

# Kansas Carbon Capture Utilization and Storage Task Force

Eugene Holubnyak, Jennifer Hollenbach, Chris Steincamp  
Tiraz Birdie, Franek Hasiuk

15<sup>th</sup> October 2019

Third Carbon Capture, Utilization, and Storage in Kansas Conference  
Beren Petroleum Conference Center, Lawrence, KS

# Outline

- Carbon Capture Utilization and Storage (CCUS) in Kansas
- Kansas – strategic region for future CCUS infrastructure
- Developing CCUS marketplace
  - Challenges and opportunities
  - Creating competitive advantages for the state

# Carbon SAFE Phase I – Project Team

## Project Management & Coordination, Geological Characterization

### Kansas Geological Survey

University of Kansas

Lawrence, KS

Tandis Bidgoli, PI, Assistant Scientist  
Lynn Watney, Senior Scientific Fellow  
Eugene Holubnyak, Research Scientist  
K. David Newell, Associate Scientist  
John Doveton, Senior Scientific Fellow  
Susan Stover, Outreach Manager  
Mina FazelAlavi, Engineering Research Asst.  
John Victorine, Research Asst., Programming  
Jennifer Hollenbah - CO2 Programs Manager

### Improved Hydrocarbon Recovery, LLC

Lawrence, KS

Martin Dubois, Joint-PI, Project Manager

## Energy, Environmental, Regulatory, & Business Law & Contracts

### Depew Gillen Rathbun & McInteer, LC

Wichita, KS

Christopher Steincamp, Attorney at Law  
Joseph Schremmer - Attorney at Law

## Policy Analysis, Public Outreach & Acceptance

### Great Plains Institute

Minneapolis, MN

Brendan Jordan, Vice President  
Brad Crabtree, V.P. Fossil Energy  
Jennifer Christensen, Senior Associate  
Dane McFarlane, Senior Research Analystist

### Kansas Oil & Gas Operators

#### Blake Production Company, Inc. (Davis Ranch and John Creek fields)

Austin Vemon, Vice President

#### Knighton Oil Company, Inc. (John Creek Field)

Earl M. Knighton, Jr., President

#### Casillas Petroleum Corp. (Pleasant Prairie Field)

Chris K. Carson, V.P. Geology and Exploration

#### Berexco, LLC

#### (Wellington, Cutter, and other O&G fields)

Dana Wreath, Vice President

#### Stroke of Luck Energy & Exploration, LLC (Leach & Newberry fields)

Ken Walker, Operator

## CO2 Source Assessments, Capture & Transportation, Economic Feasibility

### Linde Group (Americas Division)

Houston, TX

Krish Krishnamurthy, Head of Group R&D  
Kevin Watts, Dir. O&G Business Development

### CO2 Sources

#### Westar Energy

Brad Loveless, Exec. Director Environ. Services  
Dan Wilkus, Director - Air Programs  
Mark Gettys, Business Manager

#### Kansas City Board of Public Utilities

Ingrid Seltzer, Director of Environmental Services

#### Sunflower Electric Power Corporation

Clare Gustin, V.P. Member Services & Ext. Affairs

#### CHS, Inc. (McPherson Refinery)

Richard K. Leicht, Vice President of Refining  
Rick Johnson, Vice President of Refining

