



GHG Emissions Reduction Measurement and Monitoring Methodology for CCS Projects in Oil and Gas Reservoirs

*Public Workshop to Launch Development of
ARB's Carbon Capture and Sequestration Program
Sacramento, CA
February 12, 2016*



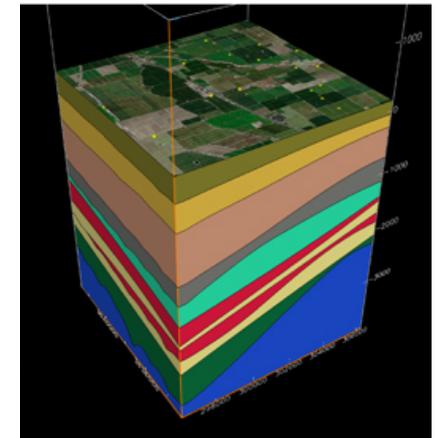
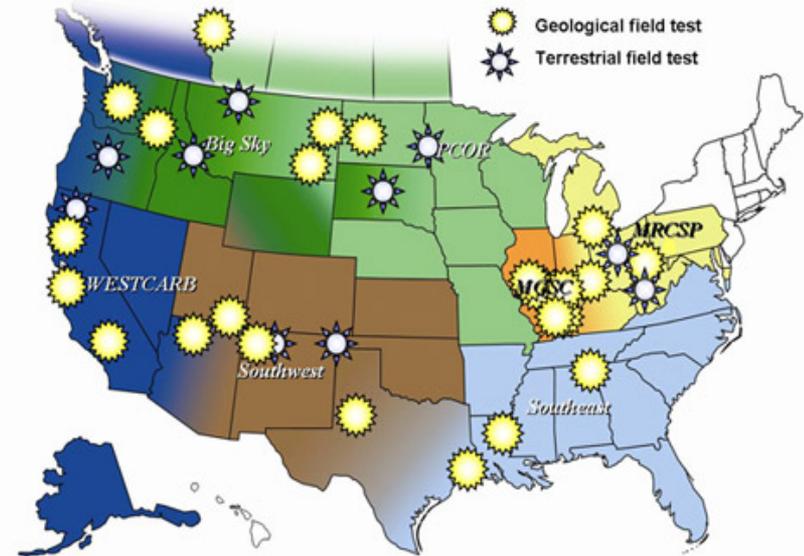
American Carbon Registry

- Founded in 1996 as the first private voluntary GHG registry in the U.S.
 - 54+ million tons of CO₂-e emissions reductions issued
- Registry roles:
 - Develop and approve carbon offset accounting standards & methodologies / protocols
 - Oversee independent verification by accredited validation/verification bodies
 - Review and register GHG emissions reduction projects, including issuance of serialized offsets
- Approved in December 2012 as California Offset Project Registry & Early Action Offset Program
 - Supports CARB's implementation of the Cap-and-Trade Offset Program



USDOE Regional Carbon Sequestration Partnerships

- Exploring geologic and terrestrial carbon sequestration opportunities in 7 regional partnerships
- Winrock led terrestrial work in WESTCARB and SECARB
- Geologic characterization, CO₂ source and sink mapping, assessment of capture technologies, cost assessment, injection field tests and pilots, public outreach and education
- Data inputs to the [National Carbon Sequestration Database and Geographic Information System \(NATCARB\)](#)



- ACR methodology builds on the Pew Center GHG accounting framework for Carbon Capture & Storage Projects, published in 2012
 - 25 workgroup participants, including Winrock/ACR

