Elenia's climate work – Scenario analysis according to TCFD recommendations

Introduction

According to experts, Finland will continue to be among the rapidly warming countries. The summer of 2022 was proof that hot periods of heat occur. The global average temperature has risen by 1.1ºC compared to pre-industrial times. The level of 1.5ºC warming will be reached in the early 2030s in all scenarios. The lower part of the atmosphere has warmed and climate zones have moved towards the poles. The Northern Hemisphere has warmed more than other regions and its growing season has become longer. Land areas have warmed more than the global average, around 1.6ºC, and Finland's temperature is considered to have warmed by as much as 2.3ºC. Warming is not uniform.

Elenia has identified climate change mitigation as one of its strategic objectives. In order to achieve our goal, we are committed to reducing our own direct and indirect emissions and to enabling the connection of renewable energy to the network. In addition, we have identified potential climate-related risks and opportunities and assessed their economic impacts. We have defined measures to manage the risks and take advantage of the opportunities. This allows us to take them into account in the best possible way in Elenia's business and strategic and financial planning in the short, medium and long term. These are also topics that are of interest to Elenia's financiers, investors and other stakeholders.

Extreme weather phenomena are an example of the physical climate-related risks caused by climate change. Elenia has created contingency processes for operations to ensure the security of supply for customers. Strategic planning has a strong connection to Elenia's risk management. In addition to physical risks, we have identified and considered the transition risks, which are categorized into policy and regulation risks, technology risks, market risks and reputation risks. Physical risks are categorized into acute and chronic risks. Alongside climate-related risks, it is also important to identify climate-related opportunities. We have classified the opportunities in our climate work into the following subcategories: resource efficiency, energy sources, products and services, as well as markets and resilience.

In the ongoing process, Elenia has identified the scenarios related to TCFD climate work that suit the company. Climate work proceeds with a closer examination of the risks and opportunities in the light of the different scenarios. When the identified scenarios materialise, this scenario work does not provide clear-cut answers on its impacts, but serves as a scientific and empirical basis for their economic impacts and provides the company with adaptive and contingency capabilities in the event of new uncertainties. The scenarios serve as an excellent tool for strategy and risk management work.

Methodology

We reviewed the possible physical and transition scenarios related to Elenia's climate work and chose the ones that were suitable for Elenia. Both physical and transition scenarios are based on the development of greenhouse gas emissions. Climate-related physical scenarios are concretely observable extreme weather phenomena and changes in the climate, while transition scenarios describe potential changes in the areas of policy, regulation and markets as well as technology. TCFD (2020) recommends to choose at least three scenarios to give the company a sufficiently diverse view of what might happen from the climate

perspective in the future. We ended up with the scenarios described below, as they allowed us to look at consistent events and uncertainties from the point of view of factors that are essential for Elenia. They provide Elenia with a good capacity with their sufficiently broad perspectives and differing approaches.

We decided to introduce three of the five**IPCC physical climate scenarios** and three of the four **IEA transition scenarios** (Climatescenarios 2022; IEA 2022; Ympäristö, 2015):

Physical scenarios

- **IPCC** (Intergovernmental Panel on Climate Change)
    - **RCP1.9, RCP4.5 and RCP8.5** (Representative Concentration Pathway)

Transition Scenarios

- **IEA** (International Energy Agency)
    - **NZE** (Net Zero Emissions by 2050 Scenario)
    - **APS** (Announced Pledges Scenario)
    - **STEPS** (Stated Policies Scenario)

The versions of the IPCC scenarios describing the conditions in Finland have been refined by the Finnish Climate Panel / Finnish Meteorological Institute. RCPs are climate change scenarios based on different temperatures, and they describe weather phenomena that occur at different temperatures. The IEA is an energy organisation working with the OECD, cooperating in different areas of energy policy and energy markets. The IEA scenarios examine the energy industry's transition and interaction with markets and regulation, as well as political movement. Energy is an indispensable commodity, both from the point of view of individual citizens and society as a whole.

Both of the above scenarios are public and based on academic research and models. They are globally used common frameworks of reference. We can use the selected IPCC and IEA scenarios in parallel in Elenia's climate work, because the RCP1.9 and NZE scenarios, for example, are based on the same climate temperature and emission levels. Other pairs include RCP4.5 and APS, and RCP8.5 and STEPS.

