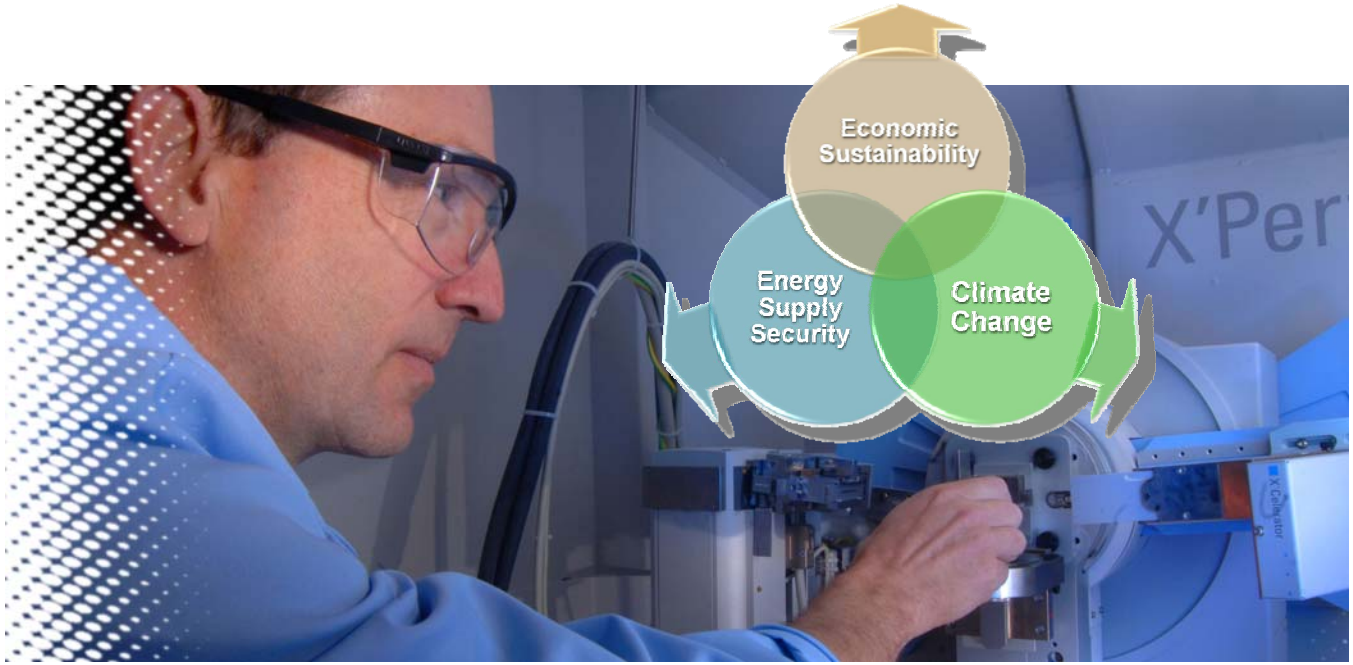
NATIONAL ENERGY TECHNOLOGY LABORATORY

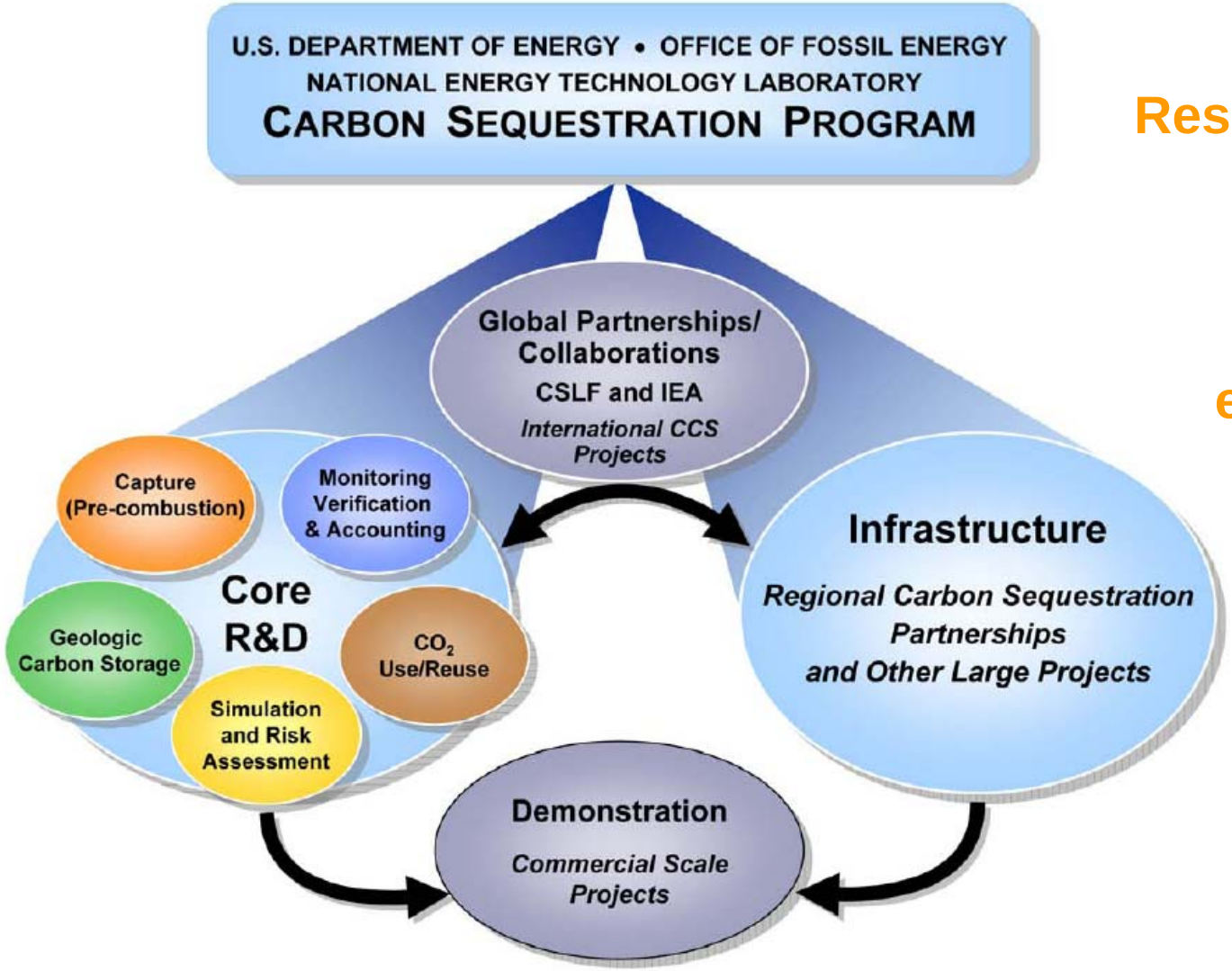


DOE's Regional Carbon Sequestration Partnerships

Dawn Deel

Project Manager – Sequestration Division

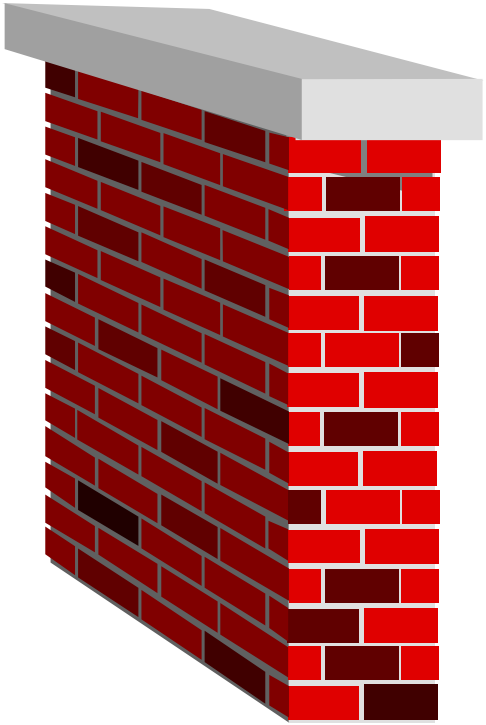
DOE's Sequestration Program Structure



Research is needed to reduce incremental costs and improve effectiveness of CCS

Key Challenges to Carbon Capture and Storage

- **Cost of CCS**
- **Sufficient Storage Capacity**
- **Permanence**
- **Best Practices**
- **Regulatory Framework**
- **Permitting**
- **Liability**
- **Ownership**
  - pore space/CO_2
- **Infrastructure**
- **Public Acceptance (NIMBY → NUMBY)**
- **Human Capital Resources**



