

Revised
Application for Certification
for
HYDROGEN ENERGY CALIFORNIA
Kern County, California

Prepared for:

Hydrogen Energy International
LLC



hydrogen energy

Submitted to:

California Energy Commission



Volume I

May 2009

Prepared by:

URS

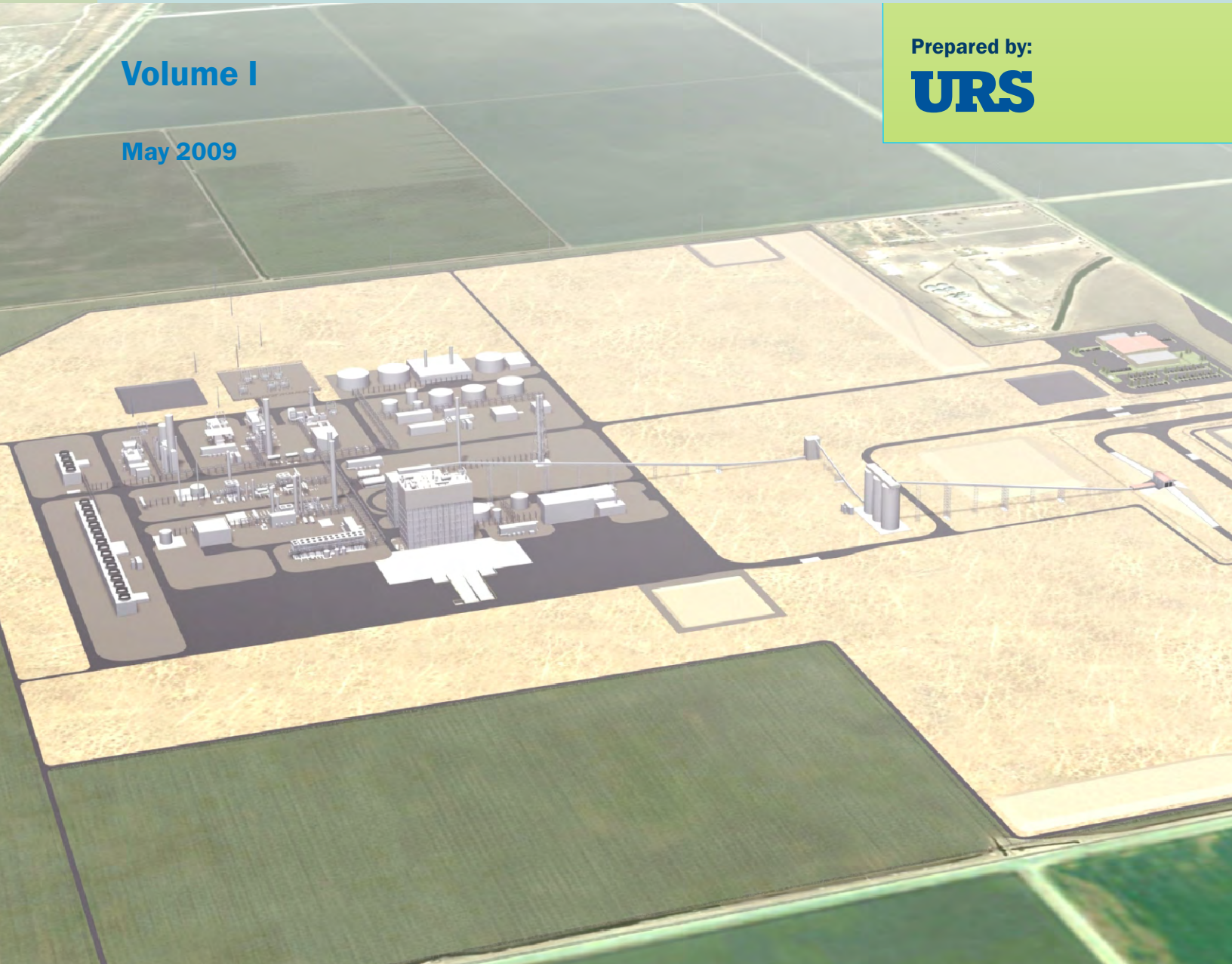


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1.1 PROJECT OVERVIEW

Hydrogen Energy International LLC (HEI or Applicant) is jointly owned by BP Alternative Energy North America Inc. and Rio Tinto Hydrogen Energy LLC. HEI is proposing to build an Integrated Gasification Combined Cycle power generating facility called Hydrogen Energy California (HECA or Project) in Kern County, California. The Project will produce low-carbon baseload electricity by capturing carbon dioxide (CO₂) and transporting it for CO₂ enhanced oil recovery (EOR) and sequestration (storage)¹.

The 473-acre Project Site is located approximately 7 miles west of the outermost edge of the city of Bakersfield and 1.5 miles northwest of the unincorporated community of Tupman in western Kern County, California, as shown in Figure 1-1, Project Vicinity. Figure 1-3 shows the Project Site existing conditions. The Project Site is near a hydrocarbon-producing area known as the Elk Hills Field. The Project Site is currently used primarily for agricultural purposes.

HEI has the option to purchase the Project Site from the site owner. This option also includes the 628 acres surrounding the Project Site, herein referred to as Controlled Area (see Figure 2-4, Site Plan in Section 2.0 (Project Description) of this Revised AFC), in which HEI will control access and future land uses.

The Project will gasify petroleum coke (petcoke) (or blends of petcoke and coal, as needed) to produce hydrogen to fuel a combustion turbine operating in combined cycle mode. The Gasification Block feeds a 390-gross-megawatt (MW) combined cycle plant. The net electrical generation output from the Project will provide California with approximately 250 MW of low-carbon baseload power to the grid. The Gasification Block will also capture approximately 90 percent of the carbon from the raw syngas at steady-state operation, which will be transported to the Elk Hills Field for CO₂ EOR and Sequestration. In addition, approximately 100 MW of natural gas generated peaking power will be available from the Project.

