



*Proposed NSPS for
GHG Emissions*

*Bruce Rising, Vice Chair
Environmental Affairs Committee*

August 1, 2013



- Alstom Power
- GE Energy
- Florida Turbine Technologies
- Meggitt Sensing Systems
- Pratt & Whitney Power Systems
- Rolls-Royce
- Siemens Energy, Inc.
- Solar Turbines Incorporated



GTA Recommendations

- Maintain exclusion of simple cycle gas turbines
- Raise the CO₂ level to at least 1,100 lb/MWh
- Prohibit the NSPS CO₂ limit from being adopted as the presumptive CO₂ BACT level for simple cycle turbines
- Include exemption for startup/shutdown and part load operation
- Allow an alternate method to CEMs for compliance measurement
- Modify method for computing the 12-month rolling average
- Exempt combined heat and power units
- Allow 500 hours of operation on backup fuel without inclusion in the emission average



Simple Cycle Exclusion

- GTA supports exclusion of simple cycle systems
- Simple cycle gas turbines are highly flexible and react rapidly
 - Enable renewable integration through enhanced grid stability
 - Rapid starts/stops and load/unload rates
 - Grid frequency & voltage regulation
 - Peak shaving, backup power, rapid installation for new demands
- NGCC while flexible, cannot substitute for simple cycle
- Many simple cycle units run more than 2,900 hours per year ^{1/3 of the year}
 - Particularly in support of renewable generation sites
- Proposed range of 950 - 1,100 lb/MWh does not reflect BSER* for SC
- Exclusion provides no incentive for simple cycle over NGCC

*Best System Emission Rate

→ Original proposal had exemption for facilities operating less than 1/3 of the year



Increase CO₂ limit to 1,100 lb/MWh Limit

- Only gas fired combined cycle turbines have the efficiencies to reach this threshold.
- But even they cannot all achieve this
 - Requires pipeline natural gas (not fuel oil)
 - Site conditions, part-load operation, design features, and operating hours all tend to raise the emissions expressed on an output basis
- Simple cycle turbines cannot reach this threshold
- While new cycle design features continue to be introduced, pre-2006 turbine designs are still manufactured and sold to support customer needs.

Operating Conditions

- Part load operation results in reduced cycle efficiency, increasing the emissions output
 - Part load is a necessity in cases where fast starting and ramping are required (e.g. support renewable energy generation, such as wind or solar)
- Site conditions substantially impact output based emissions
 - High ambient temperatures erode efficiency
 - Cooling system designs (open loop cooled vs. air cooled systems) have a major impact



Compliance Monitoring

- Monitoring can be more effectively and accurately accomplished by fuel flow monitoring
 - All gas turbine systems include high accuracy flow monitors
 - Fuel carbon content is relatively constant (75% by mass for natural gas). Pipeline tariffs maintain a relatively consistent composition
 - Performance (Megawatt-hours generated) is well measured and recorded (data filed to FERC)
 - This will produce greater accuracy in determining output based emissions compared to CEMS data.



