

Can nuclear be part of Norway's energy system, and if so, where should it be placed?

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Popular science based on master thesis:

Pre-study for SMR and nuclear establishment in Norway

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The world's largest producer of clean energy is Norway, where 98.5% of the energy produced comes from renewable sources. Most of the energy produced in the country comes from hydropower, and thanks to the country's stable power production, Norway has affordable and stable access to electricity. However, forecasts expect that by 2027, Norway will risk having a higher energy consumption than energy production and thereby an energy shortage. The construction of new energy production is therefore being investigated. But with new wind power and hydropower facing public resistance, new energy technologies, such as new nuclear technologies called small modular reactors (SMRs), are gaining more focus, and being investigated in the country.

The master thesis, which this article is based on is divided into two parts. The first part investigates Norway's different county's energy production, consumption, and energy balance to see which county is importing energy from neighboring counties and could benefit from new energy production being constructed within the county. The second part investigates the chosen county's geographical and infrastructural advantages and disadvantages for constructing an SMR.

By analyzing energy production and consumption data from 2021, every county's energy balance in Norway can be calculated. The energy balance is the relation between energy production and consumption and indicates if the county consumes or produces more energy than it needs.

The analyze resulted in the county Møre og Romsdal being chosen for further investigation due to its low energy balance and its high energy consumption from the industry.

Møre og Romsdal was then evaluated based on different criteria taken from SMR siting guidelines from the International Atomic Energy Agency, similar studies, interviews with nuclear consultants from WSP, and the county's geographical and infrastructure advantages and disadvantages.

Two groups were then set up with different criteria. The restriction criteria made an area either suitable or unsuitable. These included airports, flooding, protected areas, industry, landslides, population, and hydropower plants.

The evaluation criteria gave an area a suitability score based on the distance to roads, railways, cooling water, transmission lines, and topography.

Both groups were combined and analyzed with the ArcGIS Pro computer program, which can explore, analyze, and visualize data to create 2D and 3D maps. With ArcGIS Pro, four different suitability maps were created, showing suitable sites for SMRs, ranging from very suitable to unsuitable.

The results showed that constructing an SMR is entirely possible in Møre og Romsdal, with 58 square kilometers available in the very suitable category. The results are, however, heavily dependent on the transportation network, with railways only existing in a small part of the county. If the county would invest in a new type of transportation, such as new ports close to the SMR construction site, a significantly larger area would open up to the very suitable category, and the possibility of constructing an SMR would be even more promising.

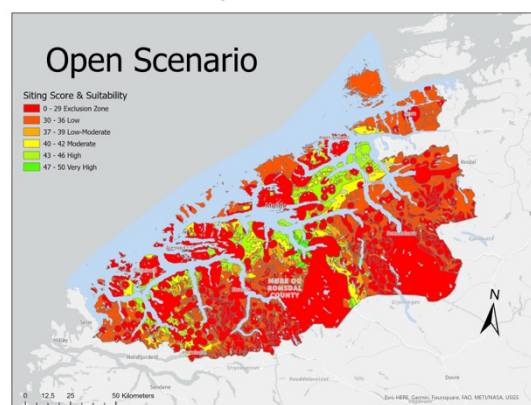


Figure 1 Suitability map.