WESTCARB Annual Business Meeting

Phase II Midpoint Report

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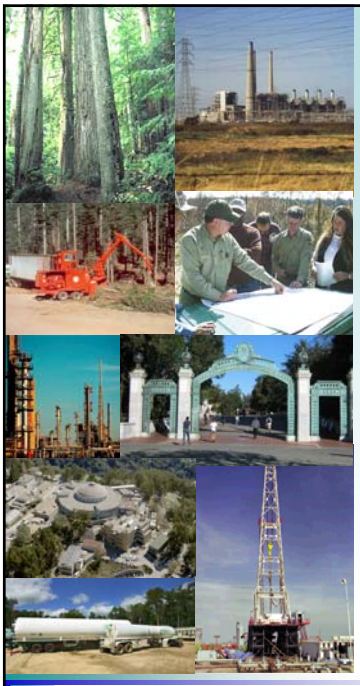


WESTCARB Features Strong and Diverse Set of Partners; Robust Cost Share

- More than 70 organizations comprising:
  - Resource management and environmental protection agencies
  - National laboratories and research institutions
  - Conservation nonprofits
  - Climate project standards organizations
  - Energy and pipeline companies
  - Colleges and universities
  - Trade associations and policy coordinating bodies
  - Consultants
- Led by California Energy Commission (CEC)
- CEC/partner cost share >$11.7 million

Meeting Objectives

- Review technical progress
  - Accomplishments to date and next steps
  - Feedback on methods and interpretation of findings
- Address deployment and commercialization issues
  - What are the priorities and barriers?
  - What are the opportunities?
  - What can WESTCARB do to address these barriers?

WESTCARB Project Overview

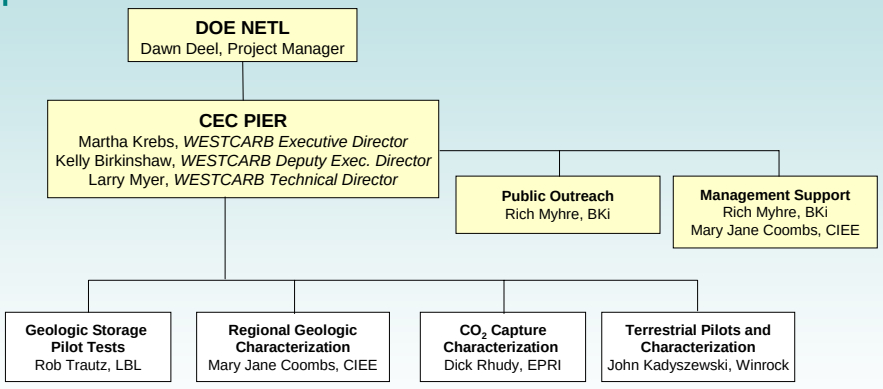
- Phase I began in October 2003
  - About 40 participants
  - Regional assessments of terrestrial and geologic storage options; locations, capacities, costs, risks
  - Raise public awareness
- Phase II began in October 2005
  - About 70 participants
  - Focus on geologic and terrestrial pilots
  - Continue regional assessments and public outreach
    - Input to policy
- Phase III is coming
  - Conduct a commercial-scale CCS test in California

Accomplishments to Date

- Centralized GIS source and sink database
- Major point sources and geologic sinks identified and characterized
- Geologic and terrestrial storage estimates made for major sinks
- Terrestrial and geologic marginal cost curves developed
- Terrestrial pilots are successfully under way
- Non-technical issues highlighted by geologic pilots
- Heightened awareness of sequestration among state, community, and industry leaders; results are informing policy
- Wealth of data for the technical and policy communities from comprehensive reports/papers