### Regulatory

#### Kansas Department of Health & Environment

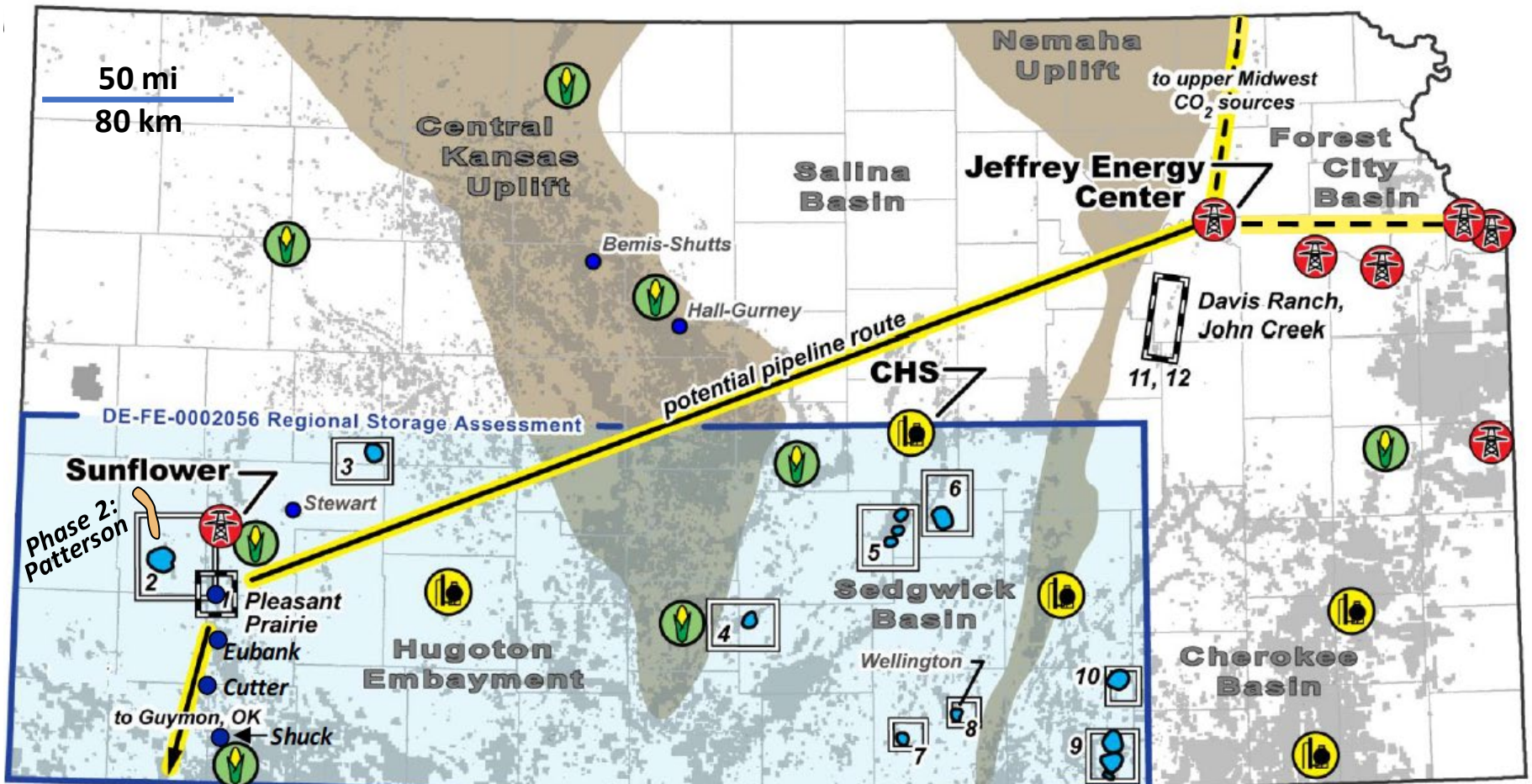
##### Division of Environment

John W. Mitchell, Director


##### Bureau of Air


John W. Mitchell, Director


# Why CCUS in Kansas




 coal-fired power plant


 petroleum refinery or manufacturing plant (cement & fertilizer)


