PIRT Meeting

15 June 2015

Regina, Saskatchewan, Canada

Report from Secretariat

Richard Lynch

CSLF Secretariat

Secretariat Report to PIRT

CSLF Recognized Projects

- As of beginning of 2015: 43 recognized projects
  - 31 were active; 12 have been completed
  - Wide geographical distribution: projects are located on five different continents
  - http://www.cslforum.org/projects/
- Recent changes: CO_2 GeoNet and CCP3 projects are concluding. Status of Lacq Project is not known.
- This meeting: Jingbian CCS Project proposed for CSLF recognition.

Secretariat Report to PIRT

Consensus from Warsaw Meeting

- The PIRT recommends approval by the Technical Group for The Norcem CO_2 Capture Project.

Secretariat Report to PIRT

Action Items from Warsaw Meeting

1. **Secretariat**: Finalize Oct. 2014 PIRT Summary, incorporating two minor changes agreed to during the meeting. Status: **Completed**.
2. **Secretariat**: Add a link from CSLF website to report from the "Best Practices and Standards for Geologic Monitoring and Storage of CO_2" Task Force at the GCCSI's **decarboni.se** website. Status: **Completed**.

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Action Items from Warsaw Meeting

3. **Secretariat**: Make adjustments to technology needs reporting template for obtaining input to CSLF Technology Roadmap (TRM) Interim Report. Status: **Completed**.
4. **Secretariat and Technical Group**: Obtain information on technology needs (in 10 different areas) for use in drafting TRM Interim Report. Status: **Completed**.

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Action Items from Warsaw Meeting

5. **PIRT Active Members**: Draft the ten "information needs" sections of the TRM Interim Report. Status: **Completed**.

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TRM Interim Report

- 2013 CSLF Technology Roadmap (TRM) was launched at 5th CSLF Ministerial Meeting in November 2013.
- An objective of 2013 TRM was to answer three key questions:
  - What is the current status of CCS technology and deployment, particularly in CSLF member countries?
  - Where should CCS be by 2020 and beyond?
  - What is needed to get from Point A to Point B, while also addressing the different circumstances of developed and developing countries?

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TRM Interim Report

10 Technology Needs Areas identified in TRM:

a) CO_2 capture in power generation
b) CO_2 capture in the industrial sector
c) CO_2 transport
d) Large-scale CO_2 storage
e) Monitoring stored CO_2
f) Mitigation / remediation procedures
g) Understanding storage reservoirs
h) Infrastructure and the integrated CCS chain (capture to storage)
i) CO_2 utilization, non-EOR
j) CO_2 utilization, EOR

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TRM Interim Report

- Template was developed by Secretariat (and approved by PIRT Chair) for gathering information about ten technology needs areas identified in 2013 TRM.
- Template was sent to representatives of many different research organizations working on various aspects of CCS.
- Only 12 responses received in time for CSLF meeting at Warsaw in Oct. 2014. Secretariat wrote short Progress Report for that meeting.

Secretariat Report to PIRT

TRM Interim Report

- Additional 12 responses were received during 1Q15. Total return on Survey now represents viewpoints from 12 countries, 4 continents.
- Survey information fed into the draft TRM Interim Report prepared in time for this meeting.
- Technology sections written by PIRT members.
- Final version of this report will be deliverable at 6th CSLF Ministerial in November.

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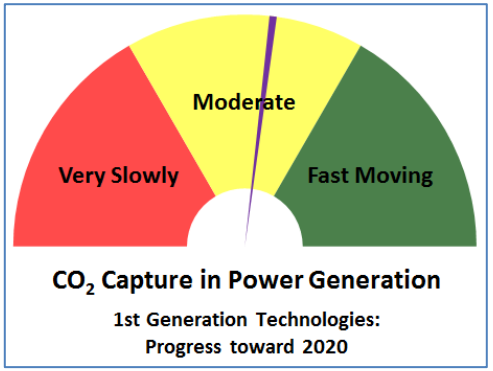
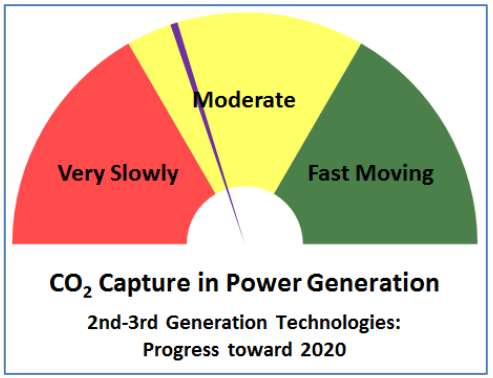
TRM Interim Report

