

And for what is Sweden famous?

MAIN TAKEAWAYS

Sweden is rapidly becoming a leader in the global green steel industry initiative.

It's being fueled by progressive government support, a mindset of the people where environmental consciousness runs deep in Swedish culture, a history of steelmaking and a region blessed with the right resources.

Will the technology developed here spread throughout the world in years to come?

W When we think of Sweden what comes to mind? Abba? Ikea? Volvo? Spotify?

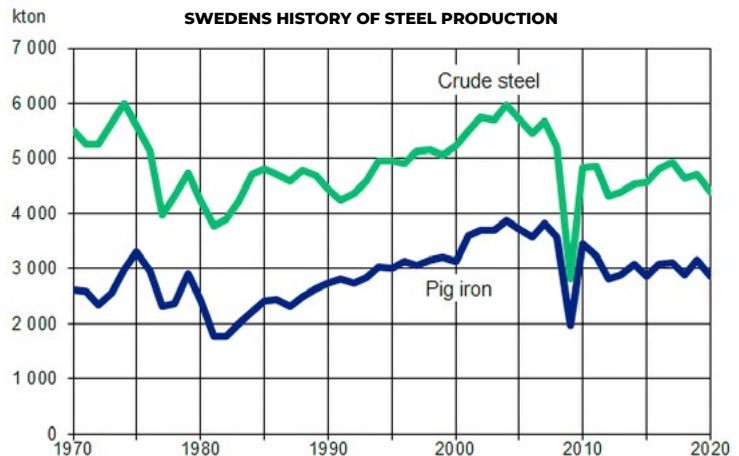
If you are in the steel industry then chances are too that you've been thinking, or at least have heard of, HYBRIT and H2 Green Steel (H2GS). These two companies are at the forefront of the global steel industrial decarbonization initiative. How is it that Sweden of all places is the country for this to happen?

Sweden actually has a long history going back to the middle ages of iron and steel production. Today the steel output of the country totals around 4.4 million tonnes and although relatively small in a world of steel production close to 1.9 billion tons the Swedish steel industry looks to be taking center stage in the global green steel initiative. **(see chart)**

HYBRIT

HYBRIT, a joint effort of steelmaker SSAB, working with Swedish utility, Vattenfall and miner LKAB, with financial support of the Swedish Energy Agency, had recently made headlines on August of 2021 with announcement of fossil free steel production for Volvo (manufacturing a load carrier for mining). HYBRIT is a reference to hydrogen break-thru ironmaking technology. The partnership claims fossil free production via:

- Production of H2 by electrolyzing water using renewable (hydro based) power.
- Maintaining an H2 storage facility.
- Fossil free iron pellets produced using biofuel.
- Use of H2 to produce DRI (also referred to as sponge iron).
- Use of the DRI and an EAF to produce steel.



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H2 GREEN STEEL

H2 Green Steel has further announced a partnership with Iberdrola, a Spanish renewable energy company, to build a 1GW plant to produce Green Hydrogen. The new plant will produce and feed Green

Hydrogen to a 2-million-ton direct reduction tower, located in the Iberian Peninsula. Significant large scale projects like this will help to further develop the commercialization of larger and more sophisticated

electrolyzers. This will result in more cost effective green hydrogen support a carbon free H2 economy. A budget of approximately 2.3 billion euros is estimated for this project.

Their plan is to have a HYBRIT demonstration plant in place in 2025, at the same time as the conversion of SSAB's blast furnace site in Oxelösund in Sweden, which will enable them to produce iron ore-based, fossil-free steel for commercial use in 2026.

The project recently announced receiving financial support of the EU Innovation Fund for large scale projects directed towards greenhouse gas emissions. The fund had been created using money from the EU Emissions Trading System and is a good example of the capital being created and directed towards green projects.

H2GS

H2GS may be in some respects an even more ambitious endeavor than HYBRIT. H2GS states that they are, "on a mission to undertake the global steel industry's greatest ever technological shift". How can you not respect this? Founded in 2020, H2GS further states that by 2024 they will be in large scale production at their Boden site, and by 2030, they will produce five million tonnes of fossil-free steel annually. Not only do they intended to more than double the country's output of steel it'll be entirely green steel from hydrogen based production. Notably H2GS plan includes the world's largest electrolysis plants for production of green hydrogen. The innovation being pursued with H2GS is applicable to more than just the steel industry as the large scale H2 production can further lead to carbon replacement across many industries. Capital investment objectives targeted for the project total over 2.5 billion euros thru a combination of equity and

green project financing.

So what is it about northern Sweden, with HYBRIT in Lulea and H2GS plans for Boden, that make a location not far from the arctic circle ideal for revolutionary steelmaking endeavors?


Water and Ore. The north of Sweden is bisected by rivers and this equates to significant means for hydroelectric power. Sweden's mines produce 80 million tons of ore per year. The hydro power is used to produce green hydrogen. Green hydrogen is used to reduce high quality iron ore used in steelmaking (see map).

Truly green, fossil free, steel produced free of CO2 emissions though the entire process from mining and reduction of ore to rolling and finishing the final steel product is possible under unique circumstances. In the case of northern Sweden it is the abundant production of clean hydro based energy for purpose of producing hydrogen and powering the steelmaking process, available iron ore, and a cultural disposition towards environmentally progressive thinking. As stated before in previous Greenway Articles (link to What in the world) the prospect of the world's 1.9 billion tons of steel demand are not going to be met with these unique circumstances. The development however of large scale hydrogen steel production will accelerate the adoption of hydrogen based steel making technology as the world's economies strive to hit stated green house gas emission reduction targets.

The Swedish people have a characteristic cultural love of nature. Natural resources are readily available to everyone as there is a right of



[WIKIPEDIA.COM](https://en.wikipedia.org/wiki/Sweden#/media/File:Sweden_topographic_map_2019.svg)

common access which applies to all forests, fields, beaches and lakes across the country. In consideration of the country, its geology and the culture of Swedish people, one can then make the connection with the Swedish endeavor to become a leading innovator in the green steel revolution. 

The hydro power generated by hydroelectric power is used to produce green hydrogen. Green hydrogen is used to reduce high quality iron ore used in steelmaking.



Randy Charles, a trained metallurgist, having been in the steel industry for over thirty years, brings experience in production, new technology and commercial responsibilities when helping industry peers to understand the transformational developments of global carbon neutral initiatives. [greenwaysteel.com](https://www.greenwaysteel.com)