrid collects figures on its direct and indirect GHG emissions in accordance with the requirements of the Greenhouse Gas Protocol (GHG Protocol) and has had this data audited by an external auditor since 2023 (see the «Independent Auditor's Report» in the Notes). Swissgrid is reporting Scope 2 emissions according to the location-based and market-based approach for the first time for the 2024 financial year, and has carried out a comprehensive survey of its indirect Scope 3 GHG emissions. The explanations and key figures in this

section are based on the location-based approach, unless they are explicitly indicated to be market-based.

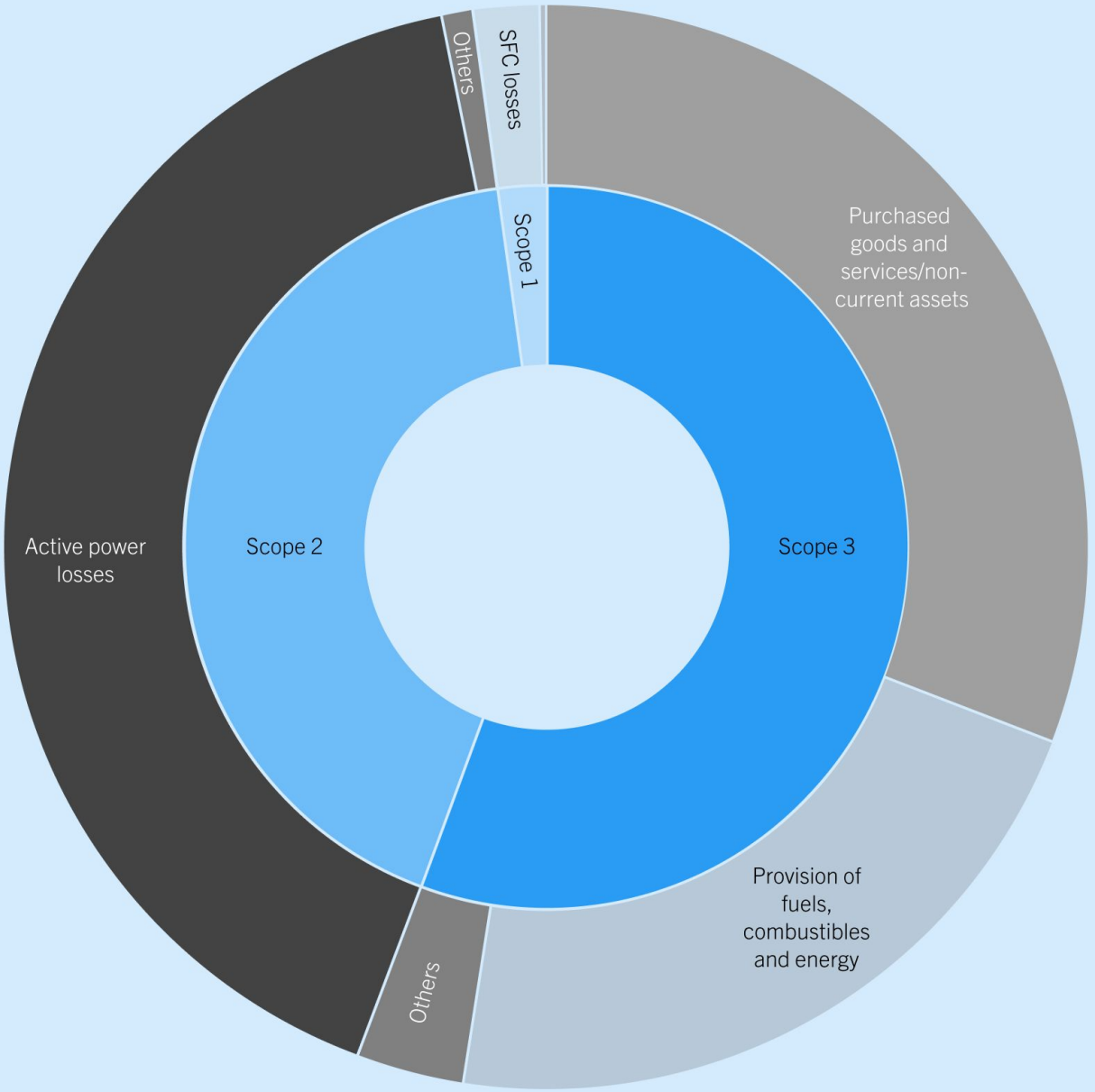
A total of 197,453 tonnes of CO_2 equivalents (CO_2e) were generated across all three scopes in the 2024 financial year. Swissgrid's direct and indirect Scope 1 and Scope 2 emissions accounted for 87,576 tonnes of CO_2e. This corresponds to 44% of GHG emissions across all three scopes. The largest sources of emissions in Scope 1 and Scope 2 are active power losses (93%), followed by sulphur hexafluoride (SF6) emissions (4.4%) and energy consumption in substations (1.6%). These three emission sources are responsible for 99% of Swissgrid's total Scope 1 and Scope 2 GHG emissions. The indirect Scope 3 emissions in Swissgrid's upstream and downstream value chain accounted for 56% of GHG emissions across all three scopes. Scope 3 is dominated by emissions from purchased (capital) goods and services (55%), followed by fuel and energy supply activities (39%). These two categories are responsible for 94% of total Scope 3 emissions.

In the 2024 financial year, Swissgrid's Scope 1 and Scope 2 emissions increased by 8.5% in relation to the previous year. This was mainly driven by the 7.1% rise in Scope 2 emissions from active power losses and the increase in direct Scope 1 emissions due to the 46% higher GHG emissions from SF6 losses. The reasons are explained in more detail below.

Change in GHG emissions, 2022 – 2024



Overview of emission sources in 2024



2024 greenhouse gas footprint in tonnes of CO_2e (✔ PwC Assurance)	2024	2023*	2022*	Change (2024 vs. 2023)
Total Scope 1 and 2	**87,576**	**80,690**	**87,276**	↗
Scope 1 (direct emissions)[1]	**4,264**	**2,999**	**4,011**	↗
SF6 losses[2]	3,865	2,643	3,688	↗
Fuel consumption of the Swissgrid vehicle fleet (diesel/petrol)[3]	352	319*	302*	↗
Fuel consumption of emergency power systems (diesel)[4]	47	37*	21*	↗
Scope 2 «location-based» (indirect emissions)[1]	**83,312**	**77,691**	**83,266**	↗

2024 greenhouse gas footprint in tonnes of CO_2e (✔ PwC Assurance)	2024	2023*	2022*	Change (2024 vs. 2023)
Active power losses from energy transmission[5]	81,477	76,061*	81' 643*	↗
Electricity consumption of substations[5,6]	1425	1,253*	1,253*	↗
Electricity consumption of locations, bases and data centres[5]	357	325*	314*	↗
Electricity consumption of the Swissgrid communication network[5,7]	16	16*	16*	→
Electricity consumption of the Swissgrid vehicle fleet[5]	1.3	1.1*	n/a	↗
District heating of locations and bases[8,9]	29	29*	30*	→
District cooling of locations and bases[8,10]	6	7*	10*	↘
Scope 2 «market-based» (indirect emissions)[1]	**82,785**			
Active power losses from energy transmission[5]	81,477	–	–	–
Electricity consumption of substations[6,11]	1,110	–	–	–
Electricity consumption of locations, bases and data centres[11]	162	–	–	–
Electricity consumption of the Swissgrid communication network[5,7]	16	–	–	–
Electricity consumption of the Swissgrid vehicle fleet[5]	1.3	–	–	–
District heating of locations and bases[9,12]	17	–	–	–
District cooling of locations and bases[10,12]	0.18	–	–	–
Total Scope 3 (indirect emissions from the supply chain)[13]	**109,877**			
Goods and services / non-current assets[14]	60,904	–	–	–
Activities for the provision of fuels, combustibles and energy[15]	42,666	39,777*	42,593*	↗
Business trips[16]	258	257*	221*	↗
Processing of waste and recyclable materials[17]	1,114	–	–	–
Employee commuting[18]	756	–	–	–
Investments[19]	4,178	–	–	–
Total Scope 1, 2 and 3 (Scope 2 location-based)	**197,453**	–	–	–
Total Scope 1, 2 and 3 (Scope 2 market-based)	**196,925**	–	–	–

[1] Emissions are consolidated based on operational control in accordance with financial reporting.

[2] Calculated with a Global Warming Potential (GWP) of 23,500 according to IPCC.

[3] Emission factors according to mobitool 3.0.

[4] Emission factor according to DETEC life cycle assessment data DQRv2:202.

[5] Emission factor according to DETEC life cycle assessment data DQRv2:2022 with a distinction between Scope 2 and Scope 3 emissions.

[6] Emissions based on measured electricity consumption values, where available, and supplemented by extrapolations based on the technical design data of the substations.

[7] Calculated per site using an efficiency calculation, taking into account the number and type of devices.

[8] Emission factor according to DETEC life cycle assessment data DQRv2:2022 with a distinction between Scope 2 and Scope 3 emissions.

[9] Based on measurements for the Aarau site and supplemented by extrapolations for other sites, taking into account the size and average heat requirements for office space in Switzerland according to the Applied Energy Journal (2021), Volume 288.

[10] Based on measurements for the Aarau site; for the other sites, the cooling requirements are covered by the electricity consumption and reported accordingly.

[11] Emission factor according to DETEC life cycle assessment data DQRv2:2022 and treeze (2021): the life cycle inventories of Swiss electricity mixes 2018.

