Planet

Swissgrid is making a significant contribution to the energy transition and is helping to decarbonise the Swiss economy. At the same time, the operation and expansion of the Swiss grid infrastructure have an impact on the environment. To avoid or minimise any negative effects, the company is particularly committed to the areas of «Climate protection» and «Environmental protection, biodiversity and circular economy».

Climate protection

Vision and goals

As the link between production and consumption and as key players in the energy system, transmission system operators make an important contribution to tackling climate change. Swissgrid considers climate protection to be part of its social mission. The company fulfils its responsibility by operating and expanding a secure, resilient and climate-friendly grid infrastructure (see chapter «2027 Strategy»). Swissgrid is paving the way for the transformation of the energy system in line with Switzerland's Energy Strategy 2050. Swissgrid is also committed to Switzerland's net-zero target and is reducing its emissions along its own value chain in line with the national reduction pathway. To this end, an implementation plan with specific reduction targets will be drawn up in 2024.

Management approach

Climate change has a significant impact on the supply of electricity and affects the entire value chain by

exerting direct and indirect effects on the availability, production, distribution and consumption of electricity. As part of this value chain, Swissgrid believes that it is important to prepare for the risks and opportunities of climate change. This will ensure that the company can continue to contribute to a secure, efficient and sustainable supply of electricity in the future.

The responsibilities and processes involved in the management of climate-related risks and opportunities are governed by Swissgrid's corporate governance structure (see chapter «Sustainability at Swissgrid»). The procedure and responsibilities for identifying, assessing and managing significant climate risks are part of Swissgrid's Enterprise Risk Management (ERM) system (see chapter «Risk assessment»).

GRI 201-2

Opportunities and risks of climate change

Opportunities are arising for Swissgrid as a result of climate change due to its role as a key driver of the energy transition in Switzerland (see chapter «Mission»). The company is also making an essential contribution to the decarbonisation of the Swiss economy. A detailed analysis of the transformation of the energy system and the associated opportunities and challenges for Swissgrid's mandate was carried out as part of Strategy 2027.

In addition, Swissgrid updated the assessment of climate risks in 2023 and summarised these risks based on the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

Overview of the risks of climate change for Swissgrid

		Risk	Classification[1]	Potential operational impact	Potential financial impact[2]	Time frame[3]	Measures
Physical climate risks	Acute	Increase in extreme weather events (e.g. storms, floods)	High	Damage to infrastructure with a potential impact on security of supply due to unexpected power outages	Moderate: additional costs due to repairs, reinforcements, relocations and/or maintenance work	K/M/L	• Regular hazard assessment by means of updated hazard maps • Established processes in the area of business continuity management (see chapter «Mission») • Monitoring of lines, partly by collecting weather data, and its impact on the infrastructure
	Chronic	Thawing of the permafrost		Impact on the stability of the 33 pylons located in permafrost areas			• Targeted monitoring of pylon stability due to changes in permafrost soils • Inclusion of risk in new planning
		Rise in forest fires due to increasing dry weather		Threat to infrastructure from forest fires			• Vegetation management (see chapter «Environmental protection, biodiversity and circular economy») • Specific use of operating facilities with increased fire resistance requirements
		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)
		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

Transition risks	Political and legal	Lengthy procedures for the approval of grid projects	High	Slow expansion and modernisation of the grid with potential delays in the integration of renewable energy resources Economic and social impact of delays and potential impact on Swissgrid's reputation	Moderate: additional operational and legal expenses and costs due to delays	K/M/L	• Transparent information and involvement of affected population groups as part of stakeholder engagement (see chapter «Stakeholder engagement») • Commitment to more efficient approval processes to speed up grid renewal and expansion
		Uncertain legal basis for the chargeability of Swissgrid's emission reduction measures	Moderate	Impact on Swissgrid's emissions reduction pathway with reputational and compliance risks	Moderate: lack of tariff reimbursement	K/M	• Regular dialogue with the regulatory authority, Swissgrid shareholders and stakeholders • Examination of specific options as part of CSER strategy development
		New regulatory requirements for the use of SF6	Moderate	Impact on the planning and maintenance of operating facilities with SF6, including risks in terms of system availability, cost increases and time horizons	Moderate due to higher procurement costs	K/M/L	• Measures to reduce SF6 emissions (see chapter «Emission reduction measures and effectiveness»)
	Technological	Increasingly volatile electricity generation due to the growing proportion of renewable energies	Medium to high	More demanding planning and greater vulnerability / higher risks for grid stability	Medium to high	M/L	• Measures as part of «Grid transfer capacity» (see chapter «2027 Strategy») • 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 bases (e.g. via mathematical algorithms) • Closer cooperation and coordination with grid operators in Europe and Switzerland
	Market and reputation	Stricter requirements for sustainability reporting and target setting, including in climate protection	Low	Further development of the standards for sustainability reporting (Swiss, EU and ESG rating agencies) with a different focus in some cases; this increases the requirements for Swissgrid's data and information management and harbours reputational and compliance risks	Moderate due to effects on capital procurement and Swissgrid's operating expenses	K/M	• Optimisation of data collection processes for 2023 and 2024 • External and internal «health checks» on the maturity of non-financial reporting (2023 and 2024) • Development of an internal control system for non-financial reporting • Exchange of experience and cooperation with industry partners and affected companies

[1] Risk classification according to ERM results from the assessment of the probability of occurrence and the potential damage for Swissgrid. If a risk cannot be supported by the company (taking into account risk appetite and risk tolerance), it must be minimised, passed on or avoided.

[2] The extent of damage comprises different aspects depending on the assessment dimension. The financial impact is spread over seven categories (from CHF 5 million to over CHF 800 million) and has been consolidated for the Sustainability Report into the categories «Low» (CHF 5 – 100 million), «Medium» (CHF 100 – 400 million) and «High» (over CHF 400 million).

