

# **CCUS Roadshow**



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- Overview of Kinder Morgan
- CO<sub>2</sub> Source and Transportation
- Planning, Specifications, Compliance
- KM Outlook and Support for CCUS

- Natural Gas Transmission
- Products Pipelines
- Terminals
- ✤ CO<sub>2</sub>



## **OUR VISION**

Delivering Energy to Improve Lives and Create a Better World



Unparalleled and irreplaceable asset footprint built over decades

#### Largest natural gas transmission network

- ~70,000 miles of natural gas pipelines
- 657 Bcfd of working storage capacity
- Connected to every important U.S. natural gas resource play and key demand centers
- Move ~40% of natural gas consumed in the U.S.

## Largest independent transporter of refined products

- Transport ~1.7 mmbbld of refined products
- ~6,900 miles of refined products pipelines
- ~5,800 miles of other liquids pipelines (crude and natural gas liquids)

#### Largest independent terminal operator

- 147 terminals
- 16 Jones Act vessels

### Largest transporter of CO<sub>2</sub>

Transport ~1.2 Bcfd of CO<sub>2</sub>

### Leading infrastructure provider across multiple critical energy products





### **CO<sub>2</sub> Segment Overview**



World class, fully-integrated assets  $| CO_2$  source to crude oil production and takeaway in the Permian Basin

	CO <sub>2</sub> Reserves	KMI Interest	NRI	Location	Remaining Deliverability	(tcf)
⊢	McElmo Dome	45%	37%	SW Colorado	20+ years	22.0
Ř	Doe Canyon	87%	68%	SW Colorado	10+ years	3.0
õ	Bravo Dome <sup>(a)</sup>	11%	8%	NE New Mexico	10+ years	12.0
NSF	Pipelines	KMI Interest		Location		Capacity (mmcfpd)
₹	Cortez	53%	McElr	McElmo Dome to Denver City		
Ē	Bravo <sup>(a)</sup>	13%	Brav	o Dome to Denver	City	375
مح	Central Basin (CB)	100%	Der	nver City to McCa	ney	700
N	Canyon Reef	97%	Ν	AcCamey to Snyde	er	290
Ö	Centerline	100%	D	enver City to Snyc	ler	300
0	Pecos	95%		McCamey to Iraar	n	125
	Eastern Shelf	100%		Snyder to Katz		110
	Wink (crude)	100%	McCar	mey to Snyder to E	El Paso	145 mbbld

Crude Reserves <sup>(b)</sup>	KMI Interest	NRI	Location	<b>OOIP</b> (billion bbls)
SACROC	97%	83%	Permian Basin	2.8
Yates	50%	44%	Permian Basin	5.0
Katz	99%	83%	Permian Basin	0.2
Goldsmith	99%	87%	Permian Basin	0.5
Tall Cotton	100%	88%	Permian Basin	0.7



#### a) Not KM-operated.

EOR OIL PROD

b) In addition to KM's interests above, KM has a 22%, 51%, and 100% working interest in the Snyder gas plant, Diamond M gas plant and North Snyder gas plant, respectively.

c) 2019 budgeted Adjusted Segment EBDA plus JV DD&A. See Non-GAAP Financial Measures and Reconciliations.

### **Kinder Morgan CO<sub>2</sub> Pipeline Systems**





Pipeline Details								
Name	Length (miles)	Diameter	Year Built					
CRC PL	138	16"	1975					
Cortez PL	502	30"	1984					
Central Basin PL	143	26", 24", 20", & 16"	1985					
Pecos PL	25	8"	1985					
Centerline PL	112	16"	2002					
Cogdell PL	4	10"	2003					
Eastern Shelf PL	91	10"	2010					
Total	1,298	4" to 30"						



- Pipeline design and integrity programs critical to safe operations
- Operation and maintenance is somewhat unique
- Trained personnel
- Adherence to product specifications
- Reliable delivery and injection for commercial use
- CO2 market and contracts to support take-away



