

Centralia, Washington Deep Coal Seam CO₂ Sequestration Evaluation

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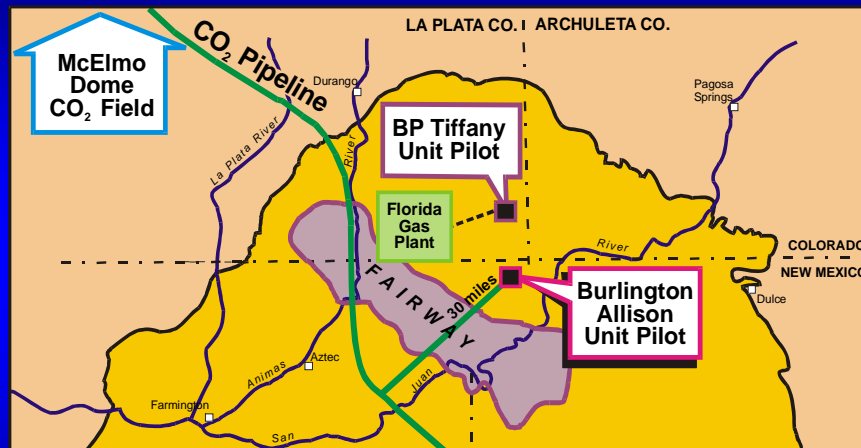
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ECBM Pilots San Juan Basin, USA

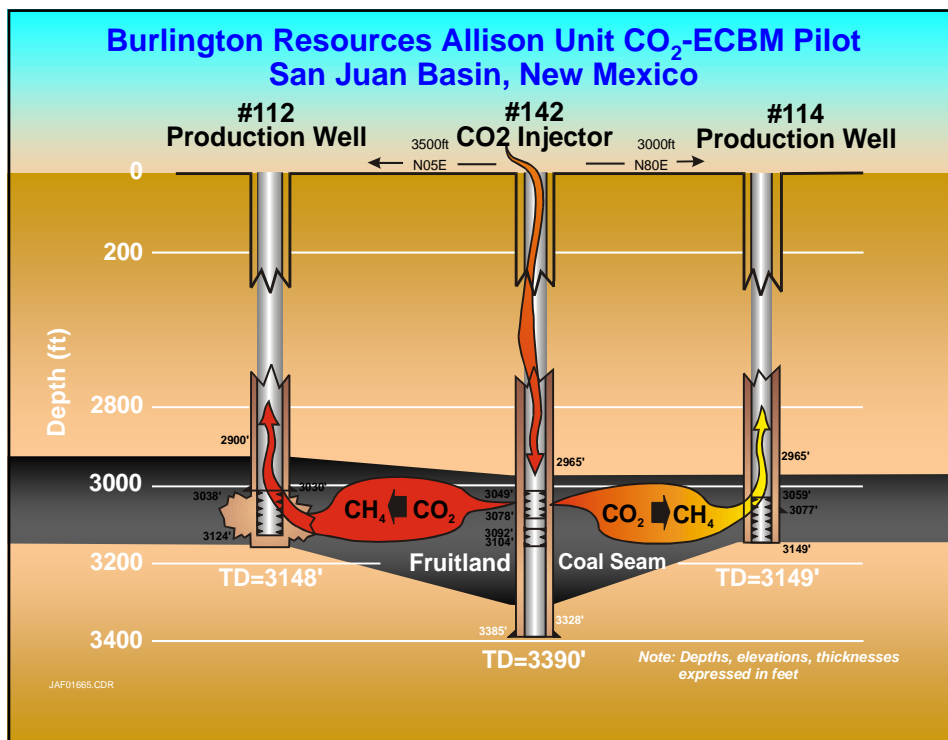


- ECBM is still “pre-commercial” technology, but has been tested successfully in the San Juan, the world’s premier CBM basin.

