Examining a "No Regrets" Policy to Facilitate a Transition to a Lower Carbon Future

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Overview

- Study objective
- NEMS Overview
- CTUS methodology
- Scenarios
- Results

Objective

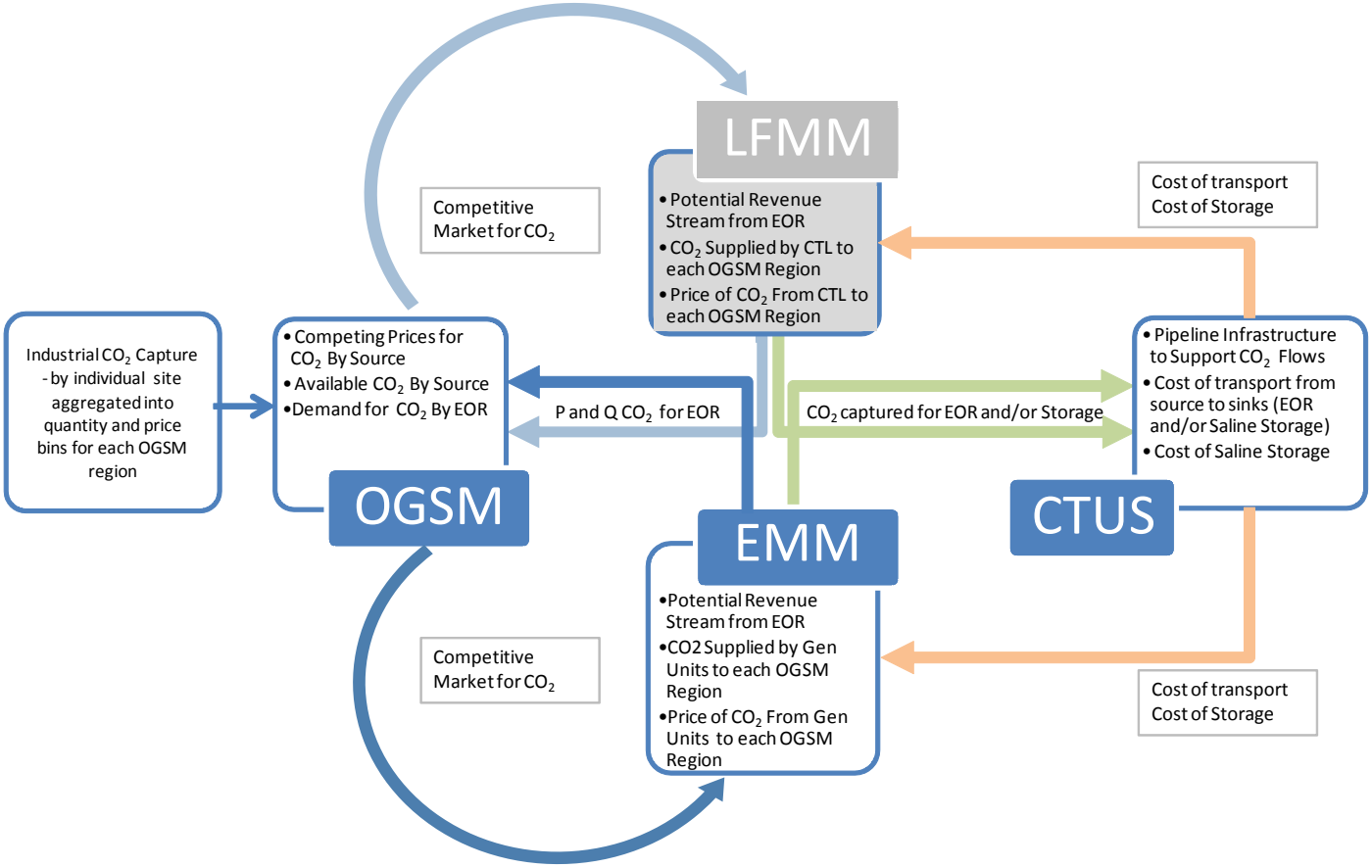
- Examine the potential of carbon capture and storage (CCS) at power plants to provide CO_2 for enhanced oil recovery (EOR)
  - How much CO_2 could be sequestered?
  - What are the impacts on CCS and EOR of a sequestration tax credit policy?
  - How do lower shale resources and higher natural gas prices affect CCS adoption and EOR production?
  - How might lower cost of capture increase CCS and affect EOR?

