Title
Supplemental View of the California CCS Review Panel Recommendations

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MEMORANDUM

TO: Carl Bauer, Chair
California Carbon Capture and Storage Review Panel

FROM: Kipp Coddington[1]

RE: Supplemental View to the Findings and Recommendations by the California Carbon Capture and Storage Review Panel ("Panel")

This memorandum supplements and elaborates upon a handful of key issues that are included in the Panel's report.

I. California Should Take Note of the Treatment Given CCS in Other Jurisdictions

The State of California ("State") is not the first jurisdiction to consider carbon capture and storage ("CCS") policy. The international climate community has endorsed CCS both in the context of offsets and compliance; significantly, such endorsement includes, but is hardly limited to, the Kyoto Protocol.[2] Many other states in the United States have adopted legislation pertaining to CCS which could be used as a starting point, if not a model, by California legislators and regulators. And of course, as discussed further below, the U.S. federal government already has done a lot of the work for the State when it comes to critical issues such as regulation of geologic storage sites.

II. CCS Will Be Required in California if the State is to Meet its Greenhouse Gas Reduction Goals

Fossil fuels will remain a necessary component of the State's energy portfolio for the foreseeable future.[3]

World electricity demand is expected to continue to grow more strongly than any other form of energy, and California will participate in that phenomenon.[4] "Increased

electrification will cause electricity to grow from 30 percent of total [California] energy consumption to 70 percent by 2050 … Electricity consumption will double in California, to over 600TWh by 2050."[5] Oil & gas production and consumption are expected to continue to grow by sizeable margins, too, at least through 2035.[6]

The State has established stringent short-term (2020) and long-term (2050) greenhouse gas ("GHG") emission reduction goals that are functionally similar to the federal U.S. and international emission reduction goals.[7] Achieving these goals in the face of ever increasing energy demands, the bulk of which can only be satisfied with fossil fuels, presents California policymakers with inordinate challenges.[8]

California's 80% by 2050 GHG emission reduction goal "would probably require" the complete de-carbonization of the power sector, including natural gas power generation.[9] CCS is not just about coal, particularly when the goal is an 80% reduction in GHG emissions.[10] Natural gas-based electricity generation will also require CCS to meet such a reduction.[11]

There thus is an urgent need to demonstrate and deploy CCS technology at scale in California, as without CCS the State's GHG emission reduction goals cannot be met.[12] Further adding to the urgency, recent analysis suggests that industrial emissions must peak prior to 2020 in order to meet the 2050 GHG emission reduction goal due to atmospheric residence times of GHGs, increasing GHG emissions due to economic growth and related factors.[13]

Separate from consideration of California's GHG emission reduction goals, effective January 2, 2011, new major sources and major modifications at existing sources in California (and elsewhere) now face questions about the deployment of CCS under the U.S. Environmental Protection Agency's ("EPA") preconstruction Prevention of Significant Deterioration permitting program.[14] EPA's guidance for this program makes repeated reference to CCS, and the likelihood that consideration and deployment, where appropriate, of CCS will become a federal mandate inexorably will increase over time.

III. CCS Requires a Mechanism to Address Geologic Site Responsibilities and Liabilities During the Post-Closure Stewardship Phase

CCS will not occur in the absence of a mechanism that addresses geologic site responsibilities and potential liabilities during the post-closure stewardship phase, for which no insurance is (or ever will be) available.[15] Rather than waiting for an eventual

federal solution (see, e.g., title V of S. 3591, the "Carbon Capture and Sequestration Deployment Act of 2010"), California should take proactive steps in advance of a federal solution. A future federal solution almost certainly would backstop, not negate, prior state actions. A growing number of states already have enacted legislation that authorizes the creation of industry-funded trust funds that would assume geologic site responsibilities and liabilities during the post-closure stewardship phase. California should do the same.