- CO<sub>2</sub> Pipelines have same metallurgy as Natural Gas Pipelines
- CO<sub>2</sub> Pipelines have higher operating pressures
  - Gas 600 to 1200 psig
  - CO<sub>2</sub> 2000 to 3000 psig
- CO<sub>2</sub> PHMSA regulated under CFR Part 195, "Transportation of Hazardous Liquids by Pipeline"
- Natural Gas PHMSA regulated under CFR Part 192, "Transportation of Natural and Other Gas by Pipeline"
- Pipeline Safety Management System API RP 1173



- State and Local agencies may have additional regulations
- Regulations are specific, prescriptive and auditable
- Regulatory and permitting processes requires significant planning time
  - 2-4 year permitting process
  - Local, state, federal agencies
  - Coordinated efforts for proper alignment
  - Time and preparation needed for agency and public meetings
  - Requirements vary by impact area

## **CO<sub>2</sub> Pipeline Specifications**



#### Quality specifications for CO<sub>2</sub> pipelines.

- a) **<u>Product</u>**. Contain at least 95 mole percentage of CO<sub>2</sub>.
- b) <u>Water</u>. Contain no free water, and not more than thirty (30) pounds of water per mmcf in the vapor phase.
- c) <u>Hydrogen Sulfide</u>. Contain no more than 20 ppm, by volume, of  $H_2S$ .
- d) <u>Total Sulfur</u>. Contain no more than 35 ppm, by weight,
- e) <u>Temperature</u>. Shall not exceed 120°F.
- f) <u>Nitrogen</u>. Contain no more than 4 mole percent.
- g) <u>Hydrocarbons</u>. Contain no more than 5% mole percent and Dew point no more than -20°F.
- h) <u>Oxygen</u>. Contain no more than 10 ppm, by weight, of oxygen.
- i) <u>Other</u>. Contain no liquid glycol or no more than 0.3 gallons of glycol per MMcf.

*Note – see Kinder Morgan CO2 pipeline specification sheet for full list* 

#### Why are these specifications important?

- a) **<u>Product</u>**. Maintain dense phase and EOR needs
- b) <u>Water</u>. Free water causes corrosion and damages pump seals.
- c) <u>Hydrogen Sulfide</u>. Dangerous to health and safety of the public. Special requirements if > 99 ppm in Texas.
- d) <u>Total Sulfur</u>. Foul odor in product and causes injection problems
- e) <u>Temperature</u>. Protect pipeline external coating
- f) <u>Nitrogen.</u> Maintain dense phase of product.
- g) <u>Hydrocarbons</u>. Maintain dense phase of product.
- **Oxygen**. Catalyst for other internal corrosion components. H<sub>2</sub>S and O<sub>2</sub> form elemental sulfur in EOR piping
- i) <u>Other</u>. Glycol damages pump seals.

## CO<sub>2</sub> Pipelines – Operations



SCADA: Operational Control

#### Cortez, Colorado Control Center



### **System Control**

- Centralized pipeline surveillance
- 24 hour monitoring and control
- Monitor pressures, flows, receives key alarms and calls out response
- Provides full remote control to:
  - Start/stop pump stations
  - Flow control to customers
  - Shut-down and closure of valves
  - Pipeline expansions supporting CCUS easily integrated into control center

### **Planning and Economics**



- Kinder Morgan brings capital discipline
  - Defined benefit
  - Experience invaluable for execution and de-risking for success
  - Investments supported by long term contracts
  - If marketing CO2, important to have reliable deliveries and good relations with customers
- Partner to support incentives like 45Q
- Helium recovery where viable helps economics
- Opposition to new pipeline infrastructure is potential barrier to CCUS



Existing CO<sub>2</sub> Pipeline Systems are a natural fit for CCUS

- Safe method for transportation and distribution
- CO2 transportation and marketing fundamentals are well established
- Network can expand
- Kinder Morgan has extensive experience and expertise in EOR and CO<sub>2</sub> system design, implementation and operation and is ready to help grow CCUS infrastructure



### Thank You !

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