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VIA EMAIL

Re: Hydrogen Energy California Project Siting Application

Dear Messrs. O'Brien and Pellissier,

On behalf of the representatives of Occidental Petroleum Corporation (Oxy) and Hydrogen Energy California (HECA) participating in the meeting you hosted on January 12, we would like to thank you for the frank and productive discussions relating to the HECA project siting application pending before the California Energy Commission (CEC). We would also like to thank Bridgett Luther and Marni Weber of the California Department of Conservation and Elena Miller of the Division of Oil, Gas and Geothermal Resources (DOGGR), for their participation and direction at our meeting. Our discussions helped bring focus on some of the early concerns about the use of CO_2 enhanced oil recovery (EOR) as the sequestration component of the HECA project, and we believe we were able to identify a process to address those concerns and re-energize the CEC permitting effort.

At the close of our meeting, you asked for a letter that outlined the information that would be provided to the CEC to define the Oxy CO_2 EOR project and help identify potential environmental impacts, with estimates of when that information would be provided. We are providing below a summary of relevant information relating to Oxy's

prospective CO_2 EOR project, a description of how this information will help inform the CEC's analysis of the HECA project application, and a timeline by which we currently expect such information to be made available. We expect that during the Siting Process the CEC will require additional information or clarification of the information provided by Oxy. Such data requests can be sent to HECA as the project applicant, and HECA and Oxy will assure timely responses of available information. We understand that all such requests will have to be addressed to the satisfaction of the CEC in order for the HECA project to be certified. We also are providing herein a more definitive description of the permitting pathway and approval authority for the CO_2 EOR project.

In the first section below is a summary description of the permitting process that we believe allows for i) prompt review of the HECA siting application, ii) assessment of any potential significant environmental impacts of the combined HECA and Oxy CO_2 projects, iii) identification of measures designed to mitigate significant environmental impacts, and iv) future permitting of the Oxy CO_2 EOR project with due consideration of all necessary mitigation measures. As noted below, Oxy and HECA are requesting an early meeting with CEC and DOGGR staff to further define the roles and responsibilities for the review of these projects and clarify the channels by which Oxy will be submitting information to the CEC.

In the second section below we summarize DOGGR's authority to issue key permits for the Oxy CO_2 EOR project and reference a more detailed legal analysis, which is attached hereto. We expect that this additional analysis will clarify the permitting issues discussed at our January 12 meeting. In the last section, we summarize the information Oxy can provide the CEC to inform their analysis of potential environmental impacts resulting from the prospective Oxy CO_2 EOR project, and provide estimates of when that information will be available.

I. <u>Outline of HECA Project and Oxy CO_2 EOR Permitting Processes</u>

Pursuant to the Warren-Alquist Act provisions in the Public Resources Code (section 25000, et seq.), the HECA project can be fully authorized through the facility siting application process (Siting Process) currently pending before the CEC. The Siting Process requires the CEC to consider all potentially significant environmental impacts of the HECA project and associated facilities. Since CO_2 sequestration is an integral element of the HECA project, the Siting Process must include consideration of potential impacts from the associated Oxy CO_2 EOR project.

Should the CEC identify potentially significant environmental impacts relating to the sequestration element of the HECA project, the CEC can specify as conditions for certification of the HECA project additional project design features and mitigation measures that should be implemented by other agencies responsible for the permitting of the Oxy CO_2 EOR project. These additional design features or

mitigation measures could include, for example, additional measuring, monitoring, verification, or abandonment standards that the CEC – in consultation with other responsible agencies - deems necessary and appropriate to meet the environmental objectives of the HECA project.

