Discussion of New Compliance Offset Protocols for the Cap-and-Trade Regulation

California Air Resources Board
March 28, 2013
Webcast Information

- Slides posted at:
  http://www.arb.ca.gov/cc/capandtrade/meetings/meetings.htm

- E-mail questions to:
  auditorium@calepa.ca.gov
Agenda

- Cap-and-Trade Status Update
- Offset Program Status Update
- Verifiers and Verification Bodies
- New Protocol Development
  - Criteria
  - Timeline
  - Early Action
- Rice Cultivation Protocol
- Coal Mine Methane Protocol
Cap-and-Trade Status Update

- Cap-and-Trade Regulation effective January 1, 2012
- Regulatory Amendments effective September 1, 2012
- Emissions Compliance began January 1, 2013
- Proposed Amendments for Linkage
  - Board hearing scheduled for April 19, 2013
- Investment plan for auction proceeds
  - Board meeting scheduled for April 25, 2013
- Additional Amendments and Offset Protocols
  - Anticipated Board consideration Fall 2013
Offset Program Status Update

• Compliance Offset Projects Listed
  • 3 by American Carbon Registry
  • 1 by Climate Action Reserve
  • Verifications are currently underway
  • First ARB offset credits from compliance offset projects likely issued as early as Summer

• Early Action Offset Projects Listed
  • 25 by ARB
  • Listings updated first Wednesday of each month
  • First regulatory verification received
  • First ARB offset credits from early action projects likely issued this Spring
Verifiers and Verification Training

- Four training sessions were in summer 2012 with attendance of:
  - 78 verifiers
  - 19 Offset Project Registry staffers
  - 6 Offset project operators/consultants

- Scheduled upcoming training:
  - April 22-26, 2013
  - For more information, see: http://www.arb.ca.gov/cc/capandtrade/offsets/verification/verification.htm
Verifiers and Verification Bodies

- 14 Verification Bodies accredited
- 68 Offset Verifiers accredited
  - 59 Lead verifiers
  - 29 Livestock project specialists
  - 26 U.S. Forest project specialists
  - 25 ODS destruction project specialists
  - 19 Urban Forest project specialists

For more information, see:

http://www.arb.ca.gov/cc/capandtrade/offsets/verification/verification.htm
New Protocol Development

- New potential protocols
  - Rice Cultivation
  - Coal Mine Methane

- Both potential protocols primarily target methane emissions reduction

- Methane (CH4) facts:
  - 100-year GWP is 21 (AR2)
  - Short-lived gas with a lifetime of 12 years
  - Is the primary component of natural gas
Offset Criteria

- Real, additional, quantifiable, permanent, verifiable, and enforceable
- Board-adopted Compliance Offset Protocols
- Cannot credit emission reduction activities already covered under the cap
  - No offset credits for fossil fuel or electricity displacement
- Must meet the same accuracy requirements as all other reported GHG emissions
- Although participation in the offset program is voluntary, all participants are subject to regulatory requirements, including oversight and enforcement.
Offset quantification methodologies must account for leakage

What is leakage?
- Increased GHG emissions that result from the displacement of activities from inside to outside the project’s boundary
- Directly resulting from offset project activity
- Indirectly due to the effects of a project on an established market

Leakage is accounted for in two primary ways
- Direct measurement of project-specific leakage with appropriate deduction from credits issued
- Application of a standard deduction based on leakage potential
Early Action for New Protocols

- Occurred between January 1, 2005 and December 31, 2014
  - Registered with ARB prior to January 1, 2014
- Results from the use of an approved quantification methodology
  - Voluntary protocols that are substantially similar to the adopted Compliance Offset Protocol will be considered for early action quantification methodologies
- Is verified pursuant to section 95990(f)
New Compliance Offset Protocol Crediting

- Project commencement date must be after December 31, 2006
- Project can only be credited for GHG emission reduction up to 28 months prior to listing
  - For example, if a project is listed on June 1, 2014 and the Offset Project Data Report is submitted simultaneously, crediting can begin February 1, 2012
Timeline for New Protocol Development

- Technical working groups: Spring 2013
- Draft protocols for public comment: Summer 2013
- Board consideration: Fall 2013
- Protocol effective date: Spring 2014
Questions?
Rice Cultivation Protocol
Overview of U.S. Rice Farming Industry

