



# **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*



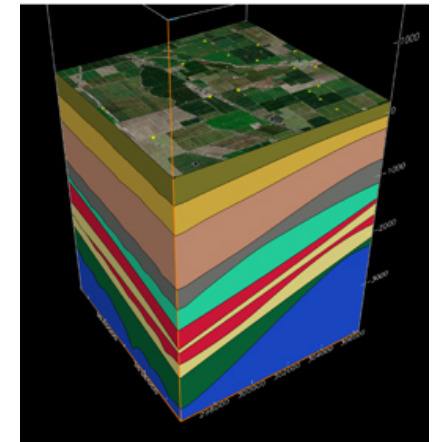
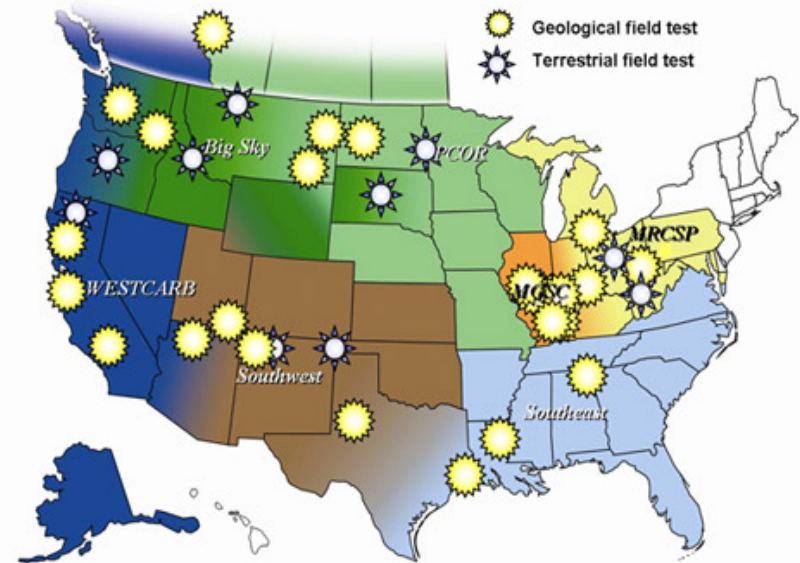
# American Carbon Registry

- Founded in 1996 as the first private voluntary GHG registry in the U.S.
  - 54+ million tons of CO<sub>2</sub>-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, CO<sub>2</sub> 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

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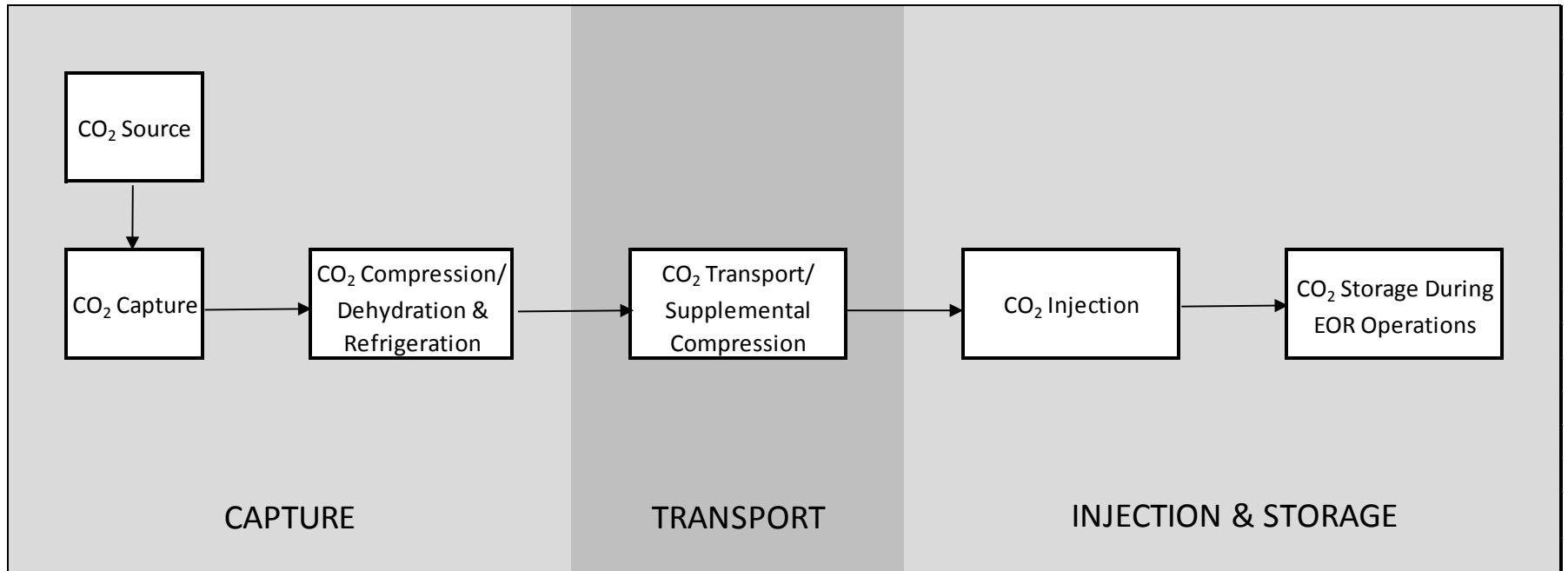
- Accounting: Baseline, Boundary, Data Collection

*Based on Pew Center work*

- Ownership of Emissions Reductions
- Project Eligibility
- Monitoring, Reporting & Verification (MRV) Plan
- CO<sub>2</sub> Leakage Issues
- Mitigation of Releases

*Developed for ACR methodology*

# Eligibility/Boundary



# Eligibility (contd.)

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- 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 CO<sub>2</sub>
  - Pipeline
  - Barge, rail, or truck

# Eligibility (contd.)

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- 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 CO<sub>2</sub> injection in the reservoir
- Current methodology does not apply to CO<sub>2</sub> injection in saline aquifers, but could be modified to include





# Monitoring, Reporting, and Verification (MRV) Plan

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- Projects to include a MRV plan to assure no leakage of injected CO<sub>2</sub> in oil and gas reservoir
- MRV plan is site-specific
- MRV plan must be developed by CO<sub>2</sub>-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 CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O
  - Consistent with industry practices and EPA reporting requirements

# Challenging Issues Addressed

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



# Further Information

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

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