UK CCS workshop – CO_2 Storage (*including aquifers*)
Web meeting hosted by UKCCSRC
Date 2 February 2022, 10 am - 12 pm
Chaired by Carys Blunt, UKCCSRC
Presenters: Jeroen Snippe, Shell; Andrew Hood, Harbour Energy; Tony Espie, OGCI and Simon Gant, HSE

Key UK research needs highlighted through workshop

Research needs identified in the January/February 2022 workshop:

- Injecting into the wellbore
  - Multi-phase flow in wellbore: modelling of multi-phase flow induced dynamic loads on wellbore architecture and impact of impurities on bubble point and phase behaviour
  - Potential for hydrate formation and vapour freezing in wellbore: Impact of impurities on temperature and phase behaviour, chemical reactions between impurities and potential for vapour freezing and water drop out conditions
  - Impact of cold injection on well integrity and hydrates
  - Low temperature well barrier systems certification
  - Simulation of kicks and back flow
- Injecting in the storage site
  - Potential freezing of connate water and/or near-wellbore thermal fracturing: effects of cold temperatures on cap rock embrittlement and thermal fracturing and cement sheath analysis for thermal cycling of injection wells
  - Potential for hydrate formation and vapour freezing in the reservoir: effective dynamic modelling of multi-phase CO_2 and reservoir interaction and thermodynamics in the reservoir and overburden
- Monitoring
  - Geophysical techniques for monitoring well plugging and well migration, how can we use seismic waves to interrogate the well and near the wellbore including 4D seismic technologies
  - New and improved monitoring technologies: monitoring on demand capability, intervention free monitoring, rebalancing seismic and noon-seismic technologies
  - Big data analysis of techniques for measurement, monitoring and verification (MMV)
- Measurements
  - Limitations and detectability of technologies to measure environment: understand CO_2 and impurity dissolution in seawater to help identify minimum detectability thresholds of environmental monitoring technologies
- HSE impacts
  - Brine release into marine environment via legacy wells: detection and impacts
  - CO_2 detectability thresholds in the environment i.e. linking leak rates to detectable limits of CO_2.
- Pressure and migration
  - Heterogeneity and impacts on pressure an migration
  - Flow under top uncertainty in different gross depositional environments
  - Understanding pressure response in areas of multiple injection and its mitigation, impacts on capacity and operation

- Active pressure management: Entrained gas in produced water, standalone water wells and CO_2 break through
- Whole system
  - How much storage will be needed? Where and when?
  - Full system coupled modelling from system inlet to reservoir storage site
- Other
  - Interactions and synergies between CCS and wind / tidal / wave power projects
  - Understand what purity level of CO_2 is acceptable for CCUS

Research needs identified in the March 2021 workshop that were categorised as high priority in 2022:

- Whole system analysis
  - Detailed reservoir modelling
- Thermodynamic research
  - Validating theoretical work with experimental research
  - Developing thermodynamic models
- Hydrates aspects – improved understanding
  - i.e. how quickly do they melt, do they form quickly enough to realistically block a blowdown valve, is there enhanced corrosion potential where they touch the surface of the pipeline?
  - Scenarios effected by impurity mix

Research needs identified in the March 2021 workshop that were categorised as medium priority in 2022:

- Repurposing onshore oil and gas (OOG) wells for CO_2 storage (general)
  - Environmental issues both local and regional
  - Associated risks
- Repurposing onshore oil and gas (OOG) wells for CO_2 storage (specific)
  - Including corrosion (existing and induced), injection pressure, wellbore design specification, thermal shock
  - Number and spacing of wells and cumulative impacts (multiple wells with overlapping pressure envelopes)