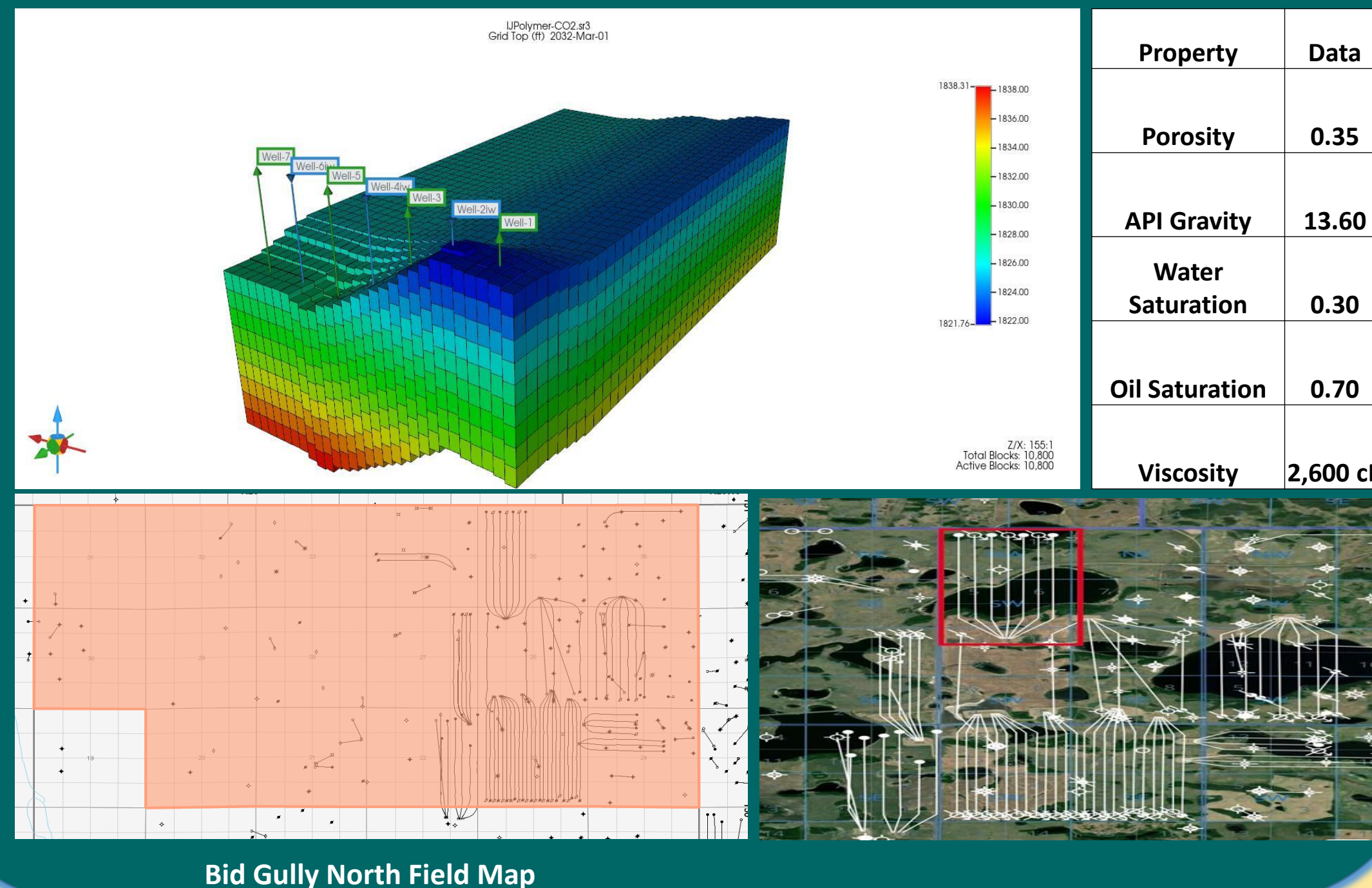


## Background

- Heavy oil reserves were previously considered economically unviable to extract.
- Technological advancements and depletion of conventional reserves have led to increased interest in exploiting these resources.
- The Landrose project in Saskatchewan focuses on the Lloydminster formation within the Big Gully North field.
- Water flooding was initially used for oil extraction but resulted in increased water cut and productivity declined due to high oil viscosity.
- In 2018 project implemented polymer flooding for Enhanced oil recovery, becoming the first in the area.
- The project comprises seven wells: Three injectors and four producers.