The Project Site and linear facilities comprise the affected study area and are entirely located in Kern County, California. These Project components are described below.

Major on-site Project components will include, as shown on Figure 2-5, Preliminary Plot Plan:

- Solids Handling, Gasification, and Gas Treatment
 - Feedstock delivery, handling, and storage
 - Gasification
 - Sour shift/gas cooling
 - Mercury removal
 - Acid gas removal

¹ This carbon dioxide will be compressed and transported via pipeline to the custody transfer point at the adjacent Elk Hills Field, where it will be injected. The CO₂ EOR process involves the injection and reinjection of carbon dioxide to reduce the viscosity and enhance other properties of the trapped oil, thus allowing it to flow through the reservoir and improve extraction. During the process, the injected carbon dioxide becomes sequestered in a secure geologic formation. This process is referred to herein as CO₂ EOR and Sequestration.

- Power Generation
 - Combined cycle power generation
 - Auxiliary combustion turbine generator
 - Electrical switching facilities
- Supporting Process Systems
 - Natural gas fuel systems
 - Air separation unit (ASU)
 - Sulfur recovery unit/Tail Gas Treating Unit
 - Zero liquid discharge (ZLD) units for process and plant wastewater streams
 - Carbon dioxide compression
 - Raw water treatment plant
 - Other plant systems

A computer-rendered view of the completed Project showing the major on-site Project components is shown on Figure 1-4, Project Site – Project Rendering. The Project also includes the following offsite facilities, as shown on Figure 1-2, Project Location Map:

- **Electrical Transmission Line** – An electrical transmission line will interconnect the Project to Pacific Gas & Electric Company’s (PG&E’s) Midway Substation. Two alternative transmission routes are proposed; each alternative is approximately 8 miles in length.
- **Natural Gas Supply** – A natural gas interconnection will be made with PG&E or Southern California Gas Company (SoCalGas) natural gas pipelines, each of which are located southeast of the Project Site. The natural gas pipeline will be approximately 8 miles in length.
- **Water Supply Pipelines** – The Project will use brackish groundwater supplied from the Buena Vista Water Storage District (BVWSD) located to the northwest. The raw water supply pipeline will be approximately 15 miles in length. Potable water for drinking and sanitary use will be supplied by West Kern Water District (WKWD) to the southeast. The potable water supply pipeline will be approximately 7 miles in length.
- **Carbon Dioxide Pipeline** – The carbon dioxide pipeline will transfer the carbon dioxide captured during gasification from the Project Site southwest to the custody transfer point. Two alternative carbon dioxide pipeline routes are proposed; each alternative will be approximately 4 miles in length.

The Project components described above are shown on Figure 2-8, Project Location Details, which depicts the region, the vicinity, the Project Site, and its immediate surroundings for Project components. All temporary construction equipment laydown and parking, including construction parking, offices, and construction laydown areas, will be located on the Project Site.

The Project advances important goals of the State of California, namely energy security and the reduction of greenhouse gases, by using petcoke as its primary feedstock and by capturing and transporting the carbon dioxide to the custody transfer point for CO₂ EOR and Sequestration. Petcoke is a by-product of the refining process of heavy oils, and is predominantly exported

overseas for use as fuel. Turning a low-value refinery by-product into much needed electricity has significant environmental benefits, including the global reduction of greenhouse gas emissions and criteria pollutants. Existing conventional power plants release carbon dioxide into the atmosphere, rather than capturing and sequestering it. In addition, the Project improves energy security for California by using a local energy source that is currently exported. Moreover, an IGCC facility has the significant advantage of using a range of abundantly available domestic fuel supplies, such as petcoke, coal, and potentially, biomass. Although the Project does not include the use of biomass as a feedstock, the Applicant recognizes and supports the desire on the part of the region to develop beneficial uses for biomass.

Another environmentally progressive aspect of the Project is the production of hydrogen. The increase in supply of hydrogen will support the State's goal of energy independence as expressed in California Executive Order S-7-04, which mandates the development of a hydrogen infrastructure and transportation in California. Importantly, the Project is poised to supplement the quantities of hydrogen necessary for these future energy and transportation technologies, and support California's role as a world leader in clean energy.

California has enacted several policies and executive orders to address greenhouse gas emissions from power plants. These are summarized below:

- In 2005, the state energy agencies issued Energy Action Plan II (EAP II). EAP II emphasized “[the] need to develop and tap advanced technologies to achieve [the] goals of reliability, affordability and an environmentally-sound energy future.” Economic performance will change over the life of the Project as technology advances occur and increasingly stringent climate change mitigation regulations are adopted.
- Assembly Bill 32 (AB 32) was passed to reduce greenhouse gas emissions to 1990 levels by 2020. AB 32 requires the California Air Resources Board (CARB) to assign emissions targets to each sector in the California economy, and to develop regulatory and market methods to ensure compliance, which takes effect in 2012. The California Public Utilities Commission (CPUC) and California Energy Commission (CEC) are to develop specific proposals to CARB for implementing AB 32 in the electricity sector, possibly including a cap-and-trade program.
- California Executive Order S-3-05 sets a state target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050.
- Senate Bill 1368 (SB 1368), passed in 2006, establishes an Emission Performance Standard (EPS) for greenhouse gas emissions from power plants used to serve baseload power in California, which was set by the CPUC at 1,100 pounds of carbon dioxide per megawatt hour (MWH) of electricity. The intended effect of SB 1368 is to encourage low-carbon power production. The Project's greenhouse gas emissions will be well below this threshold requirement.
- AB 1925, a law passed in 2006, required the CEC to provide a report to the California legislature by November 2007 “with recommendations for how the state can develop parameters to accelerate the adoption of cost-effective geologic carbon sequestration

strategies.” This type of legislation clearly demonstrates California’s commitment to supporting and encouraging in-state carbon capture and sequestration (CCS) demonstration technology.

The Project will add 250 MW of baseload low-carbon power to the grid, provide environmental benefits regarding greenhouse gases (among others), and help California meet its obligations under AB 32, AB 1925, and SB 1368. The Project is also designed to support Executive Orders S-7-04 and S-3-05.

