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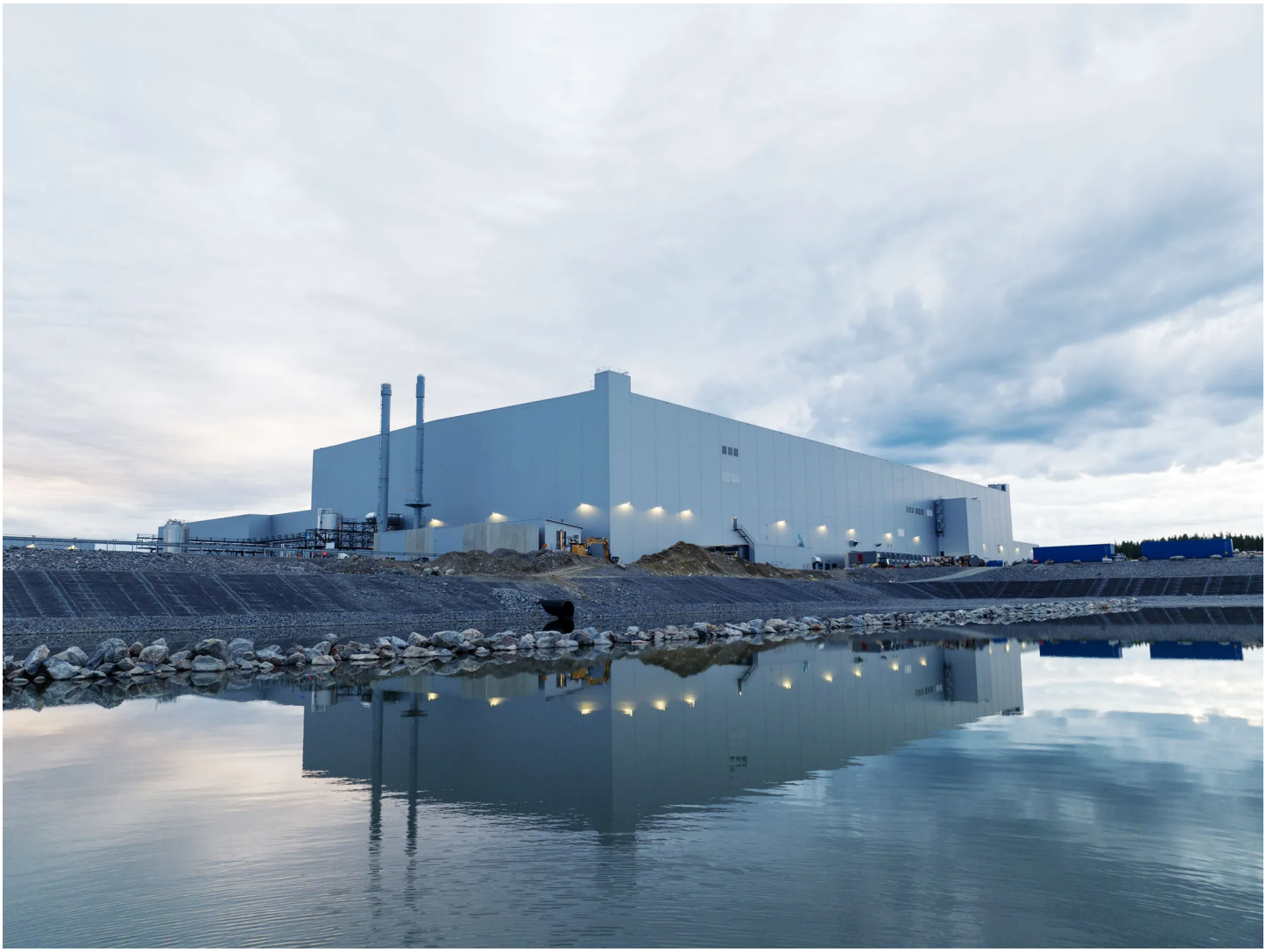
EV Batteries Have a Dirty Secret. This Company Has a Plan to Clean Them Up

European manufacturer Northvolt has plans to distribute a low-carbon, sustainable battery-manufacturing process across the world.



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SAVE

Here's the inconvenient truth about your electric vehicle: Making its battery has a big impact on the environment. Producing an EV often generates more emissions than building a conventional car, with the benefits of going electric realized only after a good amount of driving.

"Building batteries is creating a very large amount of carbon," says Peter Carlsson, CEO of European battery manufacturer Northvolt.

This is a problem, given battery production is about to explode to meet rising demand for EVs and energy storage. Phasing out internal combustion engines—a must for reaching net zero—will require roughly a tenfold increase in battery production over the next decade, Carlsson says. If the world continues making batteries as it does today, the emissions of this transmission would be equivalent to "pretty much the full carbon footprint of Spain."

Making an average battery today can release over 100 kg of CO_2 per kilowatt hour of energy provided across its lifetime, according to Carlsson. But by shaking up how and where batteries are produced, Northvolt believes it can slash the footprint of battery production. "You can actually get down to around 10 kg of CO_2 per kilowatt hour, which is our very clear goal for 2030," Carlson says.

Ahead of the Northvolt team speaking at WIRED Impact in London on November 21, WIRED caught up with Carlsson to find out more about the company's plan to green the battery sector. This interview has been edited for length and clarity.

WIRED: Slashing the emissions of battery production—how does that work?

