



Renewable Energy Storage Megastructures

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Abstract

Renewable energy is seen as a source of clean, safe and sustainable energy. Many renewable energy sources however have a common Achilles' heel, namely intermittent energy supply.

This paper confirms the global need for energy storage. The Super Flywheel Concept, a renewable energy storage megastructure, is then put forth as a possible solution to the challenge. Flywheel storage was specifically chosen as it is seen to be safe, environmentally clean, low maintenance and scalable.

By evaluating the conceptual design, construction materials, buildability and energy storage capacity of the Super Flywheel, the concept was ultimately deemed to be feasible.

Though not one of the key objectives, it was also determined that a similar concept may be used for the electrification of rural African villages...

Keywords: renewable energy; energy storage; flywheel; sustainability; megaproject; buildability; project management.

1 Introduction

1.1 Background

Renewable energy is generally seen as a source of clean, safe and sustainable energy. Many renewable energy sources however have a common Achilles' heel, namely intermittent energy supply.

These periods of intermittent supply need to be covered either by traditional energy supplies (coal, gas or nuclear power etc.) or by storing excess energy during times of generation.

In addition, South Africa currently faces the challenge of not having sufficient power generation capacity, especially during peak demand periods. Energy storage is therefore seen as a possible solution to this problem by allowing

better use of the existing power generation capacity (i.e. during off-peak periods).

As humanity moves towards greater investment in renewable energy sources, the need for energy storage will become ever greater. A country that uses more than 50% renewable energy would theoretically not be able to make up the shortage if all of the renewable energy sources stopped during periods of peak demand (after dusk and no wind for instance).

The Centre for Renewable Solar and Energy Studies (CRSES) in Stellenbosch has however found that the use of up to 40% renewable energy is considered the maximum, as the planned shutdown/maintenance of traditional power generators needs to be taken into account.