# Areva targets Energiewende storage markets

**Areva GmbH is bidding in hydrogen refueling station tenders in Germany and is on the verge of a battery deal with a large automaker. The nuclear vendor has years of experience in storage and wants to turn to good effect in the Energiewende.**

With around 3,800 staff in Germany, French nuclear engineering company Areva has a strong footprint in a market experiencing radical change.

Germany's Energiewende is heaping wind and solar intermittency on its own and neighboring networks. Technologies are needed to integrate this green power into energy, transport and heat sectors, reducing curtailment and spreading renewables' decarbonizing effect. With Germany set to phase out nuclear power by 2022, at first sight Areva GmbH is not an obvious technology partner for the Energiewende.

While its basic strategy is to export its core nuclear expertise globally, it has subsidiary businesses that go to the heart of the Energiewende, in the form of hydrogen and battery energy storage.

In an interview with S&P Global Platts March 29, Areva's Kerstin Gemmer-Berkbilek, responsible for hydrogen projects, and Jochen Lorz, responsible for battery projects, explained how the technologies have evolved, what applications they are targeting, and when they expect market viability.

### Long-term storage: hydrogen

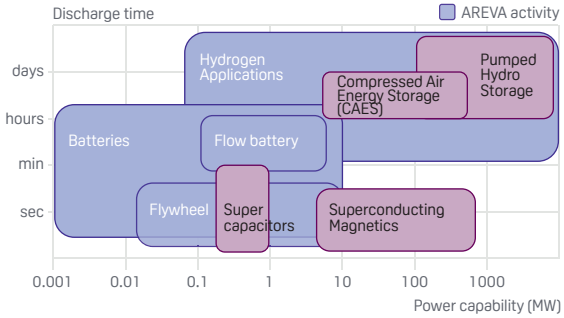
"Our involvement with hydrogen started in the 1980s [as Siemens KWU, later absorbed by Areva NP GmbH], with the development of PEM electrolyzer and fuel cell technology," said Gemmer-Berkbilek.

Areva's oldest electrolyzer has been in operation since 2000, at the Mühleberg nuclear power plant in Switzerland, where hydrogen is used to improve material conditions.

"Now we are focusing on green hydrogen derived from solar or wind power, to be used in various applications, mobility being the closest to market in Germany and indeed Europe," Gemmer-Berkbilek said.



**STORAGE APPLICATIONS, AREVA'S AREAS OF ACTIVITY**




Source: Areva

Areva has been involved in hydrogen demonstration projects supported by public funding for several years, "but for about a year now we've been seeing municipal utilities tendering for hydrogen infrastructure for buses and trains," Gemmer-Berkbilek said.

Fellow French engineer Alstom is developing hydrogen trains, while the European Commission is sponsoring fuel cell buses. The trains and buses all need hydrogen refueling stations and Areva is bidding for these. Some 120 fuel cell buses are due over the next two years under the EC's call, requiring 10 to 12 refueling stations.

Commercial projects are coming forward, meanwhile, for forklift trucks. "A lot of industries need to lower their carbon footprint and are looking to replace diesel forklifts with hydrogen forklifts," she said.

Areva is not looking to get involved in hydrogen refueling for passenger cars. "The tank systems are different. For cars you have 700 bar technology, and for buses and trains you have 350 bar," Gemmer-Berkbilek said.

"Our projects need larger stations for local fleets of say 10 or 20 buses. Car stations are much smaller, perhaps serving only one or two cars a day presently."

### Integrated offer

Unusually for this emerging sector, Areva has an integrated offer (electrolyzer and fuel cell) and a commitment to involve local small and medium enterprises in its projects.

"Most of players in this field come from the hydrogen gas business, they don't have their own electrolyzer," Gemmer-Berkbilek said.

"That gives us an advantage for those refueling stations that want green hydrogen – we expect that for around a third of the stations."