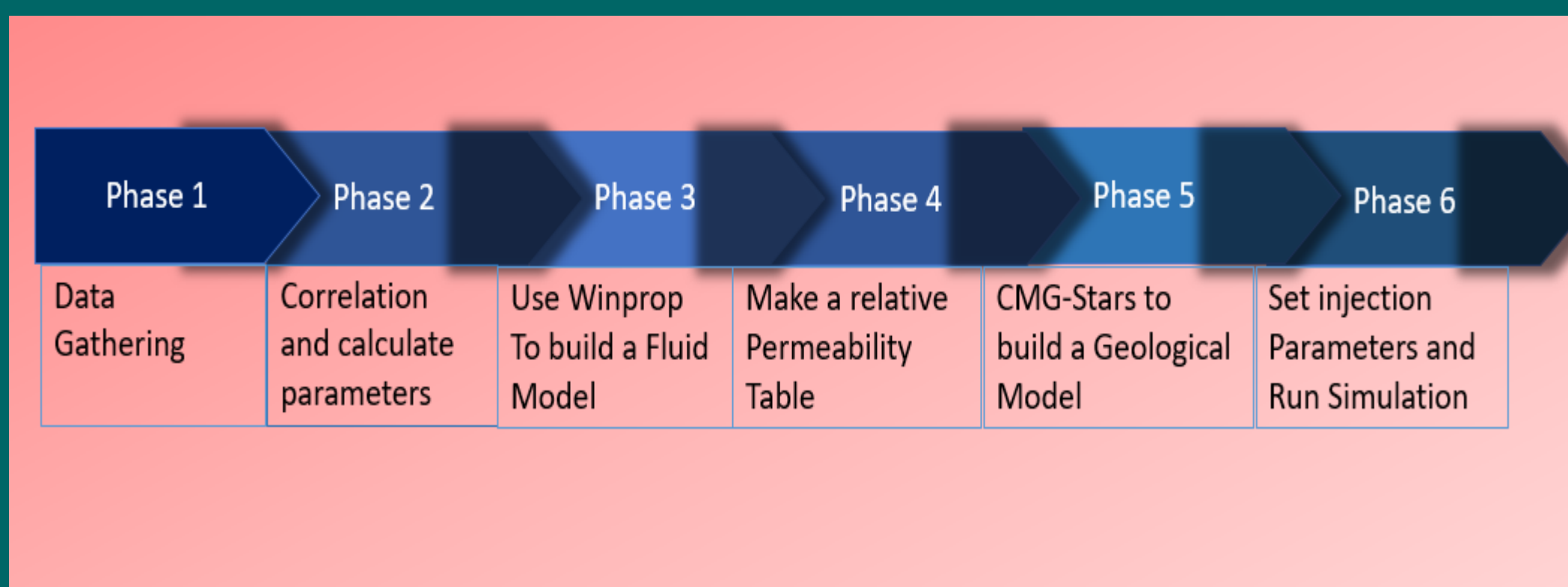
## Geological Model



## Objectives

- The main objective Of CO<sub>2</sub>-Polymer flooding is to use an optimal combination of CO<sub>2</sub> and Polymer to enhance the heavy oil recovery rate, elevate the heavy oil production and extend the viability of reservoirs with heavy oil deposits.
- Using CMG generate polymer flooding model, CO<sub>2</sub> flooding model and CO<sub>2</sub>-polymer flooding model and compare the results.

