

Centralia, Washington Deep Coal Seam CO₂ Sequestration Evaluation

Scott H. Stevens, Greg Bank

Advanced Resources International, Inc. (ARI)
Arlington, Virginia, USA

WESTCARB Annual Meeting
Phoenix, Arizona

November 8, 2006

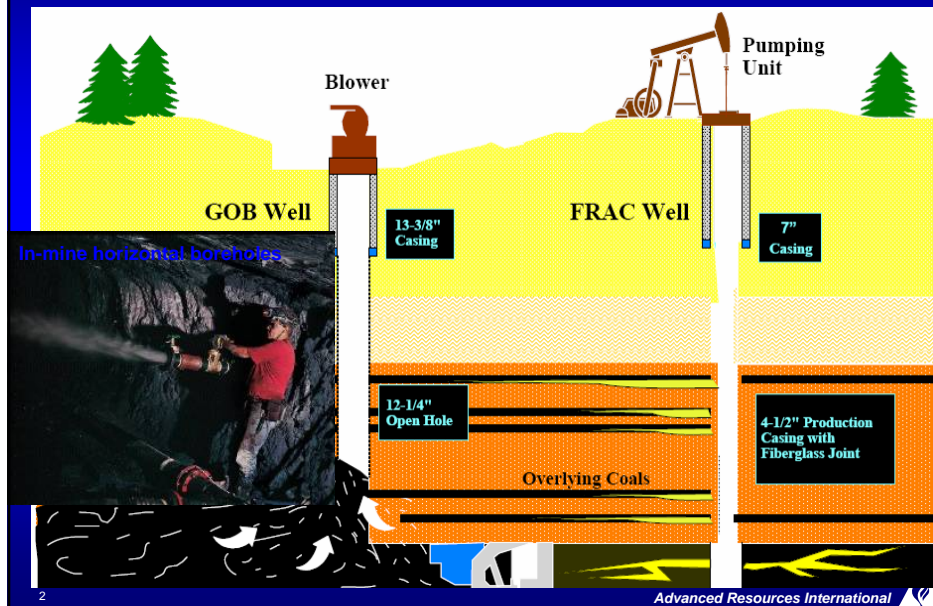


Advanced Resources International



CBM and CMM Recovery Methods

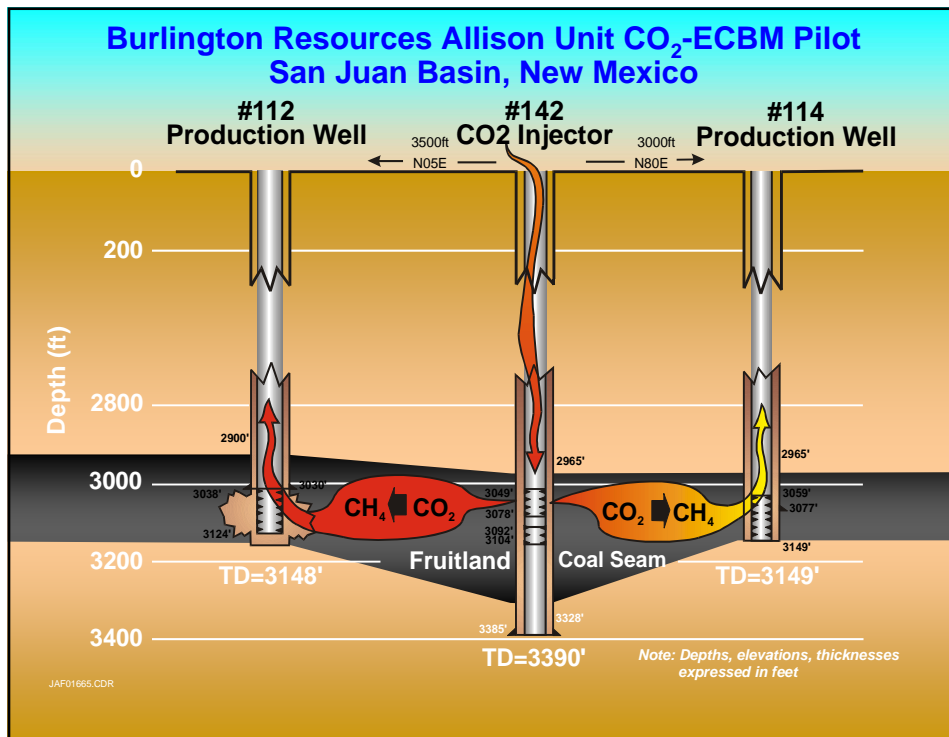
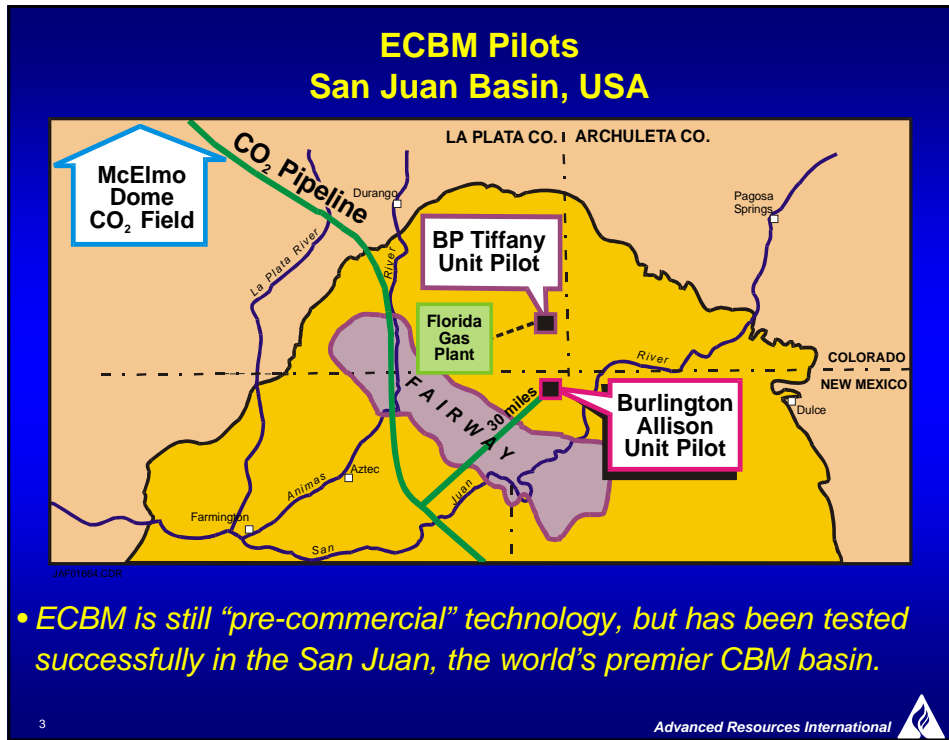
- 3 methods used : vertical frac well in virgin area, "gob" wells, in-seam boreholes.



2

Advanced Resources International





