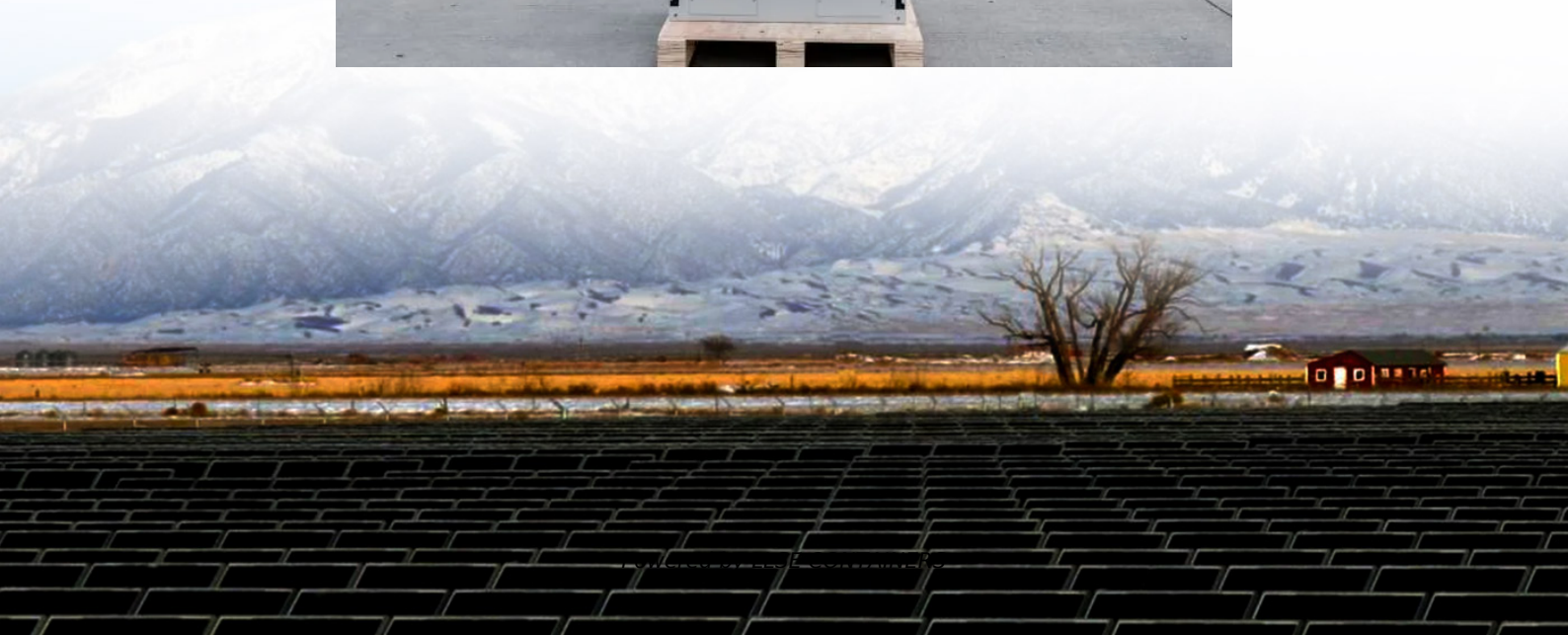


# **Italian vanadium liquid flow energy storage project**





## Overview

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The Enel X Flow Battery Project near Florence uses vanadium-based solutions to store enough solar energy to power 600 homes through dinner time (and we all know Italians take dinner seriously). What is a vanadium flow battery?

Open access Abstract Vanadium Flow Batteries (VFBs) are a stationary energy storage technology, that can play a pivotal role in the integration of renewable sources into the electrical grid, thanks to unique advantages like power and energy independent sizing, no risk of explosion or fire and extremely long operating life.

What causes vanadium precipitation?

Another factor that can cause vanadium precipitation is the species crossover through the membrane that affects the ion solubility. Due to tanks, piping, pumps, sensors, controls, reactor structure, switch converter (PCS), and BMS, a VFB power plant is usually more complex than other ECES systems. 4. Economic evaluations.

What oxidation state does vanadium have?

It exploits the ability of vanadium to exist in four different oxidation states: a tank stores the negative electrolyte (anolyte or negolyte) containing V(II) (bivalent  $V^{2+}$ ) and V(III) (trivalent  $V^{3+}$ ), while the other tank stores the positive electrolyte (catholyte or posolyte) containing V(IV) (tetravalent  $VO^{2+}$ ) and V(V) (pentavalent  $VO_2^{+}$ ).

Can kW-class vfbs be compared with all-vanadiumredox flow batteries?

The testing procedure presented in Ref. can constitute a standard approach for the performance assessment of kW-class VFBs, which at present is lacking, and can contribute to the definition of performance parameters for the comparison of different All-vanadiumredox flow batteries .



## Italian vanadium liquid flow energy storage project

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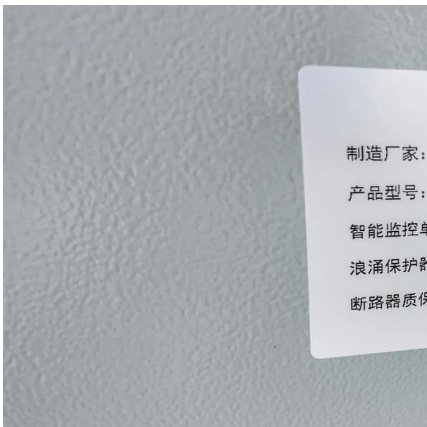


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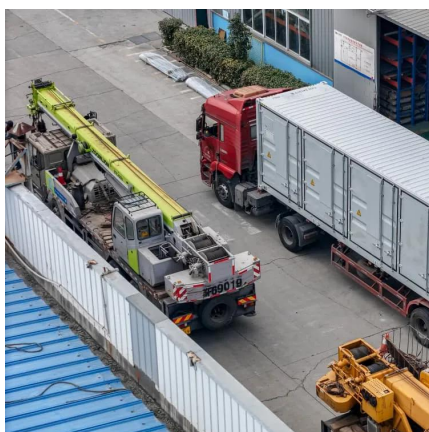
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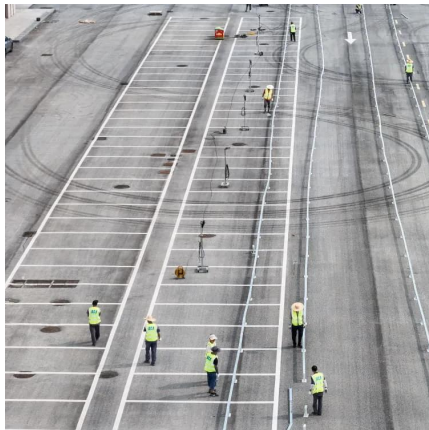
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