

# **ARB's Carbon Capture and Sequestration (CCS) Program**

## **CCS Technical Discussion Series: Health and Environmental Risks, and Environmental Justice**

### **Background on ARB's CCS Technical Discussions**

ARB is currently developing a program to allow the use of carbon capture and sequestration (CCS) in its climate change programs, and to advance the use of CCS as a greenhouse gas (GHG) reduction strategy. As part of this effort, ARB's CCS program staff seeks to better understand the ability of CCS to contribute to California's climate goals, the limitations or advantages of the technology, and the innovation and incentives necessary for adoption. To support this work, ARB is developing a quantification methodology (QM) for CCS projects. The CCS QM may be adopted for use in the Cap-and-Trade and Low Carbon Fuel Standard programs as determined appropriate in rulemaking(s) specific to these programs. For more information on ARB's CCS program and development of the QM please visit our website at <http://www.arb.ca.gov/cc/ccs/ccs.htm>.

In order to ensure staff is using the best available information and understands stakeholder concerns, we are hosting a series of technical discussions. The CCS technical discussions are topic focused stakeholder-led discussions. The intent is to allow interested parties to provide input that will inform development of the CCS QM, as well as the CCS program. ARB will identify subject areas and specific questions, with the expectation that stakeholders will provide presentations, or other materials, and participate in an open discussion.

The CCS technical discussions will be accessible via webinar, conference call, and in-person at ARB headquarters in Sacramento, California. At the discussion, ARB will provide a short overview of the identified subject area, as well as other information pertinent to the discussion if applicable, but the primary focus will be on stakeholder presentations and discussion. ARB generally will not provide a presentation or formal meeting notes, but will post all stakeholder presentations or other submitted materials to ARB's CCS website at <http://www.arb.ca.gov/cc/ccs/meetings/meetings.htm>.

### **Health and Environmental Risks**

Health and environmental risks are important considerations that can affect the development of ARB's programs. Protecting Californians' from health and environmental risks remains core to the mission of ARB and is considered at every step of the process. We must be aware of any potential risk of health or environmental degradation that may occur as a result of CCS, so that the CCS QM can be designed to minimize those risks. As part of our analysis of the potential health and environmental risks of CCS, staff will conduct an environmental review in accordance with the requirements of the California Environmental Quality Act (CEQA). Risks that may exist with CCS projects may lead to impacts that may occur in areas identified as CEQA resources areas, including water and air impacts; our CEQA analysis would strive to identify and characterize these risks accordingly.

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### Environmental Justice

Environmental justice is defined as “the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.”<sup>1</sup> As such it is important to involve stakeholders from communities that may be affected by CCS project development, and to solicit their feedback on how to design the CCS QM in order to consider and address environmental justice concerns in the provisions of the CCS QM to the extent possible.

### Technical Discussion

This technical discussion will provide stakeholders the opportunity to give ARB staff input on health and environmental risks that could result from CCS projects, and to provide input on environmental justice concerns associated with CCS. ARB staff have identified the following areas of potential risk: impacts to water sources (aquifers, lakes, oceans), impacts to the surface and near surface biosphere (soil, soil microbes, plants, animals, and people), and induced seismicity concerns from high volume fluid injection. This technical discussion will also be a forum to discuss information on possible disproportionate effects on communities based on race, culture, or income.

#### Participating in the Health and Environmental Risks, and Environmental Justice Technical Discussion

DATE: Tuesday, September 27, 2016

TIME: 9:00 a.m. to 4:00 p.m.

To attend in person:

LOCATION: Room 550

ADDRESS: Cal/EPA Headquarters Building  
1001 "I" Street  
Sacramento, California 95814

To participate by webinar:

<https://attendee.gotowebinar.com/register/7815431281001768194>

To participate by teleconference:

United States: +1 (914) 614-3221

Access Code: 142-326-775

Please note that this is a toll call.

#### Presenting at the Health and Environmental Risks, and Environmental Justice Technical Discussion

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<sup>1</sup> California Government Code Section 65040.12

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If you would like to present at the Health and Environmental Risks, and Environmental Justice Technical Discussion, please contact Ms. Xuping Li at (916) 322-9148 or [Xuping.Li@arb.ca.gov](mailto:Xuping.Li@arb.ca.gov) by September 16, 2016. ARB is requesting that presentations be limited to 20 minutes. Depending on interest, ARB may adjust presentation length and will communicate this to presenters ahead of time.

If you require special accommodation for the scheduled meeting or need this document in an alternate format (e.g., Braille, large print) or another language, please contact Ms. Regina Cornish at (916) 327-1493, as soon as possible. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

If you have questions about the Health and Environmental Risks, and Environmental Justice Technical Discussion, please contact Ms. Sara King, Air Pollution Specialist, at (916) 323-1009 or [Sara.King@arb.ca.gov](mailto:Sara.King@arb.ca.gov).

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### *Questions to Guide the CCS Health and Environmental Risks, and Environmental Justice Technical Discussion*

The following section provides a list of questions that is intended to guide stakeholder presentations and the discussion. Please note that this list is not exhaustive either in topics or questions.