Key Elements of Methodology

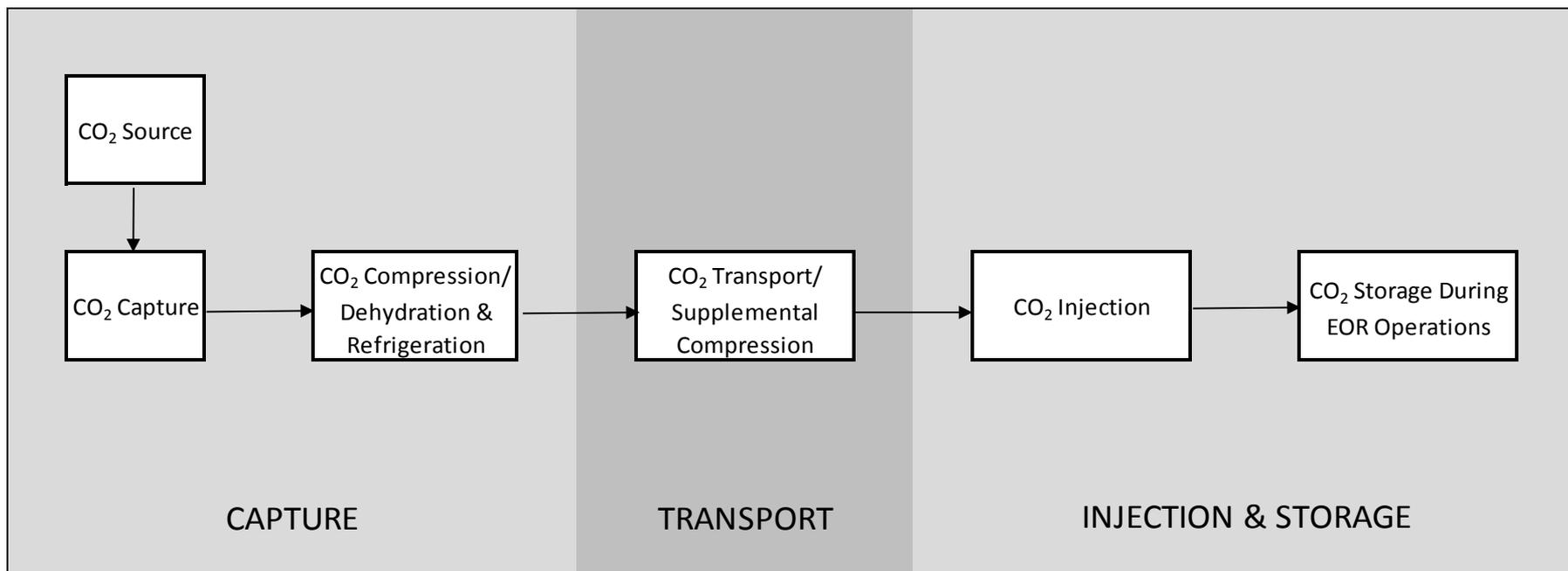
- Accounting: Baseline, Boundary, Data Collection

Based on Pew Center work

- Ownership of Emissions Reductions
- Project Eligibility
- Monitoring, Reporting & Verification (MRV) Plan
- CO₂ Leakage Issues
- Mitigation of Releases

Developed for ACR methodology

Eligibility/Boundary



Eligibility (contd.)

- Example Sources include:
 - Power Plants (pre-combustion, post combustion, or oxy-fired technologies)
 - Industrial facilities (petroleum refineries, gas plants, ethanol production, cement plants)
 - Polygeneration facilities (produce electricity and one or more commercial grade by-products)
 - Direct Air Capture (DAC) facilities
- Transport of CO₂
 - Pipeline
 - Barge, rail, or truck

Eligibility (contd.)

- Injection in enhanced oil recovery (EOR) projects
 - to enhance production from hydrocarbon producing reservoirs that have previously produced or are currently producingor
 - to produce from reservoirs that have not produced hydrocarbons but have a potential for hydrocarbon recovery through CO₂ injection in the reservoir
- Current methodology does not apply to CO₂ injection in saline aquifers, but could be modified to include



Monitoring, Reporting, and Verification (MRV) Plan

- Projects to include a MRV plan to assure no leakage of injected CO₂ in oil and gas reservoir
- MRV plan is site-specific
- MRV plan must be developed by CO₂-EOR expert and is subject to validation/verification signoff by sector expert Professional Engineer or Professional Geologist

- Calculation procedures
 - Baseline emissions (projection-based or intensity-based)
 - Project emissions (capture, transport, and storage segments)
 - Project emission sources include stationary combustion, vented and fugitive, electricity and steam usage
 - GHG gases include CO₂, CH₄, and N₂O
 - Consistent with industry practices and EPA reporting requirements

Challenging Issues Addressed

- Permanence of storage
 - Site characterization
 - Post-injection monitoring
 - Amendments to property records
- Mitigation of releases
 - Intentional
 - Unintentional
- Data Collection and Monitoring



Further Information

<http://americancarbonregistry.org/carbon-accounting/standards-methodologies/carbon-capture-and-storage-in-oil-and-gas-reservoirs>

Arjun Patney
Policy Director
(916) 520-8628

arjun.patney@winrock.org

Mary Grady
Director, Business Development
(805) 884-1961

mgrady@winrock.org