Siting/MMV Working Group
9 May 2006 Working Dinner Notes on CCS Scenario Development
Arlington, VA

Participants: Ian Duncan (TBEG), Scott Anderson (Environmental Defense), Sally Benson (LBNL), Charles Christopher (BP), Julio Friedmann (LLNL), Sasha Mackler (NCEP), Vello Kuuskraa (ARI), Anhar Karimjee (EPA), Mike Paque (GWPC), Jeff Logan (WRI), John Tombari (Schlumberger), Tiffany Rau (BP)

Our objective:
To develop scenarios that will:
---inform policymakers and regulators on how CCS projects might be sited and how MMV might be conducted.
---assist policymakers and regulators with the rule making process
---demonstrate potential paths to site certification
---show developers what steps are taken in the project creation process.
---build confidence among NGOs and the public that planning, oversight, and potential remediation are sufficient.
---add value to the working group members and earn their consensus

Our initial audience:
The larger stakeholder group will be our primary audience for the scenario development and analysis. The working group will present the scenarios to the larger group at the earliest opportunity and get feedback for modification and approval before releasing the exercise to a larger public audience. Several participants noted the importance of having the financing and (re)insurance community involved. Jeff said that WRI would share our findings with Chase Morgan, Citibank, and SwissRE for feedback.

Our work plan:
We agreed on three primary scenarios that, though based on real locations, will be documented in a generic manner by their characteristics. With simplicity in mind we will tackle a minimal set of variants. The scenarios start with the following assumptions:
---there is sufficient financial incentive for geologic storage
---the project initiator has a nearly pure stream of CO2 they are looking to store
---after considerable analysis the initiator has selected a potential storage target.

The three storage targets:
-- a greenfield saline aquifer with characteristics XXX (volunteer-Julio F.)
-- an EOR opportunity with characteristics YYY (volunteer-Ian D.)
-- a depleted gas reservoir with characteristics ZZZ (volunteer-Sally B.)
* in appendix to each scenario, we will highlight additional issues created by an offshore siting.

Vello K. volunteered to sketch a template of the elements that each scenario would cover. (Included on page 3-4.)

Jeff to solicit involvement of someone to represent: financers, insurers & public...

Timeline:
Elements distributed: Mon. May 15th
1st cut scenarios sent to John T. for consolidation: May 29th
Scenarios consolidated & distributed for comment to full workgroup: Jun 1st
Follow up conference call 2nd week June: TBA
Scenario role play workshop: June/July

****Send John Tombari your open dates & location suggestions (full day meeting).

Other discussion points noted:
---an MMV project methodology & timeline example (attached)
---what is certification
---well permitting vs. site certification
---handling of gaps
---differences created by self managed project vs. outsourced project
---incentives for technical rigor in storage operations

Template of Elements for Three Scenarios

We are looking for a quick first pass that describes only the initial conditions of the storage scenario derived from your assumed existing data (saline should have large data gaps). You will describe the base characterization, model & performance & risk analysis. After agreement on this we will then as a group work through how we take the site from this current state to being certified.

Given:

--You plan to sequester 2 million metric tons per year CO2.
--You have chosen a potential storage site based on existing data only.
--The credit you will receive for sequestration will more than cover the costs.
--We will assume a public awareness/perception program has minimized local community concerns. The scenarios will also consider how effective siting and MMV programs encourage public acceptability, and distill any important findings and communication strategies to those working on public outreach.

Describe the below three points:

1. Characterization:

--Describe what existing geologic data was used to select the site (wells, core, seismic...?) & the level of uncertainty in this data (comment on data quality, form...)
---What was determined from this data: formation type, depth, thickness, porosity, permeability, structure, geologic description (trap), capacity estimate, description of overlying formations (cap rock, aquifers...)

2. Modeling:

---What is your level of confidence in the initial static model created. Run a simulation over 1000 years...Describe the plume over time & maximum footprint of the storage site. Does the plume come in contact with any faults &/or old wells? How many old wells & what type? What data do we have about the wells, faults?

3. Performance & Risk Analysis:

---What leakage can be tolerated over time to the atmosphere? What are the major risks identified given the model, simulation & plume development? What risks to potable water? to other commercial operations (ie..O&G production...)? What are the surface risks? are there any residential/business areas above the plume?

