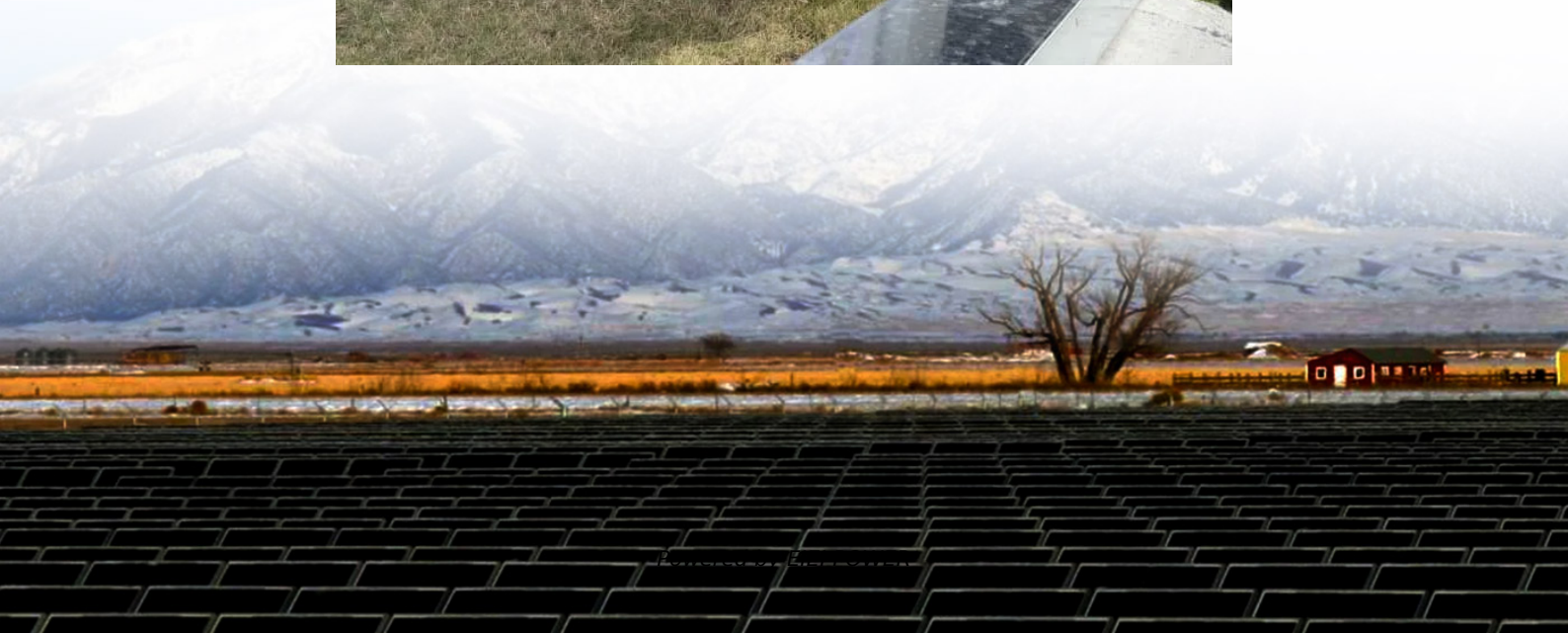


# Energy Storage Vanadium Battery Supply Chain





## Overview

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Why do we need a vanadium supply chain?

For U.S. deployments, it becomes increasingly important to onshore or friend-shore the supply chain to support the anticipated of energy storage required to transition to clean energy. Despite significant deposits, there are no primary producing vanadium mines in North America. However, plans are underway to address this situation.

What is the contribution of energy storage to vanadium demand?

The contribution of energy storage to vanadium demand is increasing rapidly

1. Overview and examples of recent VFB projects and installations outside of China (1/2) Invinity will supply an 8.4MWh VFB to a solar-plus-storage project in Alberta, Canada. It will be paired with a 21MW solar PV plant.

Can vanadium flow batteries decarbonize the power sector?

Vanadium flow batteries show technical promise for decarbonizing the power sector. High and volatile vanadium prices limit deployment of vanadium flow batteries. Vanadium is globally abundant but in low grades, hindering economic extraction. Vanadium's supply is highly concentrated as co-/by-product production.

Where are vanadium flow batteries made?

While many vanadium flow battery manufacturers are headquartered in the West, many companies utilize a contract manufacturing model. Between 70 and 80 percent of a battery system is sourced from and built in China, then shipped to finishing locations where power assemblies are added.



## Energy Storage Vanadium Battery Supply Chain

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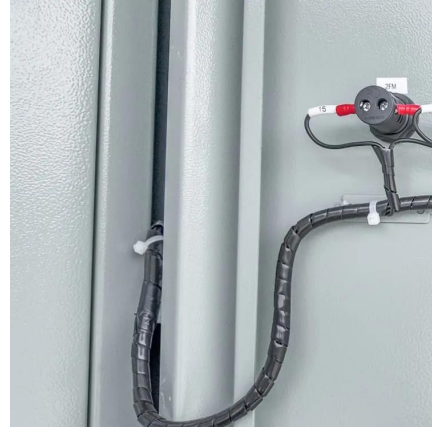


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