Involving local companies raised competence in the region and was well-received by municipal authorities, she said. "This is a new technology – if you have local companies involved, that helps public acceptance. With hydrogen involved, that is important."

### Liquified Organic Hydrogen Carrier

Areva is in the final stages of technology development of a new carbon-based liquid carrier for hydrogen, Gemmer-Berkbilek said.

The Liquified Organic Hydrogen Carrier (LOHC) in being tested in the Bavarian town of Arzberg. An electrolyzer produces renewable hydrogen from a solar plant in the town. The hydrogen is then used to charge a carbon-based liquid carrier in an LOHC module, enabling depressurized storage at reduced volume. When needed, the LOHC module discharges the hydrogen from the carrier to a PEM fuel cell to produce power.

Product development is to follow technology development of LOHC. "It can carry a lot of hydrogen, that is the big advantage for refueling stations. We have to achieve the right purity, however, and that is not easy. PEM fuel cells are very sensitive – they need N5 [99.999%] purity. For us it remains an R&D topic. It is solvable with filters after dehydrogenation, but we want an economically viable solution," Gemmer-Berkbilek said.

### Seasonal storage

Hydrogen has to be for long-term storage, Gemmer-Berkbilek said. "There are better technologies for short-term storage. For summer-winter storage, hydrogen makes sense but it has to be for large quantities of energy – we say 5 MWh is a comfortable size for a viable stationary use business case, not below. That pushes its application into seasonal storage."

What about timing? Hydrogen mobility projects are already close to market, Gemmer-Berkbilek said, citing the recent tenders. "Long-term seasonal storage I see becoming viable from 2020. And for the LOHC technology, transporting hydrogen in large amounts, I see that close to market from 2025," she said. "The strategic partnerships of the future are being built now – if you wait until the market is there, you'll miss out."

### Battery partnership imminent

Turning to shorter-term storage, Areva's Jochen Lorz said the company had been involved in batteries for over 40 years.

"Nuclear plants need independent power supply. For decades this has been provided by Areva's electrical system department via various technologies including lead acid batteries," he said.

While Areva has all the instrumentation and control technology around batteries, its focus has always been on lead acid. Seeing potential in spin-off products but not wanting to invest too heavily, it decided it needed a lithium-ion partner.

"We looked to the automotive industry, which is taking rapid steps towards e-mobility. Now, in recent weeks, we've partnered up with a huge auto maker [to be announced], and we will get all the traction batteries out of their hybrid and full electric models for the next ten years," Lorz said.

The target is to integrate new and used batteries in energy storage projects. "Second life batteries are those that have been fully used for e-mobility, but remain in good shape. Our contract is for second life and second use batteries – so both used and new," Lorz said.

### Evolving customer base

From baseload to load-following – that is the trajectory Areva sees for all large power plants, and it continues to integrate battery storage in that context to balance fluctuating grid power while enabling stable operation of the large plant at the same time. But it also sees future battery storage customers in municipal utilities, industry needing independent supply for critical processes, and in microgrid-owning communities.

"We're close to market, lithium-ion costs are decreasing but it remains hard to find a business case," Lorz said. "Even in primary reserve, where batteries are already deployed in Germany, the fee is falling."

Areva thinks it has an edge. Its automotive partner is interested in testing the stability of its batteries in low-stress stationary applications – in containers, in buildings – over the next 10, 15 years. In return, "we get the batteries on a good pricing model, cheaper than the market," Lorz said.

With integration of its I&C technology, Areva says it can offer viable battery storage even for small municipal suppliers facing the decline in primary reserve payout.

The units can range from 500 kW per hour to over 20 MW per hour. Grid applications are focusing on 5 to 10 MWs. The used batteries will come in several different designs. Areva has patented a way of integrating them in its storage units without removing their safety shells – a significant cost saving, Lorz said.

Finally, for longer term battery-based storage, Areva is working on a hybrid redox flow and lithium-ion combination. "It's in the first steps of R&D – we hope to go to the market in two or three years," Lorz concluded.