

EPA's Proposed CO₂ Power Plant Rule

Overview of Proposed Rule

- **Proposal regulates new and existing fossil-fueled power plants**
- **Core elements of the proposal**
 - Sets guidelines that states will use in setting performance standards for—
 - Existing coal-fired steam generating units
 - Existing oil- and gas-fired steam generating units
 - Existing largest, frequently operating, stationary combustion gas-fired turbines (CTs)
 - Sets performance standards for new and reconstructed gas-fired CTs
 - Repeals the Affordable Clean Energy Rule adopted by the Trump EPA

Major Impacts of the Proposed Rule

- **Aligned with Biden Administration's clean energy goals set for the electric power sector**
- **Achieves an 80% CO₂ emission reduction from the electric power sector by 2030**
- **All conventional, uncontrolled coal-fired electric generation eliminated by 2035**
- **Only 12 GW of coal-fired electric generation with carbon capture and storage (CCS) operating in 2035, dropping to 9 GW by 2040**
- **Established rules for the rapid transition from natural gas to clean hydrogen generation**

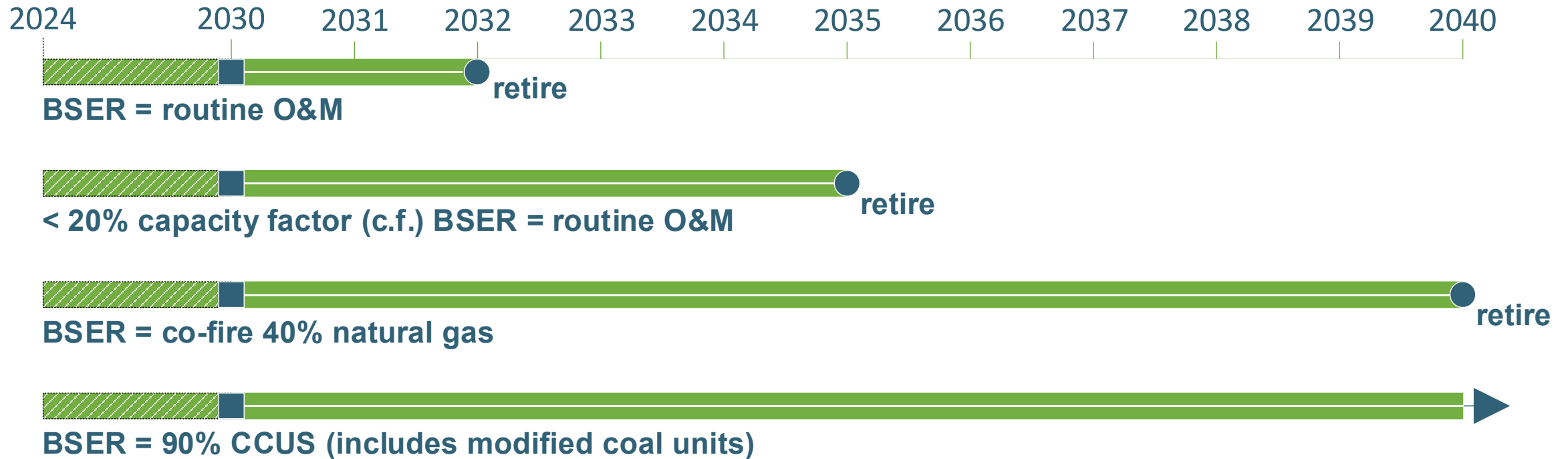
Framework for Proposed Rule

- **Traditional approach used for setting performance standards**
 - Standards based on “best system of emission reduction” (BSER)
 - Only “inside the fence” control measures used for BSER determinations
 - Efficiency improvements
 - Installation of add-on control measures (such as CCS)
 - Switching to cleaner fuels (such as natural gas to clean hydrogen)
 - Control requirements phased-in over a 10-to-15-year period
- **Affected generating units subcategorized by—**
 - Combustion technology (*e.g.*, steam boiler, combustion turbine)
 - Fuel combusted (*e.g.*, coal, oil, natural gas)
 - Retirement date
 - Annual capacity factor
- **Separate performance standards set for each subcategory**