[12] Emission factor based on specific supplier data and DETEC life cycle assessment data DQRv2:2022 with a distinction between Scope 2 and Scope 3 emissions.

[13] Emissions from upstream transport and distribution (Scope 3 category 4 according to the GHG Protocol) are included in the goods and services / capital goods category. Scope 3 categories 8 – 14 according to the GHG Protocol are not relevant for Swissgrid.

[14] Emissions based on life cycle assessment data for grid components (where available) and expenditure-based emission factors according to the CEDA database.

[15] Emission factors according to mobitool 3.0 and DETEC life cycle assessment data DQRv2:2022 with a distinction between Scope 2 and Scope 3 emissions.

[16] Emission factors according to mobitool 3.0.

[17] Emission factors according to DETEC life cycle assessment data DQRv2:2022. Office waste is not included as it is not material.

[18] Emission factors according to mobitool 3.0 and commuter mobility statistics from the Federal Statistical Office.

[19] Emission factors according to the CEDA database.

[*] Restatements of the years 2022 and 2023: in order to ensure comparability of the key figures, Swissgrid has recalculated the figures marked with an (*) for the financial years 2022 and 2023 to take into account changes to methodology. The most significant change concerns the differentiation of Scope 2 and Scope 3 emissions for the emission factors used for electricity, heating and cooling requirements under Scope 2 in accordance with the GHG Protocol. This has led to a reduction in the Scope 2 emissions reported in previous years, as the upstream proportion of GHG emissions must be recognised under Scope 3. Further adjustments were made to the values from 2022 and 2023 for the emission factors used for mobility, fuels and combustibles in order to ensure the consistency of the data sources and the data collection approach. These adjustments have led to a slight reduction in the Scope 1 emissions reported for fuels and an increase in GHG emissions for combustibles, as well as a rise in the Scope 3 emissions reported for business travel.

The increase in Scope 1 and Scope 2 emissions is also reflected in Swissgrid's emission intensity figures: in the 2024 financial year, Scope 1 and Scope 2 GHG emissions per MWh of transported electricity amounted to

1.26 kg CO_2e/ MWh. This corresponds to an increase of 16% due to the higher GHG emissions and a simultaneous reduction of 6% in the volume of electricity transported. In relation to Swissgrid's net turnover, the emission intensity decreased by 27% due to the growth in net turnover (see the «Financial Report»).

Emission intensity (✔ PwC Assurance)	2024	2023	2022
Scope 1 and Scope 2 emissions in relation to the volume of electricity transported (kg CO_2e/MWh)[1]	1.26	1.09	1.17
Scope 1, Scope 2 and Scope 3 emissions in relation to the volume of electricity transported (kg CO_2e/MWh)[1]	2.84	–	–
Scope 1 and Scope 2 emissions in relation to revenue (tCO_2e/CHF million)[1]	48	66.2	88.4
Scope 1, Scope 2 and Scope 3 emissions in relation to revenue (tCO_2e/CHF million)[1]	108	–	–

[1] Scope 2 emissions according to the location-based approach are used for the key figures on emission intensity.

GRI 2-25, 3-3, 305-4, 305-5

Emission reduction measures and key figures

Scope 1 GHG emissions

The most important source of Swissgrid's direct GHG emissions is SF6 losses, which account for 91% of Scope 1 emissions. SF6 is a highly insulating gas that is used by Swissgrid in switchgears in the extra-high-voltage range. The disadvantage of this insulating gas is that it has a high greenhouse gas potential: according to the IPCC, SF6 is approx. 23,500 times more harmful than the greenhouse gas CO_2 and has a lifespan of 3,200 years in the earth's atmosphere. For applications above 220 kV, the availability of tested and marketable alternatives with SF6-free insulating gas is currently very limited. Despite preventive measures, the risk of SF6 escaping cannot be completely ruled out. Leaks in small quantities can occur due to sealing technology and gas handling.

Measures to reduce SF6 emissions in the 2024 financial year

Preventive measures

In order to reduce SF6 losses, Swissgrid monitors all gas rooms using leakage sensors, defines internal guidelines and trains the relevant persons to handle SF6 gas. In addition, Swissgrid defines maximum permissible SF6 loss requirements for the procurement of relevant operating equipment and ensures the proper refilling, recycling and disposal of SF6 gas.

Cooperation with partners

Swissgrid is a member of the SF6 industry solution. The aim is to limit aggregated SF6 emissions from the manufacture and operation of high- and medium-voltage installations to less than one tonne per year. This corresponds to a theoretical loss rate of 0.13% based on the amount of SF6 installed by Swissgrid. Swissgrid is also working closely with other European transmission system operators to drive forward the piloting and introduction of alternative insulating gases in switchgears at the highest voltage level.

Long-term reduction in the total amount of SF6

Since the beginning of the 2024 financial year, air-insulated switchgears have been given priority over gas-insulated switchgears in new grid construction projects wherever this is operationally possible. Swissgrid has also prepared a roadmap for the introduction of operating facilities with alternative insulating gases to ensure their efficient utilisation and availability.

Key figures on SF6 emissions

Swissgrid checks the effectiveness of the measures implemented by regularly collecting SF6 data from the substations. In the 2024 financial year, the company emitted a total of 164 kg of SF6, which corresponds to an increase in SF6 losses of 46%. This marked increase is mainly attributable to an accident in a switchgear system with SF6 leakage and increased losses from isolated leaking operating facilities, which could not be replaced promptly due to long delivery times, but could not be taken out of operation either. Despite the increase in SF6 losses, Swissgrid's SF6 loss rate of 0.07% is still well below the theoretical target value of the SF6 industry solution of < 0.13%.

SF6 key figures for Swissgrid (✔ PwC Assurance)	2024	2023	2022
Total amount of SF6 (kg)	230,952	232,420*	230,905*
SF6 losses (kg)	164	112	157
SF6 loss rate (%)	0.07	0.05	0.07
Greenhouse gas emissions due to SF6 losses in relation to the volume of electricity transported (kg CO_2e/MWh)	0.06	0.04	0.05

* The total SF6 amount for the years 2022 and 2023 was updated to include SF6 reserves to ensure data completeness and consistency.

Scope 2 GHG emissions

Active power losses, which totalled 985 GWh in the 2024 financial year, are by far the largest source of Scope 2 GHG emissions. This corresponds to an increase of 7% compared to the previous year. Active power losses in the high-voltage grid occur during electricity transmission due to the electrical resistance of the lines and losses in grid components. The level of active power losses is heavily dependent on the volume of energy transported, including transits through Switzerland. Other factors also play a role, such as the voltage and current, the design of the electrical conductor, the distance covered by the energy transported, the grid topology and climatic conditions. Swissgrid currently purchases grey electricity for 100% of its active power

losses, i.e. the required volume of electricity is procured on a non-discriminatory basis without quality requirements or guarantees of origin via tenders and the spot market. The average emission factor of the consumer electricity mix in Switzerland (including imports, less exports) is used to calculate the associated CO_2 emissions.

In the 2024 financial year, GHG emissions caused by active power losses increased by 7% to 81,477 tonnes of CO_2e in proportion to the volume of active power losses. Overall, compensation of active power losses was responsible for around 98% of Scope 2 emissions and around 93% of Swissgrid's aggregated Scope 1 and Scope 2 emissions. Electricity consumption in substations is the second most important indirect source of emissions, accounting for 1.7% of Scope 2 emissions.

Measures to reduce Scope 2 emissions

Reduction of active power losses

As part of the Strategic Grid, Swissgrid has planned a series of measures, some of which have already been implemented or initiated, which have a positive impact on the containment of active power losses. In particular, they include increasing the voltage of lines to 380 kV. As the active power losses of overhead lines are generally lower at higher voltage levels, there is an important synergy between climate measures and the planning of the Strategic Grid. Applying energy efficiency criteria in the procurement of critical grid components is another important measure which can have a significant influence on the level of electric system losses. For this reason, Swissgrid assesses the loss rate of the components offered when procuring new transformers and overhead lines and defines maximum consumption values for devices for the remote control of grid systems (Substation Automation System, SAS) (see the «Sustainable supply chain» section).

Reduction of electricity and energy consumption at substations, sites and bases

The main building in Aarau is Minergie-P certified, obtains its electricity from 100% hydropower and utilises waste heat from the waste incineration plant via the district heating system. Demand is also covered by 100% hydropower in 15 other substations and locations with the highest electricity consumption. Swissgrid also further expanded its equipment with LED lighting and electric charging stations for vehicles in the 2024 financial year and takes energy efficiency criteria into account when procuring system components and IT products.

Key figures on active power losses

The effectiveness of measures is monitored indirectly via the daily measurement of active power losses. Indirectly, because key aspects relating to the GHG emissions of active power losses are beyond Swissgrid's control – i.e. the volume of electricity demanded, the corresponding production mix and demand curves, as well as the import, export and transit of electricity.

Although Swissgrid transported less electricity in the 2024 financial year, active power losses and the associated GHG emissions increased by 7%. As active power losses depend on a variety of factors, the reasons for this increase cannot be clearly identified.

Active power losses at Swissgrid (✔ PwC Assurance)	2024	2023	2022
Active power losses (GWh)	985	919	987
Active power loss rate (%)	1.41	1.24	1.33
Greenhouse gas emissions from active power losses in relation to the volume of electricity transported (kg CO_2e/MWh)	1.17	1.03	1.10

GRI 302-1, 302-2, 302-3, 302-4

Key figures on energy and electricity consumption

Swissgrid records its energy and electricity consumption as well as key figures relating to energy intensity across all three scopes in order to obtain a comprehensive picture of the most important sources of consumption and potential savings. In the 2024 financial year, Swissgrid covered more than 99% of its energy losses and energy requirements with electricity. Compared to the previous year, Swissgrid's energy consumption increased by 7%, driven by higher active power losses.

