

# Overview of Draft 2 of the Distributed Generation Regulation

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# Overview

- Discussion of comments/issues made on first draft of the DG regulation.
- Discussion of the changes made in the second draft to address these comments.
- Discussion of new sections added, or language changed or added, to the second draft.
- Other issues

# Comments

- General comments made on Draft 1 of the Distributed Generation Regulation.



- What changes were made in Draft 2 to address those comments.

# Comments

- What is the purpose of the regulation: DG or generators?



- Purpose restated to include “distributed generation” within the language and title changed to reflect this as well. “Sulfur dioxide” added to reflect its control by fuel sulfur-content limit.

# Comments

- Carbon dioxide should be dropped from the standards.



- Nothing in Delaware statute that limit's AQM's ability to regulate carbon dioxide.
- The standard serves to keep CO<sub>2</sub> emissions from “backsliding” and increasing.

## 7 Del. Code, Chapter 60, Section 6002, Definitions.

- "**Air contaminant**" means particulate matter, dust, fumes, gas, mist, smoke or vapor or any combination thereof, exclusive of uncombined water.
- "**Air pollution**" means the presence in the outdoor atmosphere of 1 or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant or animal life or to property, or which unreasonably interferes with the enjoyment of life and property within the jurisdiction of this State, excluding all aspects of employer-employee relationships as to health and safety hazards.
- "**Pollutant**" means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, hydrocarbons, oil, and product chemicals, and industrial, municipal and agricultural waste discharged into water.

- **Carbon dioxide (CO<sub>2</sub>) is a greenhouse gas and may contribute to global warming.**
- **CO<sub>2</sub> output is a function of an engine's thermal efficiency.**
- **There are currently no currently practical after-treatment controls that remove CO<sub>2</sub> from an exhaust stream.**
- **In setting carbon dioxide standards, the RAP Model Rule Working Group wanted to encourage the deployment of efficient technologies, but it did not want CO<sub>2</sub> to prove the disqualifying factor for a technology that otherwise satisfies the requirements of the rule.**
- **The CO<sub>2</sub> standard of 1,900 lbs/MWh CAN be met by the turbines and reciprocating engines.**

# Comments

- There should be a “low-end cut-off” or an exemption for residential generators.



- Applicability includes an exemption for emergency generators at residences.

# Comments

- The compliance schedule for existing generators was not long enough.



- Compliance schedule for existing generators changed:
  - Must submit letter to Department stating what type of generator it will be:
    - Emergency generators: 3 months
    - Distributed generators: 9 months

# Comments

- Definition of *emergency* needs to be clarified.



- Definition still means “lights out”. “PJM provision” deleted due to lack of supporting information to warrant such an exclusion (no generators operating in such a program in DE).

# Comments

- Definitions of *emergency generator* and *non-emergency generator* need to be clarified.



- *Non-emergency generator* was changed to *distributed generator*, and the definitions were slightly changed to clarify their meanings.

# Comments

- Since *landfill gas* and *waste gas* are defined, digester gas should be defined, as well.



- A definition of *digester gas* has been added to the second draft.

# Comments

- Various issues related to exemption & alternative requirements for existing *distributed generators*.



- Requirement broadened as to type of emission control technology which can be approved, and to whom this requirement shall apply to.
- Generator size lowered to  $\leq 300\text{kW}$  (*prime power rating*).

# NOTE:

- The “Rentar retrofit” program run by the Sussex Conservation District began before the language for this regulation was even developed.
- Potential participants were informed by the SCD that there would be no exemptions from any regulations due to their voluntary participation.
- This provision was included, after the SCD program was implemented, so as not to invalidate the program and the cost-share money used.

# Comments

- New generators operating on landfill, waste, digester gases need alternative emission limits.



- Alternative emission limits have been added for new generators operating on such fuels. Such fuels must meet alternative limits on sulfur or hydrogen sulfide content.