Program helping to address challenges –specific projects, participation in working groups, and through Regional Partnerships

Regional Carbon Sequestration Partnerships

Characterization Phase

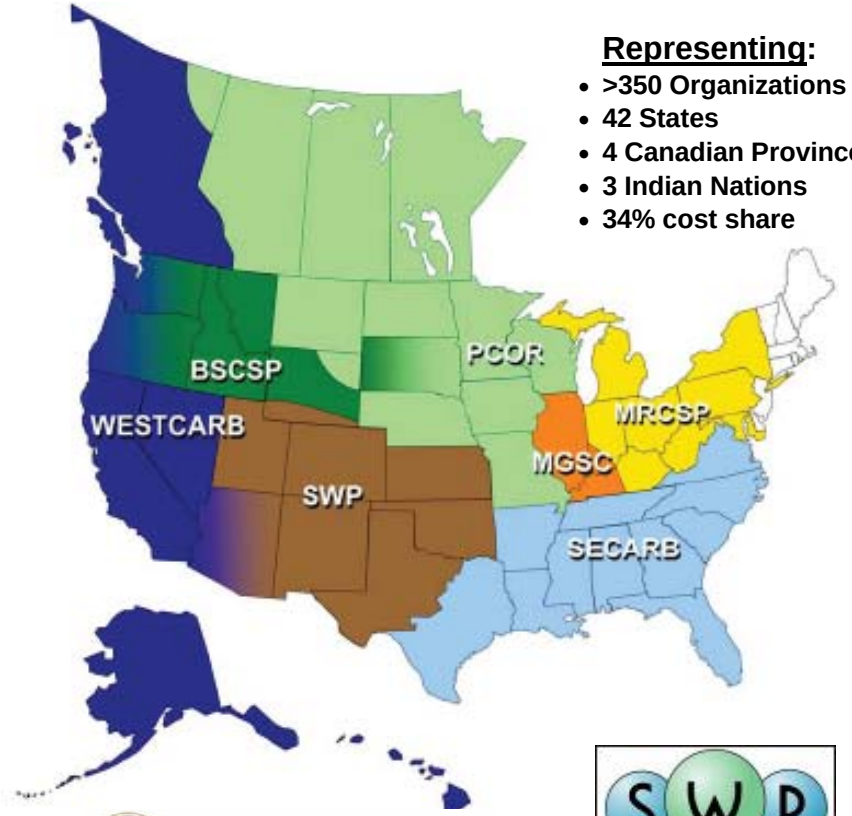
- 24 months (2003-2005)
- $16M DOE funds

Validation Phase

- 4 years (2005 - 2009)
- 7 Partnerships (42 states)
- 24 geologic field validation tests
- $112M DOE funds

Development Phase

- 10 years (2008-2017)
- Several large injection tests in different geology



Representing:

- **>350 Organizations**
- **42 States**
- **4 Canadian Provinces**
- **3 Indian Nations**
- **34% cost share**

