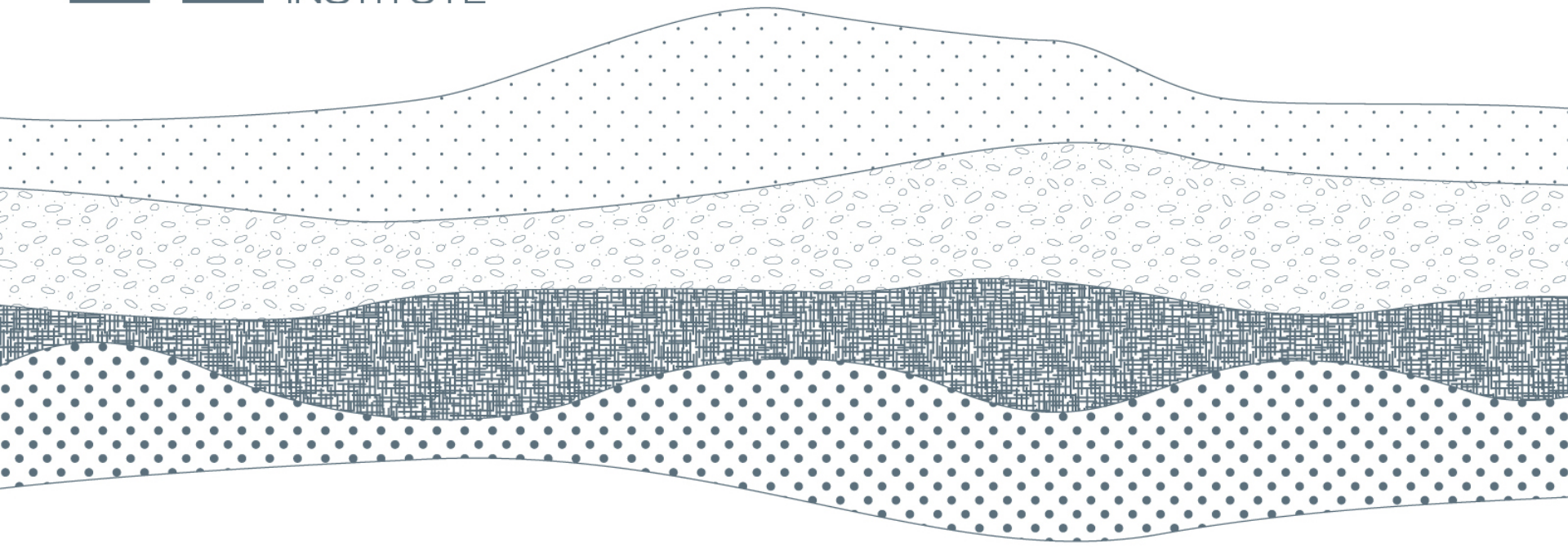


LEGAL AND REGULATORY FRAMEWORK - CCS/CCUS

Thomas Russial - Representative, North America

SSEB - 2012 Briefing to Southern Legislators
Charleston, West Virginia July 28, 2012

