

'GREEN STEEL' IS COMING



'THYSSENKRUPP' TURNING AWAY FROM CO₂ - TOWARDS H₂

Fox Resources and some ministers are wrong. Coking coal will no longer be needed for making steel. The market for it will start to shrink in the near future. Thus, allowing a coking coal mine near Bundaberg at huge cost to existing agriculture is economically irresponsible. Adding known risk to the health of some 70,000+ nearby residents is socially indefensible.

Hydrogen is successfully used for making steel

Giant German steel producer and manufacturing company ThyssenKrupp has successfully completed a demonstration of running a steel furnace completely on hydrogen. This provides a way to use hydrogen made with electricity from renewable resources. That will eliminate the need for coking coal, biochar or natural gas. It shows a way to achieve the dream of 'Green Steel'.¹

The company has committed to a 30 per cent reduction in its emissions by 2030 and aims to become carbon neutral by 2050. Experience shows this is likely to be achieved earlier.

Competition between steel makers

Sweden's SSAB had already tested this. It now has brought its timeline forward to 2026 and aims to make its steel fossil free by 2035.² In early 2019 ArcelorMittal started a project in Hamburg to use hydrogen for steel production.³ Mr Gupta has flagged a 3,000 MW renewable energy project to turn the Whyalla Steelworks into a 'Green Steel' hub⁴.

'Green steel' is no longer a dream, it is a 'Must' for any steel producer to stay in the race.

The technology to make steel with natural gas rather than coal is already operating in many parts of the world as it is cheaper. Natural gas is 60% hydrogen. ThyssenKrupp and SSAB have shown that 100% hydrogen can replace natural gas and coking coal in steel-making.

BloombergNEF said that Hydrogen technology will be competitive with coal-based plants when the cost of renewable hydrogen falls below US\$2.20 a kilogram, assuming coking coal prices at \$310 a ton. Hydrogen is currently around US\$3.30. The cost of renewable electricity used in making hydrogen is a major part of this price. It is falling rapidly.

Developments in renewables are likely to achieve this goal of less than \$2.20 before 2030. Northern Europe is windy and wind generators have become real giants.

¹ Renew Economy: <https://reneweconomy.com.au/another-nail-in-coals-coffin-german-steel-furnace-runs-on-renewable-hydrogen-in-world-first-55906>

² <https://reneweconomy.com.au/nordic-steel-giant-to-use-renewable-hydrogen-to-produce-fossil-free-steel-by-2026-2026/>

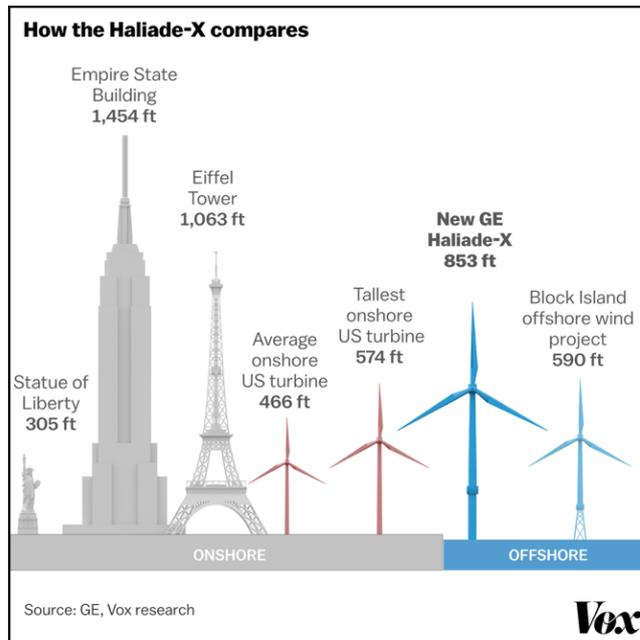
³ <https://www.youtube.com/watch?v=McJ8YHAaciI>

⁴ <https://reneweconomy.com.au/gupta-flags-3000mw-new-renewables-for-whyalla-green-steel-plans-73992/>

Giants, 256 m tall, are reducing the cost of renewable energy

A major driver of lower cost of renewable energy is the very fast development of huge wind generators. A recent one is the Haliade-X, made by GE.⁵ It reaches a height of 256m. [The tallest building in Australia is the Q1-Tower on the Gold Coast at 322m]. Its blades are 112m - longer than a football field. The first Haliade-X is rated at 12MW and has been operating in Rotterdam, The Netherlands, since now 2019. On its best day it provided enough electricity in one day to supply 45 average Aussie homes for a year.

An upgraded 13 MW version will be used for the 3.6GW off-shore Dogger Bank windfarm near the UK.⁶ By comparison, Gladstone Power Station was rated 1.64GW at its peak.



These giants have three major benefits. They reach higher where the wind is stronger. The full sweep of their blades is wider, meaning they capture more wind. And because of these two factors, they are expected to have a capacity factor (= percentage of time that they produce electricity) of **63%**. That average for wind turbines has gone up from **25.4%** (built from 1998 - 2001) to **32.1%** (2004 – 2011), to **42.5%** (2014 - 2015). That is the reason why the cost of the electricity they produce has come down rapidly. And when there is no wind, hydrogen production simply stops, not a problem.

Nuclear reactors produce electricity 80% of the time but there is no safe storage of its radioactive by-products that last 1,000's of years. Coal used to generate power for 80% of the time; this is dropping due to age. Gas for 56% as it is turned on and off repeatedly.

Australia's response to this new technology

Australia produces about 60% of the world's coking coal. Australian leaders and the coal industry chose to ignore developments in competing energy sources. They keep repeating that coking coal is here to stay for a long time. Yet the market for coking coal is likely to shrink much sooner than politicians are willing to consider.

Proposing an open-cut coking coal mine near Bundaberg makes no sense.

This is a high-value agricultural and tourism area, with a clean and green reputation and home to 70,000+ people. See Factsheet '*ABOUT FOX RESOURCES' MDL 3040*'.⁷

⁵ <https://www.vox.com/energy-and-environment/2018/3/8/17084158/wind-turbine-power-energy-blades>

⁶ <https://reneweconomy.com.au/worlds-largest-offshore-wind-farm-3-6gw-begins-construction-62385/>

⁷ <http://repowergladstone.com.au/factsheets/>