[3] The timeframe includes K – short-term risks (until 2025), M – medium-term risks (2030) and L – long-term risks (2040). If a risk spans several time horizons, they are recognised accordingly (e.g. K/M/L indicates a risk with a short, medium and long-term dimension).

Inclusion in strategic, financial and operational planning

Swissgrid takes the risks and opportunities of climate change that have been identified into account in its strategic, financial and operational planning from a short, medium and long-term perspective. Relevant climate scenarios are also included indirectly.

- **Strategy 2027 – Energy Strategy 2050 as a driver:** Swissgrid launched its Strategy 2027 at the beginning of the reporting year. A strategic need for action arises in particular from the Energy Strategy 2050, which is geared towards Switzerland's climate targets. The «Grid Transfer Capacity» priority addresses climate-related transition risks with regard to the expected expansion of renewable energy resources. Physical climate risks are included in the «Security of Supply» priority (see chapter «2027 Strategy»). The climate risks identified are based on the Swiss hazard maps and climate scenarios, which take into account two emission scenarios of the Intergovernmental Panel on Climate Change (IPCC) with and without climate protection measures (RCP2.6 and RCP8.5). Forecasts include an increase in extreme weather events and a rise in heatwaves for Switzerland.
- **The grid infrastructure of the future – the Strategic Grid 2040:** Swissgrid has started to develop the Strategic Grid 2040 in line with the Swiss Energy and Climate Strategy 2050. The results of this periodic planning for several years are based on the scenario framework for Switzerland defined by the Swiss Federal Office of Energy, which contains national target values for 2030 and 2040 for each

electricity generation technology and consumer group. All scenarios stipulate climate neutrality in Switzerland by 2050. The energy industry guidelines take into account factors including climate-relevant forecasts from the International Energy Agency's (IEA) «Sustainable Development» scenario.

- **Climate-relevant corporate objectives for 2023 – with an impact on variable remuneration:** Some of the corporate objectives for 2023 are specifically related to climate protection and have an impact on the amount of variable remuneration paid to the Executive Board and senior and specialist managers. They include optimising the processes for recording greenhouse gas emissions and developing sourcing strategies that take CO_2 reduction into account.
- **Investments and project applications – factoring in the impact on the climate and the environment:** Since 2023, the positive and/or negative effects on the climate and the environment have been weighed up when submitting proposals to the Executive Board and the Board of Directors. This applies, for example, to investments, projects and operational implementation strategies.
- **Research and digitalisation – exploiting synergies between innovation, efficiency and climate:** The risks and opportunities of climate change are important drivers for innovative digitalisation projects. These include selected pilot projects, such as the targeted use of Internet-of-Things sensors to monitor the stability of pylons taking into account climatic effects as well as forecasting of the production from photovoltaics to support system operation and dynamic line rating (see chapter «2027 Strategy»).
- **Climate training – raising awareness and involving employees:** In 2023, the company held a series of climate workshops to teach the majority of employees the scientific principles of climate change. The participants in these internal training courses developed a number of solutions for climate protection, which will be included in Swissgrid's updated climate strategy in the 2024 reporting year.

GRI 305-2

Swissgrid's greenhouse gas footprint: approach, causes, measures and impact

Approach to data collection

Swissgrid has set itself the goal of recording and continuously reducing greenhouse gas emissions along the value chain. Greenhouse gas emissions in the Scope 1 (direct emissions) and Scope 2 (indirect emissions) categories have been recorded annually since 2018 in accordance with the Greenhouse Gas (GHG) Protocol. Scope 2 emissions are determined using the «location-based» approach.

Consequently, the average emission factor of consumers in Switzerland is used to calculate greenhouse gas emissions in terms of active power losses and electricity consumption. Scope 3 primarily includes business travel and emissions from the production and transport of purchased combustibles and fuels. As set out in the corporate objectives for 2023, the data processes for recording Scope 1 and 2 emissions were reviewed and optimised in order to improve the quality, comparability and traceability of the data. For this reason, methodological changes have been made to data collection[1] for the years 2022 and 2023. To ensure data comparability, only the CO_2 emissions for these two years are shown in this report.

[1] Methodological changes have been made to extrapolations of emissions, for example, and the values

of emission factors and the global warming potential used for SF6 have been updated.

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

Swissgrid's greenhouse gas footprint

In 2023, Swissgrid emitted 123,297 tonnes of CO_2equivalents (CO_2e) in Scope 1 and 2 emissions whilst fulfilling its legal mandate. Active power losses recorded as indirect greenhouse gas emissions accounted for over 95% of aggregated Scope 1 and 2 emissions, followed by direct emissions caused by SF6 losses (2.1%). Compared to the previous year, Swissgrid reduced its aggregated Scope 1 and 2 emissions by around 7.3%, driven by lower active power losses and a reduction in SF6 losses.