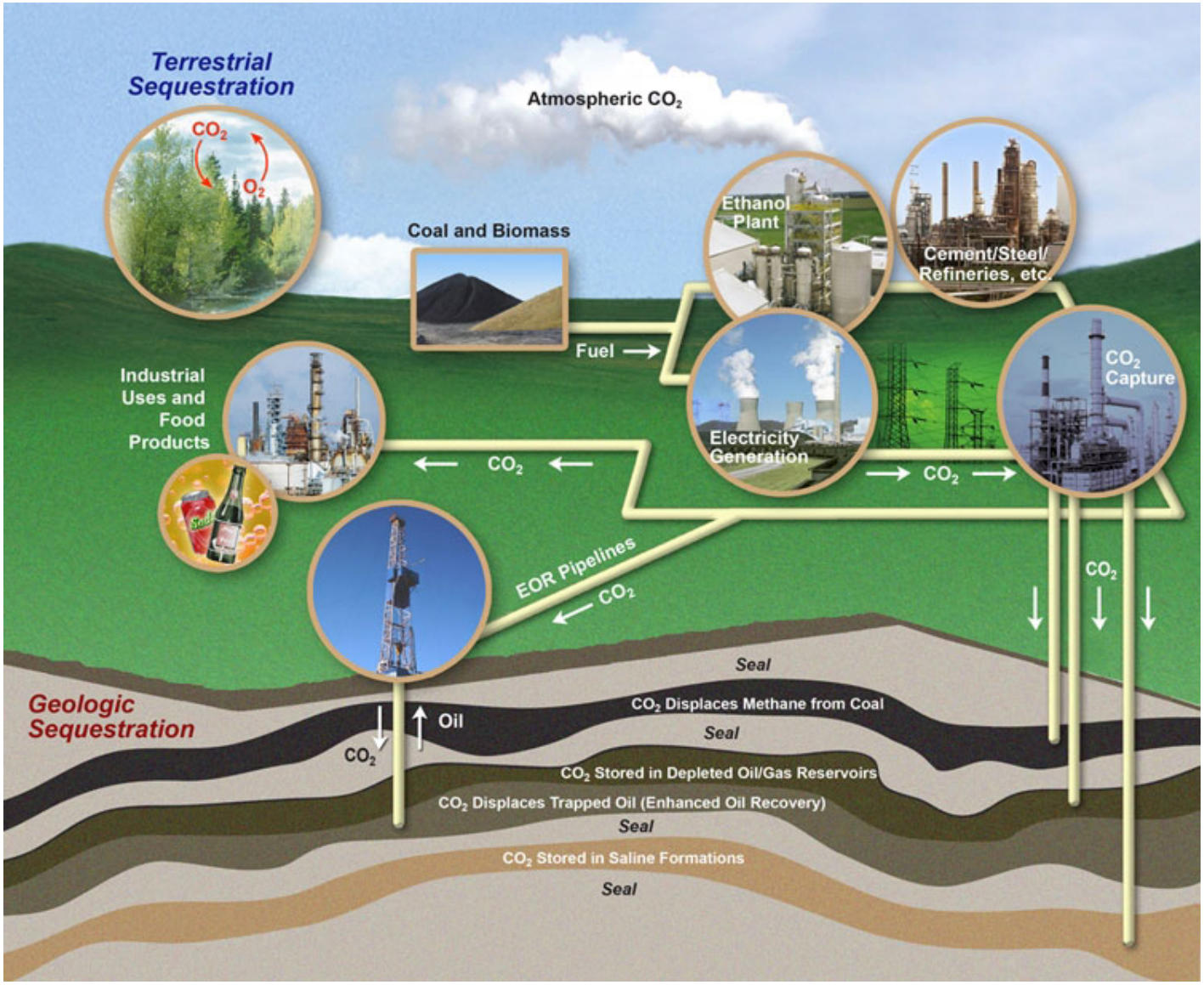
DRAFT FIVE-YEAR STRATEGIC PLAN

- The Institute was established in 2009 as a member owned, not-for-profit organization.
- The Institute has offices in Canberra, Washington DC, Paris, Tokyo and is in the process of establishing a permanent presence in Beijing.
- The Australian Government provided generous seed funding for the Institute to support its set up and early work but funding progressively reduces from 2012-13.
- The Institute is transitioning to a sustainable organization, driven and funded by its Members that will build on its track record to act as the global champion for CCS.
- The draft Five-Year Strategic Plan outlines the Strategic Framework and underlying activities to be pursued by the Institute to accelerate the demonstration and deployment of CCS.
- Following Member feedback the Strategic Plan will be finalised by end 2012.
- Implementation of the new funding and business operations model (e.g. Membership fee levels, processes for Member engagement, etc) will be a major focus in the latter part of 2012 and into 2013 – again with considerable Member consultation.

STRATEGIC PLANNING HIERARCHY OF THE GLOBAL CCS INSTITUTE

SOCIETAL OUTCOMES FROM CCS	Significantly reduce greenhouse gas emissions through CCS Diversity of low carbon-emitting fuel and feedstock choices		
INSTITUTE MISSION	To accelerate the demonstration and deployment of CCS globally		
INSTITUTE STRATEGIC OBJECTIVES	Authoritative knowledge sharing	Fact-based, influential advice and advocacy	Strengthening the capacity for CCS implementation
INSTITUTE OUTCOMES	Increased public understanding and acceptance of CCS	Increased technical readiness of CCS and improved project economics	Increased government support for CCS, with widespread policy adoption

