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## **CleanTechnica Interview With Energy Vault CEO: PSH Energy Storage & Recycling Coal Ash**

By Johnna Crider

I was recently invited to interview Energy Vault Chairman, Co-Founder, and CEO Robert Piconi, who shared some of the latest achievements about Energy Vault and what sets it apart from its competitors in the energy storage industry. Energy Vault's mission is to accelerate the decarbonization of our planet by introducing the most advance, environmentally sound, and economical energy storage technologies. Robert explained how Energy Vault is working to do this and emphasized these important points:

- Energy Vault does not use lithium.
- Energy Vault uses sustainable materials in its products.
- Saudi Aramco has invested in Energy Vault.

### **The Idea**

Robert told me that Energy Vault was founded four years ago in collaboration with someone from Idealab (Bill Gross). "I've known Bill for about 15 years and he called me about this idea he had for energy storage."

He explained that the idea has evolved from what it was initially. Energy storage is a tough problem to solve. He spoke of the cost challenges of storing solar while noting that solar is cheaper today than ever before. Energy Vault doesn't use lithium-ion batteries to store electricity generated by solar. Instead, it uses pumped storage hydropower (PSH).

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“The cheapest storage, which historically has been hydro, is between 15 to 20 cents per kilowatt-hour. When you look at wind and solar — one to two cents and you’ve got natural gas, which is five cents. You can see why people haven’t been out deploying renewables quickly, because the cost to store it is so high.”

He explained that Bill called him with the idea of taking pumped hydro — essentially gravity — but instead of building large dams and damaging the ecosystem, the idea was to build a structure (to take advantage of gravity, you need height) that would use uniquely designed composite blocks with soil. These organic composite blocks are the storage medium.

“We take excess wind and solar. It powers the motors, and when there’s excess, it stacks these composite blocks at height. That’s all potential energy in height — weighted height is potential energy. And then we have a software platform that automates this whole process.

“When the grid sends a signal that it needs the energy, the software kicks in and it will lower those composite blocks. It turns the motor and creates the electricity and just charges it to the grid.”

Robert explained that, unlike lithium-ion batteries, PSH doesn’t degrade over time. He added that Energy Vault solved the problem without using concrete, which in turn makes it extremely low cost.

“For the first time, you can take low-cost wind and solar — one to two cents — and couple it with low-cost energy storage on a large scale. Since we don’t degrade over time, can be built locally, and don’t have scarce materials, it’s something that achieves a leveled cost — ultra-low — and therefore can be deployed at a large scale. That’s how we created Energy Vault.

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“What’s really important to us, the company, is that we stick to three parameters. For us, number one was time and the urgency of getting it to market quickly. That’s why we didn’t focus on chemistry roadmaps or the science over time — that would be uncertain. It also meant that we wanted to build something quickly. Meaning, not something that would take years to build or have a supply chain.

“The second parameter that was important was the economics. I mentioned getting down to an ultra low cost, so this means that certain materials were off-limits.

“And then the third thing was the environmental sustainability. So this is unique to us. We use sustainable materials and avoided things like concrete. We also have a local supply chain, so that minimizes greenhouse gases from the transport sector. We build it locally so it’s good for the local economies and jobs.

“This becomes a neat complement to lithium-ion, which focuses more on shorter durations such as electric vehicles and some shorter duration energy storage. We become a very interesting and scalable complement to do sort of the higher end of duration, 2–4 hours, but scaling it to 6, 8, 10, and 12 hours seamlessly, economically, at very high efficiency.”