NEMS Overview

- The National Energy Modeling System (NEMS) was developed by EIA
  - Annual Energy Outlook projections
  - Congressional as well as agency requests
- NEMS has also been used extensively outside of EIA
  - DOE Policy Office
  - Program offices within DOE for R&D benefits estimation
  - Various non-governmental organizations
- OnLocation maintains several versions of National Energy Modeling System (NEMS) and works with EIA and others to enhance the model
- NEMS performs an annual simulation stepping through time
- Modular structure allows each sector to be represented by methodology and data that fit it best
  - Optimization techniques used for electricity capacity expansion and dispatch and petroleum refining
  - Extensive technology representation in most sectors

CTUS Methodology

- The representation of carbon capture, transport, utilization and storage (CTUS) spans several models within NEMS

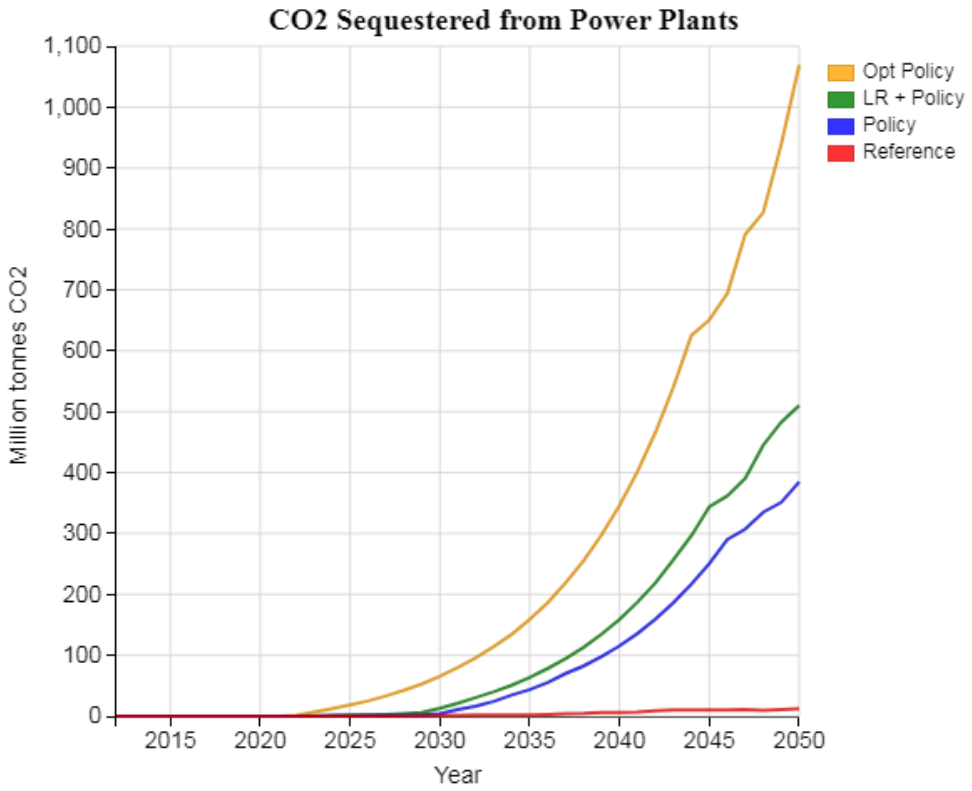


Scenarios

- **Reference Case** (*Reference*) modified from the AEO2017 reference case to include high economic growth and electricity demand and favorable EOR cost assumptions
- **Tax Credit Policy** (*Policy*) includes a tax credit of $35/ton for CO2 captured and used for EOR and a $50/ton credit for CO2 sequestered in geologic storage
- **Low Oil and Gas Resources** (*LR + Policy*) includes the same policy along with lower oil and gas shale resources and technology improvements
- **Combined Optimistic Low Cost and Policy** (*Opt Policy*) assumes roughly 20 percent lower coal CCS costs than the reference case