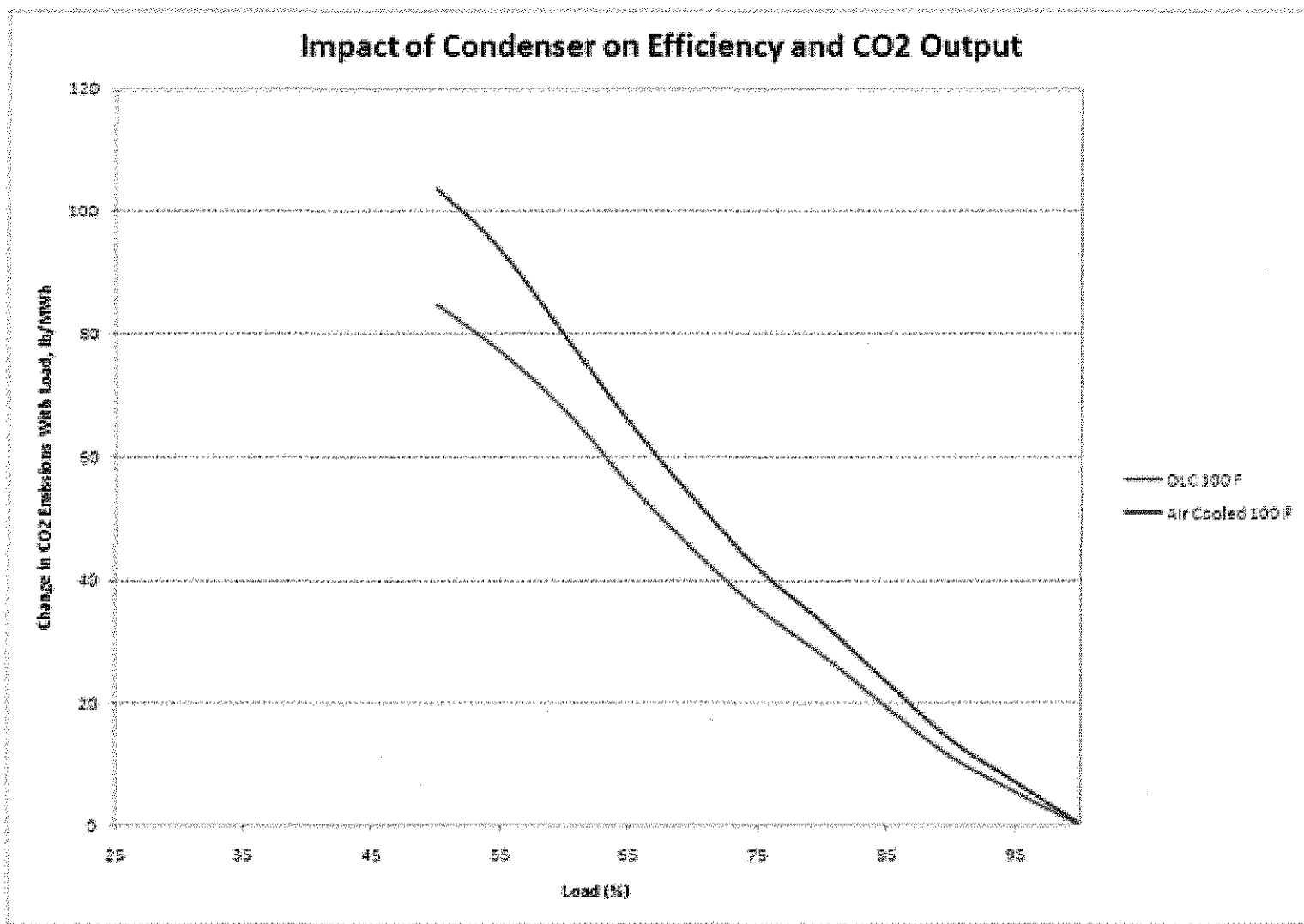
CHP/Cogen Exemption

- Recommend exemption for gas turbines in the CHP category
 - They represent a category of very efficient system systems for power and thermal energy production
 - Thermal energy is recovered from a simple cycle turbine exhaust, but not necessarily to produce electricity
 - But some Combined Heat and Power also produce electricity
- It is difficult to quantify the thermal energy in terms of equivalent kWh to determine compliance of combined heat and power with the proposed NSPS would be immense and impractical
- Some CHP units also make use of a unique fuel that may be produced in-house
 - May be substantially different from pipeline natural gas or No. 2 Fuel Oil.
 - Additional support for an alternative fuel exemption, in addition to a category exemption

