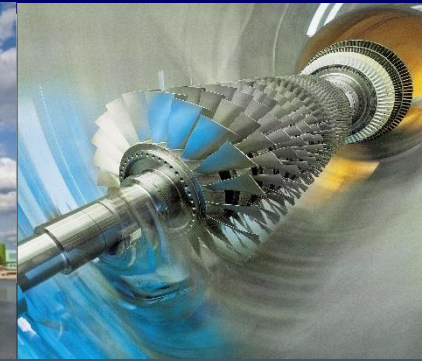
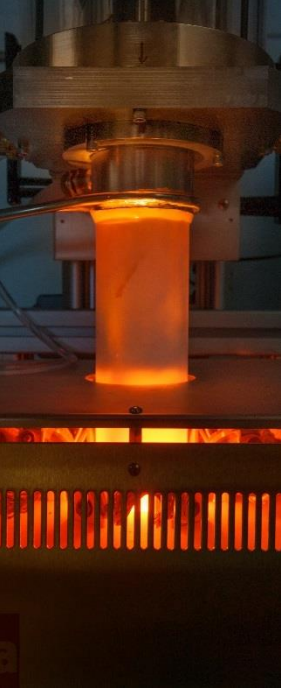




U.S. DEPARTMENT OF
ENERGY

Office of
Fossil Energy



Future Opportunities for Coal R&D

John Litynski, PE

Acting CCS Division
Director

Carbon Capture
Program Manager

Advancing Clean Coal Technologies



**Making Coal Plants
More Efficient**

**Gasification, Advanced
Turbines, Advanced
Combustion, and Fuel Cells**



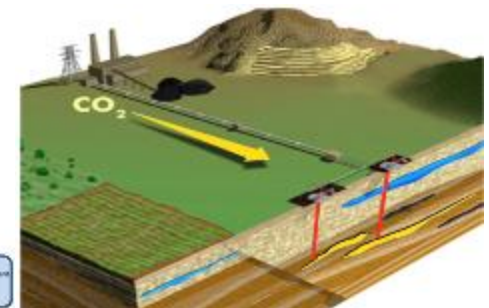
Capturing More CO₂

**Cost-effective carbon
capture for new and
existing power plants**



**Turning Coal and
byproducts into Products**

**New pathways to utilize
captured CO₂**



CO₂ Utilization

**Safe use and permanent
storage of CO₂ from power
generation and industry**



Bringing it All Together

**Crosscutting technology
development program**

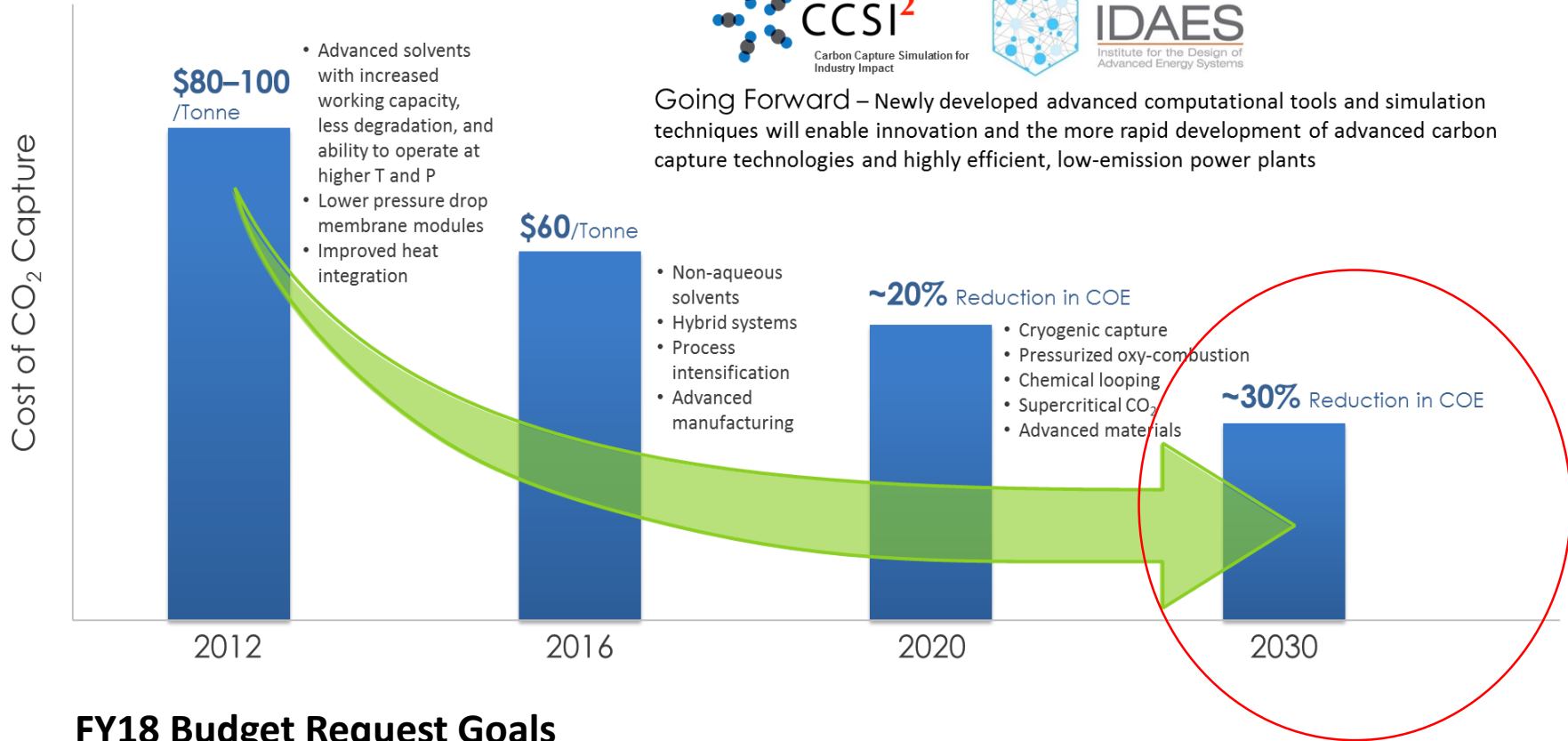


Fossil Energy – Coal Research Program Goals

Driving Down the Cost of Electricity of Coal Power



Going Forward – Newly developed advanced computational tools and simulation techniques will enable innovation and the more rapid development of advanced carbon capture technologies and highly efficient, low-emission power plants



FY18 Budget Request Goals

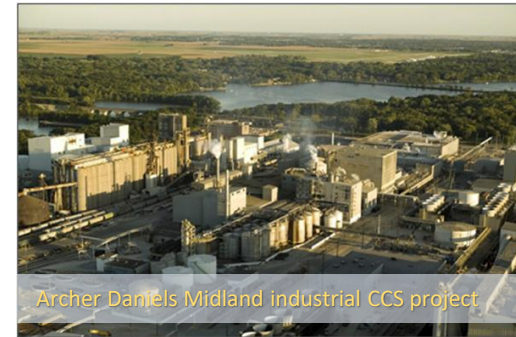
- Concludes 2nd Generation Goal
- Transformational Capture 2030 for new and existing units – COE & \$/tonne captured
 - 90% removed from goal – OPTIMIZE Economics
- Transformational efficiency goals for new and existing units -TBD



FY 2017 Budget

FE R&D: \$682M | Office of Petroleum Reserves: \$248.5M

(in thousands)	FY17 Omnibus
TOTAL FOSSIL ENERGY	930,450
Coal	423,800
Carbon Capture	101,000
Carbon Storage	95,300
Advanced Energy Systems	105,000
Crosscutting	45,500
STEP	24,000
