

## European Solar Energy Storage

# Energy storage demon



## Overview

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How does Maxwell's Demon work?

Maxwell's demon presents an apparent challenge to the second law of thermodynamics by selectively sorting molecules to reduce entropy and create a gradient. Over time, Maxwell's demon analogs have evolved into molecular processors, pumps, and ratchets powered by light or external fields.

How does triboiontronic Maxwell's Demon work?

In this study, triboiontronic Maxwell's demon was realized through triboelectric-induced polarization of electrostatic fields, enabling remote control over charge distribution and migration within electrical double layers (EDLs) and allowing for precise tuning of metal work functions.

Can es-Ting generate a negative optimal triboiontronic Maxwell's Demon?

Under the action of a positive electrostatic field applied by triboiontronic Maxwell's demon, the ES-TING with saturated  $\text{AlCl}_3$  could generate the negative optimal with the ISC of  $-11.63$  mA, QSC of  $-289.17$   $\mu\text{C}$ , PR of  $-10.14$  mW, internal resistance of  $300$   $\Omega$ , and VOC of  $-0.58$  V (Figure S30), respectively.

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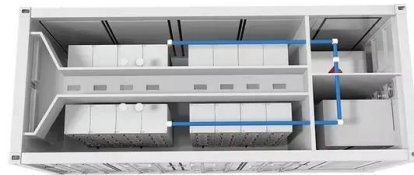
### Maxwell's Demon as a heat source on memory erasure



For this, consider the classic case of a demon separating hot and cold molecules, using an abacus for data storage. The demon measures the temperature of each gas molecule, and reduces the  $2^n$  states of the well-mixed gas to  $1$  state.

### Maxwell's Demon: New Insights into Energy Management

Inspired by a newly proposed set of fluctuation theorems, we report the first experimental verification of these equalities and inequalities in a ultracold  $40\text{Ca}$  ion system, confirming the intrinsic nonequilibrium in the system due to involvement of the demon.



### Power generator driven by Maxwell's demon

The demon's next task is to convert the generated free energy to work that acts on the surroundings. Here, we demonstrate that Maxwell's demon can generate and output electric current and power with individual randomly moving electrons in small transistors.

### Harnessing triboiontronic Maxwell's demon by

## triboelectric ...

Leveraging the triboiontronic Maxwell's demon via triboelectric-induced polarization, efficient wireless information transmission underwater and a flexible, energy-independent human-computer interface were achieved, seamlessly integrating energy harvesting, sensing, storage, and computing.



## Energy Storage 101: From Giant Batteries to Spinning Flywheels

Enter energy storage - the unsung hero of our clean energy transition. Think of it as nature's pause button, letting us capture sunshine in a box or bottle up hurricane-force winds for a rainy day (literally).

## Autonomous demon exploiting heat and information at the ...

We give a comprehensive description of the thermodynamic performance of the proposed autonomous demon in terms of stochastic trajectories and of full counting statistics and demonstrate that the precision of the cooling power strongly ...



## Maxwell demon with memory storage

In such case there is no violation of energy conservation law because the demon spends more energy for observation and calculation, but one could say that the information is stored inside the demon's memory storage.



## Information and energy exchange - on Maxwell's demon

However, according to Landauer's principle, the processing of information itself entails an energy cost, so it is considered impossible for a demon-like entity to break the law of conservation of energy.



## Harnessing triboiontronic Maxwell's demon by triboelectric ...

Inspired by the biological Max-well's demon in neural signal transmission, a triboiontronic Maxwell's demon was demonstrated, where triboelectric-induced polarization enhanced the formation of the asymmetric EDLs, enabling efficient energy-information flow.



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