

IEAGHG Weyburn-Midale Project

DE – FE 0002697

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Acting CEO, PTRC

U.S. Department of Energy
National Energy Technology Laboratory
Carbon Storage R&D Project Review Meeting
Developing the Technologies and
Infrastructure for CCS
August 20-22, 2013

Presentation Outline

- Brief summary of IEAGHG Weyburn-Midale Project, 2000 – 2012
- Benefits to US DOE Program
- Recent publications
- Moving forward: focused research

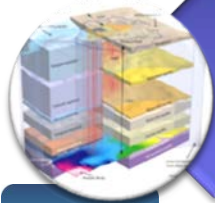
IEAGHG Weyburn-Midale CO₂ Monitoring & Storage Project (WMP) since 2000



Commercial EOR operations in Weyburn and Midale oilfields utilise anthropogenic CO₂

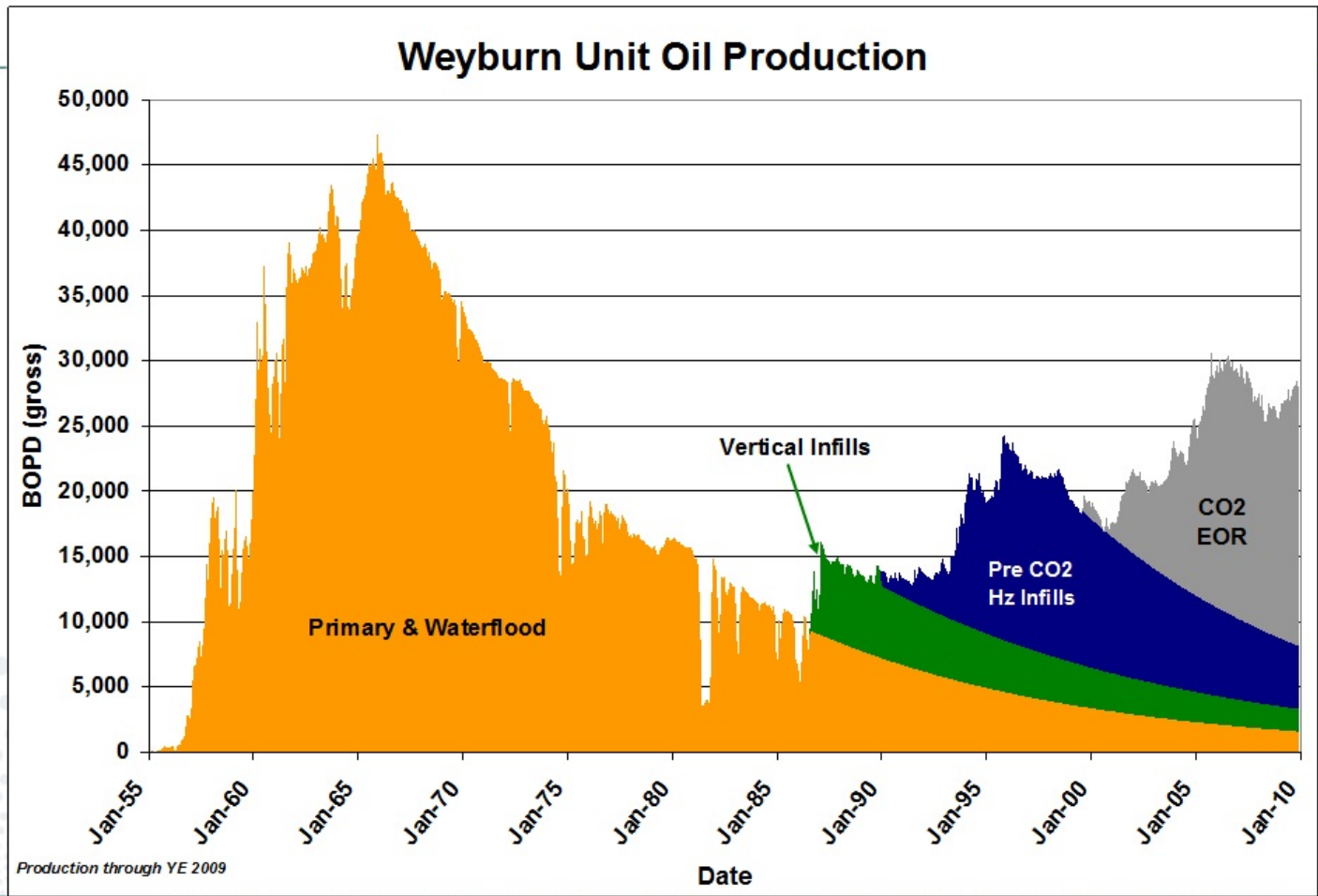


Over 25Mt of CO₂ injected and stored since 2000



WMP has used these sites to study technical aspects of CO₂ geological storage





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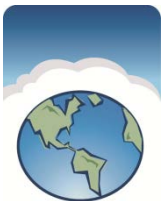
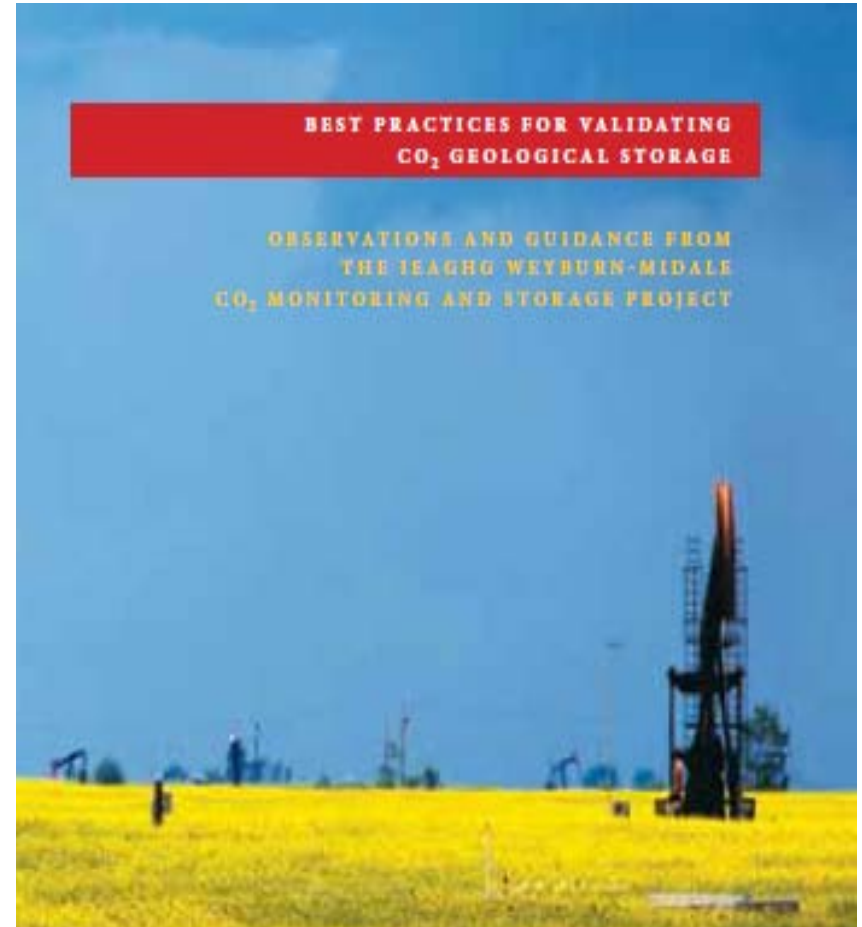


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CO₂ MONITORING
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ptrc
Petroleum Technology
Research Centre

Best Practice Manual (BPM)

- Characterisation
- Performance Predictions
- Geochemical Monitoring
- Geophysical Monitoring
- Performance Validation
- Well Integrity
- Risk Assessment
- Community Outreach