Table 1. IPCC and IEA scenarios and their general descriptions

Fyysiset- ja transitioskenaariot

IPCC	Globaali lämpötilan nousu	IEA	Päästö trendi	
RCP1.9	1.5ºC	NZE	Very Strongly Declining Emissions	**Parisiin ilmastosopimuksen mukainen** ja Elenian SBTi-sitoumuksen mukainen 1.5ºC nousu. Universaali pääsy nykyaikaisiin energiapalveluihin ja ilmanlaadun merkittäviin parannuksiin.
RCP2.6	2.0ºC	SDS	Strongly Declining Emissions	**Ilmastopolitiikan napakymppi**. CO2:n päästöt kääntyvät jyrkkään laskuun jo vuoden 2020 jälkeen ja ovat vuosisadan lopulla lähellä nollaa. CO2:n pitoisuus on korkeimmillaan vuoden 2050 tienoilla noin 440 ppm ja alkaa sen jälkeen laskea. Yhdenmukainen selvästi alle 2.0ºC:n tavoitteen kanssa samalla kun saavutetaan pääsy nykyaikaisiin energiapalveluihin ja parannetaan ilmanlaatua.
RCP4.5	2.4ºC	APS	Slowly Declining Emissions	**Ilmastopolitiikan osittainen onnistuminen**. CO2:n päästöt kasvavat aluksi hieman, mutta kääntyvät laskuun vuoden 2040 tienoilla. Vuosisadan loppupuolella ilman hiilidioksidipitoisuus tasaantuu teollistumista edeltävään aikaan verrattuna noin kaksinkertaiselle tasolle. Osoittaa tilaa, joka nykyisillä lupauksilla saavutetaan. Korostaa kunnianhimokuilua, joka pitäisi kuroa umpeen päästäkseen tavoitteeseen.
RCP6.0	2.8ºC	STEPS	Stablizing emissions	CO2:n päästöt pysyvät aluksi suunnilleen nykyisellä tasollaan, mutta ovat myöhemmin tällä vuosisadalla melko suuria.
RCP8.5	4.3ºC	STEPS	Rising emissions	**Ilmastopolitiikan täydellinen epäonnistuminen**. 4ºC nousu. CO2:n päästöt kasvavat nopeasti, ja vuoteen 2100 mennessä ne ovat kolminkertaiset verrattuna vuoteen 2000. Ilman CO2:n pitoisuus kohoaa teollistumista edeltävään aikaan verrattuna yli kolminkertaiseksi ja jatkaa kasvuaan vuoden 2100 jälkeen. Heijastaa nykyistä toimintatapaa. Tarjoaa vertailukohtaa arvioida mahdollisia nykykehityksen saavutuksia ja rajoituksia energia- ja ilmastopolitiikassa.

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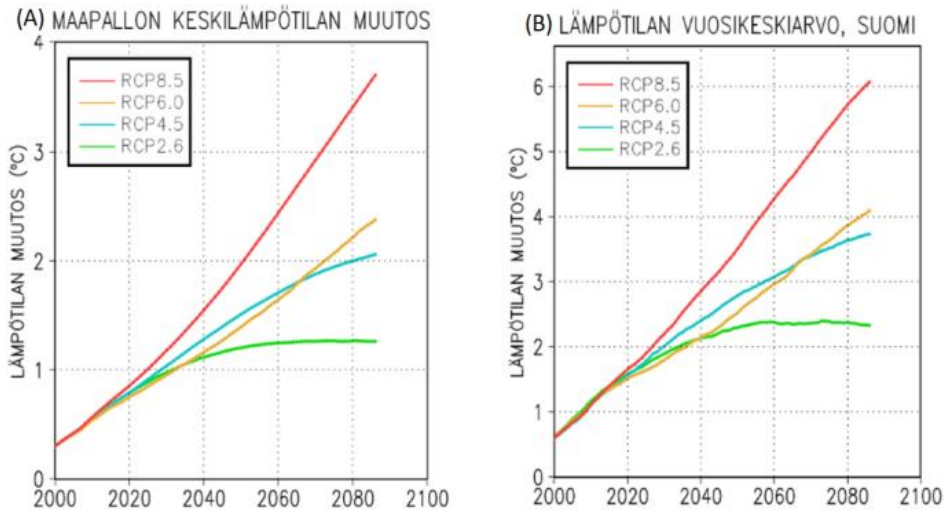

Figures 1 and 2. The change in the global average temperature and the annual average temperature in Finland in different years, described as different RCP scenarios (Tallinen, 2019).