CCS AND CCUS

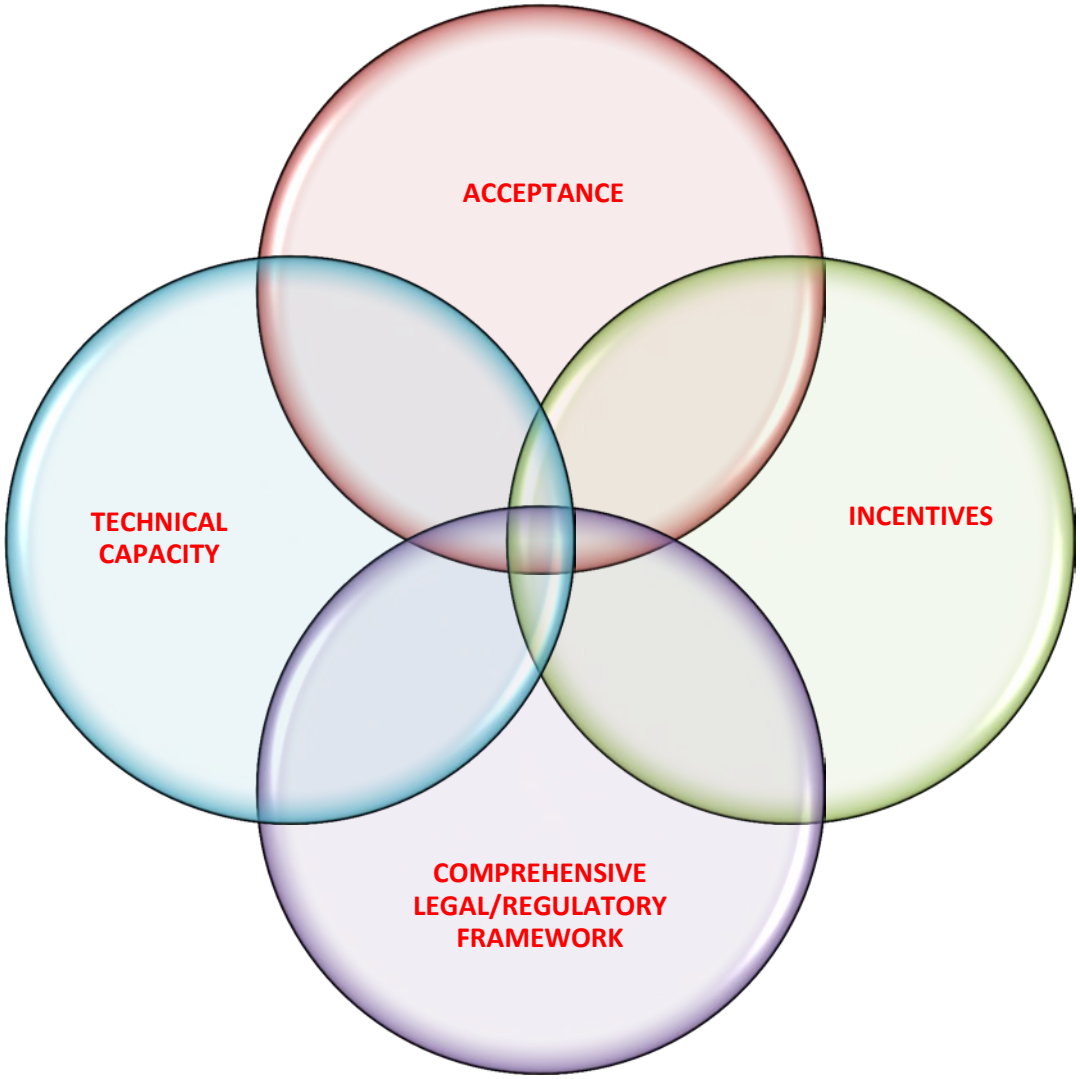


Source: *US Department of Energy*

WHY CARBON CAPTURE AND STORAGE?

