

# Carbon Capture and Storage



## Why Capture Carbon Dioxide?

Since the Intergovernmental Panel on Climate Change's first assessment report in 1990, there has been a growing consensus among scientists 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 (CO<sub>2</sub>) from fossil fuels. As data on the progression of climate change is gathered, it is appearing more and more imperative that CO<sub>2</sub> emissions be curbed. This is why California and the U.S. Environmental Protection Agency have mandated the reduction of carbon dioxide and other greenhouse gas emissions.

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 consumers begin to transition to new, renewable sources of energy, we also must take action to reduce the CO<sub>2</sub> from these traditional sources of energy. Many scientists acknowledge that along with conservation and renewable energy, carbon capture and storage must be an integral component of any successful plan to combat global climate change. This is why environmental organizations, community leaders, government and energy businesses are supporting and developing ways to capture carbon, and to store it permanently so it does not enter the atmosphere.

At the Hydrogen Energy California (HECA) project, CO<sub>2</sub> captured after the gasification process will be permanently and safely stored thousands of feet underground in a nearby oil field through a process known as enhanced oil recovery (EOR). The U.S. Department of Energy selected HECA as one of its flagship projects for the Clean Coal Power Initiative, which aims to develop carbon capture technology in order to address environmental concerns while also ensuring an adequate and stable energy supply for the United States. The U.S. Department of Energy has stated:

*"A need exists to further develop carbon management technologies that capture and store or beneficially reuse CO<sub>2</sub> that would otherwise be emitted into the atmosphere from coal-based electric power generating facilities. Carbon capture and storage (CCS) technologies offer great potential for reducing CO<sub>2</sub> emissions and mitigating global climate change, while minimizing the economic impacts of the solution."*<sup>1</sup>

## 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 beverages, 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 CO<sub>2</sub> that is believed to be contributing to global climate change.

## Carbon Capture and Utilization — Storage Through Enhanced Oil Recovery

**Carbon Storage** is the practice of sending CO<sub>2</sub> emissions into depleted oil reservoirs or other geologic formations deep beneath the earth's surface where it cannot affect the climate. Since CO<sub>2</sub> is non-toxic and nonflammable, 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 in the United States to store hundreds of years' worth of the country's potential carbon emissions.

<sup>1</sup> U.S. Department of Energy, HECA Project Facts, November 2011

HECA will productively utilize and store its CO<sub>2</sub> through a method called enhanced oil recovery (EOR). 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 stored within these porous layers of sandstone. During normal oil drilling operations some oil is unrecoverable and is left behind in the rock. In EOR, CO<sub>2</sub> is injected into the porous layers and mixes with the remaining oil, making it easy to extract. During this process the CO<sub>2</sub> takes the place of the oil in the formations and is permanently and safely stored thousands of feet underground.

Since the CO<sub>2</sub> will be sent into an existing, operational oil field, no significant amount of new exploration or drilling outside the field perimeter will be required. This is why EOR is such an efficient and cost effective means of managing CO<sub>2</sub>: much of the infrastructure is already in place. At HECA, the CO<sub>2</sub> we capture will be permanently stored in nearby, available, geologically sound oil fields.

## CO<sub>2</sub> Pipeline and Pipeline Safety

A pipeline will carry the CO<sub>2</sub> to the nearby storage site within the Elk Hills Oil Field. Pipelines are the safest means of transporting liquids and gas and are designed to withstand powerful earthquakes and other seismic activity. Pipelines have been safely transporting CO<sub>2</sub> in the U.S. for almost 40 years and over 3,500 miles of CO<sub>2</sub> pipelines are in operation in the U.S. today.<sup>2</sup>

HECA's CO<sub>2</sub> pipeline will adopt the latest pipeline safety technologies, including electronic monitoring devices and automatic isolation and shut-off valves. In the highly 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.

## CO<sub>2</sub> Storage 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 CO<sub>2</sub> 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 stored CO<sub>2</sub> would not be in danger of release due to seismic activity.

For more information please visit our website at [www.heca.com](http://www.heca.com)



<sup>2</sup> [http://www.climatechange.ca.gov/carbon\\_capture\\_review\\_panel/meetings/2010-08-18/white\\_papers/Carbon\\_Dioxide\\_Pipelines.pdf](http://www.climatechange.ca.gov/carbon_capture_review_panel/meetings/2010-08-18/white_papers/Carbon_Dioxide_Pipelines.pdf)