

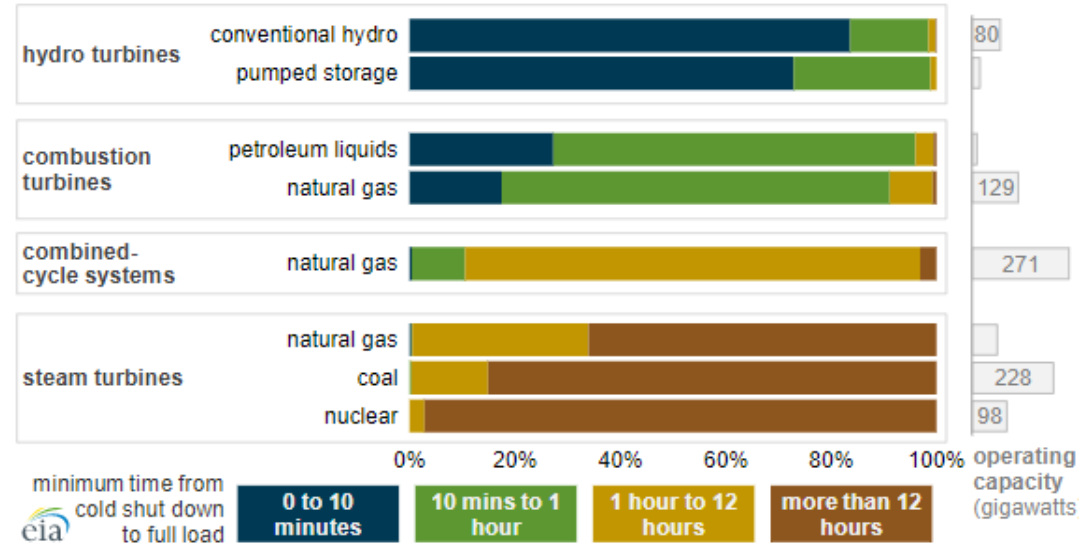
# Start Up / Shutdown Emissions

Landon Lunsford and Julie Robinson

# Start Up Emissions

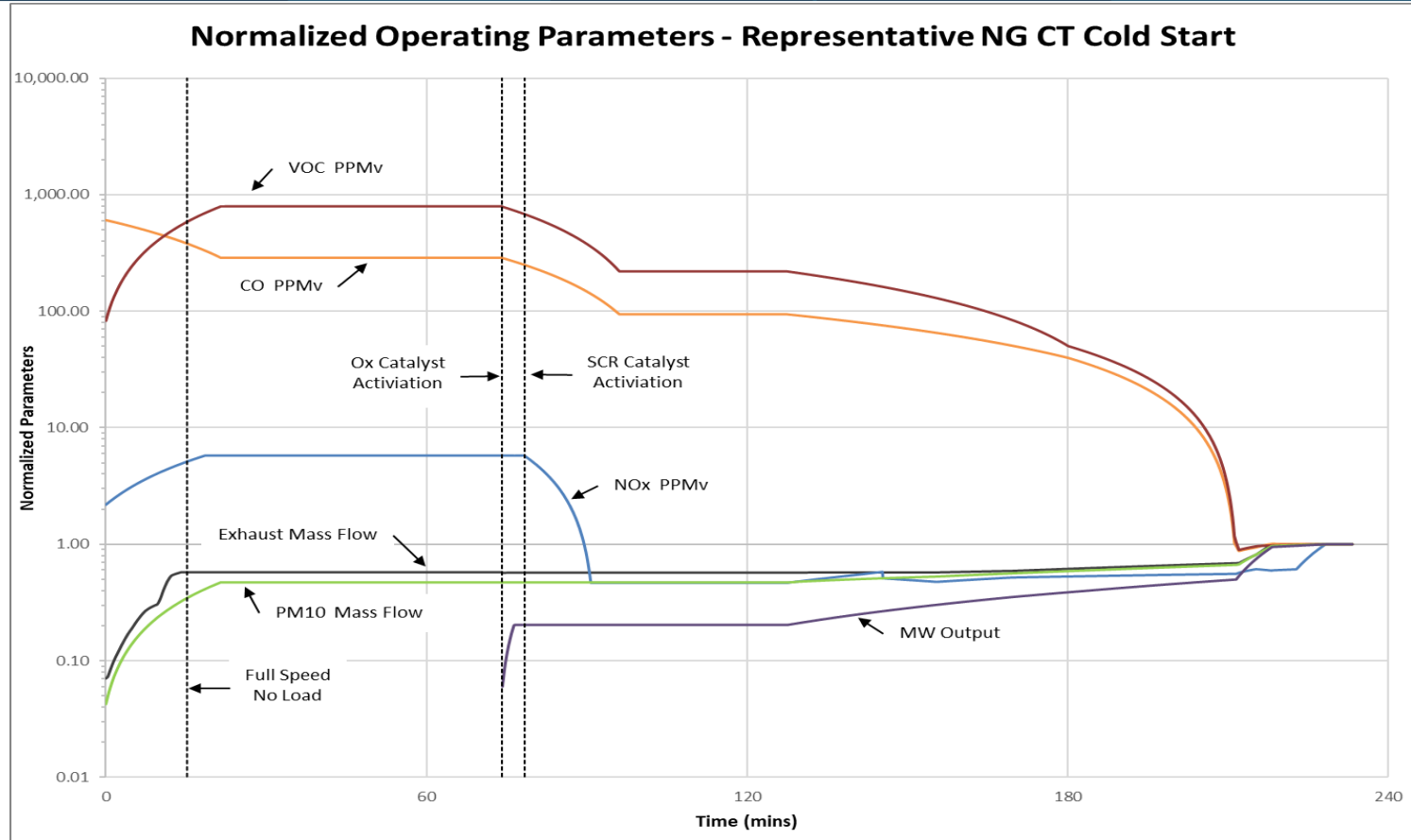
- Start up duration and emissions are unit specific and variable – impacted by the type of unit, environmental controls installed, equipment sizes, and process & permit requirements
- 3 modes of start up – Cold, Warm, or Hot - defined by starting boiler / HRSG and steam turbine temperatures
- Emissions driven by time required to place controls in service and optimize performance (combustion & environmental)
  - NGCC – SCR/Ox catalyst temperature in proper range
  - Coal – SCR catalyst temperature in proper range, particulate & sorbent controls meet process requirements
- Impact on CO2 Capture depends in part on level of integration and capture process startup timing

