Fourth Annual Conference on Carbon Capture & Sequestration

Developing Potential Paths Forward Based on the Knowledge, Science and Experience to Date

What Has Been Learned, What Is The Future Direction Of Selected North American Carbon Emission Reduction Projects Utilizing Carbon Capture And Sequestration

Overview and New Directions of the IEA GHG Weyburn CO_2 Monitoring and Storage Project

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Overview of Weyburn Phase 1

- Weyburn Phase 1 contributed an *unprecedented* dataset and fundamental science for initiating wide-scale rollout of CO_2 storage with EOR.

- Impact:
  - 6 million tonnes CO_2 stored to date
  - 26 million tonnes CO_2 stored over life of project

Gaps Identified in Weyburn Phase 1

Integration

- Research
  - deliver a package of essential research (tools and protocols) – Best Practices Manual
- Data
  - centralization

Current models and simulators are not storage-specific

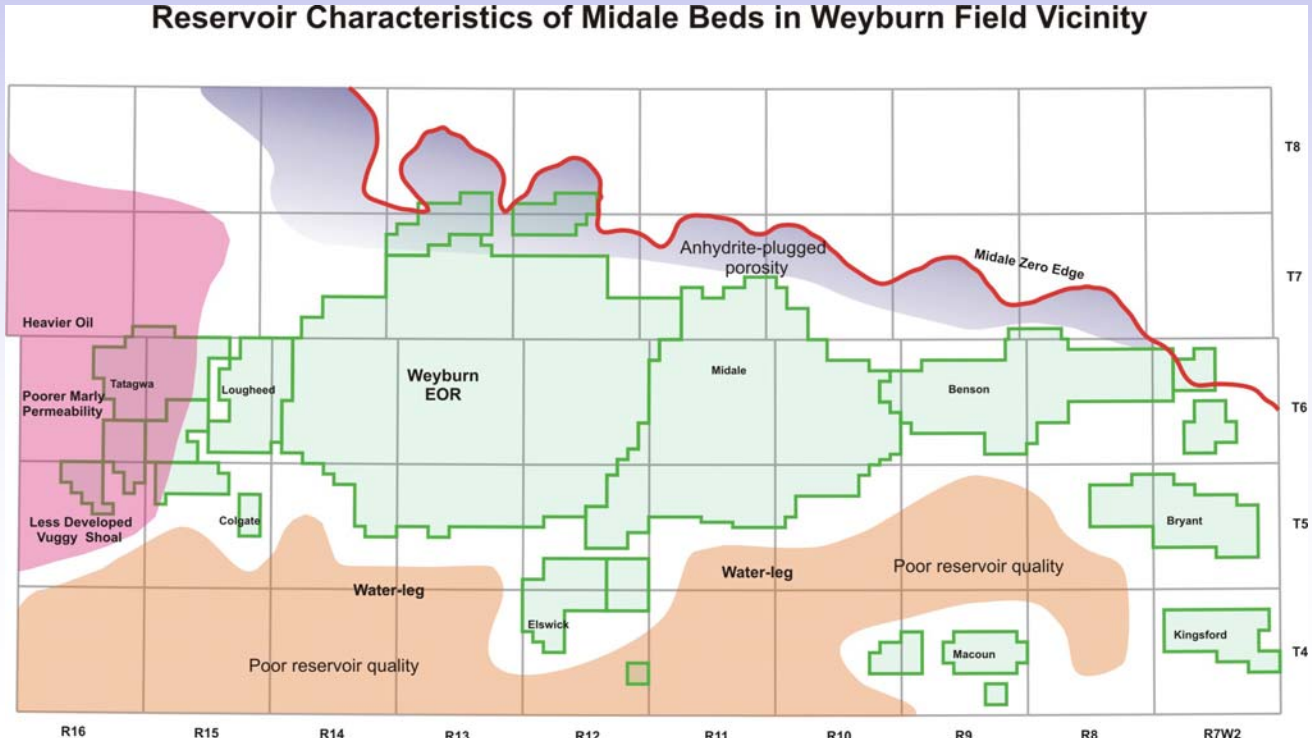
- Evolve the models
- Integrate all data

Weyburn Phase 2

- Phase 2 of the IEA GHG Weyburn CO_2 Monitoring and Storage Project officially launched on May 3, 2005.
  - Ongoing monitoring & verification on Weyburn Unit area
  - Expanded emphasis on risk assessment around CO_2 geological storage
  - Develop Best Practices Manual
  - Strong emphasis on integration of research results
- Midale
  - Initiate measurement, monitoring, and verification program on Apache operated Midale Unit – leverage learnings from Weyburn Phase 1

