KPMG

Study on electricity consumption trends in the Baltics and Nordics

Executive Summary

KPMG Baltics SIA

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February 2024

Context

An in-depth analysis of electricity demand drivers and future potential is necessary

For the complete analysis of Latvian-Swedish interconnection potential, a detailed forecast of future electricity consumption (from the transmission grid perspective) is needed

Electricity demand is influenced by variety of factors which change in time and have different effects on different electricity consumer groups

An extensive demand for new power generation connections

Different developers have reserved significant connection capacities within 110kV and 330kV grid – in total more than 6 GW of new solar, wind, hydro and hybrid energy projects [1-1]. For comparison, the current total capacity of electricity generation facilities in Latvia is less than 3 GW [1-2].

Current electricity demand does not match the projected generation

Average total annual electricity demand in Latvia in the last 10 years has been approximately 7 TWh, and the current trend is inclined towards decrease of consumption. Although currently Latvia is net electricity importer [1-3], if the abovementioned generation development plans are realised, generation would exceed local demand.

Several transmission system projects are under development

AST is working on several transmission system development projects which are related to enhancing the operations of the grid and the planned synchronisation with the Continental Europe grid system [1-4]. For planning and execution of these projects it is essential for AST to be aware of future development of electricity demand.

Technological developments might increase future consumption

Technological development of renewable energy generation, resulting in lower LCOE, as well as technological development of e-mobility, heating and Power-to-X solutions have opened new opportunities for the use of electricity. These items are expected to play a key role within the energy ecosystem in the region [1-5].

[1-1] AST – status of connection applications: link available here
[1-2] Public utilities commission – electricity generation permits issued: link available here
[1-3] AST – power system state: link available here
[1-4] AST – modernisation and development of the transmission grid: link available here
[1-5] Nordic Grid Development Perspective 2023: link available here

Results – Latvia (1 of 2)

Sectoral division

01 Industrial
02 Commercial & public services
03 Households
04 Transportation
05 Energy

Consumption is split into five sectors

Total electricity consumption – both historical and forecasted – is split into five sectors (consumer groups). Those specific sectors were chosen taking into account such criteria as uniqueness, homogeneity and uniqueness of the sector, as well as data availability and data comparability.

Historical consumption was analysed for each of the sectors, and an hourly consumption profile for eight representative days was identified. This was used as the baseline value for the forecast of future consumption.

Factors influencing demand

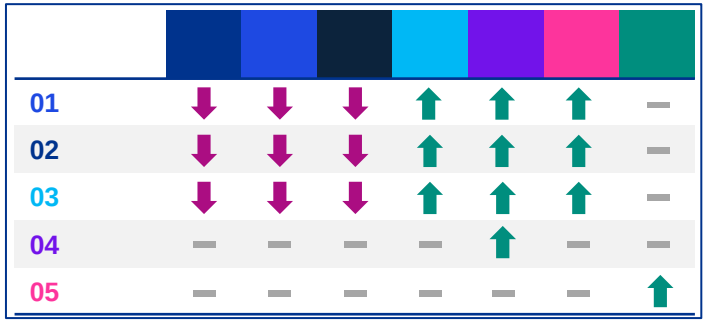
- Demographic trends
- Energy efficiency
- Prosumption
- Welfare
- E-mobility
- Heating solutions
- Power-to-X

Seven demand-influencing factors are identified

In order to forecast future electricity consumption, it is necessary to identify factors influencing electricity demand and estimate their future development. Seven such factors were identified taking into account such criteria as influence on electricity demand, significance of the influence, lack of overlap with other factors, existing expectation of changes, and sufficient coverage of the key developments.

For each of the factors we estimate an effect on the consumption if one item value of the respective factor changes.

Factor development and impact



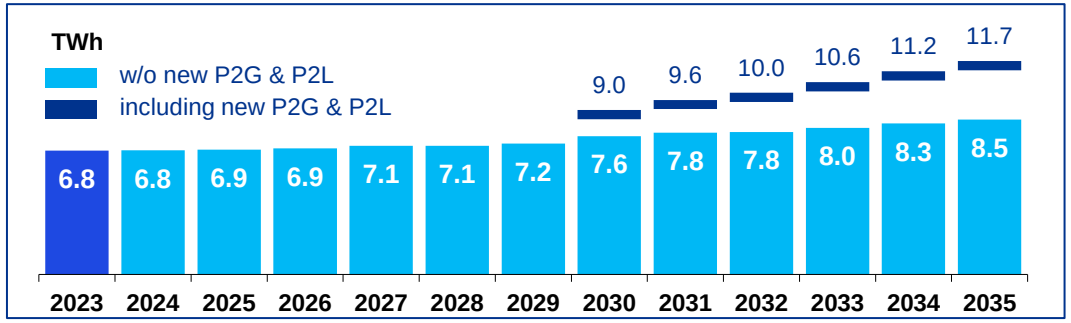
Effect and development of each factor is analysed

As mentioned previously, electricity consumption and its forecast were analysed for each sector independently. Therefore, we estimated the effect of a factor on consumption not only for the total consumption, but also for the specific sector.