NETL Coal R&D	53,000
Fossil Proviso – large-scale pilots	50,000
Oil and Natural Gas	64,000
Natural Gas Technologies	43,000
Unconventional Fossil Energy Tech.	21,000
Other Corporate	60,700
Program Direction (HQ & NETL)	60,000
Special Recruitment Program	700
NETL	83,500
NETL Infrastructure	40,500
NETL Research and Operations	43,000
TOTAL FOSSIL ENERGY R&D	682,000*
Office of Petroleum Reserves	248,450
Strategic Petroleum Reserve	223,000
Northeast Home Heating Oil Reserve	6,500
Naval Petroleum & Oil Shale Reserves	14,950



Archer Daniels Midland industrial CCS project



NETL, Chemical Looping Reactor



Bryan Mound SPR storage site

*Does not include \$14,000 use of prior year balances or \$246,515 rescission of prior year balances.

FY 2018 Budget Request Overview and Priorities

\$280M for Fossil Energy R&D

- ✓ *Focus on cutting edge, early stage R&D*
- ✓ *Continue operations of the National Laboratories*

(in thousands)	FY18 Request
TOTAL FOSSIL ENERGY	479,800*
Coal	114,800
Oil and Natural Gas	21,500
Other Corporate	58,678
NETL	141,200
TOTAL FOSSIL ENERGY R&D	280,000*
Office of Petroleum Reserves	199,800

**Reflects total new Budget Authority funding; the total request is \$335,178 with \$55,178 in prior year balances to reach the requested amount of \$280,000 for the FER&D budget.*

Coal Program Priorities

- Stabilize coal—improve the efficiency and reliability of coal-fired plants
- Carbon Capture, Utilization, and Storage (CCUS)

Oil and Gas Program Priorities

- Advance R&D to promote domestic production
- Infrastructure safety
- LNG Authorizations
- Advanced EOR

FY18 Budget (in thousands)	Request Level	House Mark	Senate Mark
TOTAL FOSSIL ENERGY R&D	280,000	668,000	572,700



Blue Sky – What's Next?