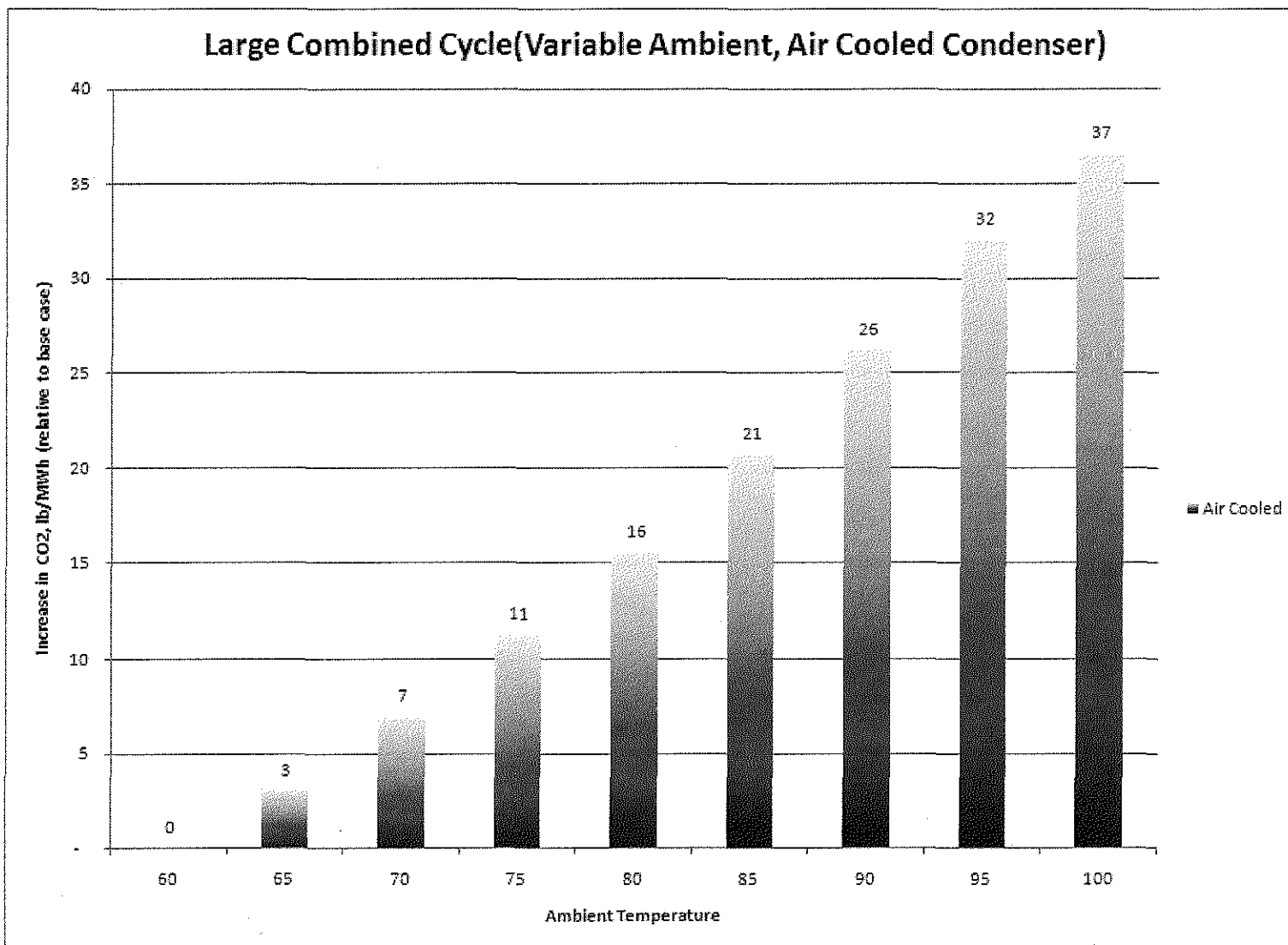
Fuel Choice

- The proposed standard is only likely to be achieved using pipeline natural gas fuel
 - While most gas turbines in the US are gas-fired, there is still a segment of the fleet that still uses fuel oil.
 - Fuel oil backup provides operating flexibility, especially on peaking units not committed to long-term gas contracts.
 - Operating with a few hundred hours of on fuel oil would push a combined cycle above the threshold, even using annualized averaging methods
- Exempt from reporting CO₂ emissions when operating fuel oil, alternative fuels (e.g. landfill gas, blast furnace gas)