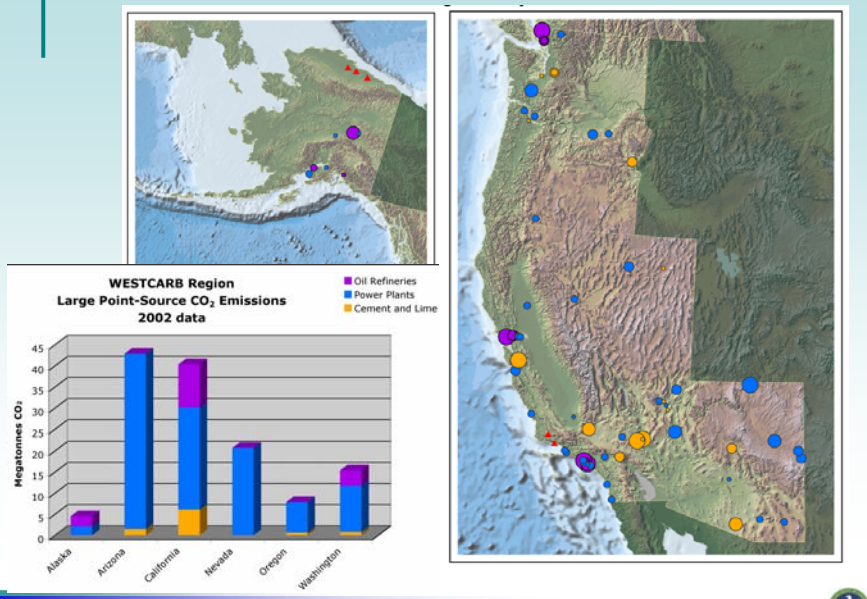
WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP 5

