ZÁPADOSLOVENSKÁ DISTRIBUČNÁ

Climate resilience statement

Introduction

The ZSE Group, through its subsidiary Západoslovenská distribučná, a.s. (ZSD), manages the largest distribution system in the Slovak Republic. It fulfils its role thanks to more than 1,500 internal employees – of which about one half works directly in the field. ZSD's distribution system is made of over 39,000 km of overhead and underground lines, hundreds of electric stations and thousands of transformer stations. ZSD has the ambition to be the leader in innovations, thanks to which it can ensure electricity transmission to the customer in an energy-efficient and reliable way.

The distribution company's infrastructure is influenced by various natural phenomena, such as floods, intense storms, rime, wind, temperature fluctuations, solar radiation, etc. Due to climate change, these events are becoming more intense and more frequent than in the past. In the near future, the consequences of these phenomena will have a major impact not only on the operation of distribution companies themselves, but also on the entire society.

Many experts in the field of long-term monitoring of global climate are pointing out, the significant changes which are happening right now. We are also witnessing the rising importance of electricity in the society as a key energy medium when it comes to decarbonisation efforts. Our company sees its role in this process as essential, which is why we want to actively prevent possible negative consequences of climate change by gradually implementing measures in the internal processes of our company.

Climate conditions in western Slovakia

The distribution area of Západoslovenská distribučná, a.s. is located in the western part of Slovakia, in northern temperate climate zone, with regular change of four seasons and changeable weather with relatively even distribution of precipitation throughout the year.

Temperature

The yearly average temperatures are 9 °C to 11 °C (January -1 °C to -2 °C, July 18 °C to 21 °C). Maximum recorded temperature in the summer months shows 39 °C to 40 °C. Minimum recorded temperatures in the winter months in open flatlands do not fall below -30 °C; in the mountain valleys, meteorologists recorded temperatures around -35 °C. The temperature gradient throughout the day may reach as much as 25 °C (the difference between the lowest and the highest daily temperature).

Wind

Wind conditions depend on the season and landscape. In the lowlands, average wind speed ranges from 3 to 4 m/s. In the mountains, depending on the elevation, it's 4 to 8 m/s. Maximum wind speeds in the lowlands reach 35 m/s and in the mountains up to 60 m/s. The Danube Lowland is one of the most windy areas in Slovakia. Bratislava is one of the windiest cities in central Europe. Immediate wind speed exceeding 50 m/s only occurs during rare tornados and downbursts also in the lowlands.

Precipitation

Precipitation throughout the year is approx. 40% in the summer (June-August), 25% in the spring, 20% in the autumn and 15% in the winter (there is evident predominance of rain in the summer). Yearly precipitation amount is around 600 mm. Precipitation generally increases by 50-60 mm per 100 meters of altitude. In the summer, storms in all of Slovakia are relatively common, and they bring along a lot of rain (almost every year, somewhere in Slovakia the daily rainfall total exceeds 100 mm). The highest number of stormy days is in the mountains, in valleys and basins where the yearly average of such days is up to 30-35.

Solar radiation

Average yearly sums of global radiation are the highest in lowlands – 1,200 to 1,300 kWh/m^2; in mountainous areas of western Slovakia it's 1,050 to 1,100 kWh/m^2, mostly due to increased cloudiness. Sunlight is longest in the Danube Lowland – up to 2,000 to 2,200 hours per year.

Climate development forecast

West Slovakia region shows general characteristics of climate change. Warming is evident in all aspects and climate zones. Atmospheric precipitation trends are not so clear-cut, but this is due to their higher volatility.

General conclusions of further climate development in Slovakia can be formulated as follows:

Air temperature

- average air temperatures should gradually rise by 2 °C to 4 °C compared to 1951-1980 average, while the current year-on-year and season-on-season time changeability will be preserved;
- daily minimums should rise faster than daily maximum air temperatures, which will cause a drop in average daily air temperature amplitude;
- future development forecasts do not assume major changes in the yearly air temperature course, however, in autumn months, the temperature increase should be lower than throughout the rest of the year.

Rainfall total

- yearly rainfall totals should not undergo significant changers, a slight increase is expected (around 10%);
- there should be major changes in the yearly course and time regime of precipitation – in the summer, a slight decrease of rainfall is expected (especially in the south of Slovakia) and throughout the rest of the year, a slight to moderate increase. In the warm part of the year, an increase of rainfall volatility is expected; it is possible that on one hand, low-rainfall (dry) periods will be longer and more frequent, and on the other hand, short rainy periods will become more abundant;
- because warmer weather is expected in the winter, the cover of snow will be irregular up to 900 m.a.s.l. and winter floods will occur more often – the snow cover will probably be higher on average only beyond 1,200 m.a.s.l.; however, such locations comprise less than 5% of the area of Slovakia and thus cannot significantly influence drain conditions.

Other climate elements and characteristics

- no major changes are expected in global radiation average, wind speed and direction;
- due to stronger storms during the warm part of the year, more frequent strong winds, gales and storm-related tornados are expected;
- decrease of soil moisture in the south of Slovakia (there will be no major increase of rainfall totals in the vegetation period of the year)

Impacts of climate change on the energy sector in general

A positive impact of the increasing yearly temperature will be reflected in the decreased energy consumption for heating. On the other hand, increasing yearly temperature does not mean that winter will be without extremely cold days. Temperature needs in these days will have to be covered with an appropriate installed heat power. However, yearly use of such heat sources will probably decrease. This puts increased demands on a more flexible energy production.