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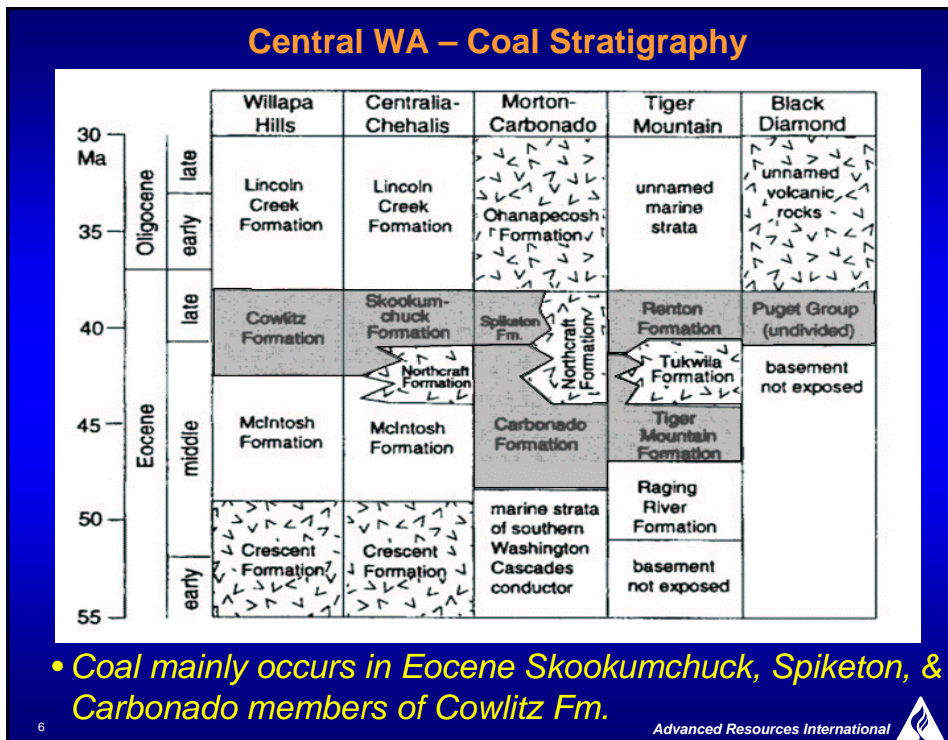
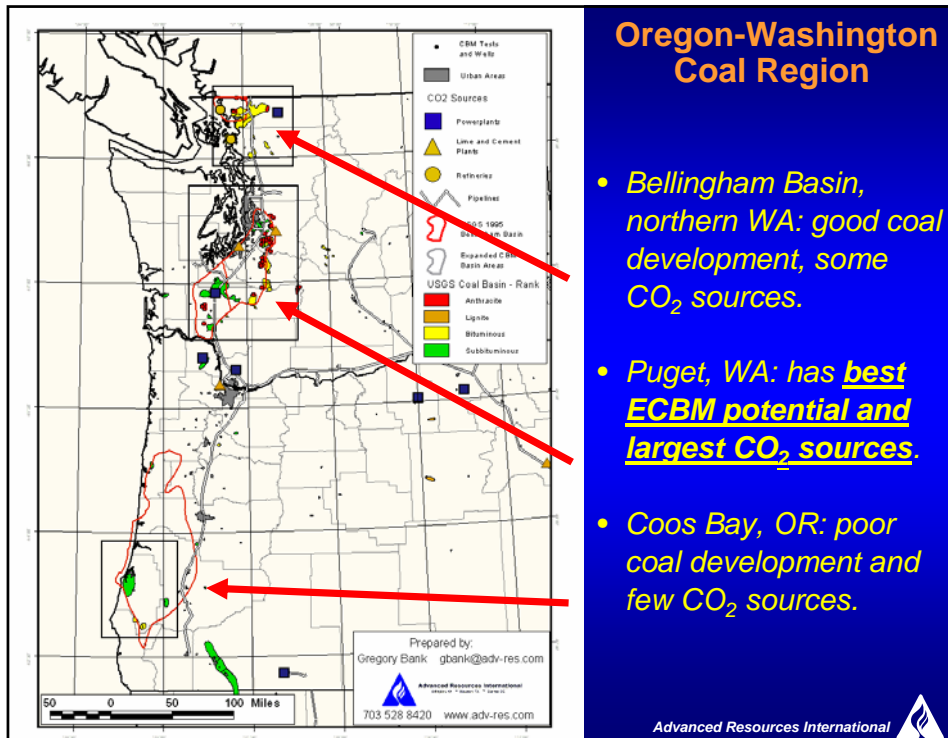


