Stanford University

Global Climate & Energy Project

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Carbon Dioxide Capture and Storage: A Primer

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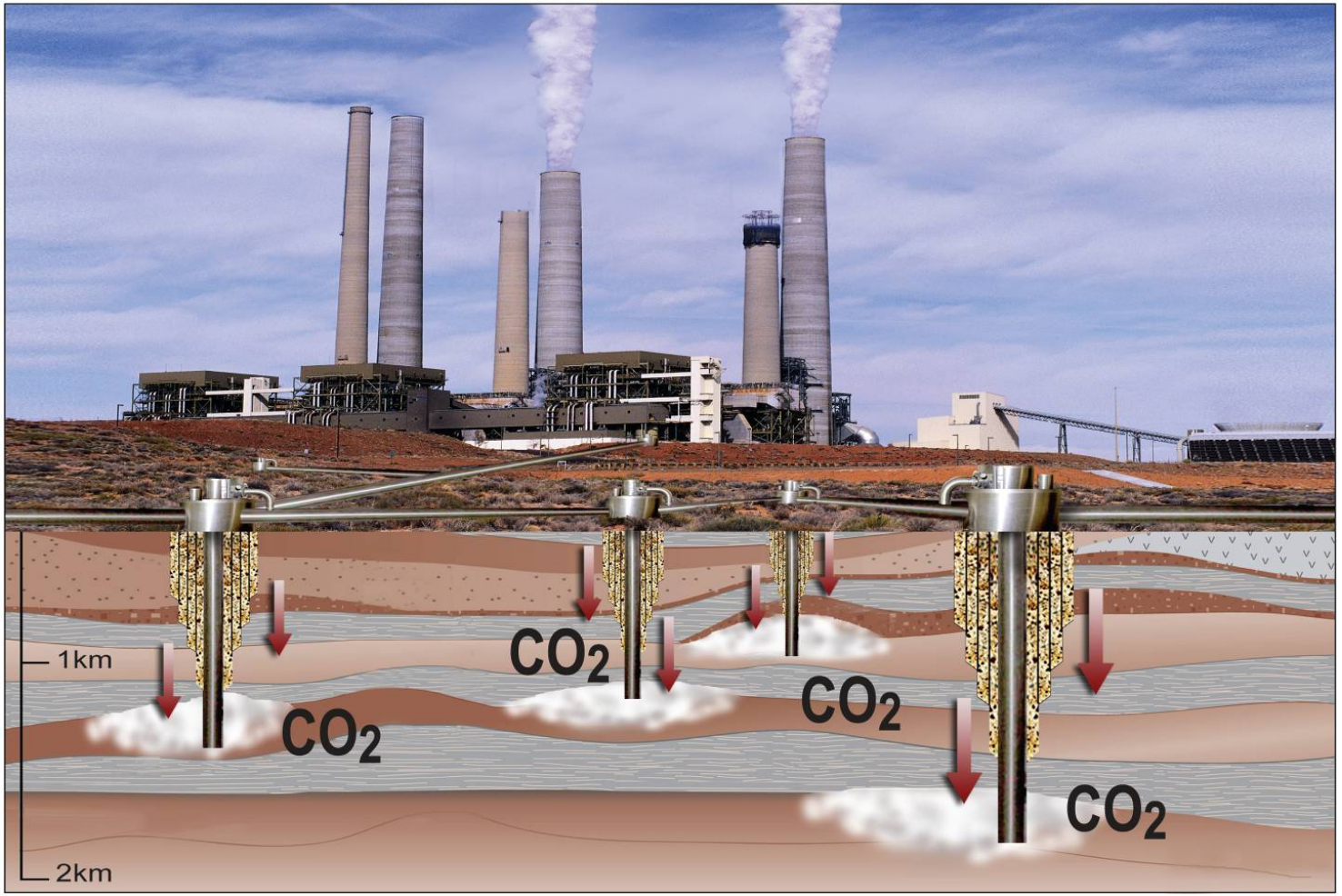
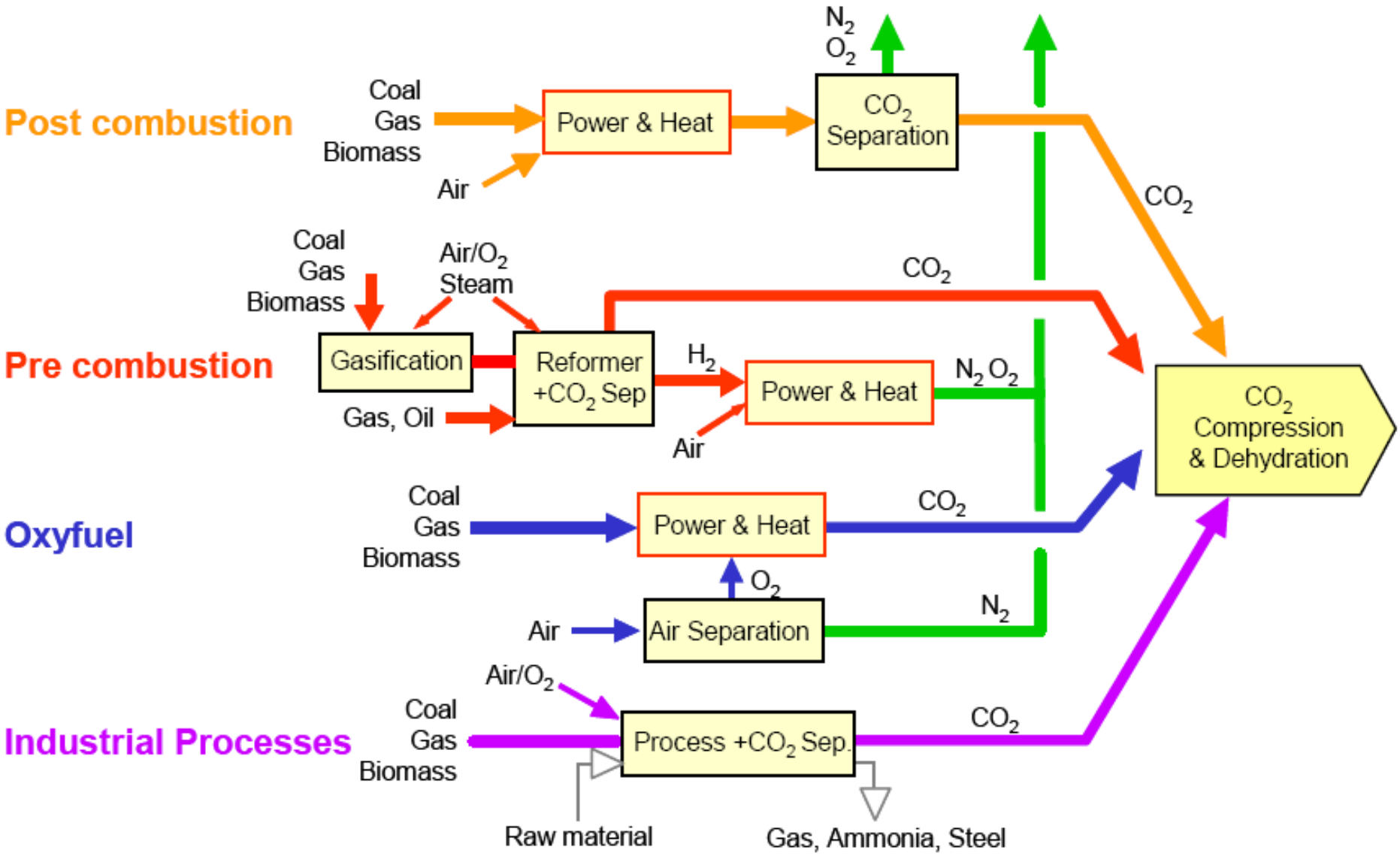
Global Challenges – Global Solutions – Global Opportunities