#### **Aquifers, Lakes, and Oceans**

1. What risk does a CO<sub>2</sub> leak pose to aquifers or other water resources?
2. Given that some CO<sub>2</sub> is naturally dissolved in many water sources, how much CO<sub>2</sub> can be released in the water before negative impacts are observed? Please be specific on the scale and intensity of impacts. If CO<sub>2</sub> is released into an aquifer, how much do the formation properties affect dispersal and negative impacts?
3. Once a leak is stopped, is recovery from each of the impacts possible, and if so, how long would recovery from each impact take? What conditions might affect this recovery rate?
4. Should risks to aquifers, lakes, and oceans be addressed in the CCS QM or is the U.S. EPA UIC program a more appropriate tool to address those risks? If the CCS QM addresses this issue, would it be appropriate to emulate the water protection standards in one of the specific U.S. EPA well classes?

#### **Soils and the Atmosphere**

1. What risk does a CO<sub>2</sub> leak pose to biological life in the soil? For example, how might CCS negatively impact microbes and/or plant root systems?
2. Given some CO<sub>2</sub> gas is naturally present in most soils, how much CO<sub>2</sub> can be present in the soil before negative impacts are observed? Please be specific on the scale and intensity of impacts.
3. Once a leak is stopped, is soil recovery from the negative impacts possible, and if so, how long would it take? What conditions might affect this recovery rate? What methods are available to speed soil recovery? How much do such methods cost?
4. What risk does a CO<sub>2</sub> leak pose to biological life if released into the atmosphere? What impact would it have on plants, animals, and humans?
5. Given that CO<sub>2</sub> gas is naturally present in the atmosphere, how much CO<sub>2</sub> can be present in the air at ground level before negative impacts are observed? Please be specific on the scale and intensity of impacts. Does the space that the leak enters affect these concentrations (e.g., open area, topographical depression, basement/building)?

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6. Should health risks due to leaks of CO<sub>2</sub> to the soil or atmosphere be addressed by the CCS QM or are those risks better addressed by the local permitting and CEQA and NEPA<sup>2</sup> determinations?

### Natural and Induced Seismicity

1. Injection of large volumes of fluids can, in rare cases, result in induced seismicity that may affect the surface<sup>3</sup>. What is the potential for and risks of induced seismicity from CCS projects?
2. What risk might induced seismicity pose to local communities near CCS projects? How do these risks from induced seismicity compare to the risks presented by natural seismicity of equivalent magnitude and frequency?
3. What risk does natural and induced seismicity pose to the integrity of the caprock at the storage site? What risk does natural and induced seismicity pose to the wells at the storage site?
4. How should assessment of risk of induced seismicity be incorporated into the CCS QM? For example, what kind of induced seismicity risk assessment should be required prior to injection?
5. For how long prior to injection should baseline seismicity data for the region be (have been, if it already exists) collected to ensure appropriate comparison data for post-injection phases of the project?
6. Some scientific literature argues<sup>4</sup> for "stoplight" systems for wastewater disposal (high fluid injection sites often used as CCS analogues when studying induced seismicity) where minor incidences of seismicity require a reduction in operations and major incidences of seismicity require complete shut-down of operations. Would a system like this be appropriate for a CCS site? Why or why not?
7. If a stoplight system is appropriate, what threshold (magnitude, frequency, or a combination of both) of seismicity should be considered disruptive enough to require scaling back injection? What threshold should be considered disruptive enough to require complete shut-down of injection activities?

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<sup>2</sup> California Environmental Quality Act, and National Environmental Protection Act

<sup>3</sup> Rubinstein, Justin L. and Alireza Babaie Mahani. "Myths and Facts on Wastewater Injection, Hydraulic Fracturing, Enhanced Oil Recovery, and Induced Seismicity." *Seismological Research Letters* 86, no. 4 (2015).

Veil, John. "A White Paper Summarizing a Special Session on Induced Seismicity." Ground Water Research & Education Foundation Spotlight Series. February 2013.

<sup>4</sup> IEAGHG. "Induced Seismicity and its Implications for CO<sub>2</sub> Storage Risk." Report 2013/09, June 2013.

Zoback, Mark D. "Managing the Seismic Risk Posed by Wastewater Disposal." *American Rock Mechanics Association E-Newsletter* Volume 11, Issue 2 (2012).

Walters, Randi Jean, et al. "Characterizing and Responding to Seismic Risk Associated with Earthquakes Potentially Triggered by Fluid Disposal and Hydraulic Fracturing." *Seismological Research Letters* 86, no. 4 (2015).

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### **Risk Assessments**

1. What risk assessment methods currently exist to address the health and environmental risks of CCS projects?
2. What are the pros and cons of the different methods?
3. How can the CCS QM be designed to minimize health and environmental risks?

### **Environmental Justice**

1. How will CCS projects and the CCS QM impact local communities?
2. Are there any suggestions that may help CCS projects and the CCS QM address concerns of environmental justice communities?
3. How can ARB partner with environmental justice communities to reduce potential local impacts of CCS projects?
4. How can ARB balance the goals of reducing GHGs and costs associated with CCS projects and improving air quality in environmental justice communities?
5. Are there specific areas of guidance that members of the AB32 Environmental Justice Advisory Committee, or the recommendations of that committee, can offer on how to reduce potential for impacts to environmental justice communities that may result from CCS projects?
6. Are there any other concerns regarding CCS projects and the CCS QM that have not been referred to or addressed in this document?