IV. The Number of Legal/Regulatory Gaps for CCS Projects Has Diminished Rapidly in Recent Weeks

While a few legal and regulatory gaps remain in the development and deployment of CCS in the State, in late 2010 EPA issued regulations under the federal Safe Drinking Water Act and federal Clean Air Act that largely impose a comprehensive and stringent regulatory regime for CCS projects in California. California should not divert from this regime, which envisions carbon dioxide ("CO_2") storage operations in all manner of reservoir types, from deep saline to enhanced oil recovery ("EOR") operations.

Following are specific recommendations regarding how California should address the few remaining major legal and regulatory gaps for CCS projects in the State.

- ✓ Inclusion of CCS in AB 32 Both for Compliance & Offset Purposes: The Air Resources Board ("ARB") should amend the Mandatory Reporting Regulation to include CCS. Doing so will require a standardized methodology for entities to measure, monitor, report and verify emissions. The Pew Center on Global Climate Change is already working on such a methodology, which ARB should consider using as a starting point. ARB also should take note of the site-specific monitoring, reporting and verification plans that EPA is now requiring under subpart RR of the federal Mandatory Reporting Rule for Greenhouse Gases.

  Additionally, the AB 32 Scoping Plan should be revised to reflect that CCS is a pre-2020 compliance option, not merely a post-2020 research endeavor.

- ✓ Inclusion of CCS in the Low Carbon Fuel Standard ("LCFS"): CCS already is specified as an option to lower the carbon intensity of high carbon intensity crude oil to the California default under the LCFS. The LCFS should be amended to allow CCS in connection with the production of alternative fuels such as hydrogen, compressed natural gas, or electricity. Accomplishing this would require the development of a CCS methodology; the methodologies discussed

above should also, at minimum, provide a starting point for the State in this regard.

- ✓ Pore Space: It would be helpful if California codified the American Rule, which is that the surface owner (whether a private party or the State) owns the pore space, with mineral rights dominant over other uses. California can look to what other states have done in enacting such statutes.[16]

  Pore space has been acquired and transacted in other states for many years – even in states that do not have pore space statutes. It is not clear whether any of these prior claims have faced litigation, and thus been upheld or rejected by the courts; for this reason alone, it would be prudent for California to address the topic legislatively. Nonetheless, concerns about pore space, while well-intended, tend to be exaggerated when it comes to a discussion of CCS project impediments.[17] It surely may be expensive and time-consuming to acquire the necessary property rights for a CCS project, but the same could be said about any number of other projects, too.[18]

- ✓ Regulation of Geologic Storage Sites: The new federal Class VI Underground Injection Control ("UIC") regulations, coupled with the new subpart RR program under the federal Mandatory Reporting Rule for Greenhouse Gases, have created what amounts to a comprehensive geologic site permitting program applicable in California at least with respect to protection of underground sources of drinking water.

  In order to ensure stringent and comprehensive regulation of other human health and environmental receptors of concern to the State (to include seismicity, for example), the State Legislature should enact a comprehensive CCS geologic site permitting statute. That statute should incorporate by reference the federal UIC requirements and require relevant State agency approval of other human health and environmental receptors of concern. This is the approach taken by other states that have looked at this issue, so here again there are ample legislative models to which California may refer.

Although other potential legal and regulatory gaps exist for CCS projects in the State -- the identity of the State regulator for intrastate CO_2 pipelines, for example – this and most other issues like it are not impediments per se to CCS. They are matters merely requiring clarification, a function that legislators and regulators routinely perform in other contexts.

California separately should encourage the Congress and U.S. Department of Interior to finalize a program for conducting geologic sequestration on federal lands, a topic that merely awaits legislative and regulatory action as it already has been exhaustively researched.[19]

V. California Must Support Efforts to Clarify How Existing Environmental Statutes Apply to Geologic Storage Sites

Geologic storage of CO_2 at scale will be significantly inhibited if that molecule is legally deemed to be a hazardous waste or hazardous substance when injected in the subsurface, with the result that existing environmental statutes would apply, despite the fact that such statutes were not enacted with the long-term geologic storage of CO_2 in mind. Examples of such environmental statutes include the U.S. Resource Conservation & Recovery Act ("RCRA") and U.S. Comprehensive Environmental Response, Compensation and Liability Act. EPA may propose a conditional exemption to RCRA for certain CO_2 injectates later this year, a development that California should support.