HEI submitted an Application for Certification (AFC) (08-AFC-8) to the California Energy Commission on July 30, 2008, which proposed the Project on a different site. HEI subsequently decided to move the Project when it discovered the existence of previously undisclosed sensitive biological resources at the prior site. HEI respectfully submits this Revised AFC for the new Project Site, which supersedes and replaces the July 30, 2008 AFC in its entirety. This Revised AFC has been prepared in accordance with the CEC’s Rules of Practice and Procedure and Power Plant Site Certification (August 2000) as amended, and is intended to provide:

- A detailed description of the Project
- An assessment of the anticipated Project impacts on the existing environment
- A discussion of compliance with applicable laws, ordinances, regulations, and standards (LORS)

The remainder of this Executive Summary encapsulates the more detailed information presented in the balance of the Revised AFC.

1.2 PROJECT SCHEDULE

The following milestones are anticipated for the Project:

Completion of CEC permitting process	May 2011
Start of construction	December 2011
Completion of construction	December 2014
Commissioning and initial startup	October 2014 through August 2015
Commercial operation of the Project	September 2015

1.3 PROJECT OWNERSHIP

HEI is jointly owned by BP Alternative Energy North America Inc. and Rio Tinto Hydrogen Energy LLC. It was formed with the prime objective of producing hydrogen for low-carbon power generation. HEI proposes to be the owner and operator of the IGCC facilities and carbon dioxide pipeline up to the custody transfer point. The transmission line will be owned by HEI up to the point of interconnect (Midway Substation) as stipulated by the California Independent System Operator (CAISO). HEI will own the carbon dioxide pipeline up to the custody transfer point. Natural gas supply lines will be owned by PG&E or SoCalGas. The process water supply line will be owned by Buena Vista Water District. The potable water supply line will be owned by WKWD.

1.4 PROJECT DESCRIPTION

Highlights of the Project are as follows:

- The Project is designed to operate with 100 percent petcoke from California refineries, and has the flexibility to operate with up to 75 percent thermal input (higher heating value [HHV] basis) western bituminous coal.
- The feedstock will be gasified to produce a synthesis gas (syngas) that will be processed and purified to produce a hydrogen-rich gas, which will be used to fuel the combustion turbine for electric power generation. A portion of the product (hydrogen-rich fuel) will also be used to supplementally fire the heat recovery steam generator (HRSG) that produces steam from the combustion turbine exhaust heat.
- At least 90 percent of the carbon in the raw syngas will be captured in a high-purity carbon dioxide stream during steady-state operation, compressed, and transported by pipeline to the custody transfer point for injection into deep underground hydrocarbon reservoirs for CO₂ EOR and Sequestration.
- The power produced by the Project will have a low-carbon-emission profile, significantly lower than would otherwise be produced by traditional fossil-fueled sources, including natural gas.
- Project greenhouse gas emissions (e.g., carbon dioxide) and sulfur emissions will be reduced through CO₂ EOR and Sequestration and state-of-the-art emission-control technology.
- The Gasification Block feeds a 390-gross-megawatt (MW) combined cycle plant. The net electrical generation output from the Project will provide approximately 250 MW of low-carbon baseload power to the grid, feeding major load sources to the north and to the south. In addition, approximately 100 MW of natural-gas-generated peaking power will be available from the Project.
- The water source for the Project will be brackish groundwater supplied by the Buena Vista Water Storage District (BVWSD), and will be treated onsite to meet Project standards. Potable water will be supplied by WKWD for drinking and sanitary purposes.
- There will be no direct surface water discharge of industrial wastewater or storm water. Process wastewater will be treated onsite and recycled within the gasification and power plant systems. Other wastewaters from cooling tower blowdown and raw water treatment will be collected and directed to one of two on-site plant wastewater ZLD units.
- The Project is designed with state-of-the-art emission-control technology. The Project will feature near zero sulfur emissions during steady-state operation. The Project is also designed to avoid flaring during steady-state operation, and to minimize flaring and sulfur emissions during startup and shut-down operations.

1.5 KEY PROJECT BENEFITS

The Project will provide numerous benefits at the local, statewide, regional, national, and global levels. Among these benefits are the following:

- **Helping to Ensure Adequate Supplies of Electricity.** The Project will provide approximately 250 MW of new, baseload low-carbon generating capacity, enough to power over 150,000 homes. The CEC estimates that the state will need to add over 9,000 MW of capacity between 2008 and 2018 to meet demand (CEC 2007). In addition, the Project will provide approximately 100 MW of natural gas generated peaking power.
- **Protecting the Environment.** The Project will prevent the release of more than 2 million tons (roughly equivalent to the carbon dioxide output of 500,000 automobiles) per year of greenhouse gases to the atmosphere by sequestering them underground. The Project will employ state-of-the-art emission control technology to achieve near-zero sulfur emissions and avoid flaring during steady-state operations. The Project will conserve fresh water sources by using brackish groundwater for Project process water needs. Direct surface water discharge of industrial wastewater will be eliminated through the use of ZLD technology.
- **Protecting Domestic Energy Supplies.** The Project will conserve domestic energy supplies, thereby enhancing energy security. The Project will advance technology to reduce stress on U.S. natural gas supplies by using a by-product from the oil refining process and coal to generate electricity. In addition, the Project will produce additional energy from existing California oil fields by injecting carbon dioxide and increasing production by an estimated 10 to 20 percent.
- **Promoting Hydrogen Infrastructure.** The Project will increase the supply of hydrogen available to support the state's goal of energy independence as expressed in California Executive Order S-7-04, which mandates the development of a hydrogen infrastructure and transportation in California. The Project is poised to supplement the quantities of hydrogen necessary for these future energy and transportation technologies, and support California's role as a world leader in clean energy.
- **Stimulating the Local and California Economy.** The Project will boost the local and California economy with an estimated 1,500 jobs associated with construction, and 100 permanent positions associated with Project operations.