U.S. electric generating capacity by minimum time from cold shut down to full load (2019)

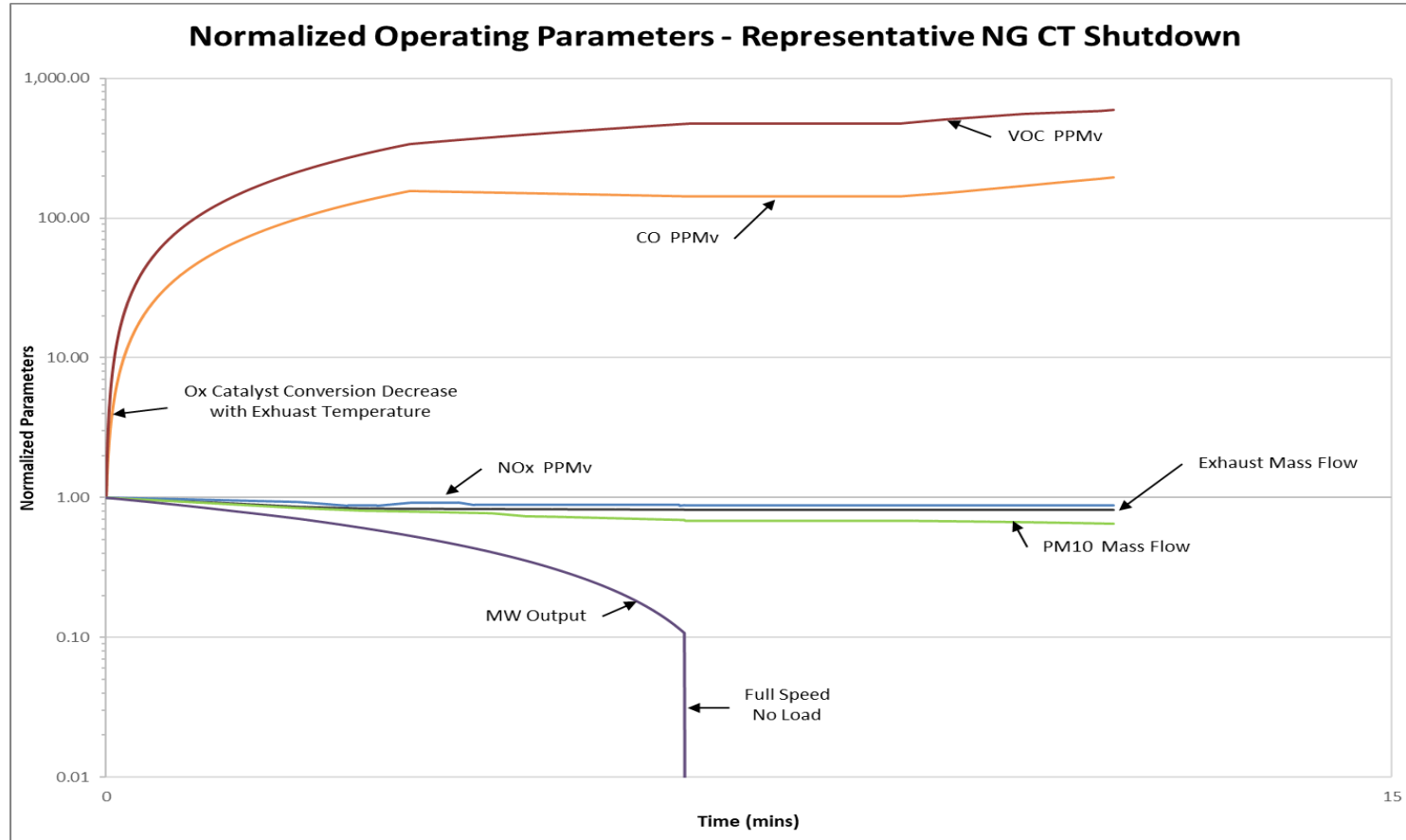


Source: U.S. Energy Information Administration, *Annual Electric Generator Inventory*  
 Note: Only technology/fuel combinations with at least 10 gigawatts of operating capacity are shown.

