Update on IEAGHG activities

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IEA GHG R&D Programme

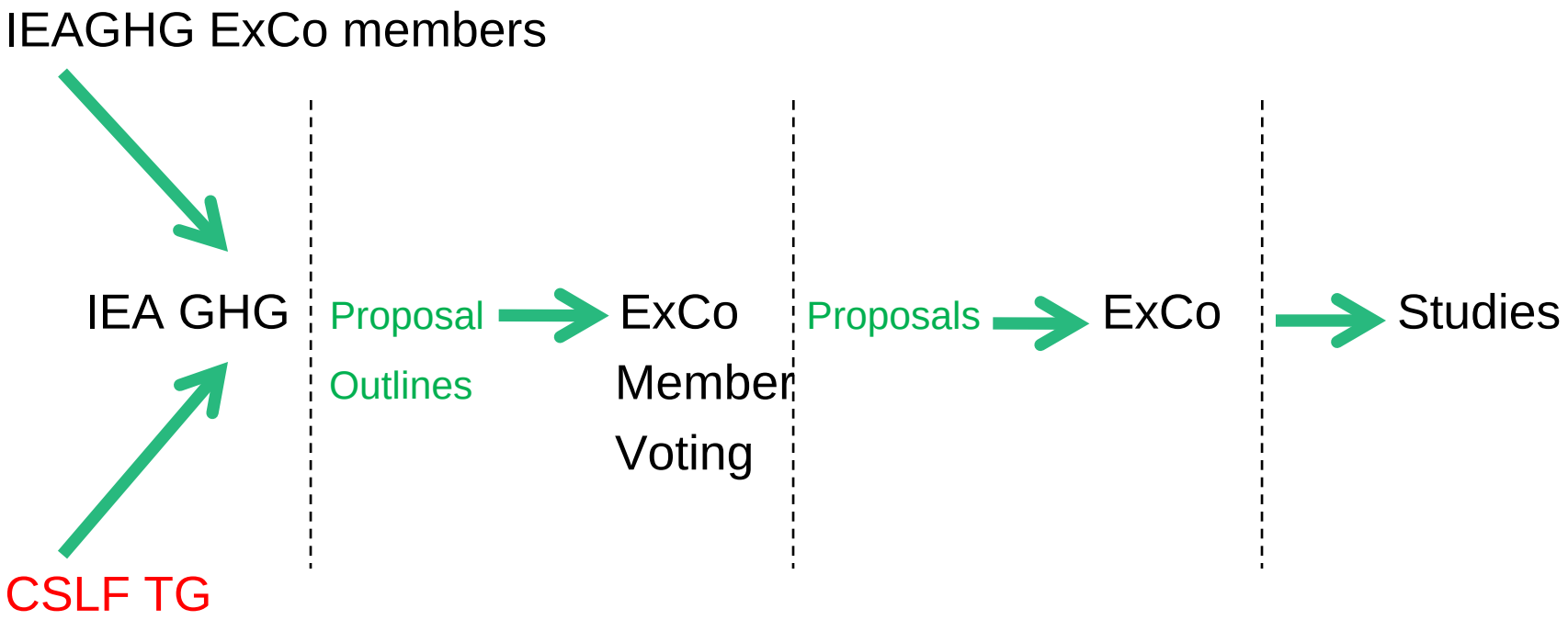
CSLF Technical Group, 17 April 2013

Update on CSLF Collaboration with IEAGHG

Arrangement between CSLF Technical Group and IEA GHG

- How CSLF TG/PIRT and IEA GHG will interact for mutual benefit through increased co-operation
  - Mutual representation of each at CSLF TG and IEA GHG ExCo (no voting)
  - Liaison with PIRT co-chairs to discuss potential activities or projects – two way process
  - Activities would require approval by ExCo or TG
  - Due reference to org providing the resource
- Agreed by IEAGHG ExCo Oct 2007 and CSLF Technical Group Jan 2008

