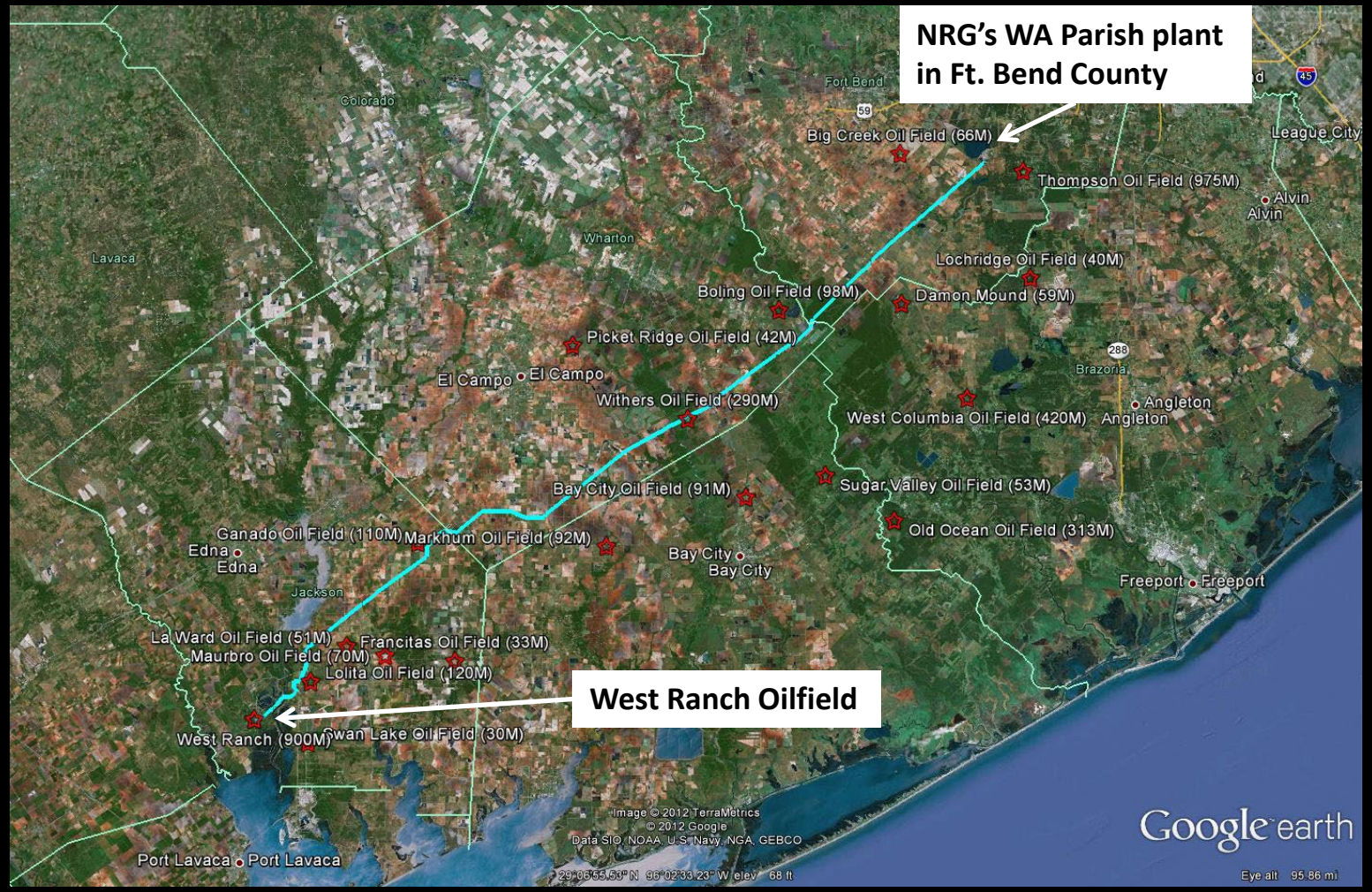
Petra Nova successful demo

First three years typical of a first of a kind ("FOAK") at full commercial scale

Petra Nova site

Petra Nova 81-mile CO_2 pipeline



West Ranch Oilfield

- 200+ new wells drilled
- 2 – central recycle stations
- 200+ miles of flow lines
- 4,000 acres areal extent
- 2 – 150K barrel tanks
- 300 – bbl/day prior to CO_2
- 6,350 – max bbl/day
- 800 – current bbl/day
- 6.4 million - incremental bbl total since EOR started

Commercially, What is Petra Nova?