Peter Carlsson: It basically comes from three things: You put manufacturing—of cathode active material, the cell—into locations with an abundance of green energy.

You also develop your own supply chains for critical things—like manufacturing of graphite, processing lithium into lithium hydroxide, the mining and refining of key metals—with very low-carbon or carbon-free setups. Half of battery

production's carbon footprint is in the supply chain: mining, refining, preparing materials.

And you combine it with a high degree of recycling. And not just the traditional way. We've developed, through a collaboration with several universities, a process for hydrometallurgical separation of the black mass—that is, the recyclable material of a battery.

Where we have Northvolt's first gigafactory in northern Sweden, you're looking at the very unique setup where you have the full circle of raw material in active cathode manufacturing on-site, going into cell manufacturing, and delivery to customers. And at the end of life those cells come back, are fully recycled, and you feed the raw materials back into the manufacturing setup.

Reducing emissions in your supply chain seems like a huge task. How do you do that?

A very large amount of the supply chain is directly controlled by us.

To be clear, we're not starting mines, we are not doing refining. But we actually did go into a joint venture with Galp in Portugal to build one of Europe's first lithium hydroxide refineries. We saw there was such a concentration of this field in China, and that it came with a pretty hefty carbon footprint, since it also is a very energy-intensive process.

Portugal is an area which has both good logistics from the sea but also lithium assets. And by building a lithium-refining plant where we are using offshore wind and some hydropower, we could develop a strategic lithium hydroxide processing plant in Europe: a more independent supply chain with a very low carbon footprint.

You mentioned China. It dominates battery manufacturing and the processing of battery materials. A lot of Northvolt's strategy focuses not just on greening the battery sector, but also regionalizing it—spreading it out from China. Why is this important?

Let me start by saying, you know, we have a lot of really, really good collaborations with Chinese companies. China has scaled this industry to a maturity that you can't find in either Europe or North America. We are at least 10 years behind.

But because we're seeing demand for batteries and battery production capacity regionally, it is also going to be developed regionally. This has to do with energy independence, but also very practical things—like, that the automotive industry needs just-in-time setups.

So there's no doubt that in both Europe and in North America, over time, you will see a regionalization of the supply chain to support industry development. From a security of supply, and from a sustainability point of view, there's a strategic need to also build these supply chains regionally. It's not just to reduce dependency on China, it's also because of the need for shorter logistics, more reliable setups, and setups with lower carbon footprints.

But can regionalized battery producers really compete with China?

When we looked at the opportunity of challenging the incumbents, we recognized that if you do a vertical integration, and put infrastructure in locations where you have both access to renewable energy and electricity at a very low cost, and you do this with the vertical integration and at scale, you could actually offset the the lower labor cost of Asia with a lower total processing cost of batteries. What is important is scale. It's a little bit like: go big or go home. It's important to recognize the head start that China, and to some extent South Korea, has. It will take a little time to build up the scale and the supply chains and get them as efficient as they are working in China today.

Most batteries are used in EVs right now. What comes next?

Right now, obviously, the vehicle transition is driving the majority of the volume. But not far thereafter comes energy storage and grid storage. The North American market is evolving incredibly fast, both in managing grid bottlenecks but also managing the increased amount of intermittent energy produced by wind and solar power.

The more renewables, the more electric vehicles, the more that industry is transforming—furnaces, ovens, and all sorts of industrial heat generation—that is going to drive a lot of energy storage needs. In almost all areas where you today see some kind of combustion engines—forklifts, materials handling, underground mining, marine areas—you see electrification plans. We are underestimating how fast and how big energy storage will need to be in order to balance the market.

And what will happen next in battery tech. Is lithium ion set to dominate?

The core battery technologies being developed today—whether it's lithium nickel manganese cobalt oxides, lithium iron phosphate—and the massive amount of infrastructure that is being invested in right now will provide a baseline of needs for a long period going forward.

You will see a continuous strong technology evolution, but you need to integrate any technology evolution with the infrastructure that is currently being built.

The one thing I do see really coming up is, basically, batteries where you use sodium instead of lithium as the energy transmitter. You won't get the energy densities that you can get from high nickel, but you can basically develop batteries that have really, really good thermal capabilities, that have really good cyclability, and do not contain lithium, nickel, cobalt. I see that as a pretty big opportunity for the further evolution of grid storage.

With very high metal prices right now, you're also seeing a very strong growth of lithium iron phosphate.

They serve a need because they're quite cost-effective. But they have certain challenges: They come with a pretty large carbon footprint, and because of their content, they are not naturally as attractive to recycle as high nickel-type batteries.

So there's a big risk that unless we start to see some pretty strong regulations around this, we will see a challenge with the end-of-life of LFP batteries that are coming to market. The LFP segment is growing really, really strong right now.

With sodium ion, you can develop a really, really sustainable battery—both because of the abundance of these metals and their carbon footprint, and because you can utilize alternative materials for the anode. You can do hard carbon out of wood fiber, or we've seen samples of hard carbon made of coconut fiber. So the ability to build a really sustainable setup with sodium ion is definitely there.

Join Northvolt and our world-class speaker lineup at WIRED Impact on November 21, at Magazine London, as we examine the opportunities for organizations to innovate and tackle humankind's most pressing challenges. Get tickets now: events.wired.co.uk/impact

Updated 11-9-2023 4:00 pm GMT: The spelling of lithium iron phosphate was corrected; in the final paragraph, "hard graphite" was corrected to "hard carbon."

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