"We can produce fossil-free steel with one tenth of the electricity"

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Sweden's industrial success story is largely based on forests, ore and steel. A tradition of forestry and mining laid the foundations for global export successes that continue to this day, with hundreds of billions of SEK in export values, a major impact on balance of trade and hundreds of thousands of employees. Sectors and companies that remain world leaders.

But the climate crisis represents a paradigm shift, not least for the iron and steel industry, which is responsible for large carbon dioxide emissions. In the EU, the taxonomy and emissions trading set strict emission limits. Globally, the Paris Agreement sets the framework and there is a growing movement in the capital markets towards investments in low-emission companies. Globally, some 60 projects for the production of fossil-free sponge iron are underway, often in partnerships between companies and governments. A race is on to transform the steel industry where the companies and countries that are first, with the right choice of technology, can count on decades of competitive advantages and sustainable growth.

We have developed a completely new process for the production of fossil-free sponge iron, in collaboration with KTH Royal Institute of Technology and Chalmers University of Technology and with the support of the Swedish Energy Agency, Lantmännen, Sveaskog, Ovako, Uddeholm and Alleima (formerly Sandvik Materials Technology). The plan is to put the shovel in the ground as soon as possible for FerroSilva's first factory at Ovako's industrial site in Hofors, with a planned start of operations in 2026. We have letters of intent in place with Sveaskog for our input material and with Ovako for land use, as well as an offtake agreement with Ovako for parts of our future production of fossil-free sponge iron. In addition, there are letters of intent with OX2 and Linde for parts of our future production of liquid biogenic carbon dioxide.

The competitiveness of our process stands on four legs: scalability, energy efficiency, technical maturity and cost to the customer. FerroSilva's input material is residues from forestry and agriculture. Over twenty million tons of "slash" (branches and tops) are produced each year in Sweden, of which we plan to collect a few thousandths for conversion to the gas that is the primary energy carrier in our production. In an increasing competition for biomass, our production is very high in the value chain with hard-to-beat climate benefits in the form of cost-effectively produced fossil-free sponge iron.

The currently most talked about methods for producing fossil-free sponge iron are based on hydrogen gas produced by electrolysis of water. This is a very electricity-intensive method. Our process requires less than a tenth of the electricity per ton of sponge iron produced compared to the electrolysis-based initiatives, as most of the energy input in our process is stored in the forest residues we gasify. FerroSilva is, as far as we know, the first in the world to commercialize this process, which is particularly suitable for countries with good access to biomass and where access to electricity is a limiting factor. The FerroSilva process also does not require an extended electricity grid infrastructure.

In the fall of 2022, we completed an extensive feasibility study and are now ready for the first factory with sub-processes that are all individually well proven. Our calculations show that our product will be more cost-effective than other currently known initiatives to produce fossil-free sponge iron in Europe.

Through a less electricity-intensive process, FerroSilva's solution facilitates the electrification of the transportation sector and many more industries than just iron and steel. It also enables lower electricity prices and greater electricity exports to surrounding countries that still rely on fossil fuels for their electricity production.

Our process also generates and captures several useful industrial inputs. In addition to biochar, a special mention can be made of biogenic carbon dioxide, which can be used for the production of electrofuels. For every ton of sponge iron produced, an equivalent amount of liquid biogenic carbon dioxide is generated.

The result of our process is a sponge iron that has been created with negative carbon dioxide emissions. In our first factory, we will produce 50 000 tonnes of fossil-free sponge iron and create an emission reduction equivalent to 40 000 petrol cars. But this is just the beginning. Globally, one ton of finished steel has generated an average of two tons of carbon dioxide emissions; our process would save three tons of carbon dioxide for every ton of finished steel.

The climate and commercial benefits of energy-efficient fossil-free steel are significant for Sweden - globally, the climate benefits are enormous. The market for pure metallic iron from ore is 1,600 million tons per year and this production will have to change and become climate efficient. There will undoubtedly be a market for many different initiatives for fossil-free sponge iron; in Sweden, through our extensive forestry, we have access to a renewable input to produce fossil-free iron in a very competitive way.

Forests, ore and steel have historically made Sweden strong. With the help of the forest, fossil-free steel will now become an important part of our future. Let's take advantage of the unique opportunity that Sweden has to produce steel in the best possible way.

For FerroSilva AB

Peter Samuelsson (left) is driving the work to build FerroSilva’s first factory in Hofors.
Former Vice President and Technical Director at Sandvik Materials Technology and Research Director at the Outokumpu Group. Master of Science in metallurgy and materials science and PhD in metallurgy, KTH Royal Institute of Technology.

Rutger Gyllenram (right) focuses on issues related to production, raw materials, logistics, environment and research.
Founder and CEO of Kobolde & Partners. Master of Science in metallurgy and materials science and licentiate in steel and metal production technology, KTH Royal Institute of Technology.

Göran Nyström (centre) drives marketing and investment matters.
Previously Executive Vice President at Ovako, Senior Vice President Supply at Sandvik Tooling and Sandvik Mining and Construction, Vice President Sales & Marketing at Sandvik Materials Technology. Master of Science in materials physics, Uppsala University.