 ethanol plant

 proposed geologic storage complex

 geologic storage complex study area and closure

 oil and gas fields

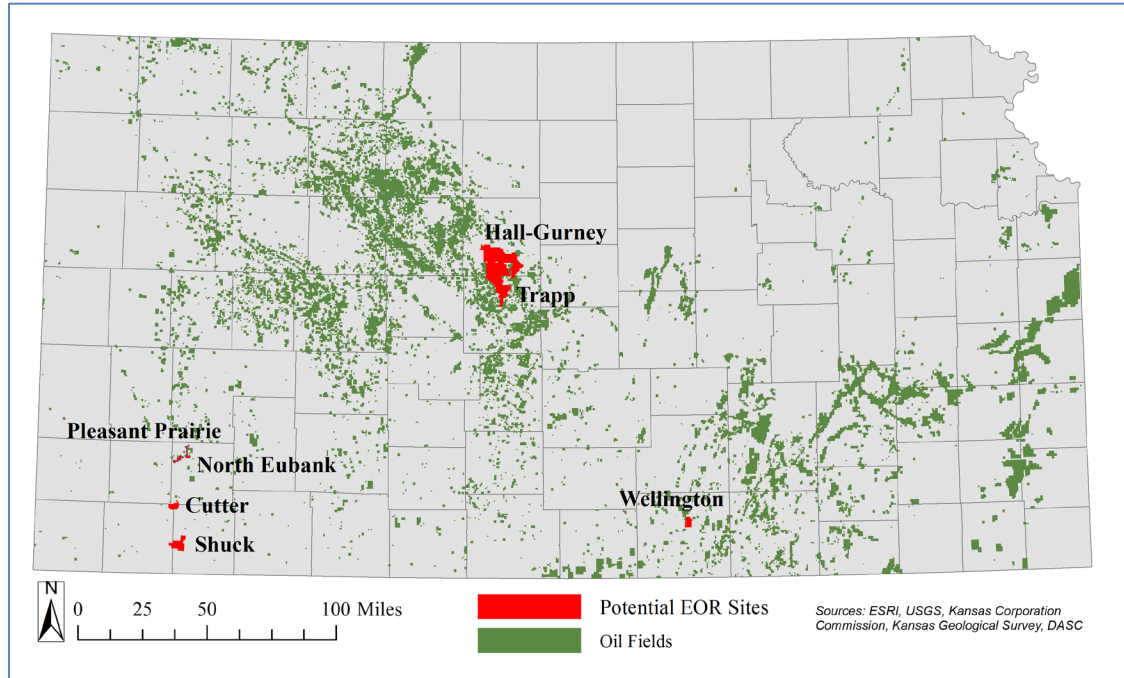
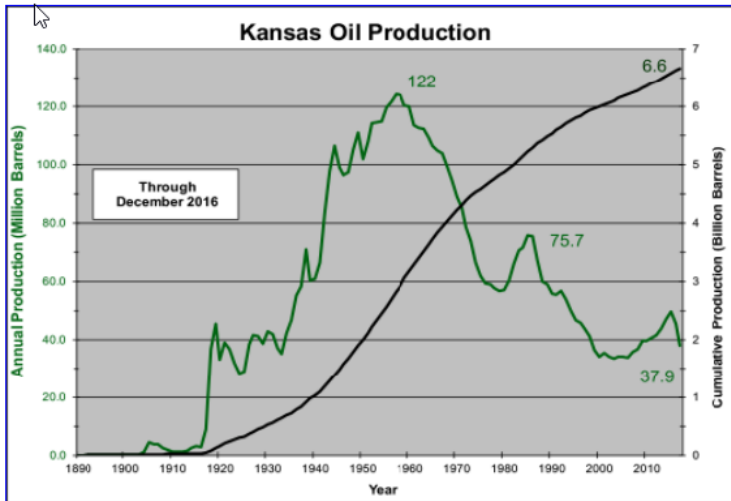
 prior DOE site characterization study