IEA GHG – Study generation



CSLF proposed studies

- ‘Development of Storage Coefficients for CO2 Storage in Deep Saline Formations’. IEAGHG Report 2009/13. Presentation at CSLF TG Mar 2010
- ‘Geological Storage of CO_2 in Basalts’, IEAGHG Report 2011/TR2. Presentation at CSLF TG Sep 2011
- Potential Implications of Gas Production from Shales and Coal for CO_2 Geological Storage. ARI. Report due to be published 2013
- Additional new study ideas invited from CSLF TG/PIRT
- Outline required by 1 June 2013

Update on IEAGHG activities

Recent Reports

Title	Contractor	Report number	Publication date
Operating Flexibility of Power Plants with CCS	Foster Wheeler	2012/6	July 2012
Gaseous Emissions from Amine Based Post Combustion CO_2 Capture Processes and their deep removal	CSIRO	2012/7	May 2012
CO_2 Capture at Gas Fired Power Plants	Parsons Brinckerhoff	2012/8	July 2012
Barriers to Implementation of CCS: Capacity Constraints	Ecofys	2012/9	August 2012
Financial Mechanisms for Long-Term CO_2 Storage Liabilities	ICF International	2012/11	September 2012
CCS at Iron and Steel Plants	MEFOS	2012/14	December 2012
Integration of Solar Energy Technologies with CCS	IEAGHG	2012/TR1	2012

Reports pending

Title	Contractor	Publication date
Key Messages for Stakeholders	Univ. Edinburgh	2013
Induced seismicity	CO2CRC	2013
Post Combustion Capture Scale Up and Challenges	Black & Veatch	2013
Subsurface resource interactions	CO2CRC	2013
Incorporating future technological change in existing capture plants	IC Consulting	2013
Implications of Gas Production on Shale's and Coals	ARI	2013
CO_2 Migration Mitigation Options	CO2GeoNET	June 2013
Non CO_2 Gases – A review	IEAGHG	August 2013
Dehydration of CO_2	AMEC	July 2013
Bio Methane	Ecofys	June 2013

Studies underway

Title	Contractor	Publication date
CO2RiskMan	DNV	December 2012
Non CO_2 Gases – A review	IEAGHG	2013
CO_2 Migration Mitigation Options	CO2GeoNET	2013
Dehydration of CO2	AMEC	2013
CO_2 Test Injection Development Process	CO2CRC	2013
Monitoring Selection Tool	BGS	December 2014
Assessment of Costs of Capture at Baseline Plant	Foster Wheeler	2014
Evaluation of reclaimed waste disposal for CO_2 Post Combustion Capture	Trimeric Corporation	July 2013
Biomass CCS – accounting for Negative Emissions	Carbon Counts	May 2014
CO_2 storage efficiency in aquifers	EERC	December 2013