	Petra Nova
Size	240 MWe
Flue gas fuel	Powder River Basin coal
Steam source	Stand-alone CCGT
Host plant owner	IPP – short term view
CO2 disposition	Project-owned oilfield
Exposure to oil price	**Yes – high**
Revenue sources	**Crude oil sales**
Host unit dispatch	Day-to-day decision
Capture technology	Mitsubishi

Petra Nova is an **Oil Company** not a **CCUS project**

Petra Nova did not have 45Q
Ongoing revenues solely tied to oil production

Petra Nova Operating Record

Outage by Component (Total Phase 3)

	2017			2018			2019		
	Total	Full (Days)	Partial (FDEs)	Total	Full (Days)	Partial (FDEs)	Total	Full (Days)	Partial (FDEs)
CC Facility	41	23	18	34	19	15	29	17	12
Cogen Facility	67	57	10	1	1	0	20	14	6
WAP Unit 8	13	8	5	30	28	2	17	12	5
CO_2 Pipeline	0	0	0	0	0	0	0	0	0
West Ranch	6	0	6	30	13	17	6	4	2
Weather	14	13	1	5	2	3	2	2	0
Planned Outage	0	0	0	52	52	0	0	0	0
Totals	**141**	**101**	**40**	**152**	**115**	**37**	**74**	**49**	**25**

Notes:

1. Except for the Cogen Facility, issues with BOP equipment is included in the CC Facility values.
2. Totals are shown for total day outages plus partial day outages (in full day equivalents, FDE). To calculate full day equivalents, daily de-rates were converted to hours (using a daily target of 5,265 tons per day), summed for the year, and divided by 24. For example, if CO_2 capture rate on a given day was 4,739 tons (or 90% of 5,265 tons) it would equate to 2.4 hours of outage time. If this occurred for 10 days, it would equal 24 hours or 1 full day equivalent.

By the 3rd year
Carbon Capture achieved
90+% online factor

Source:
W.A. Parish Post-Combustion CO2 Capture and Sequestration Demonstration Project
DOE Award Number DE-FE0003311
Final Scientific/Technical Report
March 31, 2020

Petra Nova Operating Record

CCS CO_2 CAPTURE METRICS			
YEAR	**PLANNED CO_2 CAPTURE (SHORT TONS)**	**ACTUAL CO_2 CAPTURE (SHORT TONS)**	**PERCENT OUTPUT VS. PLAN OF 85%**
2017	1,635,919	1,180,594	72%
2018	1,392,300	1,122,050	81%
2019	1,613,300	1,529,174	95%

By the 3rd year
Carbon Capture facility
captured 95% of "Plan"
despite overall 80% capacity factor

Source:
W.A. Parish Post-Combustion CO2 Capture and Sequestration Demonstration Project
DOE Award Number DE-FE0003311
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Petra Nova Operating Record

CCS PERFORMANCE METRICS (AT 100% LOAD)		
ITEM	**AT COMMERCIAL OPERATION DATE**	**PHASE 3 RESULTS (3-YEAR AVG)**
CO_2 Capture Efficiency	93%	90.2%
CO_2 Production (STON/HR)	222.6	222.5
CO_2 Purity	99.24%	> 99%
Steam Consumption (STON/HR)	243	255
Power Consumption	34,851 kW	34,903 kW
Compressor Discharge Pressure	1,905 psig (MIN)	1,806 psig (NORM)
Compressor Discharge Temperature	96 DEG F	< 120 DEG F
Make-up Water to Cooling Tower	1,328 GPM	1,350 GPM

Carbon Capture system performed as planned **on Day 1 and for 3 years**

Source:
W.A. Parish Post-Combustion CO2 Capture and Sequestration Demonstration Project
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Petra Nova Emissions

ABSORBER EMISSIONS METRICS (AT 100% LOAD)		
ITEM	**PERMIT LIMITS**	**PHASE 3 RESULTS (3-YEAR AVG)**
Volatile Organic Compounds (VOC)	24.53 TPY	2.84 TPY
Ammonia (NH_3)	1.35 TPY	0.318 TPY

Emissions were much **better than expected**

Source:
W.A. Parish Post-Combustion CO2 Capture and Sequestration Demonstration Project
DOE Award Number DE-FE0003311
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Petra Nova Water Use

CCS/COGEN WATER USE (Acre-Feet)				
ITEM	**2017**	**2018**	**2019**	**3-Year Avg**
Raw Water (primarily used for cooling)	1,303	1,312	1,681	1,432
Well Water (used to make demin water)	85	94	98	92

Water consumption was **half of estimated**

Source:
W.A. Parish Post-Combustion CO2 Capture and Sequestration Demonstration Project
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Petra Nova Capital & DOE Grant Funding
(Eligible for DOE cost share)

Petra Nova Eligible Capital Cost by Category	Cost ($Millions)
CCS	225
CO_2 Compressor/Dehydration	60
Cogen	150
Water Treatment	35
Cooling Tower	20
Flue Gas Tie-in	15
Owner's Costs	100
Total	636

DOE CCPI Grant	($Millions)
Initial Grant	167
Pro rata share of additional authorization	23
Total	190