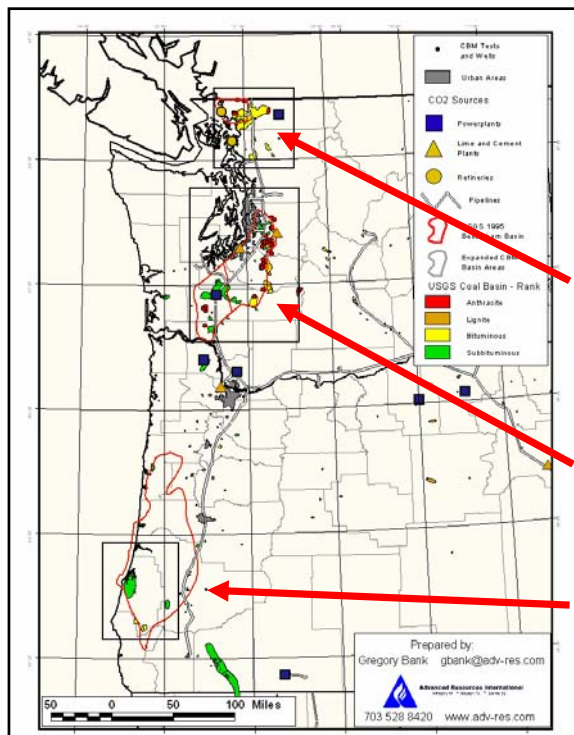
CO₂ – ECBM Study Status & Early Results

Phase 1 Summary

- 1) *The Puget Sound region has extensive deep and well-located coal deposits that may be suitable for CO₂ storage, estimated at 2.8 Gt.*
- 2) *Initial CBM testing indicates good reservoir quality: 100 ft coal, 1,000 ft³/ton CO₂ sorption, 5 md permeability.*
- 3) *Good potential for CO₂ storage using Centralia power plant (1,400 MW) near Seattle-Tacoma.*
- 4) *TransAlta to participate in detailed Phase II evaluation.*