WESTCARB Phase II Management Structure

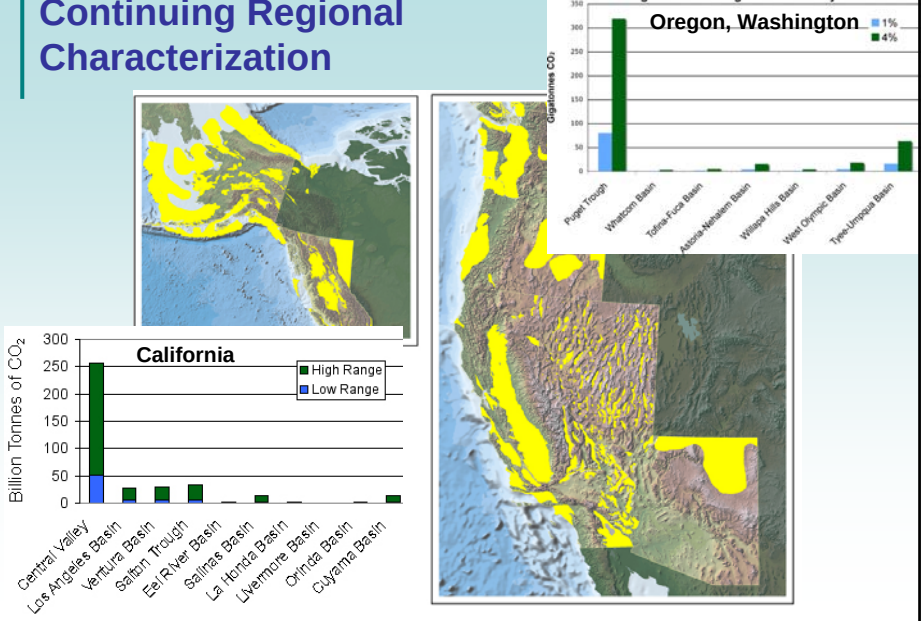


WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP 6

Characterizing Regional Sources

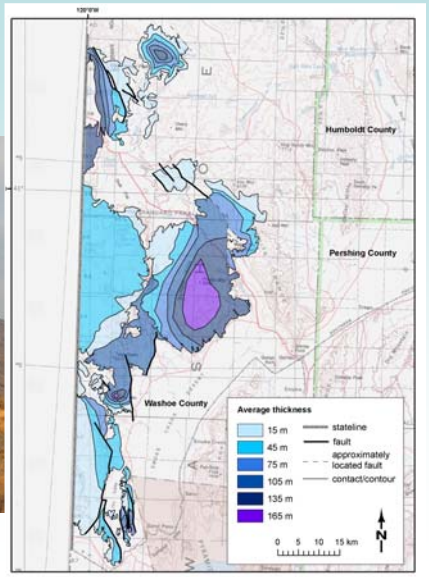


Continuing Regional Characterization



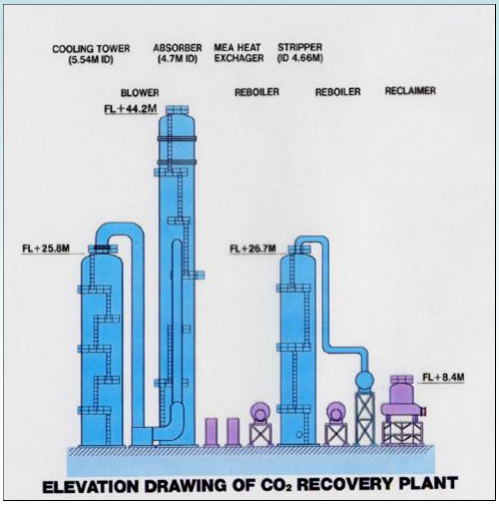
Surveying Mafic and Ultramafic Rock Volumes in Nevada

139 km³ basalt in Washoe County, Nevada (Source: NBMG)



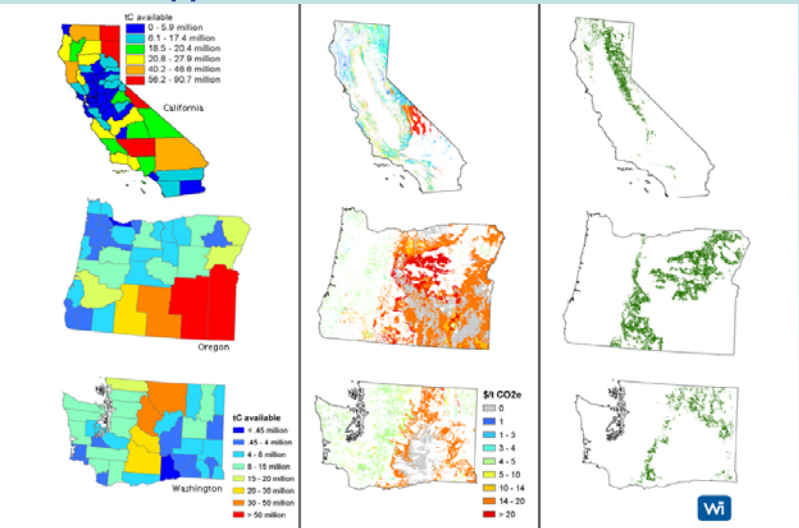
Assessing CCS System Deployment Options

- Impact of CCS on selection of future power plant locations
  - Generic assessment compete
  - Site-specific example study under way
- Scenario analysis of CCS in the Western electric grid



(Source: Fell & Keller, 2006)

Afforestation and Fuel Management Are Major Terrestrial Opportunities



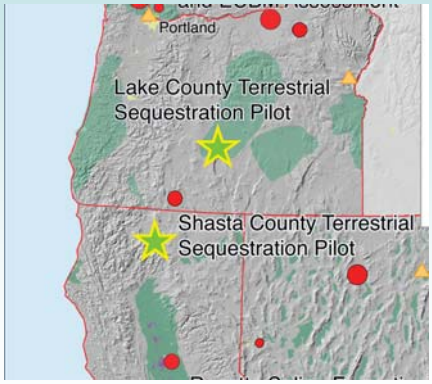
40-year sequestration potential

40-year marginal costs

Lands suitable for fuel removal

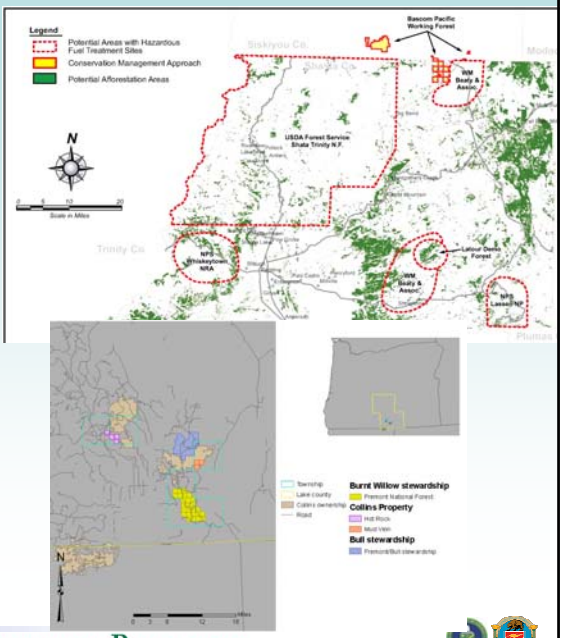
Terrestrial Pilots in California and Oregon

