



PETRA NOVA Carbon Capture

Carbon capture at commercial scale



- 240MW equivalent CO₂ scrubber on a 640MW coal-fired power plant
- Captures approximately 1.6 million tons per year of CO₂
 - To date, over 900,000 tons have been captured
- CO₂ is used to enhance oil production at the West Ranch Oilfield
 - To date, over 600,000 barrels of oil have been produced
- Sequestering 5,200 tons of CO₂ per day



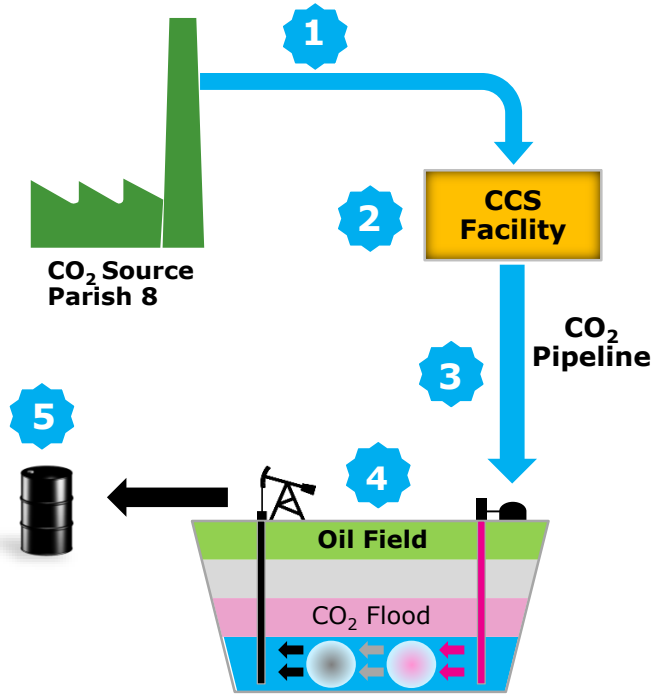
Petra Nova Project Overview

Five Step Process

1. **Diverting the flue gas** from an existing facility (Parish Unit 8)
2. **Processing flue gas** in a carbon capture system to strip out the CO₂
3. **Transport CO₂** to a nearby oil field.
4. **CO₂-EOR** operation to produce otherwise unrecoverable oil
5. **Transport and sell oil** – marketing, selling, and transporting the recovered oil