5

Advanced Resources International

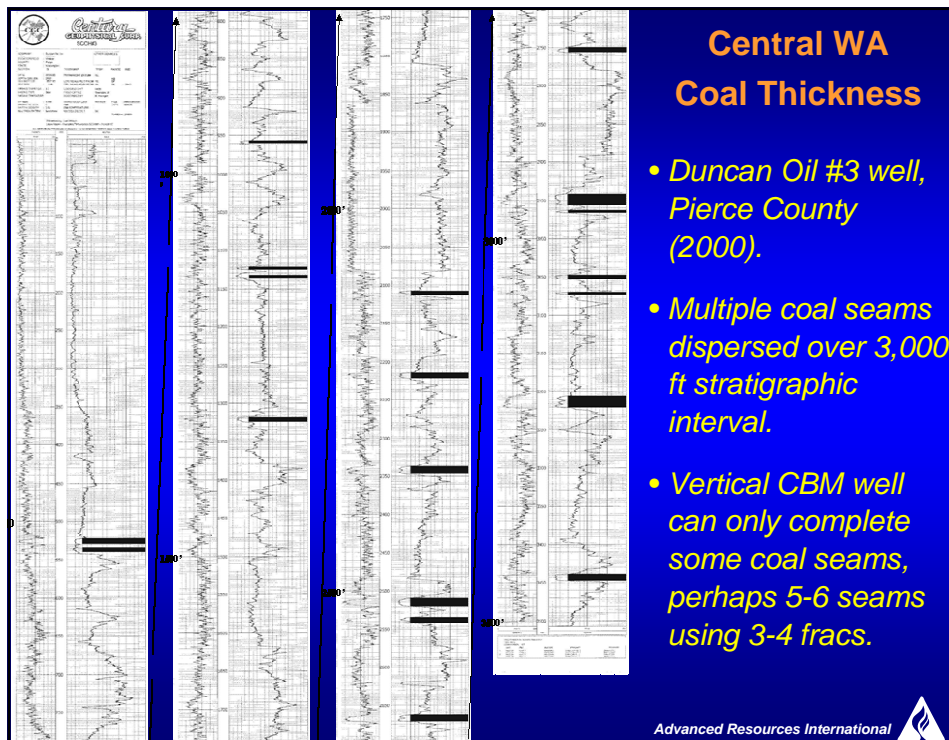
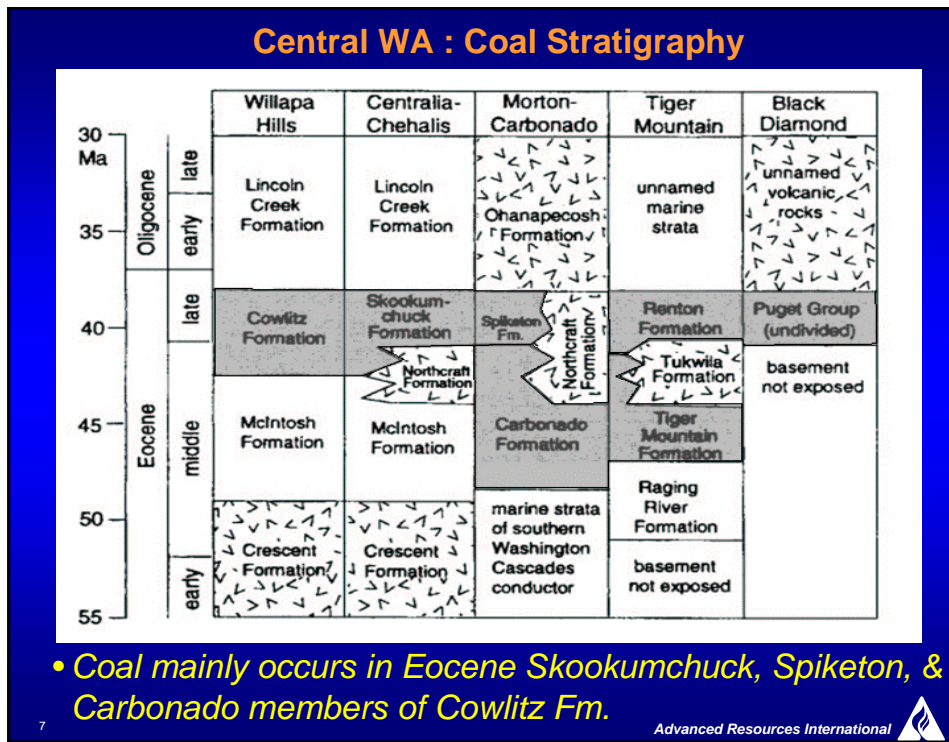