Greenhouse gas emissions in tonnes of CO_2e	2023	2022	% Scope 1 and 2 (2023)	% change
Total Scope 1 and 2	123,297	132,963		–7.3
Scope 1 (direct emissions)[1]	3,014	4,025	2.4	–25.1
SF6 losses[2]	2,643	3,688	2.1	–28.3
Fuel consumption of Swissgrid vehicle fleet (diesel/petrol)[3]	335	317	0.3	5.7
Fuel consumption of emergency power systems (diesel)[3]	36	20	0	78
Scope 2 (indirect emissions)[1]	120,283	128,938	97.6	–6.7
Active power losses from energy transmission[4]	117,681	126,317	95.4	–6.8
Electricity consumption of substations[4, 5]	1,939	1,939	1.6	0
Electricity consumption of locations, bases and data centres[4]	502	486	0.4	3.3
Electricity consumption of the Swissgrid communication network[4,6]	15	15	0	0
Electricity consumption of the Swissgrid vehicle fleet[4]	0	n/a	0	n/a
District heating of locations and bases[7,8]	77	79	0.1	–2.5
District cooling of locations and bases[7,9]	68	102	0.1	–32.8
Scope 3 (indirect emissions along the value chain)	413	364		13.5
Electricity consumption of the communication network (third parties)[4,6]	10	10		–3.6
Air travel[10]	163	133		22.1
Mobility utilisation (diesel/petrol/electricity)[3,4,11]	6	5		33
Rail travel[10]	12	10		17.8
Fuel used to power Swissgrid vehicle fleet and emergency power systems[11]	178	162		9.7
Business trips by private car[10]	45	44		2.5

Greenhouse gas emissions in tonnes of CO_2e	2023	2022	% Scope 1 and 2 (2023)	% change
Total scope 1, 2 and 3	123,710	133,327		-7.2

[1] Emissions are consolidated on the basis of 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 FOEN (2023): CO2 emission factors of the Swiss greenhouse gas inventory.

[4] Emission factor according to treeze (2021): 2018 Swiss consumer electricity mix.

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

[6] Electricity consumption is determined for each location by means of a power calculation, taking into account the number and type of appliances.

[7] Emission factor according to treeze (2017): greenhouse gas emissions of the Swiss electricity and district heating mix according to the GHG Protocol.

[8] Based on measurements for Aarau and supplemented by extrapolations for other locations, taking into account the size and average heating requirements for offices in Switzerland according to the Applied Energy Journal [2021], Volume 288.

[9] Based on measurements for Aarau; for the other locations, the cooling requirements are covered and reported via electricity consumption.

[10] Emission factors according to Mobitool 3.0.

[11] Emission factors according to ecoinvent v 3.9.1.
N.B.: Additional information on the calculation methodology, factors and sources can be found in the GRI Index (GRI 305).

Swissgrid's emission intensity decreased by 6.9% for Scope 1 and 2 emissions to 1.66 kg CO2e/ MWh in 2023. This is due to the 7.3% reduction in Scope 1 and 2 emissions, with only a slight reduction of 0.4% in the volume of electricity transported compared to the previous year.

Emission intensity	2023	2022
Scope 1 and 2 emissions in relation to the volume of electricity transported (kg CO_2e/MWh)	1.66	1.79
Scope 1, 2 and 3 emissions in relation to the volume of electricity transported (kg CO_2e/MWh)	1.67	1.79

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

Emission reduction measures and effectiveness

SF6 emissions (Scope 1)

The most important source of Scope 1 greenhouse gas emissions, responsible for 87.7% of Scope 1 or 2.1% of aggregated Scope 1 and 2 emissions are SF6 losses. SF6 is a highly insulating gas that is used by Swissgrid in switchgears in the extra-high-voltage range. There are currently no proven alternatives available for applications at 220 kV and above. SF6 is considered the strongest greenhouse gas, with a

global warming potential of 23,500. Despite protective measures, the risk of SF6 escaping cannot be completely ruled out. Natural leaks in small quantities can occur due to sealing technology and gas handling.

Emission reduction measures

Swissgrid applies the following measures to reduce CO2 emissions in connection with SF6

- Swissgrid permanently monitors gas rooms for possible leaks.
- Swissgrid provides clear guidelines and training to personnel responsible for handling SF6 gas.
- Swissgrid is a member of the SF6 industry solution with the aim of limiting aggregated SF6 emissions from the manufacture and operation of high and medium-voltage installations to less than one tonne per year. Based on the volume of SF6 installed, this corresponds to a theoretical loss rate of 0.13% for Swissgrid.
- Swissgrid and other European transmission system operators have formed a working group on the introduction of alternative insulating gases. The aim is to push forward the implementation of SF6 alternatives in switchgears at the highest voltage level by 2030 by transferring knowledge gained in pilot projects.
- When appliances and systems are decommissioned, the SF6 gas is either recycled in an environmentally friendly manner or disposed of, depending on gas quality.
- Where possible and in line with the state of the art, Swissgrid opts for SF6-free applications when procuring new devices and systems or replacing existing installations.

Effectiveness of measures: Swissgrid checks the effectiveness of measures by collecting SF6 data from the substations on an annual basis. The company emitted a total of 112 kg of SF6 in 2023, which corresponds to a loss rate of 0.05%. This represents a slight reduction compared to the previous year, which puts Swissgrid well below the requirements of the SF6 industry solution.

SF6 key figures for Swissgrid	2023	2022
Total amount of SF6 (kg)	231,100	230,900
SF6 losses (kg)	112	157
SF6 loss rate (%)	0.05	0.07
Greenhouse gas emissions due to SF6 losses in relation to the volume of electricity transported (kg CO_2e/MWh)	0.04	0.05

Active power losses (Scope 2)

Active power losses amounted to 919.4 GWh or 117,681 tonnes of CO_2e in 2023. Active power losses are the largest driver of Swissgrid's aggregated Scope 1 and 2 emissions, representing 95.4% of the

total. Active power losses occur during power transmission due to the electrical resistance of the lines and losses in the transformers.

The extent of the losses is heavily dependent on various external factors such as the grid topology, the voltage and the intensity of current. The volume of energy transported and the distance travelled also play an important role. Based on the «location-based approach» for calculating Scope 2 emissions, the greenhouse gas emissions associated with active power losses depend on the available consumer electricity mix in Switzerland.

