

## 'GREEN STEEL' IS COMING



### 'THYSSENKRUPP' TURNING AWAY FROM CO<sub>2</sub> - TOWARDS H<sub>2</sub>

**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 successfully used for making steel**

Giant German steel producer and manufacturing company ThyssenKrupp has successfully completed a first-of-its-kind 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 dependence of the industry on coking coal, biochar or natural gas. It shows a way to achieve the dream of 'Green Steel'.<sup>1</sup>

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**

Other steelmakers have the same aims. Sweden's SSAB aims to make its steel fossil free by 2035<sup>2</sup>. In early 2019 ArcelorMittal started a project in Hamburg to use hydrogen for the direct reduction of iron ore in the steel production. A pilot plant is to be built, which will initially produce 100,000 tonnes of pig iron per year.<sup>3</sup> Competition will drive this technology.

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 has now 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\$5.00. The cost of renewable electricity used in making hydrogen is a major part of this price.

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

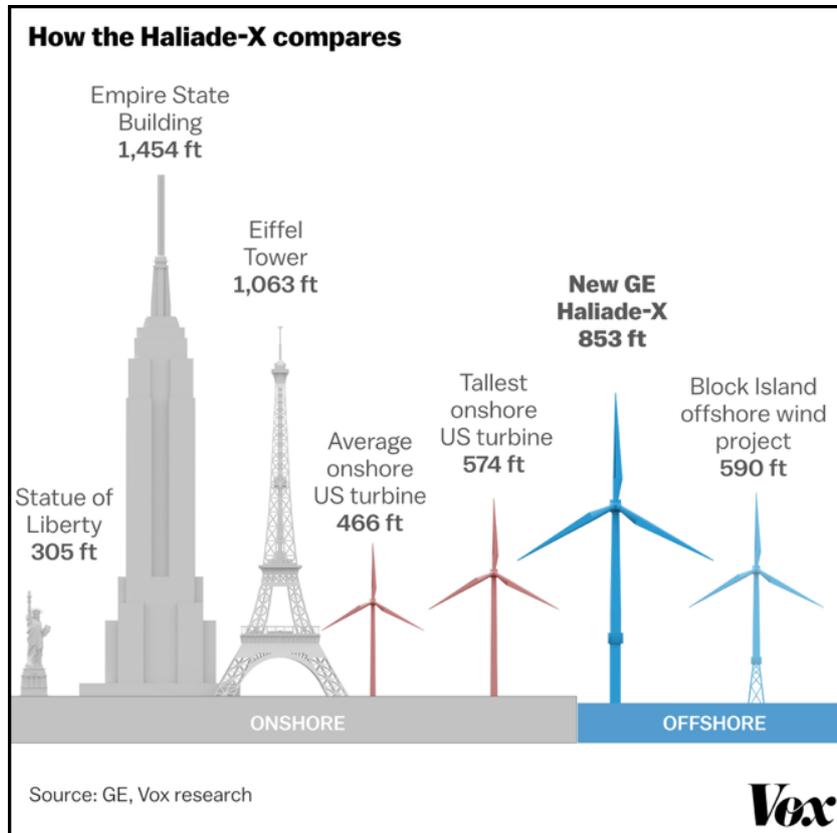
<sup>1</sup> Renew Economy: <https://reneweconomy.com.au/another-nail-in-coals-coffin-german-steel-furnace-runs-on-renewable-hydrogen-in-world-first-55906>

<sup>2</sup> Bloomberg: <https://www.bloomberg.com/news/articles/2019-07-30/fossil-free-energy-supply-gives-sweden-edge-in-green-steel-race>

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

## Giants, 256 m tall, to reduce the cost of renewable energy

A major driver of lower cost of renewable energy is the very fast development of huge wind generators. A very recent one is the Haliade-X, made by GE.<sup>4</sup> It will reach 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 under construction in Rotterdam, The Netherlands, to go out into the North Sea in a few months.



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.

Nuclear reactors produce electricity 80% of the time but has no safe storage of its radioactive by-products that last 1,000's of years. Coal used to generate power for 80%; this is dropping due to age. Gas produces power 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, due to the above developments.

### 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*'.<sup>5</sup>

<sup>4</sup> <https://www.vox.com/energy-and-environment/2018/3/8/17084158/wind-turbine-power-energy-blades>

<sup>5</sup> <http://repowergladstone.com.au/factsheets/>