Oil revenues pay for the entire project

No impact on power plant or its costs



Converting CO₂ to crude oil

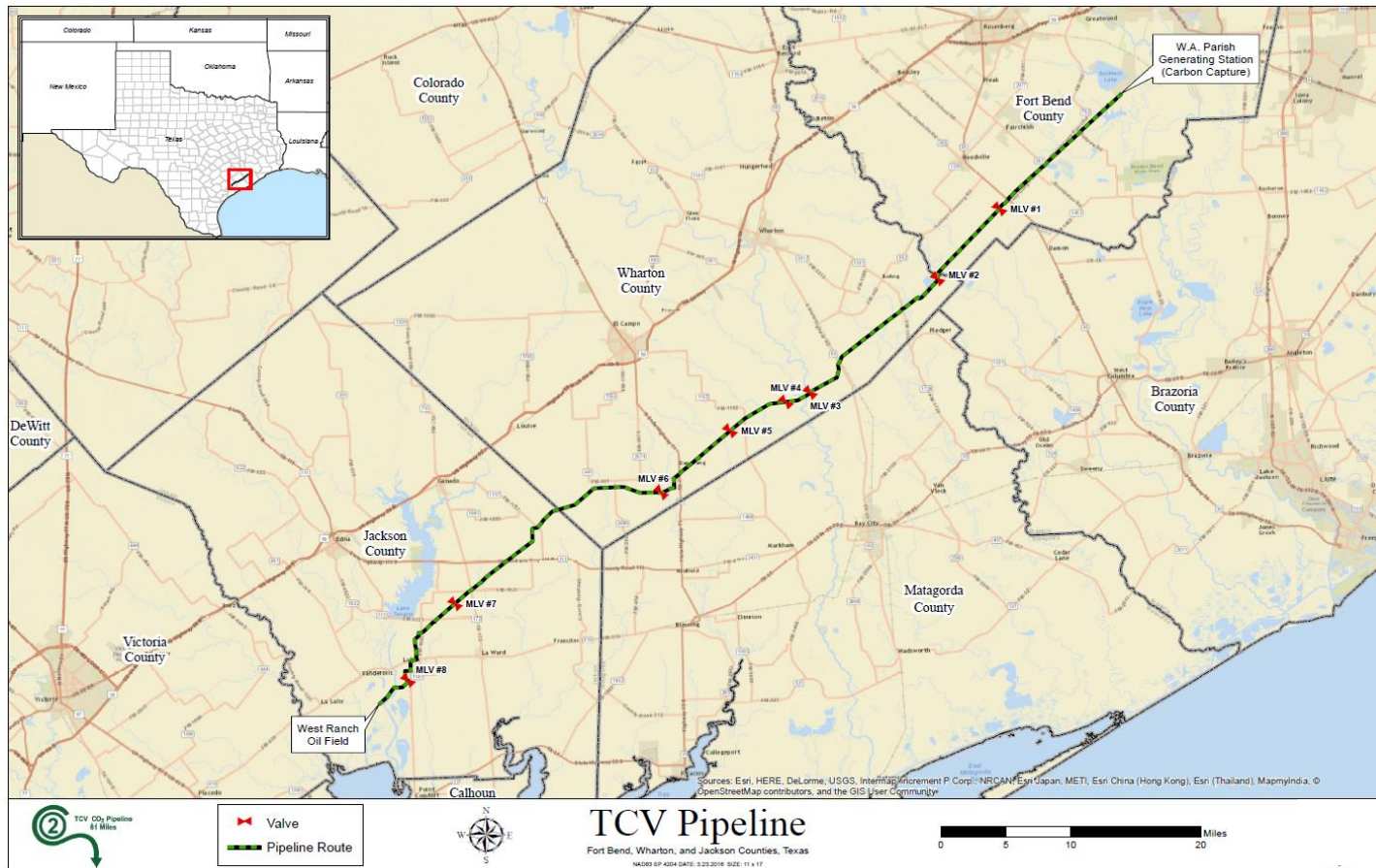
Carbon Capture System Site Layout



Cogeneration
(steam & power)