Clarifying how existing environmental statutes should apply to geologic storage sites would not lead to lessened regulation of such sites, as they already are subject to stringent federal regulation, as discussed above. Clarification instead would help to preclude unfair and unintended legal outcomes, the mere existence of which could serve to deter the deployment of CCS technology within the State, thereby frustrating the attainment of California's GHG emission reduction goals.

VI. CCS Requires Government Funding and Support – But Will Bring With It Economic Development

Upfront government subsidies and support, including at the State level, will be required to assist the demonstration and deployment of CCS.[20]

These societal costs would be offset, at least in part, by increased economic activity and higher tax revenues within the State due to the build-out and operation of CCS infrastructure and operations such as CO_2 EOR. Various studies have endeavored to quantify the economic benefits that would accrue to California through the accelerated adoption of CCS technologies.[21]

VII. Environmental Justice Considerations

Stringent regulation of CCS – including but not limited to regulation of geologic storage sites – is critical to protect human health and the environment, and indeed, such a federal regulatory program now already largely exists, as discussed above. Nobody is suggesting that CCS not be stringently regulated.

Stringent regulation of geologic storage sites will go a long way towards meeting environmental justice goals. In the CCS context, the well-intended but inadvertent misapplication of environmental justice principles could lead to unintended results such as siting geologic storage facilities for reasons other than favorable geology. Unlike nearly all other industrial facilities (which of course sit on the surface of the Earth), a geologic storage site may have less flexibility in terms of being sited precisely because subsurface geologic considerations are so important.

When environmental justice is considered for CCS, it should be accompanied by an analysis of the economic benefits that would be denied the poor and disadvantaged due to the stifling of the development of clean energy infrastructure such as CCS – at minimum, these benefits might include royalties for pore space acquisition or use, with jobs and the like to follow later on. Both the United Nations Framework Convention on Climate Change[22] and Copenhagen Accord[23] recognize that economic opportunity and eradicating poverty must not be allowed to take a back seat to concerns about the climate.

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[1] This paper reflects Mr. Coddington's personal views.

[2] At the recently concluded international climate meetings in Cancun, for example, it was decided that CCS was eligible to generate Certified Emission Reductions under the Kyoto Protocol's Clean Development Mechanism. In Europe, the Member States are in the midst of implementing a framework directive for CCS. Under that directive, emissions captured and stored are recognized as not emitted under the European Union Emissions Trading Scheme. See http://www.iea.org/work/2010/ccs_jan20_21/EU_Sauter.pdf. Australia is well advanced in issuing CCS laws and regulations, as are many other States in the United States.

[3] See "World Energy Outlook 2010, Executive Summary" (International Energy Agency, 2010) ("Fossil fuels – oil, coal and natural gas – remain the dominant energy sources in 2035 in all three scenarios, though their share of the overall primary fuel mix varies markedly") (available at http://www.iea.org/weo/docs/weo2010/WEO2010_ES_English.pdf); "Annual Energy Outlook 2011 Early Release Overview" (U.S. Energy Information Agency, 2011) ("Coal remains the dominant energy source for electricity generation … [while t]he generation share from renewable resources increases from 11 percent in 2009 to 14 percent in 2035 [and t]he share of generation from natural gas increases from 23 percent in 2009 to 25 percent in 2035") (available at http://www.eia.gov/forecasts/aeo/pdf/0383er(2011).pdf). Specifically with respect to base load power generation and transportation fuels in California: (1) as to

the former, retail sellers of electricity must serve 33% of their load with renewable energy by 2020 (Executive Order S-14-08), leaving 67% from non-renewable sources; and (2) as to the latter, the Low Carbon Fuel Standard calls for a reduction of at least 10 percent in the carbon intensity of California transportation fuels by 2020 and does not contemplate a scenario under which the State stops using gasoline and diesel for the foreseeable future. Fossil generation is also frequently needed to backstop renewable generation.

