WESTCARB Annual Business Meeting

Considerations for Geologic Sequestration in a GHG Reduction Program – California Example

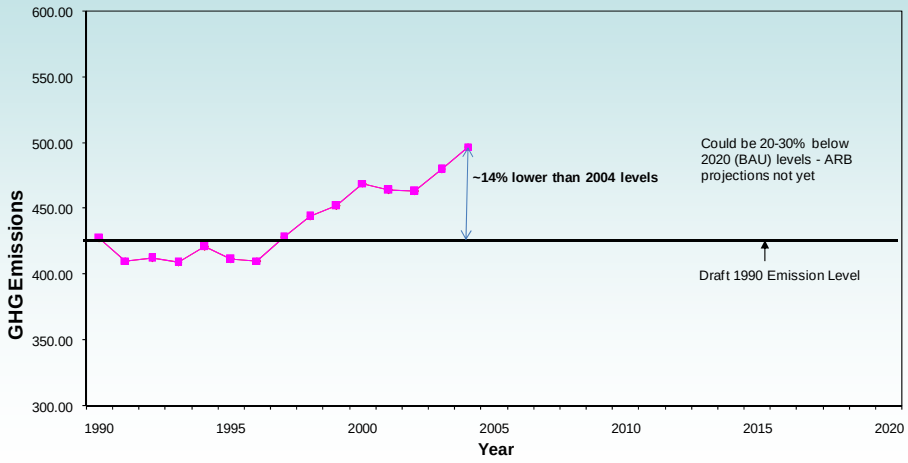
Elizabeth Scheehle
California Air Resources Board
escheehl@arb.ca.gov

Seattle, WA
November 28, 2007

Overview

- Climate relevant regulations in California
- Markets & Offsets
- What is the definition of a GHG reduction?
- How does CCS compare to other GHG reductions?
- Future: Outlook and Needs

California Greenhouse Gas Emissions (Mt CO_2) DRAFT



Goal: 2020 GHG emissions = 1990 GHG emissions

AB32 – Global Warming Solutions Act of 2006

Goal: 2020 GHG emissions = 1990 GHG emissions

- Early Actions
- Mandatory reporting for significant sources
- Scoping Plan
- Voluntary early reductions
- Public & Committee Input
  - Environmental Justice
  - Economic and Technology Advancement
- Consider:
  - Health, Economic & Environmental Impacts, Equity, Electricity Reliability, Other Environmental Laws, Impact on Low Income

AB32 – Schedule

- Jan. 1, 2008 – Mandatory Reporting guidelines and 1990 baseline
  - Reporting starts 2009
  - 'Transferred' CO_2 reported but not subtracted from facility's reported emissions
- Jan. 1, 2009 – Scoping plan adopted
- Jan. 1, 2010 – Discrete Early Actions take effect
- Major Rulemakings for reducing GHGs, including market mechanisms by 2011, take effect by 2012
- **Dec. 31, 2020 – ACHIEVE CAP**

At this point, there is still uncertainty about the details of the various mechanisms (market, offsets, regulations, etc.)

Other Relevant Regulations

- SB 1368 – GHG Emissions Performance Standard
  - Applies to baseload generation supplied to electric utilities under covered procurement
    - Includes contracts 5+ years
  - 1100 pounds (0.5 metric ton) of CO_2 per megawatt-hour
  - Geologic sequestration allowed to meet standard
    - EPS determined based on projections of net emissions over the life of the power plant
    - Must:
      - Include the capture, transportation, and geologic formation injection of CO_2 emissions
      - Comply with all applicable laws and regulations
      - have an *economically and technically feasible plan that will result in the **permanent** sequestration* of CO_2 once the sequestration project is operational
- What does this mean in terms of AB32? – Still to be determined

Markets & Offsets

- Markets
  - High uncertainty about market
    - Market advisory committee made recommendations
      - International Expertise
  - If there is a cap and trade
    - Sectors covered?
    - Cap on overall emissions, could trade to meet target
    - Allocation up in air
    - Once set: Inventory type approach - emissions would count, does not matter how achieve reductions as long as the entity inventory can be verified
  - If there is a market and offset opportunities:
    - Must meet different criteria
      - Allow for higher emissions from those under cap

Inventory Methodologies

- IPCC guidelines for National Inventories
  - Included in 2006 guidelines
  - Emissions counted where they occur therefore:
    - Emissions at source lowered
    - Emissions counted along process: Transportation, Sequestration Site
  - Sequestration Site Inventory Needs:
    - Site Characterization
    - Risk Assessment
    - Modeling and Monitoring
    - Reporting
  - Vague guidelines, not yet implemented by any country

What makes a GHG reduction?