Petra Nova
Carbon Capture
Site

CO₂ Pipeline

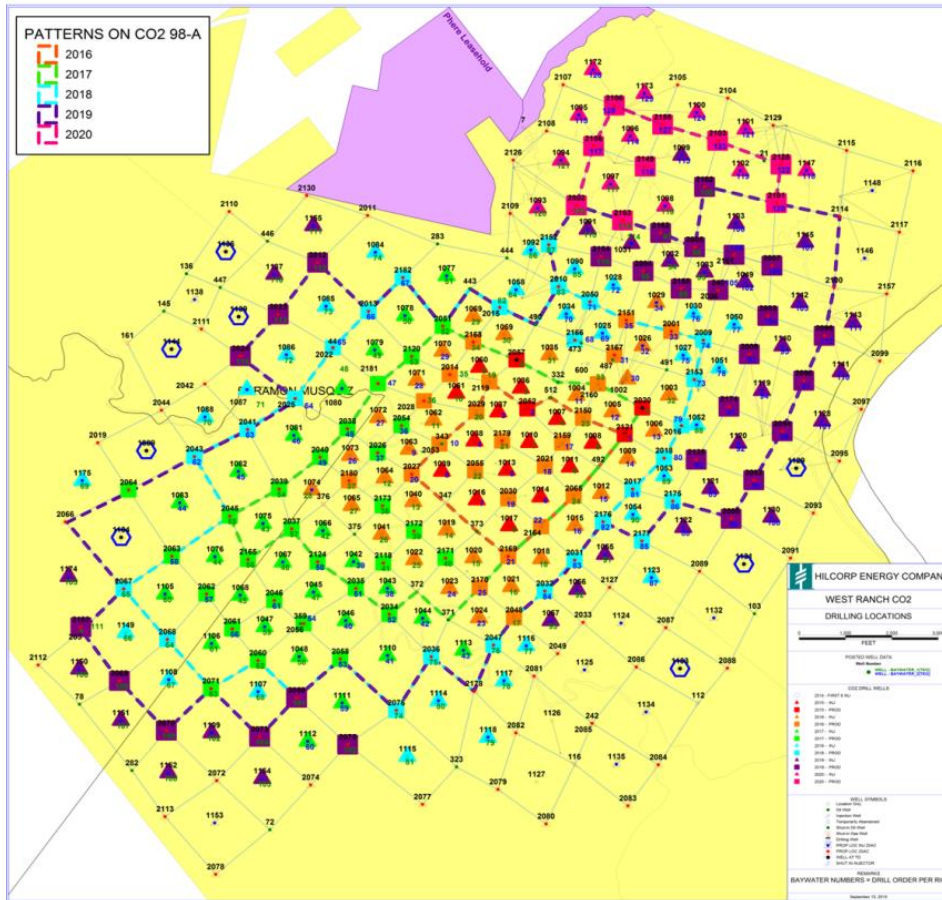


- 81 Miles
- ~160 landowners; no condemnation authority
- 12" diameter
- .330 wall pipe (.406 on HDDs)
- 8 Mainline Valves (MLVs)
- 1,900 psi at inlet; ~1,350 psi at delivery
- No intermediate compression

Flat, rural, and co-located with existing utilities



Enhanced Oil Recovery Project



West Ranch Field Development

- Field is being flooded using a “5-spot” pattern (each injector surrounded by 4 producers)
- A comprehensive monitoring, verification, and accounting plan is in place to track the flow of CO₂ and to insure that it is sequestered in the reservoir.
- University of Texas Bureau of Economic Geology developed the plan to sync with oilfield operations.



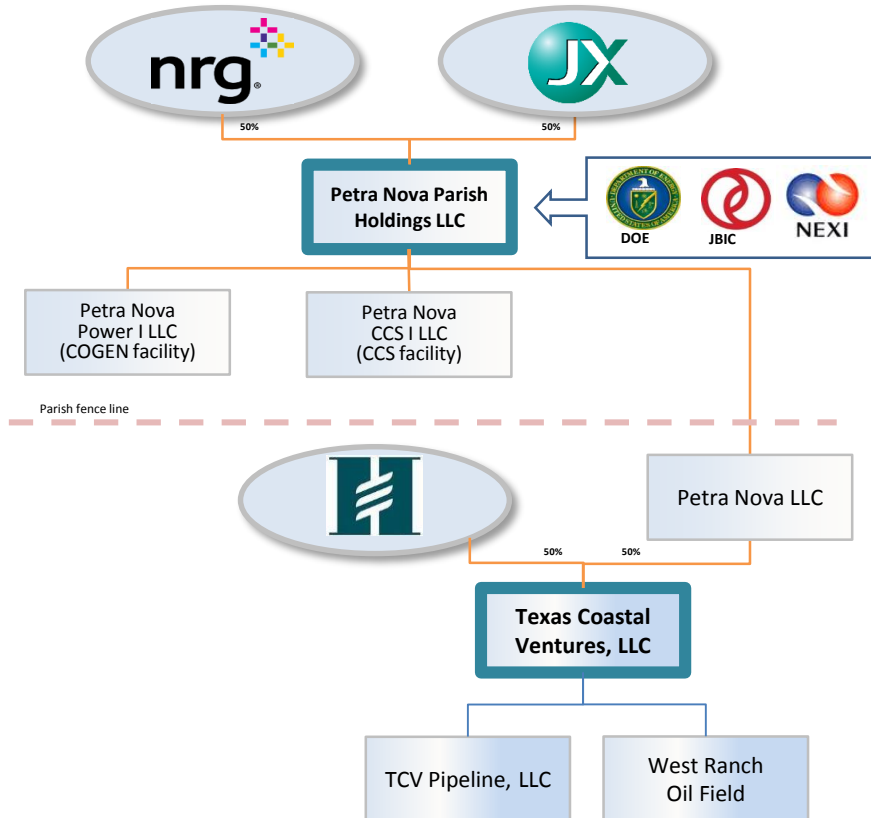
Oilfield Facilities Recapture and Inject CO₂



West Ranch Field Central Facilities

- Over 300 new wells to be drilled
- 2 central processing facilities to separate oil-CO₂-water
- All produced CO₂ and water is re-injected into the formation

Commercial Structure



Our Partners



- ✦ JX Holdings is a leading integrated energy, resources, and materials company



- ✦ NRG Energy, Inc. is the largest independent power company in the US



- ✦ Hilcorp Energy is one of the largest privately-held oil and natural gas E&P companies in the US



- ✦ JBIC and NEXI are wholly-owned by the Japanese government.