A) CO_2 Capture Technology from Power Industry

- First generation capture implementation is showing moderate progress.
- Emerging (2nd and 3rd generation) capture implementation is showing moderate to slow progress.
- Most commonly cited barriers are economics and policy. High cost, moderate public funding and limited regulations and incentives were cited.





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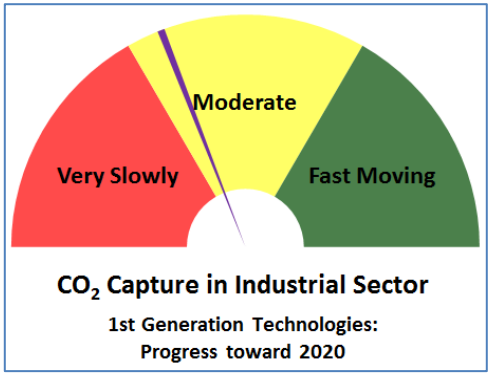
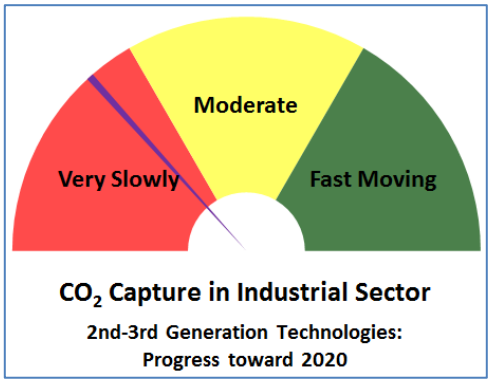
TRM Interim Report

B) CO_2 Capture Technology from Industrial Sector

- First generation capture implementation is showing slow to moderate progress.
- Emerging (2nd and 3rd generation) capture implementation is showing very slow progress.
- Most commonly cited barriers are cost of the technology and the lack of policy in most countries for directing companies to pursue large-scale implementation of CCS.





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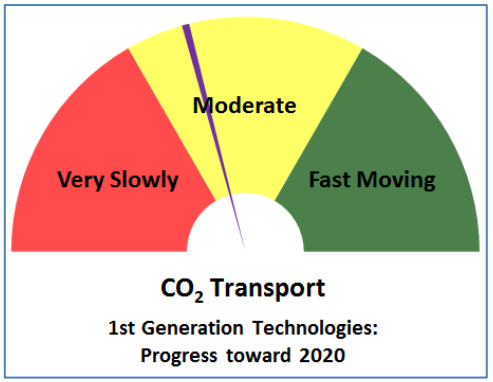
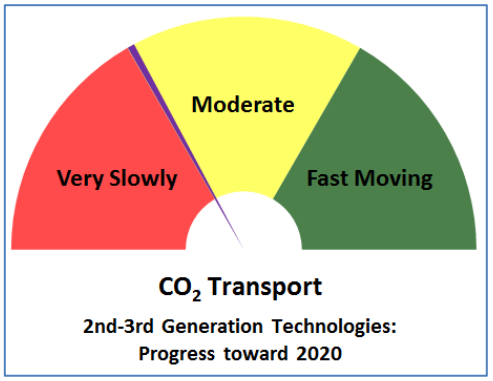
C) CO_2 Transport

- First generation CO_2 transport is showing only moderate progress.
- Emerging (2nd and 3rd generation) technology for CO_2 transport is showing slow progress.
- Most commonly cited barriers are economics and policy. With the exception of current EOR operations, societal approval and completing land access requirements for onshore CO_2 pipelines is challenging.