Weyburn/Midale Units

- Combined Weyburn/Midale Unit total CO_2 injection rate:
  - 6.4 kilo tonnes/d
- Total CO_2 volume stored ~ 36 mega tonnes (over project life)
- 100% of CO_2 is from industrial source (anthropogenic vs natural)
- Currently, the vast majority of CO2 being used for EOR is from natural sources:
  - The project demonstrated the feasibility of large-scale EOR with an industrial source
  - A focus on capture and pipeline infrastructure is now needed



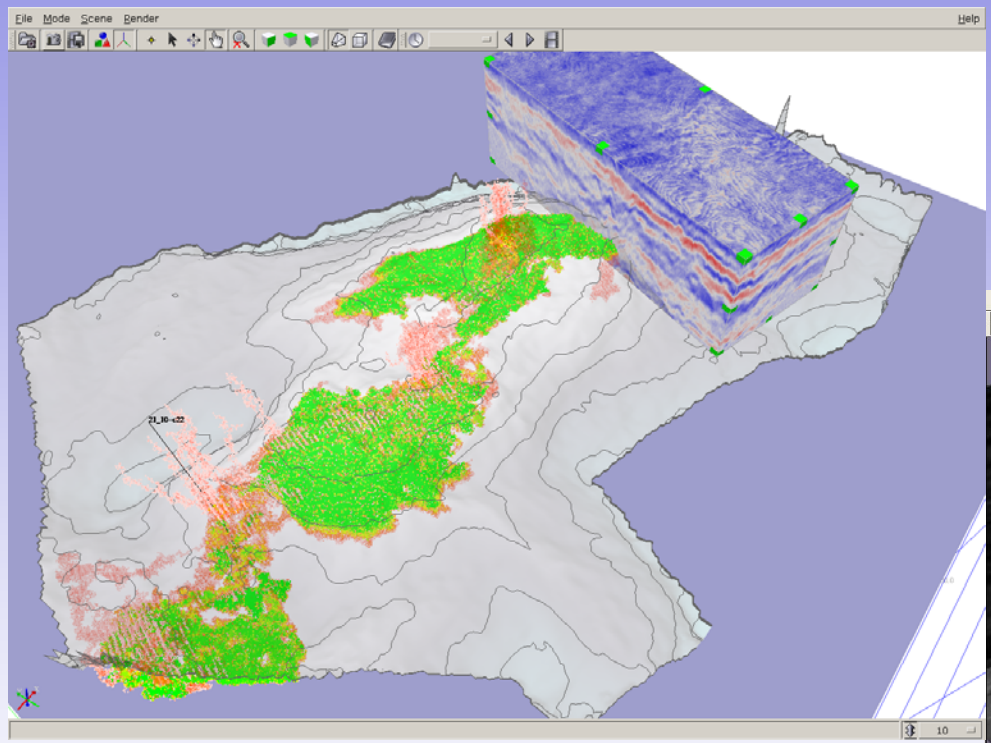
Next Phase of Storage and Monitoring Research

- Key focus:
  - Integration (collaboration)
  - Storage-specific technologies
  - Storage-specific research package (rollout of wide-scale storage R & D) – Best Practices Manual
  - Communication and public outreach