1.6 EMISSIONS SUMMARY

The Project will produce baseload electricity while substantially reducing greenhouse gas emissions by capturing carbon dioxide and transporting it for CO₂ EOR and Sequestration. Furthermore, the Project will employ Best Available Control Technology (BACT) to control project emissions. The following is a summary of the emission control equipment used on the Project:

- Project greenhouse gas emissions (e.g., carbon dioxide) and sulfur emissions will be reduced through CO₂ EOR and Sequestration and state-of-the-art emission-control technology. The Project will feature near zero sulfur emissions during steady-state operation.
- The Project is designed to avoid flaring during steady-state operation. The Project is also designed to incorporate state-of-the-art technology to minimize flaring during startup and shut-down operations.
- The feedstock solids handling system includes truck unloading using a conveyor system to transport the feedstock to the storage silos. A dust collection system has been incorporated into the feedstock solids handling system consisting of enclosed conveying systems, hoods, baghouses, and high-efficiency filtration to control particulate emissions.
- Combustion turbines incorporate post-combustion control technologies to meet BACT requirements.
- The HRSG includes a selective catalytic reduction (SCR) system to control the stack nitrogen oxide emissions and a carbon monoxide catalyst system to control the stack carbon monoxide and volatile organic compounds emissions.
- The cooling towers will include high-efficiency mist eliminators to minimize particulate emissions and reduce water losses.

1.7 WATER SUPPLY

The Project will use approximately 5 million gallons a day (mgd) of brackish water on a calendar year average basis for process water needs. This volume is seasonally variable.

The Project will use local brackish groundwater treated onsite to meet Project standards. The brackish groundwater will be supplied from BVWSD, which is a local water district with impaired groundwater sources not suitable for agricultural or drinking use. The proposed BVWSD well field for the Project's process water supply is located approximately 15 miles northwest of the Project Site. Project consumption of these impaired sources will beneficially affect local agriculture, as described in Section 5.14, Water Resources. Overall Project-specific pumping is seen as a benefit to BVWSD in that it impedes eastward flow of poor-quality groundwater and enhances westward flow of good-quality groundwater. As such, the use of impaired quality groundwater proposed by the Project will result in a less-than-significant impact to the sub-basin water balance.

Potable water will be supplied by the WKWD located near the SR 119/Tupman Road intersection, southeast of the Project Site. Potable water will be consumed for drinking and sanitary purposes only. The Project will use a small amount of potable water (approximately 1 acre-foot per year [afy]), which is a very small amount of water compared to the overall water usage within WKWD's service area. Therefore, the impact to potable water supplies in the area will be less than significant.

1.8 PROCESS OVERVIEW

In the IGCC process, solid feedstocks are ground with water to form a slurry. The slurry and high-purity oxygen that has been separated from the air are injected into the gasifier. The slurry chemically reacts with the oxygen in the gasifier to form syngas, composed mostly of hydrogen and carbon monoxide. The high temperature ensures complete gasification of the feedstock and traps inorganic matter, like ash and metal, in a glassy matrix material (gasification solids). Gasification solids from other IGCCs similar to this Project are inert and beneficially used. The gasification solids are continuously removed from the gasifiers. The syngas leaving the gasifiers is cooled in an efficient heat recovery system and cleaned in preparation as feedstock to the gas turbines.

Post-gasification treatment for raw syngas includes removal of entrained particulates, shift conversion of carbon monoxide and water to hydrogen and carbon dioxide, mercury removal, and acid gas removal. The sulfur in the raw syngas is recovered and converted into elemental sulfur for sale into agricultural and other markets.

At least 90 percent of the carbon in the raw syngas will be converted into carbon dioxide during steady-state operation, which will be captured, compressed, and transported by pipeline off site to the custody transfer point for injection into deep, underground hydrocarbon-bearing formations in the existing Elk Hills Field. The carbon dioxide will be used for CO₂ EOR and Sequestration.

Overall, the process achieves minimum levels of emissions by converting petcoke (and petcoke/coal blends) into a clean de-sulfurized hydrogen-rich fuel that is then supplied as fuel gas for power generation in efficient, advanced combined cycle combustion turbines.

1.9 ENVIRONMENTAL CONSIDERATIONS

Impacts that the Project may have on the environment have been evaluated in detail. The Project would avoid or minimize potential environmental impacts through Project siting and design, and incorporation of mitigation measures. As a result, the Project would not have any significant environmental impacts. The impact evaluations are summarized below and provided in detail in Section 5.0.

1.9.1 Air Quality

The Project would generate emissions of criteria pollutants including nitrogen oxide (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), sulfur dioxide (SO₂), and particulates less than or equal to 10 microns in diameter and 2.5 microns in diameter (PM₁₀ and PM_{2.5}). Emissions of NO_x, VOCs, SO₂, PM₁₀, and PM_{2.5} will be fully offset by providing emission reductions from emission reduction credits held by HEI entities or others, or reducing emissions from other existing sources.

- In addition, the Project will incorporate the following state-of-the-art air emission controls that reflect BACT to reduce emissions:
 - SCR to reduce NO_x emissions from the combustion turbines.

- Oxidation catalysts to reduce CO and VOC emissions from the combustion turbines.
- Enclosed conveyors and high-efficiency filtration to limit PM₁₀ and PM_{2.5} emissions from feedstock materials handling systems.
- High-efficiency mist eliminators to limit PM₁₀ and PM_{2.5} emissions from cooling tower drift.

The air dispersion modeling analysis conducted for NO_x, CO, SO₂, PM₁₀ and PM_{2.5} is presented in Section 5.1 and Appendix C of this Revised AFC. The results show that the Project, with the planned emission control systems, would neither cause an exceedance of the California and National Ambient Air Quality Standards, nor contribute significantly to an existing exceedance. Additional modeling results demonstrate that the Project would not cause an incremental impact above the significant impact thresholds under the federal Prevention of Significant Deterioration program, and would not produce significant impacts to air quality or visibility in a wilderness area in the region.