## Engineering Design

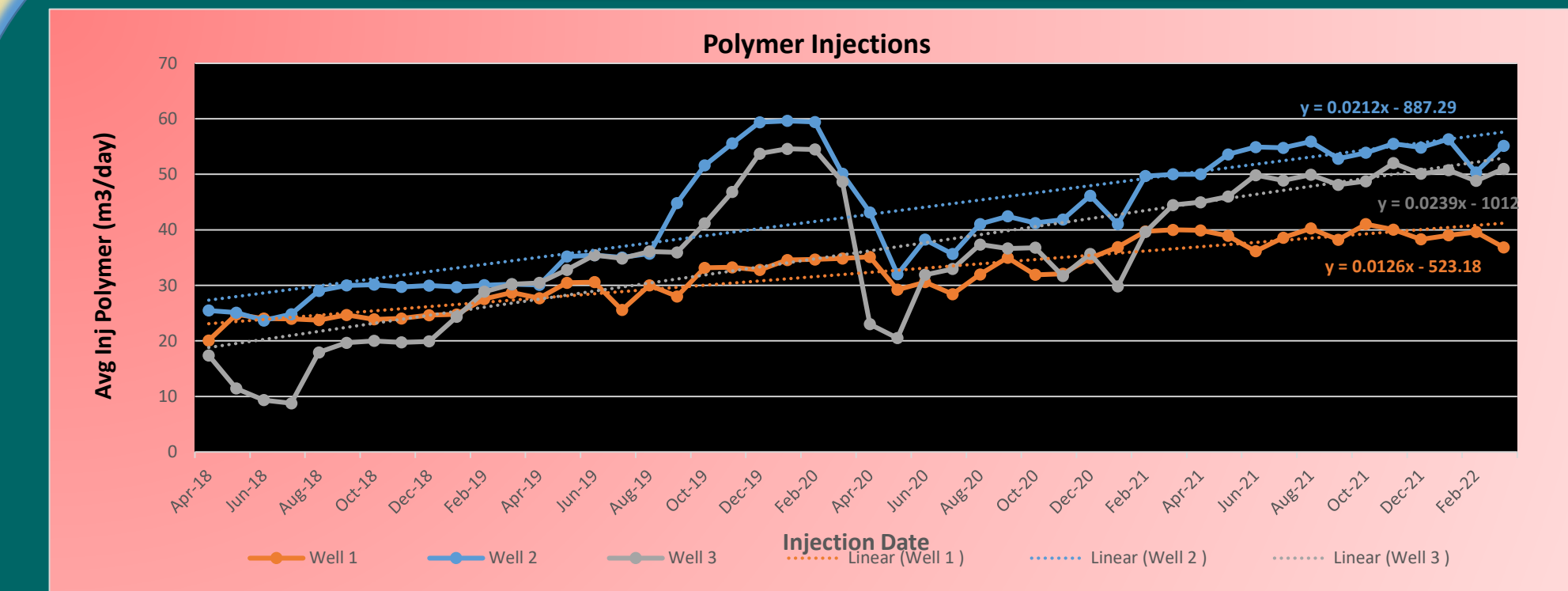


## Cost Analysis

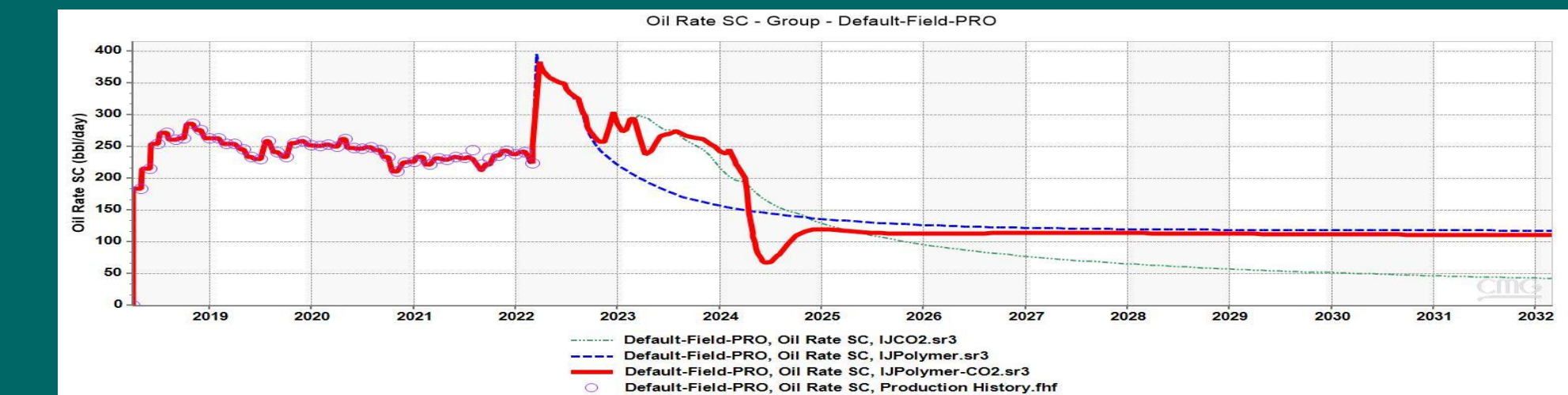
Material Injected	Injection Date	Injecton Time (Days)	Total injection	Cost	Cumulative Oil in bbl	Oil Revenue	Gross Profit
CO2 (Tonnes)	2022-03-02	365	18,012	\$ 1,440,932	114,923	\$ 12,641,530	\$ 11,200,600
Polymer (kg)	2023-03-02	31	16,077	\$ 41,157	7,959	\$ 875,490	\$ 834,330
CO2 (Tonnes)	2023-04-02	365	18,012	\$ 1,440,932	91,378	\$ 10,051,580	\$ 8,610,650
Polymer (kg)	2024-04-02	365	236,290	\$ 604,903	39,244	\$ 4,316,840	\$ 3,711,940