Emission reduction measures

Swissgrid applies the following measures to reduce CO2 emissions in connection with active power losses

- Swissgrid is investing in efficiency improvements for grid modernisation, which (all things being equal) also favour a reduction in active power losses; this involves taking into account the quantity and costs of active power losses in grid expansion planning and integrating efficiency criteria into the procurement of transformers, conductors and devices for the remote control of grid systems (substation automation system).
- As part of its stakeholder dialogue, Swissgrid has undertaken to offset the costs of renewable energies (instead of grey energy) to compensate for active power losses in the future. Based on the applicable legal principles, Swissgrid is obliged to procure energy according to transparent, non-discriminatory and market-based procedures. At present, Swissgrid would not be able to offset the potential additional costs that would arise from the purchase of renewable energy to compensate for active power losses.

Effectiveness of measures: the effectiveness of measures is checked indirectly by the daily recording of active power losses. This is only done indirectly because key aspects relating to greenhouse gas emissions from 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. At 1.24%, Swissgrid's electric system losses are already relatively low by international and European standards (IEA: Electricity Grids and Secure Energy Transitions).

Given the fundamental changes in electricity demand, it is currently difficult to estimate how the energy transition will affect electric system losses. However, the faster the decarbonisation of electricity generation is completed, the fewer CO_2 emissions will be caused by Swissgrid's active power losses. This emphasises the importance of Swissgrid's strategic focus on the needs-based expansion of the transmission system with regard to the integration of renewable energy resources.

Active power losses at Swissgrid	2023	2022
Active power losses (MWh)	919,385	986,855
Active power losses (%)	1.24	1.33
Greenhouse gas emissions from active power losses in relation to the volume of electricity transported (kg CO_2e/MWh)	1.59	1.7

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

Energy and electricity consumption

Swissgrid's energy consumption is responsible for around 97.9% of aggregated Scope 1 and 2 emissions. Excluding active power losses, the proportion is 53.6%. Energy consumption includes electricity consumption in substations and locations, fuel consumption by the Swissgrid vehicle fleet, and district heating and cooling at various locations.

Swissgrid covers more than 99% of its energy losses and energy requirements with electricity. This means that active power losses are responsible for over 97% of energy consumption within the company, followed by electricity consumption in the 125 substations.

Consumption of electricity in MWh	2023	2022	% consumption within Swissgrid (2023)	% change (2022 – 2023)
Total consumption of electricity within the organisation	940,818	1,008,226		–6.69
Total fuel consumption within the organisation from non-renewable resources	1,387	1,260	0.15	10.05
Fuel consumption of Swissgrid vehicle fleet, diesel[1]	1,212	1,137	0.13	6.62
Fuel consumption of Swissgrid vehicle fleet, petrol[2]	39	47	0	–16.55
Fuel consumption of emergency power systems (diesel)[1]	135	76	0.01	78.02
Total fuel consumption within the organisation from renewable resources	0	0	0	0
Total electricity consumption within the organisation	938,588	1,005,918	99.76	–6.69
Active power losses from energy transmission	919,385	986,855	97.72	–6.84
Electricity consumption of substations[3]	15,148	15,148	1.61	0
Electricity consumption of locations, bases and data centres	3,924	3,798	0.42	3.33
Electricity consumption of the Swissgrid communication network[6]	118	118	0.01	0
Electricity consumption of the Swissgrid vehicle fleet	13	n/a	0	n/a
Thermal energy consumption within the organisation	446	458	0.05	–2.53
District heating[4]	446	458	0.05	–2.53
Cooling energy consumption within the organisation	396	590	0.04	–32.84
District cooling[5]	396	590	0.04	–32.84
Total consumption of electricity outside the organisation	965	814		18.66

Consumption of electricity in MWh	2023	2022	% consumption within Swissgrid (2023)	% change (2022 – 2023)
Electricity consumption of the communication network (third parties)[6]	75	77		–3.63
Air travel[7]	508	412		23.34
Mobility utilisation (diesel/petrol/electricity)[1,2]	16	12		34.44
Journeys by private car[1,2,8]	151	151		0.58
Rail travel[9]	215	162		33.11

[1] Diesel conversion factor according to the EMPA energy density for Euro-5 standard diesel.

[2] Petrol conversion factor according to the EMPA energy density for Euro-5 standard petrol.

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

[4] Based on measurements for Aarau and supplemented by extrapolations for other locations, taking into account the size and average heating requirements for offices in Switzerland according to the Applied Energy Journal [2021], Volume 288.

[5] Based on measurements for Aarau; for the other locations, the cooling requirements are covered via electricity consumption.

[6] Electricity consumption is determined for each location by means of a power calculation, taking into account the number and type of appliances.

[7] Based on emission factors from Mobitool 3.0 and assumptions from treeze (2016): Life Cycle Inventories of Air Transport Services, and FOEN (2023): CO2 emission factors of the greenhouse gas inventory of Switzerland.

[8] Electricity consumption of electric vehicles according to Mobitool 3.0.

[9] Conversion factor from SBB emissions report for Swissgrid.
N.B.: additional information on the calculation methodology, factors and sources can be found in the GRI Index (GRI 302).

Emission reduction measures

Swissgrid is implementing the following measures to reduce the CO2 emissions of its energy and electricity consumption

- In order to reduce its own electricity consumption, Swissgrid set up a task force in the wake of the 2022/2023 energy crisis and implemented the following energy-saving measures: switching off power-operated non-operational display elements, removing or switching off permanent light sources, equipping lighting systems with LEDs, including at the Aarau and Prilly sites, requiring employees to switch off screens overnight, providing information on and adjusting ventilation, restricting ventilation operating times.
- Swissgrid uses hydropower from Switzerland to cover 100% of the electricity consumption of its sites and 16 substations that have access to the free market due to their electricity requirements.
- In order to reduce the energy consumption and greenhouse gas emissions of its vehicles, Swissgrid launched the procurement of a new vehicle fleet in 2023 with the aim of replacing 100% of passenger vehicles with electric models by 2025. Swissgrid already offers its employees electric charging stations in the car park at its main site, and is gradually expanding these facilities.
- In order to reduce its demand for cooling and thermal energy in buildings, Swissgrid has adjusted the building temperatures in winter and summer as part of its electricity-saving measures.
- Swissgrid endeavours to reduce the fuel consumption caused by business trips. In 2023, the company modified its regulations for business travel, which generally specify that public transport should be used, with certain exceptions for time reasons. For example, employees are encouraged to take the train for international business travel taking up to six hours.