- Two terrestrial pilots (multiple sites)
  - Forest treatment/fire risk reduction and fast-growth afforestation assessment in Lake County, OR (as part of an Oregon Solutions Project)
  - Forest treatment/fire risk reduction, native-species afforestation, and forest conservation management in Shasta County, CA



Terrestrial Pilots Are Under Way

- Afforestation pilots now at five locations in Shasta County, CA
- Baseline measurements/fuel treatments under way on PG&E, W.M. Beaty, and California (LaTour) forest lands in Shasta County
- Baseline measurements/fuel treatments under way on Fremont-Winema National Forest, and Collins Co. lands in Lake County, OR



Afforestation Pilots Test Practical Aspects of Sequestration

- Validate Phase I potential
  - Baseline carbon stocks
  - Carbon accumulation potential
  - Costs (site prep, planting, maintenance, MMV, registration/reporting)
- Explore conditions of landowner participation
  - What type of landowners? Under what conditions?
- On-the-ground experience in site prep requirements, planting, maintenance
- "Road-test" California Climate Action Registry protocols

Measuring Forest Carbon Pools a Key for Fuel Treatment Pilots

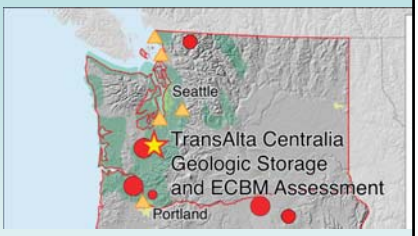
Terrestrial Pilots Address Market Issues

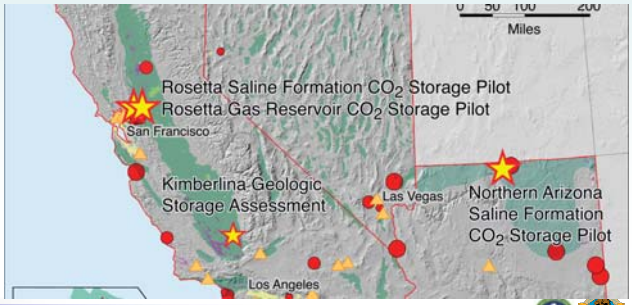
- Assess practicality and effectiveness of protocols
- Effectiveness of certification oversight
- Cost and cost-effectiveness
- Offsets from fuel treatments?

Source: Pacific Forest Trust

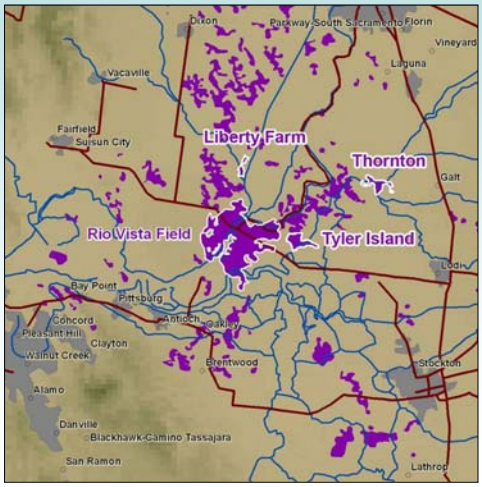
Geologic Pilots in Arizona, California, and Washington

- Two injection pilot sites
  - EGR and saline formation injections in Thornton, CA
  - Saline formation injection in northeast AZ
- Two "site characterization" pilots
  - ECBM/saline in Centralia, WA
  - EOR/saline in Kimberlina, CA