Carbon Dioxide Capture and Storage Involves 4 Steps

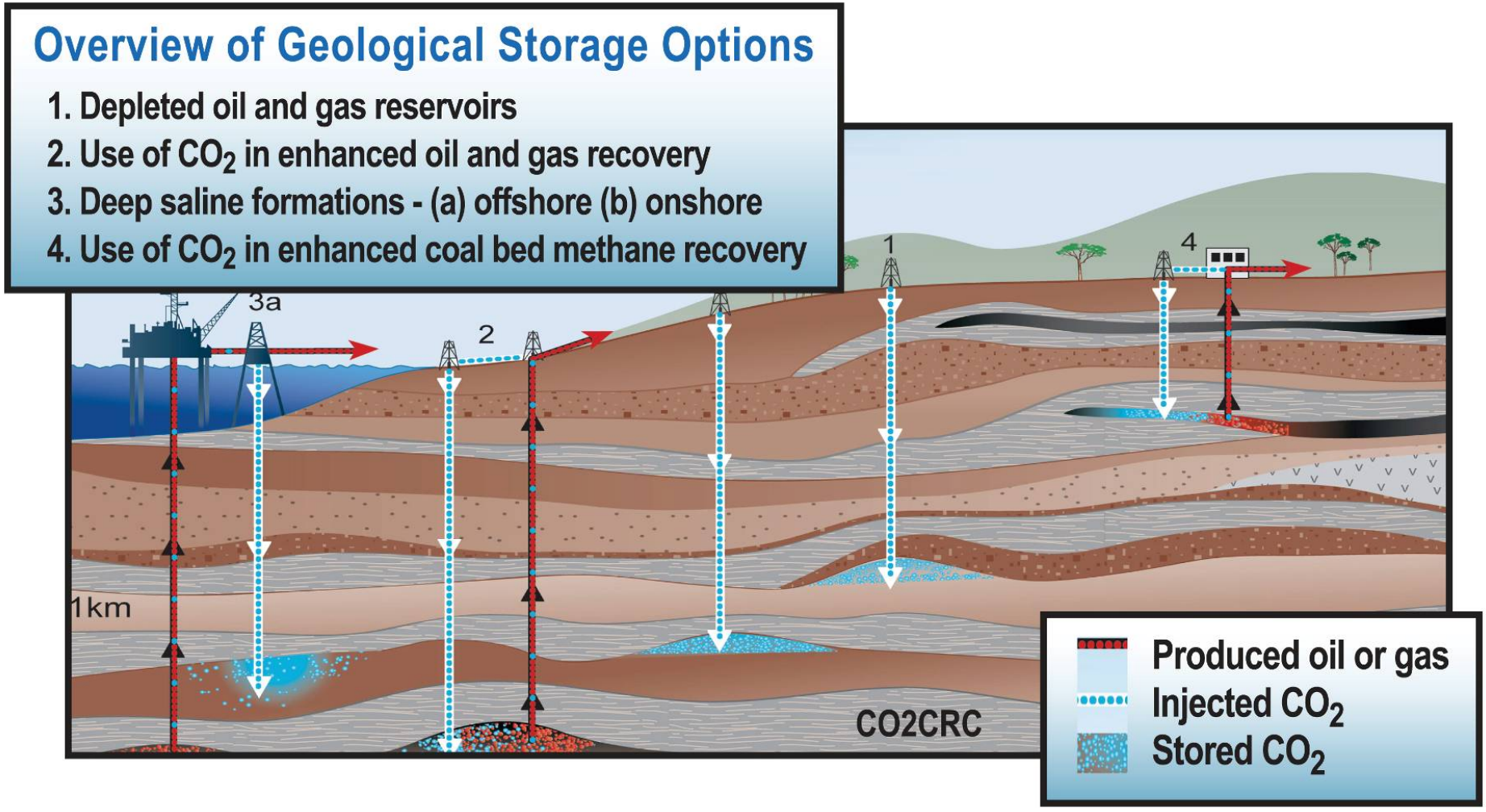


Capture → **Compression** → **Pipeline Transport** → **Underground Injection**

Options for CO_2 Capture

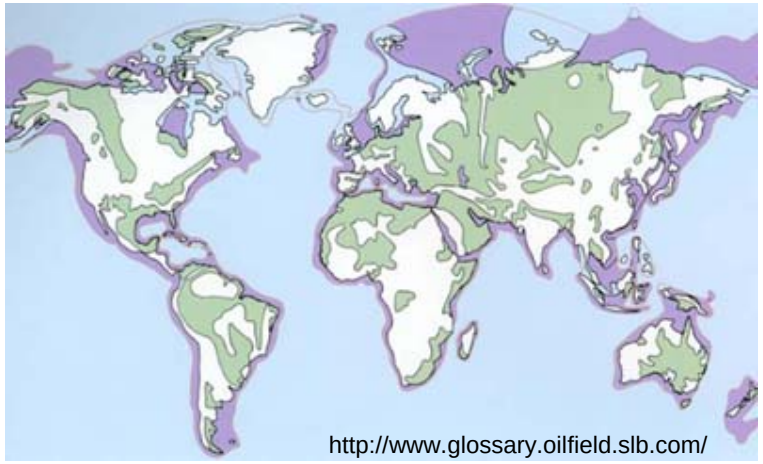