With implementation of Project design features and proposed mitigation measure, the Project would result in less-than-significant impacts to air quality.

1.9.2 Biological Resources

No threatened or endangered plant species were identified on the Project Site. Three listed plant species have the potential to occur along the linear facilities.

No threatened or endangered wildlife species were identified on the Project Site. Five Federally and/or State-listed threatened or endangered wildlife species are likely to occur along the linear facilities. In addition, eight sensitive wildlife species are also likely to occur along the linear facilities.

In order to ensure that no threatened or endangered plant or animal species are affected by the Project, avoidance and mitigation measures, such as pre-construction surveys and exclusionary fencing, would be implemented to reduce impacts to threatened and endangered species to less-than-significant levels. All blunt-nosed leopard lizards, which are listed as both State and Federally Endangered and State Fully Protected, will be avoided.

Potential Jurisdictional Waters and Wetlands of the United States and the State of California would not be affected by project construction and operation activities. Any potential waters or wetlands along the linear facilities determined to be Jurisdictional Waters will be avoided by horizontal directional (HDD) drilling underneath the feature. No impacts to Jurisdictional Waters or Wetlands of the United States and the State of California are anticipated.

With implementation of Project design features, including measures to reduce global greenhouse gas emissions, as well as proposed avoidance and mitigation measures, the Project will not result in significant impacts to biological resources.

1.9.3 Cultural Resources

The California Native American Heritage Commission (NAHC) was contacted on four occasions during the course of the Project, requesting a records search of the Sacred Lands File and a list of

local Native American contacts (individuals and/or organizations) that might have knowledge of cultural resources within the Project study areas and various linear alternative alignments. According to the NAHC, the searches were negative for the presence of Native American cultural resources in the archaeological resources survey areas comprised of the Project Site, as well as the various linear alignment alternatives. The responses from the Native American contacts did not contain any information on additional cultural resources.

Pedestrian surveys were performed of the Project Site and linear corridors. Twenty-four archaeological resources were identified within the archaeological resources Area of Potential Effect (APE) as defined for the Project during the course of the current investigation. Of these, 16 were previously recorded sites, with the remaining 8 comprised of newly discovered resources. None of the known archaeological resources situated within the Project APE have been formally determined (e.g., SHPO concurrence) ineligible for listing to either the National Register of Historic Places (NRHP) or California Register of Historical Resources (CRHR). As such, all archaeological resources within the Project APE must be considered NRHP and/or CRHR eligible until formally determined otherwise.

In addition to the pedestrian reconnaissance, archaeological monitoring was conducted during the geotechnical investigation conducted within the Project Site. No archaeological materials were observed within any of the five geotechnical borings placed within the Project Site.

All buildings (built environment resources) constructed before 1964 within the study area were recorded and evaluated. Only two of the buildings or structures in the study area for the Project appear to meet the criteria for listing in the National Register of Historic Places. All buildings or structures in the study area around the Project location over 50 years old received evaluation. None of the more recently constructed buildings appeared to meet the exacting standards of exceptional significance. Therefore, none of the buildings in the study area appear to be significant historic properties subject to Section 106, nor do they appear to be historical resources for the purposes of CEQA.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts to cultural resources.

1.9.4 Land Use

The majority of the Project Site is currently used for agricultural purposes, and designated as Prime Farmland. The entire Project Site is also under Williamson Act contract. Williamson Act restrictions on the Project Site will need to be cancelled pursuant to California Government Code Section 51280(b).

Operation of the Project is not expected to conflict with existing land uses within the vicinity of the Project Site, which include farming, the Tule Elk State Natural Reserve, and a few scattered single-family dwellings. The Project Site is included in the Intensive Agriculture land use designation; permitted uses in the designation include public utility uses. The Project Site is included in the Exclusive Agriculture (A) zone; Electrical Power Generating Plants are permitted under Zoning Ordinance with a Conditional Use Permit. Therefore, the Project is consistent with the County's General Plan and Zoning designations.

With implementation of Project design features, the Project will not result in significant impacts to land use.

1.9.5 Noise

Noise impacts to sensitive receptors were evaluated for construction, commissioning, operations, ground-borne vibrations, and vehicle traffic. In addition, worker exposure noise impacts were evaluated.

Given the intermittent and temporary nature of construction activities, potential noise impacts during construction are considered to be less than significant. To ensure compliance with applicable LORS during ongoing Project operations, extensive noise-reduction features were incorporated into the Project design, including low-noise designs for some equipment items, and applying external treatments such as enclosures or noise control panels on selected equipment. In addition, mitigation measures are proposed to reduce potential noise increases from vehicular traffic to less-than-significant levels.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts from noise.

1.9.6 Public Health

Because Project construction will be of short duration, significant long-term public health effects are not expected as a result of construction. During operation, the emissions control systems of the Project will minimize potential toxic air emissions. The maximum incremental cancer risk from project emissions is estimated to be well below the significance criterion of 10 in one million. For sensitive receptors, the maximum chronic total hazard index (THI) and the maximum acute THI are both estimated to be less than the significance criterion of 1.0. Based on this evaluation using conservative assumptions, Project emissions are expected to pose no significant cancer or non-cancer health effects. As demonstrated by the air quality analysis, criteria pollutant emissions from the Project would not cause or contribute to violations of California or National Ambient Air Quality Standards, which have been set at levels designed to protect public health. Adverse health effects from criteria pollutant emissions would be well below significance thresholds.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts to public health.

1.9.7 Worker Safety and Health

Worker exposure to physical and chemical hazards would be minimized through adherence to appropriate engineering design criteria, implementation of appropriate safety and administrative procedures, use of personal protective equipment, and compliance with applicable health and safety regulations. With implementation of Project design features, the Project will not result in significant impacts to worker safety and health.

1.9.8 Socioeconomics

The Project would have a positive impact on fiscal resources in the local community and region. Construction and commissioning is expected to occur over a 44-month period.