Rosetta Resources CO_2 Storage Pilot

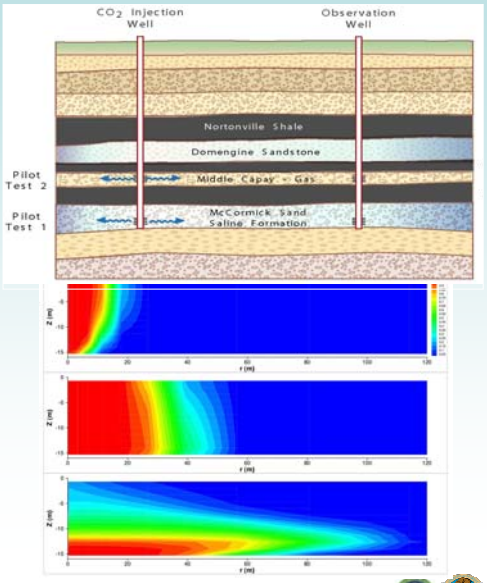


Major Sacramento Valley gas fields shown in purple

- Lead industrial partner: Rosetta Resources
- Validate sequestration potential of California Central Valley sediments
- Test CO_2 Storage Enhanced Gas Recovery
- Inject up to 2000 tons at two elevations about 3400 ft deep
- Focus on monitoring

Rosetta Pilot Progress

- NEPA and CEQA documentation completed
- Site manager selected
- Draft UIC permit submitted
- Agreement in principle on liability issues and property access
- Detailed field test plans finalized; informed by reservoir simulations
- Equipment purchased

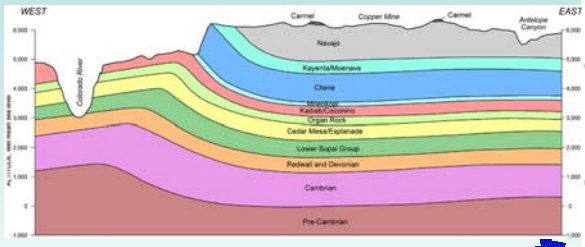


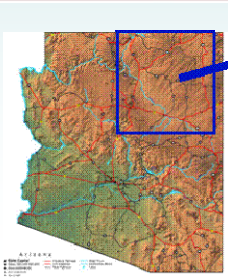
Arizona Utilities Saline Formation Pilot

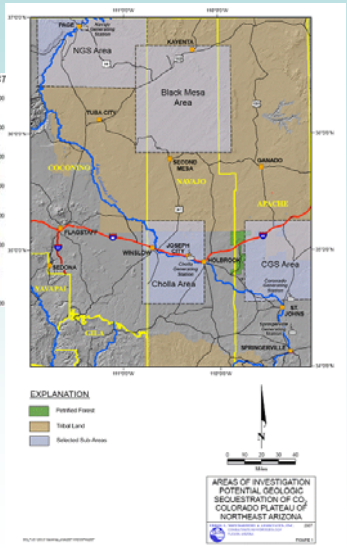
- Lead industrial partners: Salt River Project (through EPRI Tailored Collaboration program), Arizona Public Service, and Tucson Electric Power
- Establish carbon sequestration potential of Colorado Plateau

SRP generating assets

Site Selection Builds on Regional Characterization





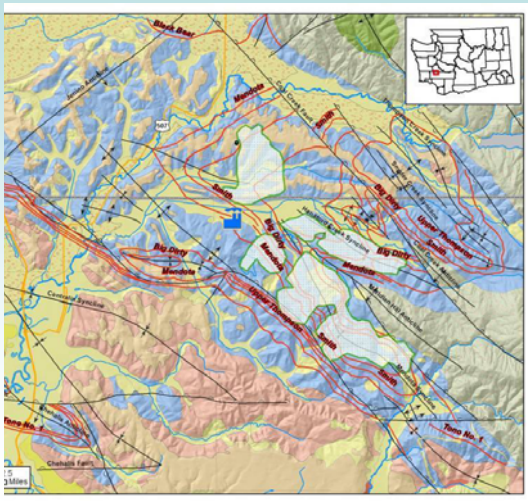


Current Status

- Salt River Project convened advisory committee of key stakeholders
- Permitting issues discussed with key Arizona agencies
- Outreach to local land owners, Navajo Nation
- Detailed test planning under way for scheduled injection in 2008

