

carbon capture and sequestration

Many scientists agree that the earth's temperature is rising, and there is strong evidence to suggest that this is due at least in part to increased emissions of carbon dioxide (CO₂) from fossil fuels. As data on the progression of climate change is gathered, it is appearing more and more imperative that carbon dioxide emissions need to be curbed. This is why California and other states have passed legislation to reduce emissions of carbon dioxide into the air.

This is also why environmental organizations, community leaders and energy businesses are supporting and developing ways to capture carbon, and to store it permanently so it does not go into the atmosphere. Over the past decade, energy companies in different places around the world have been employing a safe, efficient, and cost-effective method for managing carbon dioxide emissions: they are capturing it and safely storing, or "sequestering" it, underground.

At the Hydrogen Energy California project, carbon dioxide captured after the 'gasification' process to produce hydrogen for power generation, will be contained and kept out of the atmosphere by this method of 'carbon sequestration'.

Today, much of the world's economy runs on fossil fuels and, in developing countries like China and India, fossil fuel usage is expanding significantly. While policymakers, scientists and consumers begin our transition to new, renewable sources of energy, as well as adopt conservation and efficiency measures to reduce the use of traditional energy sources, we also must take action to reduce the CO₂ from these traditional sources of energy. So how do we get a handle on CO₂ emissions? Carbon capture and sequestration is one of the most important measures. Most people agree that to not pursue this viable, safe and proven means of addressing global warming would be environmentally and socially irresponsible.

carbon dioxide -- a natural part of our environment.

Carbon dioxide is the gas we exhale when we breathe, the source of the bubbles in our carbonated beverage of choice, and the gas that trees synthesize into oxygen. Carbon dioxide is neither toxic nor dangerous. It is a natural part of our atmosphere. It is the *increased concentration* of atmospheric CO₂ that is believed to be contributing to global climate change.

It is believed that increased concentration of CO₂ in the atmosphere is trapping heat from the sun and causing the Earth's temperature to rise. *Carbon Sequestration* is the practice of sending CO₂ emissions into depleting oil reservoirs or other geologic formations deep beneath the Earth's surface where it cannot affect the climate. Since CO₂ is non-toxic and non flammable, when stored underground, it poses no threat to people or the environment. Moreover, it is estimated that there is enough space in these underground formations to store thousands of years worth of the world's potential carbon emissions.

Oil and gas exist in networks of billions of pores within layers of rock sediments, often sandstones. Oil extraction involves drilling through layers of solid, non-porous 'cap rock' to reach the porous, oil-rich layers underneath. Once the oil and gas have been extracted, other fluids can be placed within these porous layers of sandstone. In carbon sequestration, this surplus of space beneath the earth is used to permanently store CO₂.

Since the CO₂ will be sent into existing oil fields through existing oil wells, no significant amount of new exploration or drilling, outside the field perimeter will be required. This is why carbon sequestration is such an efficient and cost effective means of managing CO₂: much of the infrastructure is already in place.

At the HECA project, the carbon dioxide we capture will be permanently stored in nearby, available, geologically sound oil fields.

CO₂ pipeline and pipeline safety

In addition to building the hydrogen powered electric generating plant, the HECA project also would build a pipeline to carry the CO₂ to the nearby storage within the adjacent Elk Hills oil field. This pipeline will travel a short distance through or along an existing or new pipeline route.

Pipelines are the safest means of transporting liquids and gas. While trucks and trains pollute and are more prone to accidents, pipelines transport their contents cleanly and silently. The US Department of Transportation and the Centers for Disease Control estimate that one is 420 times more likely to die in a motor vehicle accident than as the result of any pipeline related incident.

Since pipelines are designed to withstand powerful earthquakes and other seismic activity, almost all pipeline related accidents are due to “third party interference”. Usually, this involves accidental rupture of the pipeline by construction equipment. This, of course, can be effectively prevented with proper caution on the part of both pipeline operators and any construction company who may be contracted to dig in the area.

The HECA project’s CO₂ pipeline will adopt the latest pipeline safety technologies, including electronic monitoring devices to instantly pinpoint any rupture’s exact location, and automatic isolation and shut off valves will be appropriately placed along the pipeline route. In the unlikely event of a release, the quantity lost to the atmosphere would be limited, by the valves, to a small part of the inventory in what would be a short pipeline. And since this pipeline’s contents -- carbon dioxide -- is non-flammable and non-toxic, the potential environmental and safety threats of any accident are minimal.

sequestration safety

Throughout recorded history, no earthquake has ever been powerful enough to cause an instantaneous and catastrophic release of oil or gas from a deep-seated geologic formation. And since the CO₂ would be held in place by the very same “cap rock” that has held oil and gas under the earth through millions of years and countless earthquakes, history has demonstrated that sequestered CO₂ would not be in danger of release due to seismic activity.

The only place where the sequestered CO₂ might escape to the earth’s surface would be from the oil wells through which it was injected into the earth in the first place. As is the case with pipelines, oil wells are designed to withstand seismic activity, and are monitored with leak detection technologies. Any leak of CO₂ from a well would be quickly detected, and only a small amount of the non-flammable, non-toxic CO₂ would be able to escape. Under new rules being developed by both federal and state agencies, it is proposed, any escaped CO₂ would have to be made up and “re-sequestered” by the party responsible for its release.

sequestration -- a method available right now.

As soon as the HECA plant comes on line, the infrastructure necessary to keep its carbon emissions out of the atmosphere will be in place. The available oil fields for sequestration have been in operation for decades, as have the wells through which the CO₂ will be injected into the earth.

The apparatus for oil and gas production can now serve a new purpose. Instead of just extracting oil and gas from the ground, oil wells can be used to inject CO₂ deep into the earth to be stored safely and permanently. In California, carbon sequestration is a method that makes use of existing infrastructure, and can be employed just as easily in still functioning oil fields as well as in depleted fields.

Just as the HECA project would be extracting low-carbon hydrogen fuel from a petroleum refinery by-product, the project also will be using existing oil fields and wells as a means of managing its carbon “footprint”. In other words, with hydrogen energy technology and carbon sequestration, carbon emissions can be curbed right away.