When the HECA project is certified or nearing certification, Oxy would submit to appropriate agencies all permit applications necessary for the Oxy CO_2 EOR project, including Underground Injection Control (UIC) Class II well permit applications submitted to DOGGR. As a responsible agency under the Siting Process, DOGGR could include in any Class II UIC permits issued to Oxy in relation to the HECA project all appropriate mitigation measures identified by the CEC. As more fully described in the authority discussion below, DOGGR is fully authorized to issue Class II UIC permits for the Oxy CO_2 EOR project and to incorporate the mitigation measures identified by the CEC in the Siting Process.

Oxy and HECA seek an early meeting with CEC and DOGGR staff to discuss more specifically the siting and permitting processes for their respective projects. At this meeting, the parties can revisit the development of a Memorandum of Understanding or an alternative working document which details the roles and responsibilities of the parties. We would welcome your facilitation of such a meeting.

II. Summary of Permitting Authority

The attached memorandum summarizes the authority for DOGGR to permit the Oxy CO_2 EOR project. As you will see, DOGGR has broad authority under the Public Resources Code (Code), and pursuant to a delegation from the United States Environmental Protection Agency, to permit the injection of fluids and gases for the purpose of EOR. As a condition to issuing UIC permits, DOGGR is required to undertake a comprehensive review of the proposed activity and ensure that underground sources of drinking water, hydrocarbon resources and the environment are protected. The Code further authorizes DOGGR to impose as permit conditions any UIC-related mitigation measures identified by the CEC in its consideration of the HECA project, such as measures to verify the sequestration of CO_2 injected for EOR or to assure proper abandonment of EOR sites that result in the permanent sequestration of CO_2.

III. Submission of Information Relating to the Oxy CO_2 EOR Project

The following is a list of the types of documents Oxy will be submitting to the CEC in the course of the HECA Siting Process to allow CEC's full evaluation of potential environmental impacts associated with the associated Oxy CO_2 EOR project:

A. Oxy CO_2 EOR Project Description (Expected late March 2010) – the project description will include the following elements:
   1. An overview of the project's technical and environmental characteristics;
   2. A statement of project objectives;
   3. The project location, boundaries and all relevant and detailed maps;
   4. A description of the elements of the project design, construction, and operational characteristics (including information describing specific pipeline alignments) and a discussion of the project's technical design, construction and operation features as they relate to the HECA project (greater detail regarding construction and operation equipment may be available later in the Siting Process when Oxy undertakes the front-end engineering and design stage);
   5. Graphs, plans and tables necessary for the description and explanation of the design, construction and operation of the project;
   6. A discussion of future/foreseeable project-related activities, if any, that would result from project approval;
   7. A general discussion of baseline and existing regional and proximate environmental settings; and
   8. A discussion of project consistency with applicable land use plans.

B. Technical Studies Analyzing the Potential for CO_2 EOR as Sequestration (Expected mid-February 2010) - Occidental will be submitting to the CEC studies and reports on the effectiveness of CO_2 EOR as a form of sequestration. These studies demonstrate several key points:
   1. EOR reservoirs are effective in geologically confining CO_2;
   2. Industry has a longstanding record for the safe handling of CO_2 for EOR operations and the effective containment of CO_2 through the course of EOR; and
   3. The CO_2 EOR process is effectively a closed-loop system storing essentially all injected CO_2.

C. Sample Class II UIC Permit (Expected mid-February 2010) - Oxy will be able to provide a non-confidential summary of the type of Class II UIC permit application expected to be submitted to DOGGR when the Siting Process reaches or nears a successful conclusion. This summary could be supplemented with a full draft UIC permit application as needed and desired by the parties.

D. Proposed Measuring, Monitoring, Verification and Abandonment Standards (Expected in March 2010) - Oxy and HECA will work with key environmental non-governmental organizations with expertise in geologic sequestration to develop a proposed set of measuring, monitoring, verification and site abandonment standards applicable to the Oxy CO_2 EOR project. These proposed standards can be used by the CEC to develop appropriate mitigation measures to address any potential significant environmental impacts associated with the Oxy CO_2 EOR project in relation to the HECA project.