- Rice has been commercially cultivated for over 300 years in the US
- More than 90% of rice consumed in US is grown by US rice farmers
- 6 major rice–producing states: AR, CA, LA, MS, MO, and TX
- Total planting area: 2.6 - 3.5 M acres
- Rice cultivations provides significant economic and ecological value
Rice Cultivation Projects Protocol

- First crop-based offset protocol considered by ARB
- Flooded rice paddies serve ecological functions as man-made wetlands; but also a source of GHG emissions
- Protocol quantifies greenhouse gas emissions reductions from rice cultivation practices
- Maintains yield and preserves current associated ecological benefits
- Potential reductions of 0.5 – 3 MMTCO2e thru 2020
Greenhouse Gas Emissions from Wetlands and Flooded Rice Fields

Source: http://www.ibp.ethz.ch/research/environmentalmicrobiology/research/Wetlands

California Air Resources Board
Staff Proposal for Discussion
Current Rice Cultivation Protocols in Voluntary Market

  - California regional quantification methodology
  - Adding Mid-South Module to quantification methodology

- CAR: Rice Cultivation Project Protocol Version 1.0 (Dec 2011)
  - California region quantification methodology
Project Definition

- The implementation of approved practices that reduce methane emissions from rice cultivation
  - California
    - Straw removal after harvest
    - Switch from wet seeding to dry seeding
    - Early drainage at the end of growing season
  - Mid-South States
    - Straw removal after harvest
    - Early drainage at the end of growing season
    - Intermittent flooding (alternate wet and dry)
    - Staggered winter flooding
Eligibility Criteria

- Project geographic location
  - California
  - Mid-South

- Project commencement
  - First day of cultivation cycle during which a project activity is implemented

- Project reporting period
  - Cultivation cycle – approximately one year

- Crediting period
  - 7 years
Project Boundary of GHG Sources, Sinks, and Reservoirs

- Soil systems – biochemical reactions affecting GHG emissions
- Increased fossil fuel emissions (outside CA only)
  - CA Fossil fuels will be capped in 2015
  - Field preparation
  - Fertilizer/pesticide/herbicide application
  - Straw handling
- Straw residue usage
- Leakage
Emissions Quantification Methodology

- Soil systems emissions quantified using DeNitrification DeComposition (DNDC) model
  - [http://www.dndc.sr.unh.edu/](http://www.dndc.sr.unh.edu/)

- A computer model that can be used for predicting emissions of GHGs based on field-specific parameters. Calibrated with:
  - Crop-type specific data
  - Region specific data
  - Activity specific data
  - Quantify both baseline and project emissions
Emissions Quantification Methodology (cont)

- Fuel usage emissions quantified using default fuel specific emissions factors and fuel volumes
- Straw residue usage emissions quantified using emissions factors specific to end-usage and mass of straw
  - Includes emissions from bailing
- Leakage emissions quantified using normalized annual average yields within the same geographic region and baseline emissions
Baseline Determination

- None of these GHG mitigation practices are widely adopted so none would be considered business as usual
- ARB has not identified any federal, state, or local regulations mandating adoption of any of the identified GHG mitigation practices
Seeking Comments

- Accuracy of DNDC model
- Simplification of DNDC model
  - Use and verification
- Rice specific verification techniques
  - E.g. how to ensure a practice was done
- Project aggregation
  - Methods
  - Risks
- Potential for leakage
Questions?
Overview of U.S. Coal Mining Industry

- Commercial coal mining began in Virginia in 1748
- Annual coal production roughly 1.1 billion short tons from both surface and underground mines
- About 1/3 of mines are federally owned
  - Mainly in the western U.S.
Coal Mine Methane Projects Protocol

- Methane is released before, during and after mining activities
- 11.6% of all U.S. anthropogenic methane emissions result from coal mining
- Three project types
  - Active underground mines
  - Abandoned underground mines
  - Active surface mines

U.S. CMM Emissions

- 7% Abandoned Underground
- 22% Surface Mining
- 71% Underground Mining

Potential Total Methane Emission Reductions from U.S. Coal Mining through 2020

50-100 MMTCO2e
Coal Mine Methane Protocols in the Voluntary Market

- CAR: Coal Mine Methane Project Protocol (October 2012)
  - Active underground

- VCS: Revisions to CDM consolidated methodology ACM008 version 6 to Include Pre-drainage of Methane from Active Open Cast Mines (VMR001) (March 2009)
  - Active underground and surface

