CLEAN AIR TASK FORCE

The Future of CCUS

Carbon Capture Utilization and Storage and Oil & Gas Technologies Integrated Review Meeting

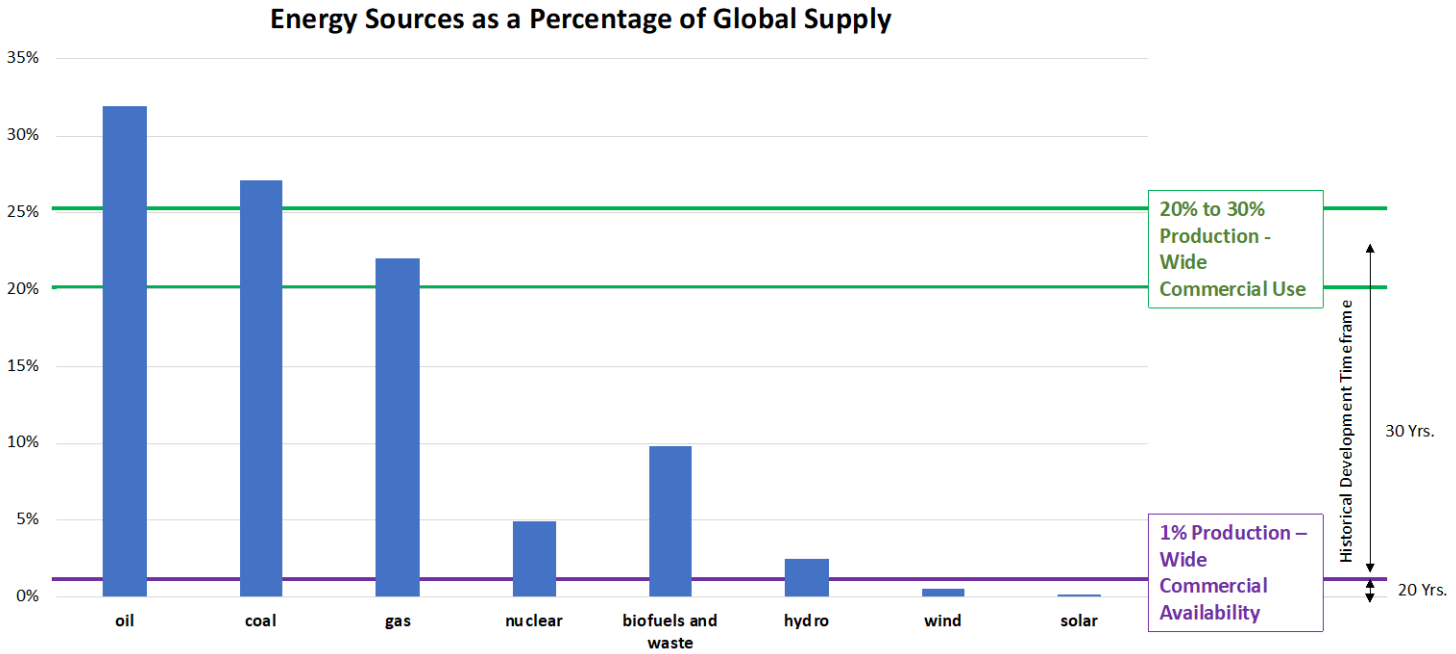
Kurt Waltzer
Clean Air Task Force

AUGUST 27, 2019

A Word About Scale (of the Energy System)