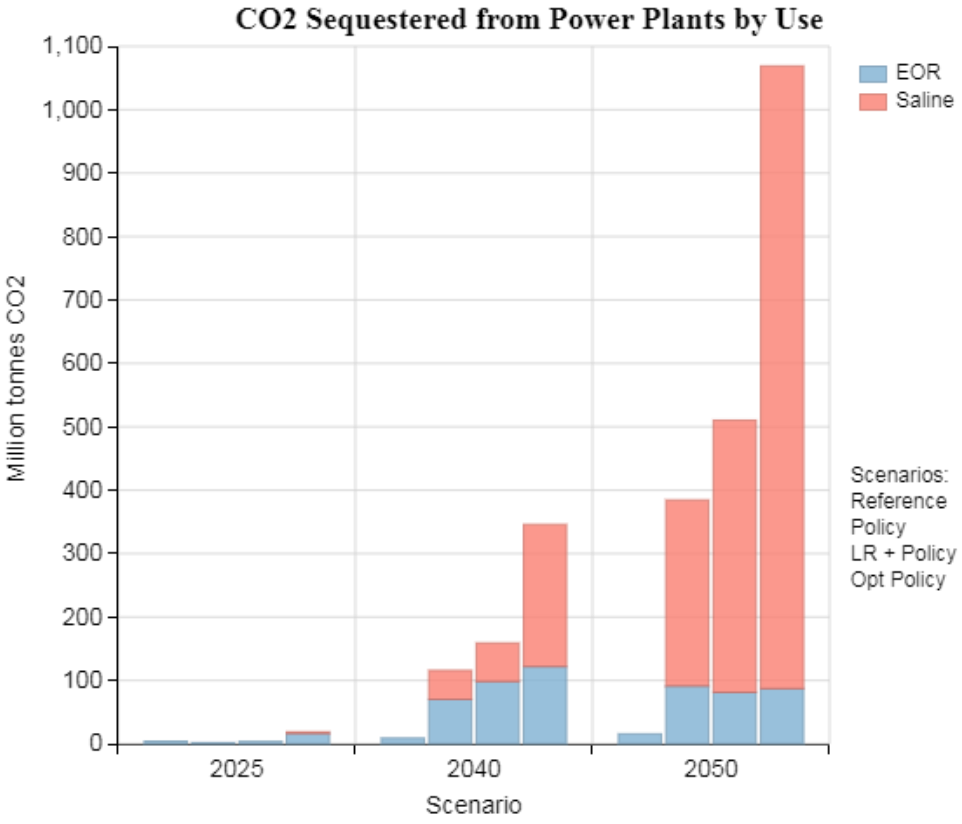
CO_2 Sequestered From Power Plants

- Providing a subsidy for sequestration leads to considerable capture of CO_2 from power plants, especially under favorable CCS cost assumptions.