Existing Coal-Fired Steam Generating Units

- **Four subcategories established based on retirement date and annual capacity factor of the coal-fired steam generating unit**
 - ***Imminent-Term***: units retiring before January 1, 2032
 - ***Near-Term***: units retiring before January 1, 2035, and adopting an annual capacity factor limitation 20%
 - ***Medium-Term***: units retiring before January 1, 2040, and natural gas co-firing at 40%
 - ***Long-Term***: units retiring on or after January 1, 2040
- **Separate performance standard set for each source subcategory**
- **Compliance deadline for each applicable performance standard is January 1, 2030**

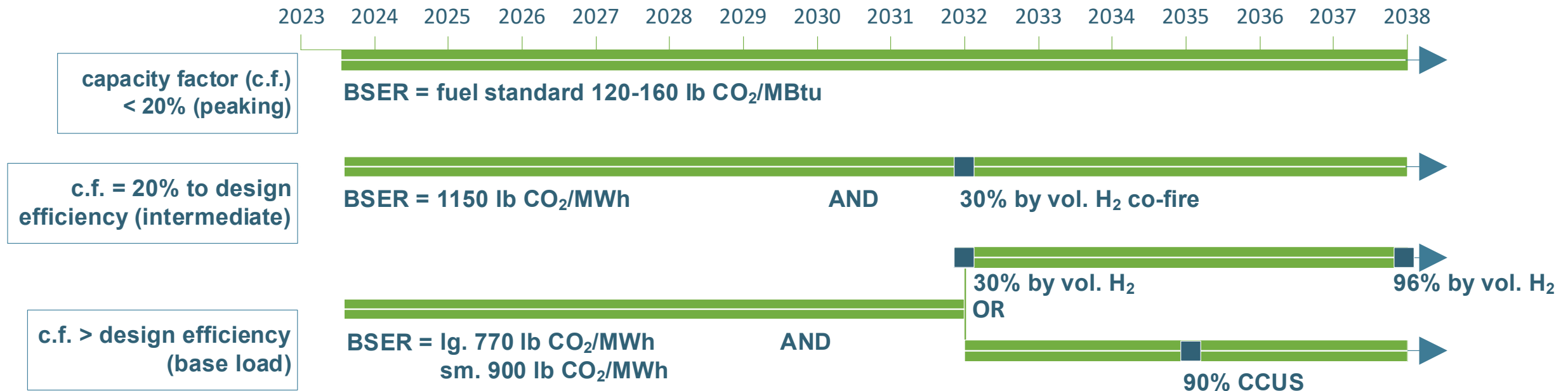
Performance Standards for Existing Coal-Fired Steam Generating Units



New Natural Gas-Fired Stationary CTs

- **Three subcategories established based on annual capacity factor of the CT**
 - ***Low-Load (Peaking)***: units with annual capacity factor of less than 20%
 - ***Intermediate-Load***: units with annual capacity factor ranging between 20% and upper bound threshold of ~50%
 - ***Base-Load***: units with annual capacity factor above ~50%
- **Separate performance standard set for each source subcategory**
 - Two pathways for compliance: clean hydrogen and CCS
- **Compliance deadlines for the applicable performance standard**
 - Begins upon startup of the new affected CT unit
 - Standard increases in stringency over time between 2032 and 2037