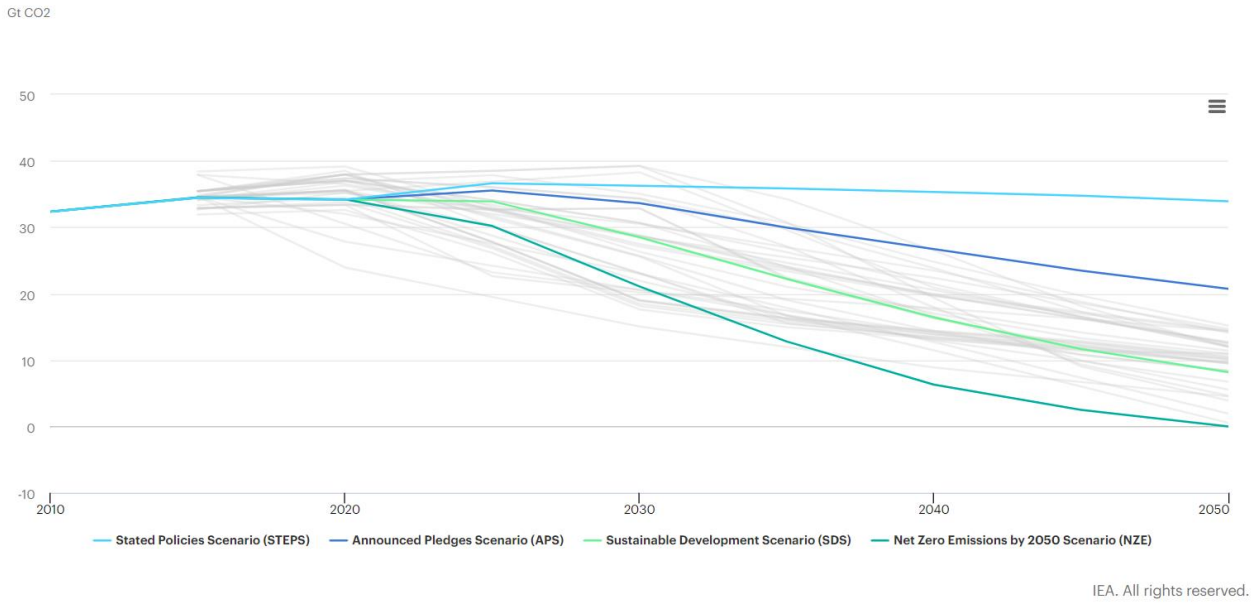

Figure 3. Emission reductions for IEA transition scenarios by 2050 (IEA, 2022).

Scenario description 1.5ºC (RCP1.9 / NZE)

The Net-Zero target for climate change pursuant to the Paris Agreement aims to limit global warming to 1.5ºC. The EU and all its Member States have signed and ratified the Paris Agreement and are therefore strongly committed to its implementation. In line with this commitment, EU Member States have agreed that the EU will become the first climate neutral society by 2050. In December 2019, the European Commission published the European Green Deal, outlining the means to achieve climate neutrality. The European Climate Law entered into force in summer 2021. The Climate Law defines the climate neutrality target for 2050 and the Fit for 55 target (55% emission reduction target) compared to the 1990 baseline for 2030. These are legally binding on Finland. In addition, on 14 July 2021, the Commission published a major package of climate and energy legislation proposals. As part of the Green Deal, the Commission has also published a proposal for a European climate agreement to involve all citizens and stakeholders in climate work. (Council of the European Union, 2022; Ministry of the Environment, 2022a.)

Elenia is also committed to the objectives set out in the Paris Agreement. To achieve these targets, Elenia is committed to the Science Based Targets initiative (SBTi) targets of reducing GHG Scope 1 and Scope 2 emissions by 42% from the baseline level of 2020 by 2030. Elenia has set itself an even more ambitious target in this respect, a 75% reduction in emissions by 2030 and a Net Zero target for Scope 1 and 2 emissions by 2035. In addition to the SBTi, Elenia is committed to the Business Ambition for 1.5ºC target, which aims to reduce Scope 1–3 emissions overall by approximately 90%, including the company's supply chain, by 2050.