BIG SKY CARBON SEQUESTRATION PARTNERSHIP

SWP SOUTHWEST PARTNERSHIP CO_2 SEQUESTRATION

MRCSP MIDWEST REGIONAL CARBON SEQUESTRATION PARTNERSHIP

PCOR Partnership — EERC — Plains CO_2 Reduction Partnership

SECARB Southeast Regional Carbon Sequestration Partnership

MGSC

WEST COAST REGIONAL CARBON SEQUESTRATION PARTNERSHIP westcarb.org

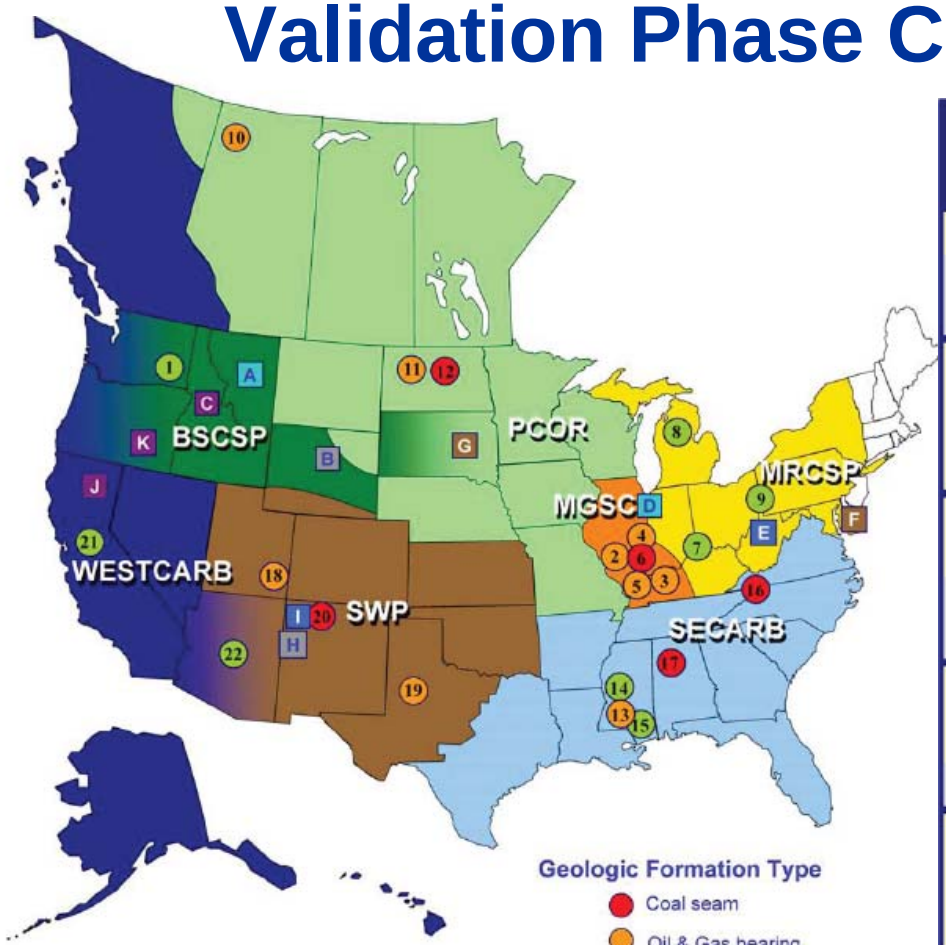
Regional Partnership Goals

- **Develop necessary infrastructure to demonstrate large-scale geologic sequestration technologies across North America**

- **Demonstrate safe CO_2 storage during pilot-scale and large-scale injection tests**
  - Verify plume location via monitoring
  - Predict plume fate via modeling