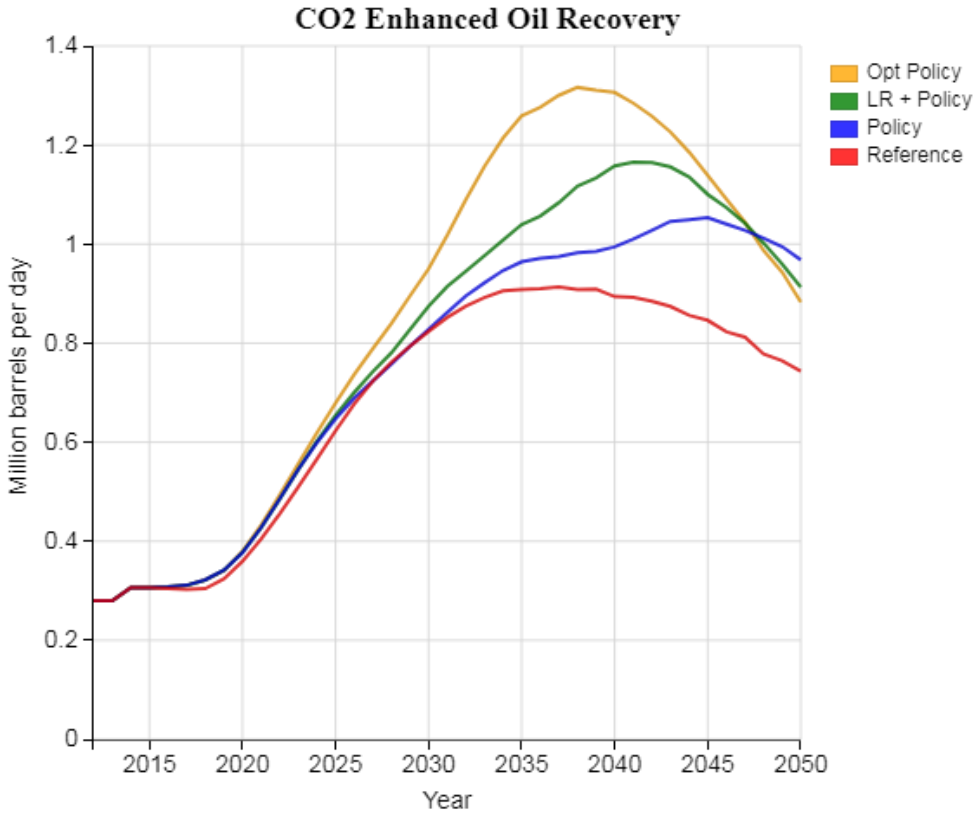
Sequestration Sinks

- Initially captured CO_2 is used primarily for EOR production, but, over the long run and when a large amount is captured, saline geologic storage is used.



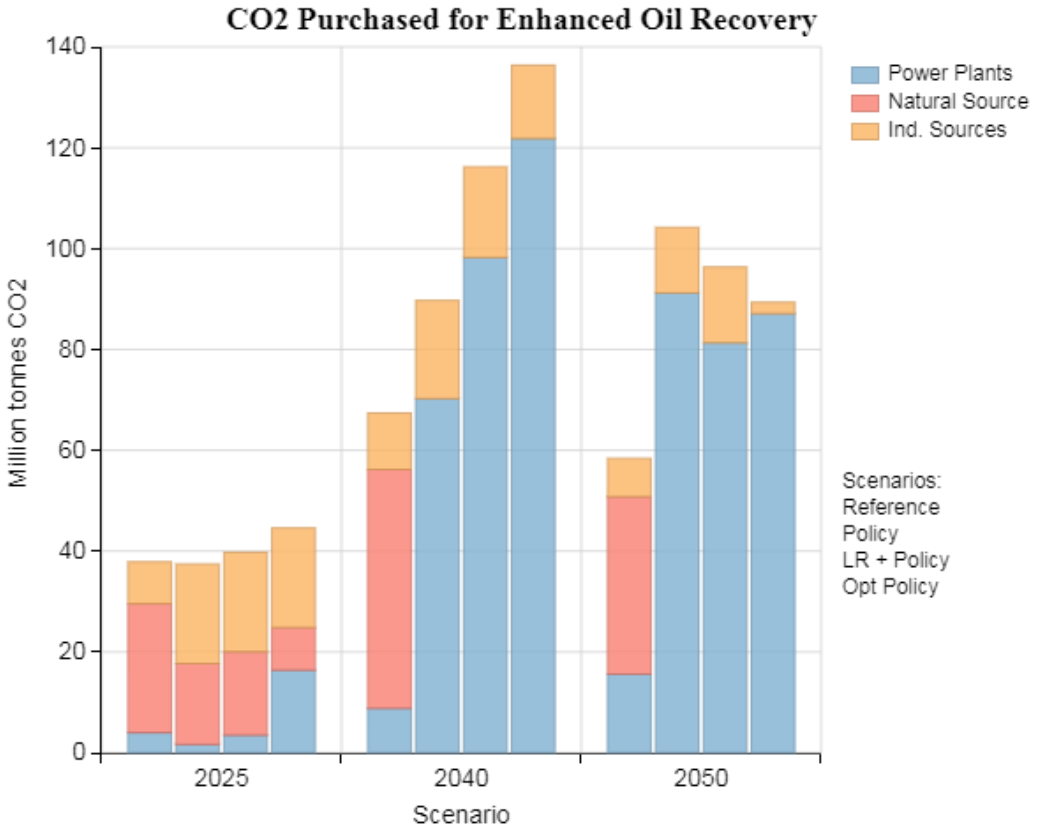
CO_2 EOR Production

- EOR production expands with the availability of greater, low cost CO_2 sources.



CO_2 Purchased for EOR

- As the tax credit stimulates more capture from power plants and industrial sources, most of the CO_2 is provided by power plants and CO_2 from natural sources is no longer needed.



Conclusions

- Significant amounts of CO_2 could be sequestered economically from power plants CCS under some market and policy conditions.
  - Initially, available CO_2 stimulates additional EOR production, while over the long-term and at high volumes CO_2 is sequestered in saline formations.
- A sequestration tax credit is successful at stimulating CCS investment
- Higher natural gas prices and lower CCS costs also stimulate more CCS