Observations related to physical risks

According to the IPCC (2022) Climate Report, anthropogenic greenhouse gas emissions have already significantly changed the climate. The Intergovernmental Panel on Climate Change (IPCC) states in its report that the likelihood of various extreme weather phenomena has increased. The nature and frequency of weather events in this Net Zero scenario are similar to what has been seen in Finland in recent years. Although the climate has changed, the physical climate-related risks in this scenario are more moderate in terms of likelihood and impact than in the two scenarios described below.

Elenia has taken measures to prepare for the negative effects of the weather phenomena pursuant to this scenario. The underground cabling of electricity network infrastructure is seen as one of the activities that can prevent negative impacts on consumers, network companies and other stakeholders, as well as improve the efficiency of the weather service (Finnish Climate Panel, 2021).

Observations relating to transition risks

The Ministry of the Environment (2022b) points out that limiting warming to 1.5ºC requires rapid emission reduction measures in all sectors, as well as significant changes in the energy system. The RCP1.9 scenario places a strong emphasis on sustainable development and high and equitable economic growth throughout the world. Energy services are modern, and everyone has universal access to them. Significant improvements can be seen in air quality. (Finnish Climate Change Panel, 2021)

According to the IEA (2022), the goal of the NZE scenario from the perspective of electricity use is that advanced economies will, as a rule, use emission-free electricity in 2035. Another goal is that around 70% of electricity production globally will come from solar panels and wind by 2050. With regard to transport, the NZE target is that 60% of global car sales will be electric vehicles by 2030. The manufacturing industry target for 2050 is for over 90% of heavy industrial production to be low-emission.

According to the report of the Finnish Climate Panel, effective ways of reducing emissions include increasing the use of renewable energy as a form of energy production, improving the energy efficiency of buildings, the use of low-carbon building materials and the use of renewable energy sources in heating and cooling. The electrification of transport provides potentially the biggest emission reductions in passenger car traffic. In the manufacturing industry, emission reductions can be achieved, for example, through new material technologies, low-emission energy production processes and carbon capture and storage. (Finnish Climate Change Panel, 2021; Prime Minister's Office, 2008.)

The NZE scenario is aligned with Elenia’s ambitious emission and climate work Elenia will continue to reduce Scope 1–3 emissions in line with the existing Net Zero Business Plan. This scenario also creates opportunities for Elenia besides the risks. We develop different technological smart solutions for the electricity network to serve the green transition. We enable the connection of renewable energy to the network and promote energy efficiency. From Elenia’s point of view, the rate of electrification of society is faster, and small-scale production is seen to play a greater role in this scenario than in the ones below. The prevailing situation in society also challenges Elenia to develop the readiness for change (resilience) of the electricity distribution network, which has been identified as one of the opportunities.

Scenario description 2.4ºC (RCP4.5 / APS)

The RCP4.5 scenario is seen as a partial success of climate policy. CO_2 emissions will initially increase slightly but begin to decrease around 2040. Towards the end of the century, the carbon dioxide content of air will stabilise at about twice the preindustrial level. The RCP4.5 scenario indicates the state achieved by the current pledges and highlights the ambition gap that should be bridged in order to reach the targets. It has been estimated that the increase in temperature in Finland pursuant to the RCP4.5 scenario is approximately 3.3ºC by the end of the century, compared to 2.4ºC globally (Tallinen, 2019).

Observations related to physical risks

In the RCP4.5 scenario, the frequency and impact of extreme weather phenomena and storms is higher than in the RCP1.9 (Net Zero) scenario described above. It seems that heat periods will continue to become hotter and longer in Finland as well as in the whole of Northern Europe. Finland will continue to be one of the regions with the fastest warming in the world. Therefore, we will inevitably have to extensively adapt to change in different sectors of society, and Elenia in the energy sector in particular.

