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Flow batteries are a viable alternative

I'm submitting my prior comments as a PDF, as my text-based submission did not get published with the right formatting.

Additional submitted attachment is included below.

<u>Flow batteries are a viable alternative</u>

The developer's characterization of flow batteries as "infeasible" for utility-scale projects is inaccurate and does not reflect the state of the technology. While lithium-ion has dominated early deployments in California, flow batteries have distinct advantages for grid-scale applications and are already being deployed at commercial scale internationally.

1. Proven at Scale

Contrary to the assertion that flow batteries are "not a proven technology at this scale," multiple utility-scale projects have already been constructed and are operating. For example, Rongke Power in China has developed over 3.5 gigawatts of vanadium redox flow battery projects, including a single 200 MW / 800 MWh system in Dalian. Other flow battery projects at the tens-to-hundreds of megawatt level are operating or under construction in Europe, Australia, and Japan. These are directly comparable in scale to lithium-ion BESS projects already approved in California. While flow batteries may not yet be deployed at the same global volume as lithium-ion, they are indisputably "proven" at utility scale.

2. Availability and Maintenance

The claim that flow batteries require "recurring time periods of unavailability" lasting "hours to days" in order to rebalance chemistry is misleading. Rebalancing can generally be accomplished while the system remains online or with minimal downtime (often comparable to routine inverter maintenance in lithium-ion systems). Flow battery electrolytes are stable and do not degrade in the same way lithium-ion cells do, meaning their expected lifetime is 20+ years with limited capacity fade. This contrasts sharply with lithium-ion batteries, which require augmentation or full replacement after 8–12 years.

3. Energy Density and Space Requirements

It is true that flow batteries have lower energy density than lithium-ion cells, but for stationary, utility-scale projects where land is available, volumetric density is not a primary constraint. In fact, flow systems can be scaled independently in terms of power (stacks) and energy (tank size), making them uniquely flexible for long-duration storage (e.g., 6–12+ hours), where lithium-ion costs escalate significantly. California has recognized the importance of long-duration storage through programs such as the CEC's LDES initiatives—flow batteries are a leading candidate technology to meet those needs.

4. Efficiency

Flow batteries typically achieve round-trip efficiencies in the 65–75% range, compared to 85–90% for lithium-ion. While this is somewhat lower, efficiency is not the sole determinant of value in grid operations. Flow batteries offer unique capabilities—such as unlimited cycle life, no thermal runaway risk, and long-duration scalability—that offset modest efficiency differences, especially when considering lifecycle economics.

5. Cost Trajectory

The claim that flow batteries are “higher cost” due to lack of large-scale manufacturing ignores the rapidly developing supply chain. China, Europe, and Australia are scaling vanadium electrolyte production and manufacturing capacity. Costs are declining, and as deployment increases, economies of scale are expected to mirror the cost curve that lithium-ion has followed. Importantly, lifecycle cost (including augmentation, replacement, and fire suppression for lithium-ion) makes flow batteries competitive over a 20-30 year project horizon.

6. Technical Compatibility

The argument that lower voltage range “removes the ability to use standard inverters” is incorrect. Commercial flow battery systems already operate successfully with grid-connected inverters. Integration is not a fundamental barrier and has been demonstrated in projects worldwide.

7. Safety and Reliability

Flow batteries use aqueous electrolytes that are non-flammable and non-explosive, providing a significant safety advantage over lithium-ion batteries, which carry risks of thermal runaway and require extensive fire-suppression and safety setbacks. Flow batteries, by contrast, are inherently safer for deployment near communities and sensitive infrastructure.

Conclusion

Flow batteries are not a hypothetical or unproven technology. They are a commercially deployed, utility-scale solution with unique attributes—safety, long cycle life, and long-duration scalability—that make them an important complement and, in some cases, a superior alternative to lithium-ion batteries. The developer’s dismissal of flow technology as “infeasible” is inconsistent with international practice, emerging California policy priorities, and the demonstrated track record of flow battery deployments at scale.

Respectfully,

Perry Goldberg