 proposed phase 2 site: Patterson



# Why CO<sub>2</sub> EOR in Kansas

Oil fields and potential Enhanced Oil Recovery sites in Kansas



Tertiary oil recovery potential of CO<sub>2</sub>-ready sites in Kansas

	CO <sub>2</sub> EOR Ready Level	Inject. Rate (Mt/yr)	CO <sub>2</sub> Stored (Mt)	Primary & Secondary (mmbo)*	CO <sub>2</sub> EOR (mmbo)	Basis for Estimate
Shuck	1	0.4	1.5	7.9	3.6	DE-FE000256
Cutter	1	0.5	1.3	5.4	2.8	DE-FE000256
N Eubank	1	0.6	1.5	7.4	4.6	DE-FE000256
Pleasant Prairie	1	0.3	0.5	4.7	2.2	DE-FE000256
Hall Gurney	1	1	11.3	62.5	26.8	DE-AC26-008C15124 PILOT & C12 Ener
Trapp	2	0.5	4.3	31.3	10.3	KGS reports
Wellington	1	0.6	2.2	16.2	5.3	DE-FE0002056 and PILOT
		<b>3.9</b>	<b>22.8</b>	<b>135.4</b>	<b>55.7</b>	

Basin	EOR potential (Mil bbl)	Net CO <sub>2</sub> Demand (MMT)	Direct Jobs Created
Illinois/Indiana	500	160 – 250	1,550 – 3,100
Ohio	500	190 – 300	1,550 – 3,100
Michigan	250	80 – 130	800 – 1,800
<b>Kansas</b>	<b>750</b>	<b>240 – 370</b>	<b>2,300 – 4,600</b>
<b>TOTALS</b>	<b>2,000</b>	<b>670 – 1,050</b>	<b>6,200 – 12,400</b>

# 45Q tax credits are a gamechanger

45Q tax credits make CCUS projects economically feasible.

- Up to \$35/tonne for EOR and \$50/tonne for saline aquifer storage for CO<sub>2</sub> injected and stored

Kansas operators are well-positioned

- Kansas candidate oil fields have been delineated
- Within pathway of possible large-scale CO<sub>2</sub> pipeline system

CO<sub>2</sub> captured in NE and KS ethanol plants could be transported to Kansas oil fields cheaply - \$14 per tonne (\$0.75/mcf).