Heavy rainfall will be more frequent and more intense in this scenario. In urban environments, the consequences of warming are stronger, as cities are often warmer than their surroundings, especially at night, and therefore cities will experience more extreme weather, such as heat waves, in addition to heavy rainfall. In Finland, rainfall and the number of rainy days will increase, especially in winter. In the future, extremely cold periods will occur less frequently. As the temperature rises, rainfall will increasingly be water instead of snow, and the 24-hour temperature fluctuation will decrease during the winter. In addition to traffic disruptions, stormwater floods can damage buildings with moisture, for example. Solar radiation will be brighter in summer, while in winter it will be cloudier compared to the RCP1.9 scenario described above. As a result of climate warming, the number of days with risk of forest fires will increase in Finland (Kontula-Sokka, 2021; Finnish Climate Panel, 2021.)

Elenia has considered extreme weather phenomena to be a significant risk in its own risk management. In addition, it has identified forest fires due to prolonged droughts, floods and freezing rains as acute risks in this scenario compared to the one described above. In case of moisture and flood risks, Elenia must pay more attention to the structures of secondary substations and distribution cabinets, as well as flood resistance. Identified chronic risks include the shorter frost season, which has a significant impact on wind damage and soil carrying capacity, as well as the impact of heat waves on electricity network structures.

Observations relating to transition risks

According to the IPCC (2022) report, the emission reduction commitments announced by governments so far are not sufficient to limit global warming to 1.5ºC by the end of the century. Current emissions trends will result in warming of around 3°C by the end of the century without rapid and effective emission reduction measures over the next two decades. Similar to the EU Member States, Finland must continue the EU's emissions reduction policy Fit For 55 by 2030 and Net Zero by 2050. Based on the IEA's APS scenario, 40% of total final consumption will come from renewable energy sources, based on the EU Renewable Energy Directive. (IEA, 2022; IPCC, 2022; Ministry of the Environment, 2022a.)

If the RCP4.5 scenario materialises, Elenia will continue its own emission reduction path in accordance with its targets. However, Elenia needs to take into account potentially stricter regulatory requirements and greater pressure to increase prices in this partially failed scenario, as society seeks solutions for renewable energy and environmentally friendly alternatives, among other things, compared to the Net Zero (NZE)

scenario. The reputation and other transition risks identified by Elenia are also seen to be higher in this scenario than in the previous scenario's transition description. The readiness for adaptation and contingency planning (resilience) identified as an opportunity is called for in this scenario.

Scenario description 4.3ºC (RCP8.5 / STEPS)

If the Intergovernmental Panel on Climate Change (IPCC) RCP8.5 scenario materialises, climate policy is said to have completely failed. CO_2 emissions will grow rapidly and by 2100 they will be three times higher than in 2000. Atmospheric carbon dioxide levels will more than triple compared to pre-industrial levels and will continue to increase after 2100. It has been estimated that the increase in temperature in Finland pursuant to the RCP8.5 scenario is approximately 5.6ºC by the end of the century, compared to 4.3ºC globally (Tallinen, 2019).

Observations related to physical risks

If the physical scenario RCP8.5 materialises, of the three scenarios presented in this analysis, extreme weather events and their impacts can be seen most clearly in Finland. Weather phenomena will be more severe, more common and occur repeatedly. Freezing rains will become more common in Finland and the likelihood of heavy snowfall will decrease widely. The probability of heavy rainfall lasting 1–3 days will double (Punkka, 2019). The likelihood of very rainy days will increase, especially in late summer and autumn.

When considering the economic impact of climate change, the period is of key importance. Some impacts occur quickly and last for a short time. These include, in particular, sudden weather events such as storms, forest fires, heat waves, rainfall floods and coastal floods. Many of the impacts of climate change will occur gradually and regardless of the success of mitigation efforts. Examples include drought, snow loads, river and lake floods, loss of biodiversity, degradation of soil and ecosystems and lengthening of the growing season. Rising temperatures and extreme weather phenomena damage property and critical infrastructure, affect human health and efficiency of work. The impacts of changes will be manifested in different ways in different sectors, such as energy use and production, agriculture and forestry and transport. Through international trade and the financial system, the spill-over effects of impacts of climate change elsewhere will be transmitted to Finland as well. If living conditions deteriorate for a long time or permanently, the situation may also lead to migration, of which there is already evidence in the world. (IPCC, 2022; Finnish Climate Change Panel, 2021.)