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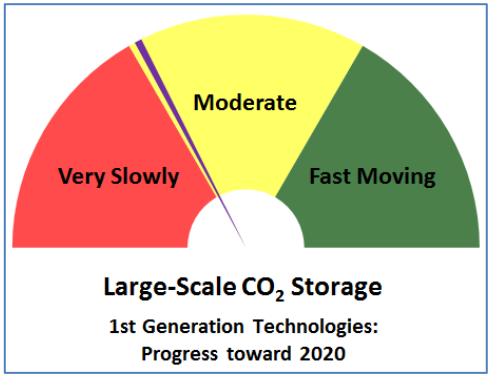
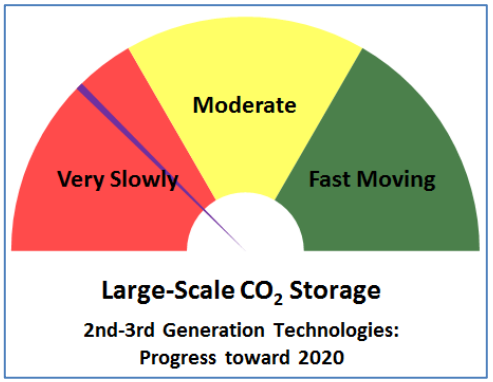
D) Large-Scale CO_2 Storage

- First generation large-scale CO_2 storage implementation is showing very slow to moderate progress.
- Emerging (2nd and 3rd generation) large-scale CO_2 storage implementation is showing very slow progress.
- Most commonly cited barriers are policy (e.g., uncertainty in long-term liability) and economics (overall cost of a project rather than the cost of storage).





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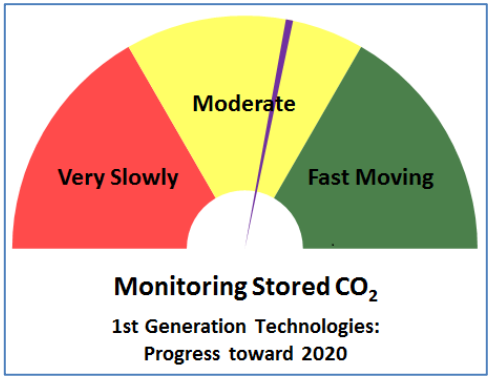
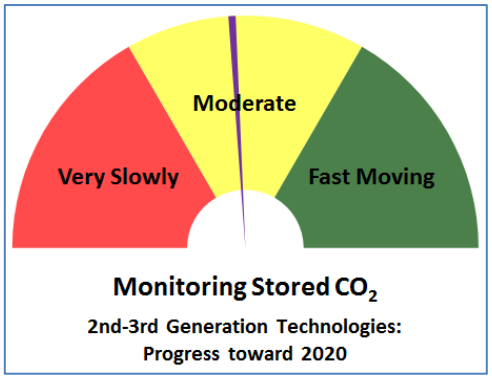
TRM Interim Report

E) Monitoring Technologies for CO_2 Storage

- First generation monitoring technologies for CO_2 storage are showing moderate progress.
- Emerging (2nd and 3rd generation) monitoring technologies for CO_2 storage are showing moderate progress.
- Most commonly cited barriers are economics and policy. Lack of large-scale test sites and the fact that most technology development and field tests are government-funded were commonly cited issues.





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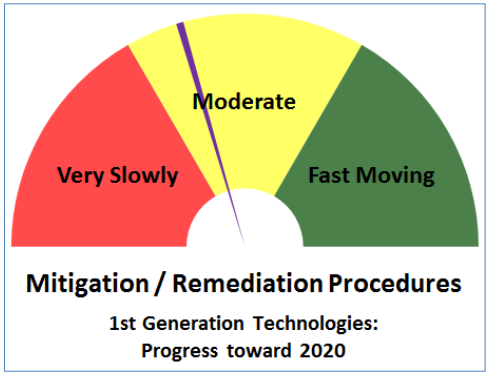
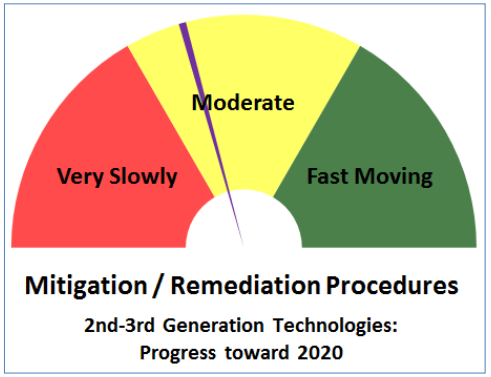
F) Mitigation and Remediation Procedures

- Mitigation and remediation procedures are showing slow to moderate progress.
- Research and demonstration are needed to bring this technology to fruition.
- Most commonly cited barriers are economics and policy. For example, there is no obvious consensus as to what constitutes a leakage and hence when a regulator might require remediation.