Overview of energy consumption in MWh (✔ PwC Assurance)	2024	2023*	2022*	Change (2023 vs. 2024)
Total primary energy consumption within the organisation	**2,655,435**	**2,476,175**	**2,653,641**	↗
Total fuel consumption within the organisation from non-renewable resources	**1,563**	**1399**	**1,271**	↗
Fuel consumption of the Swissgrid vehicle fleet, diesel[1]	1,357	1,223*	1,147*	↗
Fuel consumption of the Swissgrid vehicle fleet, petrol[2]	36	40*	48*	↘
Fuel consumption of emergency power systems (diesel)[1]	171	136*	76*	↗
Total fuel consumption within the organisation from renewable resources	0	0	0	→
Electricity consumption within the organisation (primary energy)[3]	**2,653,298**	**2,474,198**	**2,651,680**	↗
Active power losses from energy transmission	2,595,964	2,423,384	2,601,226	↗
Electricity consumption of substations[4]	45,403	39,928	39,928	↗
Electricity consumption of locations, bases and data centres	11,383	10,344	10,010	↗
Electricity consumption of the Swissgrid communication network[5]	508	508	515	→
Electricity consumption of the Swissgrid vehicle fleet[6]	40	34	n/a	↗
Thermal energy consumption within the organisation (primary energy)[3]	**371**	**369**	**379**	↗
District heating[7]	371	369	379	↗
Cooling energy consumption within the organisation (primary energy)[3]	**203**	**209**	**311**	↘
District cooling[8]	203	209	311	↘

Overview of energy consumption in MWh (✔ PwC Assurance)	2024	2023*	2022*	Change (2023 vs. 2024)
Total primary energy consumption outside the organisation	**10,541**	**n/a**	**n/a**	
Preparation of fuels and combustibles[1, 2]	1,592	1,426*	1,296*	
Waste[9]	4,163	n/a	n/a	
Business trips[10]	1,026	1,030*	876*	
Employee commuting[11]	3,760	n/a	n/a	
Total primary energy consumption (within and outside the organisation)	**2,665,976**	**n/a**	**n/a**	

[1] Diesel conversion factor according to mobitool 3.0.

[2] Petrol conversion factor according to mobitool 3.0.

[3] Conversion factor for primary energy based on DETEC life cycle assessment data DQRv2:2022.

[4] Electricity consumption based on measured values, where available, and supplemented by extrapolations based on the technical design data of the substations.

[5] Electricity consumption is determined for each location using a power calculation, taking into account the number and type of devices.

[6] Electricity consumption of electric vehicles according to mobitool 3.0.

[7] Based on measurements for the Aarau site and supplemented by extrapolations for other sites based on their size and the average heat requirements for offices in Switzerland according to the Applied Energy Journal (2021), Volume 288.

[8] Based on measurements for the Aarau site; for the other sites, the cooling requirements are covered by the electricity consumption.

[9] Energy factors according to DETEC life cycle assessment data DQRv2:2022.

[10] Based on energy factors from mobitool 3.0.

[11] Energy factors from mobitool and commuter mobility statistics from the Federal Statistical Office.

[*] Restatements for the years 2022 and 2023: in order to ensure comparability of the key figures, Swissgrid has recalculated the figures marked with an (*) for the financial years 2022 and 2023 to take into account changes to methodology. This affects the key figures for business trips due to an adjustment of the energy factor used from person-km to vehicle-km and the underlying data source (mobitool). For reasons of consistency, the same data source (mobitool) is now used for all data relating to fuels. Due to these adjustments, the energy consumption reported in connection with business travel has increased for 2022 and 2023.

Primary energy consumption within Swissgrid increased by 14% compared to the volume of electricity transported in the 2024 financial year and fell slightly by 1.32% in relation to the number of employees.

Key figures on energy intensity (✔ PwC Assurance)	2024	2023	2022
Primary energy consumption within the organisation per volume of electricity transported [MWh consumed/ MWh transported][1]	0.038	0.033	0.036
Primary energy consumption within the organisation per employee (MWh/employee)	2,865	2,903	3,605

[1] Includes fuel, electricity, heating and cooling.

Scope 3 GHG emissions

Swissgrid carried out the comprehensive collection and reporting of its Scope 3 emissions for the first time for the 2024 financial year. Scope 3 emissions represent 56% of total emissions and therefore have a significant impact on Swissgrid's CO_2 footprint along its value chain. A combination of life cycle assessments and an expenditure-based approach is used to calculate GHG emissions.

Emissions from goods, services and capital goods procured represent 55% of total Scope 3 emissions, making them the largest source of Swissgrid's indirect emissions arising in the company's upstream and downstream value chain. In the 2024 financial year, the main drivers of GHG emissions in this category were conductors (15%), switchgears (4.3%), cables (2.5%) and pylons (1.8%). The second most important category comprises energy, fuel and fuel treatment, which accounts for around 39% of Scope 3 emissions. Upstream emissions in connection with active power losses play the largest role within this category.

Measures to reduce Scope 3 emissions in the financial year

When procuring goods and services, Swissgrid systematically takes into account ecological criteria that help to reduce the CO_2 footprint of the components. These criteria are described in the «Sustainable supply chain» section. In October 2024, the Executive Board commissioned the cross-divisional Climate working group to develop Scope 3 climate targets and a specific roadmap of measures in the 2025 financial year. This should be done in accordance with the legal obligations, taking into account the scientific requirements according to SBTi and the benchmark with comparable companies in Switzerland and Europe.

Scope 3 emission intensity (✔ PwC Assurance)	2024
Scope 3 emissions per km of conductors procured (t CO_2e/km of conductors)	156
Scope 3 emissions per material input flow (t CO_2/t material)	0.94

GRI 3-3

Outlook: climate targets and transition plan (TCFD Strategy)

Net-zero emissions target by 2040

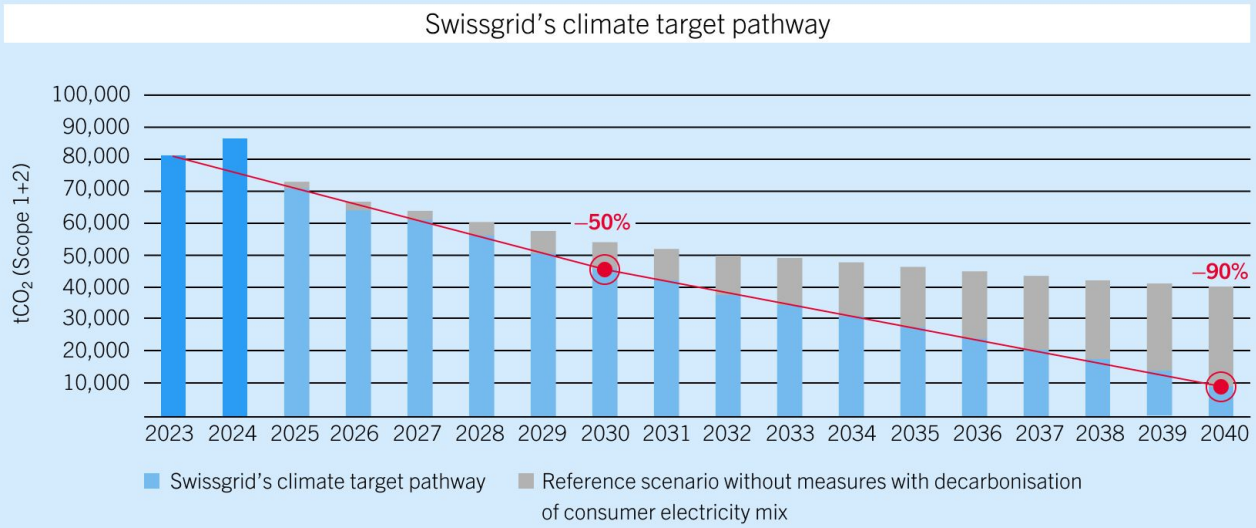
In line with the scientifically required goal of limiting the global temperature increase to 1.5°C compared to pre-industrial levels and in accordance with the legal requirements in force in Switzerland, the Swissgrid Board of Directors approved the following medium and long-term climate targets for Swissgrid's Scope 1 and Scope 2 GHG emissions in January 2025:

- 50% reduction target by 2030 (compared to 2023) with a linear reduction path of –6% per year from 2025

to 2030.

- 90% reduction target by 2040 (compared to 2023) with a linear reduction path of –4% per year from 2031 to 2040.
- From 2040, the remaining GHG emissions will be offset by the use of certified negative emission technologies in order to achieve the net-zero target.

Swissgrid's climate target: net zero by 2040 for Scope 1 and Scope 2 emissions



Roadmap of measures for achieving the set targets

The roadmap of measures for achieving the set targets focuses on Swissgrid's three main emission categories because together they are responsible for more than 98% of the combined Scope 1 and Scope 2 emissions for the reference year 2023.

Measures concerning active power losses

The roadmap for reducing and decarbonising active power losses builds on measures that have already been initiated, and combines them with new measures. Measures include technical measures to reduce active power losses by implementing the planned voltage increases in accordance with the Strategic Grid and the systematic application of efficiency criteria when procuring critical grid components. In addition, Swissgrid will cover a linearly increasing share of compensation of active power losses with certified low CO_2 electricity instead of grey electricity from 2025. Swissgrid is guided by the Swiss production mix in accordance with the criterion of non-discrimination for ancillary services.