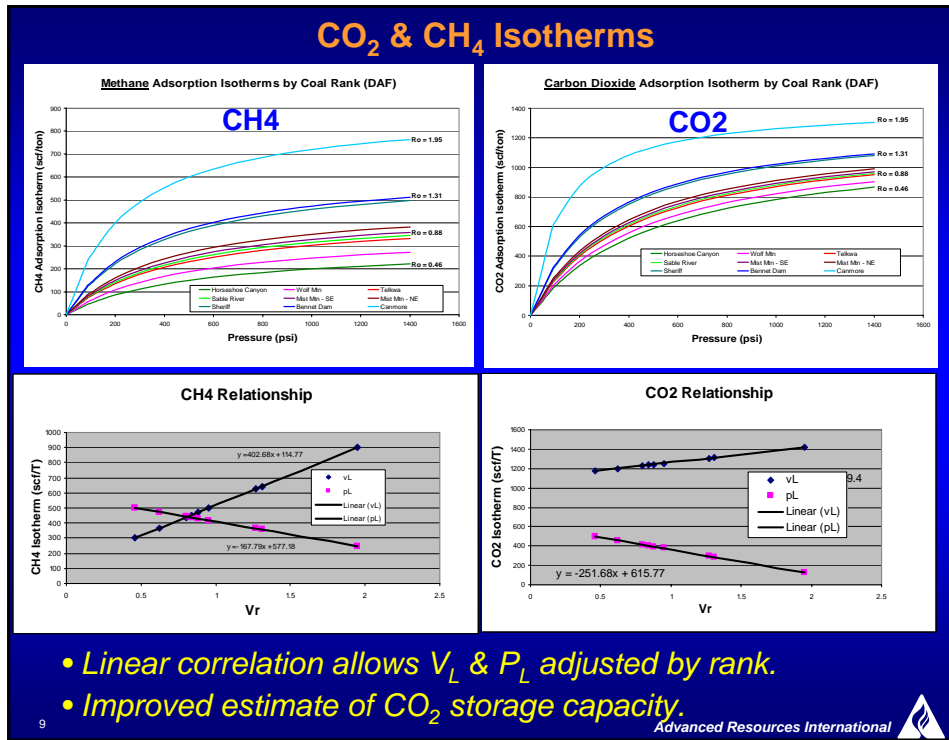
Phase I Evaluation

- *Oregon-Washington Eocene coal region.*
- *3 areas assessed:*
- *Bellingham Basin, northern WA: good coal development, some CO₂ sources.*
- *Puget, WA: has best ECBM potential and largest CO₂ sources.*
- *Coos Bay, OR: poor coal development and few CO₂ sources.*

Advanced Resources International







CO₂ Storage Estimate

Sub-Basin	Area (sq mi)	Avg Coal Thickness (ft)	Ash + Moisture (%)	Net Coal Tonnage (million tonnes)	Avg Depth (ft)	CO ₂ Isotherm (scf/t d.a.f.)	Estimated CO ₂ Storage Potential (Tcf)*	Estimated CO ₂ Storage Potential (Gt)*
Carbonado	125	130	57%	8,513	1,691	817	7.0	0.366
Black Diamond	466	110	60%	24,979	1,550	692	17.3	0.910
Storm King	57	65	71%	1,309	1,860	811	1.1	0.056
Centralia	209	100	61%	9,930	1,860	811	8.1	0.424
Rest of Puget Region	1,777	50	71%	31,391	1,500	636	20.0	1.051
Totals	2,634			76,122			53.3	2.807

Represents TOTAL available potential for each region; actual Stored volume would be significantly less (~15-50%)