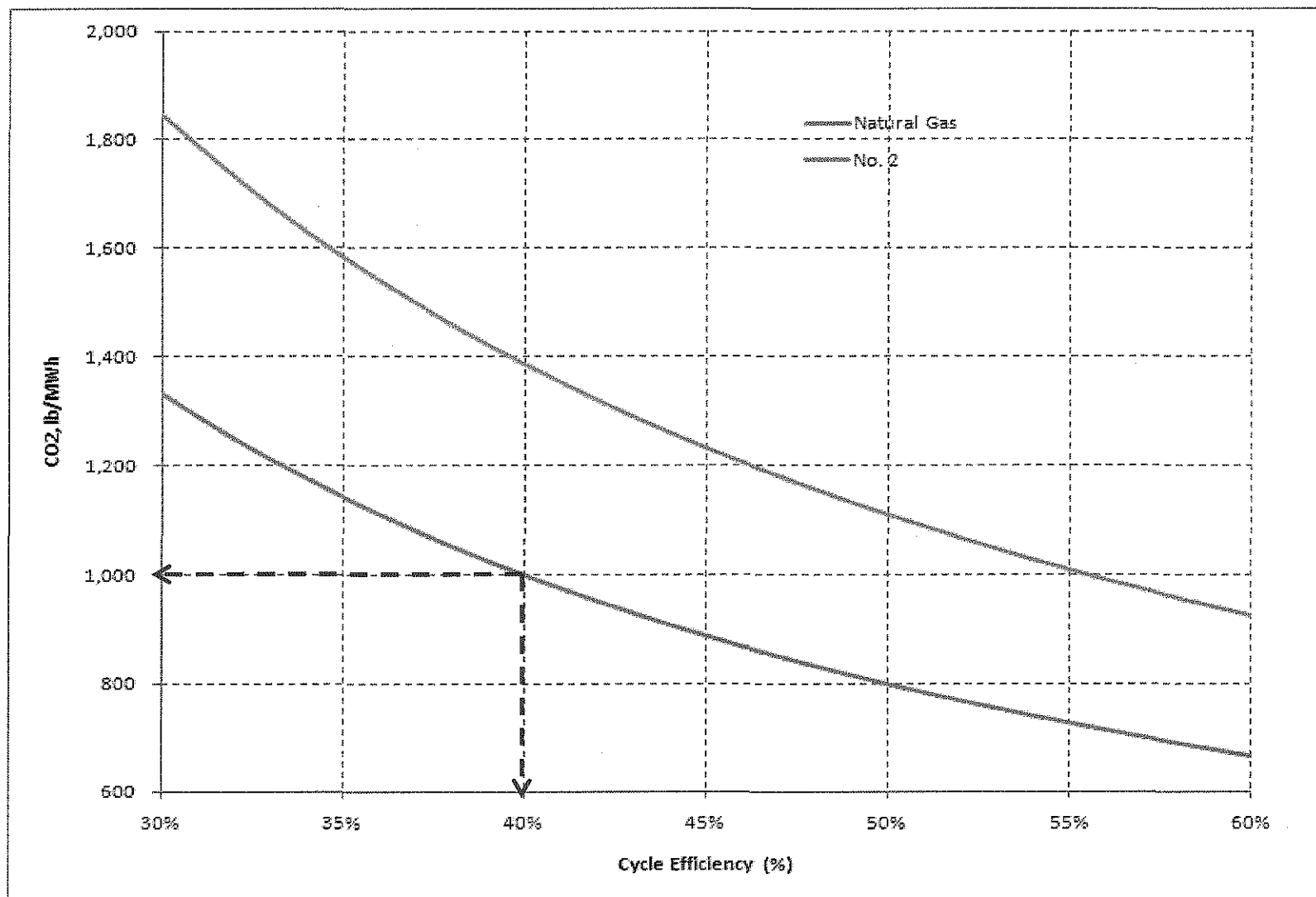
Impact of Load on CO₂



Impact of Ambient Temperature

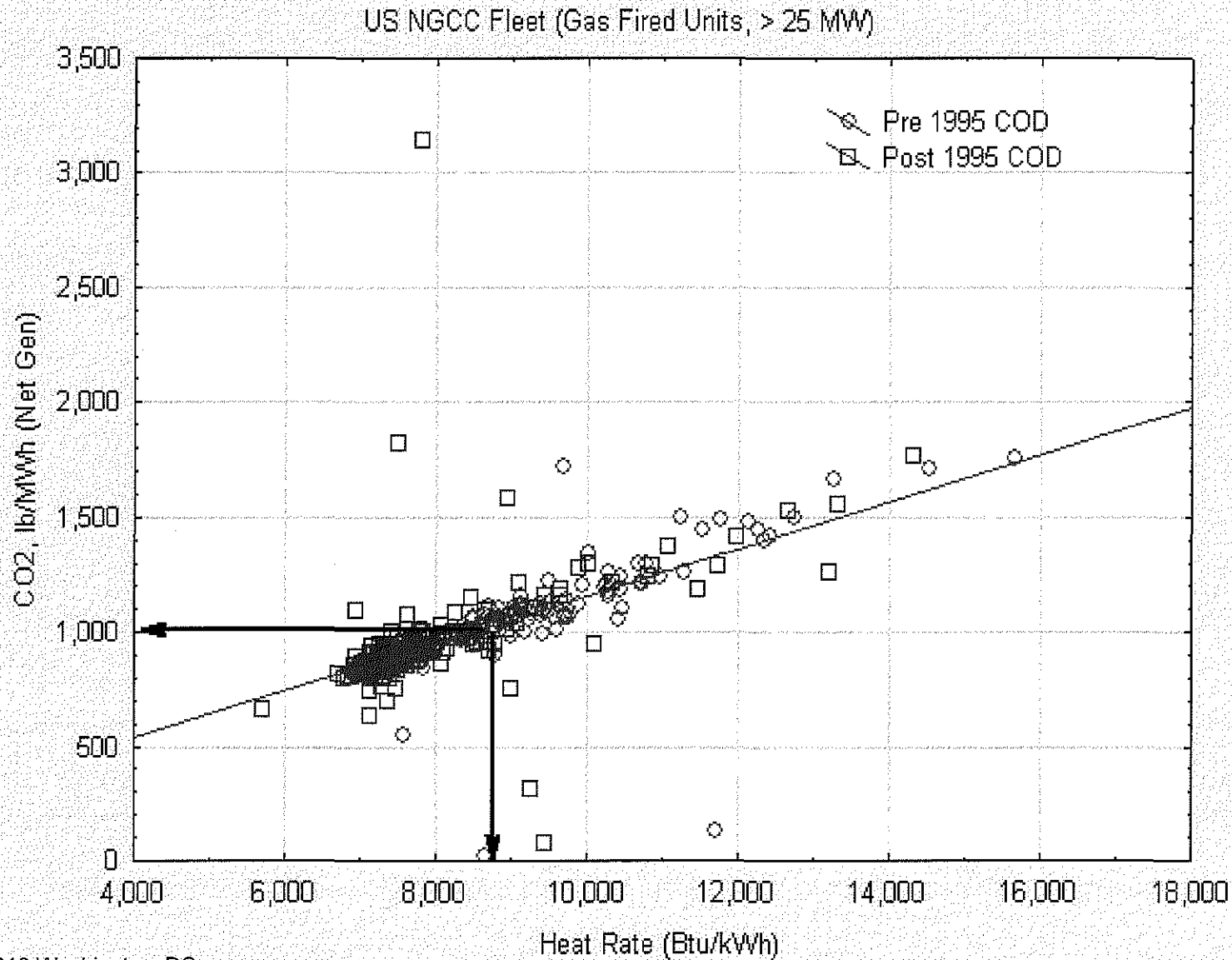