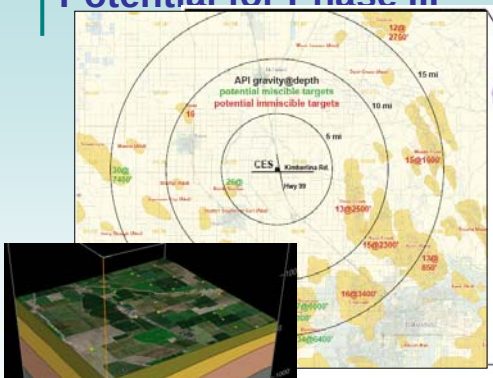
Two Site Characterization Pilots

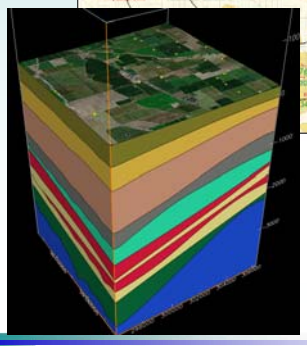
- Lead industrial partner: TransAlta Centralia Generation
- Evaluate ECBM potential of deep coals near plant in Centralia, Washington; also saline formation potential
- Lead industrial partner: Clean Energy Systems
- Evaluate EOR and saline sequestration potential near plant in Kimberlina, CA

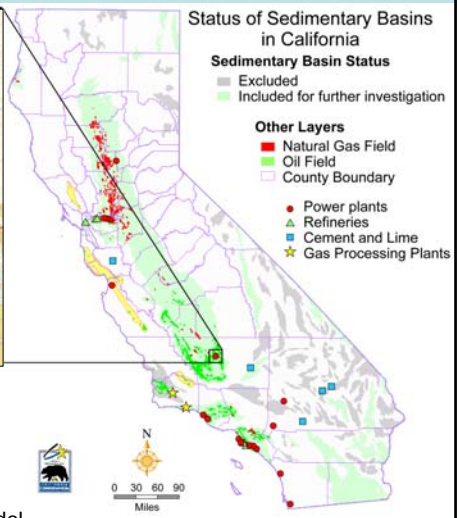


Geologic data, Centralia region (Source: TransAlta)

Kimberlina Geologic Characterization Shows Potential for Phase III







Initial geologic model (Source: LLNL)

Public Awareness Continues to Grow

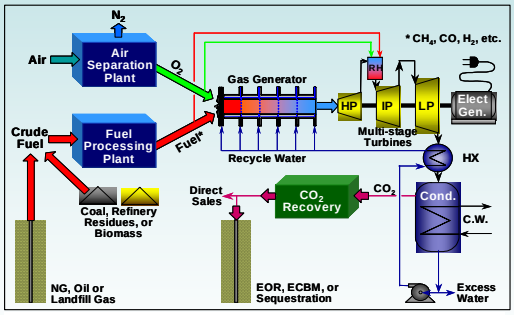
- Legislative initiatives and executive orders require policy-relevant information
- Pilot-related media inquiries are increasing; fact sheets developed
- Public outreach materials tailored for general public
- Public perception research project
- Meetings with state and local leaders under way
- International interest in U.S. program

Results Informed Recent Policy Decisions

- California
  - AB 1925 report to Legislature on accelerating CCS
  - AB 32 framework for GHG emissions reductions
  - SB 1368 1100 lb/MWh baseload generation performance standard
- Oregon
  - House Bill 3543 GHG emissions reductions (forest sequestration)
- Washington
  - Senate Bill 6001 GHG emissions reductions
- Nevada
  - Senate Bill 422 GHG emissions reporting

WESTCARB Phase III: Integrated CCS Test at New CES Oxy-Combustion Unit (Kimberlina, CA)

- Lead industrial partners: Clean Energy Systems (CES), Schlumberger
- Advanced power generating technology
- Prime California geologic sink (Central Valley)
- Commercial scale and advanced subsurface technology demonstration
- Addressing regulatory and legal issues
- Inject 250,000 tons CO_2 per year for four years



CES oxy-combustion generating system

Summary

- WESTCARB continues to improve data and information on regional sequestration opportunities
- WESTCARB continues to provide information for policy-makers as well as data for participants interested in commercial development
- Terrestrial pilots under way and progressing well
- Field activities in geologic pilots expected to begin in 2008
- Public interest and scrutiny on the rise
- Phase III is coming soon!