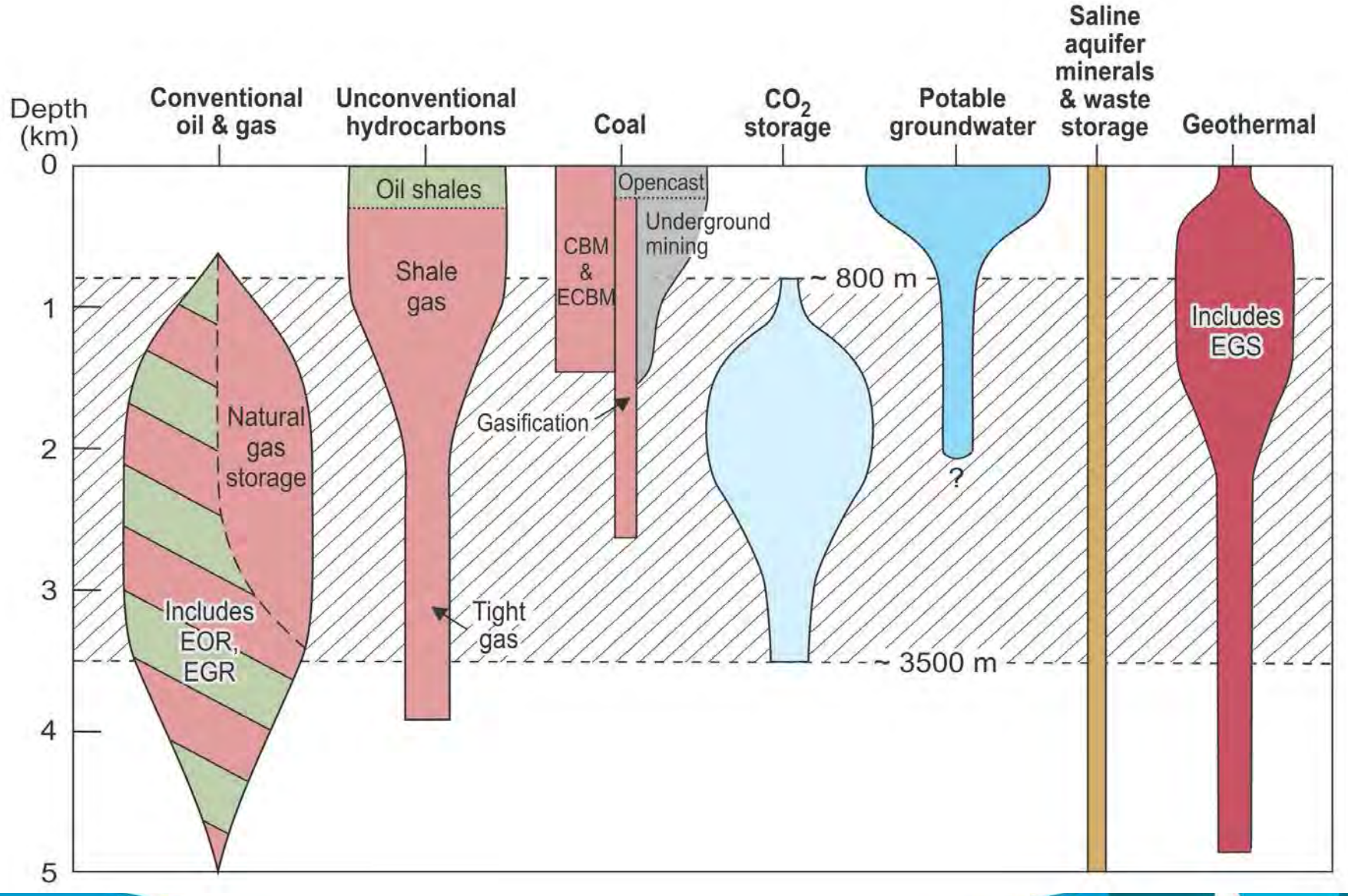
Interaction of CO_2 with Subsurface Resources

- Study undertaken by CO2CRC and Lead by GNS in conjunction with Alberta Innovates – Technology Futures and BGS
- Aim of Study:
  - review potential subsurface interactions including some case studies. Provide a checklist of potential interactions and impacts and management options.
- Study aimed primarily at policymakers

Interaction of CO_2 with Subsurface Resources

- Outline of Report
  - Short technical background for policymakers
  - Subsurface geological resources and potential interactions with CO_2
  - Case Studies
  - Resource Interaction Issues and their Resolution

Subsurface Resources



Case Studies

- Groundwater – Cassem (UK)
- Natural gas storage – Hewett gas field (UK)
- Geothermal – Delft (Netherlands), Paris Basin (France)
- Waste disposal – Sellafield (UK), Gorgon (Australia)
- Oil and Gas – North Sea,
- Pressure Transmission – Zama (Canada)
- Gas over bitumen/ oil – Alberta (Canada)