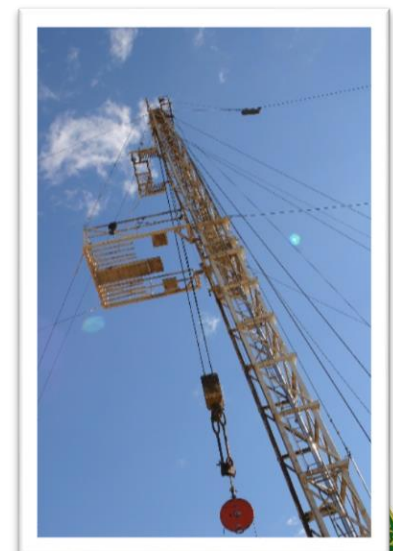
Administration Goals/Priorities

- ✓ U.S. Energy Dominance
- ✓ GRID Reliability and Resiliency
- ✓ Infrastructure
- ✓ Job Creation
- ✓ Energy Security

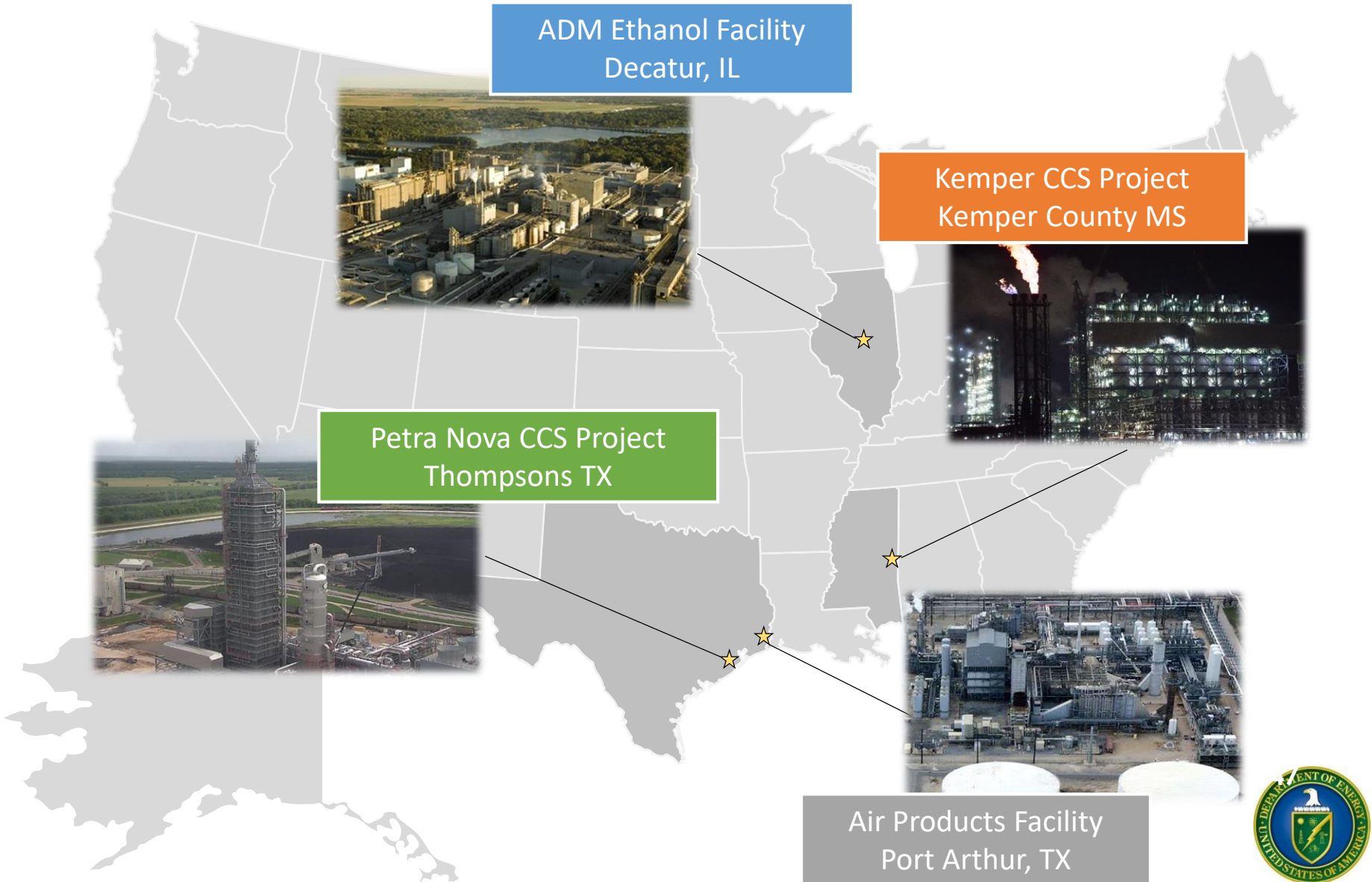


DOE FE Future Priorities/Outlook

- ✓ Focus on early stage/lower TRL R&D
- ✓ Organize research around technologies rather than commodities
- ✓ Impactful regional initiatives (ex. Ethane Hub)
- ✓ Next generation technologies (oxy-combustion, chemical looping)
- ✓ Advanced Materials
- ✓ Carbon utilization – EOR, materials, chemicals, etc.