Advanced Resources International

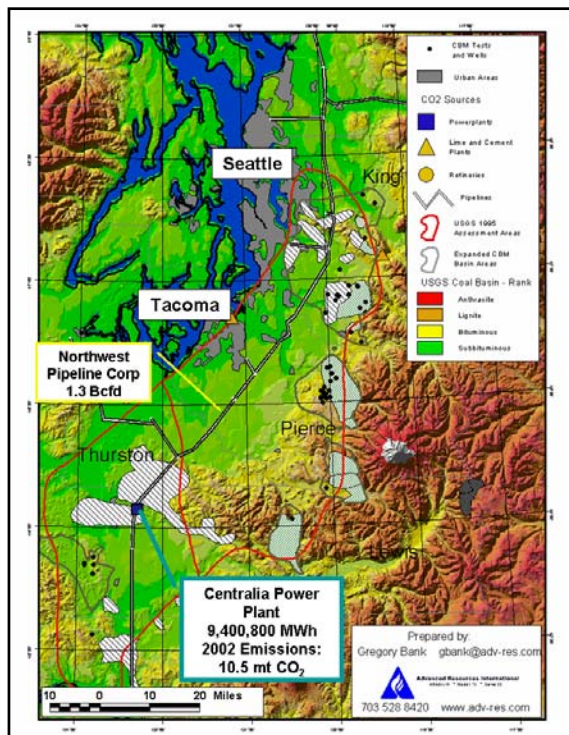
CO₂ – ECBM Study Status & Early Results

Phase 2 (in progress)

- 1) *Geologic data provided by TransAlta.*
- 2) *Evaluating total CO₂ storage potential.*
- 3) *Evaluating coal physical properties.*
- 4) *Select best area(s) for test drilling.*
- 5) *Design testing program.*
- 6) *Study to include non-coal saline aquifers at Centralia, although initial indications not encouraging (low P & P).*

11

Advanced Resources International

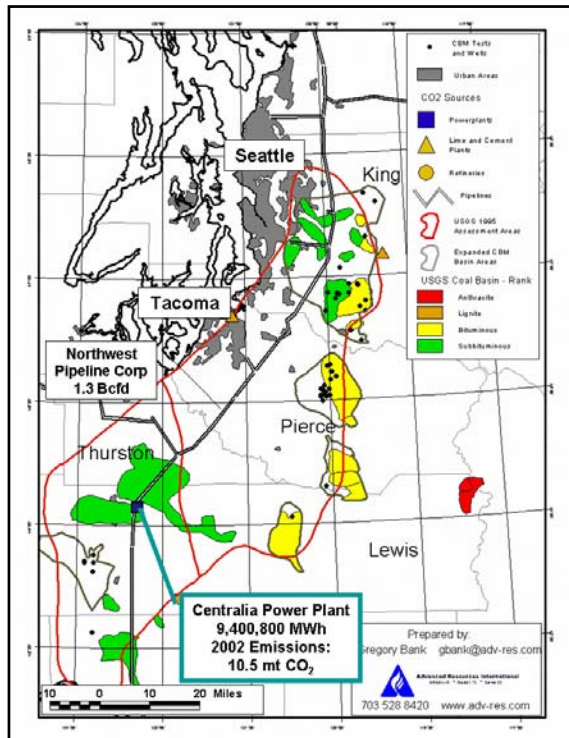


Puget Sound CBM

- *Favorable coal rank: sub-bituminous in the W to anthracite in E.*
- *El Paso Production CBM pilot tested good permeability (5 md) in coals undersaturated with methane.*
- *Centralia is major point source of CO₂ near the coal fields.*

