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Emerging Technologies: Hydrogen, Storage and More

BRAD STANHOPE, SENIOR EDITOR, NOVOGRADAC

Many emerging technologies in the green energy world aren't new.

"We're not really talking about new technologies, but the expansion of development and investment in technologies that aren't the run-of-the mill solar and wind projects," said Jenn Wnek, a partner in the global projects, energy, natural resources and infrastructure practice of Allen & Overy, who was the moderator of the Nov. 4, 2021, "Best Practices for Emerging Technologies" panel at the Novogradac 2021 Fall Renewable Energy and Environmental Tax Credits Conference in Washington, D.C. "We've seen a flood of new investment opportunities in technologies such as carbon capture, hydrogen projects, fuel cells, renewable natural gas and battery storage. Some of the reasons for that expansion have to do with competition in the market and some have to do with the way technologies have been evolving as well as differences in legislation that has come across recently."

Her fellow panelists agreed.

"Most of these things aren't really emerging technology," said Sam Kamyans, another partner in the global projects, energy, natural resources and infrastructure practice at Allen & Overy. "Carbon capture has been around since the '70s and '80s, batteries have been around quite a while and they're just being deployed at scale, but we fast-forward to the point where a lot of these technologies need to be accelerated and put into the ground, so proposed legislation is expanding the existing credits and financing opportunities."

Still, things change fast in the green energy world. With the proposed Build Back Better Act, the federal

government is encouraging even more progress from such technologies as carbon capture and hydrogen, as well as from energy storage.

Shifting Marketplace

Izzet Bensusan, managing partner and founder of Captona, an investment company specializing in energy transition investing in renewable power generation and clean fuel infrastructure assets, said this is a similar scenario to 15 years ago.

"Think what you were doing in 2007," Bensusan told attendees. "In 2007, it was the beginning of the Kyoto Protocol, after its signing in 2005, generating and trading carbon credits. What happened was two things: We wanted to generate clean fuel for transportation and generate clean electricity. ... Carbon credits led the way to the creation of many other environmental commodities like renewable energy credits. There was then a high concentration around 2013, where most investors focused on developing solar assets and much less wind farms. The industry concentrated on doing renewable energy from solar."

Bensusan said it's similar now.

"Fast-forward to today and a complete opening up of all the markets," he said. "What you're really looking into is to help generate clean electricity. You can do it with solar and wind, but you can do it with fuel cells, biomass, biogas and other technologies. We're creating new credits that support projects here and around the world."

Hydrogen: Green, Blue and More

Sandro Wrysch, manager of acquisitions, investments and financial advisory at ENGIE Acquisitions Investments and Financial Analysis group, highlighted the variety of hydrogen uses, but said that green hydrogen—when water molecules are split, using electricity generated from low-carbon sources—is the easiest to sell to investors. Part of that is the shifting definition of green hydrogen—and what formula is used to calculate the net carbon use.

“A lot of the labeling of green hydrogen is really off-taker driven,” said Wrysch. “Some off-takers are comfortable with having annual renewables production match hydrogen production and calling that green hydrogen. Others are looking for hourly matching.”

Bensusan said he is most interested in green hydrogen and also in blue hydrogen—when natural gas is split into hydrogen and carbon dioxide.

“Blue [hydrogen] requires carbon capture and it’s not easy,” said Bensusan. “Hydrogen is being pushed to be a fuel to be used in transportation.”

He pointed out that using green or blue hydrogen in vehicles is complicated, requiring fuel cells in the vehicles. There are questions about whether that will work in consumer vehicles or only with large vehicles, but the payoff for green and blue hydrogen working in cars is huge.

“Unless you’re really generating electricity from renewables, you’re not reducing emissions [with electric cars],” Bensusan said. “From a technological standpoint, if you can run on hydrogen, the car needs a tiny battery and can go 825 miles on one fill [which was done in May 2021]. It’s a really good choice.”

Bensusan expects hydrogen—particularly green hydrogen projects—to continue to grow.

