

Storelectric Ltd

Hydrogen Patent – Technical Executive Summary

Overview

The patent brings together 3 sources or vectors of energy – renewable electricity, green hydrogen and industrial waste heat – in a new way. It uses a process called High Temperature Electrolysis, which can produce green hydrogen up to 100% efficiently. The hydrogen can then be stored at a global scale that can completely eliminate fossil fuels, using the disused stranded assets and infrastructure of the fossil fuel and plastics industries. In this way, the assets of two polluting industries can be repurposed to tackle climate change.

The Problem

The patent solves 3 major problems that are holding back the move to a Net Zero economy:

- A lack of green energy storage at a scale and duration that will compensate for seasonal imbalances in the supply of and demand for renewable electricity generated from weather-dependent sources (wind and solar) – this has to be done at a scale of 1000's of TWh to eradicate fossil fuel baseload / peaking plant.
- A method of producing green hydrogen 100% efficiently and storing it at scale.
- Improving the efficiency of industrial processes, including compression, which currently account for 15% of global greenhouse gas emissions, without adopting completely new technology.

The Patented Solution

The patented method is as follows:

- Use the excess heat from 1) compressed air and other compression technologies used in energy storage 2) industrial processes that produce waste heat, to produce green hydrogen 100% efficiently using High Temperature Electrolysis and similar processes.
- High Temperature Electrolysis is a method whereby:
 - pressurised water is heated to high temperatures (the patent uses the waste heat from gas compression and industrial waste processes to do this).
 - an electrical current is passed through the water using 2 electrodes (the patent uses the excess renewable energy in summer / when demand is low).
 - 100% pure hydrogen is produced at one electrode and 100% pure oxygen at the other electrode. The heat and electrical current energy is used to effectively break the bonds in the water molecule (ie. $2 \text{H}_2\text{O} \Rightarrow 2\text{H}_2 + \text{O}_2$).
- The hydrogen and oxygen can then be stored safely in underground cavities - using salt caverns (from the chloro-alkali (plastics) industry) or in depleted oil & gas fields (from the fossil fuels industry). This creates huge underground batteries that can store vast quantities of renewable energy, and then produce instant electricity, using hydrogen-ready turbines that Storelectric has full access to through its Collaboration Agreement with a large OEM (Original Equipment Manufacturer).
- The hydrogen and oxygen can also be used in fuel cells and other industrial applications.