Options for Geological Storage

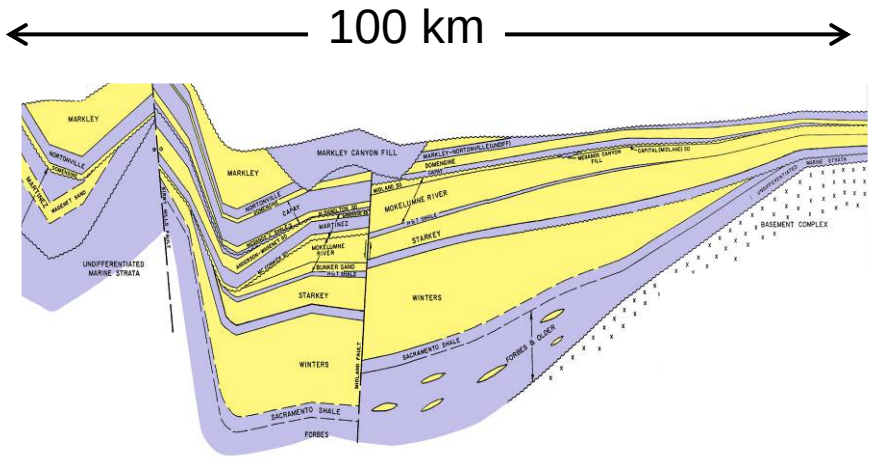


What Types of Rock Formations are Suitable for Geological Storage?

Rocks in deep sedimentary basins are suitable for CO_2 storage.