Advanced Resources International

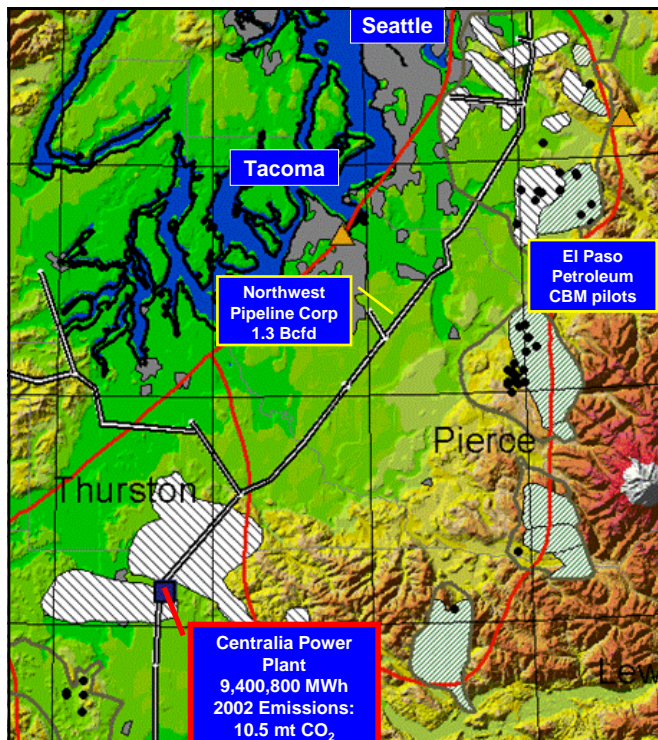




Infrastructure

- *TransAlta's Centralia power plant near Tacoma & Seattle.*
- *Near coal fields with CBM testing data.*
- *1.3 Bcfd gas pipeline.*
- *1,404-MW coal-fired (1971-2). New 248-MW gas-fired CCGT (2002).*
- *10.5 mt CO₂ emissions in 2002.*

Advanced Resources International

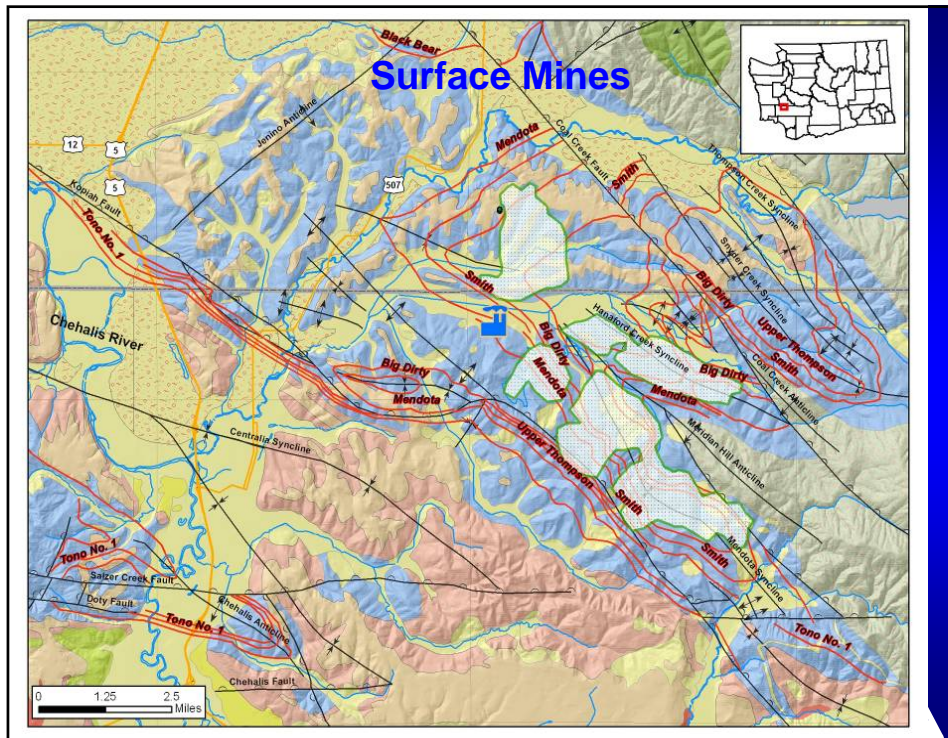
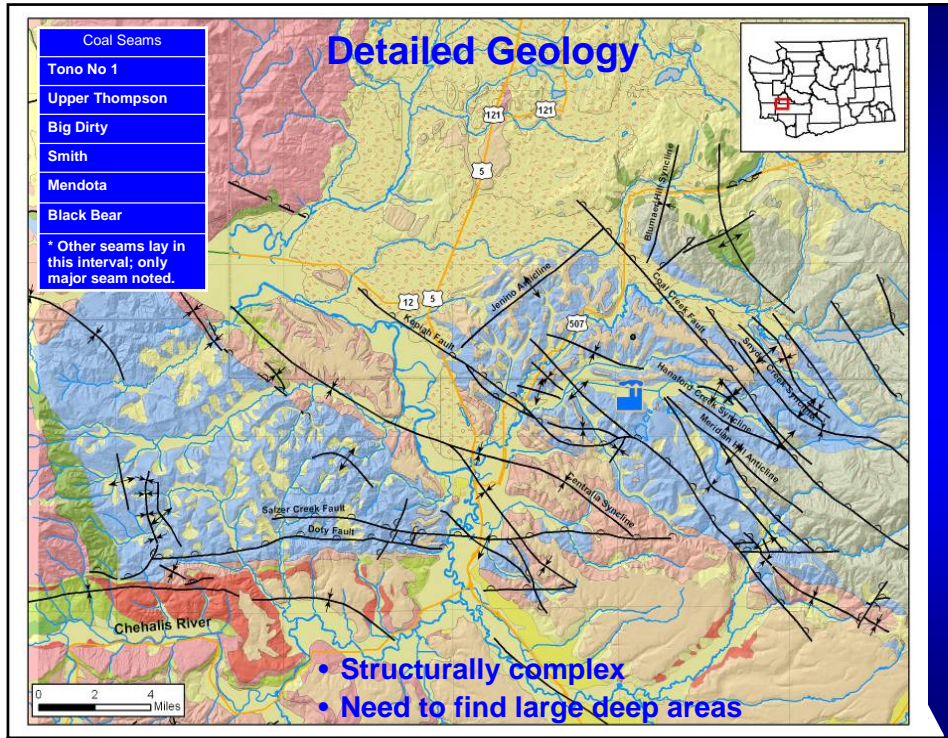