Again, Oxy and HECA appreciate the time and interest shown by the Office of Governor in the HECA and Oxy CO_2 EOR projects, and the concerns expressed by CEC and DOGGR regarding the availability of information relating to the Oxy CO_2 EOR project. We are ready to support the process to site and permit the projects, and to establish effective channels of communication to facilitate that process. While we continue to prepare the information outlined above, we request an early meeting with CEC and DOGGR to further discuss these matters.

Sincerely,

Elliott Heide
Assistant General Counsel

Enclosure

cc: Bridgett Luther, Director, Department of Conservation
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Summary of DOGGR Authority to Permit the OXY CO_2 Project

Occidental of Elk Hills, Inc (Oxy). is proposing an enhanced oil recovery project (EOR) utilizing as one of the injectant fluids carbon dioxide ("CO_2") produced from a power generation facility proposed by Hydrogen Energy California LLC ("HECA"). The California Department of Conservation, Division of Oil, Gas & Geothermal Resources ("DOGGR") seeks clarification of its authority to regulate Oxy's proposed CO2 EOR project ("OXY CO_2 Project"). This summary legal analysis affirms: (1) DOGGR's authority to issue Class II underground injection control ("UIC") permits for Oxy's CO_2 Project; (2) that DOGGR's UIC program provides the appropriate regulatory framework for any additional permitting criteria necessary or desirable to assure that CO_2 injected for EOR is concurrently sequestered; and (3) that such actions are consistent with DOGGR's statutory mandate to increase oil and gas resources in the state.

I. PROJECT BACKGROUND

The HECA project involves the capture of CO_2 from an integrated gasification combined cycle power generating facility and the compression and transport of the CO_2 to the nearby Elk Hills Oil Field Unit for use in CO_2 EOR. The CO_2 EOR process will improve oil recovery at the Elk Hills Oil Field Unit through the use of a closed-loop system involving surface and subsurface facilities for injection, production, processing, separation, compression and reinjection of CO_2. The injected CO_2 – which is in a "supercritical" fluid state – reduces the viscosity and enhances mobility of oil to improve extraction. CO_2 is not emitted into the atmosphere during the CO_2 EOR process or after operations cease, other than de minimis fugitive losses from equipment. Injected CO_2 becomes sequestered in pore space voided by oil and other fluids or gasses produced in the EOR operation, as well as through other geochemical trapping mechanisms.

During the operational phase of an EOR operation, some volume of injected CO_2 is extracted (along with hydrocarbons and other gases and fluids) through production wells. Injected CO_2 that is subsequently extracted remains a valuable commodity and is not vented to the atmosphere. Instead, using a closed-loop system, it is separated from the hydrocarbons, other gasses and fluids, and then reinjected for additional EOR use. With every injection cycle 40-60 percent of the injected CO_2 volume becomes sequestered in the formation, making it unrecoverable regardless of the intent of the operator to store or produce the CO_2. The irreversible trapping effect is an unavoidable characteristic of the CO_2 EOR process, one that creates a persistent demand for additional CO_2 over the course of the EOR operation. This predictable demand and geologic permanence is why CO_2 EOR is an ideal technology for sequestering CO_2 emissions.

II. DOGGR'S AUTHORITY TO REGULATE THE OXY CO_2 PROJECT

California Public Resources Code ("PRC") and DOGGR regulations provide authority for DOGGR to permit injection and extraction wells and associated well facilities for the purpose of injecting fluids and gases, including CO_2, for EOR.[1] The federal UIC Program has been

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[1] *See generally* Cal. Pub. Res. Code Division 3, Chapter 1 and 14 Cal. Code Regs. Division 2.

implemented since 1980 and has responsibility for managing over 800,000 injection wells. California has been delegated authority to implement the federal UIC program since approximately 1981. The programmatic components of the UIC Program are designed to prevent fluid movement into underground sources of drinking water ("USDWs") by addressing the potential pathways through which injected fluids can migrate out of the target injection formation. These programmatic components are described in general below:

Siting: Injection wells are required to be sited to inject into a zone capable of storing the fluid, and to inject below a confining system that is free of known open faults or fractures that could allow upward fluid movement that endangers USDWs.