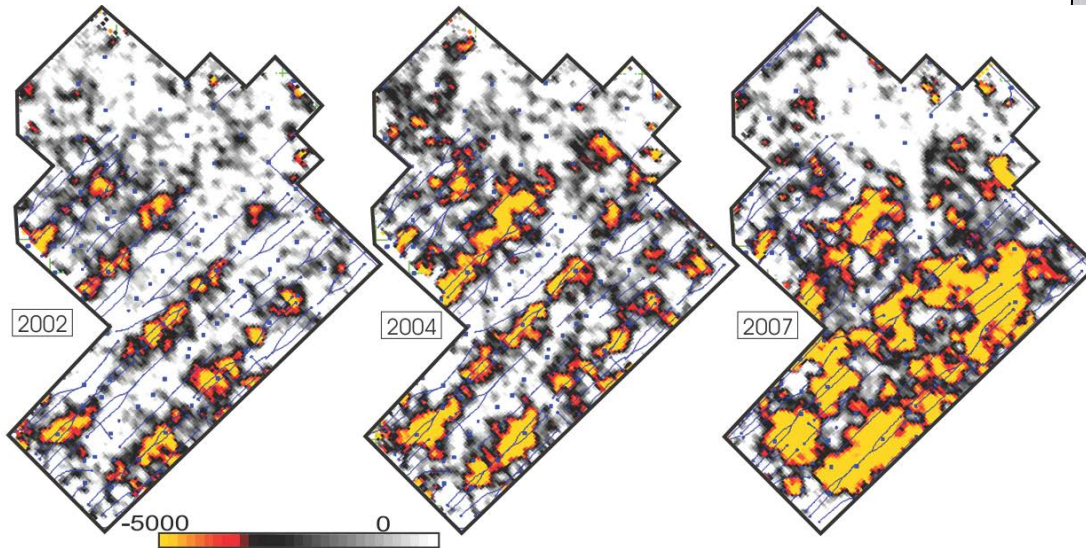
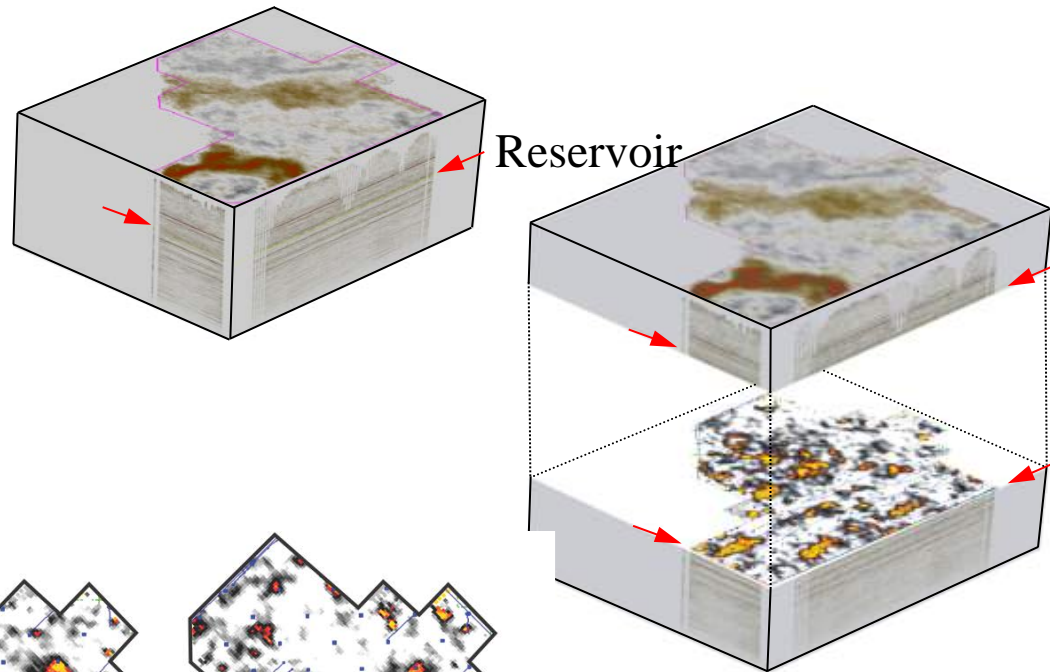


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AND STORAGE PROJECT

3D Time-Lapse Seismic: CO₂ Distribution

Monitoring regional subsurface distribution of CO₂:

- *Verifying storage conformance*
- *A primary input for updating reservoir models*
- *Optimal resolving capability*
- *Sensitive to low CO₂ saturations*
- *Data repeatability is fundamental*



Top Slots

Degrees

0 30 60 90 120 150 180 210 240 270 300 330 360

1318

1319

1320

1321

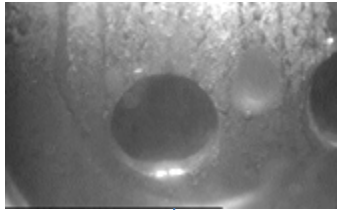
Depth (m)