Additionally, we performed forecasts of the respective factor development to assess the resulting impact on the electricity consumption.

Results – Latvia (2 of 2)

Total consumption forecast (Base scenario)

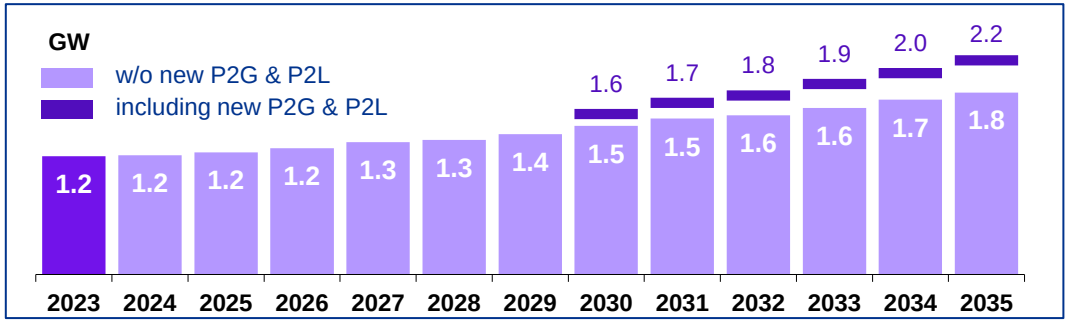


Growth in consumption is expected to accelerate starting from 2030

Electricity consumption forecast was performed for three different scenarios: Low scenario, Base scenario (main scenario), and High scenario. The scenarios have different assumptions related to e-mobility, heating solutions and Power-to-X factor development, reflecting the possible different development cases.

Total electricity consumption in Latvia (from the perspective of the transmission grid) until 2029 is forecasted to marginally increase, fuelled by increase in welfare and development of e-mobility and heating solutions. Starting from 2030, this growth rate increases, and furthermore additional factor is expected to come into play – new capacities of power-to-gas (P2G) and power-to-liquid (P2L) technologies. However, those factors have to be treated with caution due to P2G and P2L technologies currently being less-established and their development plans being less certain (than for other factors). Therefore, in each scenario forecasts are made for both cases: with the assumption of new P2G and P2L capacity development, and without such assumption. The results show that these technologies can have a substantial effect on total electricity consumption.

Peak consumption load forecast (Base scenario)



Peak consumption load is forecasted to have a stable and moderate growth

Like in the case of electricity consumption forecast, the electricity consumption load (from transmission grid perspective), including the peak load, is forecasted for three different scenarios: Low scenario, Base scenario (main scenario), and High scenario.

Similar to electricity consumption trends, peak load in Latvia is forecasted to increase, yet more substantially than the total consumption. Also, starting from 2030, the effect on peak load from new P2G and P2L capacities is important, yet current development plans of those are less certain (than for other factors). To take this into account, same approach as for electricity consumption is applied. Namely, for each scenario forecasts regarding consumption load are made for both cases: with the assumption of new P2G and P2L capacity development, and without such assumption. The results show that these technologies. The results show that these technologies may have proportionally higher effect on total electricity consumption than the peak load due to the economic need of high utilization of such capacities.

Results – Baltics and Nordics (1 of 2)

Countries analysed

- Latvia
- Lithuania
- Estonia
- Finland
- Sweden
- Norway
- Denmark

Factors and technologies identified

- Demographic trends
- Energy efficiency
- Prosumption
- Welfare
- E-mobility
- Heating solutions
- Power-to-gas
- Power-to-storage
- Industrial development
- Other

The analysis was performed on the Baltics and Nordics

The scope of the analysis includes the Baltics (Latvia, Lithuania, Estonia) and the Nordics within the Nord Pool system (Finland, Sweden, Norway, Denmark). These countries from an electricity market perspective are interconnected and the situation in one country has an effect on others. In future, with development of new interconnections, this aspect will only become stronger.

The analysis is performed on the historical consumption data, as well as publicly available forecasts. These forecasts are obtained from different sources, including transmission system operators of the respective countries and different global databases.

The consumption level in noticeably different between the Baltics and the Nordics. However, if consumption per capita is taken into account, then the consumption is Denmark is closer to the one of the Baltics, rather than the Nordics.

