# THERMAL ENERGY STORAGE TO PROVIDE DISPATCHABLE LOW-CARBON PROCESS HEATING

Ref-No: TA-20221

## BACKGROUND

The proposed solution is a TES system which can utilize waste heat or excess (ideally renewable) electricity and store the contained energy in a low-cost storage media. The system can be charged using waste heat passed through the system or through electrical heating where this energy can then be stored for use as required (generally a few days but can be longer if necessary). When the energy is required, it is retrieved by way of a heat transfer fluid (HTF) which can then be used directly in a process or deliver contained energy to another fluid by way of heat exchange. For applications requiring power generation, the discharged thermal energy can be converted to electrical energy by way of a steam-, air-, or supercritical carbon dioxide power block. Additionally, storage materials are chosen so that they are non-toxic, abundant, low-cost, have low environmental impact, well suited to high temperatures, and are capable of large numbers of thermal cycles (e.g., natural materials, ceramic or ceramic-like materials, molten salts, etc.).

## SOLUTION

The main value of the system is the storage of energy thermally in a low-cost media which is significantly cheaper than traditional storage. When required the stored energy can be retrieved and used directly and/or converted to electricity. The storage media is selected to minimize system costs, size, and environmental impact and is suitable for longer duration storage. The storage material does not degrade with charging and discharging and can be recycled or easily disposed at the end of system life (> 25 years). The system is designed in such a way that it is suited to high temperatures (up to 700 °C) and thermal cycling, leading to a long lifetime, while the system is also modular, allowing process or site expansion as required. The technology is best suited for air-based applications with a heat requirement from 150-250 °C, although higher temperature applications are possible or other fluids usable. Furthermore, in coupling with a power block, the discharged thermal energy can be converted to electricity. Longer term work will aim to develop novel storage materials which will increase system efficiency, increase storage density, and reduce system cost.

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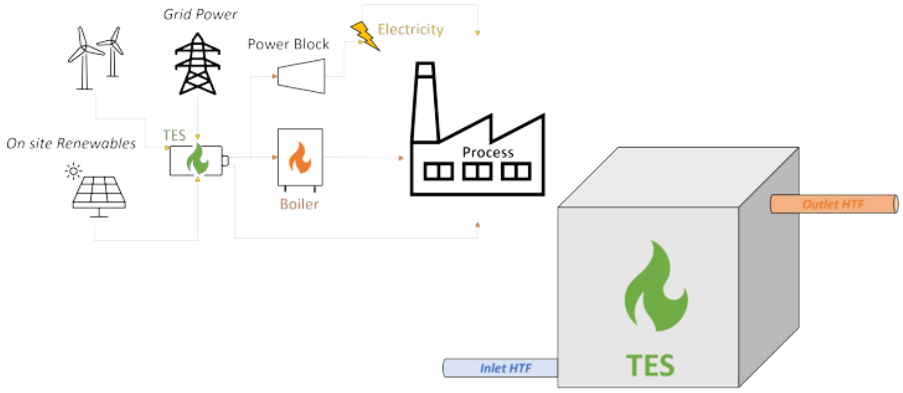
## DEVELOPMENT STATUS

Prototype

## CATEGORIES

//Energy engineering //Energy engineering and energy storage //Chemistry




## SCOPE OF APPLICATION

The technology is well suited to air-based lower temperature applications (150-250 °C) of a smaller size (i.e. < 5 $MW_t$). Ideally, the application is continuous or largely operates in non-solar times (i.e. 6PM-8AM). As the system is designed to be low maintenance, remote areas or sites with limited personnel are also beneficial. Grid restrained operators are also well served by this technology.

There are several business partnerships which may be beneficial:

- Direct selling of technology to end-user
- Licensing of technology to 3rd party who can then on sell to end-users
- Licensing of storage material to thermal engineering company for use in their product offerings or development of their own TES system
- Commercial partnership with power block manufacturer to develop 'carnot battery' systems (i.e. TES with a power block to deliver thermal and/or electrical energy)
- Research collaboration by way of contract research to further develop TES concepts, containment materials, impact of power block integration, or storage media

## SERVICE

If you have questions about the technology please refer to:

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