- Real
- Quantifiable
- Verifiable
- Enforceable
- Permanent
- Additional

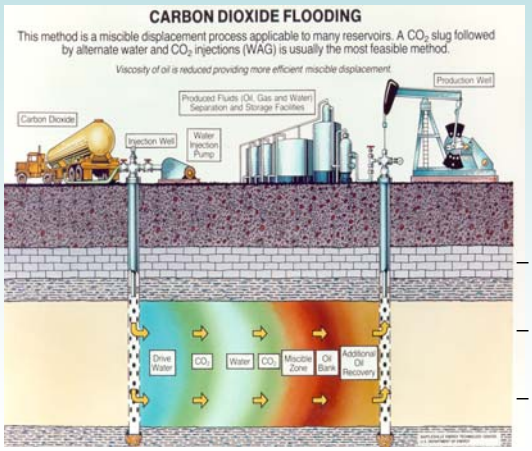
Considerations for CCS as a GHG reduction

Sequestration: No protocol currently available

- REAL: In general - Life cycle suggests overall reductions. Include all emissions (fugitives, indirect emissions).
  - Additionality: SB 1368
- QUANTIFIABLE: Difficult. Would likely need similar site specific info such as IPCC methodology.
  - Detection limits, modeling and monitoring limitations
  - What monitoring schemes could quantify CO_2 losses? If not possible, how to deal with inability to quantify? Who monitors where (potentially # of different operators)
- VERIFIABLE: Models are not transparent and rely on operator supplied data. Third party verification difficult. Would specific training be necessary as in forestry protocols?
- PERMANENT: Difficult to prove permanence at start-up
  - Assurance increases with performance
  - Few projects to verify long-term performance
  - Short and long term seepage issue – full credit at start despite potential? Would need to payback if leakage? Due diligence – no payback? Multitude of options.
- ENFORCEABLE: Depends on number of sites, Inspector enforcement difficult due to quantification/verification issues.

Disclaimer: These are considerations and not CARB policies

Additional Considerations for EOR



- REAL and QUANTIFIABLE: What's the overall reduction:
  - Need proof of how much CO_2 is sequestered. Monitoring results.
  - Life Cycle:
    - How much is emitted (transit, surface facilities)?
    - How much energy is used throughout process?,
    - What are the end of life losses?
    - How much leakage through abandoned wells or other active wells nearby? Status of wells?
- Additionality: Given rising oil prices would CO_2-EOR have happened anyway?
- PERMANENT: Would need agreement to not blow down field on closure. Abandoned wells additional issue.
- Timing: Largest reductions at field closure but costs much earlier.

Disclaimer: These are considerations and not CARB policies

Comparison to other GHG reduction option

Landfills

- Real: Yes, can measure amount collected and used. Can estimate losses.
- Permanent: Yes, every ton combusted is not emitted. No issues.
- Quantifiable: Yes, can measure
- Verifiable: Third party can reproduce calculations and inspect measurement records
- Enforceable: Enforcement can inspect recovery facilities. Limited number of sites.
- Additional: Only counted if above and beyond current federal and state regulations

How does this compare to other programs?

- Voluntary programs
  - EOR allowed with limited or no monitoring, no surface emissions estimates
  - But recently more scrutiny on rigor
- Under a regulatory system
  - Small emissions can mean a big difference economically
  - Will likely encounter similar public acceptance issues
- Current status:
  - RGGI: Does not include CCS as offset
  - CDM: No approved methodology
  - Alberta: Have draft protocol for EOR

Current Status of CCS in AB32 Implementation

- Voluntary early reduction status
  - No protocol, reduction uncertainties
- Not expected to be a large part of 2020 goal
  - Few low cost options
- Improvements may help participation in long term GHG reduction strategies
- Uncertainties in AB32 implementation remain:
  - Could still play a part in 2020 goals
  - EOR may be considered separately from Sequestration

Other considerations

- Environmental Justice Advisory Committee
  - On record as having doubts about this technology
    - Would likely oppose
- Economic and Technology Advancement Advisory Committee
  - Recommendations for pursuing CCS in draft report
    - Technology Game Changer
  - Acknowledge limitations in use for meeting 2020 goals

Long term

- Executive Order goal of reduction to 80% below 1990 levels by 2050
  - Need protocols, life cycle analysis, comprehensive monitoring results
  - Monitoring techniques able to detect and quantify seepage losses from storage sites
- Environmental Justice/ Public Acceptance Concerns
  - Local risks for global benefits
- Economics:
  - Effect when and to what extent this technology helps to reach a climate goal
    - CA: Costly options in general
    - Costs of Regulation, costs of wells (finding all wells, determining status, and plugging/monitoring)

What is ARB doing?

- Realize that CCS is an important tool in meeting the potential state GHG reduction target beyond 2020
- In-house field project to ascertain well leakage (if any) of methane in oil and gas field(s) as a first step in determining risks and leakage potential
  - DOGGR and WESTCARB collaboration
- Coordination to determine any low-cost CCS options in state that could feed into short and long term goals
- Potential to investigate life-cycle emissions and energy use
- More work expected after 2012
  - Regulations and alternative mechanisms in place
- Numerous workshops
  - Your input encouraged
  - http://www.arb.ca.gov/cc/cc.htm for list