- Kansas oil production could **increase by 28% (10 million BO/yr)** through EOR

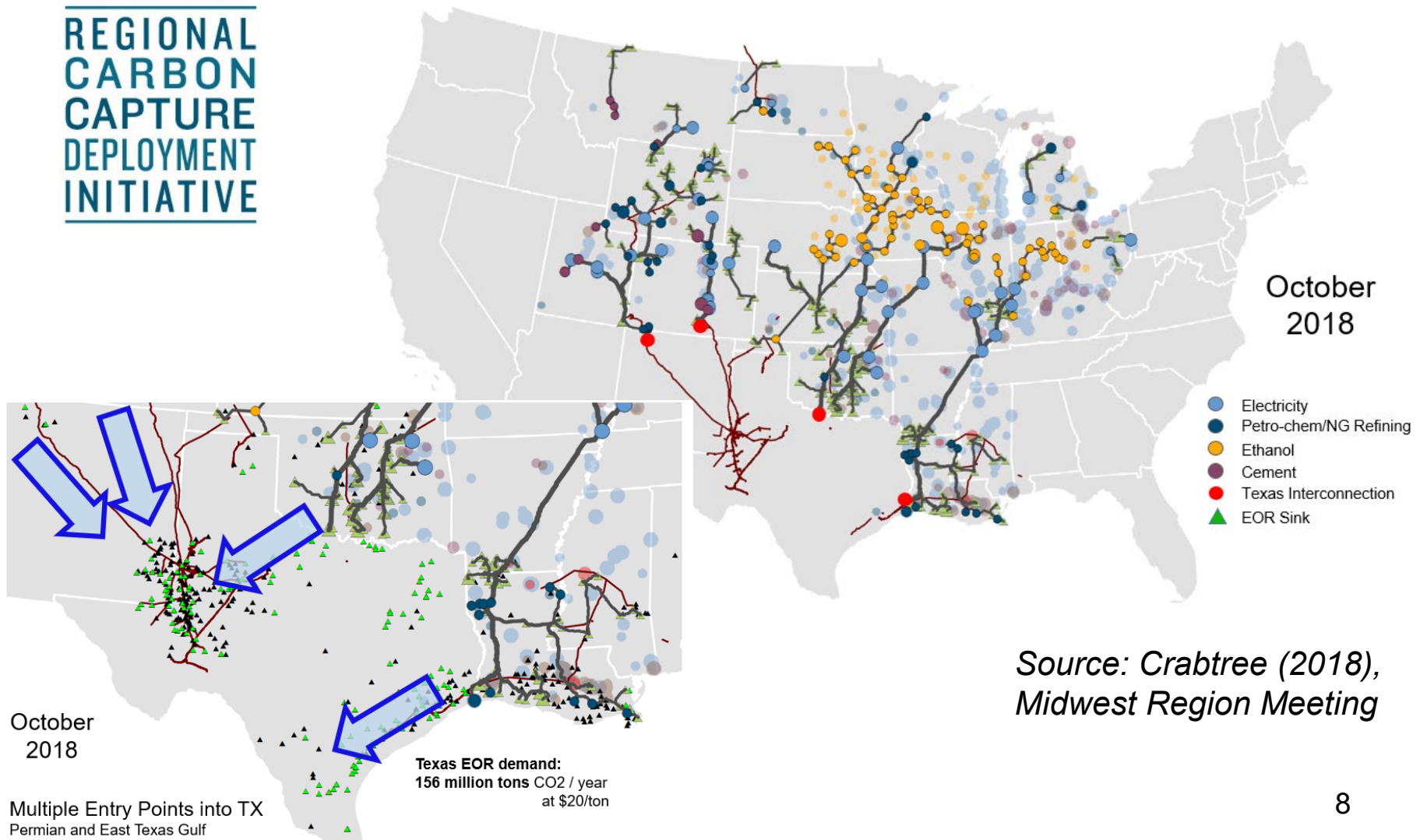
# Plausible Kansas business scenarios and their economics

- Three scenarios of varying scale
  1. Point-to-point (ethanol plant to oil field)
  2. Kansas-Nebraska system (15 ethanol plants to Kansas oil fields)
  3. Regional pipeline system with off ramps in KS (Midwest gathering system – delivery to West Texas)
- EOR, saline aquifer storage, until new technologies enter the market