Direct Effects

The average size of the workforce over the 44-month site preparation and construction period will be 740 workers (including construction workers and contractor staff). Peak construction employment will represent approximately 7 percent of construction jobs in Kern County in 2007, and less than 1 percent of construction jobs in Kern County and Los Angeles County combined. The majority of the workforce (approximately 60 percent) is expected to be hired from within Kern County.

The Applicant estimates that operation and maintenance of the Project will require 100 skilled full-time employees, including 50 to 60 shift workers. The Applicant estimates that operations payroll for the Project will be approximately \$15 million in the first year of operation. On average, the annual operations and maintenance cost for the Project will be \$80 million, including payroll. Approximately 30 percent (\$19.5 million) of material and supply purchases will occur within Kern County. These estimates are in 2008 dollars. The labor income and materials spending related to the Project will represent a permanent economic benefit to Kern County.

Indirect and Induced Effects

Estimated indirect and induced effects of construction that will occur within Kern County will be more than 4,000 jobs, approximately \$209 million in labor income, and approximately \$638 million in economic output. Output includes spending for materials and supplies (non-labor costs), plus value added, which is comprised of employee compensation, proprietary income, other property income, and indirect business taxes. These beneficial effects of the Project during construction will be temporary, occurring over the 44-month site preparation, construction, and commissioning/start-up period, and will lag behind the direct effects of construction by approximately 6 to 12 months. The labor income and materials spending related to the Project will represent a permanent economic benefit to Kern County. Estimated indirect and induced effects of annual operation in Kern County will be approximately 55 additional jobs, \$2 million in annual labor income, and \$7 million in annual output, based on 2008 dollars. These economic effects will represent a long-term economic benefit to Kern County.

The local fire protection, emergency response, and law enforcement systems are adequately staffed and equipped to serve the additional population associated with Project construction and operation. Consequently, construction and operation impacts are expected to be less than significant on public services.

With implementation of Project design features, the Project will not result in significant impacts to socioeconomics.

1.9.9 Soils

The surficial soils of the Project Site will likely be excavated and re-compacted or replaced with granular soils within and adjacent to the areas of Project facilities. Preliminary grading plans indicate that approximately 1.1 million cubic yards of soil required for construction will be derived from offsite sources. The anticipated borrow site for the Project is located approximately 5 miles west of the Project Site. Additionally, soil removed through grading activities is expected to be reused on site to construct berms at the northwestern and northeastern portions of the Project Site; therefore, no on- or off-site fill disposal is expected. However, it may be necessary to dispose of vegetative matter and excavated debris.

The soils at the Project Site have a low potential for wind erosion. Project-related soil erosion will be minimized through implementation of erosion control measures. Therefore, impacts from soil erosion are expected to be less than significant.

During construction and installation of the linear facilities, the soil within the alignment for the linear facilities may become more susceptible to erosion. The extent of this construction-related impact on soils and agricultural lands, however, will be temporary and appropriate best management practices (BMPs) will be implemented to minimize potential impacts. With the implementation of mitigation measures, no significant impacts to native soil, receiving water bodies, or area agricultural lands are anticipated at or near linear facilities.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts to soils.

1.9.10 Traffic and Transportation

During Project construction, the study area will experience short-term increases in traffic associated primarily with construction worker commute and material and equipment delivery trips. During the peak construction month, there will be approximately 1,500 workers on site working on a daily basis. During the peak construction month, there will be 50 truck deliveries daily. In addition, during Project construction, soil fill materials will be imported to the Project Site. The soil fill material deliveries will be originating from a local source. There will be on average 160 truck deliveries daily.

The Project will work and coordinate with Kern County Roads Department to remedy potential pavement deterioration associated with heavy loadings; improve the local intersections to facilitate traffic flow via the introduction of dedicated turn lanes; and improve the turn radius at the affected intersections. These mitigation measures will reduce impacts to roadway loading during construction to less-than-significant levels. Additional proactive measures implemented by the Project will continue to benefit the Project during operations, ensuring more efficient traffic circulation, movement of feedstock material deliveries, and operations and maintenance trips to and from the Project Site.

During Project operations, the Project study area will experience increases in traffic associated primarily with operation worker commute, feedstock deliveries and operation and maintenance trips. The first full year of commercial operation will be Year 2016. During the normal

operations of the Project, there will be a full-time employee workforce of about 100. There will be regular deliveries of feedstock to sustain Project operations. Occasional deliveries and maintenance-related trips are anticipated as part of normal Project operations. The Level of Service (LOS) analysis concluded that all study intersections would operate at an acceptable LOS during both morning and evening peak-hour analysis periods.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts to traffic or transportation.

1.9.11 Visual Resources

In general, the Project area is comprised of primarily agricultural lands/farming activities, with scattered residences, as well as oilfield extraction, grain storage, fertilizer production activities/industrial facilities, and electrical transmission lines. The overall landscape is highly modified by human activity and is representative of a low scenic quality. The Project will be clearly visible from the west, north, and east, with sporadic visibility from areas located to the south and southeast (within the identified 5-mile radius).

With implementation of Project design features and proposed mitigation measures, no significant impacts are expected to occur within the Visual Sphere of Influence and region as a result of the construction, operation, maintenance, and long-term presence of the Project.

1.9.12 Hazardous Materials Handling

Hazardous materials to be used during operations include aqueous ammonia, molten sulfur, methanol, compressed gases including hydrogen, corrosive materials, solvents, gasoline, diesel fuel, oil, and lubricants, as well as minimal amounts of cleaners, solvents, adhesives, and paint materials. Only minimal quantities of paints, oils, solvents, pesticides, and cleaners, typical of those packaged for retail consumer use, are or will be present during operation of the power plant. Small volumes of petroleum products associated with construction equipment will be on site during construction. No Acutely Hazardous Materials (AHMs) will be used or stored on site during construction or operation, and no storage of hazardous materials will occur outside of the Project Site. Liquid hazardous materials will be stored within containment berms or will have other secondary containment.