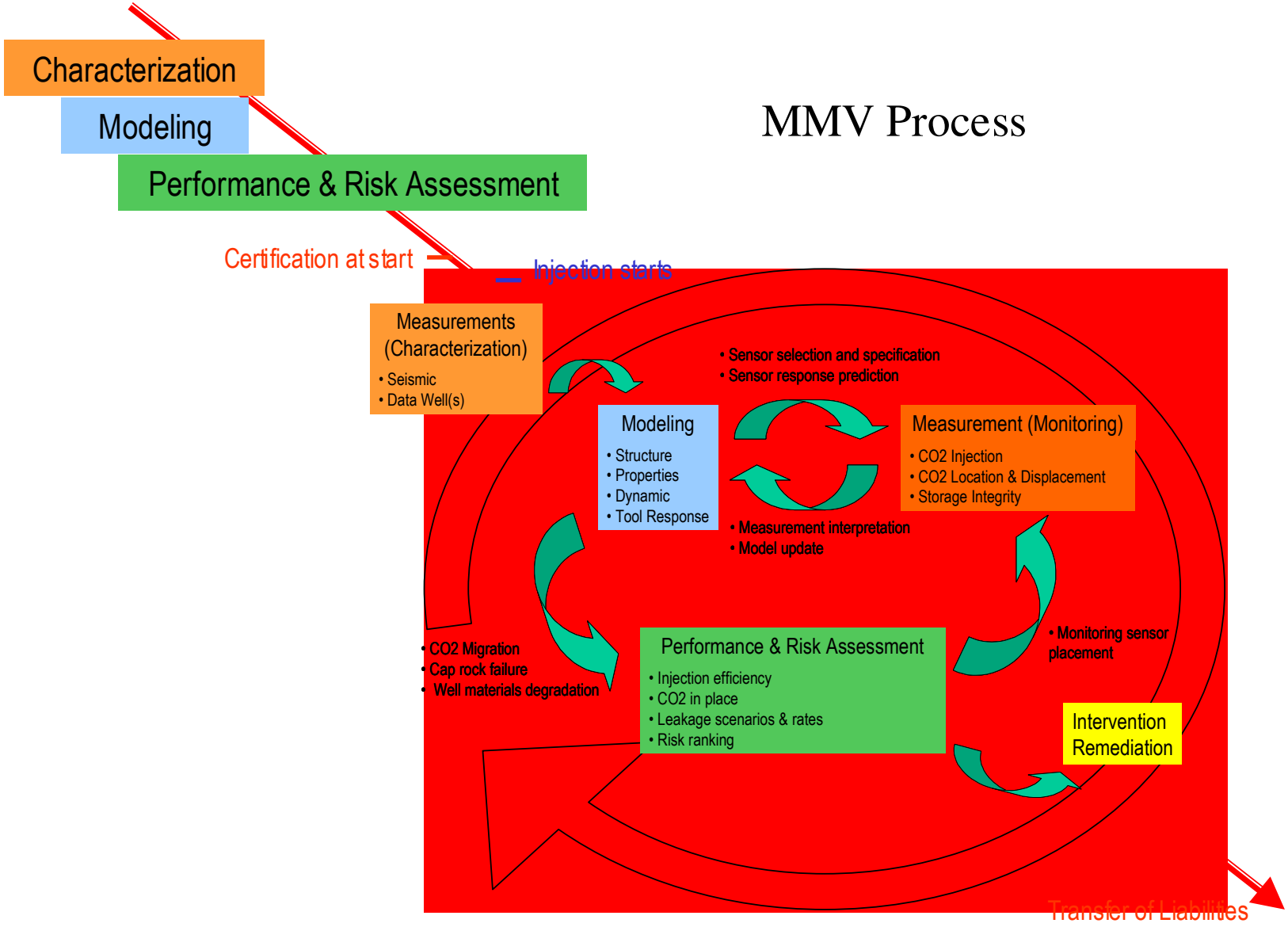
DONE: Lets stop here & distribute & iterate:

Once we agree on these we will as a group determine for each scenario the below:

--What additional pre-injection data should be gathered prior to application for site certification & what data is needed for background characterization to compare

monitoring data to: drill data wells, shoot seismic, take cores, core analysis, analyze fluid samples, soil analysis, surface background characterization...
--Given the simulation & risk analysis what monitoring plan will be required for certification (operational monitoring, cap rock monitoring, plume monitoring, well monitoring & environmental monitoring):
--What optimal combination of sensors are needed? placed where? recorded in what intervals over what period of time?
--How often will data be presented to/scrutinized by regulators
--What needs to be demonstrated in the development plan to regulators: site preparation, construction material in wells, number & types of wells, injectivity, back up capacity, risk mitigation plan? QHSE plan?

MMV Process


Characterization
Modeling
Performance & Risk Assessment
Certification at start
Injection starts
Measurements (Characterization)
• Seismic
• Data Well(s)
• Sensor selection and specification
• Sensor response prediction
Modeling
• Structure
• Properties
• Dynamic
• Tool Response
Measurement (Monitoring)
• CO2 Injection
• CO2 Location & Displacement
• Storage Integrity
• Measurement interpretation
• Model update
• CO2 Migration
• Cap rock failure
• Well materials degradation
Performance & Risk Assessment
• Injection efficiency
• CO2 in place
• Leakage scenarios & rates
• Risk ranking
• Monitoring sensor placement
Intervention Remediation
Transfer of Liabilities