

Current Status of MATS Implementation and Consideration of MATS controls on other Environmental Drivers

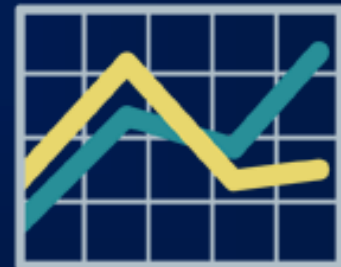
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MATS Implementation

- Compliance Dates
- Concerns with Existing MATS compliance
- What types of Projects are On-Going
- Key Drivers for Determining MATS Controls
- Strategic Considerations of MATS
Compliance with other regulatory drivers

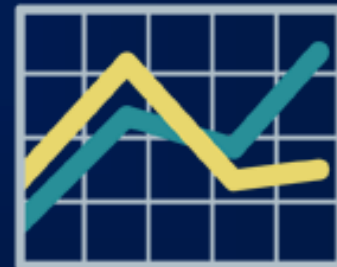
Compliance Dates

- Clean Air Act allows states to grant one year extension to compliance
- EPA adding an additional year under certain circumstances (but legal risks exist)
- Many utilities have requested one year extensions (Most have been granted)
- With one year extension, compliance date is April 2016



Concerns with MATS

- Even with April 2016 compliance date, larger fleets and units requiring high capital cost controls have significant compliance schedule risks
- **Startup/shutdown definition not consistent with AQCS design/current operations**
- Permit modifications and other regulatory approvals requirements
- Impacts on other air/water/ash issues
- Monitoring
- Boiler tuning



Uncontrolled Emissions included in permit limits

- MATS 30 day rolling average includes startup/shutdown emissions
 - Many opting to stack test for compliance
 - Different averaging methodology can give different results
- AQCS may not operate during part of time
 - Hg: No startup until sufficient gas flow/temperature
 - NO_x: SCR needs minimum temperature
 - SO₂: DFGD needs minimum temperature
 - PM: ESP typically doesn't operate during SSM

Uncontrolled Emissions included in permit limits

- New Controls such as DSI/ACI may have periods of uncontrolled PM emissions requiring permit modifications
- Change in startup procedures
- New Controls may require additional cost items
 - DFGD: DSI
 - WFGD: Upgrades/eliminate bypass-new stack?
- Existing controls upgrades:
 - ESP to Fabric Filter conversion
 - New Fabric Filter
 - Increase ESP plate area, spacing, T-R upgrades, control modifications

On-Going Projects

- Dependent on coal characteristics, expected operations, economics and consideration of future regulations
- Coal characteristics
 - Maintain fuel flexibility for cost and operating considerations
 - However, different fuels may require different controls
- Operations
 - Unit dispatch can impact control effectiveness