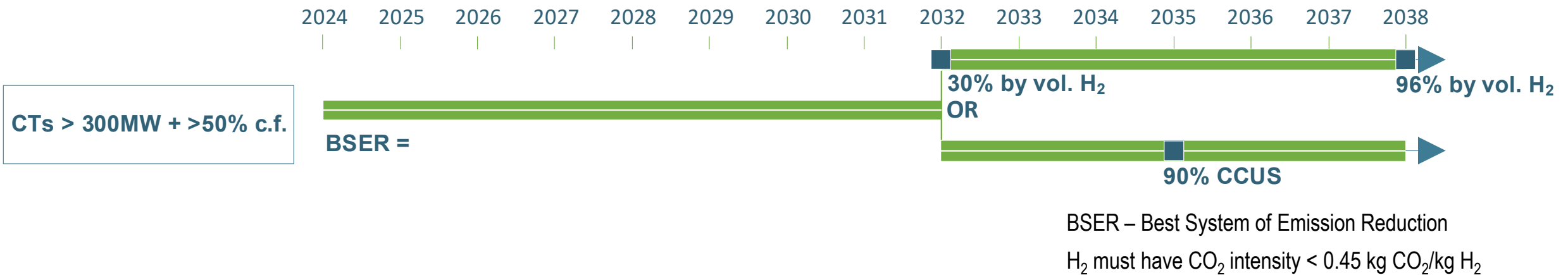
Performance Standards for New Natural Gas-Fired CT Units



Existing Natural Gas-Fired Stationary CTs

- **Only one performance standard set for existing CT units that are the “largest and most frequently operated”**
- **Regulated existing CTs include only those units with—**
 - Generating capacity above 300 MW; and
 - Annual capacity factors above 50%
- **Other existing CTs will be regulated under a future EPA rulemaking**
 - EPA taking comment on lowering the applicability thresholds for regulation
- **Two pathways for compliance: clean hydrogen and CCS**
- **Compliance deadlines phased in over time during the 2032-2038 period based on the compliance pathway selected**

Performance Standards for Existing Natural Gas-Fired CT Units



EPA is taking comments on BSER for the remaining existing gas units with a rule at a later time.

Timeline for State Implementation of Existing Source Requirements

Date	Milestone
June 2024	Issuance of Final Emission Guidelines
June 2026	State Submission of State Plans
August 2026	EPA Completeness Determination of State Plans
August 2027	EPA Approval or Disapproval of State Plans
January 2030	Compliance for Existing Coal-Fired Units
January 2032	Compliance for Existing Gas-Fired CTs – Phase 1 Hydrogen
January 2035	Compliance for Existing Gas-Fired CT – CCS
January 2038	Compliance for Existing Gas-Fired CT Phase 2 Hydrogen

Note: EPA is required to issue a federal implementation plan within 12 months from the date of either the state's failure to submit a complete state plan or EPA's disapproval of that complete state plan.

Reactions and Controversies: Overall

- **Failure to assess electric grid reliability impacts**
 - Need to perform reliability assessment
- **Revisions for low-load, peaking units**
 - Increase annual capacity factor?
- **Problems with 40% natural gas co-firing requirements**
 - Not cost effective, not achievable by Jan. 1, 2030.
 - Agency underestimated natural gas prices
 - Time necessary for design, permitting and construction of infrastructure
- **Hydrogen co-firing and CCS not adequately demonstrated**
 - Not technically or economically feasible to implement today, required under section 111(a)(1) of the Clean Air Act

Reactions and Controversies: Reliability

- **EPA analysis and modeling does not assess grid reliability but rather resource availability**
 - Grid reliability matters that you have the right power in the right part of the grid at the right time, not intermittent generation
 - EPA considers renewable generation as resources fully available
- **Integrated Planning Model (IPM) analysis**
 - Based on economic assumptions, if units shut down what will the generation be replaced with? EPA assumptions regarding renewables replacement are unrealistic.
- **Overly optimistic modeling assumptions**
 - EPA assumes only shutting down a small amount of generation that is already happening as part of the grid transition to clean energy
 - EPA assumes the Inflation Reduction Act funding will drive the acceleration to renewables and replace shuttered power plants