1322

1323

1324

1325



**Pressure transient test
confirms cement effectiveness**

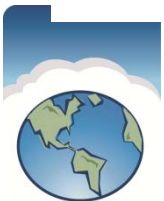
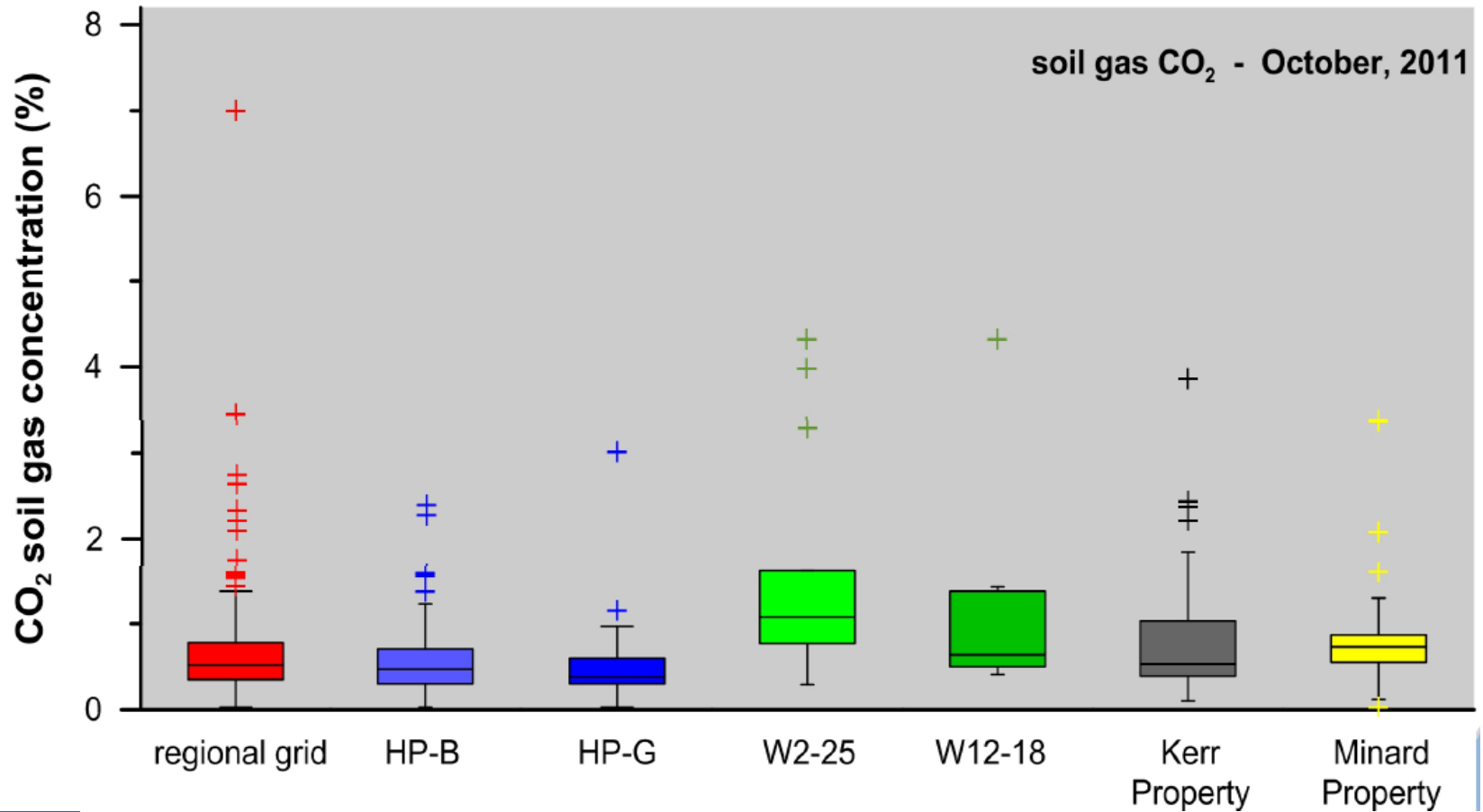
● Slot Holes