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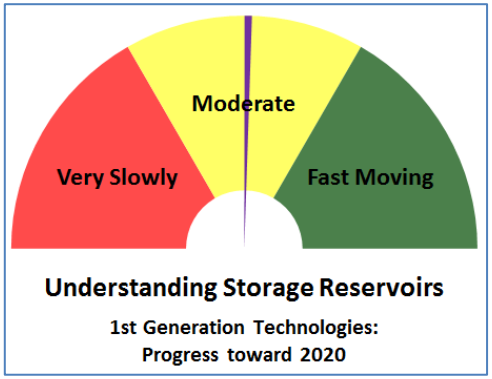
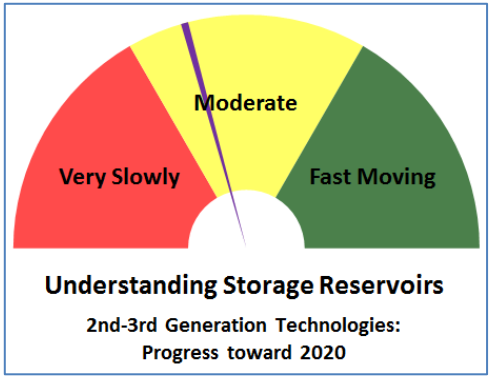
G) Understanding Storage Reservoirs

- Reservoir understanding in early projects is progressing at a moderate rate.
- Progress of emerging (2^{nd}/3^{rd} generation) understanding moderate to slow.
- Most commonly cited barriers are economics and technology. Technology deployment is expensive, and predicting CO_2 plume behaviour using modelling techniques can be far from straightforward.





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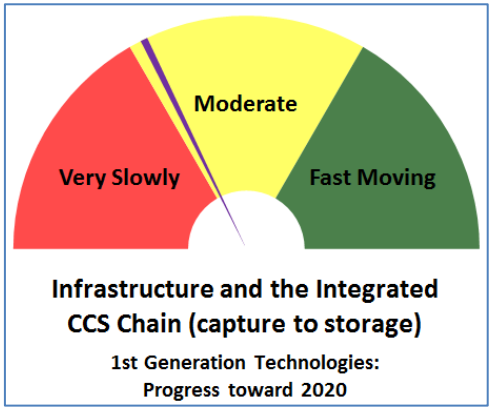
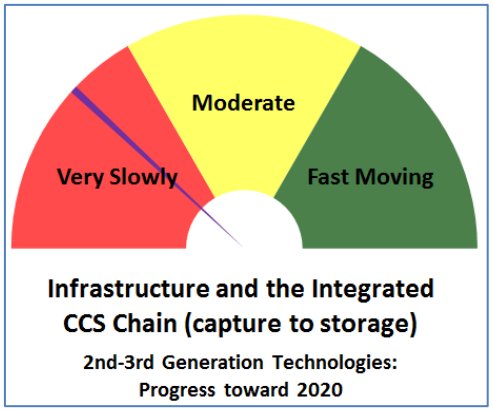
H) Infrastructure and the Integrated CCS Chain

- First generation infrastructure and integration implementation is showing moderate to slow progress.
- Progress with emerging (2nd and 3rd generation) infrastructure and integration implementation is very slow.
- The most commonly cited barriers are lack of policy and economics, including finance, ownership, business cases, risk allocation, etc. No major technical barriers, but CO_2 purity could be an issue.





