



# CLEVE HILL SOLAR PARK

## **OTHER DEADLINE 3 SUBMISSIONS THE APPLICANT'S RESPONSE TO GREAT EXPERT REPORT ON THE STATEMENT OF NEED - REFERENCE 8**

August 2019  
Revision A

Document Reference: 11.4.10.8  
Submitted: Deadline 3  
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**CLEVE HILL**  
SOLAR PARK

# Union of Concerned Scientists

## Science for a Healthy Planet and Safer World

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### How Hydrogen is Made (2015)

April 2015



Producing hydrogen fuel can lead to global warming emissions—but the extent of those emissions depends on how the hydrogen is made.

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[Fact sheet](#)

**Fuel cell vehicles** generate electricity by converting hydrogen and oxygen into water and energy. This reaction produces no air pollution and no **global warming pollution**—only water leaves a fuel cell vehicle’s tailpipe—but the process used to make the hydrogen can generate carbon emissions.

**Steam methane reforming**, or SMR, is the most common method for producing hydrogen at large industrial scales. SMR causes the methane found in **natural gas** to react with steam, producing hydrogen and carbon monoxide. The carbon monoxide undergoes further reactions, generating more hydrogen and, crucially, carbon dioxide—a heat-trapping gas. Despite this, fuel cell vehicles driven on SMR-sourced hydrogen are still cleaner than their conventional counterparts, and produce even fewer emissions when the methane comes from waste, not natural gas.

Hydrogen can also come from water. **Electrolysis** is the process of splitting water into hydrogen and oxygen with electricity; when powered by renewable sources, this process produces very few emissions, but may not be feasible at larger scales. **Photochemical production** (using sunlight to drive electrolysis); **thermochemical production** (using high temperatures to split water apart); and

**biophotolysis** (using algae to produce hydrogen from sunlight) are also options, with vary degrees of feasibility and expense.

Other sources of hydrogen include **biomass gasification**—where plant matter is heated and reacted to produce hydrogen and carbon dioxide—and **fermentation**, where certain types of bacteria generate hydrogen as part of their metabolism.

Most hydrogen produced today comes from SMR, generating *some* emissions—but because fuel cell vehicles are highly efficient, SMR-sourced hydrogen leads to **fewer emissions overall** than if the vehicles were gasoline or diesel-powered. Future advances in hydrogen production technology and increased use of **renewable electricity** will enable these vehicles to reduce their emissions even further.

Learn more by [downloading the fact sheet](#).

## We Need Your Support to Make Change Happen



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