— WR Plug

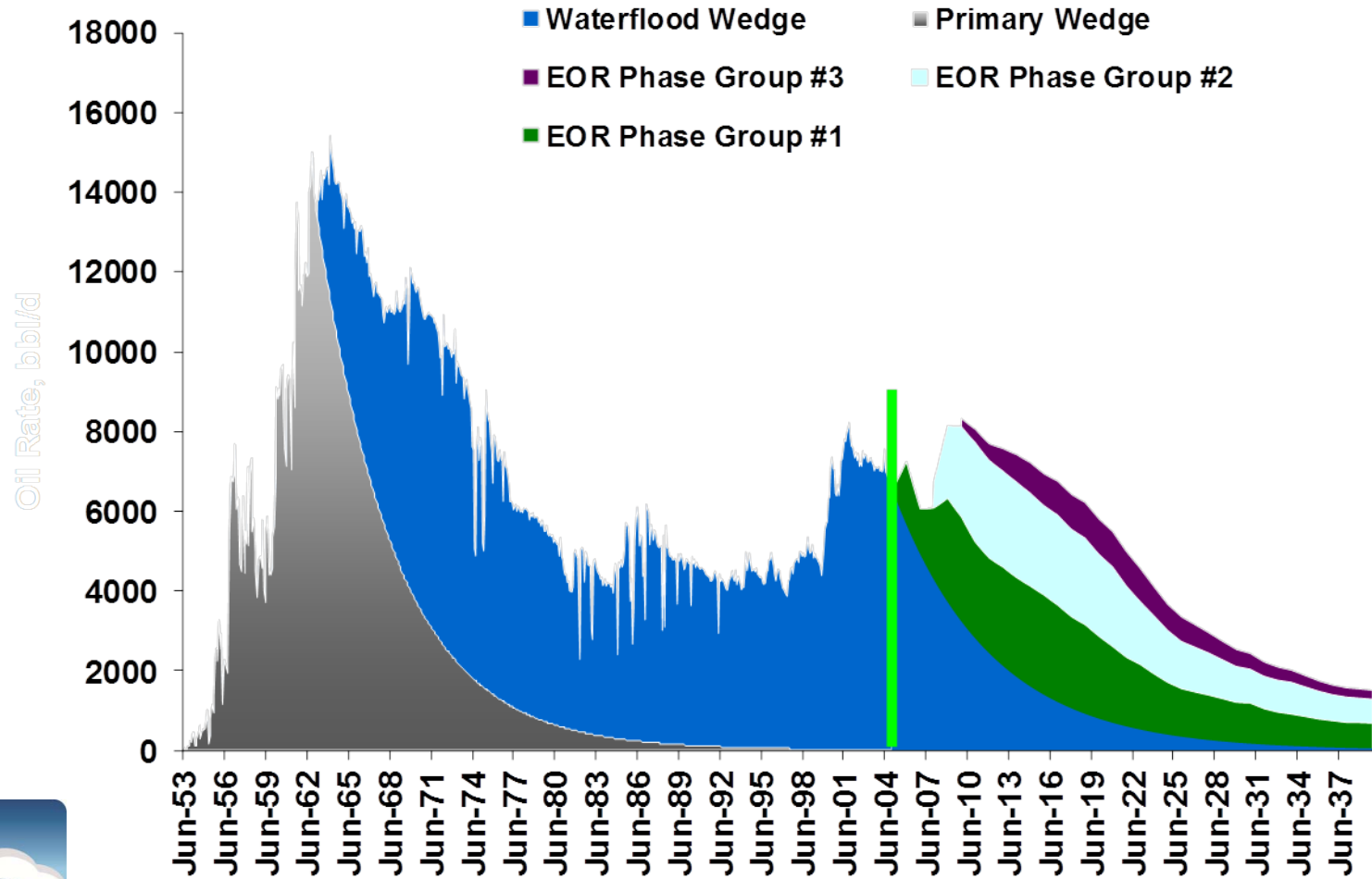
Field Testing Program



Soil Gas: Disproving Leakage Allegations



Midale Field CO2-EOR



Benefit to the Program

- Develop and validate technologies to ensure 99% storage permanence
- Focused research at Apache's Midale field offers unique opportunities:
 - Access to angled wellbores already exposed to injected CO₂, for integrity and abandonment studies
 - Monitoring: analysis and interpretation of legacy and forthcoming 3D seismic datasets
 - Feasibility study for micro-sensor mote investigations