Measures concerning SF6 emissions

The roadmap for reducing SF6 losses in switchgears takes advantage of the existing synergy, consisting of measures that have already been initiated and implemented as part of the strategic planning and operation of grid installations. Measures include the prevention of SF6 losses and the long-term reduction of SF6 thanks to the use of air-insulated switchgears and the gradual introduction of alternative insulating gases.

Measures concerning own consumption in substations

The measures adopted to reduce electricity consumption in substations include technical unbundling and the installation of smart measuring instruments, the use of efficient system components and the decarbonisation of electricity consumption with certified electricity from renewable energies, including hydropower.

Analysing the effectiveness of the timetable: Swissgrid's predicted emission trends and the effectiveness analysis take into account various emission and cost scenarios, different developments of exogenous influencing factors (e.g. sensitivity analysis of the speed and scope of decarbonisation of the production mix in Switzerland and abroad), as well as possible risk factors that could influence the implementation, efficiency or effectiveness of the planned measures. These include regulatory and technological risks, market and reputational risks and financial risks.

Implementation and monitoring: operational implementation takes place as part of the multi-year planning for grid projects and procurement planning in connection with active power losses. The climate target pathway will be managed as a top KPI within the strategic corporate objectives from 2025 onwards and will influence the variable remuneration of the Executive Board and Swissgrid's specialist and management staff. Regular, centrally managed monitoring and a comprehensive review of the climate strategy are carried out to check implementation progress. The monitoring and audit results and any modifications are submitted to the Board of Directors for discussion and/or decision.

Environmental protection

Protecting the environment is an integral part of Swissgrid's mission. As a sustainable company, Swissgrid not only ensures the safe and reliable operation of the transmission grid, but also takes responsibility for protecting the environment in which its grid infrastructure is embedded. This is both an integral part of Swissgrid's mission and legal responsibility and an essential basis for ensuring the social acceptance of grid projects.

GRI 3-3

Ambition and goals

Swissgrid has set itself the goal of systematically taking environmental interests into account in its activities and minimising potentially harmful effects on land, air and water. To this end, Swissgrid operates a comprehensive environmental management system and endeavours to continuously reduce wastewater, noise and other emissions.

GRI 3-3

Management approach

Swissgrid's integrated management system

In the 2024 reporting year, the Executive Board commissioned the Sustainability team with the management and further development of the environmental management system at Swissgrid. This organisational change is intended to further the integration and harnessing of synergies from the management systems for sustainability, environmental protection and occupational safety. The existing Health, Safety and Environment management system (HSE for short) continues to form the framework for the targeted implementation and continuous improvement of environmental protection at Swissgrid, compliance with legal requirements and the establishment of environmental protection within the corporate culture. The management system is based on the PDCA management model («plan-do-check-act») to support the continuous improvement of HSE performance.

The integrated management system is certified in accordance with the ISO 14001 and 45001 standards by an accredited auditing body. In the 2024 financial year, a monitoring audit was carried out in accordance with the standardised three-year audit cycle. The existing HSE management system was confirmed to be suitable, appropriate and effective. No deviations were identified in the area of environmental protection, and the external auditors underlined the extensive HSE expertise of the Swissgrid employees involved, some of whom have been with the company for many years.

Identified impacts, risks and opportunities

Swissgrid identifies and assesses the impacts and risks of its business activities on the environment as part of the dual materiality analysis and the environmental impact analysis. The environmental impact analysis determines the effects of operational activities and processes on materials/raw materials, water, energy consumption, emissions, soil, non-ionising radiation, waste, noise, nature conservation and the landscape, as well as other risk factors. On this basis, the materiality analysis assesses identified environmental impacts according to their extent, scope, the irreversibility of the impact and the probability of occurrence. In addition, Swissgrid conducts regular stakeholder analyses as part of its HSE management system and materiality analysis in order to determine and take into account the expectations and requirements of stakeholder groups. The materiality analysis and environmental impact analysis are updated annually. The results are incorporated into Swissgrid's ERM system and form the basis for deriving and implementing risk-based measures as part of the HSE management review.

The potential and actual environmental risks and impacts identified include the disturbance and damage of protected habitats, negative impacts on fauna and flora due to the construction and operation of installations, the release of environmentally hazardous substances, and environmental damage due to the incorrect handling of contaminated material. Furthermore, the visual impact on the landscape, electromagnetic fields and noise are among the most frequent concerns of the population with regard to extra-high-voltage lines. Swissgrid proactively addresses environmental risks, impacts and concerns with the aim of either eliminating them by taking adequate measures or minimising them to an acceptable residual risk.

GRI 2-25, 2-26, 413-1, 413-2

Systematic inclusion of environmental protection in grid construction projects

The potential and actual effects on the environment can be considerable, especially in grid construction projects. Swissgrid systematically considers and minimises the environmental impact when planning and implementing grid infrastructure. Compliance with environmental protection laws and ordinances is a matter of course for the company.

Compliance with environmental regulations is verified by the Federal Office for the Environment (FOEN) when approving grid construction projects. The process consists of several phases in which the concerns of various interest groups are also taken into account (see the «Stakeholder engagement» section). When major projects are being carried out, for instance to build a new extra-high-voltage line, all the phases must be complied with; when implementing smaller projects, relevant environmental protection measures are implemented in accordance with the legal requirements.

Overview of the inclusion of environmental aspects in the approval of grid construction projects

Phase	Activities	Inclusion of environmental aspects
Needs analysis	• Future grid development requirements are analysed as part of the planning for several years, known as the Strategic Grid. The planning of the Strategic Grid is based on the scenario framework for Switzerland, which is drawn up by the Swiss Federal Office of Energy (SFOE).	• The future grid is planned according to the NOVA principle (grid optimisation before grid enhancement before grid expansion). This means that the impact of grid expansion on the environment and the landscape can be kept to a minimum. • The environmental and landscape impact is optimised by bundling infrastructure such as transmission lines with national roads and railway lines. One example of this is the second tube of the Gotthard Road Tunnel, where the line from Göschenen to Airolo, which is approximately 18 km long, is combined with a national road.
Preparation	• In this phase of each relevant grid construction project, Swissgrid prepares various underground cable and overhead line corridors for the areas in which lines are planned.	• A preliminary environmental impact assessment is carried out taking into account the following impacts: air, noise and vibrations, non-ionising radiation, groundwater and springs, surface water and aquatic systems, drainage, soil, contaminated sites, waste, environmentally hazardous substances, environmentally hazardous organisms (neophytes), disturbances, forests, flora, fauna and habitats, landscape and townscape (incl. light emissions), cultural assets and archaeology.
Inclusion in the federal Transmission Lines sectoral plan (SÜL)	• Swissgrid submits the application for the SÜL procedure. This is the federal government's overarching planning and coordination tool for the expansion and new construction of transmission lines. At the end of this phase, the Federal Council determines the corridor for the line and the technology (overhead line, underground cable or a combination of the two).	• A support group appointed by the SFOE with representatives of the Swiss government, cantons, environmental protection organisations and Swissgrid discusses the proposed options and submits a recommendation. • The Swiss government's evaluation scheme for the transmission lines plays a key role in this respect. Regional development, the environment and economic viability are factors which are taken into consideration in addition to technical aspects. • A public consultation and participation procedure allows affected parties to make their views known (consultation and participation procedure in accordance with Art. 15 ff. of the Electricity Act).
Construction project	• Swissgrid prepares the specific construction project within the planning corridor defined by the Federal Council.	• In this phase, Swissgrid appoints a project advisory council for selected projects in order to integrate the concerns of the population and other stakeholder groups into project planning. • Swissgrid also carries out a detailed environmental impact assessment, taking into account the above-mentioned aspects. The environmental impact assessment is part of the planning application that Swissgrid submits for the planning approval procedure.
Planning approval procedure	• Swissgrid submits an application for planning permission to the relevant authorities. At the end of this phase, the authorities – either the Federal Inspectorate for Heavy Current Installations (ESTI) or the SFOE – issue Swissgrid with the planning approval decision, including the construction permit, and may impose additional conditions that must be included in the project planning.	• In this phase, the public presentation of the project takes place, if required by the procedural regulations, including the environmental impact assessment. • Directly affected parties, environmental organisations, cantons and municipalities have the opportunity to lodge objections and to appeal before the courts. • Approval is granted by the federal authorities and usually includes additional environmental requirements for the construction of the line.

Construction	• Once the legally binding construction permit has been granted, the construction work can begin. Swissgrid procures the necessary supplies and services in accordance with the provisions of public procurement law.	• Swissgrid procures materials and services taking environmental aspects into account (see the «Sustainable supply chain» section). • Swissgrid implements ecological protection, restoration and/or alternative measures in accordance with the environmental impact report and the official requirements. • Construction projects are subject to external environmental construction/ecological supervision and/or soil science construction supervision – on behalf of Swissgrid – in order to ensure the implementation of protective measures and environmental compliance.

GRI 2-26, 3-3, 416-1

Measures and key figures

Environmental protection measures

In accordance with the statutory national and cantonal requirements, Swissgrid consistently and systematically implements measures to avoid, minimise and compensate for the environmental impact of the planning, construction, maintenance and servicing of grid projects. Specific examples of environmental protection measures for ongoing grid projects are described on the Swissgrid website (Project overview).