# Example of NGCC Cold Start Up – Normalized Parameters

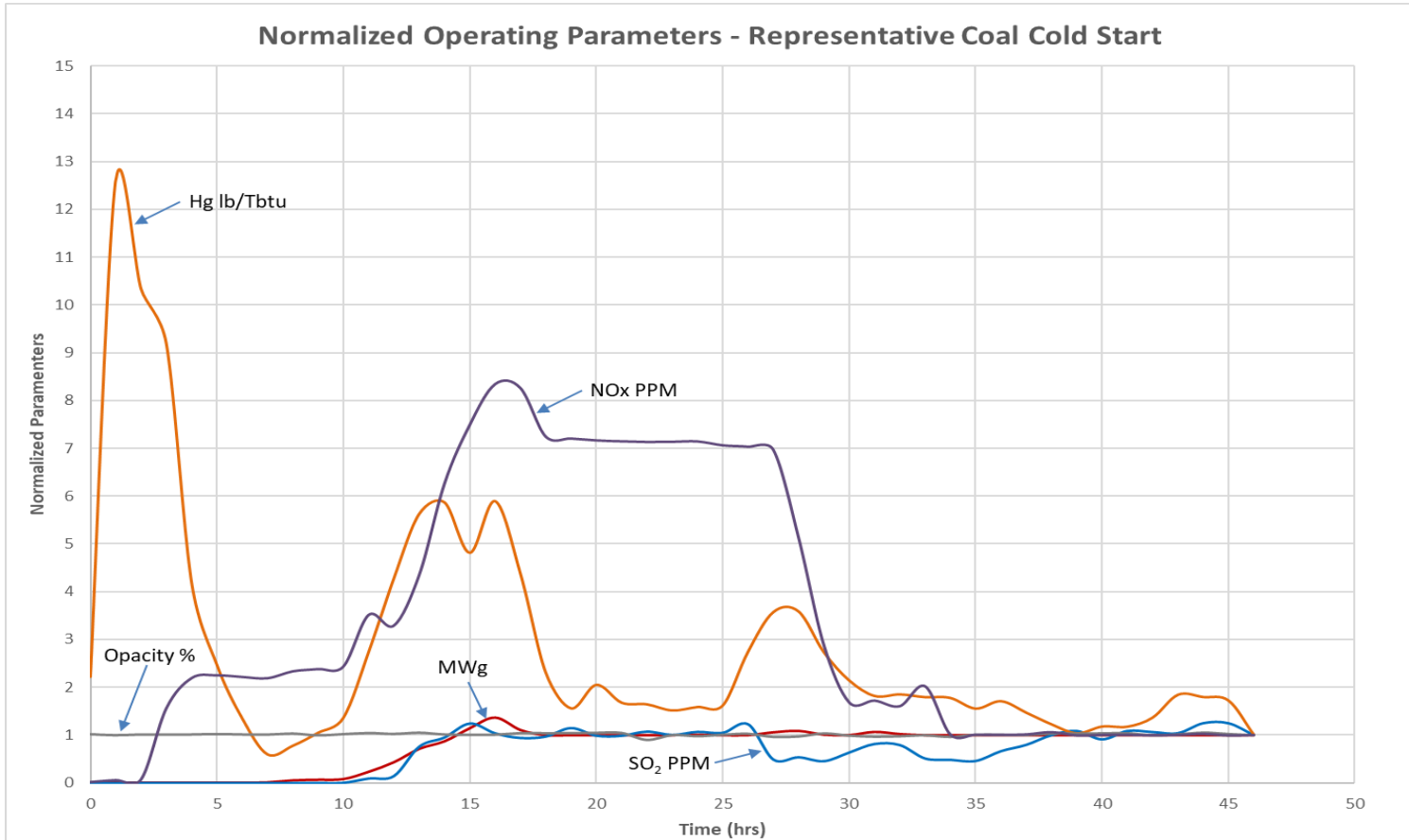


# Example of NGCC Shut Down – Normalized Parameters



Back Up

# Example of Coal Cold Start Up – Normalized Parameters



# BACT Assumptions for *new* NGCC

Parameter	Gas-Fired	Oil-Fired	Control	Rule
NO <sub>x</sub> <sup>1</sup>	2 ppm	4-5 ppm	SCR	BACT, NSPS KKKK
CO	2 ppm	2 ppm	CO catalyst	BACT
VOC	1-2 ppm	2 ppm	CO catalyst	BACT