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Belgium, as a member state of the European Union, has to set ambitious targets towards carbon-neutrality by 2050; this ambition in turn requires a carbon-neutral energy supply to all end use sectors in Belgium on their respective pathways towards a net-zero carbon future. However, how much renewable electricity from wind and solar can be generated within the Belgian borders?

EnergyVille/VITO has estimated the technical potential for renewable energy generation from PV on roofs and onshore wind installations in Belgium to be 118 GW. The assessment is based on a spatial explicit approach to account for the roof area and land requirement of decentralized electricity generation in a country where space is scarce. To this end, it builds on recent collaborations with local and regional authorities and their policy frameworks and ambitions.

The study is part of the BREGILAB project (Balancing the Belgian electricity system for maximal use of Renewable Energy generation by a Grid Injection Limit Algorithm and optimal Battery deployment) which investigates how a balanced electricity system can be established in Belgium at minimal cost.

The Dynamic Energy Atlas (DEA, Figure 1) is used to map and analyze both current and potential solar and wind electricity generation. The software tool combines spatial data and spatial modelling with technology and meteorological data to produce results on the spatial resolution of 100×100 meters for the entire Belgian territory - including offshore.

Construction permits for wind turbines are subject to safety and policy guidelines that aim to keep the risk for accidents, nuisance or impact on the environment as low as possible. Therefore, a list of distance limiting criteria (e.g. distance to housing, transport infrastructure) and no-go zones (e.g. nature reserves) are to be taken into account when modelling the available space for additional wind turbines. Not all aspects of this potential impact can be grasped with one single distance rule for each turbine type or boundary condition.

Solar technology is a rapidly developing field with continuously improving efficiencies of PV modules [1]. For the assessment of additional potential on residential and commercial roofs the SPR-MAX3-400 premium market module (226 Wp per m?) is selected which is expected to be common in the next 5 to 10 years. It remains a conservative estimate because according to the ITRPV projections PV technology is expected to evolve to efficiencies far beyond that figure as new technologies will become mainstream (e.g. tandem cell technology).

The potential for ground-mounted PV, floating PV and building integrated PV (BIPV) offer an important additional opportunity to increase the use of PV in Belgium. Unfortunately, no clear policy guidelines exist to prioritize ground-mounted PV over other land uses (waterbodies, agriculture or industrial complexes) nor to evaluate in a spatially explicit manner the technical potential for BIPV in a reliable way and therefore are not

yet assessed in this study.

To assess the total additional capacity that can technically be installed and the respective hourly electric energy that could be generated, the identified locations for wind and PV solar are combined with technical parameters and meteorological data from the year 2017. This results in a dataset of additional renewable capacity and the corresponding hourly energy generation for each location in Belgium. Figure 3 and Table 1 report for the regions the installed capacity and technical potential considering future technology options for the different regions in Belgium.

Attention: The information contained within this table is based on the assumptions specific to the BREGILAB project, information provided by third parties and sensitive to progressive insight over the course of the research project (end date 2022).

The resulting map (Figure 4) indicates that the Antwerp harbor region, northern part of East-Flanders and the southern parts of Luxembourg, Limburg and Hainaut have a high potential for additional onshore wind generation. Brussels, both Brabant provinces, the coastal region and the northern parts of Li?ge, Limburg and Hainaut have a low technical potential.