Preventive measures

Swissgrid attaches great importance to preventive protective measures in an effort to avoid negative effects on the environment. These include:

- The systematic inclusion of environmental impacts in the preliminary project phase in order to compare the ecological impacts of different variants and to consider this aspect as part of the decision-making process. This is done by conducting an environmental conflict analysis, the results of which are incorporated into the subsequent project phases. Furthermore, since the beginning of 2024, Swissgrid has been using a data-based tool called «Pathfinder», which takes ecological and regional planning aspects into account in addition to technical criteria to help select optimal line routes (see the box on data-based route planning with «Pathfinder»).
- The implementation of measures to prevent the release of environmentally hazardous pollutants (e.g. insulating oils). This includes the implementation of safety precautions and monitoring systems to detect and prevent potential leaks or accidents at an early stage, as well as the establishment of special storage and disposal areas for contaminated materials to prevent improper handling.
- Building up capacity and expanding the expertise of local site managers to ensure full implementation of the laws, requirements and specific measures, including those relevant to the environment, in all implementation projects.
- Regular training of the relevant employees on the safe handling of hazardous materials and work equipment. In addition, employees and external parties have the opportunity to submit reports, indications and/or suggestions for improvement regarding environmental risks via the «RiskTalk» app.
- The implementation of prevention measures during the implementation of approved grid projects and work. Examples include prior vegetation surveys, the planning of material storage areas or construction slopes, the covering of green areas during corrosion protection work and/or strict compliance with regulations for the storage and use of hazardous substances and machinery.

Measures concerning noise emissions

Due to corona discharge, power lines can generate localised noise emissions in the form of crackling or humming, especially in damp weather conditions. In addition, there may be temporary noise pollution during the construction or maintenance of systems. Swissgrid is implementing the following measures to reduce noise emissions while complying with the statutory immission limit of 45 to 55 decibels in residential zones:

- Reduction of the strength of the electric field on the surface of the conductor by optimising the conductor arrangement.
- Inclusion of technical criteria for noise emissions in the procurement of conductors and transformers.
- Structural and operational measures to limit noise emissions (e.g. use of noise-reducing technologies and processes during the operation and maintenance of systems).

Measures concerning electromagnetic fields

Electric and magnetic fields are generated wherever electricity is produced, transported and used. Swissgrid adheres to the strict Swiss limits in this respect. Additional information is available on the Swissgrid website under Emissions. Swissgrid implements technical measures to ensure that electromagnetic fields are kept as low as possible:

- Optimisation of the phase position in the grids in order to minimise electromagnetic fields.
- Implementation of protective measures (e.g. choice of route and pylon locations, height of lines) to minimise the exposure of people and the environment to electromagnetic fields.

Implementation of restoration and alternative measures

If protective measures to avoid negative environmental impacts are not possible, restoration measures are taken. These measures are designed to repair temporary interventions into nature. For example, a meadow that was used for an access track during the construction phase must be restored once the work has been completed. If this is not sufficient, Swissgrid will implement ecological alternative measures as a last resort. These measures ensure that the overall ecological balance of the region is preserved. One example is the reforestation of a comparable forest if permanent clearing is required under a new line.

Environmental supervision

Environmental supervision ensures that environmental issues are managed and monitored during construction projects and helps Swissgrid to guarantee the legally compliant and environmentally compatible implementation of projects. It ensures compliance with environmental laws, regulations, guidelines, instructions and requirements of the planning approval decision. It advises and supports the parties involved, observes and evaluates environmental problems at the construction site and ensures that the project is implemented in a legally compliant manner.

GRI 2-27

Key figures on environmental protection

The effectiveness of protection, restoration and alternative measures is assessed in detail during the approval process. The implementation of measures is also monitored by regular HSE inspections and external environmental construction supervision. Random checks can be carried out by the cantonal authorities once grid projects have been completed. In addition, specific control measurements are carried out, e.g. to ensure compliance with the imission limits for electromagnetic fields and noise, as well as ground measurements to determine pollution levels.

In the 2024 reporting year, there were no significant judgements or monetary fines against Swissgrid for compliance violations in relation to environmental protection. Swissgrid carried out a total of 396 HSE inspections, in the course of which no potential high-risk environmental deviations were identified.

Despite the preventive measures implemented, three incidents with a potentially negative impact on the environment occurred in grid operations during the 2024 financial year due to the leakage of oil in two cases and the loss of SF6 due to an accident in a switchgear in the third case. In all three instances, immediate measures were taken (removal and proper disposal of the contaminated soil, switching off of equipment) and internal investigations were initiated.

Key figures on environmental protection	2024	2023	2022
Significant[1] violations of environmental protection laws and ordinances (including monetary and non-monetary sanctions)	0	0	0
Fines paid or deferred for significant[1] environmental violations committed in previous years	0	0	0
Number of HSE inspections carried out	396	357	368
Number of HSE inspections with potential deviations in relation to environmental protection with medium risk	2	0	7
Number of HSE inspections with potential deviations in relation to environmental protection with high risk	0	1	0
Number of events with a potentially negative impact on the environment	3	n/a	n/a

[1] A penalty of CHF 10,000 was defined as the materiality threshold for reporting.

Data-based route planning with «Pathfinder»

Swissgrid uses «Pathfinder» to develop and analyse route variants for new high-voltage lines in the preliminary project phase (SIA 31). «Pathfinder» is a tool that facilitates planning by integrating technical, environmental and regional planning criteria and illustrating their interrelationships (see the illustration, «Fictitious example of route planning with Pathfinder»). Quantitative factors such as life cycle assessments and life cycle costs are calculated automatically. In terms of environmental and biodiversity protection, «Pathfinder» makes these aspects both visible and comparable.

How «Pathfinder» works
«Pathfinder» combines geodata with powerful algorithms to calculate optimal routes:

- **Resistance analysis:** criteria such as topography, protected areas and residential areas are evaluated and shown on a resistance map that highlights the routes that are more or less suitable.
- **Route suggestions:** based on the map, the tool creates specific routes, including pylon locations, thereby enabling precise and transparent planning.

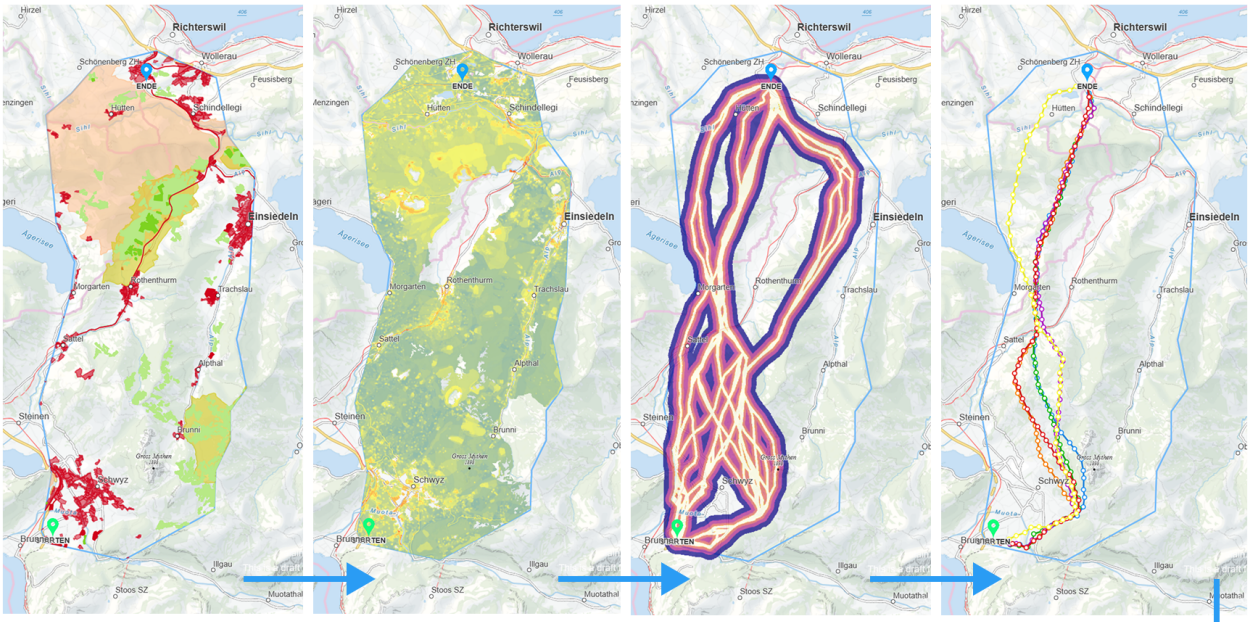
Automatic analysis of costs and environmental impacts
The tool then analyses the costs and environmental impacts:

- **Cost analysis:** calculation of investment and life cycle costs (CAPEX and LLC).
- **Environmental assessment:** consideration of GHG emissions, the landscape, nature conservation areas, biodiversity protection and compatibility with regional planning objectives.

Planning advantages
The results from «Pathfinder» represent a data-based decision-making tool that helps Swissgrid to finalise the entire preliminary project phase and submit a well-founded route proposal.

Fictitious example of route planning with Pathfinder

Geographical resistance points | **Resistance map** | **Corridor** | **Path variants**



Cost calculations

	Ecological balance CO_2 (kg CO_2eq)	Ecological balance Environmental impact points	Ecological balance Consumption of renewable energies (kWh oil-eq)
A	192,701	726,895,856	712,399
B	189,729	715,682,576	701,409
C	193,569	730,168,481	715,606
D	189,459	714,667,252	700,414
E	193,507	729,936,737	715,379
F	199,914	754,104,948	739,065

Figure: the five steps of route planning with «Pathfinder», illustrated using a fictitious project: analysis of geographical resistance, creation of a resistance map, definition of suitable corridors, development of route variants and calculation of costs.