Impact of Fuel



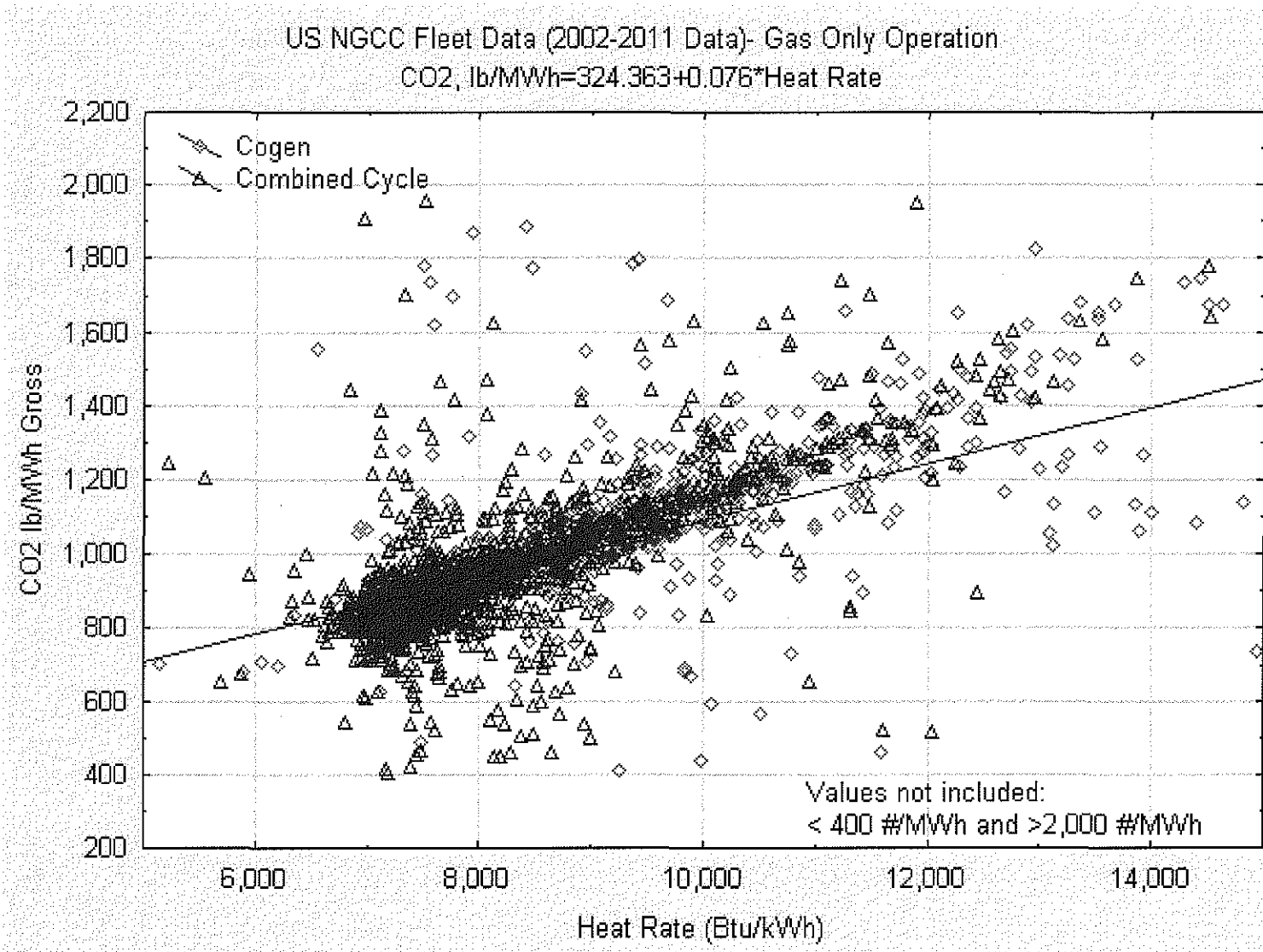


Cumulative Impact of Operating Conditions, Design, Site Conditions, and Fuel