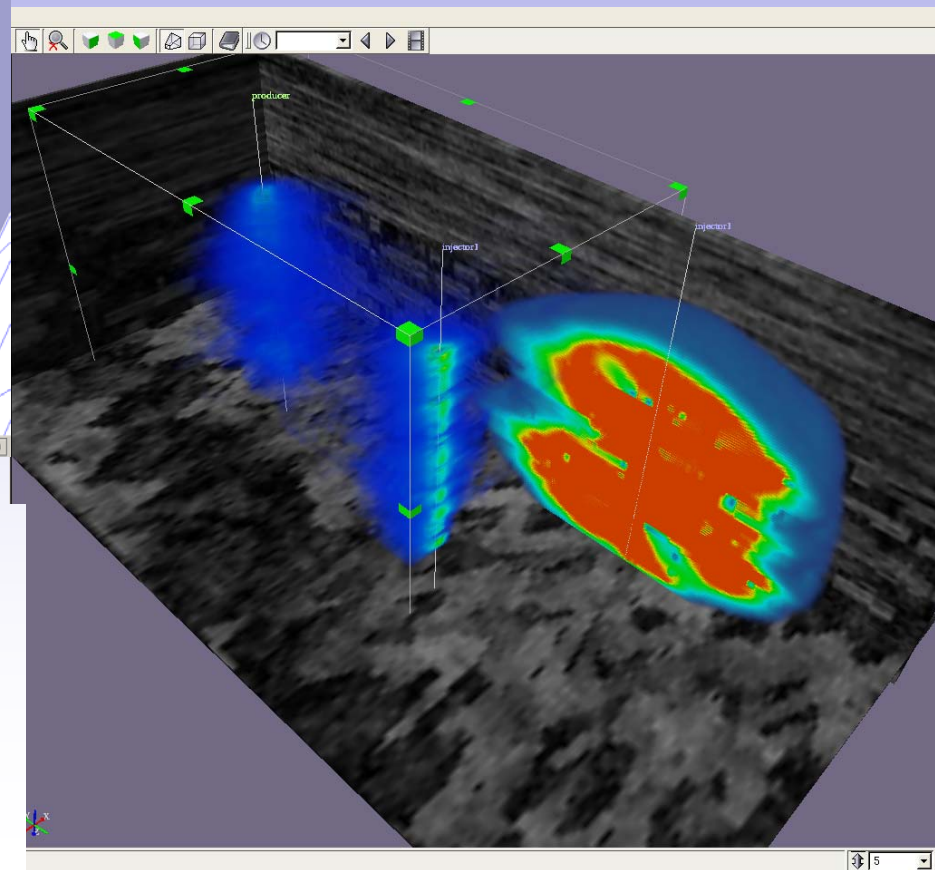
Risk Assessment

- Global network
- Centralization of data - collaborators will be able to access and work with Weyburn data and data of other projects
  - Grid Computing
- New generation of models/simulators
  - Integrate all of the data (geochem., 3D & 4D seismic…) into one simulator/model
  - Tailor models/simulators to address special requirements for CO_2 storage projects
  - Eg. Permedia
    - State-of-the-art software development
    - Fast matrix solvers
    - Data manipulation and visualization technologies

Modeling and Simulation - Permedia



Top Left:
Risk simulation of CO_2 injection from a well. The colors represent probability of presence across several realisations.



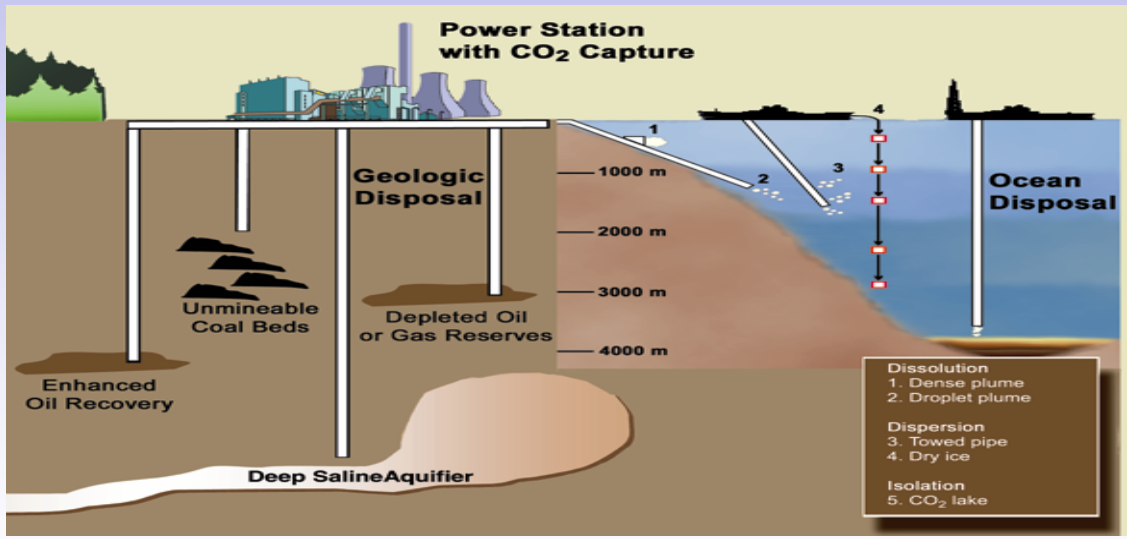
Bottom Right:
Image taken from advection-diffusion solvers, shows both fluid velocities and tracer concentrations around an injector. The tracer will become CO_2 as the simulator is further developed.

CO_2 Capture/Storage Integration

- PTRC is working in close collaboration with International Test Centre for Carbon Capture (University of Regina)
  - Development of post-combustion capture technology (90% of new power plants will be based on current tech – not capture-ready)
  - Development of capture demonstration plant (coal-fired power plant) in southern Saskatchewan with SaskPower
- CO_2 will be available if economic drivers are in place

Saline Aquifers

- Represent storage capacity necessary to meet Kyoto commitments or similar reductions commitments.
- Pilot project: PTRC saline aquifer CO_2 storage study
  - Local CO_2 source
  - 1000 tonnes of CO_2/day
  - Integrate with Weyburn 2, RA, etc.



Centre of Excellence

Adobe
Acrobat Document

- PTRC's range of activities has the potential to develop into a global centre of excellence in carbon capture/storage and monitoring/verification.
- The keys to wide-scale deployment of capture and storage will be:
  - Collaboration
  - Integration – of data and of capture and storage
  - Storage-specific technologies
  - Best Practices Manual
  - Fundamental Science for public outreach and policy development
  - Independent monitoring and verification agents

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