Biodiversity

The health and resilience of nature and its biodiversity are important prerequisites for the well-being and resilience of society, the economy and infrastructure. This also applies to Swissgrid's transmission grid: its resilience is better protected against flooding and other extreme weather-related events by an intact ecosystem. As the operator of a national infrastructure, Swissgrid takes its duty to preserve biodiversity seriously as part of its legal and social responsibility.

GRI 3-3

Ambition and goals

Swissgrid is committed to the preservation of biodiversity. As required by law, Swissgrid applies the mitigation hierarchy according to the «no net loss» principle: avoid, minimise, restore and – where unavoidable – compensate.

GRI 3-3

Management approach

GRI 304-2

Identified impacts and risks

Swissgrid identifies and assesses the impacts and risks of its business activities on biodiversity as part of the dual materiality analysis and environmental impact analysis, as described in detail in the «Environmental protection» section. The expected impacts of specific grid projects and compliance with the legal provisions on the protection of the environment and biodiversity are analysed and presented as part of the environmental impact report and the environmental impact statement. As far as biodiversity is concerned, the effects on groundwater and springs, surface waters and aquatic systems, drainage, soil, environmentally harmful organisms (neophytes), forests, flora, fauna and habitats are analysed. The identification and mitigation of impacts on biodiversity are part of Swissgrid's legal obligation for the approval and implementation of a grid project.

The environmental impact analysis classes the planning and construction phase of routes as one of the activities with the highest relevance for biodiversity and ecosystems, in the same way as the maintenance of underground cables. As part of the materiality analysis, the impacts are considered to be largely local or regional, long-term (i.e. longer than five years) and to have a relatively high degree of irreversibility, partly due to the long service life of Swissgrid's infrastructure. However, the specific impacts on biodiversity are highly dependent on the location and the type of grid project or maintenance work, and can affect forests, flora and/or fauna. For example, keeping vegetation levels down can disturb the habitat of plants and animals. The same applies to clearing work near lines which is necessary for their safe operation, or keeping the ground above cable conduit blocks free of tall or deep-rooted trees. In addition, forest aisles for laying underground cabling or installing overhead lines can favour the spread of invasive neophytes, and lines can represent a collision risk for birds. When laying underground cables, the aisles in forests required for safe operation, access roads and additional compensation systems and transition structures leave their mark on the landscape (see «Technologies in the extra-high-voltage grid»).

GRI 304-1

Inventory of grid infrastructure in protected areas

According to the Transmission Lines sectoral plan, protected areas of national or cantonal importance are also taken into account when considering planning areas and analysing corridor variants. It is not always possible to completely avoid a protected area when planning and installing a line. In these cases, Swissgrid examines and implements protection, restoration and/or alternative measures.

In Switzerland, national protected areas cover around 6.2% of the total national territory. Of the extra-high-voltage infrastructure networked throughout Switzerland, a total of 2,806 pylons (24%) and 19 substations (15%) are located in one or more protected areas (without counting any elements twice).

Overview of protected areas and grid infrastructure[1]

Protected areas	Type of protected area	Protection status	Pylons	Substations
Federal Inventory of Landscapes and Natural Monuments[2]	Landscapes of national importance	National legislation	1,214	7
Moorlands	Landscapes of national importance	National legislation	186	1
Floodplains	Biotopes of national importance	National legislation	114	0
Raised and transitional bogs	Biotopes of national importance	National legislation	5	0
Low-moor bogs	Biotopes of national importance	National legislation	54	0
Amphibian spawning areas	Biotopes of national importance	National legislation	112	0
Dry meadows and pastures	Biotopes of national importance	National legislation	136	0
Emeralds	National protected areas	Berne Convention (international agreement)	208	3
Hunting ban areas	National protected areas	National legislation	346	2
Swiss parks	Landscapes of national importance	National legislation	1,204	10
Water and migratory bird reserves	National protected areas	National legislation	41	1
Biosphere reserves	Landscapes of national importance	UNESCO (international programme)	78	0
Ramsar	National protected areas	Ramsar Convention (international agreement)	52	1
Infrastructure in protected areas of national importance (number)[3]			2,806	19
Infrastructure in protected areas of national importance (%)[3]			24%	15%
Surface area of railway lines in protected areas of national importance[4] (km^2)			22	n/a
Surface area of pylons in protected areas of national importance[4] (km^2)			0.4	n/a

[1] To determine the locations of pylons and substations in protected areas, the 11,879 pylon locations and 126 substations were cross-referenced with the GIS data of the protected areas. The data shown includes pylons and substations within landscapes and biotopes of national importance and within national protected areas.

[2] According to the Federal Inventory of Landscapes and Natural Monuments (BLN).

[3] Pylons and substations in the vicinity of protected areas are not included. Each pylon and substation is only counted once.

[4] The area for routes and pylons was calculated based on average values. Due to the complexity of data collection in relation to substations, which are often shared with other partners and are less standardised, the area was not surveyed.

GRI 304-3

Measures and key figures

The Federal Act on the Protection of Nature and Cultural Heritage follows the zero-balance approach. This means that the ecological value after the intervention should be the same as before. Swissgrid consistently complies with the strict legal requirements for the conservation of biodiversity and implements measures in accordance with the principle of «avoidance – protection – restoration – replacement».

Measures in protected areas

Swissgrid consistently implements the measures for the protection and preservation of biodiversity defined in the approval processes for each grid project and complies with the relevant legal requirements. Examples of measures implemented in the main protection areas include:

Protected area	Measures
Measures in protected areas and preservation of livelihoods	• Choice of line corridors taking into account the consequences for biodiversity (see the box on data-based route planning with «Pathfinder»)
	• Placement of installation areas outside special protection zones, such as biotopes of national importance
	• Minimisation of impact areas
	• Protection of existing earthworks, (small) bodies of water (amphibian habitats), hedges, trees and other habitat structures (e.g. dry stone walls and cairns) by marking, blocking off or covering them during construction
	• Determination of construction times with consideration for hoofed game
Measures to protect forests	• Restoration of temporarily required forest areas
	• Real replacement or equivalent measures in favour of nature and landscape conservation
	• Additional alternative measures if clearing affects habitats in need of special protection
Measures to protect flora	• Use of excavator mats to protect vegetation
	• Protection of rare and protected plants around pylons via coordinated development and construction site planning (including information for all the parties involved)
	• Professional control of neophytes at pylon sites and substations (see: Control of invasive neophytes).
	• Green space maintenance concepts at substations

Measures to protect fauna	• Bird protection measures (see: What's all that chirping?) ◦ Routing to bypass highly sensitive areas (e.g. water and migratory bird reserves) ◦ Line markings to reduce the risk of collision ◦ Avoidance of disturbance by carrying out work outside breeding and setting phases ◦ Partnership with external initiators to install nesting boxes for particularly endangered bird species (e.g. jackdaws or kestrels) • Minimisation of impact areas, in particular reptile priority areas • Creation of small structures in substations (piles of stones, deadwood, etc.) • Creation of new homes for cavity-nesting birds in suitable locations • Adaptation of the mowing frequency at substations • Promotion of structures at substations made of piles of sand and stones to protect species such as wild bees (see: Wild bees under tension)

Route management measures
Route management on existing lines currently includes keeping down the trees under the lines, as regulated in the easements with the landowners, recorded in servitude agreements or ordered during the planning approval procedure. Vegetation does not need to be kept down under all lines, as many of them do not touch or span forest areas.

Swissgrid's internal foresters plan this work along the lines. This ensures that the lines can be operated safely at all times. The vegetation management carried out by Swissgrid's foresters is not only important for security of supply, but can also create ecological added value by encouraging greater biodiversity. One example of this is a Swissgrid pilot project in which the management of the extra-high-voltage line was adapted to keep down vegetation in an area where the Alpine longhorn beetle has found a suitable habitat in deadwood (see: «New life in deadwood»).

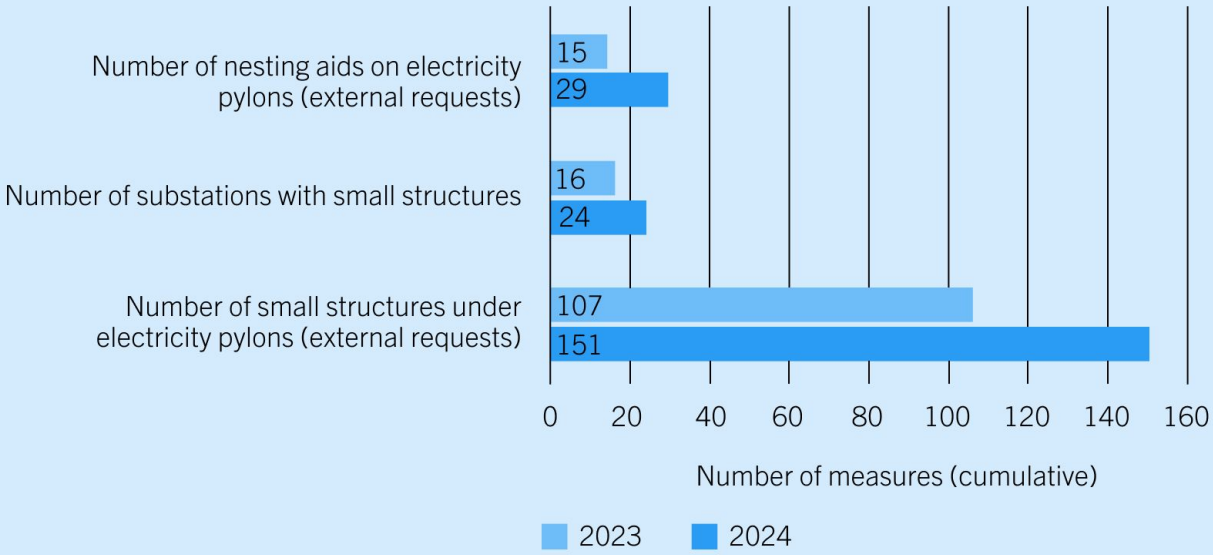
Cooperation with external partners
Swissgrid works with external partner organisations to protect, maintain and enhance the ecological infrastructure in Switzerland, above and beyond regulatory and official measures. The installation of small structures under pylons is an example of this cooperation work. Piles of branches and stones or small ponds are used to create habitats for amphibians, reptiles, insects or other anthropods and small mammals. Swissgrid assists the nature conservation organisations that supervise these projects by providing the necessary geodata and specifying the conditions that must be met to ensure the safety of the lines.