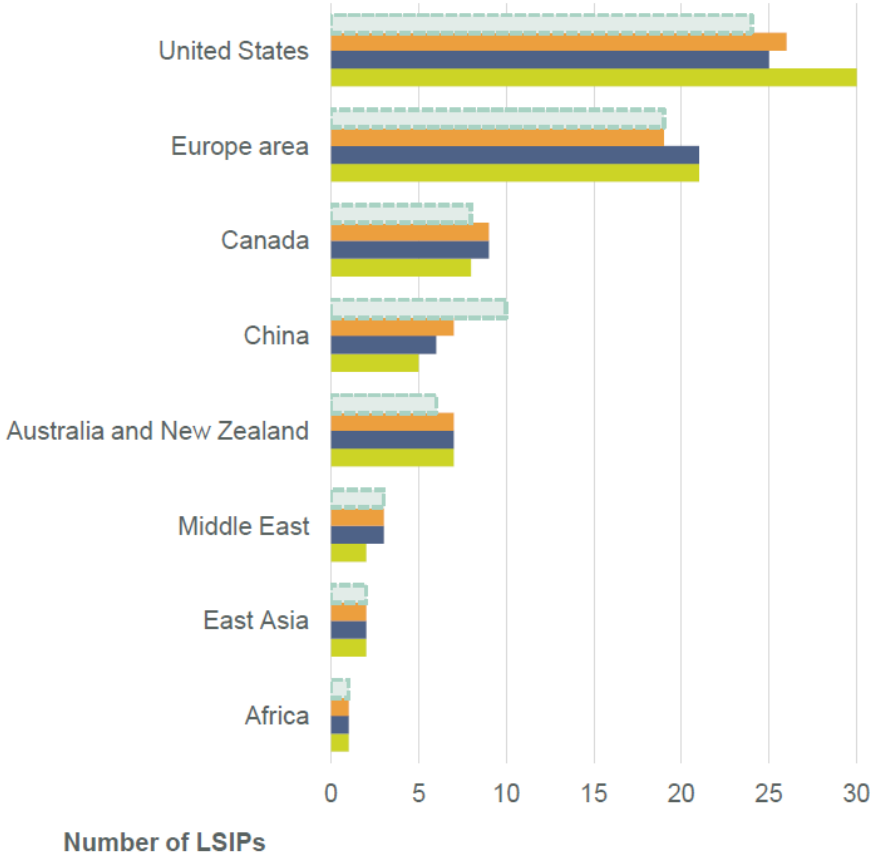
- Copenhagen Accord < 2° C Target.
- CCS could account for approximately one fifth of the emission reduction portfolio.
- Without CCS, costs increase substantially.