Reactions and Controversies: Reliability

“As a threshold matter, the Joint ISOs/RTOs are concerned that the Proposed Rule could result in material, adverse impacts to the reliability of the power grid. These reliability concerns primarily arise from the possibility that the significant technological advances in low-greenhouse gas (GHG) hydrogen production, transport and generation, as well as in carbon capture and storage (CCS) that are identified as BSER under the Proposed Rule may not occur as anticipated, or may not occur at the pace anticipated by the EPA. If the technology and associated infrastructure fail to timely materialize, then the future supply of compliant generation—given forced retirements of non-compliant generation—would be far below what is needed to serve power demand, increasing the likelihood of significant power shortages.” – Joint ISOs/RTOs Comments to Proposed Rule

Reactions and Controversies: CCS and H₂

- **CCS and low-GHG hydrogen “adequately demonstrated”?**
 - Technology development status
 - Whether CAA section 111 allows EPA to projections of improvements by setting compliance deadlines
 - Some argue projections allow for technologies not able to be immediately deployed in practice
 - Section 111: “has been adequately demonstrated”
 - Currently available technologies?

Reactions and Controversies: CCS and H₂

- **Legal on “adequately demonstrated”**
 - An adequately demonstrated system is “one which has been shown to be reasonably reliable, reasonably efficient, and which can reasonably be expected to serve the interests of pollution control without becoming exorbitantly costly in an economic or environmental way.”
 - *Essex Chem. Corp. v. Ruckelshaus*, 486 F.2d 427 (D.C. Cir. 1973)
 - EPA must show emission limitations and compliance deadlines from BSER are achievable across a wide range of operating conditions.
 - *Nat’l Lime Ass’n v. EPA*, 627 F.2d 416 (D.C. Cir. 1980)
 - EPA make “look toward what may fairly be projected for the regulated future” rather than currently widespread technologies.
 - But not a “crystal ball inquiry”
 - *Portland Cement Assoc. v. Ruckelshaus*, 486 F.2d 375 (D.C. Cir. 1973)
 - But, *Lignite Energy Council v. EPA*, 198 F.3d 930 (D.C. Cir. 1999) (EPA cannot base standards on “mere speculation or conjecture”)

Reactions and Controversies: CCS and H₂

- **CCS and hydrogen require elements outside the control of individual EGUs**
 - Infrastructure: pipelines and geologic storage sites
 - Accounting of lifecycle GHGs of hydrogen production
- **Power generators argue not feasible or reliable for widespread application**
 - Reliance on pilot projects for hydrogen
 - CCS: Petra Nova, Texas; Boundary Dam facility, Canada
 - Slipstream, steady-state
- **Concern EPA downplaying infrastructure challenges, overplaying current deployment and demonstration**

Reactions and Controversies: CCS

- **Proposed compliance deadlines of CCS-based performance standards**
 - 2030: all existing coal-fired EGUs operating past 2040
 - 2035: new and existing large, base load gas-fired EGUs
 - “not adequately demonstrated”, “unachievable”, “not realistic”
 - Individual EGUs: FEED Study, technical and commercial arrangements, monitoring and permitting, construction
 - Ecosystem outside EGUs: CO₂ pipeline permitting and construction, NEPA requirements, storage sites, Class VI permits
- **Proposed BSER of CCS at 90% capture rate**
 - New and existing base load natural gas-fired EGUs (89% red. annual basis)
 - Existing coal-fired EGUs (88.4% red. annual basis)
 - “unachievable”, “not realistic”
 - Potentially reasonable on design basis only
 - Variable operating conditions impact capture rate

Reactions and Controversies: CCS

- **Affordability assumptions**

- EPA assumes high capacity factors
 - 65-75% for gas-fired EGUs, 50-70% for coal-fired EGUs, up to 30 years
- EPA assumes Section 45Q tax credit lasts long term
 - Section 45Q lasts 12 years, construction must commence by 2033
- EPA modeling: LCOE for coal-fired units with CCS: $-\$7/\text{MWh}$
 - 12-year amortization period, 70% c.f.
 - Overly optimistic assumptions