To date, a total of 151 small structures have been built under electricity pylons thanks to partnerships of this kind. Nesting aids have also been installed on 29 pylons. The number of enquiries from nature conservation organisations has steadily increased in recent years. The figure for the installation of small structures under electricity pylons rose by 41% in 2024 in relation to the previous year.

Key figures on biodiversity
Environmental protection measures that also focus on the preservation of biodiversity are defined in the approval process. The means of monitoring the effectiveness of measures is explained in the «Environmental protection» section. Swissgrid strictly complies with the legal requirements in order to maintain the natural value of biodiversity in accordance with the overarching net-zero target. However, the effectiveness of measures is not analysed in detail by measuring species diversity or other biodiversity aspects. The following

diagram and key figures provide an overview of selected biodiversity measures that are being implemented along Swissgrid's grid infrastructure.

Overview of selected biodiversity measures along the grid infrastructure



Circular economy

The circular economy is becoming increasingly important as a key concept for a resource-conserving and sustainable economy. This concept plays a major role for Swissgrid, as the construction, operation and maintenance of its infrastructure is associated with a high material input. The application of the circular economy approach along the value chain of its systems enables Swissgrid to utilise valuable resources efficiently and to reduce the environmental footprint over the life cycle of its infrastructure.

GRI 3-3

Ambition and goals

Swissgrid is committed to making responsible use of natural resources. To this end, it integrates the principles of the circular economy along the value chain in order to optimise resource efficiency, promote the reuse and recycling of materials, and reduce waste.

GRI 3-3, 306-1

Management approach

Identified impacts and risks

Swissgrid determines and assesses the impact of its business activities in relation to the circular economy as part of the dual materiality analysis and the environmental impact analysis (see the «Environmental protection» section). The main impacts occur along the value chain of grid projects. The planning and design phase in particular has a major influence on the type and quantity of materials, raw materials and auxiliary materials used. This affects both the environmental footprint of the grid components procured by Swissgrid and the extent of the potential environmental and social risks in the upstream value chain, particularly with regard to primary raw materials (see the «Sustainable supply chain» section). The waste-related impacts caused by dismantling systems dominate the end of the life cycle of Swissgrid's plants. In this respect, the proper handling and disposal of hazardous waste is a key concern for Swissgrid, for instance to avoid potential contamination of soil and water.

Procedure in the planning phase

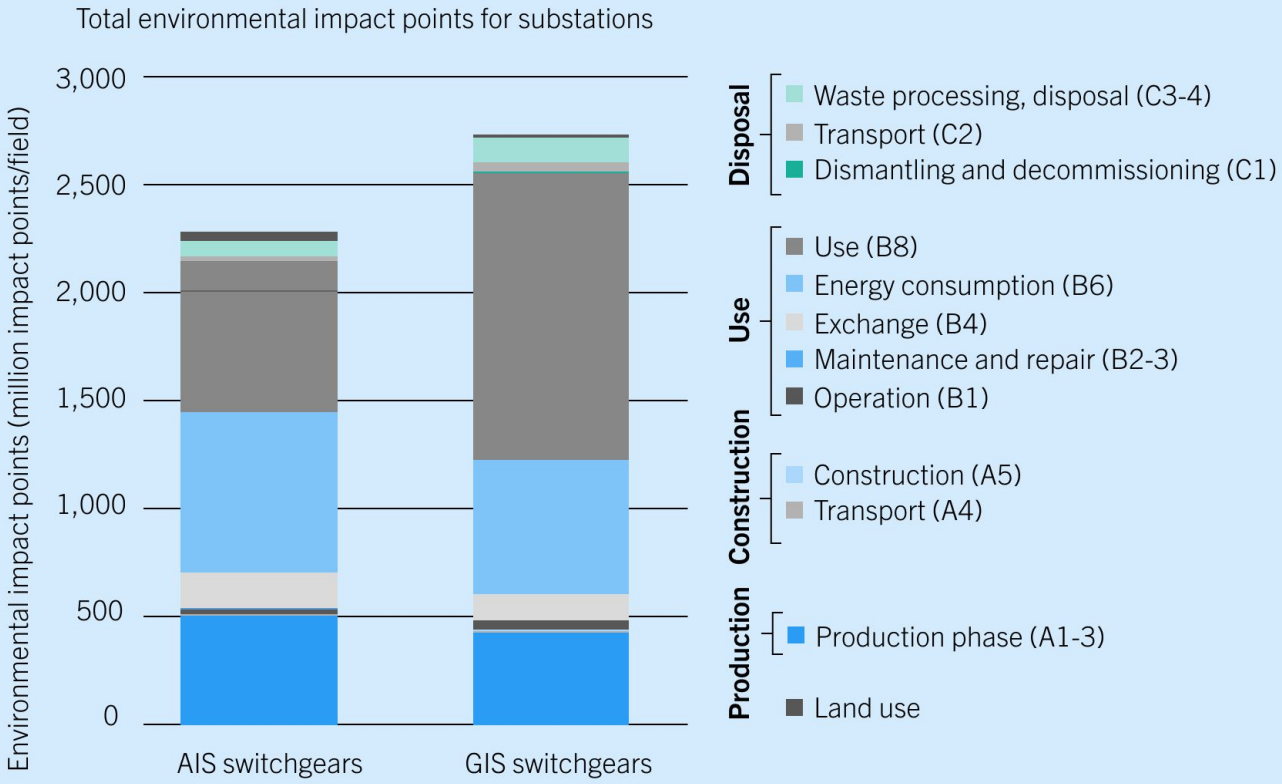
Swissgrid uses various management approaches as early as the planning phase in order to promote and optimise the use of resources in support of the circular economy.

NOVA principle: Swissgrid pays attention to resource conservation and minimal environmental impact during grid planning. Swissgrid always applies the NOVA principle for this purpose. The NOVA principle stands for grid optimisation before grid enhancement before grid expansion. It aims to minimise the impacts of grid expansion on the environment and the landscape. If more efficient grid operations (e.g. topological measures, redispatching or use of flexibilities) are not sufficient to control the congestion identified, grid optimisation is carried out first and, if this is not effective, grid enhancement is used (e.g. more powerful conductors, higher voltage). The last option envisaged is material-intensive grid expansion (new route). Permanently unnecessary lines are dismantled wherever possible.

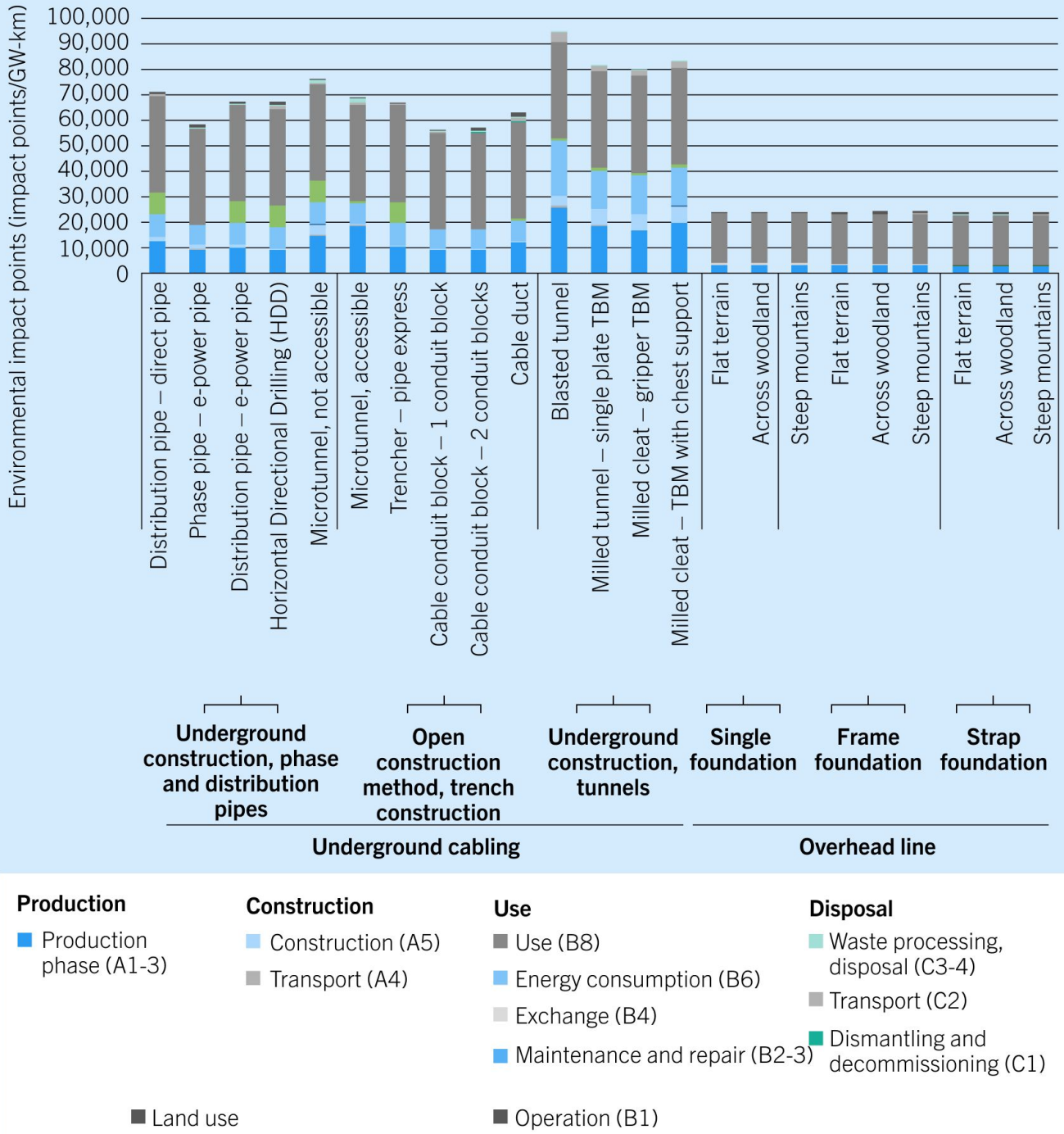
Life cycle assessments: if grid expansion is necessary, Swissgrid examines various options, taking into account the results of life cycle assessments. This means that Swissgrid analyses the environmental impact of key systems or individual system components over their entire life cycle and compares various alternatives. After analysing the environmental impact of transmission technologies in the previous year, Swissgrid prepared a life cycle assessment of substations in the 2024 financial year to evaluate the environmental aspects of air-insulated switchgears (AIS) and gas-insulated switchgears (GIS), among other things. The