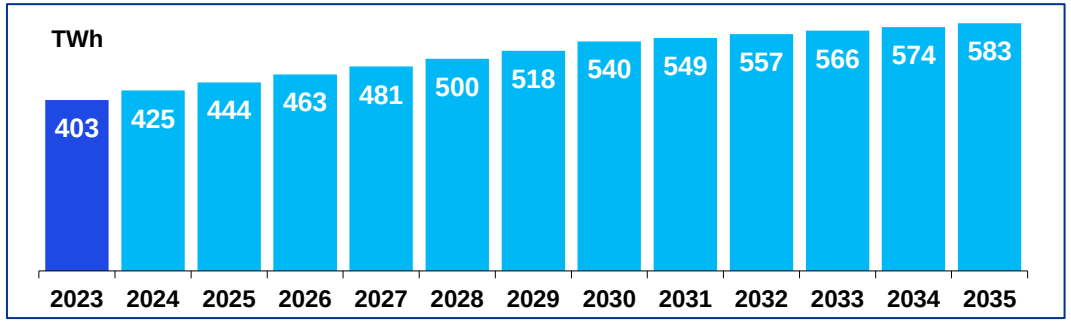
The largest electricity consumption, both total and per capital, is observed in Norway, while the lowest (both total and per capita) is observed in Latvia.

Different technologies are observable, but not all are applicable to Latvia

Electricity consumption in the region is expected to be significantly influenced not only by different factors (like demographic trends, energy efficiency, prosumption, welfare), but also by new technologies (like e-mobility, heating solutions, power-to-gas, power-to-storage). However, some of those technologies are country-specific. For example, in various planning documents related to the Nordics it is mentioned that an important factor in the future will be new data centres. This is not the case for the Baltics. Also, the Power-to-X items have more detailed plan in the Nordics than in the Baltics.

Results – Baltics and Nordics (2 of 2)

Forecast of total electricity consumption in the Baltics and Nordics



Growth in consumption is expected to accelerate until 2030

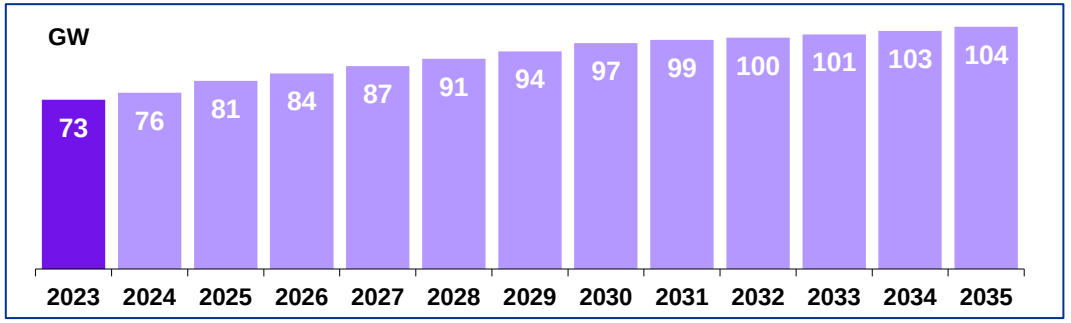
Electricity consumption forecast is based on publicly-available secondary data from different sources, including the transmission system operators of the respective countries.

The electricity consumption in the region is expected to grow in the next 10 years. This growth is expected to be fueled by more extensive application of new technologies like e-mobility and Power-to-X.

Although there are differences between the countries, all of them expect an increase in electricity consumption.

Please take into account that these forecasts include assumptions on successful application of various Power-to-X technologies. Some of those, at the moment of this analysis, are not fully developed and economically viable.

Forecast of total consumption peak load in the Baltics and Nordics



Peak consumption load is forecasted to have a stable growth

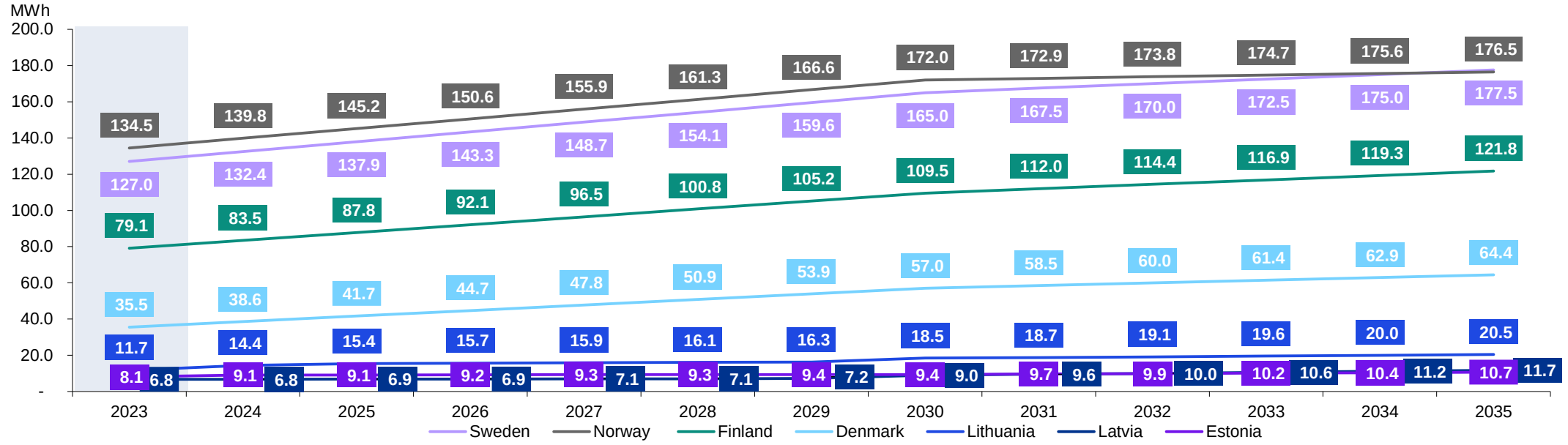
Similar to electricity consumption trends, peak load is forecasted to increase.