- ✦ US DOE awarded \$190 MM grant funded through Clean Coal Power Initiative



Successes

1. Partners



Alignment & commitment; appropriately allocated & shared risks

2. Structure



No impact to the price of power; vertically integrated (no CO₂ sales)

3. Approach



Dedicated team, system optimization, cogen, pipeline co-location

4. Planning



Comprehensive FEED studies, agility and ability to react to change

5. Contractors



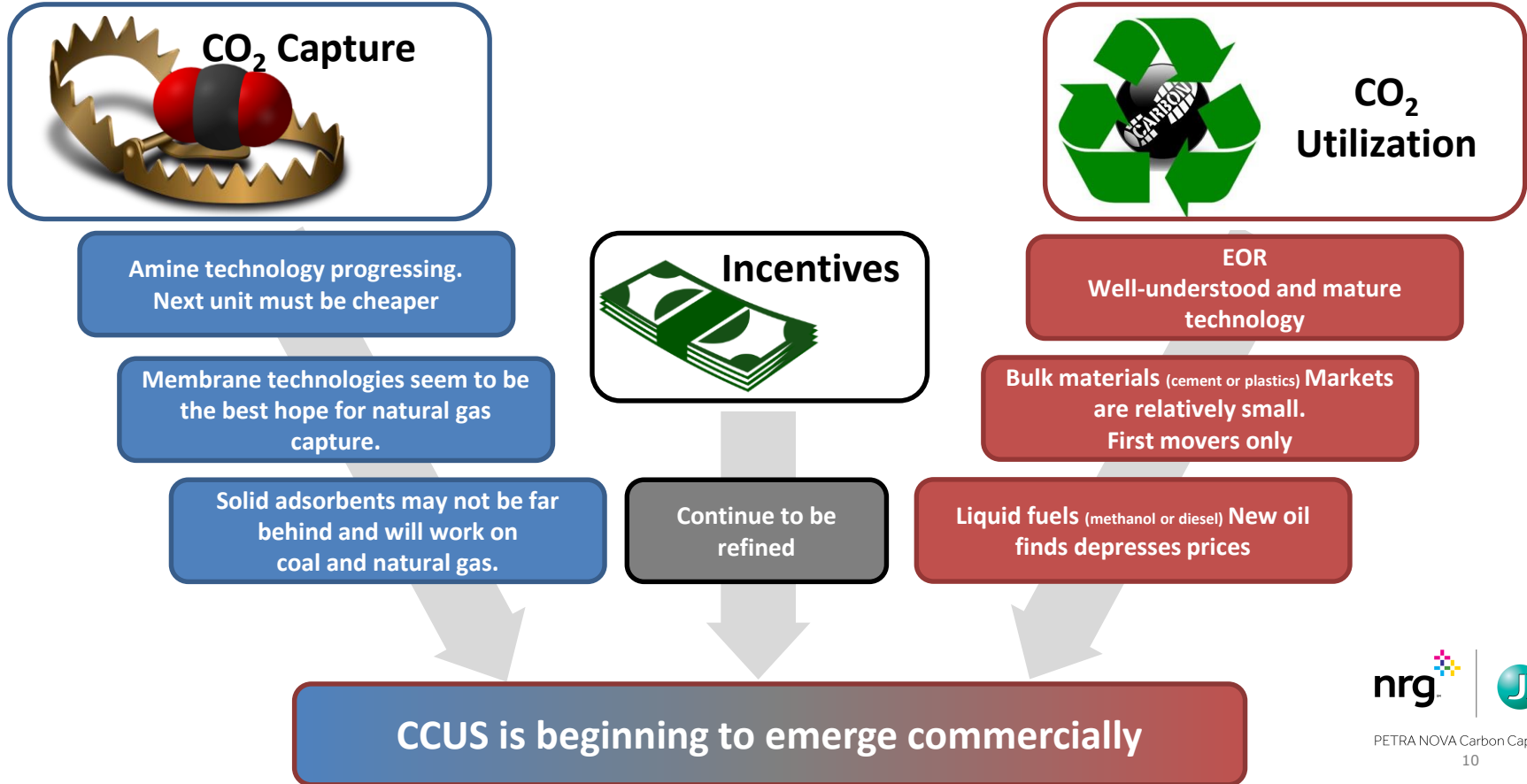
Qualified, capable, competent w/ financial strength; LSTK contract

6. Execution



Disciplined, open, transparent, objective and constructive mgmt.