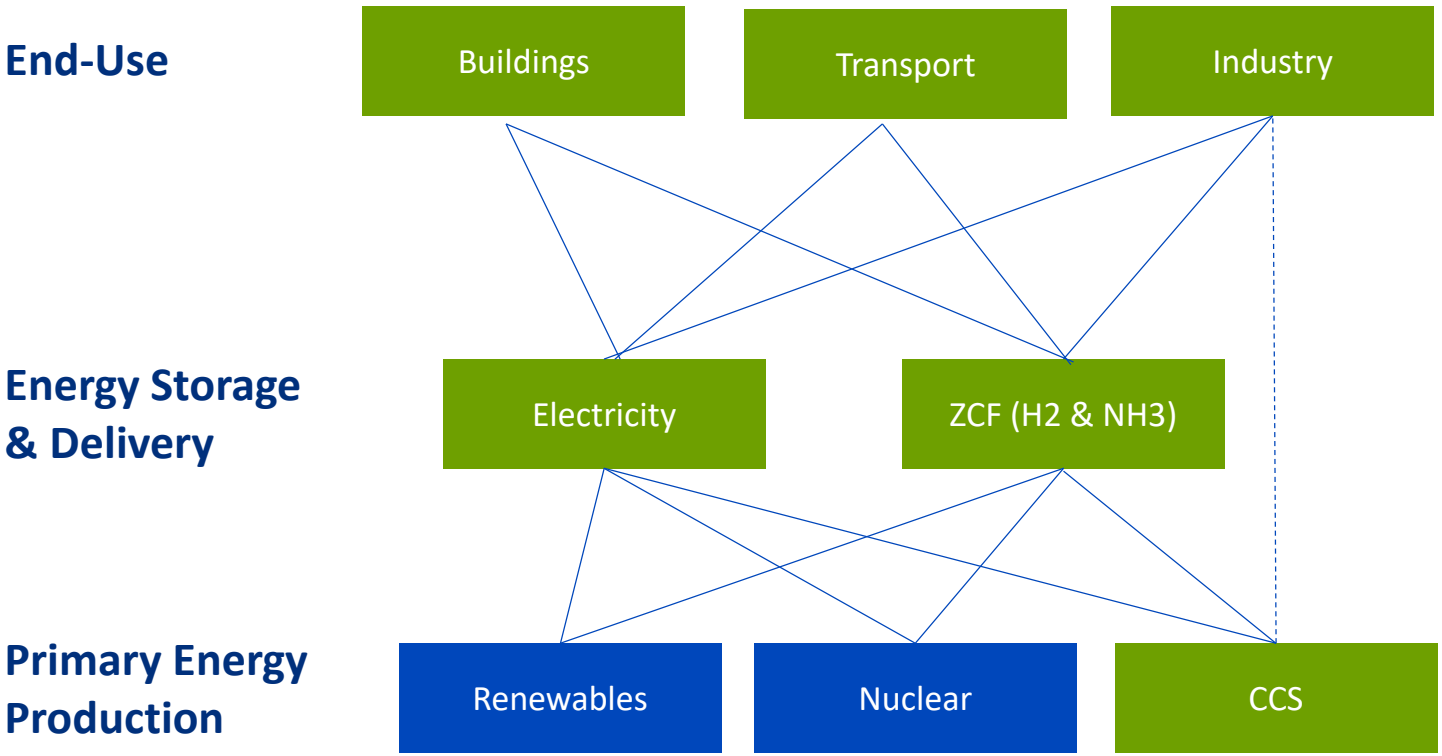
- The global energy system represents $25 trillion of infrastructure investment.
- Unabated coal, oil, and gas dominate the world's primary energy use.

Source for energy production: International Energy Agency, Key Energy Statistics, 2018 (2016 data); Source for development times: Kramer and Haigh (2009), Bento and Williams (2016)



- A technology is considered to have wide-scale availability in the system when it reaches a threshold point of supplying 1% of global primary energy.
- In terms of low carbon sources, nuclear energy exceeded the 1% threshold level decades ago but its growth began to stall in the 1990s. Wind and solar have been experiencing exponential growth, but have not yet crossed the 1%

A Word About Scope (of Potential in Energy System)