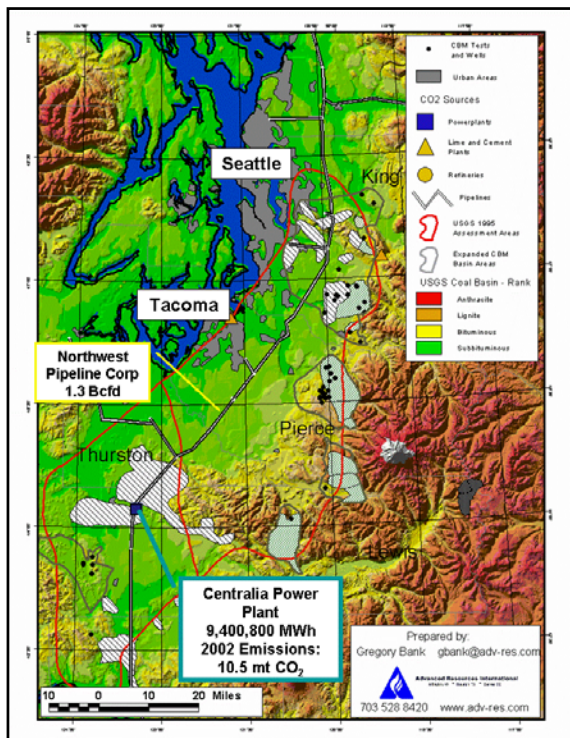


CO₂ – ECBM Study Status & Early Results

- 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, 1-5 md permeability.*
- 3) *Potential for CO₂ storage using Centralia power plant (1,400 MW) near Seattle-Tacoma.*
- 4) *TransAlta providing corehole and analytical data for more detailed Phase II evaluation.*
- 5) *Centralia coal field itself is mostly shallow but potential for locating more suitable deeper areas for CO₂ storage.*



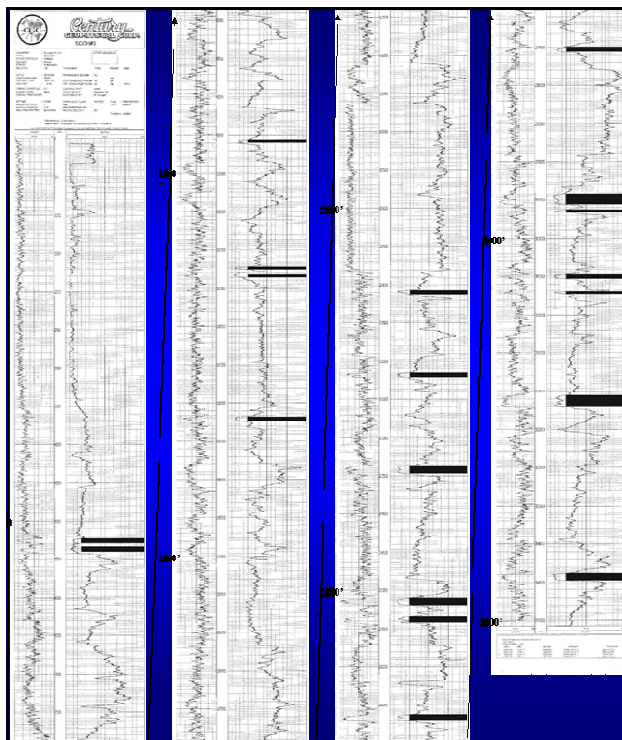




Puget Sound CBM

- Favorable coal rank: sub-bituminous in the W to anthracite in E.
- El Paso Production CBM pilot tested good permeability (1-5 md) in coals undersaturated with methane.
- Centralia is major point source of CO₂ near the coal fields.