Major Project Demonstrations



Accelerating the Rate of RD&D - Transformational

Partnership between national labs, academia, and industry

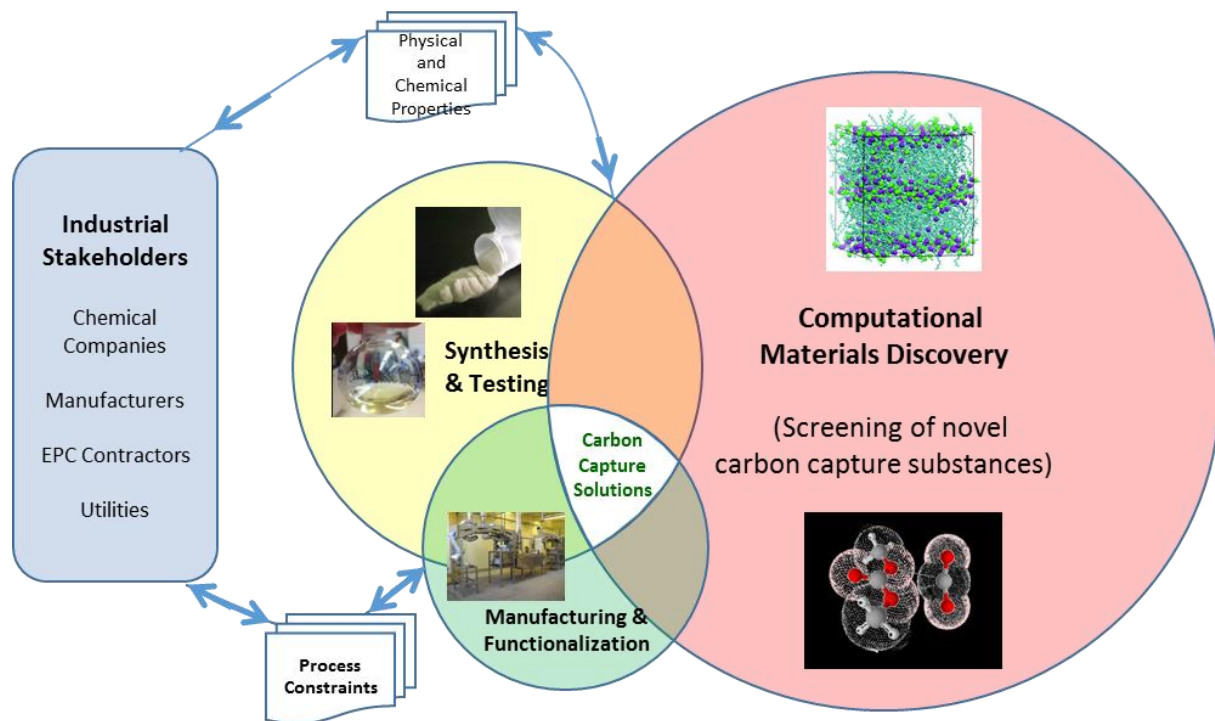
Accelerate deployment by 50% in TRL 2-4 range

Parallel paths for materials discovery – synthesis – process design

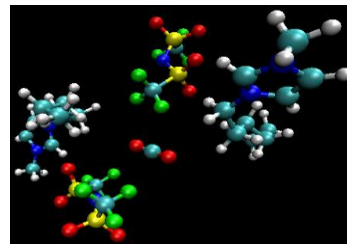
Leverage advanced computing

Robotics for rapid synthesis and analytical capabilities

“Transformational Technology Development”



Non-aqueous and phase change solvents



Molecular Design



Advanced Manufacturing

Questions