- VCS: Revisions to CDM consolidated methodology ACM008 version 6 to Include Methane Capture and Destruction from Abandoned Coal Mines (VMR002) (July 2010)
  - Active and abandoned underground
Coal Mine Methane Protocols in the Voluntary Market (cont)

- CCX: Coal Mine Methane Collection and Combustion Offset Protocol (August 2009)
  - Active and abandoned underground
  - Excludes Ventilation Air Methane

- ACR: Draft
  - Active and abandoned underground, and surface
Project Definition

• Installation of a device or set of devices associated with the capture and destruction of methane gas that would otherwise be vented into the atmosphere as a result of coal mining activities in:
  • Active underground mines
  • Ventilation Air Methane (VAM)
  • Drainage Systems
    • Pre-Mining Boreholes – surface and horizontal
    • Post-Mining Boreholes
Project Definition (cont)

- Installation of a device or set of devices associated with the capture and destruction of methane gas that would otherwise be vented into the atmosphere as a result of coal mining activities in:
  - Abandoned underground mines
  - Drainage Systems
    - Installation and operation of new wells
    - Continued operation of in-mine boreholes and post-mining (gob) wells drilled during active mining
  - Active surface mines
    - Drainage Systems
      - Pre-Mining Boreholes - vertical
<table>
<thead>
<tr>
<th>Project Type</th>
<th>Included Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Underground Mines</td>
<td>Active Mine Venting &lt;br&gt; Ventilation Air Methane (VAM) Collection &lt;br&gt; VAM Oxidation &lt;br&gt; Collection, Transport, and Processing of Methane &lt;br&gt; Destruction Emissions &lt;br&gt; Onsite Usage &lt;br&gt; Flare &lt;br&gt; Vehicle Operations &lt;br&gt; Offsite usage (pipeline)</td>
</tr>
<tr>
<td>Active Surface Mines</td>
<td>Active Mine Venting &lt;br&gt; Collection, Transport, and Processing of Methane &lt;br&gt; Destruction Emissions &lt;br&gt; Onsite Usage &lt;br&gt; Flare &lt;br&gt; Vehicle Operations &lt;br&gt; Offsite Usage (pipeline)</td>
</tr>
<tr>
<td>Abandoned Underground Mines</td>
<td>Abandoned Mine venting &lt;br&gt; Collection, Transport, and Processing of Methane &lt;br&gt; Destruction Emissions &lt;br&gt; Onsite Usage &lt;br&gt; Flare &lt;br&gt; Vehicle Operations &lt;br&gt; Offsite Usage (pipeline)</td>
</tr>
</tbody>
</table>
Eligibility Criteria

- **Project Location**
  - United States

- **Project Commencement Date**
  - The date at which the device(s) used to capture and destroy coal mine methane becomes operational

- **Project Reporting Period**
  - 12 calendar months

- **Project Crediting Period**
  - 10 years
Quantification Methodology

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Quantification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Underground Mines</td>
<td>Metered methane destruction</td>
</tr>
<tr>
<td>Active Surface Mines</td>
<td>Metered methane destruction</td>
</tr>
<tr>
<td>Abandoned Underground Mines</td>
<td>Lesser of metered methane destruction or decline curve</td>
</tr>
</tbody>
</table>

- Abandoned mines decline coefficients based on either:
  - Mine specific
    - Computational fluid dynamics flow simulation model
    - Mine specific parameters
  - Basin decline coefficients
Spatial & Temporal Boundary – Underground Mines

- Physical boundaries defined by the mine area as permitted by a federal or state agency

- Conservative temporal boundary
  - Emission reductions issued only when a well is mined through
    - Working face intersects or passes the borehole
  - Baseline methane emissions are accounted for in the periods in which the emissions would have occurred
  - CO$_2$ emissions that result from the destruction of methane are accounted for in the period during which destruction occurs
Spatial & Temporal Boundary – Surface Mines

- Physical boundary defined as all strata above mined seams and strata not more than 130 feet below the base of the lowest mined coal seam

- Conservative temporal boundary
  - Only methane collected from within a physical boundary known as the zone of influence will be eligible for crediting
  - Wells are considered to be in the zone of influence when:
    - Elevated amounts of atmospheric gases are produced, or
    - It is physically bisected by mining activities
Spatial & Temporal Boundary – Abandoned Mines

- Horizontal extent is defined by final mine map submitted upon closure.