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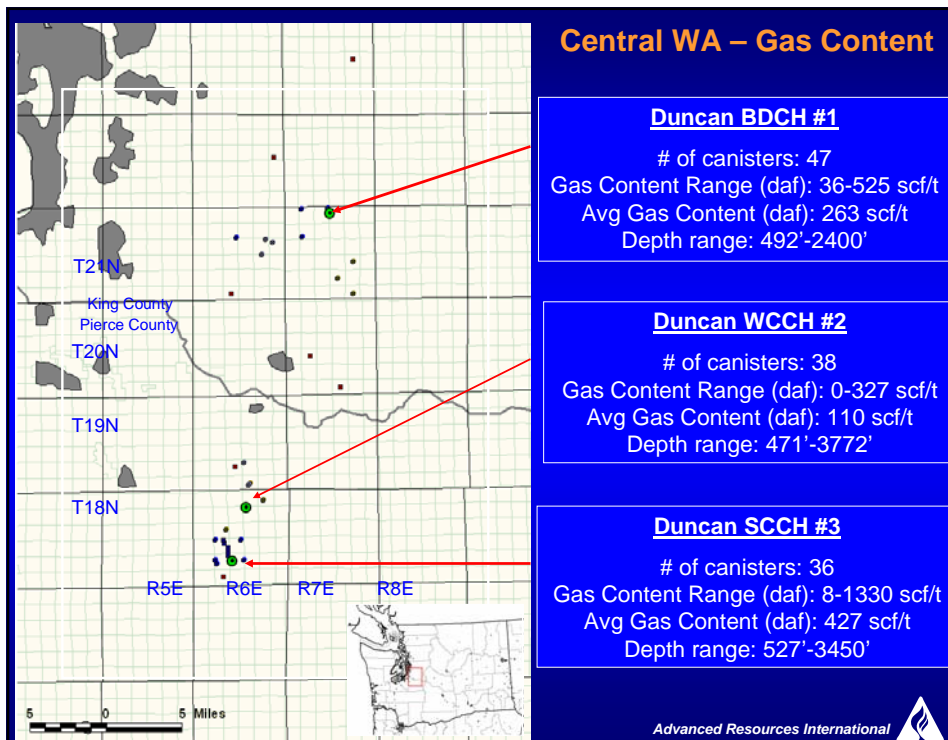


