



Engineering Novel Large Scale Solid Media Storage to Be Inherently Safe

Alex Elliott · EVP of Engineering, Fourth Power

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Charge

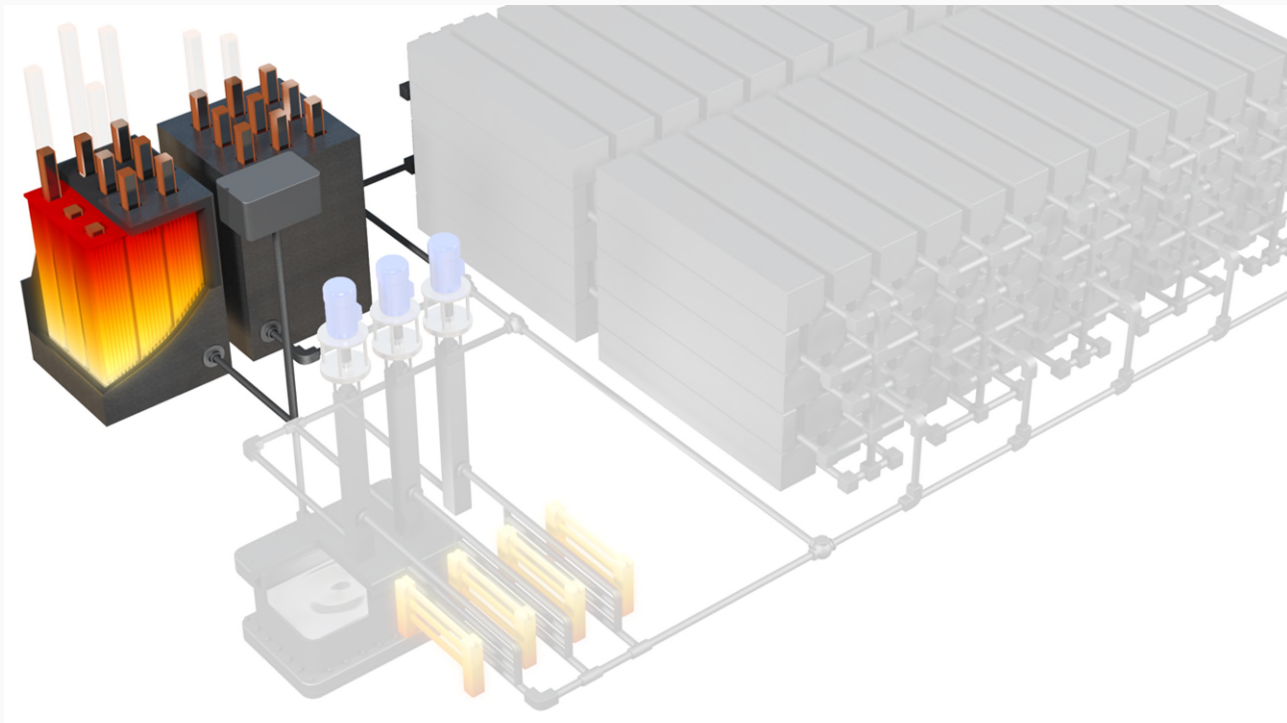
Off-peak electricity powers resistive heaters that radiate heat to graphite pipes shuttling liquid tin as the heat transfer fluid to the storage section

Store

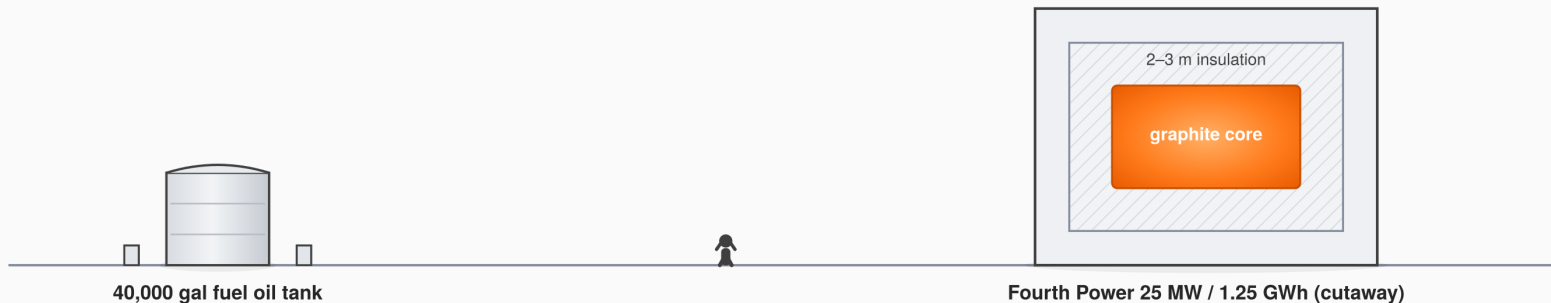
Heat is stored in graphite blocks within a heavily insulated, inert environment, resulting in minimal thermal loss for days or weeks at a time

Discharge

On dispatch, graphite pipes carry liquid tin to the Power Block where the heat is thermally emitted as high-intensity light and converted to electricity using thermophotovoltaic cells.



