Traditionally, CAES technology has been used for grid operational support applications such as regulation control and load shifting. But a new major possibility that is especially relevant for a carbon constrained world is to enable exploitation at large intermittent wind resources that are often remote from major electricity demand centers. CAES appears to have many of the characteristics necessary to transform wind into a mainstay of global electricity generation.

The wide availability of potentially suitable geology in wind-rich areas points to CAES as a technology well-suited for making baseload power from wind—thereby making it feasible to provide wind power at electric grid penetrations far greater than 20%+ penetration rates that are feasible without storage. And, to the extent that wind-rich regions are remote from major electricity markets, such baseload power can often be delivered to distant markets via high voltage transmission lines at attractive costs.

Previous studies on the combination of wind and CAES have focused on economics and emissions. This report highlights these aspects of baseload wind/CAES systems, but focuses on the technical and geologic requirements for widespread deployment of CAES, with special attention to relevant geologies in wind-rich regions of North America.

Large penetrations of wind/CAES could make substantial contributions in providing electricity with near-zero GHG emissions if several issues can be adequately addressed. Drawing on the results of previous field tests and feasibility studies as well as the existing literature on energy storage and CAES, this report outlines these issues and frames the need for further studies to provide the basis for estimating the true potential of wind/CAES.
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