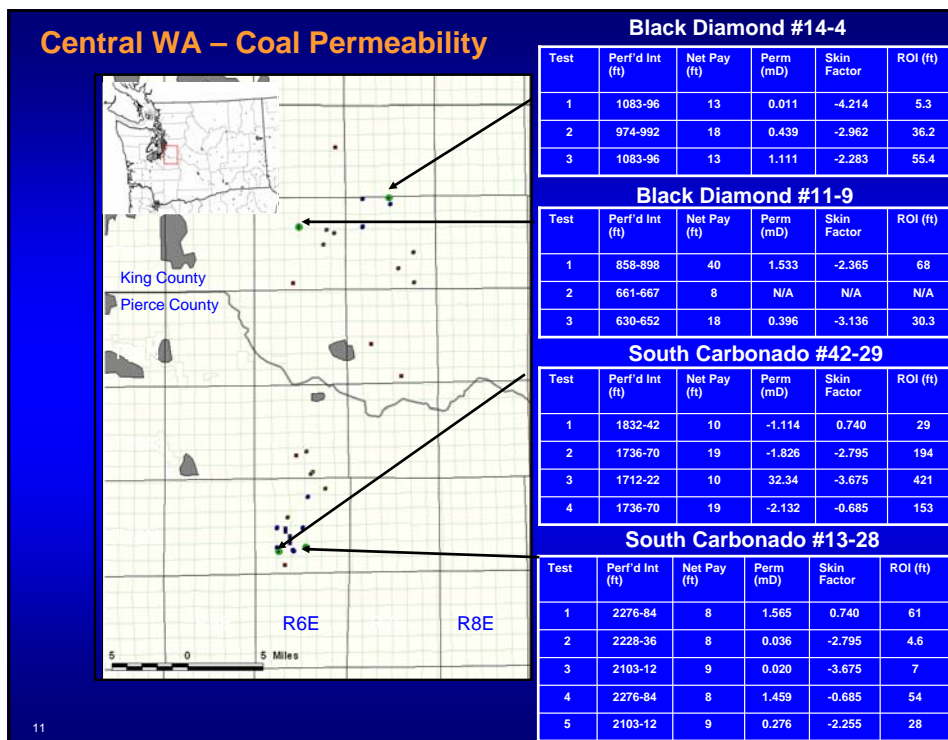
Central WA Coal Thickness

- Duncan Oil #3 well, Pierce County (2000).
- Multiple coal seams dispersed over 3,000 ft stratigraphic interval.
- Vertical CBM well can only complete some coal seams, perhaps 5-6 seams using 3-4 fracs.

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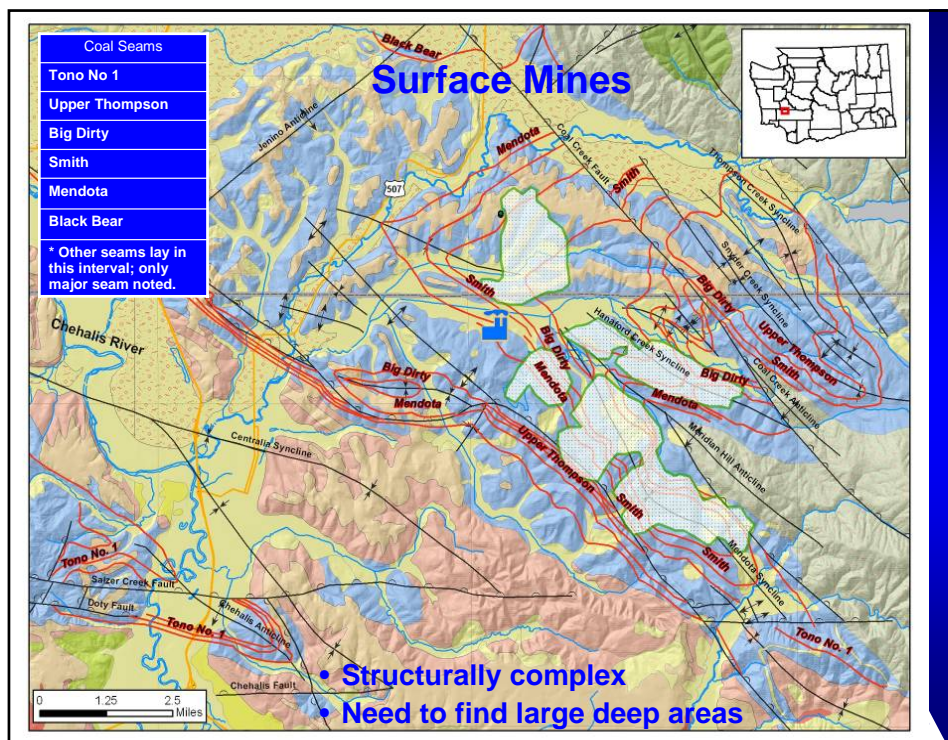
Central WA – Preliminary CO₂ Storage Estimate

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%)

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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.*