The right benchmark: the fuel tank we replace



ALREADY PERMITTED ON PEAKER SITES

~1.5 GWh

chemical energy · concentrated · liquid

Burns until the fuel is gone

The liquid spreads, the flame follows.

WHAT REPLACES IT, SAME SITE, SAME JOB

2.5 GWh

thermal · dilute · solid

Cools until it's boring

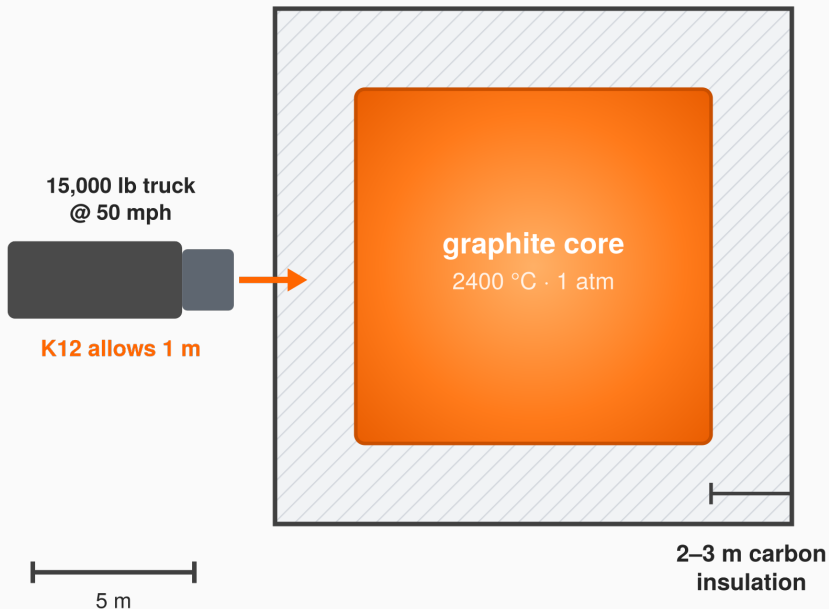
A breach stays the size of the hole, and everything that leaves must pass through it: even for a 1 m² opening the total release is on the order of normal day's standby loss

Chemical energy escapes at the speed of **combustion**.

Sensible heat escapes at the speed of **heat transfer**.

The insulation does double duty

Duty 1: hold the heat in. 1% loss per day at rest. **Duty 2: safety barrier**



99.3% of the energy is in solid graphite at 1 atmosphere. Outer surface: **touch safe, <60 °C**

0.7% as liquid tin

No pressure behind it, the only thing moving a leak is gravity. It pours, beads up on carbon, and freezes inside the insulation barrier.

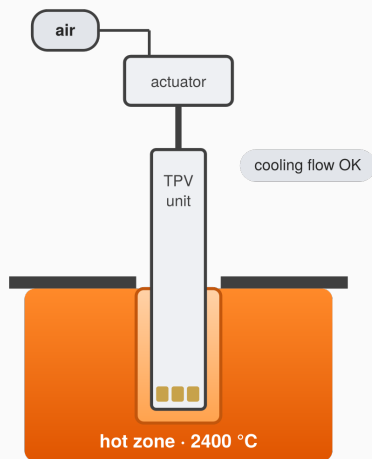
How tough is that barrier?

2-3 m of dirt-like fill: stopping mass comparable to the 1.8 m earth barrier that passed the K12 crash test. Their wall is fabric and wire; ours is a thin shell. The fill is the barrier.

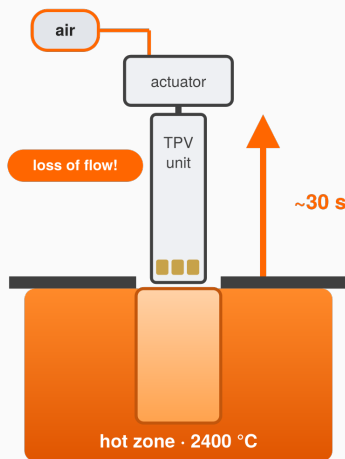
What keeps the heat in **keeps everything else out.**

Grid down, generator dead: still safe

Each module watches itself and retracts on stored on-board energy: **no operator, no grid, no generator required**



NORMAL: unit seated in cavity



TRIP: compressed air removes unit

Proven in an unplanned failure

- 1 Cooling line let go, unplanned, mid test
- 2 Loss of flow detected
- 3 Compressed air removed the unit in ~30 s, no operator intervention
- 4 No damage. Not even to the test unit.

Fault to safe state in ~30 seconds

Water on board: **5 gallons per power unit**. Worst case draws **0.003%** of stored heat and vents outside the building.

Engineering Safety From Fundamentals

INHERENT

solid media · 1 atmosphere · sensible heat · 99.3% of energy immobile

PASSIVE

2–3 m insulation mass · non-reacting material choices · crush-tolerant barrier

ACTIVE

flow monitoring · compressed-air unit removal (~30 s) · engineered venting

PROCEDURAL

no safety function relies on a procedure

The storage safety is inherent. Everything around it fails safe. · Thank you