Local Geology

- *No CBM testing yet at Centralia*
- *Project CBM well testing results to Centralia*
- *Will need corehole tests to confirm reservoir properties.*

Advanced Resources International



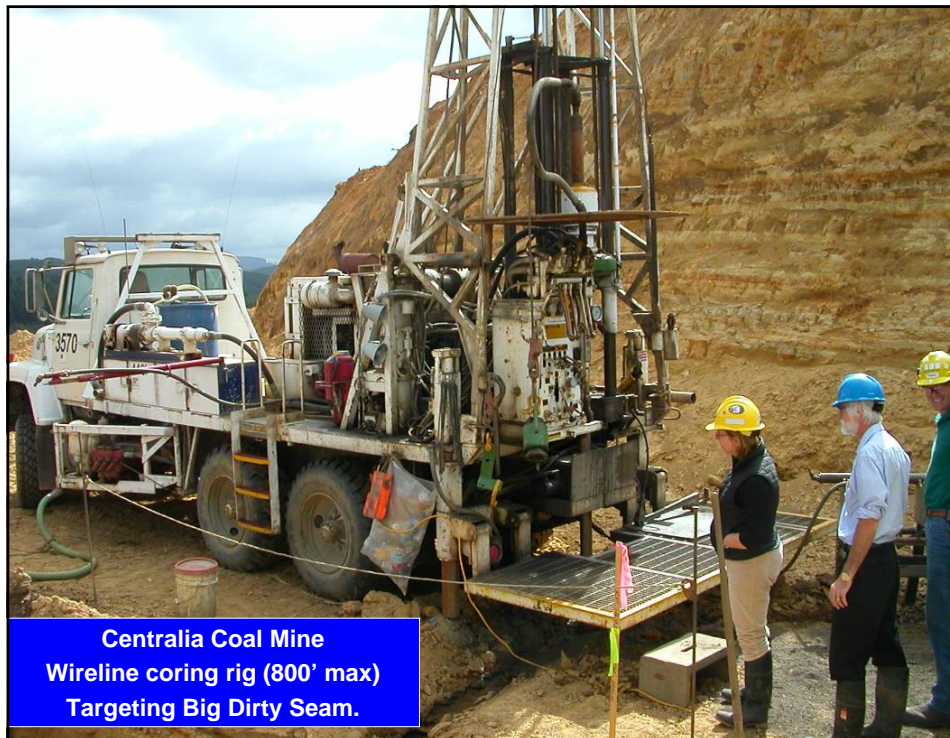








Centralia Coal Mine
Lower Thompson Seam



Centralia Coal Mine
Wireline coring rig (800' max)
Targeting Big Dirty Seam.

