



## Integration of Renewable Energy Sources in High Voltage Transmission Grids

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### Description

As the world increasingly recognizes the pressing need to reduce greenhouse gas emissions, renewable energy sources such as wind, solar, and hydroelectricity have emerged as key players in the fight against climate change. However, the intermittent nature of these sources poses challenges for their integration into high voltage transmission grids, which are designed for the reliable and continuous delivery of electricity. The integration of renewable energy sources into high voltage transmission grids is not only feasible but also necessary to transition to a sustainable energy future.

Firstly, it is important to acknowledge that the integration of renewable energy sources into high voltage transmission grids is not a new concept. Many countries, including Germany, Denmark, and Spain, have made significant progress in incorporating wind and solar power into their grids. However, these countries have experienced grid stability issues due to the variability and unpredictability of these sources. For instance, sudden changes in wind or cloud cover can cause fluctuations in power output that can destabilize the grid and compromise its reliability.

One solution to this problem is the deployment of energy storage systems, which can store excess energy during times of high production and release it when production decreases. Battery storage systems, in particular, have become increasingly popular due to their decreasing costs and improving performance. However, large-scale

deployment of these systems is still limited by the high upfront costs and the lack of standardized regulatory frameworks.

Another promising solution is the use of demand-side management techniques, which involve adjusting electricity consumption patterns to match renewable energy production. For example, electric vehicle charging stations could be programmed to charge vehicles during periods of high renewable energy production, rather than during peak demand times. This would not only reduce the strain on the grid but also increase the overall utilization of renewable energy sources.

In addition to these technological solutions, policy support is crucial for the integration of renewable energy sources into high voltage transmission grids. Governments can incentivize the deployment of renewable energy sources through feed-in tariffs, tax credits, and other financial mechanisms. These policies can help level the playing field for renewable energy sources and provide the necessary market signals for investment in renewable energy technologies.

Furthermore, regulatory frameworks need to be modernized to enable the integration of renewable energy sources into the grid. For instance, grid codes need to be updated to account for the variability of renewable energy sources and to ensure grid stability. Additionally, grid operators need to be trained and equipped to manage the complexities of a grid that relies heavily on intermittent renewable energy sources.

Finally, public education and awareness campaigns are also important for the successful integration of renewable energy sources into high voltage transmission grids. Many people still view renewable energy sources as unreliable or costly, and it is essential to dispel these misconceptions to build support for the transition to a sustainable energy future.

### Conclusion

In conclusion, the integration of renewable energy sources into high voltage transmission grids is not only feasible but also necessary to transition to a sustainable energy future. While there are challenges to overcome, such as the variability of renewable energy sources, technological advancements and policy support can help overcome these challenges. Governments, regulatory bodies, and the public all have a role to play in making the integration of renewable energy sources into high voltage transmission grids a reality. By working together, it can create a more sustainable energy system that benefits both current and future generations.