- **Generate results that assist regulators and policy-makers**

Validation Phase CO_2 Storage Projects



Geologic Formation Type

- Coal seam
- Oil & Gas bearing
- Saline formation

Terrestrial Project Categorization

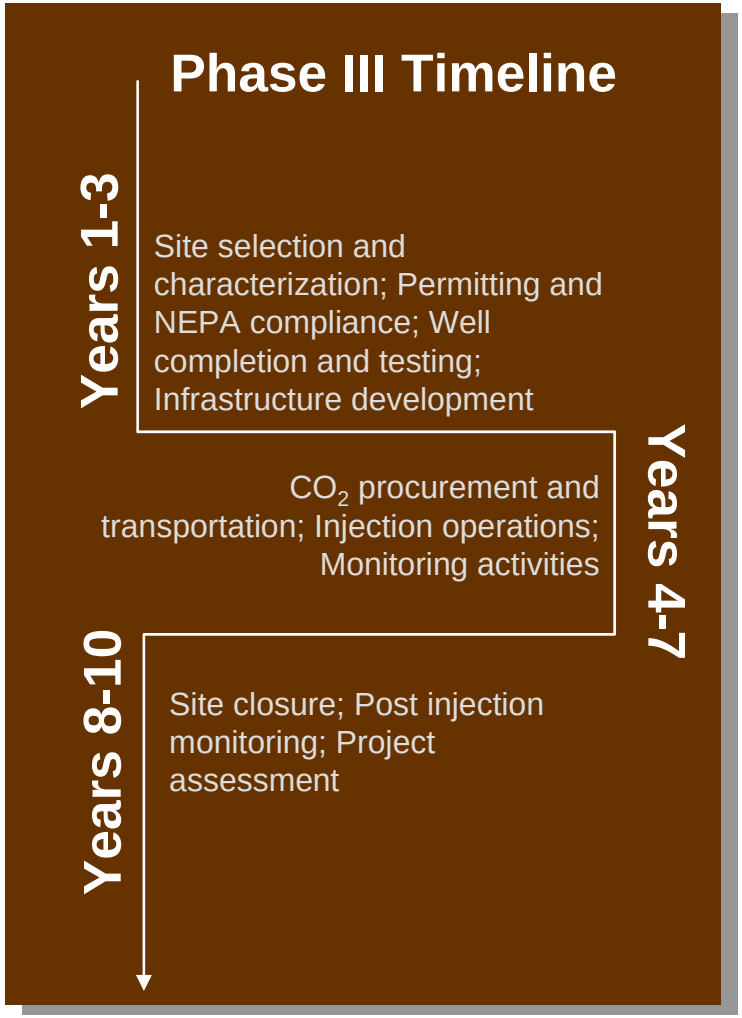
- Agricultural Soils
- Soil Reclamation
- Afforestation/Forest Treatment
- Regional Carbon Budget
- Wetlands Reclamation

	Partnership	Geologic Province / Project Location	Geologic: Total CO_2 Injection (tons CO_2)	Geologic: Approximate Depth (feet)	Terrestrial: Estimated CO_2 Capacity
1		Columbia Basin	3,000	2,500 – 4,000	
A	Big Sky Carbon Sequestration Partnership	North Central MT			60 Mt over 20 years
B		Eastern WY			30 MT over 10 years
C		Region-wide			640 - 1,040 Mt over 80 yrs
2	MGSC	Illinois Basin	50	1,550	
3		Illinois Basin	1,000	1,549	
4		Illinois Basin	3,000	1,548	
5		Illinois Basin	3,000	1,551	
6		Illinois Basin	200	1,000	
7	MRCSP	Cincinnati Arch	3,000	3,200 – 3,500	
8		Michigan Basin	10,000	3,200 – 3,500	
9		Appalachian Basin	3,000	5,900 – 8,300	
D		Region-wide			25 Mt over 20 years
E		Region-wide			100 Mt over 20 years
F		Cambridge, MD			TBD
10		Keg River Formation	100,000	5,000	
11	The Plains CO2 Reduction Partnership PCOR	Duperow Formation	<1,000	10,000 – 10,500	
12		Williston Basin	<1,000	1,600 – 1,800	
G		Great Plains wetlands complex (PPR)			14.4 Mt
13	SECARB	Gulf Coast (stacked test)	500,000	10,304	
14		Gulf Coast (stacked test)		10,400	
15		Mississippi Coastal Plain	3,000	8,600	
16		Central Appalachian	1,000	1,600 – 2,300	
17		Black Warrior Basin	1,000	1,500 – 2,500	
18	SWP Southwest Partnership on Carbon Sequestration	Paradox Basin, Aneth Field	450,000	5,600 – 5,800	
19		Permian Basin	900,000	5,800	
20		San Juan Basin	75,000	3,000	
H		Region-wide			TBD
I		San Juan Basin Coal Fairway (Navajo City, NM)			TBD
21	West Coast Regional Carbon Sequestration Partnership westcarb.org	Sacramento Basin	2,000	8,000	
22		Colorado Plateau	2,000	4,000	
J		Shasta County, CA			4,600 Mt over 80 years (CA)
K		Lake County, OR			900 Mt over 80 years (OR)

