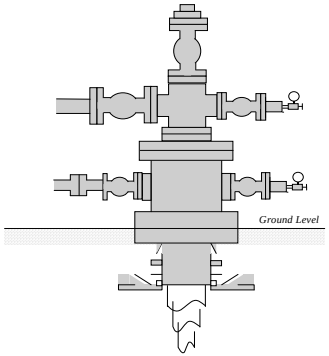
# EPA Class V Injection Well Permitting for $CO_2$ Research Test Status and Remaining Items

**Presentation**
**to**
**Kentucky Consortium for Carbon Storage (KYCCS)**

**October 2, 2008**

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# Presentation

Permit Form
Application 90%

Technical Report overall 85%

- 1.0 Admin Operator Info – 95%
- 2.0 Geology – 95%
- 3.0 Modeling – 85%
- 4.0 Well Design/ Construction 75%
- 5.0 Monitoring 75%

EPA Packer and Monitoring Issue

Estimated time remaining 3-5 Days to complete remaining items

Circulate for a Final Draft & Group Comments

Revisions >>>>>>>> Submittal

# Remaining Items

- 1.0 Admin Inform.  -- 85% complete

- Financial Assurance
- KY O&G Permit
- Include Phase I ESA or not
- Table of CZ, IZ, II, USDW
- Type Log using Knight Bros Well
- Max Injection Rates
- MASIP Operating Pressure
- Volumes requested
- CO2 intervals

# Remaining Items

- 2.0 Geology – 95%

- Text Polish
- Additional Figure / Maps
- Area of Review most work necessary
- Well Schematics and Construction, abandonment documents for the Knight Bros.well and other shallow > 1000’ wells

# Remaining Items

- 3.0 Modeling—85%

- Writeup on Justification of model layers, inputs
- Geologic Model
- Reservoir Model
- Permeability/Porosity/Thickness
- Frac Gradient/Pore Pressure
- Max Injection Rates

# Remaining Items

- 4.0 Well Construction—75%
- Final Well Plan, Drilling, fine
- Cement Bond curing time for Log time
  - Circulating cement, difficult in large borehole, placement, fill the voids
  - EPA witness CBL, Bond Log useless in large boreholes
  - Run logs on Surface casing, intermediate casing
  - Annulus pressure test 110% of max injection pressure
  - Other option—EPA option, use Packer/Tubing/Annulus—fixed conventional injection well, but not a long term well
- Configuration of the well for monitoring in EPA eyes

Well Testing

- Monitoring pressure/conditions with Surface readout gauge, better gauge of realtime reservoir conditions, more flex in testing
- Permit or request additional volumes 3x for flexibility if intervals did not reach radial flow, analyzable test for permeability interval evaluation—Memory pressure gauges do not allow for that to be determined right away, must pull gauges and stop test
- Addition of Temperature Log for MIT assists in evaluation of integrity and baseline for fluid flow and final injection test
- Final MIT and annulus pressure allows well to be tested via Straddle Packer Design

# Remaining Items

- 5.0 Monitoring—75%
- Continuous monitoring, record pressures, volumes, etc….especially during Injection
- Suggestion to use Trip Tank system to allow for continuous volume, annulus usage
- Pressure Gauges on surface
- MIT, cement bond on Surface and Long String prove Isolation, Protection of USDW
- Short Term
- If pressure lost or seal lost on interval during Straddle Packer, test will be ended….not due to leak but wellbore conditions
- EPA Item Bubble of CO2 may migrate up without monitoring—address that via Trip Tank, SRO gauge, SP gauge, volumes, chart recorders, etc.  Will have standard rig well control for

# Summary

EPA Packer and Monitoring Issue

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