Weather events such as storms, snow loads and decreasing soil frost will affect the susceptibility of electricity distribution networks, damage infrastructure and thus create direct costs for society, consumers and network operators. Weather phenomena will also cause a shortening of the service life of buildings and a deterioration of the condition of forest roads, making it more difficult to harvest timber. An increasingly warm and humid climate threatens to increase the costs of mould damage in Finland, among other things. The moisture load of buildings will increase throughout Finland. Precipitation will increase throughout the year, and the moisture load especially in winter seasons in particular will increase as more rainfall will come in the form of water and sleet. Climate warming will be reflected as lower heating costs in the winter, while cooling costs in the summer will increase accordingly. (Finnish Climate Change Panel, 2021.)

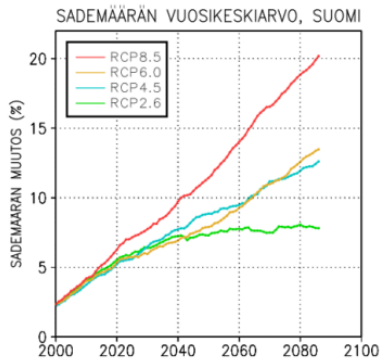

Figure 4. Annual average precipitation in different RCP scenarios by 2085 (Tallinen, 2019).

Observations relating to transition risks

In the case of emissions development pursuant to the RCP8.5 scenario and our total failure to mitigate climate change globally, the world economy can be expected to be unevenly distributed. The impact on the Finnish economy will be such that it will develop comprehensively and significantly in a worse direction than the EU average. At the latest if the STEPS scenario materialises, the EU, together with the Member States, needs to highlight national recovery and resilience plans. The EU and local governments must take measures and regulatory decisions to ensure the necessary emission reductions in the long term. Short-term measures are no longer possible. At the national level, companies must make solid Net Zero pledges and invest in renewable energy sources, energy efficiency and low-carbon transport solutions. (IPCC, 2022; Finnish Climate Change Panel, 2021.)

Should this scenario materialize, it would be the worst case scenario from the risk perspective of the three scenarios. Its impact and likelihood are high, both in the short and long term. Elenia has recognized this in both risk management and climate work. The cost impact and reputation damage of the identified climate risks can escalate very quickly to very high levels. Regulatory requirements can be challenging and require a lot of work. In this scenario, the work to reduce emissions is the slowest and the negative impacts of this scenario are long-lasting for society as a whole. The readiness for adaptation and contingency planning (resilience) identified as an opportunity is called for in this scenario.

Conclusions

The climate scenario analysis helped Elenia to perceive the effects of weather conditions, markets, regulation and reputation on its own business, based on different emission levels and temperatures. The risk profile appears different in different scenarios, as do the opportunities. Uncertainties related to society and the global economy, such as COVID-19 or Russia's war on Ukraine, can easily escalate new risks besides climate change. The readiness for change of the electricity distribution network plays an important role in the risk management of the different scenarios. We consider Elenia's climate-related scenario work and increasing strategic adaptability and preparedness (resilience) to have begun well.

The Net Zero (RCP1.9 and NZE) scenario is the closest to what Elenia is currently doing. The identified risks have not materialised and the opportunities are very likely. The scenario is also in line with Elenia's ambitious emission and climate work. Keywords include technological smart solutions, connection of renewable energy to the network, energy efficiency, electrification of society and small-scale production.

The second RCP4.5/APS scenario involves a higher likelihood of risks than the first Net Zero scenario. The identified physical and transition risks of Elenia are more likely and have a greater impact. Although Elenia will continue its own emission reduction work, it must be prepared for stricter regulatory requirements, greater price pressure and reputation risk when seeking solutions to issues such as renewable energy and environmentally friendly alternatives in a partially failed climate situation.

The third RCP8.5/STEPS scenario has the highest negative impact in terms of the likelihood and impact of the risk, both in the short and the long term. The materialization of the climate risk is strongly present, and the identified opportunities of climate efforts are seen as the smallest compared to the two scenarios described above. Elenia has identified the potential cost and other impacts related to this scenario in its own risk management. Short-term measures will no longer help in this most challenging of the three scenarios. Emissions reduction efforts are the slowest in this scenario.

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