Effectiveness of measures: Compared to 2022, Swissgrid's energy consumption has fallen by 6.67%. This reduction is due to the measures implemented, but also to external factors such as weather conditions or occupancy. The following additional key figures are relevant to the effectiveness of measures.

Swissgrid key energy figures	2023	2022	% change (2022 – 2023)
Total consumption of electricity (within and outside the organisation) (MWh)	941,783	1,009,040	–6.67
Electricity consumption within the organisation covered by guarantees of origin (%)	0.66	0.61	7.17
Extent of the reduction in consumption of electricity achieved as a direct result of energy savings and energy efficiency initiatives (MWh)[1]	59.23	n/a	n/a
Consumption of electricity within the organisation per volume of electricity transported (MWh consumed/MWh transported)[2]	0.0127	0.0135	–6.33
Electricity consumption of locations, bases and data centres per employee (MWh/employee)	4.6	5.16	–10.84
Number of electric vehicles	4	3	33.33

[1] This amount covers the reduction in electricity and heat consumption in 2023 compared to 2022 as a

direct result of energy-saving and energy-efficiency initiatives.

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

Environmental protection, biodiversity and circular economy

Vision and goals

The protection of the environment, the preservation of biodiversity and the considerate use of natural resources are part of Swissgrid's social responsibility and and these values represent an important part of its corporate culture. The company has set out its strategic goals in its environmental mission statement (see Swissgrid website):

- Swissgrid is committed to avoiding or at least minimising negative impacts on the environment.
- Swissgrid is committed to the responsible use of natural resources and the preservation of biodiversity and is constantly looking for ways to increase energy efficiency and optimise the use of raw materials.
- Swissgrid strives to continuously avoid or minimise greenhouse gases, waste, sewage, noise and other emissions.

Management approach to environmental protection

Swissgrid's business activities have both positive and negative impacts on the environment. As the national transmission system operator, the company enables the efficient and secure transport of electrical energy thanks to a well-developed and reliable grid infrastructure. Swissgrid therefore not only bears a specific responsibility for ensuring a reliable supply of electricity, but also helps to connect renewable energy resources with the consumer centres throughout Switzerland. However, the operation, modernisation and maintenance of this nationwide infrastructure have impacts on the landscape, flora and fauna, among other things.

Swissgrid has established a comprehensive environmental management system to address these effects. This system is certified in accordance with ISO 14001 and is part of the company-wide health, safety and environment management system (HSE management system) (see chapter «Occupational health and safety»). The environmental management system is based on the environmental relevance matrix drawn up by Swissgrid. This is designed to determine and assess the impact of the company's activities on the environment. Various criteria are taken into account, such as the significance of the environmental aspect for the company and the environmental hazard potential of individual activities. The matrix also considers the vulnerability of the local, regional and global environment.

In addition, Swissgrid carries out a risk assessment to identify and evaluate environmental risks and to develop suitable strategies and measures. The environment-based risk assessment is integrated into Swissgrid's Enterprise Risk Management System. The environmental relevance matrix and the environmental risk analysis are regularly updated, fields of action and measures are derived from them, and significant changes are reported as part of the HSE management review. Finally, as part of its HSE management system, Swissgrid carries out regular stakeholder analyses in order to determine and take into account the expectations and requirements of the stakeholder groups with regard to the environment.

At Swissgrid, potential and actual environmental risks and impacts include, in particular, disturbance

and damage to protected habitats, fauna and flora caused by installations and the associated work, the release of environmentally hazardous substances, and environmental damage resulting from 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 and concerns with the aim of either eliminating them or minimising them to an acceptable residual risk.

GRI 2-25, 3-3, 413-1, 413-2

Systematic inclusion of environmental protection in grid construction projects

The potential and actual impact of Swissgrid's business activities on the environment can be considerable, particularly in grid construction projects. Swissgrid systematically considers and minimises the environmental impact during the planning and implementation of lines and substations. Compliance with environmental protection laws and regulations is a matter of course for the company.

Compliance with environmental regulations is ensured during the federal approval process for grid construction projects. The process consists of several phases, in which the concerns of various stakeholder groups are taken into account (see chapter «Stakeholder engagement»). When carrying out major projects such as the installation of a new extra-high-voltage line, all phases must be complied with, whereas for smaller projects, relevant environmental protection measures are implemented based on the legal requirements.

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 study for the environmental impact assessment[1] takes into account the following effects: 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), perturbations, forests, flora, fauna and habitats, landscape and local blindness (incl. light emissions), cultural assets and archaeology.
Inclusion in the federal sectoral plan for transmission lines (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 monitoring 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. • Stakeholders can make their views known as part of a public consultation and participation procedure (in accordance with Art. 15ff 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 «Supply chain sustainability» 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

[1]The requirements are based on the Ordinance on Environmental Impact Assessments and the Environmental Impact Assessment Manual.

GRI 308-2

Environmental protection measures for grid construction projects

Measures to avoid, minimise and compensate for the environmental impact of grid construction projects are already defined as part of the approval process and are consistently implemented by Swissgrid. Ecological measures are taken during the actual construction phase and when maintaining and servicing the infrastructure. Examples of measures that have been adopted or that are already implemented for selected grid projects can be found on the Swissgrid website.