Map showing world-wide sedimentary basins



Northern California Sedimentary Basin

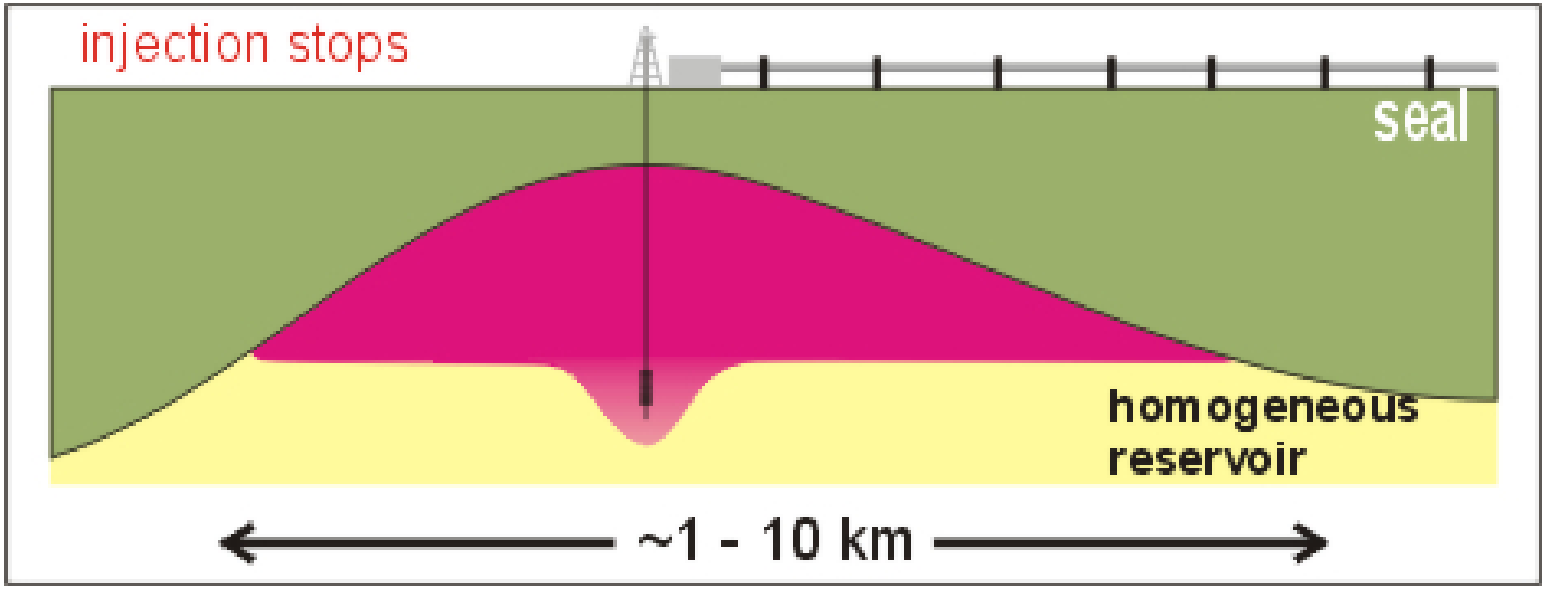
1 inch

Sandstone

Example of a sedimentary basin with alternating layers of sandstone and shale.

Basic Concept of Geological Sequestration of CO_2