Area of Review and Corrective Action: The UIC Program requires examination of both the vertical and horizontal extent of the area that will potentially be influenced by injection and storage activities and identification of all artificial penetrations in the area that may act as conduits for fluid movement into USDWs (e.g., active and abandoned wells) and, as needed, perform corrective action to these open wells (i.e., artificial penetrations).

Well Construction: Injection wells must be constructed using well materials and cements that can withstand injection of fluids over the anticipated life span of the project.

Operation: Injection pressures must be monitored so that fractures that could serve as fluid movement conduits are neither propagated into the layers in which fluids are injected or initiated in the confining systems above.

Mechanical Integrity Testing: The integrity of the injection well system must be monitored at an appropriate frequency to provide assurance that the injection well is operating as intended and is free of significant leaks and fluid movement in the well bore.

Monitoring: Owners or operators must monitor the injection activity using available technologies to verify the location of the injected fluid, the pressure front, and demonstrate that injected fluids are confined to intended storage zones (and, therefore, injection activities are protective of USDWs).

Well Plugging and Post-Injection Site Care: At the end of the injection project, the UIC Program requires injection wells to be plugged in a manner that ensures that these wells will not serve as conduits for future fluid movement into USDWs. Additionally, owners or operators must monitor injection wells to ensure fluids in the storage zone do not pose an endangerment to USDWs.

DOGGR will not be permitting any aspect of the OXY CO_2 Project for the purpose of determining any sequestration credits or accounting. Rather, DOGGR will be permitting the injection of CO_2 for the purpose of EOR. By virtue of the EOR process, the chemistry and physics of EOR naturally results in sequestration of the injected CO_2.[2] Although the Class II permit application for the Oxy CO_2 EOR Project may include certain features relating to the demonstration of sequestration, the inclusion of those features does not alter DOGGR's

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[2] *See* Revised Application for Certification for Hydrogen Energy California, Kern County, California, Appendix F (May 2009).

discretionary authority to issue the Class II EOR permit. These features will be appropriate for this EOR project to measure and validate permanent CO_2 sequestration for purposes of demonstrating compliance with CEC and PUC expectations for the HECA Project, and to mitigate any risk of environmental impact associated with the two projects.

Existing statutory authority would allow DOGGR to consider these features and develop enforceable criteria to assure safe operation. Specifically, the California Environmental Quality Act ("CEQA") empowers DOGGR to impose additional mitigation measures and/or project design elements to measure and verify the sequestration of CO_2 injected for EOR and to mitigate potential impacts through DOGGR's discretionary permitting authority. [3]

UIC Class II permitting by DOGGR, as supplemented by additional CEQA mitigation measures, represents the most sensible regulatory framework to regulate the injection of CO_2 for purposes of EOR and to verify sequestration given DOGGR's existing regulations for, and expertise in, the injection of fluids for EOR. As described above, the existing regulatory requirements for Class II UIC wells adequately assure the integrity and permanence of CO_2 injected into target formations. Furthermore, Class II has long been used to permit projects injecting CO_2 for purposes of EOR, which is widely recognized as the best platform for the early demonstration of commercial-scale sequestration. United States Environmental Protection Agency ("EPA") guidance further supports DOGGR's authority for regulation of these activities. EOR has historically been permitted under Class II, and EPA has clearly stated that CO_2 injection for EOR will continue to be permitted under Class II despite any additional rulemaking addressing injection wells intended for the exclusive purpose of CO_2 sequestration.[4]

Finally, DOGGR's regulation of CO_2 injection for EOR and sequestration is entirely consistent with the agency's mandate to increase the recovery of oil and gas resources within the state.[5] CO_2 injection for EOR is a proven method for enhancing oil and gas recovery, and CO_2