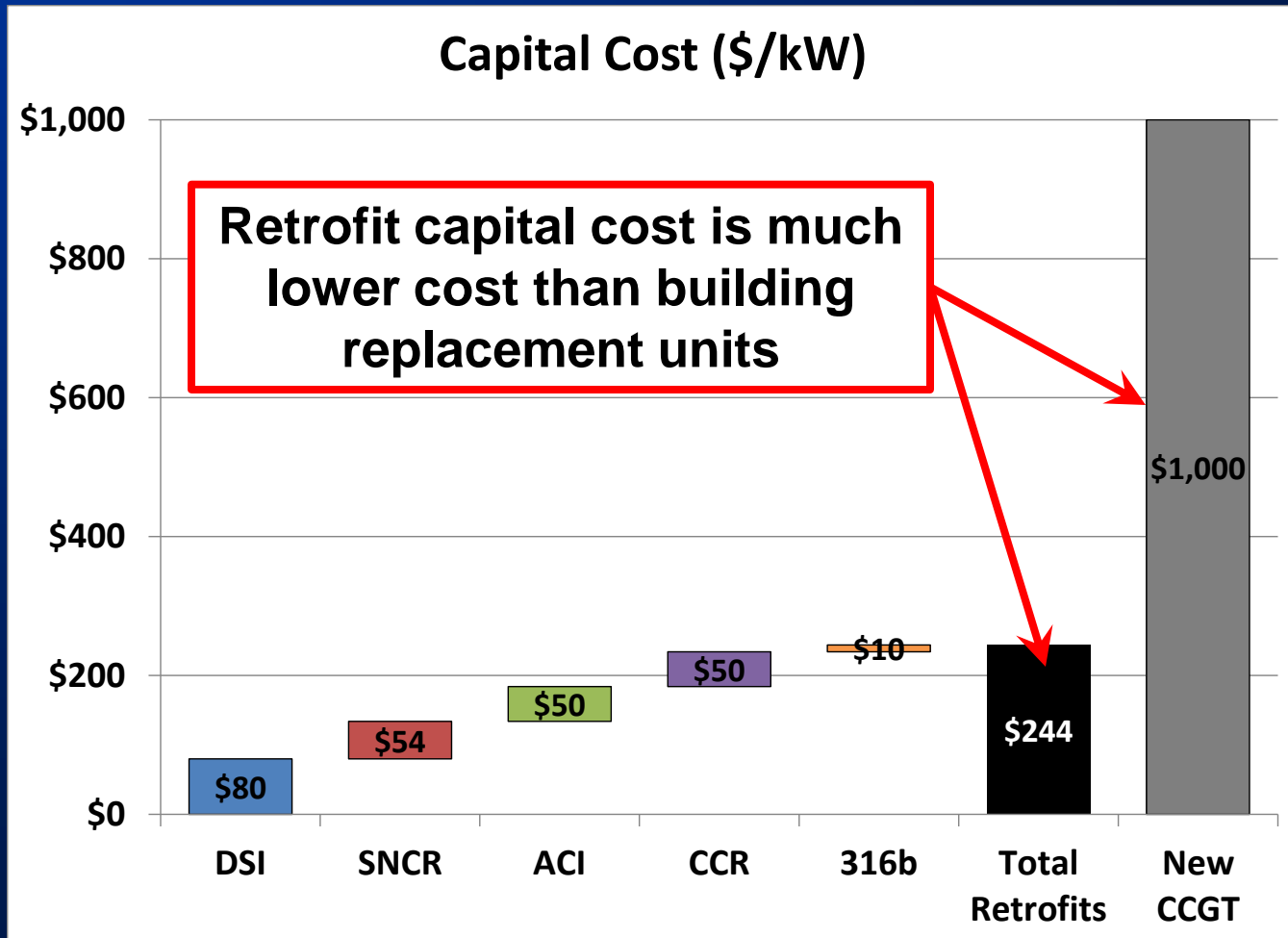


Consideration of Other Regulations

Wide Range of Compliance Controls & Costs

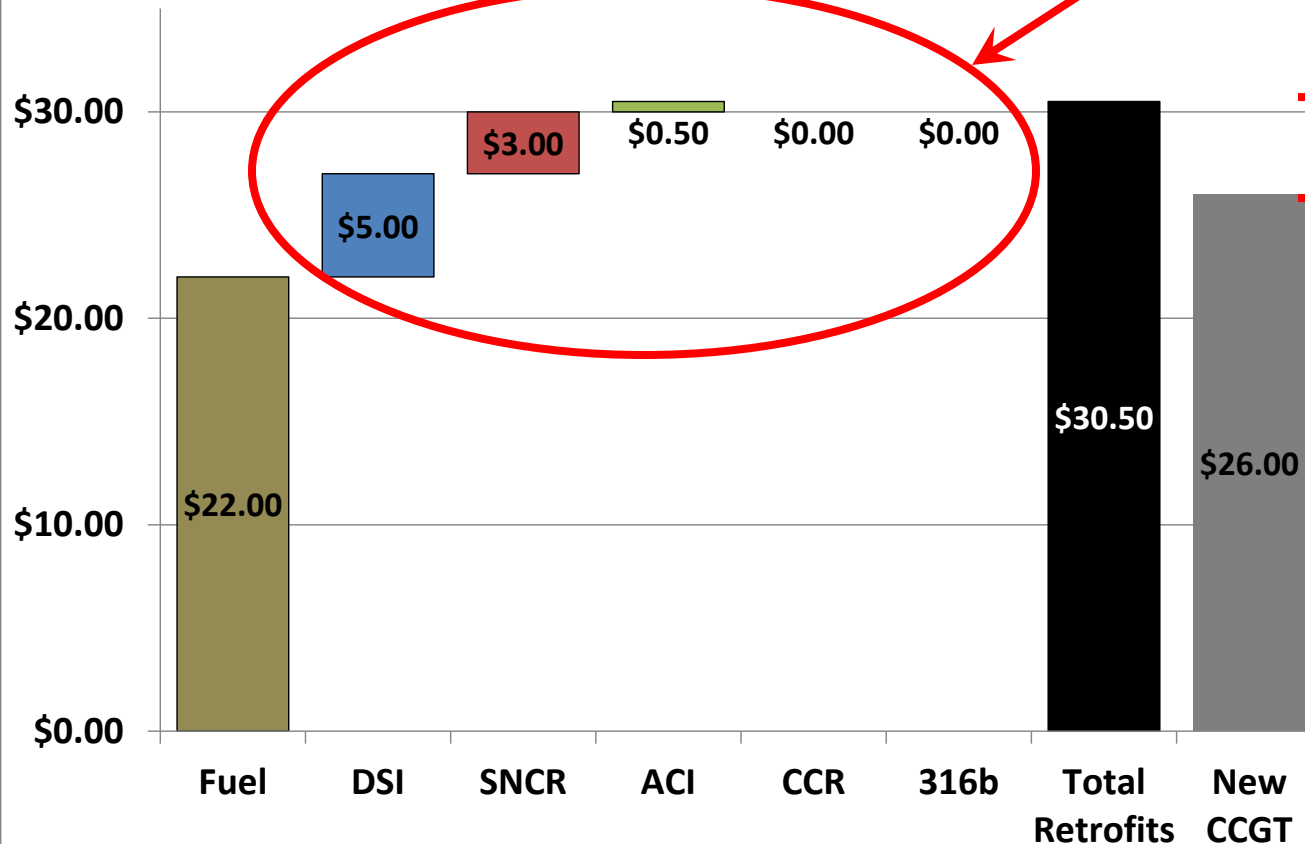
Item of Concern	Regulations	Lower Capital & Higher O&M Cost Option	Higher Capital & Lower O&M Cost Option
Hg	MATS	Additive	Additive/Baghouse
PM	MATS/Regional Haze	ESP upgrades	New Baghouse
Acid Gases	MATS/CSAPR/RH	Sorbent	FGD
NOx	CSAPR/Regional Haze	SNCR	SCR
PM/SO2/NOx	NAAQS	Fugitive dust control	New stack, FGD, SCR
GHG	NSPS, NSR	Efficiency	Carbon capture/storage
Ash	RCRA	New landfill liner	New liner, convert wet to dry ash, close ash pond, ZLD
Water	316a/b	Intake Modification	Cooling tower
Water	CWA discharges	Physical Treatment	Zero Liquid Discharge

How Does a Low Capital Retrofit Compete in Market versus New Combined Cycle?



Variable Costs may Curtail Dispatch

Dispatch Costs (Fuel + Variable O&M, \$/MWh)



Lower capital cost may come at a penalty of higher dispatch costs

Consumables can drive energy cost greater than CCGT energy cost

If capacity is main driver, this may be the lower cost option...however dispatch may be significantly reduced