- Pumped into rocks with tiny pore spaces at depths of about 1 mile
- Primary trapping
  - Beneath seals of low permeability rocks



Courtesy of John Bradshaw

X-ray Micro-tomography at the Advanced Light Source

Micro-tomography Beamline

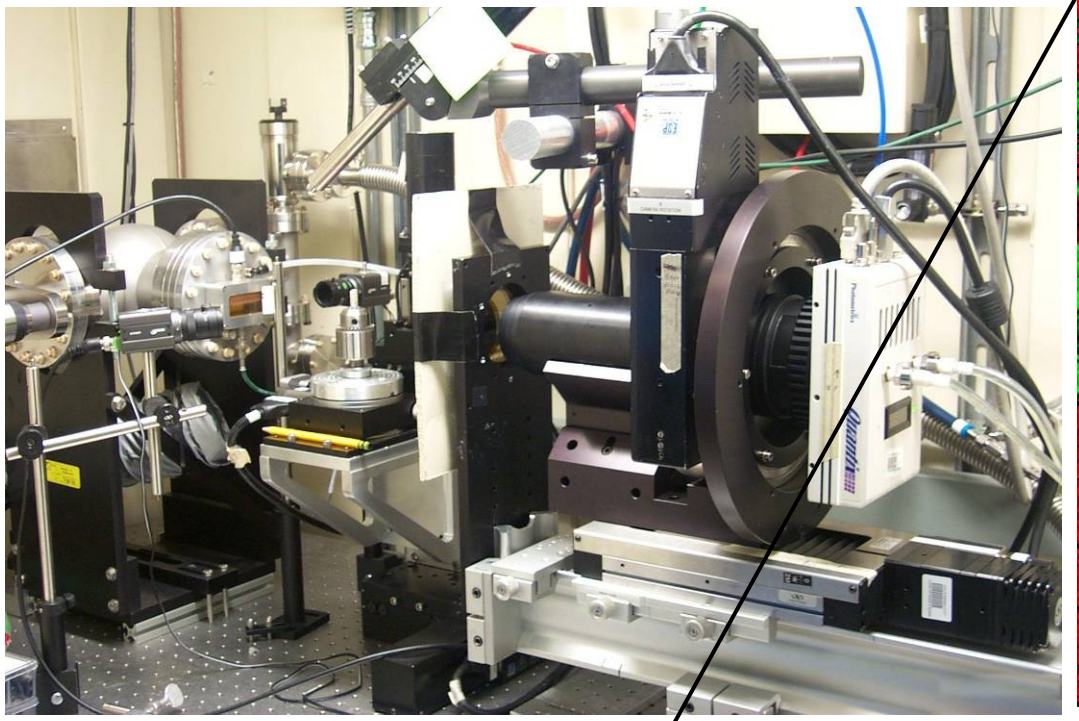
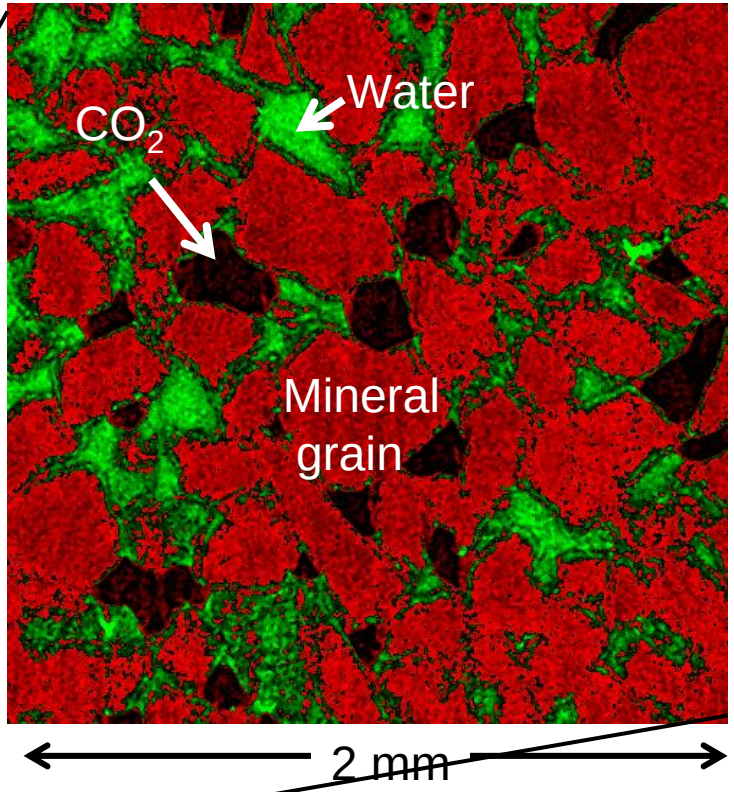