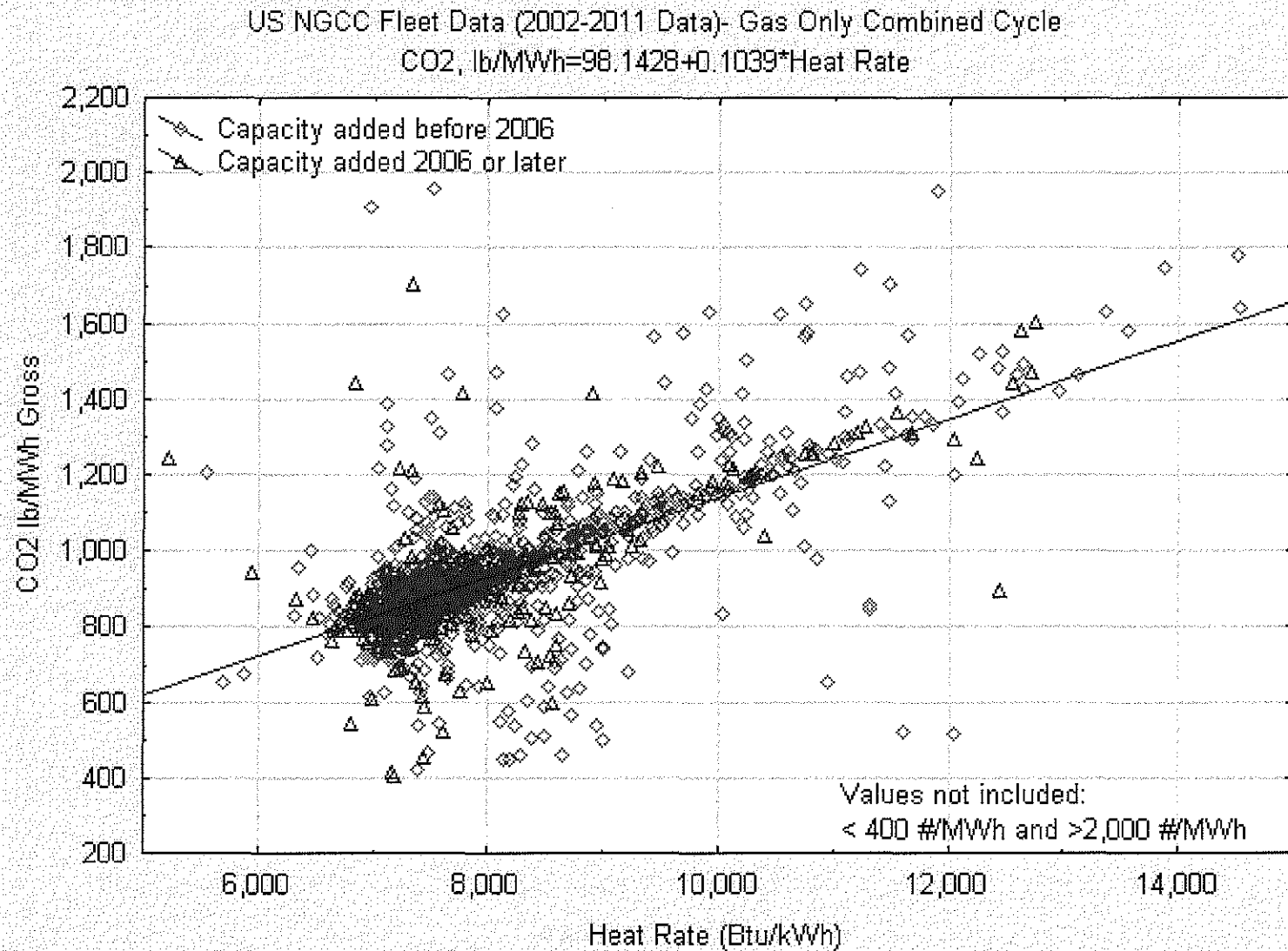


Cumulative Impact of Operating Conditions, Decadal Data Summary



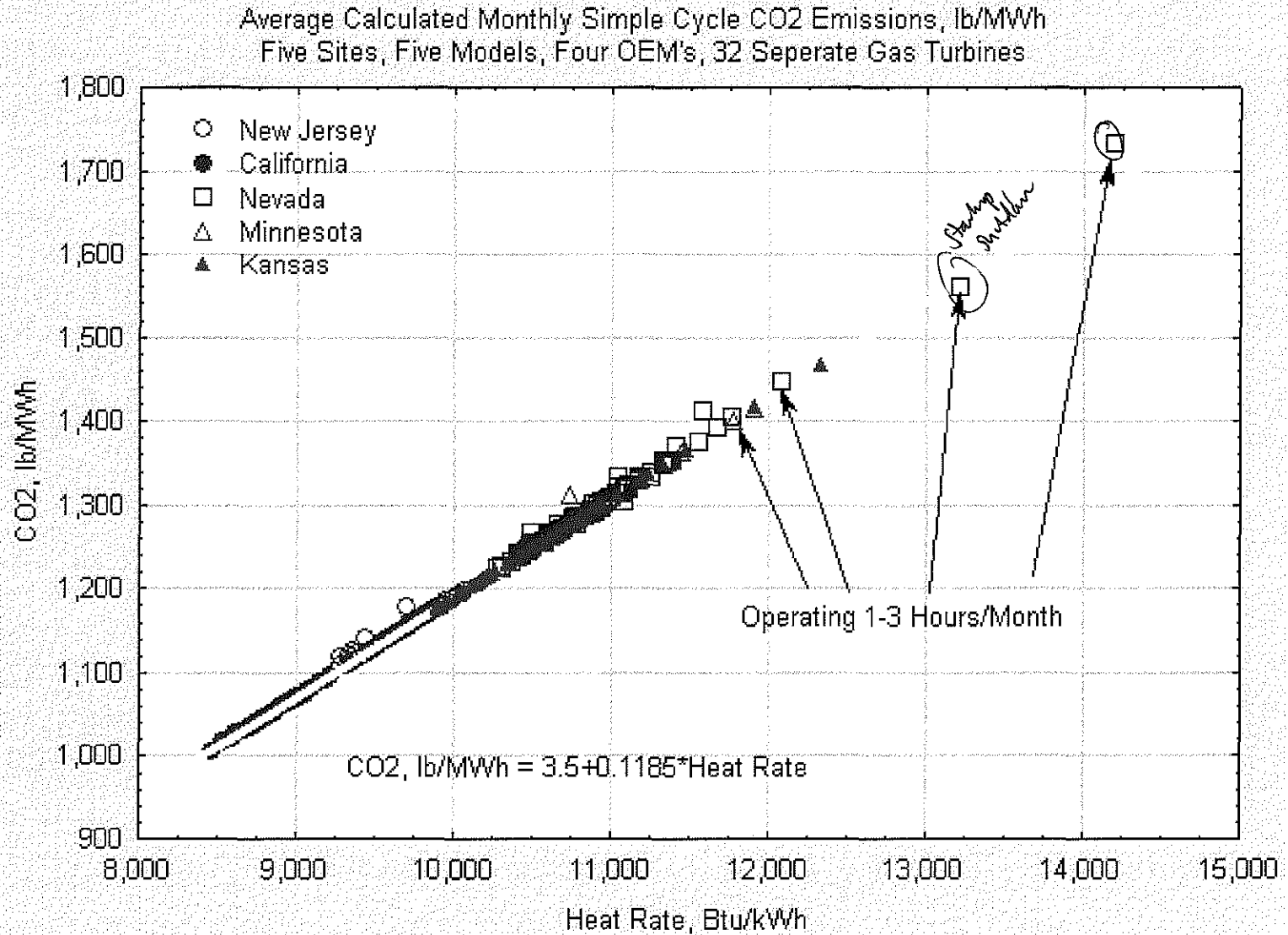