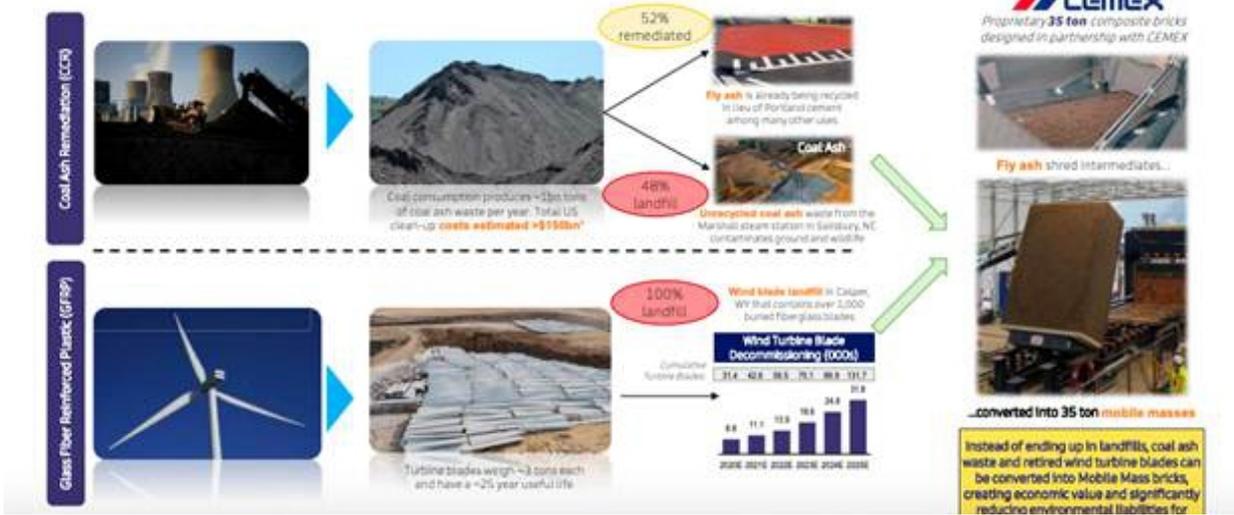
### **Composite Blocks**

The composite blocks which are the medium used are mostly made up of soil but can also contain materials such as coal ash, which typically ends up in landfills. Robert explained that the blocks have environmentally sustainable solutions that utilize waste material. Other types of waste material include retired wind blades and tailings from the mining industry.

The photo below is a screenshot from Energy Vault’s Investor Presentation. You can see the composite blocks and the details of how waste such as unrecycled coal ash can be recycled and used to store solar and wind energy.

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# Circular Economies Create Economic Value While Eliminating Environmental Liabilities Causing Global Warming



Screenshot of Energy Vaults Investor Presentation

The composite blocks used in the testing were 96% soil that was innovated with a Cemex polymer developed that would enable soil and water to be mixed with cement powder. This allows Energy Vault to avoid the use of concrete.

## 1/4 Scale Model

Robert explained that they built a quarter-scale model and tested it. Next, they went to scale. SoftBank backed the company with an investment which they used to build a 5 MW system, shown in the video above. It's the first generation and both Energy Vault and its customers have been testing it.

This resulted in the agreements Energy Vault signed with Saudi Aramco — announced last spring. Enel Green Power is another company that is partnering with Energy Vault to integrate decommissioned wind turbine blades into Energy Vault's gravitational energy storage technology.

## **Circular economy**

Using coal waste and decommissioned wind turbines in the soil product is an integral part of Energy Vault's circular economy. Robert explained the different types of coal ash and noted that coal plants generate millions of tons of coal combustion residuals (CCR). Energy Vault's product is a solution to this, helping convert waste to energy.

## **Saudi Aramco**

One thing Robert wanted to emphasize is how important the investments and partnerships with Saudi Aramco and Enel are. The former is the largest energy company in the world and the latter is the largest independent power producer (IPP) in the world. Having them become a part of Energy Vault's circular economy plan is exciting, Robert told me.

Regarding Saudi Aramco, a fossil fuel company, backing Energy Vault, Robert said:

"I'm really excited about their support of our storage. And the fact that they invested in our company, what does that mean? That means that they're behind it strategically for Aramco and their needs to make the clean energy transition. It's a massive signal from what has been a traditional OPEC leader and a company that clearly people are expecting to help not only make the transition but to lead.

"I think that's a great signal and the fact that they're going to be looking at alternative fuels like using the sun to make green hydrogen, for example, is a perfectly clean fuel. So I think it's a great signal and we're very happy to have their support, as some of our larger initial deployments are going to be in the Middle East."

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