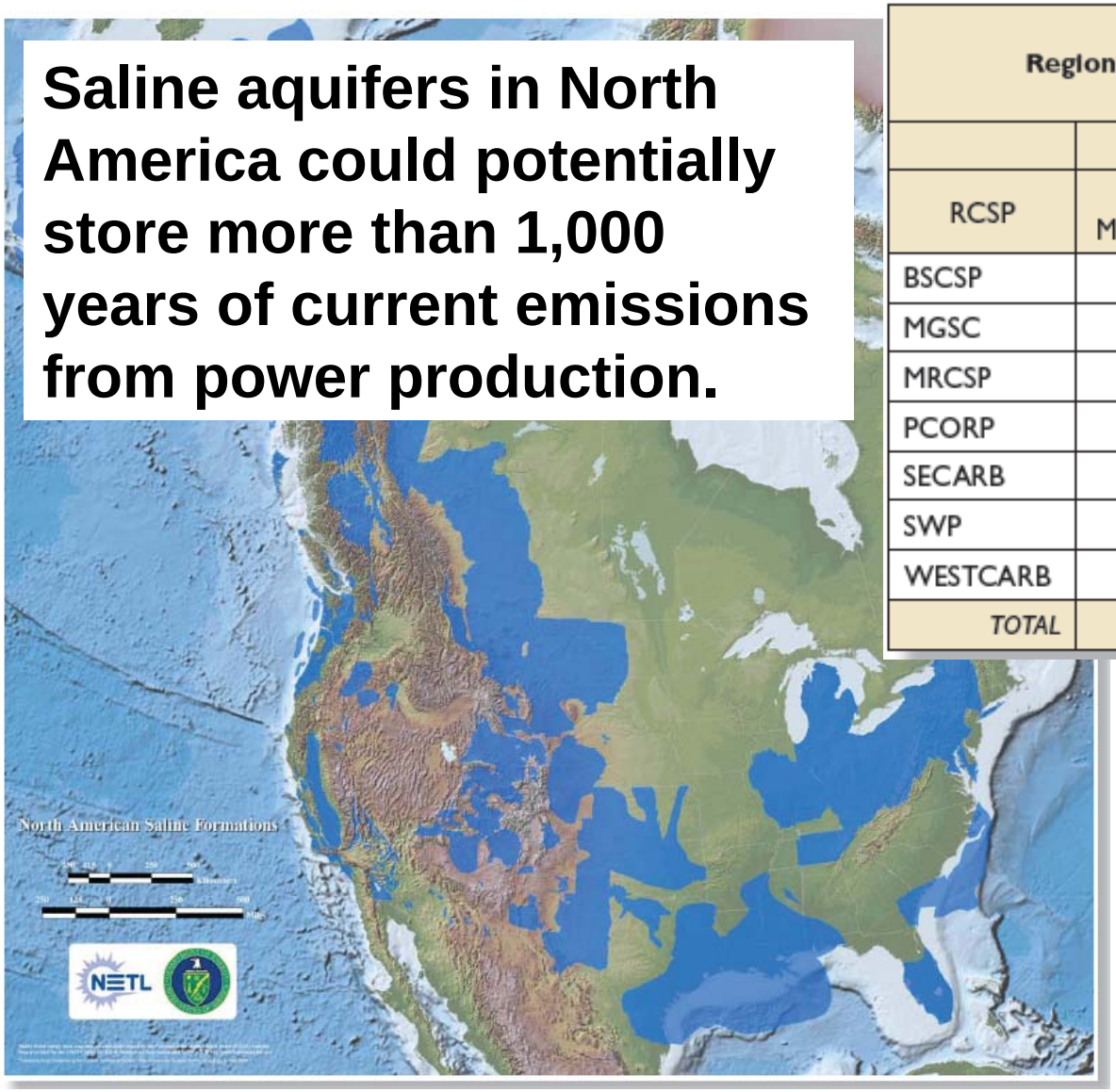
Image of Rock with CO_2



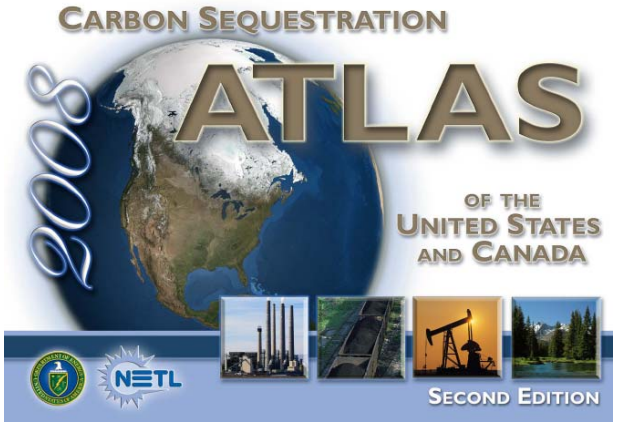
"Tiny pore spaces in rocks."

Saline Aquifers

Saline aquifers in North America could potentially store more than 1,000 years of current emissions from power production.

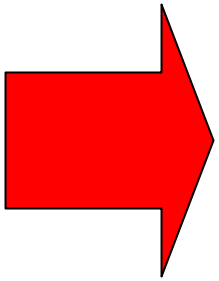


CO_2 Resource Estimates by Regional Carbon Sequestration Partnership for Saline Formations				
	Low		High	
RCSP	Billion Metric Tons	Billion Tons	Billion Metric Tons	Billion Tons
BSCSP	460.9	508.0	1,831.5	2018.9
MGSC	29.2	32.1	116.6	128.6
MRCSP	117.8	129.8	117.8	129.8
PCORP	185.6	204.6	185.6	204.6
SECARB	2,274.6	2,507.3	9,098.4	10029.3
SWP	10.7	11.8	42.6	47.0
WESTCARB	204.9	225.9	817.3	900.9
TOTAL	3,283.6	3,619.5	12,209.8	13459.0



CCS Can Be Safe and Effective with Necessary Precautions

- Careful site characterization and selection
- High quality wellfield engineering
- Safe site operations
- Monitoring
- Remediation planning
- Regulatory oversight
- Plans for long term stewardship and financial responsibility



"… risks similar to existing activities such as natural gas storage and EOR."

"… the fraction retained is likely to exceed 99% over 1,000 years."

IPCC, 2005