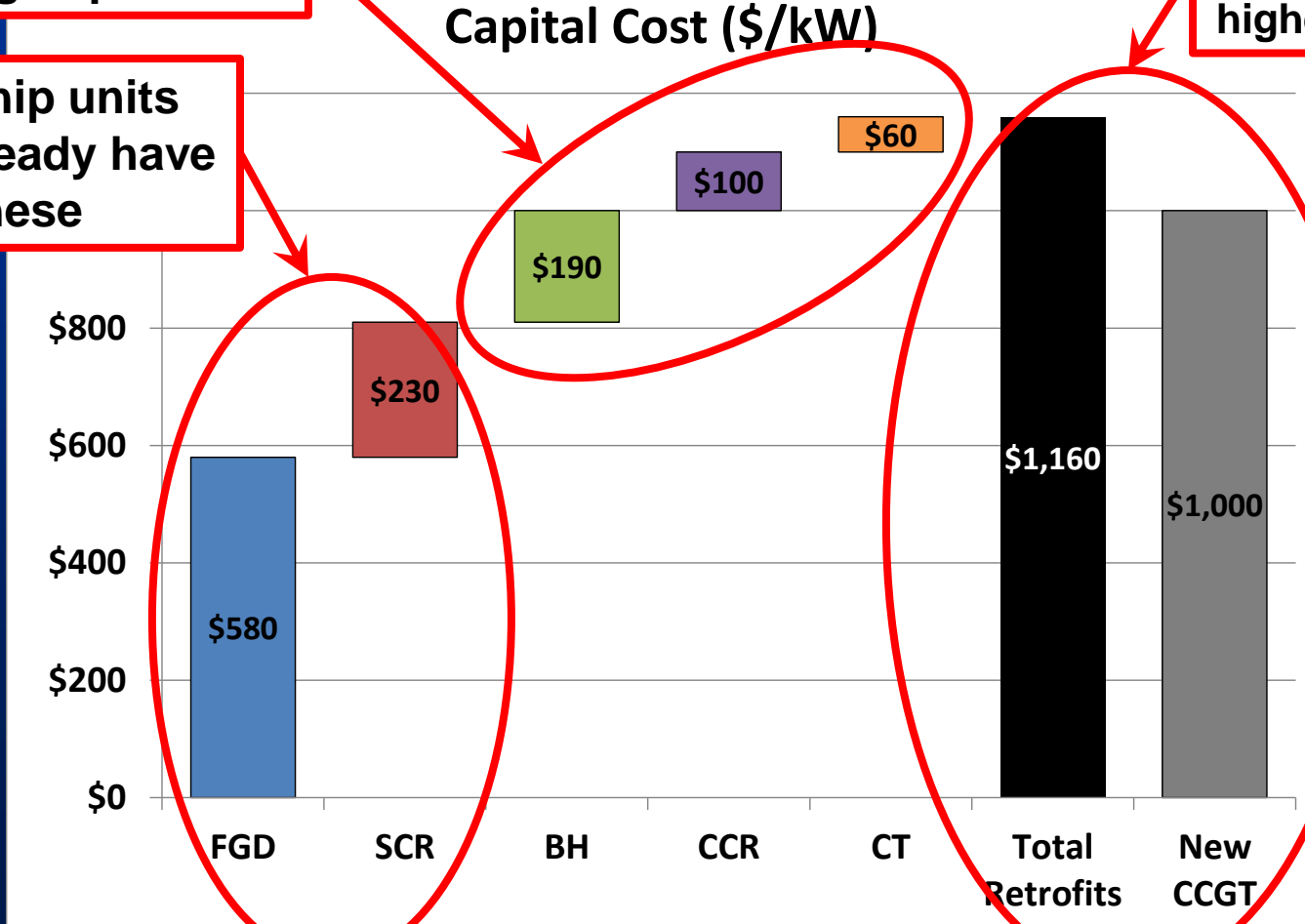
How Does a High Capital Retrofit Compete in Market versus New Combined Cycle?



