# What Will it Take for AWE to be Successful in Remote & Mini-grid Applications?

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AWES show promise to greatly increase the potential of wind harvesting on a global scale. However, due to the significantly higher costs than other renewable energy sources like solar PV & conventional wind plants, many AWE system integrators target off-grid / mini-grid markets for their initial commercial products in the 100-500 kW range, as cost-constraints are believed to be less of a hurdle in these markets.

While this appears to be a viable strategy to increase the number of deployed units and drive down cost via learning effects, a number of critical real-world parameters need to be considered for the design of these initial products.

Modern mini-grids generally use a solar-battery system with diesel backup, achieving a 30-70% solar share. Adding AWES will increase the share of renewables at a cost below that of additional solar PV & storage. AWES will not be able to compete with solar PV during daylight hours in most locations, as PV costs are already very low (investment costs of <$150 / kWh / day). Instead, AWES are needed at night and during bad weather, when solar PV would require storage, driving up investment costs to around $500 / kWh / day (in 2019 but falling by 10% annually).

There are some requirements for early commercial AWES products:

(a) Ability to operate during night-time and bad weather need to be demonstrated early on.

(b) Initial mini-grid deployments will often be in remote, harsh (e.g. arctic, tropical, marine) environments and components need to be designed to withstand these conditions.

(c) Given that most potential clients will already have deployed solar and storage, in-house development of balance of systems and storage integration by AWES manufacturers is probably not required, as this task can be outsourced to existing technology providers.

(d) Fully autonomous operation is not a key requirement, as most potential clients have local operators for the diesel generators.

(e) Cost of business development for these applications is high, as customers are in remote locations. Suitable business development strategies, including commercial frameworks for distributors and local O&M providers, will need to be developed early on.

(f) While ground-space can be a concern on islands, airspace is often not a problem, but it makes a compact design (shippable in standard ISO containers) a must.

(g) Demonstrating the complementarity of AWE production with solar PV needs to be a priority for the industry, as this will provide a justification for further investment by both public & private funding sources.