Benefit to the Program

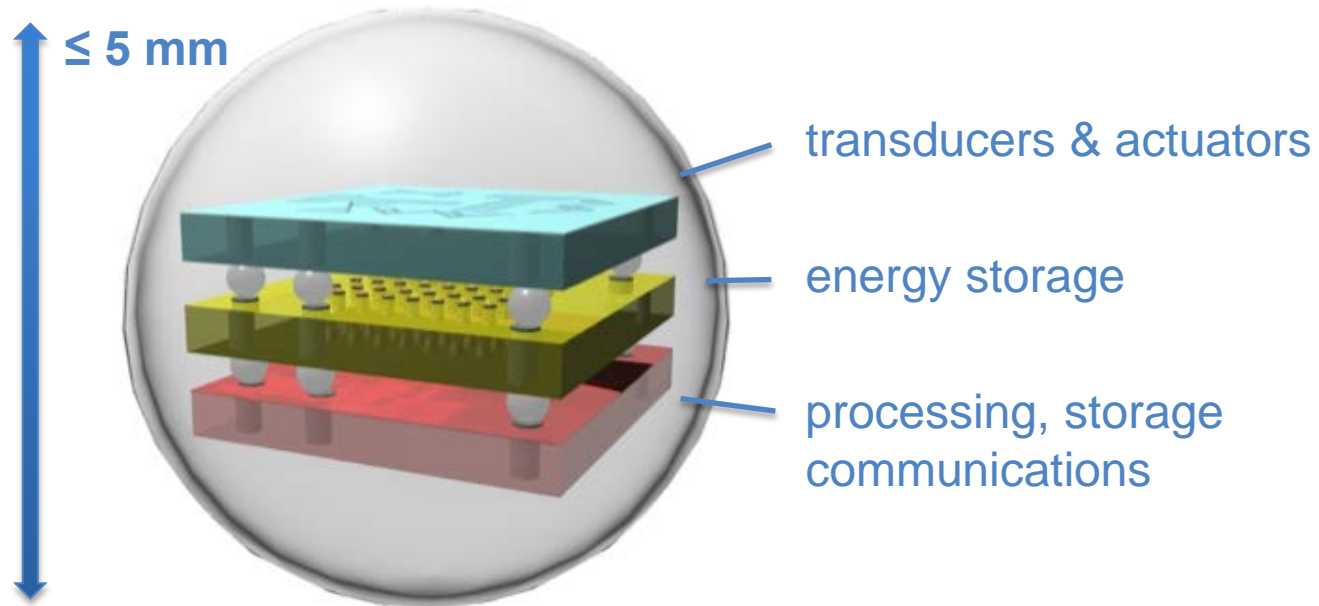
- Develop technologies to improve reservoir storage efficiency while ensuring containment effectiveness
- Research into injection strategies using coupled geomechanical-flow simulation studies of the reservoir and surrounding storage complex, building on characterization and monitoring work

Project Overview:

Goals and Objectives

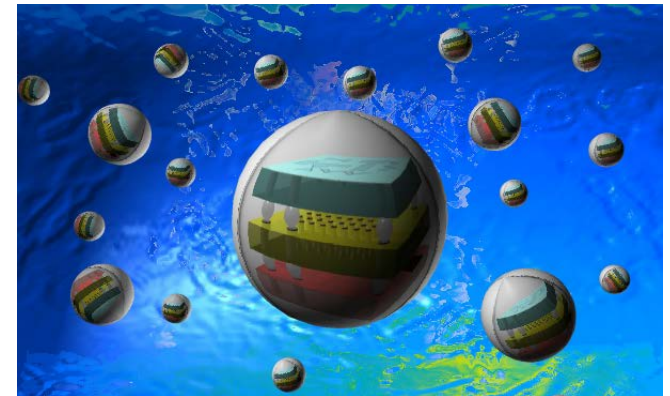
- Expand upon BPM research results and lessons learned, by deploying applied research to commercial operations in Saskatchewan
- Conformance, monitoring, wellbore integrity
- Scope of Work for 2 year project:
 - Task 7: Work Plan
 - Task 8: Implementation of Applied Research
 - Task 9: Research for Improved Operations
 - Success criteria: feedback from operator