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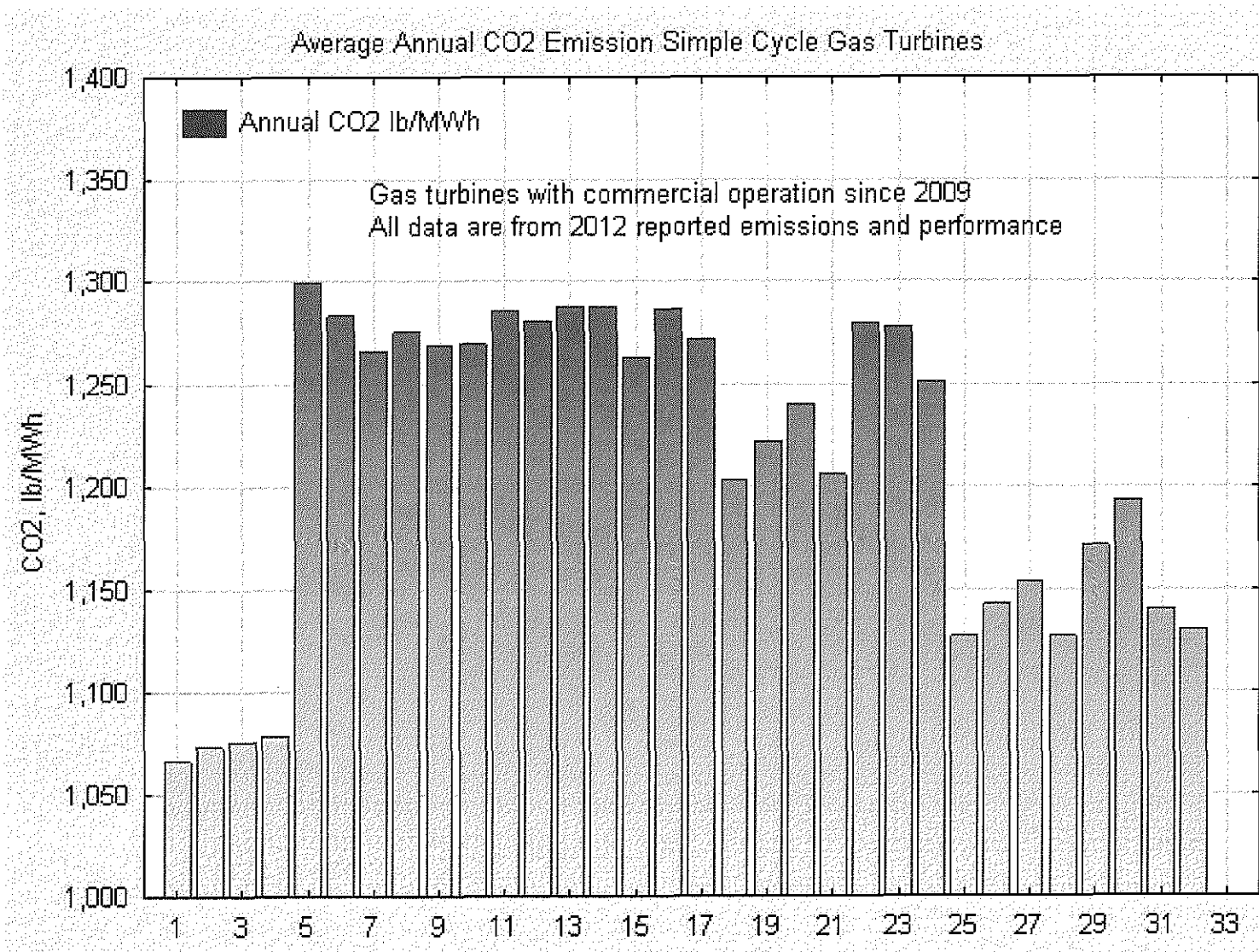


Reported Monthly CO2 Emissions, Multiple Sites (Simple Cycle Gas Turbines)





Reported Annual CO2 Emissions, Multiple Sites (Simple Cycle Gas Turbines)





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