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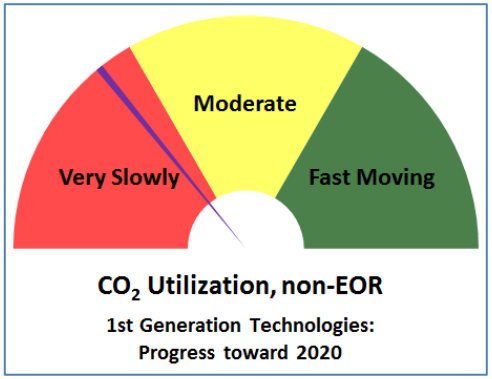
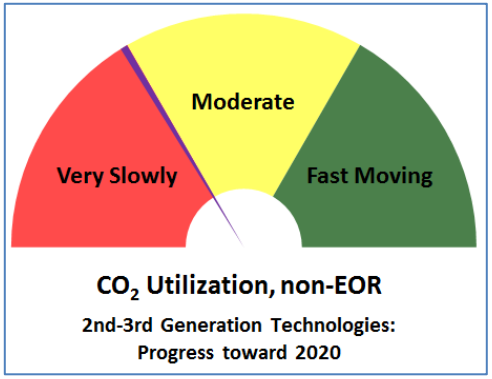
TRM Interim Report

I) CO_2 Utilization, non-EOR

- First generation technology for non-EOR CO_2 utilization is moving very slowly.
- Second generation technology for non-EOR CO_2 utilization is moving very slowly.
- Most commonly cited barriers are economics and technology. Improvement of technology, small volume of used CO_2, and the necessity for commercial demonstration of 1st generation technology for non-EOR CO_2 utilization.





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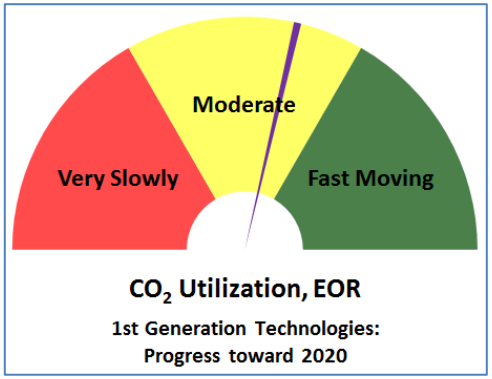
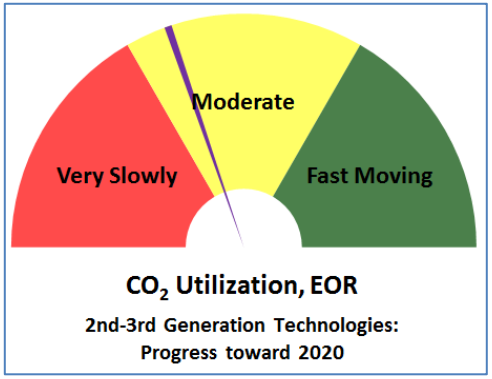
J) CO_2 Utilization, EOR

- First generation CO_2-EOR implementation is showing moderate to fast moving progress.
- Emerging (2nd and 3rd generation) CO_2-EOR implementation is showing moderate to slow progress.
- Most commonly cited barrier is economics (EOR will significantly increase the cost of extracting oil compared to waterflooding or tertiary recovery using natural gas and solvents).





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TRM Interim Report

Conclusions:

- Except for a very few niche industrial sector applications, for 1st generation technologies, none of the ten technology needs areas perceived as progress being ‘fast moving’.
- Progress for 2nd and 3rd generation technologies perceived as proceeding at an even slower rate.

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TRM Interim Report

Conclusions:

- The 2013 TRM established the year 2020 as an achievable timeframe for demonstration of the 1st generation of CCS technologies and 2030 for demonstration of 2nd generation technologies.
- Two years later, barriers are still in place that inhibit the accomplishment of these goals.

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TRM Interim Report

Recommendation #1:

Concerning economic barriers, governments should urgently consider methods to assist stakeholders to significantly drive down the cost of CCS deployment, since it is the stakeholders who will be making the majority of the financial investments.

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TRM Interim Report

Recommendation #2:

Concerning policy barriers, governments should review institutional regulatory policies to identify how these barriers to CCS deployment may be reduced.

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Recommendation #3:

Concerning technology barriers, stakeholders should increase their mechanisms for sharing best practices, particularly regarding communications, regulation and cost reduction, and pledge to engage in public-private partnerships to encourage the development of additional demonstration projects and facilitate the development of CCS projects internationally.