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[3] *See* Cal. Pub. Res. Code § 21000 *et seq.*

[4] Proposed Rule for Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells, 73 Fed. Reg. 43,492, 43,502 (Jul. 25, 2008) ("CO_2 is currently injected in the U.S. under two well classifications: Class II and Class V experimental technology wells. The requirements in today's proposal, if finalized, would not specifically apply to Class II injection wells or Class V experimental technology injection wells. Class VI requirements would only apply to injection wells specifically permitted for the purpose of GS. Injection of CO_2 for the purposes of enhanced oil and gas recovery (EOR/EGR), as long as any production is occurring, will continue to be permitted under the Class II program.")

[5] *See, e.g.*, Cal. Pub. Res. Code § 3106(a) (establishing DOGGR's environmental protection authority by mandating the supervisor to "supervise the drilling, operation, maintenance, and abandonment of wells … *so as to prevent, as far as possible, damage to life, health, property, and natural resources*….") (emphasis added), § 3106(b) (authorizing DOGGR "to permit the owners or operators of the wells to utilize *all methods and practices known to the oil industry for the purpose of increasing the ultimate recovery of underground hydrocarbons*…. including, but not limited to, the injection of air, gas, water, or other fluids into the productive strata…") (emphasis added), § 3013 (stating that the Oil and Gas division of the PRC "*shall be liberally*

has become a valuable commodity for this purpose resulting in increased demand for CO_2 for EOR.[6] DOGGR's regulation of EOR and sequestration under Class II permitting will facilitate the economical use of CO_2 to advance oil recovery within the state, thus, advancing its mandate.

As a last matter, we acknowledge the concerns raised at our January 12, 2010, meeting that DOGGR's statutory or regulatory authority expressly prohibits the regulation of the OXY CO_2 Project activity as "storage." Although we have researched this issue extensively, we have been unable to find any such legal restriction or prohibition. We surmise that this concern is an negative extrapolation from provisions in the Public Resources Code that empower DOGGR to regulate certain aspects of "storage" of "gas," where "gas" is defined as "hydrocarbons from earth." Assuming so, we offer the following:

1. The activity sought to be permitted is the injection of fluids for the purpose of enhanced recovery of oil and natural gas. This activity is clearly within the defined parameters of UIC Class II, which does not limit the spectrum of fluids injected for such purposes to hydrocarbons.

2. As noted in our attached memorandum, the U.S. Environmental Protection Agency has expressly indicated that the injection of CO_2 for the purpose of EOR, and resulting sequestration, is and will remain regulated by the EPA pursuant to UIC Class II.

3. The CO_2 used for EOR is in a <u>fluid</u>, rather than gaseous, state. The authority regarding gas storage referenced above would not apply to the injection of fluid CO_2 for the purpose of EOR or any other purpose, and certainly does not prohibit such.

4. The injection of CO2 for enhanced recovery of hydrocarbons is an activity DOGGR is expressly authorized to permit. We are aware of no legal principle by which the affirmative authorization to permit one activity (i.e., "storage" of "gas") can create the negative inference that other activities the agency is affirmatively authorized to permit (i.e., the injection of CO_2 fluids for the purpose of EOR) are prohibited. In fact, such an inference would be contrary to the basic principle of statutory interpretation that statutes should be read in harmony so as to give them full effect.

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construed to meet its purposes, and the director and the supervisor, acting with the approval of the director, shall have all powers, including the authority to adopt rules and regulations, which may be necessary to carry out the purposes of this division.") (emphasis added); Cal. Code Regs. Tit. 14, Subchapter 2 (Environmental Protection), § 1779 ("The Supervisor in individual cases may set forth other requirements where justified or called for.")

[6] *See* http://www.fossil.energy.gov/programs/oilgas/eor/index.html.