

delivering real world solutions to global warming

California has long led the nation and the world in the search for new ways to meet the nation's basic energy needs while producing less pollution, including those emissions that contribute to global climate change. Nowhere has this leadership been more evident than in providing the electricity that powers our economy.

Recently, new laws have been passed in California to encourage a reduction in the greenhouse gases, especially carbon dioxide (CO₂), that are believed to contribute to global climate change. Now, both the government and the private sector are taking the necessary steps to move toward a cleaner and more sustainable "hydrogen" energy economy.

Hydrogen Energy California (HECA): hydrogen power and greenhouse gas reduction

Hydrogen Energy International (HEI), a joint venture between BP and Rio Tinto, has proposed a new hydrogen-powered electricity generating facility for the Kern County area that would capture and sequester (store) most of its carbon-related emissions.

This facility will be similar to, but with lower emissions than, the cleanest of natural gas power plants. Instead of using natural gas to run its turbine electrical generators, this plant will use hydrogen. The result will be local power generation in a local area with growing power demands – enough power for over 150,000 homes – along with 90% reduction in the emission of carbon dioxide, the most common greenhouse gas. CO₂ emissions will be captured and stored deep underground, preventing release into the atmosphere.

HECA is proposed to be located adjacent to the existing Elk Hills oil field. It plans to use petroleum coke that is a by-product of oil refining, (or blends of petroleum coke with coal, as needed) as feedstock to create hydrogen that will be used for power generation. Currently, petroleum coke is trucked from refineries to ports to be loaded onto ships for export to other nations where it is burned, releasing CO₂ emissions directly to the air. The use of petroleum coke and coal by HECA will ensure the captured CO₂ emissions associated with their use will be prevented from being released into the atmosphere.

At Hydrogen Energy California, the carbon-rich coke and coal will be converted into hydrogen gas and carbon dioxide through widely-proven gasification and capture industrial processes. The hydrogen gas will then be used to fuel a combined cycle power plant to generate low-carbon electricity. Ninety-percent (90%) of the CO₂ will be captured and sent via pipeline and injected into depleted and deep-seated oil reservoirs for long-term storage.

a new power plant and pipeline

Here in California, HECA will establish a model for future hydrogen-based power generation. HECA will also demonstrate carbon sequestration is a viable strategy for mitigating global warming through specialized monitoring and verification techniques developed for underground CO₂ storage.

The HECA site will include a storage facility for receiving petroleum coke (and coal, as needed) from several sources. It will include a closed-loop process gasification facility that will convert the coke to hydrogen fuel and carbon dioxide. The power generation component will utilize today's most advanced and energy efficient combined cycle turbine technology that will meet or exceed applicable requirements for air emissions.

Importantly, the captured CO₂ will NOT be released into the air and contribute to global climate change, but instead it will be stored deep underground in oil and gas reservoirs. HECA will include a very short pipeline -- to transport the CO₂ to an injection facility located within the Elk Hills oil field for permanent storage.

capture and store: an effective method for the management of CO₂

In California, policymakers agree that one of the first steps in the fight against global warming is to curb CO₂ emissions. Geologists agree that the most immediate and effective way to do this is to capture the CO₂ before it gets into the air, and then store, or “sequester” it, underground in depleted oil and gas reservoirs.

CO₂ itself is a natural component of our air and in every breath we exhale, but too much from traditional industrial and power generation sources has contributed to global climate change. Today, the best method to limit future CO₂ emissions from those sources is through carbon capture and sequestration. When properly stored underground, sequestration poses no threat to people or the environment.

HECA’s gasification process will enable the extraction of hydrogen for power generation from petroleum coke, but it will also enable the removal of its carbon, which will be captured and stored thousands of feet underground in sealed oil reservoirs. The injection of carbon dioxide deep underground has been in common practice for several decades and geologists have documented that there is enough space in existing oil reservoirs and other subterranean formations to store CO₂ emissions for thousands of years. Here in Kern County, the CO₂ will also be used for enhanced oil recovery, resulting in increased oil production, along with related positive job and economic impacts.

Hydrogen Energy California -- community and environmental benefits

- *HECA will provide over 150,000 homes in the local community with new, clean electric power at a time when state agencies are predicting possible power shortages in coming years.*
- *HECA will eliminate more than 2 million tons/yr of greenhouse gases from the atmosphere by sequestering, or storing, them underground.*
- *HECA will enable additional production from existing California oilfields, producing previously unrecoverable oil reserves by injecting the CO₂ into oil reservoirs, where the CO₂ would also be permanently stored.*
- *HECA will boost the local economy by creating up to 1,500 construction jobs and up to 100 permanent operational positions. HECA’s construction will generate \$5 million in new tax revenues, and its operation will generate \$1 million in annual tax revenues.*
- *HECA will reduce dependence on US natural gas supplies, by using a refinery by-product as fuel.*
- *HECA also will create clean hydrogen, making it available for power generation as well as other potential uses, including clean transportation, contributing to the realization of the hydrogen highway.*
- *HECA will preserve limited fresh water resources by using brackish ground water supplied by a local agricultural water district. Currently the water’s poor quality and shallow location negatively impacts local agricultural activity. Process wastewater will be treated on site and recycled within the gasification and power plant systems.*

safety and the community

HECA will be designed, constructed and operated to the highest environmental, safety and health standards, including California and the San Joaquin Valley APCD emission standards.

Each component of hydrogen power technology is proven and in use today. Hydrogen itself is in common usage in a variety of applications, including in oil refining for the formulation of clean fuels. Gasification technologies have been in use for many years, and integrated combined cycle turbines are currently used in natural gas power generation throughout southern California and the world. Gas pipelines and underground storage are in widespread use. CO₂ already is transported by pipelines that are similar to other gas and liquid pipelines located throughout southern California.

Why Kern County, California?

HECA is proposed for the Kern County area because of the existing, adjacent available oil reservoirs for CO₂ storage, and for economic use in enhanced oil recovery operations. Existing electric transmission lines and substations are nearby, providing the opportunity to interconnect to the local electricity grid. Refineries producing the petroleum coke by-product are nearby, as are local delivery points for western coal. Pipeline corridors already exist and are within proximity to existing reservoirs to store carbon dioxide. There also is a local supply of recycled and produced wastewater.