CCS DEPLOYMENT – WHAT IT WILL TAKE

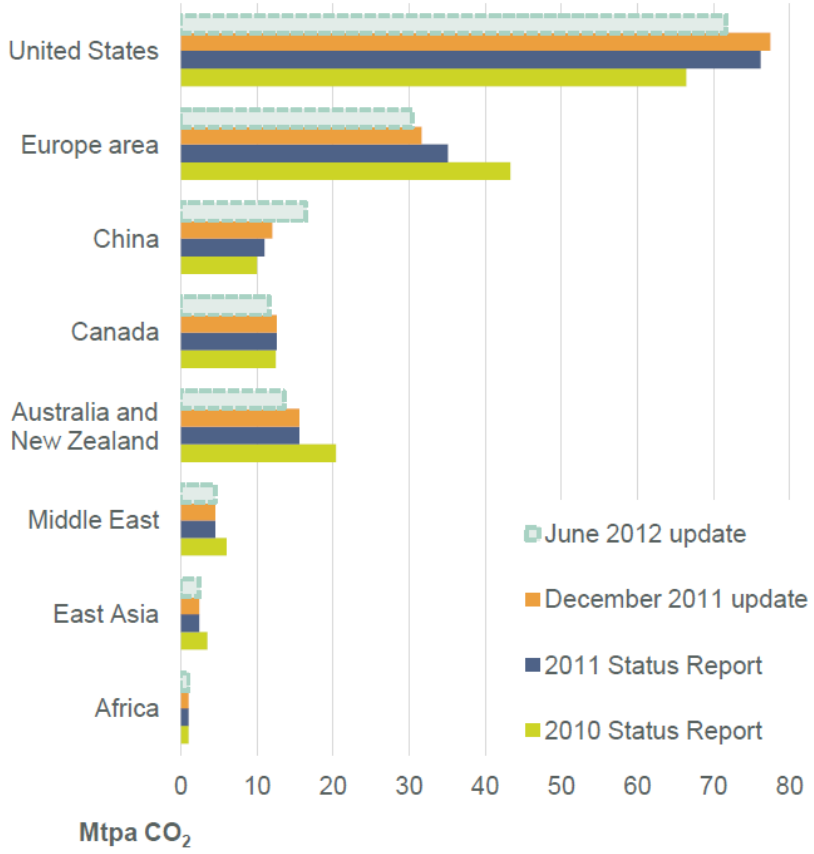


LARGE-SCALE INTEGRATED PROJECTS BY REGION

Number of LSIPs by region since 2012



Actual and potential volume of CO_2 by region since 2012



US DOE DEMONSTRATION PROJECTS

Company	Location	Technology	Storage
Power			
Hydrogen Energy California (HECA)	California	IGCC/polygeneration	EOR
Futuregen Alliance	Illinois	Oxycombustion	Saline
NRG Energy Inc.	Texas	Post-combustion capture	EOR
Southern Company Services	Mississippi	IGCC	EOR
Texas Clean Energy Project (Summit Power)	Texas	IGCC/polygeneration	EOR
Industrial			
Air Products and Chemicals	Texas	CO_2 capture from steam methane reformers	EOR
Archer Daniels Midland	Illinois	CO_2 capture from ethanol production	Saline
Leucadia Energy, LLC	Louisiana	CO_2 capture from methanol production	EOR

CCS BARRIER ISSUES THAT CAN BE ADDRESSED THROUGH A COMPREHENSIVE LEGAL AND REGULATORY FRAMEWORK

- Access
  - Storage sites and pipelines
  - Clarification of pore space ownership
  - Harmonization of storage with other rights
- Air permitting
- Geologic storage permitting
  - Site selection and suitability
  - Financial responsibility/security
  - Measurement, reporting and verification
  - Site closure, certification, abandonment
  - Harmonization with hazardous waste rules
- Long-term liability and stewardship
- Financial support for early movers
  - Grants
  - Tax incentives
  - Loans and Loan Guarantees
  - CCS inclusion in clean energy standards
  - CCS recognition in trading schemes

FEDERAL REGULATORY SCHEME UNDERGROUND STORAGE

Class VI Basics

- Rigorous geologic site characterization.
- Well construction, operation and monitoring requirements.
- Development, implementation and periodic updates of project-specific management plans.
- Periodic re-evaluation of the area of review (≤ 5 years).
- Mechanical integrity testing of injection well, ground water monitoring and CO_2 tracking using direct and indirect methods.
- Post-injection monitoring and site care until it can be demonstrated that USDWs are no longer endangered (50 Yr. default).
- Financial responsibility for corrective action, well plugging, post-injection site care, closure, and emergency and remedial response.
- Considerations for permitting wells that are transitioning from Class II to Class VI.

FEDERAL REGULATORY SCHEME GREENHOUSE GASES

- Prevention of Significant Deterioration (PDS) and Title V Operating Permits for stationary sources
- New Source Performance Standards for Electric Utility Generating Units
- Guidelines for existing units?

PSD AND TITLE V PERMITTING

- Prevention of Significant Deterioration (PSD) Permits
  - Goal is to reduce pollution emitted to atmosphere.
  - Applies to major sources that are newly built or substantially modified.
  - Emission reductions are achieved through the use of Best Available Control Technology (BACT).
  - BACT is determined on a case-by-case basis, and takes into account technical feasibility, cost, and other environmental and energy considerations.
- Title V Operating Permits
  - Intended to improve sources' compliance with other CAA requirements.
  - Does not add new pollution control requirements, but requires that each permit contain all air quality control requirements or "applicable requirements" required under the CAA (*e.g. NSPS and SIP requirements, including PSD).*
- Tailoring Rule: Phased application starting with largest facilities

WHAT DOES PSD PERMITTING MEAN FOR CCS?

- PSD permitting includes a 5-step, top-down analysis for BACT
  - Step 1: Identify all available control technologies.
  - Step 2: Eliminate technically infeasible options.
  - Step 3: Evaluate and rank remaining control technologies based on environmental effectiveness.
  - Step 4: Evaluate cost effectiveness of controls and energy, and other environmental impacts.
  - Step 5: Select the BACT.

- EPA's March 2011 permitting guidance identifies CCS as an add-on pollution control technology that is 'available' for facilities emitting CO_2 in large amounts and should be listed as an option at Step 1 of the BACT process.