Principle of «prevention is better than cure»

Protective measures based on the principle of «prevention is better than cure» are a priority for Swissgrid, especially during the realisation phase. The aim of these preventive measures is to avoid negative interventions and impacts on the environment. Examples include covering green areas during corrosion protection work so that they are not affected by the construction activities, using protective equipment such as mobile collection pans or hoppers when working with environmentally hazardous substances, and compliance with strict regulations regarding the storage and use of machines and materials.

Implementation of restoration and alternative measures

If protection measures to prevent negative environmental impacts are not possible, restoration measures are taken. These measures are designed to remedy the temporary impact on the environment. If, for example, an access route is required for the realisation phase, the affected field must be restored to its original condition after construction. As a final option, Swissgrid implements alternative ecological measures – if protection or restoration measures are not possible – in order to maintain the region's overall environmental balance. An example of this could be the reforestation of a comparable area if Swissgrid has to permanently clear woodland under a new line.

Ecological measures in system operation

Ecological measures are also taken in system operation and maintenance and for the upkeep of areas affected by lines and substations. For example, Swissgrid implements ecological maintenance measures such as vegetation management, neophyte control and green space management in substations.

Effectiveness of measures: 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 are carried out by the cantonal authorities once the grid project has been completed. In the past reporting year, 357 HSE inspections were conducted by project employees and the health and safety team. In addition, Swissgrid has specific control measurements carried out in certain areas. Examples include measurements and calculations to check compliance with the emission limits for electromagnetic fields (see Swissgrid website) and noise, as well as soil measurements to determine pollution levels.

The effectiveness of measures is reflected partly by the fact that no significant judgements were brought against Swissgrid in 2023 for compliance violations in relation to environmental protection, and no significant monetary fines from previous judgements had to be paid.

Key figures on environmental protection	2023	2022
Significant[1] violations of environmental protection laws and ordinances (including monetary and non-monetary sanctions)	0	0
Fines paid or deferred for significant1 environmental violations committed in previous years	0	0
Number of HSE inspections carried out	357	368
Number of HSE inspections with potential deviations in relation to environmental protection with medium risk	0	7
Number of HSE inspections with potential deviations in relation to environmental protection with high risk	1[2]	0

[1] An amount of CHF 25,000 was defined as the materiality threshold for reporting.

[2] In 2023, this related to deficiencies with regard to adequate firefighting equipment on site. Corresponding corrective measures were agreed, documented and implemented.

GRI 2-25, 304-2

Biodiversity management approach

The construction and maintenance of lines and substations can have a significant impact on biodiversity. This impact is taken into account during the extensive federal approval process for grid projects («Systematic inclusion of environmental protection in grid construction projects»), and appropriate measures to protect biodiversity are defined. The overarching goal of the Federal Act on the Protection of Nature and Cultural Heritage is to achieve «zero balance». 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 applies the principle of «avoidance – protection – restoration – replacement».

The environmental risk analysis prepared by Swissgrid under its HSE management system identifies various potentially negative impacts, for example on forests, on flora and fauna at pylon sites, along line routes or above underground cables due to vegetation management. Keeping vegetation down can disturb the habitat of plants and animals, as can carrying out clearing work near lines that is necessary for their safe operation. Forest aisles can also favour the spread of invasive neophytes. The grid infrastructure also has an impact on fauna, particularly birds, mainly due to the risk of collision with lines.

GRI 304-1

Inventory of grid infrastructure in protected areas of national importance

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

A total of 3,729 pylons (31%) and 73 substations (58%) belonging to Swissgrid are located in at least one protected area of national importance.

Protected areas of national importance[1]	Pylons	Substations
Federal Inventory of Landscapes and Natural Monuments[2]	1,211	20
Moorlands	187	0
Floodplains	109	11
Raised and transitional bogs	5	0
Low-moor bogs	54	10
Amphibian spawning areas	112	17
Dry meadows and pastures	136	15
Emeralds	208	Not recognised

Protected areas of national importance[1]	Pylons	Substations
Hunting ban areas	346	Not recognised
Swiss parks	1,190	Not recognised
Water and migratory bird reserves	41	Not recognised
Biosphere reserves	78	Not recognised
Ramsar sites	52	Not recognised
Total in protected areas of national importance[3]	3,729	73
Percentage in protected areas of national importance[3]	31.3%	58.4%

[1] To determine the locations of pylons and substations in protected areas, approximately 12,000 pylon locations and 125 substations were cross-referenced with the GIS data for the protected areas from Swisstopo. The data shown includes pylons and substations within protected areas.

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

[3] Multiple counts are possible if protected areas overlap. Pylons and switchgears in the vicinity of protected areas are not included. Not all protected areas have been recorded yet for substations.

GRI 304-3

Measures for the conservation of biodiversity

Measures in the various protected zones

Swissgrid consistently implements the measures for the protection and conservation of biodiversity defined in the approval process for each grid project, and strictly complies with the relevant legal requirements. Examples in the main protected zones are:

Protected zone	Measures
Measures in protected areas and preservation of livelihoods	• Choice of line corridors taking into account the consequences for biodiversity
	• Placement of installation areas outside sensitive zones such as biotopes of national importance
	• Minimisation of impact areas
	• Protection of existing earthworks, (micro) water bodies (amphibian habitats), hedges, trees and other habitat structures (e.g. dry stone walls, 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 the clearing affects habitats in need of special protection
Measures to protect flora	• Use of elements such as 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 removal of neophytes (especially common ragwort and goldenrod) at pylon sites and substations. Currently, 31 substations are knowingly affected by invasive neophytes
	• Green space maintenance concepts at substations
Measures to protect fauna	• Bird protection measures, such as:
	• Routing to avoid highly sensitive areas (e.g. water and migratory bird reserves) and reduce the risk of collision
	• Ladder markings or bird brooms
	• Avoidance of disturbance by carrying out work outside breeding and setting phases
	• Partnership initiated by external parties to build 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. Protection of hollow trees, otherwise replacement by increasing the proportion of old wood/deadwood
	• Creation of new homes for cavity-nesting birds in suitable locations
	• Adaptation of the mowing frequency at substations
	• Protection or strengthening of structures at substations made of piles of sand and stones to protect species such as wild bees

Route management

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. This is not necessary under all lines, as many lines span forest areas. However, where this is not the case, the vegetation height must be kept low in wooded areas under lines. Six foresters at Swissgrid plan this work along the lines and have it carried out by specialist companies in the relevant region. This ensures that the lines can be operated safely at all times. However, the vegetation management carried out by the foresters is not only important for security of supply and line maintenance, but also creates ecological added value, for example by encouraging greater biodiversity.

Collaboration with external partners to preserve biodiversity

Swissgrid works with external partner organisations to protect, maintain and enhance the ecological infrastructure in Switzerland, above and beyond regulatory and official measures. Small structures under pylons are 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 assessing sites in association with external partners, providing the necessary geodata, and specifying the conditions that must be met to ensure the safety of the lines.

To date, a total of 107 small structures have been built under electricity pylons thanks to partnerships of this kind. Nesting aids have been installed on 15 pylons. Various small structures can be found between Uznach and Weesen, for example, where the Lebensraum Linthebene foundation has helped to create ponds and piles of branches below Swissgrid's overhead lines. Overall, the number of enquiries from nature conservation organisations has steadily increased in recent years.

Effectiveness of measures: Environmental protection measures that also focus on preserving biodiversity are defined during the approval process. The means of monitoring the effectiveness of measures is set out in the «Environmental protection measures for grid construction projects» section. Swissgrid strictly complies with the legal requirements in order to maintain, and in some cases even increase, 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 the biodiversity measures implemented along Swissgrid's grid infrastructure.

Biodiversity measures along the grid infrastructure

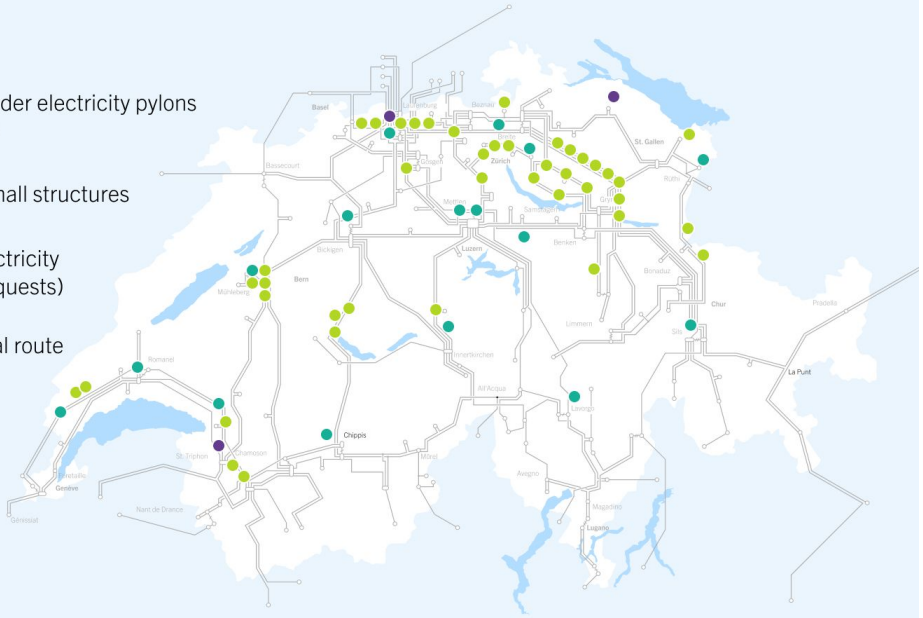
- **107** small structures under electricity pylons (external requests)
- **16** substations with small structures
- **15** nesting aids on electricity pylons (external requests)

500 metres of ecological route management

6,700 kilometres of lines

125 substations

12,000 pylons



Management approach to the circular economy and resource efficiency

As the operator of a nationwide infrastructure, Swissgrid pays particular attention to the optimisation and efficient use of resources along material cycles. The company prepared a material flow analysis for the years 2021 to 2023 in order to obtain information about its own material turnover. Large material flows at Swissgrid are primarily caused by grid projects. The materials used include concrete, steel, aluminium and various plastics for electrical insulation or mechanical protection. Concrete, excavated material and steel again top the list in terms of waste. Material flows in other areas such as buildings, administration, mobility, etc. are of secondary importance.

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

Measures for the circular economy and resource efficiency

Swissgrid uses various tools and measures in the planning, procurement and realisation phases of projects and when disposing of materials in order to promote and optimise the use of resources in the interests of a circular economy.