“We like green hydrogen because only green hydrogen has legitimacy to be carbon free,” said Bensusan.

“The others are complicated. ... I think hydrogen will become a dominant player for next five years, even though most people think it hasn’t started yet.”

Storage: Beyond Lithium Ion?

Panelists were asked whether lithium ion storage—the leading form of renewable energy storage—has the market locked down.

“I really believe the answer is no,” said Chris Wright, executive director at E3 Consulting, a technical and business adviser to the energy and infrastructure industry. “When it comes to grid-based storage activities, we’re seeing flywheels again, there’s compressed-air opportunities on both the small scale and large scale. We are also seeing more novel mechanical energy storage technologies and there’s a lot of work being done in alternative battery technologies.”

Wright said there is an opportunity for other battery technologies, particularly those that can handle longer-term charging durations that exceed six hours.

“[Lithium ion] is definitely not the only choice, but I would caveat that because of the manufacturing capacity and performance improvements and cost declines we’ve seen within the technology,” Wright said. “If you get on projects up to four hours in duration and less, it would be tough to knock lithium ion off its pedestal, but the economics of lithium ion start to degrade fast after four hours. There’s a really big opportunity in what we call long-duration energy storage. A lot of these alternative battery technologies are aiming for that sweet spot. They’re trying to find eight-plus hours of energy storage, then they can compete.”

Financing standalone storage was a significant issue for panelists. Kamyans said it’s a work in progress.

“The way I like to think about batteries is they’re like a toddler learning to push boundaries against parents,” said Kamyans. “The first battery that was financed was attached directly to the solar. Then there

was a discussion of whether it should be AC coupled or DC coupled. Then fast-forward to, 'is it connected to storage?' And then, because there's a fire risk, [the battery] can't be on same property, so I will finance it across the street. Then the question becomes, could I put it in a different ZIP code?"

Kamyans said that the big test will be when standalone storage is hundreds of miles or thousands of miles from the electrical generating source, noting these questions will be moot if a standalone credit passes.

Daniel Crotzer, CEO at Fractal EMS, which works to maximize safety and profitability of storage and hybrid systems, said various storage technologies gain momentum when they're used frequently, reminding attendees that lithium ion batteries are in laptops and mobile phones.

"Everyone has lithium in their pocket or laptop," said Crotzer. "One thing that will help is hydrogen, which will help flow batteries [a fuel cell that allows extreme longevity]. We need people to use [flow batteries] in their cars, so flow batteries will become more economic. If that doesn't happen, it doesn't have a chance economies of scale."

More Credits, More Competition?

With the likelihood of expanding tax credit availability, panelists were asked whether demand by investors will decrease.

"I think there's a very interesting world out there today, especially with new options proposed in Build Back Better and existing credits with significant growth of value per unit" said Bensusan. "[Solar] generation is sellers' market."

He added that changes and the growth of offshore wind power—and its ability to qualify for federal tax credits—could change things.

"That's going to eat up so many tax credits, because the money will go there," Bensusan said. "I wonder if the market will shift to become more of a buyers' market for these tax credits. It's a remarkable question mark that may shift in next few years."

What's Next?

With change happening constantly, what's next for green energy? Crotzer suggested advances for existing technology.

"The paradox is the newest generator type is solar, which was invented in 1950s or 1960s," said Crotzer. "That's our newest type of generation unless you count nuclear. The newest storage is flow batteries, which were invented in 1980s. That's our new stuff. What's really going to be interesting is digitizing the grid, being more software-driven. Remember when we had telephone operators patch through to other operators to complete a call? That's how we operate our grid today: We have guys manually sit at desk and decide whether to bring energy from one generator to the grid. That's like using a carrier pigeon."

Wright expects investors to get more comfortable with newer technology.

"From my view, the risk tolerance is getting higher," said Wright. "Money flows to new technologies faster now. I think seeing emerging technology doesn't have to be deployed for five or 10 years before it can get financed." ❖

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