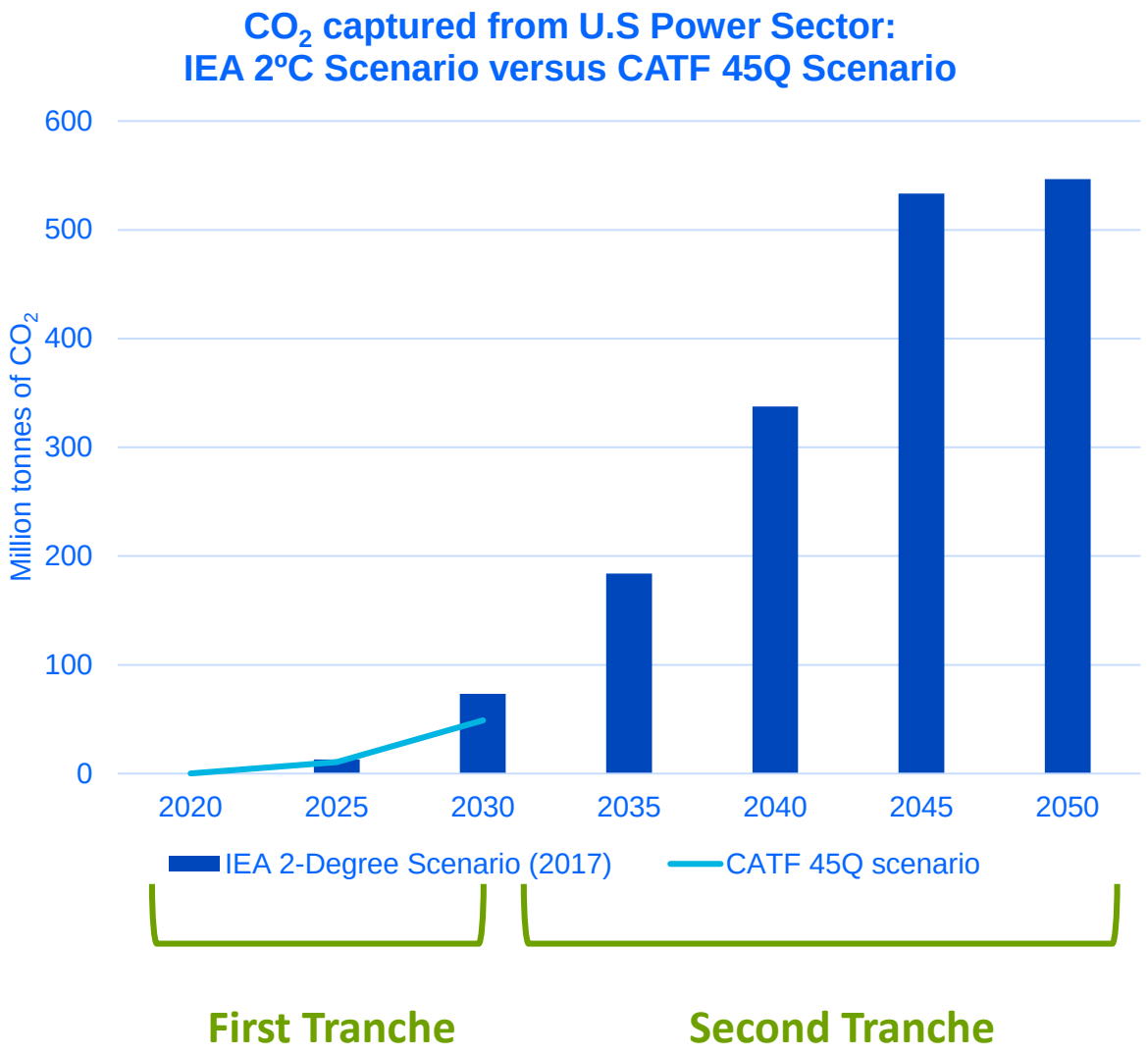
Think About CCUS in Two Tranches

- The current world of 45Q

- Taking the steps necessary to achieve widescale deployment

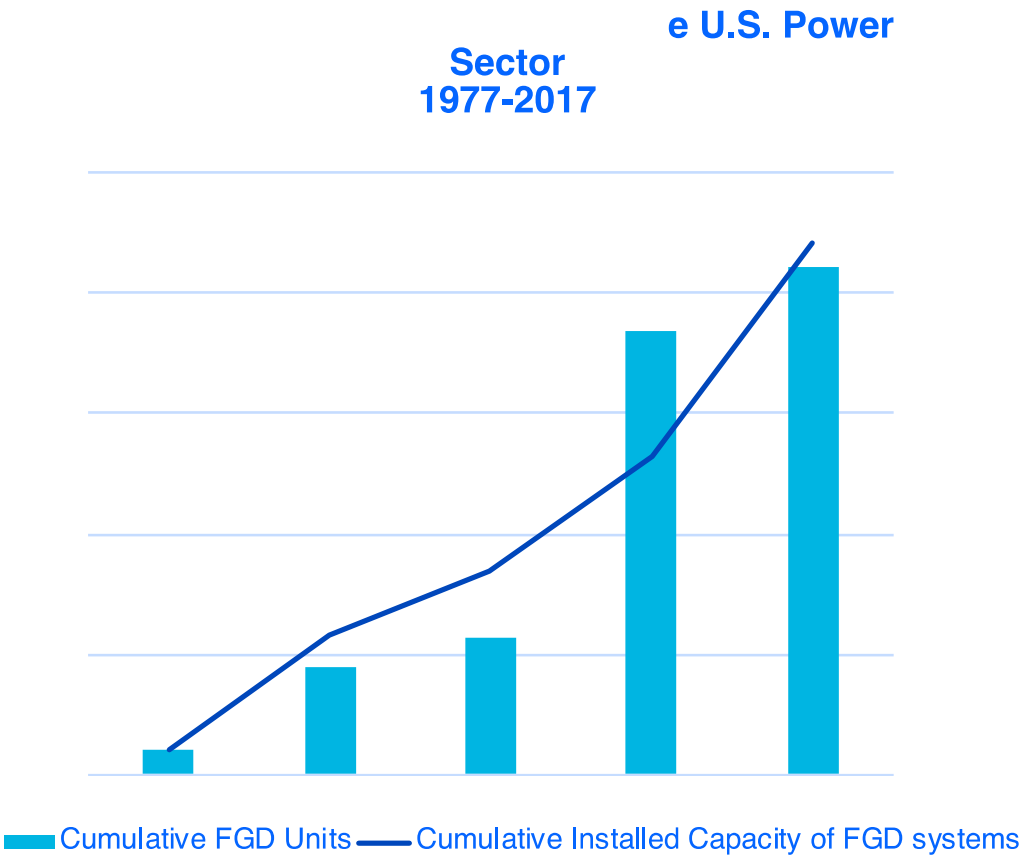
Potential Scale of CCUS

- In February 2018, U.S. Congress adopted the Bipartisan Budget Act that expanded existing federal tax credits for carbon capture and sequestration (45Q). CCUS plants that commence construction prior to January 2024, are eligible to claim tax credits for 12 years.
- CATF-led power sector modeling indicates that 45Q tax credits could result in the incremental capture of 49 million metric tons of CO_2 annually from U.S. power sector by 2030. This is equal to removing emissions from all of the (7 million) new cars sold in the U.S. in 2017 every year.
- This volume is closely aligned with International Energy Agency's 2017 modeling scenario in which 50 percent chance of limiting average global temperature rise to 2ºC by 2100.



History shows technologies like CCUS have scaled quickly.

- SO_2 scrubbers (Flue Gas Desulfurization) remove SO_2 from a power plant boiler's post-combustion exhaust. Clean Air Act Amendments in the 1972 created a market for FGD deployment on U.S. coal power plants.
- Over the past 20 years, the number of FGDs installed has quadrupled.[10] Today around 72% of U.S. coal power capacity is fitted with SO_2 scrubbers. This indicates the industry can apply CO_2 scrubbers and scale deployment in a meaningful timeframe.
- Three quarters of 4500 miles of existing CO_2 pipeline network was built between 1980 and 1990. It has been estimated that 23,000 miles of CO_2 pipelines would be needed to support CCS deployment on several hundred GW of power plants.[11]
- For comparison, approximately 150,000 miles of natural gas pipeline or approximately half of the current pipeline network was built in the U.S. between 1950's and 1960's in response to increased demand.