Oil price/ bbl	\$110
Density Of CO2	1.8 Kg/m <sup>3</sup>
CO2 /ton	\$80
Pam polymer/ 1000Kg	\$2,560

## Simulation Result

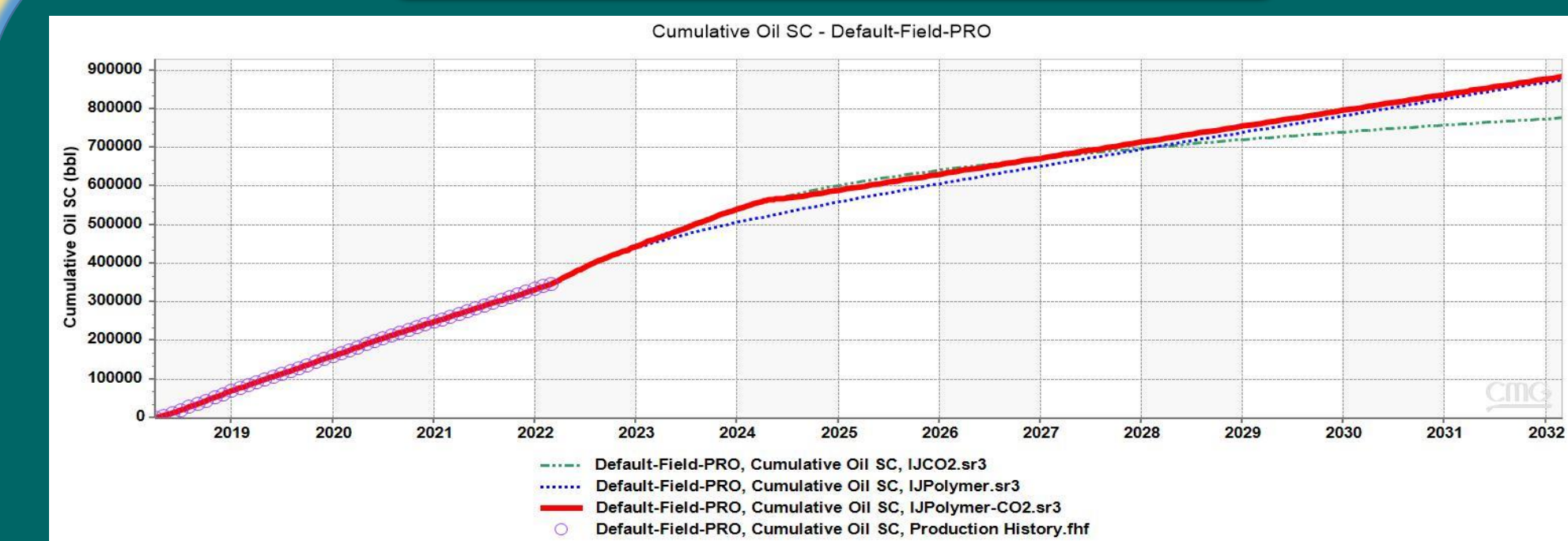


- Analyzing historical polymer injection rates, injection rate increased over time. Although the increase in historical injection rates was inconsistent, this method will help to predict the injection rate changes in future.



- The results of simulation projects using different polymer injection amounts are shown in the red and blue curve in the figure. The simulation experiment results of pure CO<sub>2</sub> injection are shown in the green curve. The best economic evaluation results were found from polymer flooding, CO<sub>2</sub> - polymer flooding injection.

## Conclusion



- The best economic benefit method has been shown through economic analysis results that CO<sub>2</sub> polymer flooding will create more economic benefits.
- The total cumulative oil production of polymer flooding and CO<sub>2</sub>-Polymer flooding has the largest gap of 44,009 barrel in 2024.

## Acknowledgement

- Dr. Na Jia
- Dr.Peter Gu
- Dr. Zhongwei (David) Du
- Dr. Sam Hong
- Runzi Li
- All the Faculty members of PSE Program