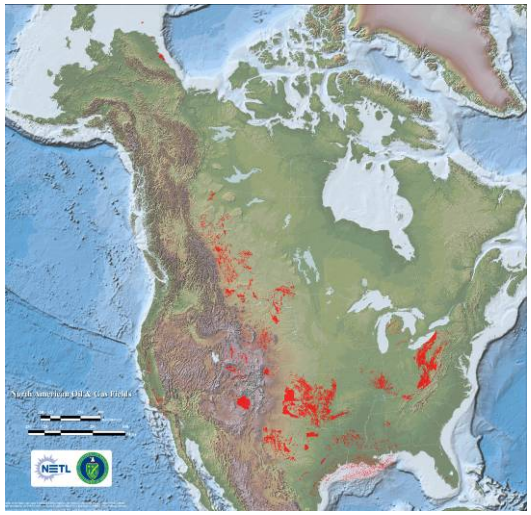
Development Phase

Scaling Up Towards Commercialization

- FY 2008-2017 (10 years)
- Development of large-scale (> 1 million tons CO_2) CCS projects across North America
- Research geologic formations representative of relatively large storage capacity for each Region *(saline formations)*
- Maximize CO_2 injection volumes that fully utilize the infrastructure of the Region

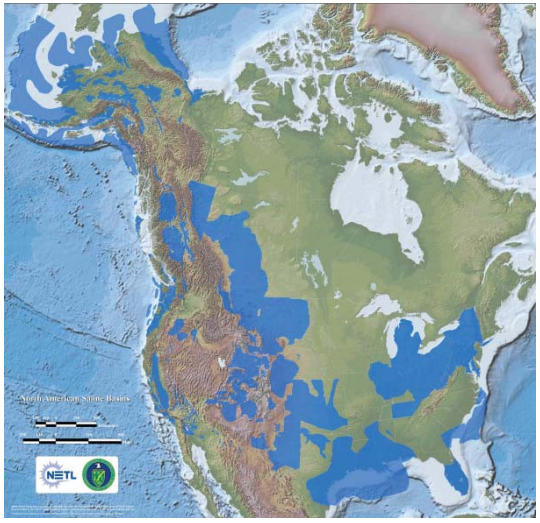


Potential CO_2 Resource Estimates



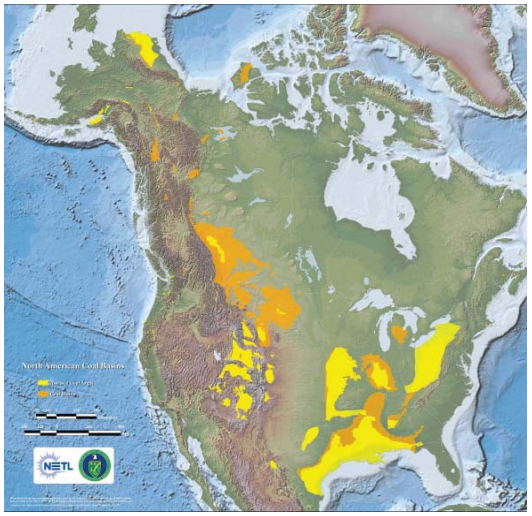
Oil and Gas

140 billion metric tons



Saline

3,300 – 12,600 billion metric tons



Coal

160-180 billion metric tons

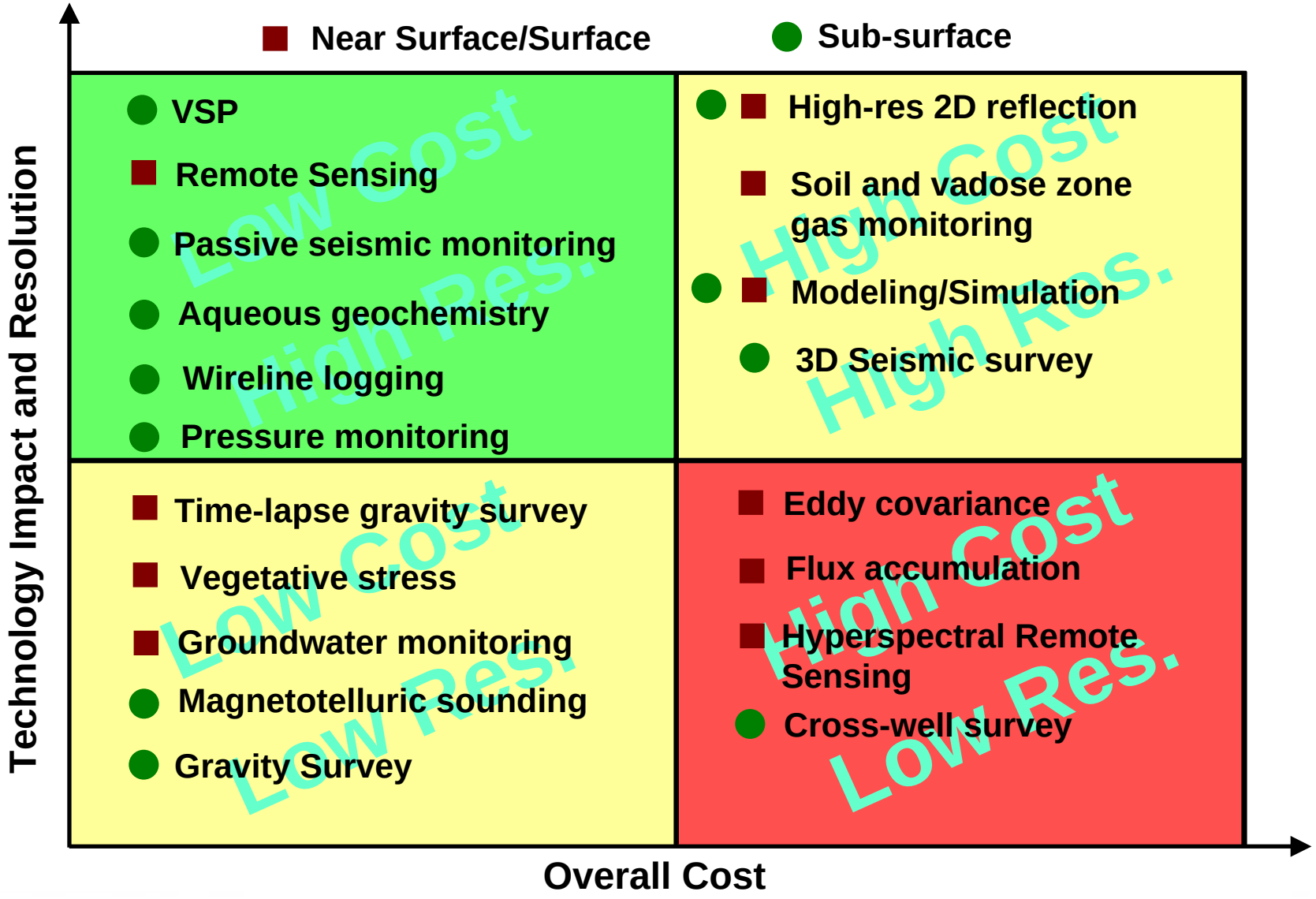
CCS Best Practice Manuals

- **Phase II (2008-2009)**
  - Monitoring Verification and Accounting (Dec 2008)
  - Site characterization (2009)
  - Simulation and Risk Assessment (2009)
  - Well construction and closure (2009)
  - Regulatory Compliance
  - Public Education

- **Phase III Updates**

MVA Best Practices Being Developed

Over 40+ technologies being investigated



Summary

- **DOE's Carbon Sequestration Program - reducing incremental costs of CCS and improving effectiveness**
- **Regional Carbon Sequestration Partnerships – completing pilot scale injections (best practices) - performing large-volume injections (capacity and model validation)**
- **Ready for cost-effective commercial deployment of CCS by 2020**

Thank you