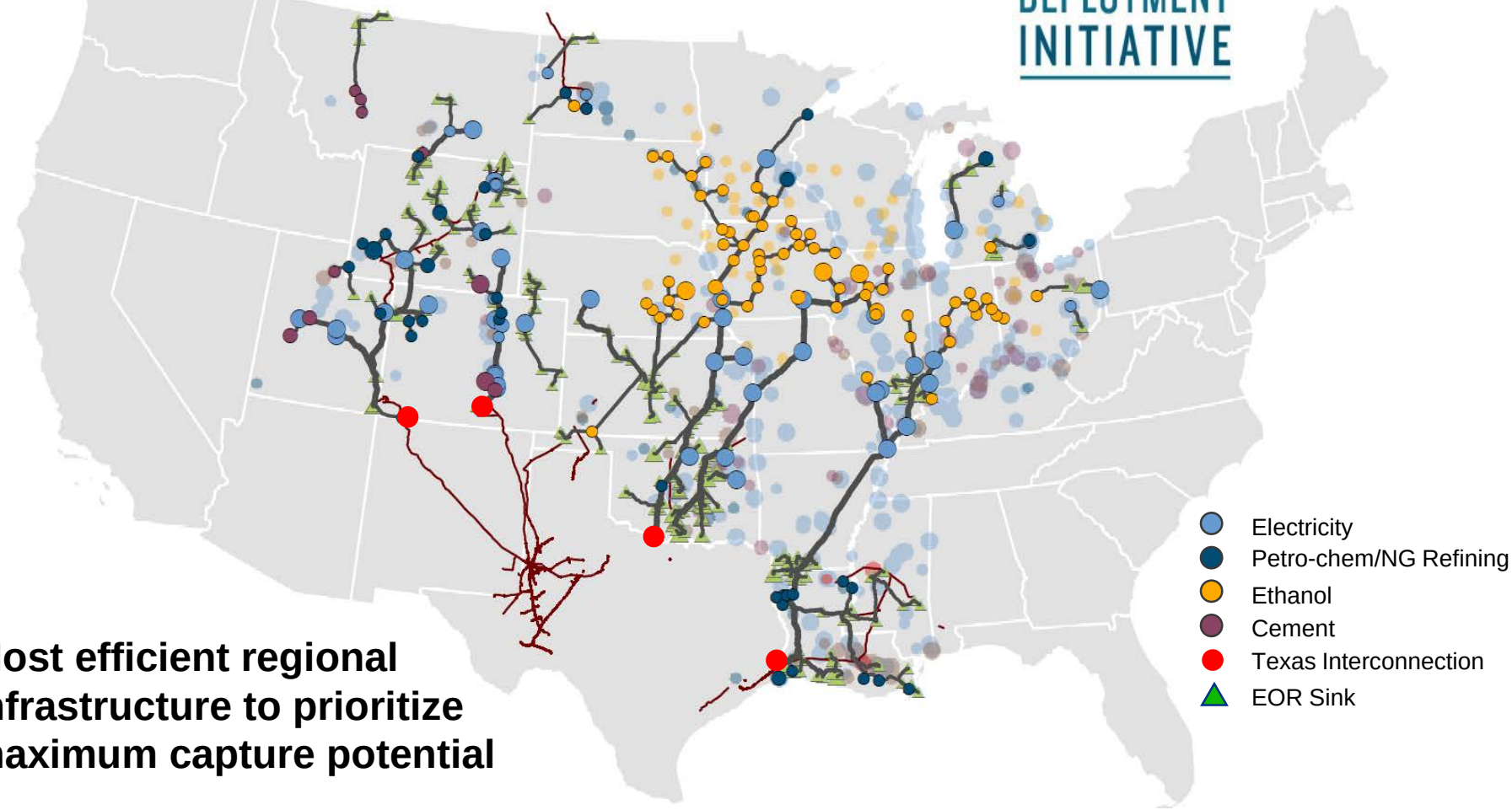


First Tranche – What's needed?

- A final Treasury rule
- An extension of commence construction window
- Addressing BEAT tax
- Improved transferability
- **Support for pipeline development**

REGIONAL CARBON CAPTURE DEPLOYMENT INITIATIVE

Draft National Scenario



Most efficient regional infrastructure to prioritize maximum capture potential

CATF

Second Tranche - Reaching wide-scale availability requires addressing four key factors.

1. Cost Competitiveness (without incentives)

Technology Costs – The ability of the technology to compete (or nearly compete) with the most competitive carbon intensive alternatives (without subsidy) – particularly in the developing world, where most future emissions will come from

2. Project Deployment Time

Project Development Speed – Sufficiently rapid project development time in order to provide a major wedge of global primary energy production by mid-century.

3. Investment Access

Investment Access – Technologies and deal structures that are sufficiently de-risked, enabling access to the largest, most risk averse and largest pools of global capital.

4. Market Ecosystems

Market Ecosystems– adaption to, or modification of, market ecosystems - consisting of “non-price” market factors, such as enabling physical infrastructure and regulations.

Second Tranche - Strategic efforts can get CCS to wide-scale availability by addressing all factors with an array of policies.

CLEAN AIR TASK FORCE

Kurt Waltzer

Managing Director

kwaltzer@catf.us

114 State Street

Boston, MA 02109