- If the permitting authority eliminates the option at some later point in the process, the grounds for doing so should be reflected in the record with an appropriate level of detail.

NSPS FOR ELECTRIC UTILITY GENERATING UNITS

- EPA proposed a standard of 1,000 pounds of CO_2 per megawatt-hour for GHG emissions from new electric generating units.
- Coal-fueled power plants could not meet the standard without CCS.
- 'Transitional' units that have permits and start construction within 12 months of the EPA proposal are not subject to the rule.
- New power plants that use CCS would have the option to use a 30-year average of CO_2 emissions to meet the proposed standard, rather than meeting the annual standard each year.

GUIDELINES FOR EXISTING UNITS

TBD

STATE ACTION TO FILL GAPS

A number of states have enacted legislation to address barrier issues.

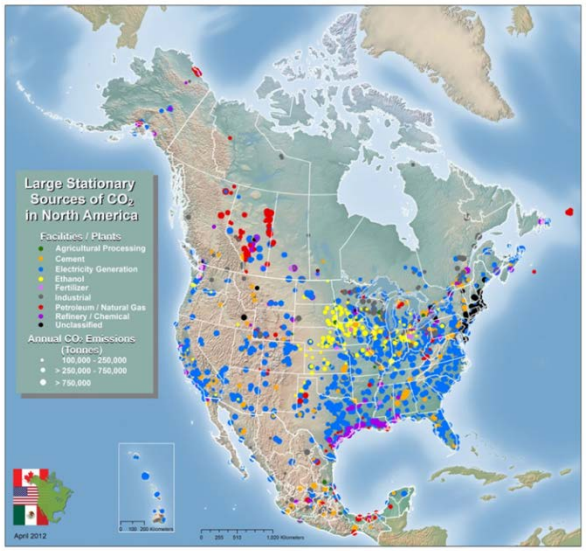
Examples include:

- North Dakota, Montana and Louisiana law provides for transfer of liability to the state after a post-injection monitoring period;
- Louisiana law provides eminent domain authority for CCS pipeline and storage projects;
- Wyoming, North Dakota and Montana law presumes title to pore space is vested in the surface owner;
- North Dakota law creates a mechanism to amalgamate property interests in a storage facility;
- Texas law authorises the state to develop state-owned offshore storage facilities which the state may make available on a fee basis;
- States have established tax credits and other incentives for CCS; and
- States have harmonized storage rights with the rights of the mineral estates.

WHERE DOES THE US GO FROM HERE?

- Federal support for CCS demonstration projects has been generous in the past.
- But incentives for new early adopters are limited and do not bridge the CCS cost gap in most applications.
- There currently exists no policy or market driver that encourages CCS use.
- Which leads to the question – how does the US keep moving forward on CCS?