CCS industry is progressing



Some headwinds moving forward



1. Cost



Commercially available technologies are capital intensive

2. Competition



More options and technologies are needed

3. Scale



Technologies need to be proven at a sufficient scale

4. Development



Approaches and incentives need to be re-evaluated

5. Reputation



Confidence in this space has eroded

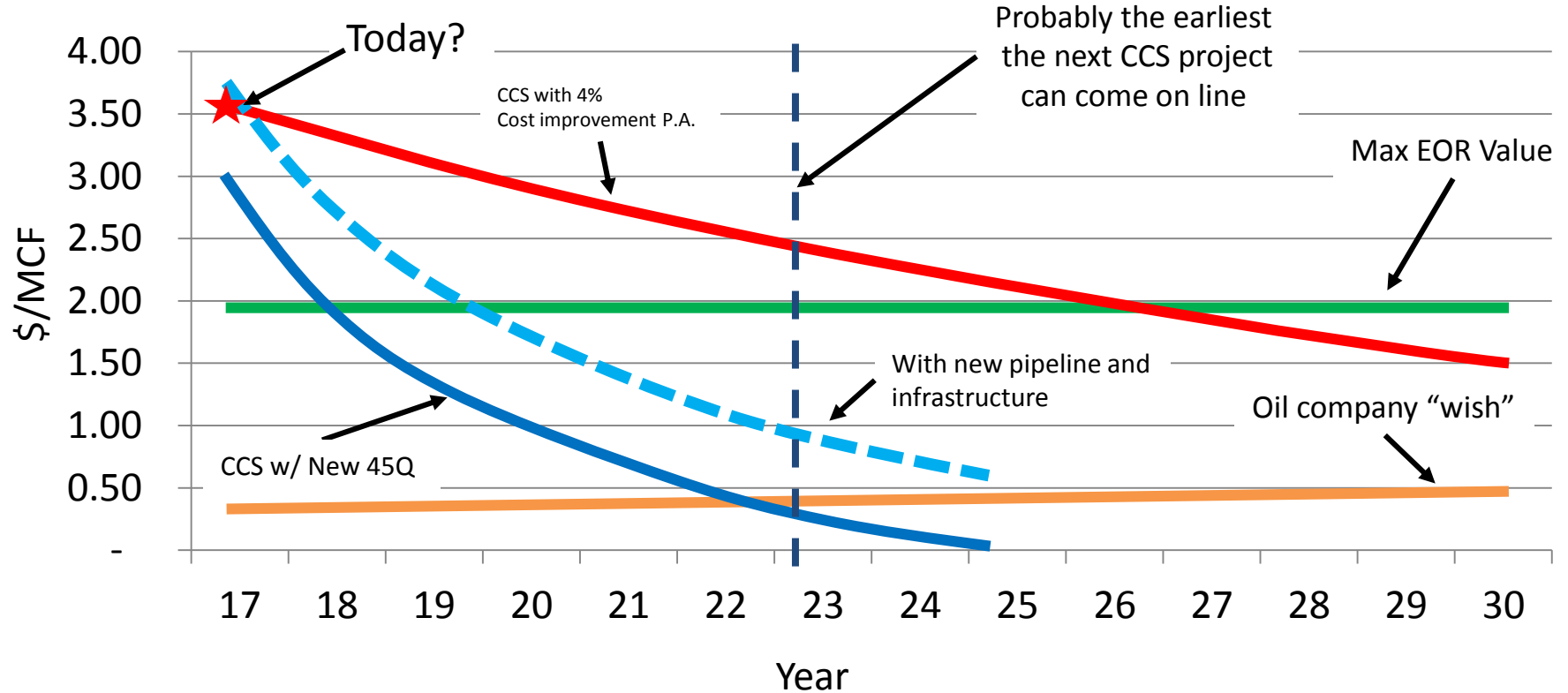
6. Time



Need to start now. Projects can take years to develop and build



Path to success – improving economics



Thank You!



When Petra Nova is operating, Parish Unit 8 has the same carbon intensity as a combined cycle.