- **CCS v. CCUS**

- Clarification sought

Reactions and Controversies: Hydrogen

- **“low-GHG hydrogen”**

- BSER based on GHG emission rate of 0.45 kg CO₂e/kg H₂
 - Well-to-gate basis
 - Different than clean hydrogen from the IRA (4 kg CO₂e/kg H₂)
- “Unrealistic” timelines and volumes of future production
- EPA argues federal tax credits (45V) and technology-forcing nature of CAA supports making low-GHG hydrogen available
- Questions on whether EPA can condition BSER on emissions attributable upstream
- Additionality requirements (newly built clean resources)

- **Infrastructure**

- Currently 1M miles gas v. 1,600 miles hydrogen
- Requires storage and compression
- Traditional siting, permitting constraints

Reactions and Controversies: Hydrogen

- **Cost**

- EPA based modeling on aspirational DOE studies
 - “Hydrogen Shot” (Earth shot)
- Supply of electrolyzers
- Supply of renewable generation
 - High demand for clean electricity, lack of transmission infrastructure
 - Land to site, interconnection access
- Water supply

Reactions and Controversies: Hydrogen

As an example, CARB estimates that in 2045, when CA must have a zero-carbon grid, ~4% of CA's installed power generation will be hydrogen-based, or 9.35 GW.

California Hydrogen Production in 2045	
H ₂ Capacity for CA Power Gen, 2045	9.35 GW
Assumed Capacity Factor of H ₂ Power Generators	15%
Hydrogen Required	0.73 Million Metric Tons (MMT)
Solar Capacity Required to Generate H ₂	12.9 GW
Land required for New Solar Capacity	101 square miles
Water Required	1,679 million gallons (5,152 acre-feet)

Comments on State Planning Process

- **Extending 24-month state planning process**
 - Additional flexibility into the development of SIPs
- **Assumes expensive capital expenditures taken early by electric utilities**
 - Owners and operators would begin implementing compliance options at the same time as states would be setting standards
- **Should EPA consider establishing a more flexible framework for the development of SIPs?**
 - Rather than imposing highly prescriptive state planning requirements
 - Give deference to states in development of performance standards and monitoring provisions adopted under the state plans

Additional Divisions

- **States split on issue**

- 21 Republican state AGs devoting most of comments to whether CCS and hydrogen are adequately demonstrated, stating compliance “impossible”
- 19 Democratic state AGs argue standards are source-specific enough to meet *West Virginia v. EPA* requirements

- **Major Questions Doctrine**

- *West Virginia v. EPA* (S.Ct. 2022)
- “Traditional” pollution controls such as cleaner fuels, efficient design and operation, and end-of-stack emission requirements
- But “economic and political significance”
 - Did Congress authorize EPA to interpret the Clean Air Act in this way?

- **NGOs pressing for further regulation**

- Additional existing gas capacity in 2035 (“peakers”)
- Earlier regulation of coal-fired plants
- Environmental justice concerns

Support for Proposal

- **Some support use of CCS and hydrogen in proposal**
 - Argue CCS and hydrogen are adequately demonstrated given adequate lead time and deployment of related infrastructure, and can be cost-effective
 - CCS was BSER for new coal plants in 2015 NSPS
 - Turbine manufacturers offer models that can co-fire hydrogen
- **Support of proposal mostly hinges on major federal incentives**
 - Inflation Reduction Act (IRA)
 - Infrastructure Investment and Jobs Act (IIJA)
- **Some renewable and nuclear utilities support the proposal**
 - Conflict with other utilities

Final Regulatory Observations

- **Lack of EPA support for emissions trading as a compliance option**
- **Problems with state planning process for implementation of the “existing source” performance standards**
 - Prescriptive framework
 - Timing challenges for compliance planning
 - Inflexible procedures for revising state plans
- **Potential electric grid reliability impacts**
- **Legal vulnerability to court challenges**

Questions and Answers

Contact

A.J. Singletary

Associate

asingletary@vnf.com