Life cycle assessment in the planning phase

ecological design aspects play an important role in grid planning. They are implemented according to the NOVA principle (see chapter «Systematic inclusion of environmental protection in grid construction projects»). The process therefore involves examining alternatives to material-intensive grid expansion. If grid expansion is necessary, several different options are evaluated. To this end, Swissgrid carries out a life cycle assessment, which means that the environmental impacts are analysed over the entire life cycle. One example is the comparison of underground cabling and overhead line technologies: a life cycle assessment carried out in 2023 concluded that the ecological impact of an overhead line (380 kV) is lower over the entire life cycle of the line than that of underground cabling. The use of materials also plays a particularly important role. An analysis carried out in 2023 to compare the use of reinforced concrete and recycled concrete is another example. The study concluded that the use of recycled concrete reduces the extraction of gravel and sand and the amount of material sent to landfill, but does not lead to a reduction in CO

Use of selected award criteria in procurement

As part of the procurement process, Swissgrid sets technical requirement criteria to maximise the service life of the products and materials used and to reduce the need for resource-intensive repairs and alternative measures. In 2023, Swissgrid also applied various award criteria to promote the circular economy, resource optimisation and energy efficiency. Some examples are listed below:

- In steel construction and building work: the use of regional and/or recyclable building materials (reinforcement, cable protection pipes); the use of resource-efficient installations and/or the optimisation of routes;
- For switchgears: compulsory life cycle assessment of the components offered (circuit breakers, transformers or disconnectors/earth electrodes) in accordance with ISO 14044.2006 or ISO 14040.2006;
- For transformers and conductors: capitalisation of energy losses; use of green energy in production processes.

Use of recycled materials in construction

According to the material analysis, concrete is one of the most frequently used materials at Swissgrid in terms of quantity, alongside steel. In order to examine the use of recycled concrete to promote the circular economy, Swissgrid analysed the properties of various concrete options and their use cases in 2023. Based on this analysis, Swissgrid has revised its standards for the use of reinforced concrete. The Swissgrid standards specify that recycled concrete can be used for lean concrete, for internal or weather-protected ceilings and walls in buildings, and for cable conduit blocks. For other applications, especially for concrete structures exposed to the weather, primary concrete is used to achieve high resistance and durability, and to fulfil the technical requirements. In total, 600 tonnes of recycled concrete were used for noise barriers when installing new transformers in the Mettlen substation, for instance. Swissgrid plans to use a further 839 tonnes of recycled concrete by 2026. This means that around 18% of the concrete required for the project will be recycled concrete.

Waste and recycling of materials

According to Swissgrid's material flow analysis, waste from construction projects tops the list of materials for disposal or further processing. This waste includes excavated material and steel in particular, and is already estimated as part of the Environmental Impact Assessment, which also defines measures for proper further processing or disposal. Most of the metals and other materials such as ceramics are recycled and therefore remain in the cycle as recyclable materials. Around two-thirds of the concrete, which is by far the largest material in terms of volume, can be recycled in Switzerland. The rest of the concrete is mixed with other material or is of inadequate quality for recycling and is sent to a landfill. The excavated material (27,399 m3) is reused on site or restored. Only a small proportion of the materials produced during dismantling are contaminated. They are disposed of and documented professionally by service providers or specialised companies in accordance with the concepts developed in the grid projects.

There are strict legal regulations on the handling of hazardous substances and contaminated sites, which are consistently implemented by Swissgrid. Swissgrid maintains a register of contaminated sites and pollutants. There are particularly high volumes of transformer oil, which is sent to specialised companies by the service providers and recycled there, depending on its quality. It can be assumed that the recycling rate is 90%. Problematic contaminated sites are continuously remediated – at the latest when a substation is due to be renovated. For example, increased heavy metal contamination is to be expected in the ground around pylons due to the weathering of the protective coating over the decades. If these pylons are dismantled, this material is treated or disposed of by a certified service provider.

There are only low quantities of waste at sites and bases, largely generated by office operations. This waste is separated into recyclable and other waste. An external facility management company is responsible for the professional disposal of all waste arising from the ongoing operation and maintenance of the technical systems at the bases and locations. In Switzerland, non-recyclable municipal waste is incinerated in waste incineration plants with energy recovery.

Taking a three-year average for the period from 2021 to 2023, Swissgrid generated 20,912 tonnes of waste, 254 tonnes of which was controlled waste or hazardous waste containing harmful substances. Around 49% of the waste was recycled and/or reused, and 0.13% was thermally recycled with energy recovery. The remaining 51% of the waste, mainly concrete, was sent to landfill. This category also includes the foundations of pylons, 80% of which are left in the ground after the dismantling of routes. Hazardous waste was professionally disposed of by authorised service providers, who also ensured that the waste was reused after it had been properly processed.

Swissgrid waste statistics[1]	Non-hazardous waste (t)	Hazardous waste (t)
Reuse	0	0
Recycling[2]	10,004	227
Composting	n/a	n/a
Recovery, including energy recovery[3]	24	0
Waste/hazardous waste incineration	0	27
Storage	0	0
Landfill[4]	10,630	0
Total waste	20,658	254

[1] Project and maintenance waste is estimated on the basis of the dismantled plants. A three-year average was used to calculate the number of plants, and the amount of waste was estimated based on the material generated during the dismantling of typical plants. Swissgrid is working on a system to record the actual quantities of waste from service providers.

[2] Recycled materials consist of metals (80 – 100%), electronic waste, waste glass, waste paper (together 100%), transformer oil (90%) and concrete (67%).

[3] Primarily municipal waste sent to waste incineration plants with energy recovery.

[4] Non-recyclable concrete waste is sent to type A (no contamination) or B (light contamination) landfills. The pylon foundations, which are made of concrete and reinforcing steel, are also listed here. 20% are removed and 80% are left in the ground when a route is dismantled.

Effectiveness of measures: Swissgrid examines the effectiveness of measures for the circular economy and resource efficiency on a selective and/or project basis. Swissgrid checks efficiency criteria on site during factory acceptance tests when procuring grid components, for instance. Compliance with contractually guaranteed efficiency values is linked to a financial incentive mechanism (see chapter «Supply chain sustainability»). However, with the exception of key figures on waste, Swissgrid does not yet systematically collect company-wide information and key figures on the circular economy and resource efficiency.