None of the chemicals at the Project Site would be stored in quantities above the federal thresholds, and only aqueous ammonia would be stored on the site in a quantity greater than the California Accidental Release Prevention Program threshold. Based upon the Off-site Consequence Analysis (OCA), the Project will not result in significant impacts from hazardous materials and handling with implementation of Project design features and proposed mitigation measures.

1.9.13 Waste Management

Wastes generated by the Project during construction and operation include non-hazardous and hazardous wastes. Non-hazardous wastes include scrap metal, paper, sanitary waste, some types of spent catalysts, and stormwater. Hazardous wastes to be generated include paint, solvents, cleaners, sludges, oil, batteries, and hazardous spent catalysts.

Wastewater generated during construction of the Project will include sanitary wastes, equipment wash water, hydrotest water, and stormwater runoff. Sanitary wastewater will be disposed in an on-site sanitary leach field. Non-hazardous hydrotest water will be routed to the appropriate process area stormwater retention basin for reuse.

There will be no direct surface water discharge of industrial wastewater or stormwater from process areas. Process wastewater will be treated on site in a ZLD unit and recycled within the gasification and power plant systems.

All waste will be handled and disposed of in accordance with applicable LORS and will be recycled or disposed of in licensed disposal facilities, as appropriate. Based on the remaining capacity and estimated closure dates of the Class I, II, and III landfills in California, the hazardous and nonhazardous wastes that cannot be recycled are not expected to significantly impact the capacity of the landfills. Managed and disposed of properly, these wastes will not cause significant environmental or health and safety impacts.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts from waste management.

1.9.14 Water Resources

As noted above under Section 1.7, Water Supply, the Project is not expected to have significant impacts from process or potable water demands.

The Project will treat and recycle process water using ZLD technology; therefore, there will be no process wastewater discharge. In addition, the Project will collect stormwater runoff from the process areas of the Project Site in onsite retention basins; this water will be used for cooling tower make-up water. During construction, BMPs will be implemented to minimize the potential for erosion and minimize impacts to offsite areas, including the nearby canals. For portions of the pipelines that cross the West Side Canal, the Outlet Canal, and the Kern River Flood Control Channel, the HDD installation method and appropriate BMPs will be implemented; therefore, the Project's impacts to surface waters will be less than significant.

The Project Site is not located in a designated floodplain. Pipelines that cross floodplain areas will be buried, or installed using HDD technology at canal crossings; therefore, there will be no impacts to floodplains.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts to water resources.

1.9.15 Geologic Hazards and Resources

There are no known active or potentially active faults at the Project Site or crossing the Project linears. The closest known major faults classified as active by the State of California Geologic Survey (CGS) are the San Andreas Fault located approximately 21 miles to the west, the White Wolf fault located approximately 23 miles to the southeast, and the Pleito Thrust located approximately 27 miles south of the Project Site.

The primary geologic hazards at the Project Site and linear facilities include ground motion from a seismic event centered on one of several nearby active faults, and the potential for expansive soils due to high clay content in surface soils.

Project facilities will be designed in accordance with applicable building code seismic design criteria. To reduce the potential for adverse differential settlement beneath heavily loaded settlement-sensitive structures, removal of the susceptible soils and replacement with engineered fill have been recommended for structures to be founded on shallow foundations. Alternatively, deep foundations (driven piles) have been recommended. Settlement design criteria can be provided by a design-level geotechnical investigation.

To reduce the potential for adverse differential settlement beneath heavily loaded structures, landsliding, lateral spreading, and adverse expansion, removal of the susceptible soils and replacement with engineered fill have been recommended.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts to biological resources.

1.9.16 Paleontological Resources

Project construction could impact paleontological resources within the Quaternary alluvium and the Plio-Pleistocene Tulare Formation. Therefore, mitigation measures will be implemented to reduce potential adverse impacts to paleontological resources resulting from Project construction. The paleontological resources impact mitigation program will reduce direct, indirect, and cumulative adverse environmental impacts on paleontological resources that could result from Project construction to a less-than-significant level. The mitigation measures will allow for the salvage of fossil remains and associated specimen data, and corresponding geologic and geographic site data that otherwise might be lost to earth-moving and to unauthorized fossil collecting.

With implementation of Project design features and proposed mitigation measures, the Project will not result in significant impacts to paleontological resources.

1.10 PROJECT ALTERNATIVES

This will be the first project of its kind in California, and among the first anywhere in the world. The Project will demonstrate a combination of proven technologies at commercial scale that can provide baseload low-carbon power that is fully consistent with California's express clean energy policies. The Project will thus make an essential contribution to California's long-term environmental, economic, and energy security objectives. The Project will play a significant role in California's goal of addressing climate change and leading the world in production of low-carbon energy. The Project and its environmental benefits may be implemented elsewhere in the world in an effort to combat climate change.

Section 6.0, Alternatives, provides a detailed discussion "on the range of reasonable alternatives to the Project, including the no project alternative...which would feasibly attain most of the basic objectives of the project, but would avoid or substantially lessen any of the significant effects of

the project, and an evaluation of the comparative merits of the alternatives.” An evaluation of alternative site locations, linear facilities, generating technologies and configurations, and water supply sources is presented. Based on the Project objectives, the following general evaluation criteria were used to evaluate and rank alternatives:

- Provide an efficient, reliable, and environmentally sound power generating facility to help meet future electrical power needs.
- Mitigate impacts related to climate change by dramatically reducing average annual greenhouse gas (GHG) emissions relative to the GHG emitted from a conventional power plant by capturing and sequestering carbon dioxide emissions.
- Facilitate and support the development of hydrogen infrastructure in California by supplementing the quantities of hydrogen available for future energy and transportation technologies.
- Conserve domestic energy supplies and enhance energy security by using a by-product from the oil refining process to generate electricity, and enhancing production of domestic petroleum reserves.
- Minimize environmental impacts associated with the construction and operation of the Project through choice of technology, project design, and implementation of feasible mitigation measures if necessary.
- Site the Project at a location over which HEI is reasonably likely to obtain control, and which offers reasonable access to necessary infrastructure, including natural gas and non-potable water supply, transmission interconnection, and geologic formations appropriate for CO₂ EOR and Sequestration.
- Ensure the economic viability of the Project by minimizing costs while achieving other Project objectives.