[4] "World Energy Outlook 2010, Executive Summary" (International Energy Agency, 2010) ("In the New Policies Scenario, [world electricity demand] is projected to grow by 2.2% per year between 2008 and 2035, with more than 80% of the increase occurring in non-OECD countries") (available at http://www.iea.org/weo/docs/weo2010/WEO2010_ES_English.pdf).

[5] "Meeting California's Long-Term Greenhouse Gas Reduction Goals," at p.4 (Energy & Environmental Economics LLC, Nov. 2009).

[6] Id. at p.6.

[7] The Copenhagen Accord sets a goal of limiting the global temperature increase to two (2) degrees Celsius, which is roughly equivalent to stabilizing concentrations of carbon dioxide equivalent at 450 parts per million which scientists report is necessary to avoid "dangerous" interference with the climate system within the meaning of the 1992 United Nations Framework Convention on Climate Change, to which the United States is a party.

[8] See generally "Meeting California's Long-Term Greenhouse Gas Reduction Goals" (Energy & Environmental Economics LLC, Nov. 2009).

[9] "The Future of Natural Gas: An Interdisciplinary MIT Study, Interim Report," at p. xiii (Massachusetts Institute of Technology, 2010) ("A more stringent CO_2 reduction of, for example, 80% would probably require the complete decarbonization of the power sector").

[10] Id.

[11] This conclusion is also compelled by recent analysis indicating that "natural gas is no better than coal in terms of its [GHG lifecycle] footprint when evaluated over the course of the next several decades." R. Howarth, "Assessment of the Greenhouse Gas Footprint of Natural Gas from Shale Formations Obtained by High-Volume, Slick-water Hydraulic Fracturing" (Cornell Univ., Nov. 15, 2010); accord A. Armendariz, "Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements" (Southern Methodist Univ., Jan. 26, 2009) (noting that "predicted 2009 emissions of greenhouse gases like carbon dioxide and methane were approximately 33,000 tons per day of CO_2 equivalent [in the Barnett Shale region of Texas, an amount that] is roughly equivalent to the expected greenhouse gas impact from two 750 MW coal-fired power plants").

[12] "The Future of Natural Gas: An Interdisciplinary MIT Study, Interim Report," at p. xiii (Massachusetts Institute of Technology, 2010) (noting that the 80% reduction goal "makes it imperative that the development of competing low-carbon technology continues apace, including CCS for both coal and gas"); World Energy Outlook 2010, Executive Summary," at p.12 (International Energy Agency, 2010) ("Cutting emissions sufficiently to meet the 2˚C goal would require a far-reaching transformation of the global energy system … Carbon capture and storage plays an important role in reducing power-sector emissions: by 2035, generation from coal plants fitted with CCS exceeds that from coal plants not equipped with this technology, accounting for about three-quarters of the total generation from all CCS fitted plants"); "Meeting California's Long-Term Greenhouse Gas Reduction Goals," at p.4 (Energy & Environmental Economics LLC, Nov. 2009) ("We find five key GHG reduction approaches that California must implement successfully and simultaneously over the next 40 years to meet the 2050 GHG target … [including] [l]ow carbon generation [which] needs can be met with different types of renewable energy, nuclear energy

and/or generation with CCS") (emphasis added); "Limiting the Magnitude of Future Climate Change," at pp. 4, 7 (Natural Research Council, 2010) ("We conclude that there is an urgent need for U.S. action to reduce GHG emissions [including d]evelopment and demonstrate[ion of] power plants equipped with [CCS]").

[13] "The Emissions Gap Report" (United Nations Environment Program, 2010) (available at http://www.unep.org/publications/ebooks/emissionsgapreport/).

[14] Draft "PSD and Title V Permitting Guidance for Greenhouse Gases," 75 Fed. Reg. 70254 (Nov. 17, 2010) (stating that CCS is an "available" technology under Step 1 of the Best Available Control Technology test and providing further guidance to California permit writers as to how CCS is to be considered in the permitting process). To date, both the United States Courts of Appeals for the Fifth and D.C. Circuits have denied motions to stay nationwide enforcement of this regulatory program; however, on December 30, 2010, the United States Court of Appeals for the D.C. Circuit stayed enforcement of the program for the State of Texas until such time as the court completes a merit review.

