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Over the next 25 years, the Belgian economy will accelerate the phase-out of fossil fuel use. There will be a decisive switch to electrification, or to low-carbon molecules (hydrogen, methane, ammonia, etc.) where electrification is not possible. This will entail a profound societal change that needs to be well prepared so that the final steps in the energy transition take place in the most sustainable and cost-effective way.

In the Belgian Electricity System Blueprint 2035-2050, system operator Elia looks further ahead than the usual 10-year time frame used in reports on security of supply or grid development. The calculation model in this study quantifies, for the first time, the entire energy system, encompassing both electricity and molecules as well as the economic and technical implications of variations in energy mix.

Given the long lead time (at least 10 years) for the development of large-scale generation and transmission infrastructure, there is an urgent need for a long-term vision providing direction for the future. The report shows that not taking a decision is the costliest option in every scenario and will double Belgium"s dependence on electricity imports by 2050 (compared with 2020).

Recent policy decisions (development of the Princess Elisabeth offshore wind zone, extension of the lifespan of nuclear power plants, etc.) mean that low-carbon electricity generation in Belgium will increase significantly in the coming years. However, due to the rising demand for electricity, this will no longer be sufficient in 10 years" time. If policy remains unchanged, we will see Belgium"s dependence on electricity imports steadily increase, from 50-60TWh in 2036 to 70-90TWh in 2050.

Without a long-term strategy on the future energy mix and new policy measures, Belgium will therefore become more reliant on electricity imports. In an integrated European electricity market, exchanging power is common practice. Even so, the level of dependence we seek to achieve must be based on a carefully considered strategy. Indeed, this choice has implications for the price of electricity, the trade balance, and our autonomy in energy, climate, industrial policy, and fiscal matters.

Although its domestic renewable generation is insufficient in the long run, Belgium has every interest in maximising its solar and wind potential (both onshore and offshore). Various future scenarios show that domestic renewable generation has a positive effect on the cost of the electricity system, including construction, maintenance, and costs for the proper functioning of the system.

There are several options for supplementing the shortage of domestic renewable generation. In our "central scenario", "non-domestic offshore wind" as an additional large-scale electricity source is more cost-effective than "new nuclear". However, the study also calculated other scenarios that, based on a sensitivity analysis, arrived at different results. Thus, there is still considerable uncertainty about future technology costs and, especially for nuclear power, about the success of planned technological developments.

Therefore, various considerations and diversification strategies must be taken into account in order to determine the future energy mix. The development of non-domestic offshore wind requires international agreements on planning and financing, among other things. And while new nuclear power plants also appear to be a viable solution, these come with their own challenges in terms of safety, location, complexity, and financing.