

Belgium electricity supply forecast made by Energyville Path2050 report is irrelevant!

SUMMARY

The Energyville Path2050 report is wishful thinking !

Technical assumptions are too optimistic, technology developments are unlikely, and the modeling parameters are questionable.

Their conclusions are therefore irrelevant, misleading and propose an unrealistic renewable infrastructure for the future.

100TWh, the citizen movement for a sustainable electricity mix where nuclear energy constitutes the most important part, recommends the Energyville's readers to reconsider the nuclear possibilities to reach carbon neutrality by 2050.

WHO IS ENERGYVILLE?

According to their brochure "Energyville is a collaboration between the Belgian research partners KU Leuven, VITO, IMEC and UHasselt in the fields of sustainable energy and intelligent energy systems. Energyville develops technology and knowledge to support public and private stakeholders in the transition to an energy efficient, decarbonised, and sustainable urban environment"

100TWH ANALYSIS OF THE ENERGYVILLE'S REPORT PATH2050

On Oct 12th, 2022, Energyville issued a report defining the theoretical path Belgium would have to follow to reach carbon neutrality by 2050.

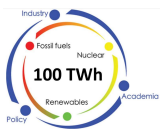
Would the carbon neutrality be achievable, the path described by Energyville is very questionable. The study assumes very optimistic developments of technologies to produce electricity to replace fossil sources. This implies a drastic change in the production means of our industry. No consideration is given to the implementation calendar, phenomenal expenses or our competitiveness on international markets. The study does neither consider the profound adaptation of the lifestyle and habits of our citizen.

For 100TWh this "study" is untrustworthy ! At best, it can be regarded as a theoretical dream, but being unachievable. If implemented, it might turn into a nightmare!

Let us point out some fundamental mistakes or weaknesses!

1. Energy intensity

The technical note, accompanying the Energyville's study « Description of the Energyville TIMES Be model », mentions « an intensity of 18.4 TWh/km² » (*Study page 3*). But according to FPS Economy, today's primary energy consumption in Belgium is ~450 TWh/y or 0.015 TWh/km².



2. Reduce energy needs by 30% and keep the same GDP in 20 years!

Energyville ensures that no sector will have to reduce its activity to reach the carbon neutrality in 2050, except the oil industry for evident reasons. But at the same time, their Belgian « Final Energy Demand » falls from 350 TWh in 2020 (why is this different from FPS Economy?) down to 250 TWh in 2040...

This is even more questionable since Energyville recognizes that industries like steel manufactures will use more energy to reach the carbon free objectives: « EUROFER estimates that by 2050 the steel sector will consume 400 TWh (seven times the current EU steel industry demand) for electric processes and hydrogen production » (*Study page 12*)

Furthermore, Energyville admits that new processes like de carbon capture usage and storage (CCUS) for cement plants are needed but not yet in use today. And « steelmaking in Europe will need to reduce around 21 MtCO₂ /yr through CCUS » (*Study page 12*). All these will increase the energy demand implying that a reduction to 250 TWh is unlikely.

Industry, Transport, Residential, Commercial and Agriculture are concerned. For all these sectors Energyville suggests: « To reach carbon neutrality the sectors can invest in energy efficiency measures like building renovation, more efficient vehicles, efficiency gains in space heating systems, and so on. Furthermore, new process technologies are modelled: fuel substitution, electrification, the use of synthetic molecules like hydrogen or for the industry and supply sector in CCUS or CCS » (*Study page 8*). But Energyville doesn't reveal how their model defines the magic combination of those technologies leading to the aimed carbon neutrality: the model « ...decides which technology to install that minimizes the system cost considering the electricity demand and hourly profiles. The portfolio of technologies available for the model includes gas turbines, biomass plants, CHPs, solar PV, wind onshore and offshore, hydrogen turbines (from 2030 onwards), existing nuclear reactors and nuclear small modular reactors (available from 2045) » (*Study page 30*).

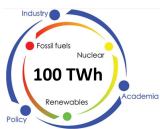
Surprisingly enough, the life extension of existing nuclear reactors is not considered by their model even if this kind of nuclear is and remain the cheapest and safest way to produce electricity according to the OECD and IEA!

Instead of life extension of nuclear reactors, their model concludes that the cheapest way to decarbonize is to build 6 GW of Small Modular Reactors (SMR), which is exactly the power of the Belgian reactors nowadays! This is only understandable if the Energyville's researchers have taken for granted the political decision of the Nuclear Phase-Out imposed by the 2003 Deleuze Law, which raises the question of the scientific independence of Energyville!

3. False assumptions and technical mistakes

Beside the above-described mistakes, the assumptions made by Energyville to feed their model are unrealistic (*Study page 8*).

Solar panels: the model assumes 104.1 GW installed in 2020 while Elia mentions 6.1 GW. This implies that 4 % of the 23.688 km² non-forested area in Belgium would be covered by solar panels!