[15] C. Hart, "Advancing Carbon Sequestration Research in an Uncertain Legal and Regulatory Environment" (Harvard University, Jan. 2009); Report of the Interagency Task Force on Carbon Capture and Storage (Aug. 2010).

[16] See P. Marston, "From EOR to CCS: The Evolving Legal and Regulatory Framework for Carbon Capture and Storage," 29 Energy Law Journal 421 (2008).

[17] The literature suggesting diminution of private property rights as a function of subsurface depth is compelling. See J. Sprankling, "Owning the Center of the Earth," 55 UCLA Law Review 979 (2008). Such an approach is distinguishable from the "air rights" cases, however, because subsurface matters could lead to conflicts with mineral right owners as society develops better techniques to extract resources at depth – for example, in Residual Oil Zones, which are subsurface geologic regions of specific relevance for concurrent CO_2-EOR/sequestration operations.

[18] The same outcome holds for CO_2 pipeline infrastructure, too. The need for a new regulatory structure to address what is frequently put forth as a massive, over-night build-out of CO_2 pipeline infrastructure is frequently cited in the literature as an impediment to CCS. This scenario is unlikely, as pipelines are more apt to be built incrementally over time. The U.S. already has a regional, but nonetheless extensive, network of CO_2 pipelines, and that system has operated safely and grown incrementally over the decades under the current regulatory structure.

[19] See http://www.blm.gov/wo/st/en/info/newsroom/2009/june/nr_0507_2009.html. California might also consider: (1) working with Congress on developing a program for sub seabed geologic sequestration in federal waters off the coast, and (2) undertaking a separate study of what might be required to do the same under State territorial waters.

[20] "Analysis of Financial Incentives for Early CCS Deployment" (Harvard University, Oct. 2010) ("The additional substantial costs and complexity of CCS facilities over and above conventional use of fossil fuels mean that government subsidies are required to assist the demonstration and deployment of the technology [and] CCS is not unique in this respect – other forms of low carbon power generation also require policy support"); "Limiting the Magnitude of Future Climate Change," at p. 50 (Natural Research Council, 2010) ("The investments need[ed] to create this portfolio of CCS demonstrations will certainly be significant – approximately one billion dollars per project for large coal plants – but there is no benefit in waiting to make such investments").

[21] See, e.g., "Basin Oriented Strategies for CO_2 Enhanced Oil Recovery: California" (U.S. Department of Energy, April 2005) (available at http://fossil.energy.gov/programs/oilgas/publications/eor_co2/California_Document.pdf); "U.S. Oil

Production Potential from Accelerated Deployment of Carbon Capture and Storage" (Advanced Resources International, Inc., Mar. 10, 2010) (available at http://www.adv-res.com/pdf/v4ARI%20CCS-CO2-EOR%20whitepaper%20FINAL%204-2-10.pdf). There is no statewide severance tax on oil and gas production in California; there are, however, ad valorem taxes which are administered by each county tax assessor.

[22] United Nations Framework Convention on Climate Change ("UNFCCC"), at preamble ("Affirming that responses to climate change should be coordinated with social and economic development in an integrated manner with a view to avoiding adverse impacts on the latter, taking into full account the legitimate needs of developing countries for the achievement of sustained economic growth and the eradication of poverty"), at art. 3 sec. 4 ("taking into account that economic development is essential for adopting measures to address climate change").

[23] Copenhagen Accord, at sec. 2 ("bearing in mind that social and economic development and poverty eradication are the first and overriding priorities of developing countries"). The United States is not a developing country, of course, but the U.S. policymakers who agreed to this document (as well as to the UNFCCC noted above) would not have intended to put U.S. poor and disadvantaged further at risk of economic peril through the pursuit of climate policies.