Potential Influences of CO_2 Storage

Resource	Positive	Negative
Oil	Might increase sweep efficiency hence more effective resource use; EOR can offset cost of storage, but not always usable; creates demand for CO_2 and hence improvement of capture technology; similar industries and service and supply needs; possible pressure enhancement	Pressure interference with existing operations; contamination of oil; infrastructure conflict; timing delays to CO_2 storage if EOR not feasible or wanted
Gas	EGR possible in some reservoirs (though rarely done); possible pressure enhancement	High cost of separating CO_2 from the produced gas if they mix; pressure interference with existing operations
Coal	CO_2 can flush out methane, creating valuable by-product	CO_2 would sterilize coal for mining or underground gasification
Groundwater	Could re-pressure low-productivity aquifers; pressure-relief wells used to increase CO_2 injection rates might produce useable water	Could acidify or contaminate potable water, or change hydraulic heads through pressure interference
Dissolved minerals	CO_2 could flush or displace saline water, enhancing water, and hence mineral extraction	CO_2 might react with some dissolved mineral salts, plugging pores
Geothermal	Better heat transfer medium than water; possible pressure enhancement	High temperatures might increase risk of corrosion; possible pressure interference with existing operations
Natural gas storage	Nil	Pore space unavailable for CO_2 storage for life of gas storage facility; pressure interference with existing operations
Waste	Nil	Pressure effects or the presence of CO_2 may affect waste

Major factors in Regulatory Decisions

- Checklist created – includes the factor, stage, scale, resource type, examples, references

- Priority of use
- Timing of interaction
- Risk assessment
- Storage capacity
- Improved recovery
- Resource sterilisation
- Injectivity
- Seal integrity
- Pressure fronts
- Surface Deformation
- Composition of gas detected
- Mobilisation of other substances
- MMV
- Regulatory conflict/ overlap

Suggested stages for Regulators

- Identify resources within basin
  - Map distribution
  - Assess quality
- Establish resource priority
- Assess storage project – site characterisation, MMV, mitigation plans etc
- Review injection plans – achievable? Lead to resource conflict?
- Review abandonment plans including longer term MMV and liability transfer

Conclusions

- Interaction can be positive or negative
- Interaction depends on geology, existing resources, economic potential, regulatory environment
- 2 activities may take place at same site, dependent on pore space overlap, pressure connectivity
- Interaction may be contemporaneous/ sequential
- Delays in establishing storage regulations could lead to future detrimental resource interaction
- Regulations need to be clear and account for potential resource prioritisation and interaction
- Assessment of potential resource uses in a region and possible interactions - enable effective prioritisation and efficient allocation of resources. As well as potential effects on storage injectivity and capacity

IEAGHG Meetings 2012

- Joint Storage Networks Meeting, June 2012, Santa Fe, LANL
  - Reviewed achievements to date
  - Future direction
- Environmental Assessment Network, July 2012, Bozeman, University of Montana
  - Controlled release projects – first time together
  - Marine monitoring
  - ZERT facility


Oral Sessions
Poster Sessions
Prof. Yoichi Kaya

IEAGHG Network Meetings and Conferences 2013+

- Risk Management Network and Modelling Network
  - 10-12 Jun 2013, Trondheim. Hosts Statoil
- Monitoring Network and Environmental Research Network
  - 26-30 Aug 2013, Canberra. Hosts CO2CRC
- Post Combustion Capture Conference - 2
  - Bergen, Norway September 17th -20th 2013. Hosts Gassnova
- Oxyfuel Combustion Conference - 3
  - Leon, Spain 9th -13th September 2013. Hosts CUIDEN
- High Temperature Solid Looping Cycles Network
  - 2-3 Sep 2013, Cambridge. Hosts Cambridge University
- GHGT-12, Austin, Texas, 5-9 Oct 2014
  - Call for abstracts ~July 2013, deadline ~January 2014

IEA GHG Collaborations etc

- GCCSI
- CSLF
- EU ZEP
- IEA, and IEA Regulators Network
- CO2GeoNet
- UNFCCC – **CCS CDM transboundary deferred to 2016**
- London Convention – **revised CO2 Specific Guidelines to allow transboundary subsurface**
- ISO – **work started. 5 Working Groups**

Thank you

Any questions?