District heating: from 1.21 TWh in 2020, the study foresees 5.20 TWh in 2025, and 9.20 TWh in 2030. How would it be possible to build this infrastructure in such a short period, knowing the technical and social challenges that would be faced?

Onshore wind: from 2.8 GW in 2020 (same as for Elia), the study predicts 4.0 GW in 2025, 5.0 GW in 2030), and 18.27 GW in 2035 and beyond. According to Energyville, « To reflect the current hurdles in the growth of onshore wind, mainly due to local acceptance, we have included an annual growth constraint of 250 MW from 2020 to 2030. After 2030, this annual growth constraint is released ».

This implies that 6 % of the 23.688 km² non-forested area in Belgium, including urban areas, will be covered by wind turbines! Again, is such a growth realistic?

Offshore wind: according to Energyville, « investment in direct access with a 'High Voltage Direct Current' (HVDC) connection of 16 GW of the vast offshore wind potential in other parts of the North Sea is possible. For the availability factor of offshore wind far from the North Sea (like Doggerbank), we have used a capacity factor of 60% ». This capacity factor is 50% above the actual offshore factor! The existence of such large and windy fields only 300 km off the Belgian coast is still to be demonstrated.

Hydrogen: the model forecasts future price of 1.7€/kg H₂ produced by water electrolysis (*Study page 10*). But given the present market price for H₂ produced by steam reforming of methane (1.7-2.4 €/kg) and the IRENA report on the possible evolution, even if progress in the technology is foreseeable, the expected target price considered by Energyville seems rather optimistic!

Energyville also assumes that « pure hydrogen can be imported through cross-border pipelines », ignoring that a design of such pipelines avoiding leakages for the smallest molecule in nature does not yet exist.

4. Electricity import

In the Energyville's model, « Power interconnection capacity increases from 6.5 GW in 2020 to 13 GW by 2040 ».

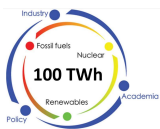
Thus in 2040, Belgium would have enough interconnection capabilities to almost overcome the seasonal electricity scarcity estimated by Elia for 2025.

Here again, Energyville takes its dream for reality even if it and mentions that its “TIMES works with the concept of ‘copper plate’, which simplifies the actual electricity flow in the grid. However, although this approach guarantees the energy balance in all periods and provides insight into the quantity of electricity flowing in each voltage level, it doesn't assess the flow balance and possible congestion of the grid”? (*Study page 31*).

Are the conclusions of such a model reliable?

5. Carbon capture

“Carbon capture and storage (CCS) technology is crucial in both the industry and supply sectors to achieve fast reductions by 2030. From 2030 onwards, 20 million ton of CO₂ emissions are annually captured, transported, and stored cross-border”. (*website [PATHS2050](#)*)



Where will Belgium find safe leak-free underground locations to store that quantity of CO₂?
Would any country accept it? At what cost?

6. Electricity storage

The Energyville's study recognizes that there is a need for "Improving flexibility options to accommodate large volumes of intermittent renewable electricity production", especially "battery storage" (*Study page 4*)

Although smart grid management could make it possible to shift some specific consumptions by a few hours or a few days at most to be more in line with the renewables production, that will be virtually impossible at the week, month or season level. Therefore, renewable energy intermittency does not allow to fulfill the grid demand at any time.

But the use of batteries to store foreseen overproduction in long sunny or windy periods is not possible at the scale of a country. According to 100TWh, to cover the electricity needs as experienced in 2022 and to minimize recourse to imports/exports, the energy storage requires a minimum of 10,750 GWh for the "Central" scenario of PATH2050 and a minimum of 2,000 GWh for the "Electrification" scenario.

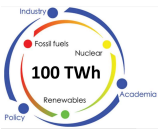
With these figures, Belgium would need at least 400 times the capacity of Coe, our biggest electricity storage facility, which is totally impossible !

7. Costs

Energyville forecasts annual expenses 21G€ to reach the "zero" carbon energy. This is 4,2% of Belgium's 2021 GDP (502 G€) !

But Energyville concedes "Having access to 16 GW additional far offshore wind and 6 GW new nuclear 'Small Modular Reactors' leads to the lowest annual societal costs, 11,7 billion euro" per year! This is still 2.3% of the 2021 GDP. This is also higher than the average annual growth observed in the last 10 years, which is only 1.5%!

Could Belgium really afford those expenses?



100TWH CONCLUSION

Our conclusion is that the Energyville Path2050 report is wishful thinking !

The report is based on too optimistic technical assumptions and improbable technology developments, and it relies on questionable modeling parameters.

The conclusions are therefore not only irrelevant, they are also misleading, and make a dream look like a possible reality – which it is not.

Instead of imposing unrealistic renewable infrastructures, 100TWh recommends the Energyville's readers to reconsider the nuclear possibilities to reach carbon neutrality by 2050.

Reference site [PATHS2050](#)