Retrofit cost for flagship units

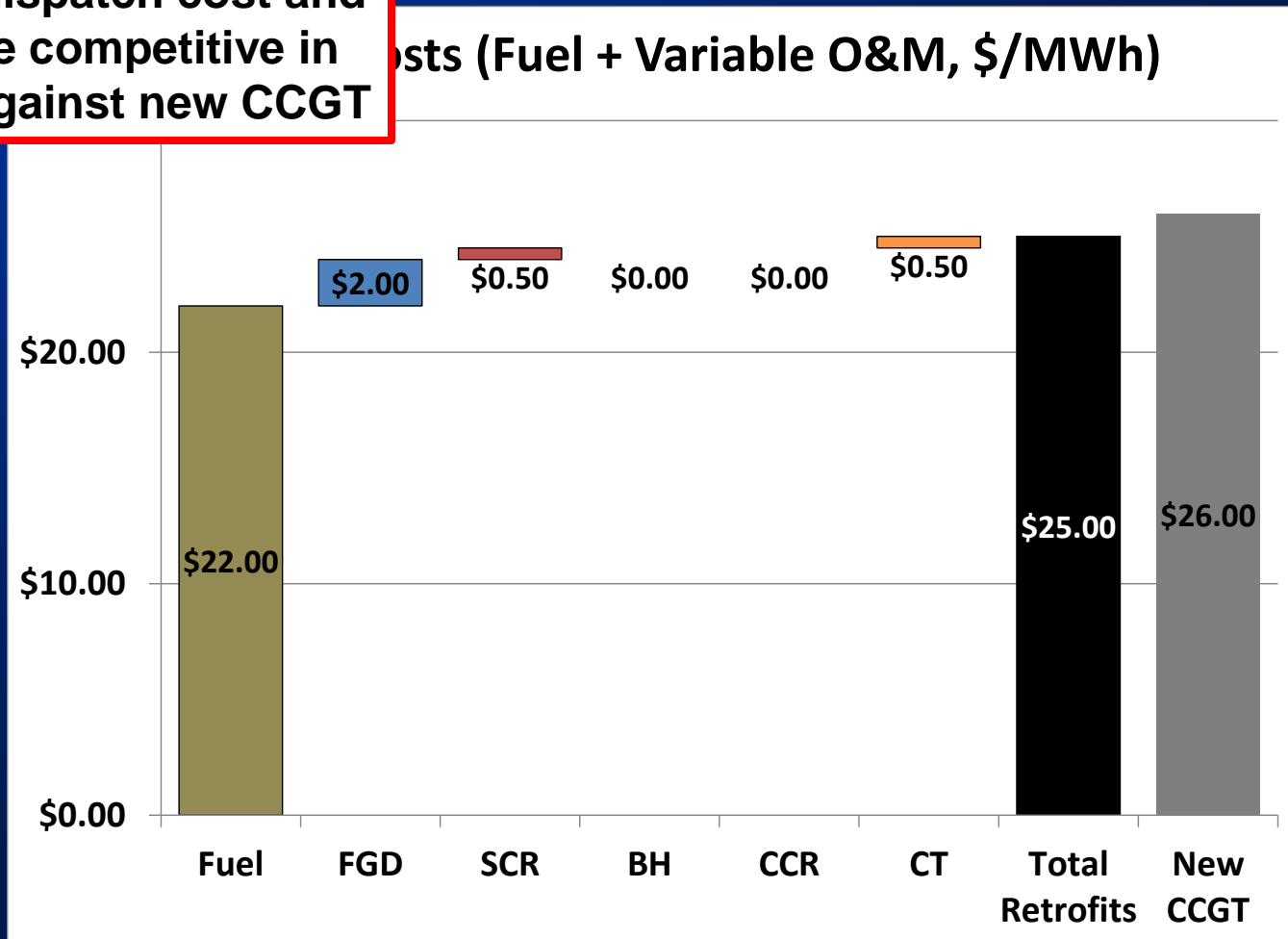
Retrofit cost for older units may be higher than new CC

Flagship units may already have these



Dispatch Costs are Less Impacted with Higher Capital Investment

Higher capital cost options have lower dispatch cost and will be more competitive in the market against new CCGT



Summary

- MATS controls currently being tested, permitted and implemented
- Low Capital Cost AQCS likely to meet schedule
- High Capital Cost AQCS and large fleets could need additional timeframe
- Type of controls implemented is highly fuel, unit, system and regulation specific
- Make Decision Defensible: Expect interveners on any and all fossil fuel related public meetings (End game: no GHG)



Questions/Discussion

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