results of life cycle assessments of this kind are incorporated into the decision-making process during the planning phase. The following illustrations of the results for switchgears and transmission lines show that, with the technologies currently available for extra-high-voltage systems, the environmental footprint is particularly important in the manufacturing phase and during utilisation. Assuming that, in the future, only alternative gases will be used for insulating and that the proportion of renewable energies in the electricity mix increases steadily at the same time, the production phase will become dominant in terms of the environmental impact of substations.

Results of ecological balance for switchgears (environmental impact points)



Results of ecological balance for lines and cables (380 kV)



Procedure in the procurement phase

As part of the procurement process, Swissgrid applies technical requirements/specifications and criteria to maximise the service life of the products and materials used and reduce the need for resource-intensive repairs and alternative measures. As part of a partnership with other transmission system operators, Swissgrid developed approaches to promote the circular economy in the procurement of key grid components in the 2024 financial year. The aim is to harmonise and raise the expectations of suppliers with regard to the environmental footprint of grid components and to strengthen the effectiveness of procedures

by adopting a coordinated approach.

Procedure when dealing with contaminated sites and waste

Swissgrid consistently implements legal requirements relating to contaminated sites and waste and puts them into practice by means of internal directives, manuals and operating instructions. The environmental impact assessment estimates the amount of construction waste such as excavated material, road debris and demolished concrete that will be produced by grid projects and defines methods for its further processing or disposal. Metals and materials such as ceramics are processed and remain in circulation. Around two thirds of demolished concrete is recycled in Switzerland, the rest is sent to landfill. Excavated material is reused on site or stored temporarily and utilised in other regional, mostly external projects. Contaminated materials are professionally disposed of and documented by the relevant service providers or specialised companies.

Swissgrid maintains a register of contaminated sites and pollutants for the professional handling of hazardous substances and contaminated sites. Excavated materials from contaminated sites and transformer oil represent significant volumes. Around 90% of transformer oil is recycled by external service providers. Problematic contaminated sites are cleaned up on an ongoing basis, at the latest when renovation work is carried out. For example, heavy metal contamination in the soil around pylon sites is treated during dismantling or disposed of and professionally replaced by a certified service provider.

Waste from sites and bases, mainly from office operations, is disposed of separately. An external facility management company takes care of professional disposal, which involves disposing of non-recyclable municipal waste in waste incineration plants with energy recovery.

GRI 301-1, 301-2, 306-2, 306-3, 306-4, 306-5

Measures and key figures

Application of the NOVA principle with innovative technologies

Swissgrid is examining the use of new technologies in order to reduce material consumption, meet the increased legal requirements and fulfil the growing demand for electricity. In the 2024 financial year, Swissgrid completed the test for the use of High Temperature Low Sag (HTLS) cables. Thanks to their characteristics, HTLS cables can help to optimise the grid in accordance with the NOVA principle and avoid more material-intensive enhancement or expansion work. The carbon-core conductors have a high current-carrying capacity, are lightweight and can therefore be installed with greater ground clearance and less impact on the pylons. This means that pylons can be made smaller and shorter, using less material. In renovation projects, HTLS cables can also help to reduce the need to replace pylons. Following the completion of the preliminary project investigation, Swissgrid is working on the specific application of HTLS technology in the current financial year.

Materials used in the 2024 financial year

In the 2024 financial year, Swissgrid prepared a comprehensive material flow analysis to assess the material turnover along its value chain. The material inputs and outputs of all ongoing grid projects, including dismantling, were taken into account. Material flows in other areas such as buildings, administration and mobility are of secondary importance. In total, Swissgrid installed around 117,000 tonnes of material in the 2024 financial year. The three most important materials were concrete (72%), gravel (22%) and steel (5%).

Materials used in 2024 (in tonnes)	2024*
Non-renewable materials	**117,094**
Normal/stainless steel	6,076

Materials used in 2024 (in tonnes)	2024*
Non-ferrous metals (Al, Cu, Zn)	561
Concrete	83,878
Gravel, aggregates	25,365
Asphalt, tar	596
Porcelain, glass	52
Thermoplastics, polymers, thermosetting plastics, elastomers and plastic packaging	133
Paint, protection against corrosion	21
Transformer oil/insulating oil	402
SF6 gas	3
Other materials	7
Renewable materials	**104**
Wood, paper, cardboard	104
Total weight of renewable and non-renewable materials	**117,198**

* Due to a change in methodology and enhancement of the material flow analysis compared to previous years, the values for previous years are not listed because they would not be comparable. For projects lasting longer than one year, the proportion for the 2024 financial year was calculated in relation to the project duration.

Based on the material flow analysis and average values for the market-compliant proportion of recycling of the materials used, the percentage of recycled raw materials/recyclable materials/metals used to manufacture Swissgrid's most important products and services is around 28%.

Procurement criteria used in the 2024 financial year

In the 2024 financial year, Swissgrid used various criteria to promote the circular economy, resource optimisation and sustainable waste management. For example, it demanded proof of the sustainable disposal and/or reuse and recycling of components, recyclable materials and/or construction waste during planning and dismantling work; (capitalised) transport optimisation for the delivery and/or acceptance of selected grid components; the availability of a life cycle assessment in accordance with ISO 14044:2006 or ISO 14040:2006 for the components offered (e.g. circuit breakers, transformers, disconnectors/earth electrodes, SAS); and requirements for the service life of components.

Composition of waste in the 2024 financial year

Based on the material flow analysis, Swissgrid compiled key figures on the waste generated from grid projects. With regard to materiality, regular municipal waste from office operations was not taken into account. In total, Swissgrid produced around 75,000 tonnes of waste from grid projects in the 2024 financial year, 42% of which was disposed of and 58% of which was reused or recycled. The most important waste categories are excavation (78%), building rubble/road debris (19%) and metals and ceramics (3%).

Composition of waste from grid projects in 2024* (in tonnes)	Total waste	Reuse/recycling	Disposal
Excavated material	58,123	32,192	25,931
Building rubble/road and track debris	13,821	8,677	5,144
Metals and ceramics	2,319	2,273	46
Plastics	48	0	48
Wood, cardboard and paper	87	0	87
Solids containing toxic substances and water-polluting liquids	163	148	17
Gases (SF6 etc.)	1	1	0
Total	**74,563**	**43,289**	**31,274**

* Due to a change in methodology and enhancement of the material flow analysis, the values for previous years are not listed because they would not be comparable.

Of approximately 43,000 tonnes of waste diverted from disposal, 16% is processed for reuse and 84% is recycled.

Total weight (tonnes) and category of reprocessed or recycled waste in 2024*

Category	Hazardous waste	Non-hazardous waste
Processing for reuse[1]	0	7,014
Recycling[1]	147	36,129
Total	**147**	**43,143**

* Due to a change in methodology and enhancement of the material flow analysis, the values for previous years are not listed because they would not be comparable.

[1] Reuse and recycling of all waste take place outside Swissgrid's sites and plants.

Of approximately 31,000 tonnes of waste sent for disposal, around 99.5% was sent to landfill, 0.4% was incinerated with energy recovery and 0.1% was disposed of using other processes.

Total weight (tonnes) and category of waste disposed of in 2024*

Category	Hazardous waste	Non-hazardous waste
Incineration (with energy recovery)[1]	0	135
Landfill[1]	0	31,122
Other disposal methods[1]	17	0

Category	Hazardous waste	Non-hazardous waste
Total	**17**	**31,257**

* Due to a change in methodology and enhancement of the material flow analysis, the values for previous years are not listed because they would not be comparable.

[1] All waste is disposed of outside Swissgrid's sites and plants.