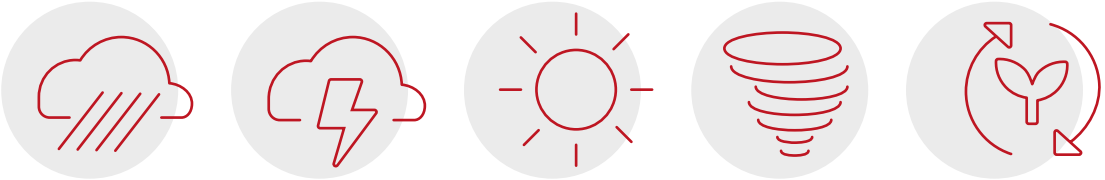
A negative impact of the increasing yearly temperature will manifest in the increased demand for cooling. The number of tropical nights (above 20 °C) will increase. This will lead to increased energy consumption for cooling in the yearly consumption total.

Extreme weather fluctuations such as storms, droughts, periods of high and low water levels may negatively influence electricity generation (decreased generation efficiency, decreased cooling potential, etc.) More frequent and abrupt meteorological phenomena such as storms, lightning strikes, snow calamities or black ice may damage distribution infrastructure facilities like the overhead electric lines, transformers, etc. These factors will pose an increased risk for electricity distribution, higher demand for maintenance and quality of these facilities.

Increasing the climate resilience of the distribution system

Within the strategic analysis of the impacts the climate change has on the distribution system, it is essential to accept that this system is exposed to the majority of influences. Facilities such as overhead power lines often pass through highly exposed areas.

Impacts of climate on the distribution system can generally be divided into two basic spheres:



1. **Direct – physical influences which may lead to damage to the distribution system**
   a. Strong wind – risk of damage to overhead lines
   b. Snow – risk of damage to overhead lines, risk of lower accessibility of facilities due to impassable roads
   c. Rime – risk of damage to overhead lines, risk of lower accessibility of facilities due to impassable roads
   d. Strong rain – risk of occurrence of transient phenomena in the distribution system – short-term restriction of electricity supply
   e. Floods – risk of damage to distribution system facilities in general – possible long-term electricity supply interruption
   f. Thunder phenomena – risk of damage to distribution system facilities in general – possible long-term electricity supply interruption
   g. High temperatures – risk of damage to overhead lines, deteriorated transmission capabilities
   h. Fires – risk of damage to distribution system facilities in general – possible long-term electricity supply interruption.

2. **Indirect – initiated by user behaviour**
   a. Changes in system load due to climate change – risk of power line and transformer overload, possible short-term and long-term electricity supply interruption
   b. Changes in behaviour of the distribution system users in order to prevent climate change – implementation of measures in order to prevent climate change (implementation of RES, reduction in use of fossil fuels, changes in the manner of using transport infrastructure – transition to e-mobility, etc.).

Our goal is to ensure continuous improvement of the distribution system's climate resilience alongside the increasing frequency and severity of effects the above-mentioned influences have. For this reason, we consider it a part of our social responsibility to fully digitise our networks and convert them to smart grids. With higher degree of digitisation and automation, we will be able to prevent electricity distribution interruptions more effectively and fix them faster. With the increasing digitisation level, we also focus on increasing the cybersecurity on all operational levels.

Strategic activities increasing the distribution system's climate resilience

In addition to digitising our distribution system to convert it to smart grid, Západoslovenská distribučná takes also other steps to improve the global climate resilience:

- Replacement of overhead lines with cables in locations which are historically most affected by atmospheric phenomena, surrounding vegetation.
- Continuous improvement of middle voltage network automation level with the aim to shorten the time necessary to locate, identify, disconnect and repair of failures occurring in the system.
- On the low voltage level, we continuously improve our ability to measure and monitor network events in order to prevent overload and identify electricity supply interruptions thanks to digital "smart" low voltage switchboard modernisation.
- We install electricity consumption smart metering systems for our customers, increasing the awareness of changes and current network situation.
- We implement schemes to support dispatch centres' network management – they can prioritise electricity renewal during calamities depending on the number of affected customers. These activities lead to automatic management of extensive electricity supply outages.
- Customers are informed online about the network situation, planned works, and failures we are repairing. With this channel, we increase our customers' trust in our competence to reliably operate the distribution system. At the same time, through the Distribution Portal, customers can communicate online with their electricity distributor.
- We do pilot projects concerning sustainable maintenance of vegetation under high voltage power lines in order to eliminate vegetation logging and decrease carbon footprint.
- In cooperation with local meteorological institutions we actively monitor weather development in our area. In case of various weather alerts, our emergency employees are ready in advance. We also analyse lightning intensity in our distribution area and use this information as part of analysis of failures in our system.
- In the most exposed locations, we have special meteorological stations which monitor not only the temperature and wind speed but also glaze on our power line conductors. This way we can prevent potential damage to these facilities by climate phenomena.
- In addition to above-mentioned strategic activities, we continuously strive to improve the parameters of newly installed grid elements. Demands for new facilities also reflect the expected increased operational temperature ranges, as well as new materials with increased resilience against wind, frost and other negative climatic influences.
- We are also trying to develop a plan how to cover the distribution losses by the guarantees of origin from renewable energy sources.

All these activities support the development of a reliable climate-resistant distribution system for our customers. Fulfilling these strategic goals is not only our commitment but also a natural way to sustainable path of life in the region.