

## **GIS-based optimization – achieving Austria's 2030 wind energy target**

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### **Abstract-**

**In this paper, we take a look at Austria's renewable energy targets established in the Renewable Energy Expansion Act (EAG), aiming to annually generate an additional 10 TWh of wind power by 2030. We conduct a GIS (geographic information system)-based analysis to determine average wind power density in Austria on a cellular level while considering prohibited regions, such as national parks, where building wind turbines might not be allowed. The calculated expansion potential for all remaining regions of Austria is allocated to the closest corresponding transmission nodes. Furthermore, we suggest an optimization algorithm to geographically distribute the expansion of wind power capacity to applicable transmission nodes. Finally, we conduct a case study to validate the algorithm using historical data on expansion and utilize it to predict an annual scenario for wind power expansion from 2021 to 2030 on a regional level. The total expansion required to achieve the goal of 10 TWh is assessed to be 4 GW based on predefined full load hours while assuming an exponential increase in annually added capacity (from 250 MW in 2021 to 590 MW in 2030).**

**Index Terms-** wind power; renewable energy; GIS-based analysis; wind power potential; Weibull distribution; optimization.

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### **Citation:**

*Gaugl, R.; Klatzer, T.; Bachhiesl, U.; Wogrin, S.; Jodl, S. "GIS-based optimization – achieving Austria's 2030 wind energy target", Elektrotechnik und Informationstechnik, vol.138, no.8, pp.590-596, December, 2021.*