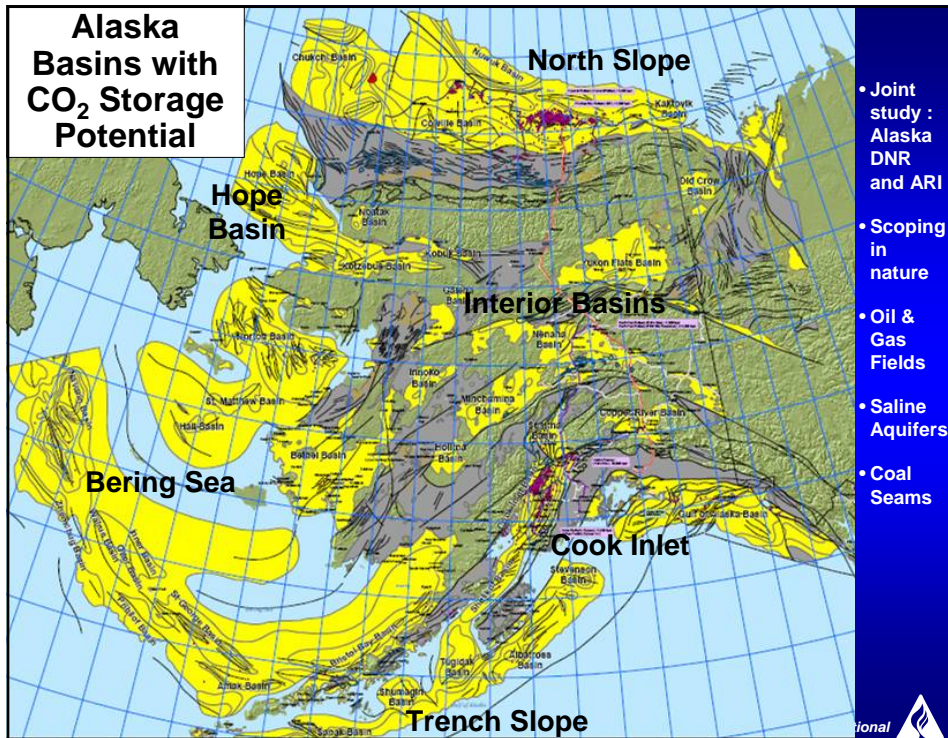
Alaska Scoping CO₂ Sequestration Evaluation

Scott H. Stevens, Greg Bank
Advanced Resources International, Inc. (ARI)
Arlington, Virginia, USA

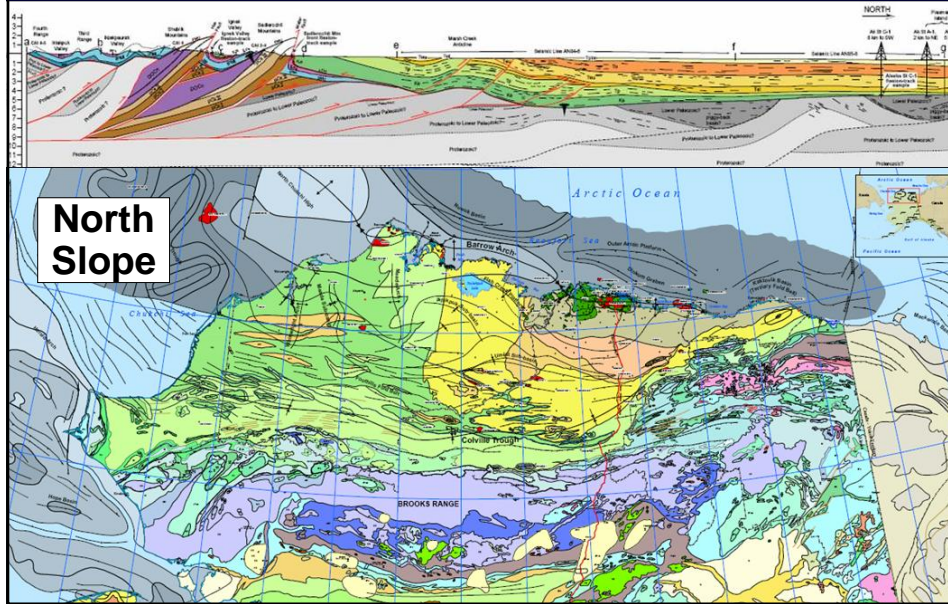
Laura Silliphant, Jack Hartz, Shaun Peterson
Alaska Department of Natural Resources
Anchorage, AK

WESTCARB Annual Meeting
Phoenix, Arizona

November 8, 2006



- *Franlinian – stable continental shelf “basement” with poor reservoir quality.*
- *Elesmerian – Jurassic passive margin, clastics & carbonates, excellent reservoirs, good seals.*
- *Beaufortian – K/Jr, good reservoirs such as Kuparuk and Kingak SS.*
- *Brookian – K/Jr, transgressive, ss to sh, imbricate thrusts, few good reservoirs.*



Cook Inlet

- *Active mainly offshore oil & gas region.*
- *Close to Anchorage.*
- *Excellent data sets.*
- *Also large CBM resources.*

Advanced Resources International