Nanotechnology Based Micro Sensor Motes

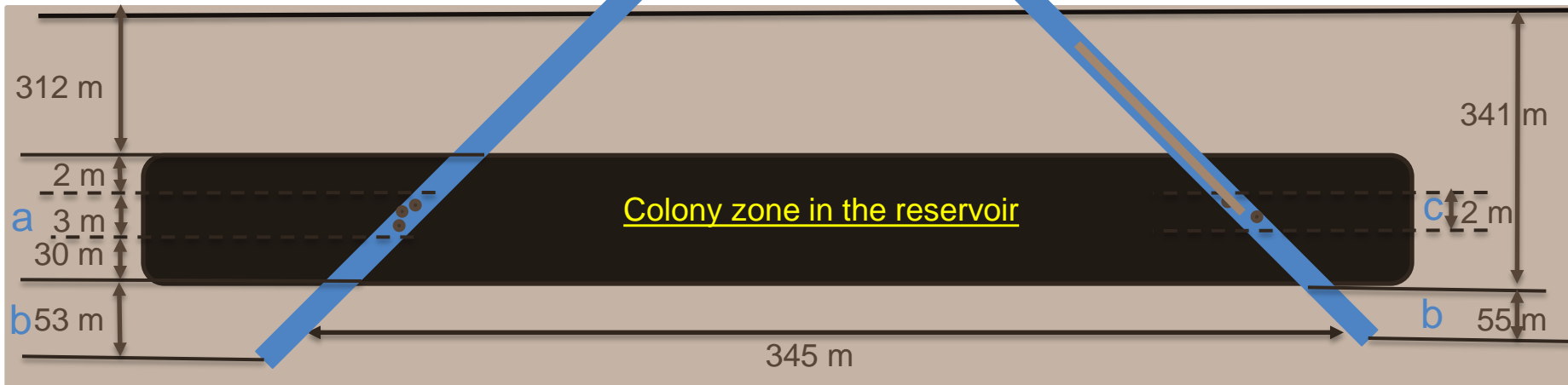
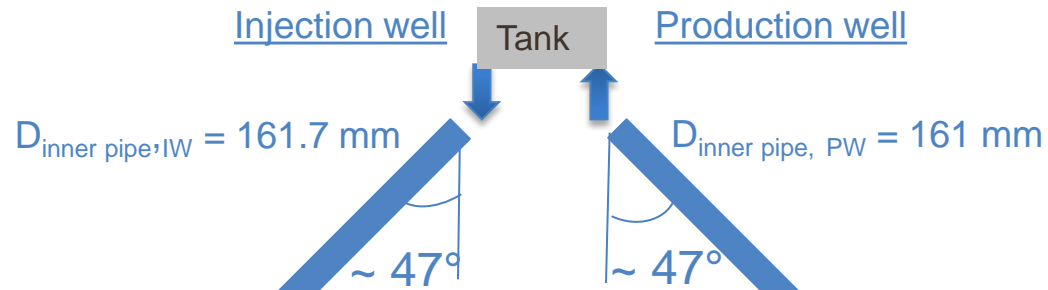


TU Eindhoven, RWTH Aachen,
 KU Leuven, INCAS³

Application going to FP7 EU program:
 January 2013



Proof of principle @ Bonnyville Site



Accomplishments to Date

- WMP final phase (2005 – 2012) completed on time and within budget
- Reporting completed with BPM and supplementary issue of IJGGC journal
- Final phase (extension option) MOU with Apache Canada
- Contract extension and SOPO agreed with DOE

Summary

- WMP Final Phase (2000 – 2012) completed
- Reporting completed
- Project proposals for focused research at Midale with Apache Canada over 2 year period
- Opportunities for applied research relevant to commercial operator: conformance, monitoring, wellbore integrity
- Funding discussions and work plan in progress

Appendix

- These slides will not be discussed during the presentation, **but are mandatory**

Organization Chart

- Project manager: PTRC
- Project Host: Apache Canada
- Potential sponsors: US DOE, NRCan, Saskatchewan and Alberta provincial governments, industry
- Technical steering committee: Apache, PTRC, independent theme advisors

Proposed Timelines

	Q1	Q2	Q3	Q4	Year 2			
Task 1	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Task 7	Orange	Light Blue						
Task 8		Orange	Orange	Orange	Orange	Orange		
Task 9					Orange	Orange	Orange	Orange

Bibliography

- Journal, multiple authors:
 - Wildgust, N., Tontiwachwuthikul, P. and Gilboy, C. (Editors), The IEAGHG Weyburn-Midale CO₂ Monitoring and Storage Project. IJGGC, v. 16 supplement 1, 308p.
- Publication:
 - Hitchon, B. (Editor), 2012, Best Practices for Validating CO₂ Geological Storage: Geoscience Publishing, 353 p.