- Vertical extent must be within the extents of the final mine map and meet the following criteria:
  - Drilled 130 feet or less below the mine seam.
  - Gob area up to 525 feet above the mined seam when wells are cased to at least 525 feet above the mined seam.
  - Gas from two vertically separated mines cannot be comingled in a wellbore (to avoid cross flow).

- Mines classified by the Mine Safety and Health Administration (MSHA) as permanently abandoned and temporarily abandoned are eligible.
## Eligible Activities

<table>
<thead>
<tr>
<th>Destruction / Use Activity</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destruction of methane from pre-mining drainage systems (underground and surface mines)</td>
<td>Yes</td>
</tr>
<tr>
<td>Destruction of methane from post-mining drainage systems/gob wells (underground and abandoned mines)</td>
<td>Yes</td>
</tr>
<tr>
<td>Destruction of methane from ventilation shafts (underground and abandoned mines)</td>
<td>Yes</td>
</tr>
<tr>
<td>Destruction of methane through flaring, power generation, and heat generation</td>
<td>Yes</td>
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<tr>
<td>Destruction of methane through injection into gas pipeline</td>
<td>Yes</td>
</tr>
<tr>
<td>Displacement of grid-delivered electricity or fossil fuel use outside the project boundary</td>
<td>No</td>
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<tr>
<td>Destruction of coalbed methane not associated with active coal mining activities (also known as virgin coalbed methane)</td>
<td>No</td>
</tr>
<tr>
<td>Destruction of methane from mines that use CO₂ or any other fluid/gas to enhance CMM drainage</td>
<td>No</td>
</tr>
<tr>
<td>Destruction of methane from mines that employ mountain top removal mining methods</td>
<td>No</td>
</tr>
</tbody>
</table>
Injection into Gas Pipeline
Under Consideration

- ARB is considering making the injection of CMM into natural gas pipeline an eligible end use
  - Productive utilization of captured CMM is preferred
  - Only 14 of 295 active gassy mines in the United States currently inject into a pipeline

- The protocol will not allow for the issuance of credits for emission reductions associated with the displacement of fossil fuels that may result from natural gas pipeline injection
Leakage Potential

- Coal Mine Methane and Leakage Potential
  - Project activities that increase gas drainage capacity could reduce constraints on mining operations resulting in increased coal production.

- The protocol must account for applicable leakage

- Leakage Discount Factor – to be determined through technical working group process
Quantification of CMM Emission Reductions

1. Emissions Reductions = (Baseline Emissions – Project Emissions) x Leakage Discount Factor

2. Baseline Emissions
   - Methane Destruction
   - Release into Atmosphere
   - Production of Power, Heat or Pipeline Injection

3. Project Emissions
   - Energy Use to Capture and Use Methane
   - Methane Destruction
   - Un-Combusted Methane

4. Leakage Discount Factor
Seeking Comment and Input

- Projects on federal lands – what is the:
  - Permitting process for mines on federal lands?
  - Relationship between mine operators and federal regulators?

- Ownership of methane – who is Offset Project Operator on:
  - Federal Lands?
  - Private Lands?

- Accounting for leakage:
  - Data to inform the setting of an appropriate discount factor for increasing coal production
Technical Working Group

- ARB is convening a technical working group to provide:
  - Technical expertise
  - Forum for issue discussion
  - Problem resolving
- Kick-off call: April 2013
  - Monthly meetings
  - Identify technical experts
    - Contact program staff if interested
  - Summary of meetings
  - Available to the public
Program Contacts

- Steve Cliff, Chief, Program Evaluation Branch, scliff@arb.ca.gov
- Greg Mayeur, Manager, Program Operations Section, gmayeur@arb.ca.gov
- Jessica Bede, Coal mine methane protocol contact, jbede@arb.ca.gov
- Yachun Chow, Rice cultivation protocol contact, ychow@arb.ca.gov
Please submit your comments to:
http://www.arb.ca.gov/cc/capandtrade/comments.htm

by 5:00 pm April 22, 2013
Questions?