Unlike forecasts on electricity consumption, the peak load forecasts were not publicly available for the Nordics. Therefore, for peak load forecast a mathematical estimation is made. It involves taking into account the historical relationship between monthly consumption and peak load, and applying it to the forecasted consumption.

Please take into account that these forecasts include assumptions on successful application of various Power-to-X technologies. Some of those, at the moment of this analysis, are not fully developed and economically viable.

Total forecasted electricity consumption by year

Forecast of annual electricity consumption by countries in 2024-2035

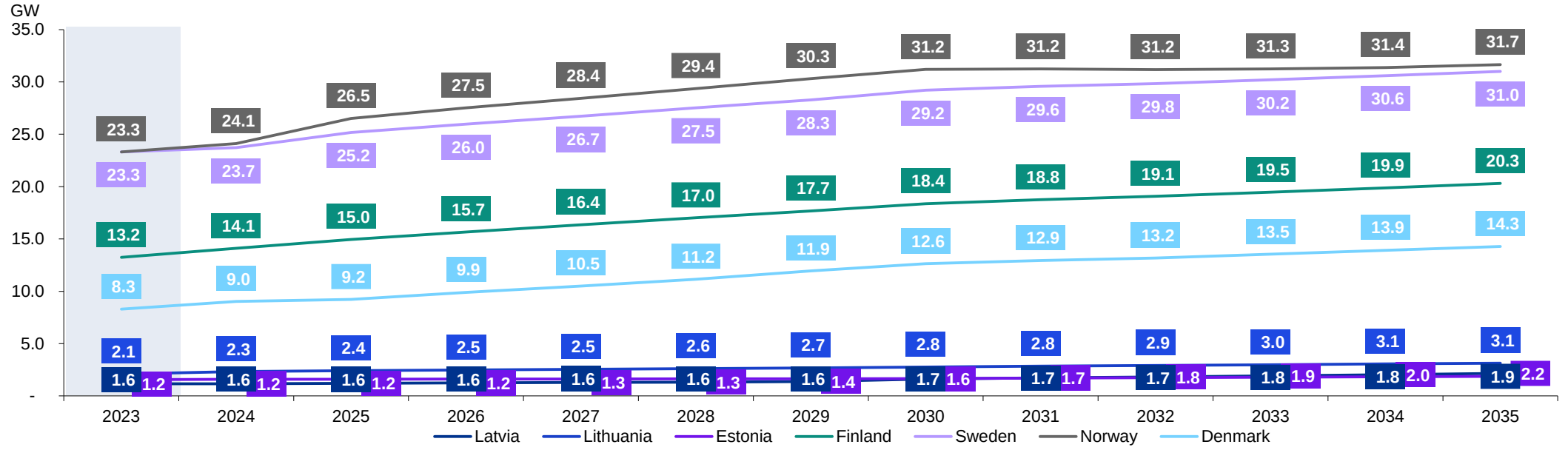


Source: Litgrid[6-1], DNV GL[6-2], Elering[6-3], Statnett[6-4], KPMG analysis

[6-1] Litgrid Development Plan of the Electric Power System and Transmission grid 2022-2031: link available here
[6-2] Scenario Building for the Evolution of Lithuanian Power Sector for 2020 – 2050: link available here
[6-3] Security of supply report of the Estonian electricity system: link available here
[6-4] Key figures from the 2020 Long-term market analysis: link available here

Forecasted peak load by year

Forecasted peak load by year



Source: Litgrid[6-1], DNV GL[6-2], Elering[6-3], Thomson Reuters[7-1], Statnett[6-4], KPMG analysis

[7-1] Thomson Reuters – Refinitiv Eikon database

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