ONE ANSWER MAY BE CO_2-EOR/CCUS

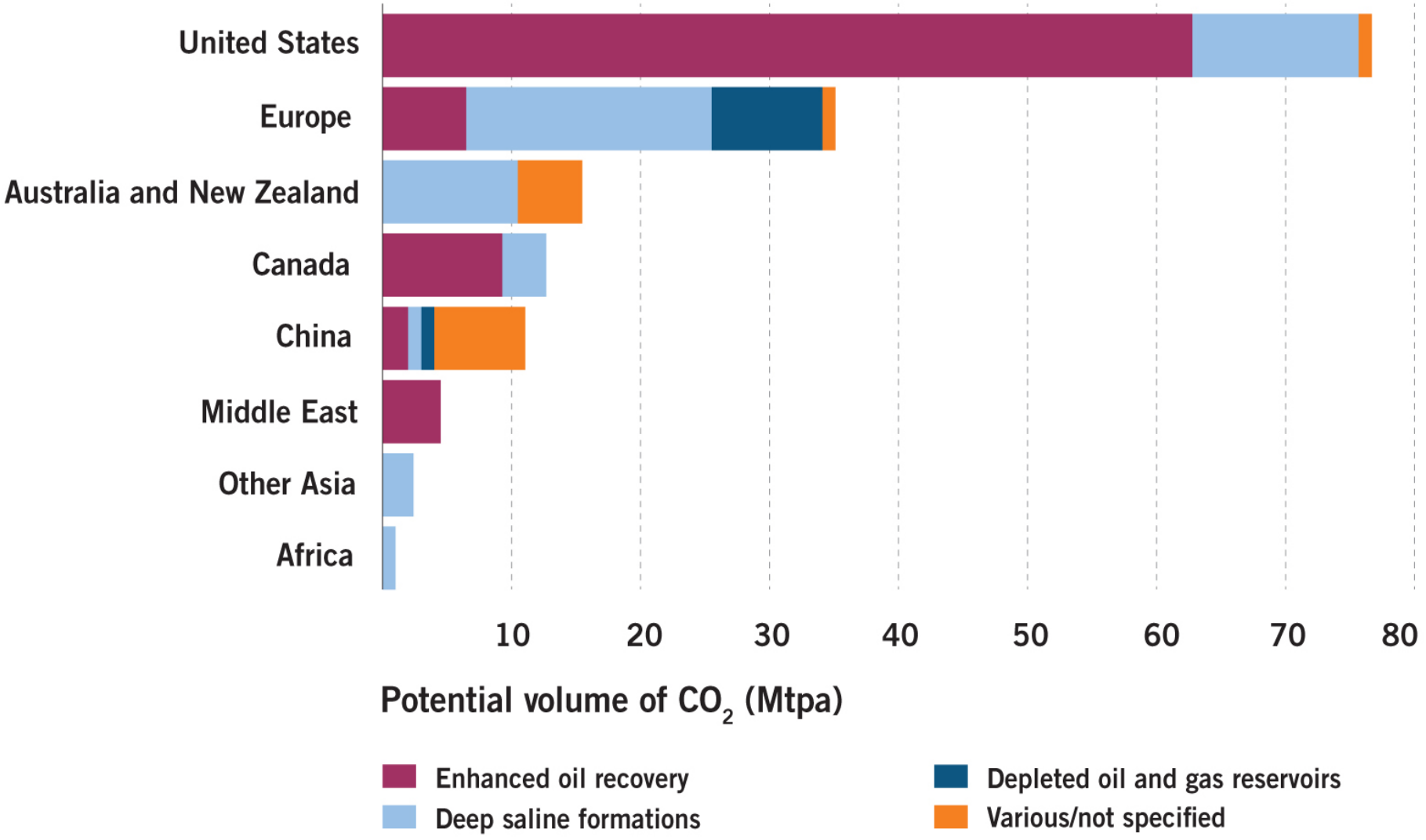


North American Carbon Storage Atlas 2012

KEY NUMBERS	
US CO_2 storage potential for oil and gas reservoirs	120 Gt[1]
US annual CO_2 emissions from large stationary sources	3 Gt[1]
Economically recoverable oil - Current EOR technology - Next generation technology	 27 BBl[2] 67 BBl[2]
Potential shortfall in available CO_2 for EOR	18 Gt[2]
Potential value to the US economy	$8 -12 Trillion[3]

[1] *North American Carbon Storage Atlas 2012*
[2] *Improving Domestic Energy Security and Lowering CO2 Emissions with "Next Generation" CO2-Enhanced Oil Recovery (CO2-EOR).* V. Kuuskraa et.al., (DOE/NETL Report 2011/1504)
[3] *Enhanced Oil Recovery & CCS* , L. D. Carter, (USCSC 2011)

REGIONAL LARGE-SCALE STORAGE PROJECTS BY VOLUME AND TYPE



RECENT STUDIES HAVE SUGGESTED A FEDERAL TAX CREDIT FOR CO2-EOR/CCUS

- The credit would be structured to:
  - Supplement revenue received from CO_2 sales.
  - Subsidize CO_2 capture/transport
  - Bridge the CCS cost-gap
- Analysis shows that the credit could be revenue positive due to additional federal tax revenue from increased domestic oil production

RECOMMENDED READING

- *Carbon Dioxide Enhanced Oil Recovery: A Critical Domestic Energy, Economic, and Environmental Opportunity,* (NEORI 2012).
- *An Early Deployment Strategy for Carbon Capture Utilization and Storage (CCUS) Opportunities, L.D. Carter,* (USCSC, 2012).
- *Harnessing Coal's Carbon Content to Advance the Economy, Environment, and Energy Security,* (National Coal Council, 2012).
- *Accelerating the Uptake of CCS: Industrial Use of Captured Carbon Dioxide,* (Global CCS Institute, 2011).

www.globalccsinstitute.com