The Applicant also used the following additional site evaluation criteria:

- Environmental impacts
- Safety (proximity to residents, schools, daycare centers, etc.)
- Proximity to sensitive receptors (population and sensitive species)
- Environmental justice considerations
- Economic feasibility
- Site acreage (300+ acres), topography, lowest elevation (to maximize power generation)
- Proximity to carbon dioxide customer for CO₂ EOR and Sequestration
- Minimize impacts on transportation corridors
- Feasibility of land acquisition
- Proximity to infrastructure to minimize impacts from Site access and linear facilities
- Proximity to raw water supply.

The Applicant has also assessed the “No Project Alternative.” The details of this analysis are provided in Section 6.0, Alternatives.

In all cases assessed, the Project as presented in this Revised AFC represents the least impact to the environment and the most benefit to the California economy, the best technology to promote California’s greenhouse gas and climate change policies, and support the United States’ and California’s goal of energy independence.

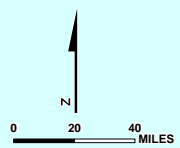
1.11 REFERENCES

California Energy Commission, 2007. *2007 Integrated Energy Policy Report*. Report Number CEC-100-2007-008-CMF-ES.



LEGEND

- Major Cities
- Major Highways
- State Boundaries
- County Boundaries



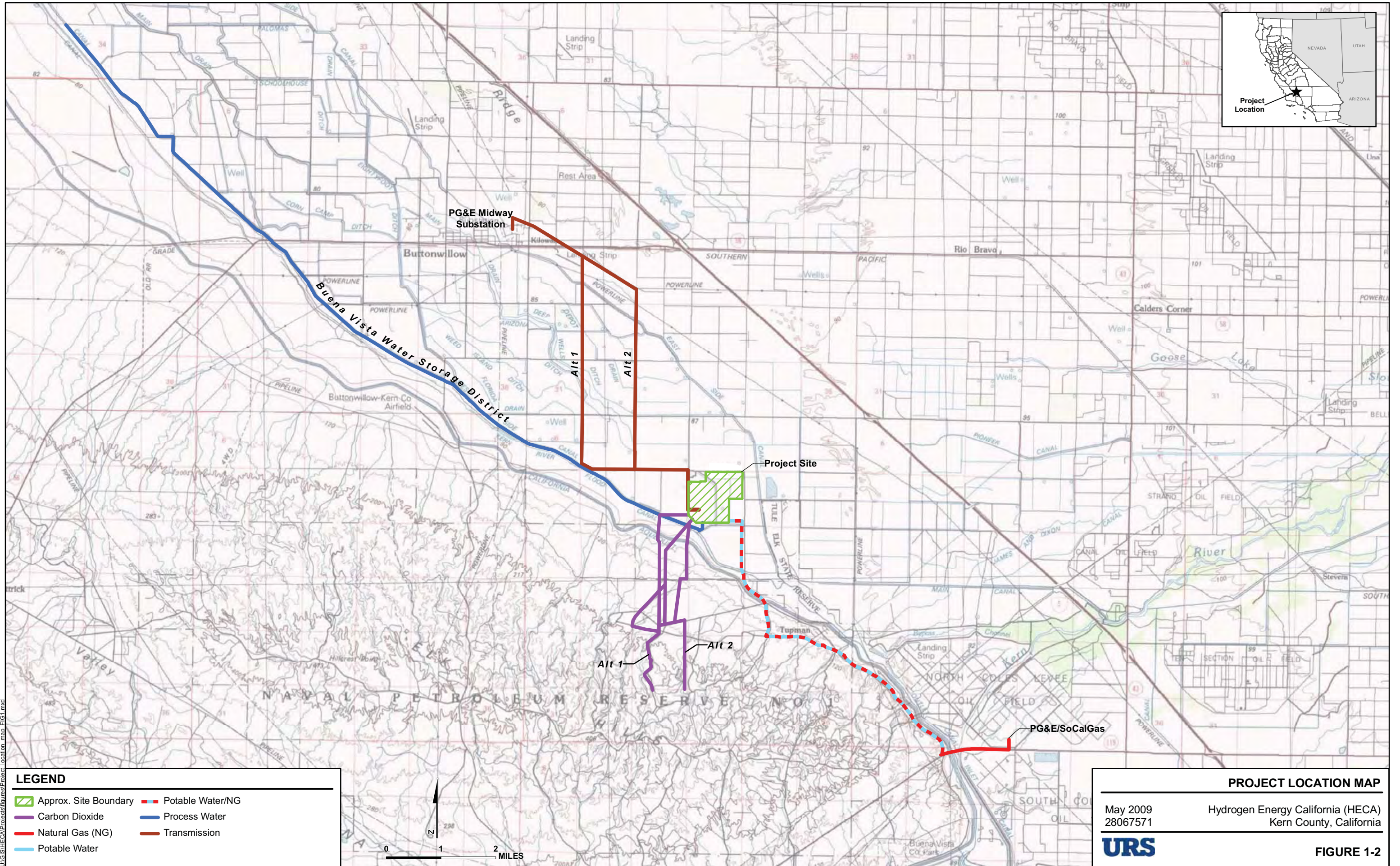
PROJECT VICINITY MAP

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California



FIGURE 1-1



J:\GIS\HECA\Project\figures\Project_Location_map_FIG1.mxd

Sources: USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPOI, ©2006 National Geographic Maps, All Rights Reserved. Kern County and State of California (proposed and approved projects).



PROJECT SITE – EXISTING CONDITIONS

May 2009 Hydrogen Energy California (HECA)
28067571 Kern County, California



FIGURE 1-3