# Initial mapping analysis

## State CO<sub>2</sub> EOR Deployment Work Group

REGIONAL  
CARBON  
CAPTURE  
DEPLOYMENT  
INITIATIVE



Source: Crabtree (2018),  
Midwest Region Meeting



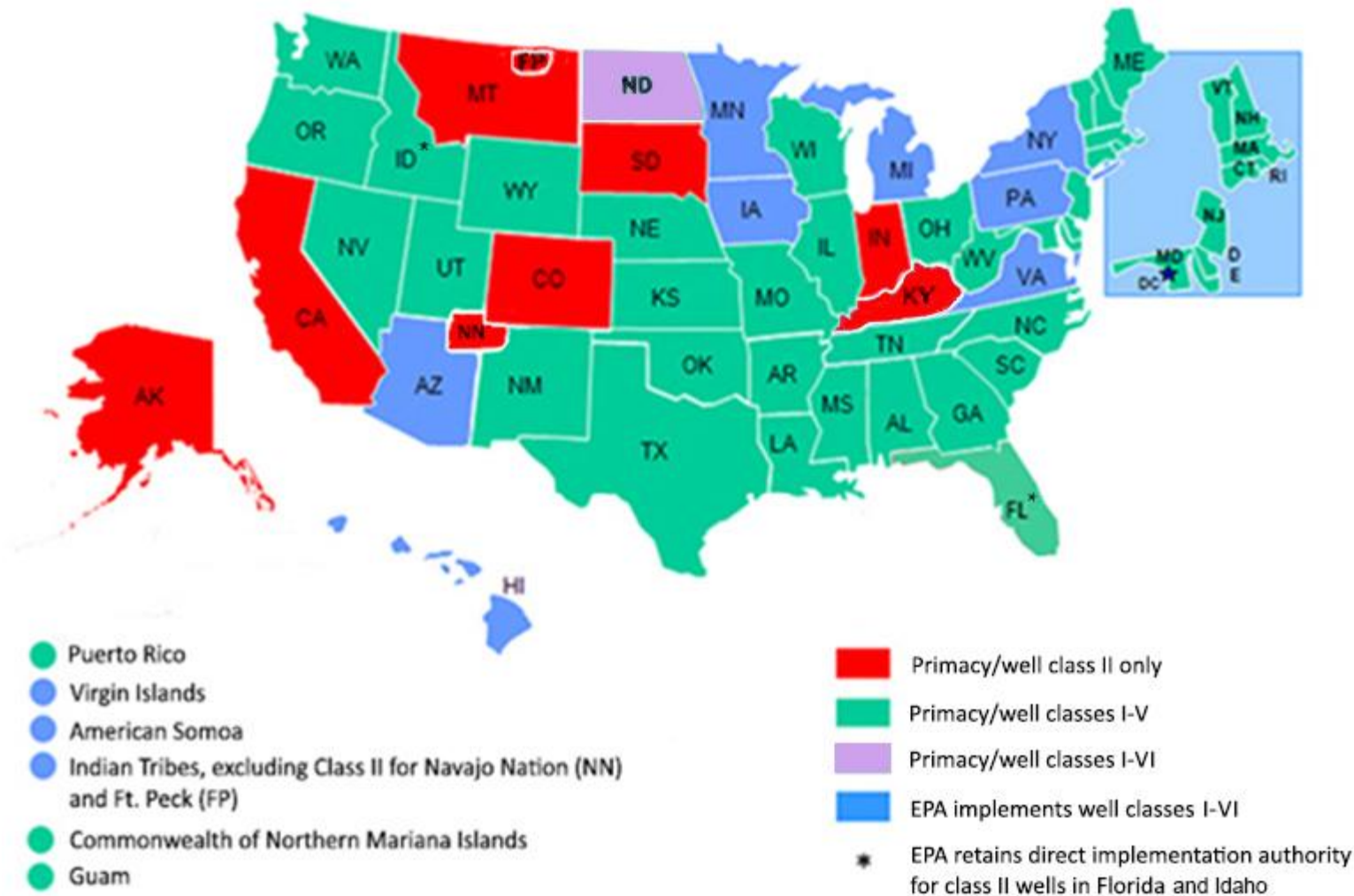
# Challenges and Opportunities

- **Legislation to regulate capture, transportation, injection and storage**
- **Allowances for eminent domain to be used for pipeline right-of-way and pooling of pore space**
- **Streamlining the U.S. EPA UIC Class VI well permit process**
  - state primacy would further support development of commercial-scale CCS
- **Effective public outreach is critical for support of State regulatory changes, and for public acceptance**
  - induced seismicity
  - economic impact and opportunity

# Key Points for Discussion and Action

- KGS is taking a lead in guiding regional stakeholders to enable CCUS projects
- Policy and regulatory changes needed for CCUS deployment in KS
  - Draft Statues
  - Meetings: September 17<sup>th</sup> and October 14<sup>th</sup>
  - Finalize by January, 2020
  - Comments are welcome
- UIC Class VI primacy
  - Example of ND, WY, and LA – invite for discussion
- 48A tax credits
  - Discussion with **Shannon Angielski** being scheduled
    - Carbon Utilization Research Council Executive Director
- 45Q tax credits and California's Low Carbon Fuel Standard
- Other discussion topics are welcome
- Please, support this initiative and sign **Call to Action**
- Development of a Kansas CCUS Industry Consortium

# Primary Enforcement Authority for the Underground Injection Control Program



Questions?

