

## European Solar Energy Storage

# Sun and moon energy storage



## Overview

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How can energy be stored on the Moon?

The environmental conditions of the lunar surface and its day-night cycle, with long periods of darkness, make the provision of energy a critical challenge. Several approaches have recently been considered to store and provide energy in the surface of the Moon by means of ISRU (In-Situ Resource Utilisation).

Can an ISRU-based system store heat and generate electricity for lunar missions?

We present a trade-off analysis of the options identified for an ISRU-based system to store heat and generate electricity for lunar missions with both robotic and human activities. A critical review of the energy requirements for a mission scenario consisting of long duration stays on the lunar surface has been carried out.

Is solar energy a viable option on the Moon?

Given the unique conditions of the lunar environment, solar energy stands out as the most viable option. With no atmosphere to scatter sunlight and long periods of uninterrupted solar exposure at certain locations, the Moon offers favorable conditions for harnessing solar power.

Can energy be stored in a lunar regolith?

Storage of energy in lunar regolith of any kind has never been tested, neither on Earth nor on the Moon. Heat has been stored in concrete at DLR and at EnergyNest, although a generator has never ran for the time required in our application. 3.2.4. Heat-to-electricity conversion.

Can a robotic system store energy on the Moon?

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Utilisation). We present a trade-off analysis of the options identified for an ISRU-based system to store heat and generate electricity for lunar missions with both robotic and human activities.

How can we develop a sustainable power system on the Moon?

Developing a sustainable power system on the Moon will involve integrating multiple energy sources, ensuring that a stable and continuous power supply can support future lunar settlements and scientific missions.

## Sun and moon energy storage

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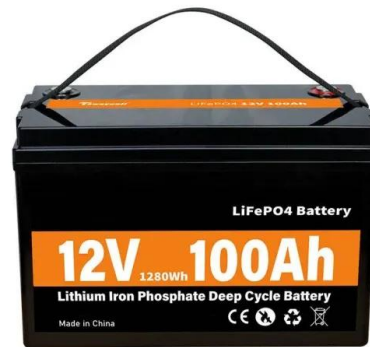


### Optimizing Moon Energy Storage for Resilience: A 20-Year Life ...

This study focuses on battery technology and presents an algorithm to identify the smallest possible battery that can meet the energy needs of the microgrid for the intended duration of the battery's life. Simultaneously, it determines the battery's ideal operating conditions.

### Generating and storing power on the moon using in situ resources

We have selected solar concentrators with thermionic conversion for solar-electric energy generation and flywheel energy storage as the solutions suited to the Moon as well as constructible from lunar resources.



### Lunar ISRU Energy Storage and Electricity Generation

We present a review of the energy requirements for a long mission scenario, and a trade-off analysis of the potentially suitable technologies for an ISRU-based system able to store heat and generate electricity. The most promising combinations of technologies are presented.

### Novel thermal energy storage and electricity ...

In a more concise definition, the main objective is to perform numerical and experimental studies for the design of an efficient technology for storing thermal energy, and reusing it to produce electricity in situ.



## Novel thermal energy storage and electricity generation for Moon

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## (PDF) Moon Energy Storage and Generation

Assess the potential of thermal energy storage systems to store heat and re-use it for in-situ electricity production as means of supporting future lunar exploration scenarios.



## Heat storage and electricity generation in the Moon during the ...

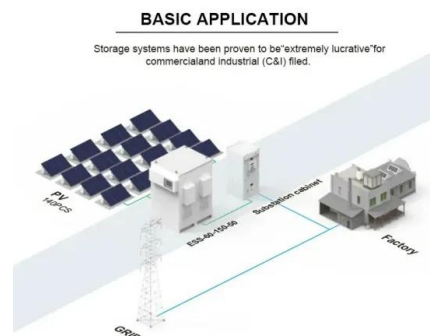
The second system studied here is the Thermal Energy Storage (TES), which is able to run a heat engine during the lunar night to produce electricity. When the Sun is shining on the Moon's surface, the system can run the engine



directly using the solar power and simultaneously heat a thermal mass.

## Lunar ISRU Energy Storage and Electricity Generation

A critical review of the energy requirements for a mission scenario consisting of long duration stays on the lunar surface has been carried out. Technologies potentially suitable for system components have been identified.

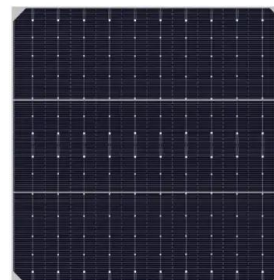


## How We Will Power the Moon , New Space Economy

To overcome this challenge, energy storage solutions, such as batteries and fuel cells, must be integrated with solar generation. Nuclear power represents another possibility for lunar energy production, providing a continuous supply ...

## (PDF) Moon Energy Storage and Generation

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## Lunar ISRU energy storage and electricity generation

In a sintering process, a solid mass of material is compacted and formed by applying pressure or heat at temperatures below the melting point. The most likely regolith sintering methods to be used on the Moon are based on ...

## Moon Energy Storage and Generation: Proof of Concept

Thermal wadis are engineered sources of stored solar energy using modified lunar regolith as a thermal storage mass that can supply energy to protect lightweight robotic rovers or other



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