# Comments

- The proposed standards for new generators are too stringent.



- The emission standards for new generators less than 15 MW are achievable NOW by various combustion turbines, with or without after-treatment, and engines with after-treatment.
- Second “tier” of standards extended out to 2010.

# Potential Reductions from Existing Generators

Facility	UNIT #	MMBtu/hr	NOx Factor (lb/MWh)	Proposed Limit (lb/MWh)	% reduction in NOx factor	Potential Ozone TPD Reduction
Conectiv Christiana Peaking Station	Unit 11	391	9.917	4	59.7%	0.305
Conectiv Christiana Peaking Station	Unit 14	391	10.574	4	62.2%	0.327
Conectiv West Peaking Station	Unit 10	264	8.497	4	52.9%	0.119
Conectiv Madison Peaking Station	Unit 10	196	33.851	4	88.2%	0.200
Conectiv Delaware City Peaking Station	Unit 10	270	8.196	4	51.2%	0.160
Conectiv Edge Moor Power Plant	Unit 10	210	8.328	4	52.0%	0.162

# Potential Reductions from Existing Generators

Facility	UNIT #	MMBtu/hr	Lowest NOx Permit Limit (ppm)	NOx Factor (lb/MWh)	Proposed Limit (lb/MWh)	% reduction in NOx factor	Potential Ozone TPD Reduction
Warren F. Beasley	Unit 10	407	5	0.190	4	0.0%	0.000
City of Dover Van Sant	Unit 11	447	42	1.600	4	0.0%	0.000
NRG Energy Center Dover	Unit 2	465	25	0.952	4	0.0%	0.000
NRG Energy Center Dover	Unit 3	465	25	0.952	4	0.0%	0.000
Indian River Generating Station*	Unit 10	360	162	6.170	4	35.2%	0.130

\*For the Indian River Generating Station, there is no permitted NOx limit. The number listed is actual stack test emissions.

Facility	UNIT #	MW	NOx Factor (lb/MWh) *	Proposed Limit (lb/MWh)	% reduction in NOx factor	Potential Ozone TPD Reduction
Lewes	Unit 1	0.91	32.04	4	87.5%	0.092
Lewes	Unit 2	0.91	32.04	4	87.5%	0.096
Seaford	Unit 1	1.36	32.04	4	87.5%	0.147
Seaford	Unit 2	1.36	32.04	4	87.5%	0.140
Seaford	Unit 3	1.136	32.04	4	87.5%	0.122
Seaford	Unit 4	1.136	32.04	4	87.5%	0.127
Seaford	Unit 6	2	32.04	4	87.5%	0.204

\* NOx Factor represents EPA AP-42 emission factor for diesel engines greater than 600 hp.

Total Potential TPD Reduction in NOx from Existing Units:

**2.329 TPD NOx**

# Comments

- In the future, emissions from existing generators may be more of a concern, possibly requiring additional limits or “tiers” of emission standards in the future.



- The current realm of existing generators is finite, and the current standards for existing generators control their emissions to an achievable level.
- The “review” requirement under Section 3 was changed so that the intent of the review will be to see if ANY emission requirement needs to be updated, amended, or added prior to the 2010 emission limits taking effect.

# Comments

- Operating requirements of Section 4 were unclear or confusing.



- Section 4 was re-written to clarify when an *emergency generator* or a *distributed generator* may operate.
- Operating restriction on “Ozone Action Days” (& other days) only applies before 5:00 PM.

# Comments

- What is meant by *testing* and *maintenance*?  
The 50 hour limit may be too small.



- Specific definitions were added, which allow for the testing and maintenance of ancillary equipment, as well, as opposed to just the generator itself.
- Limit of 50hrs/12 months deleted, though these hours must still be recorded.

# Comments

- Recordkeeping requirements are too much of a hassle, and are they even needed?



- **Yes, the recordkeeping is needed, though it has been simplified. Monthly/yearly records must be recorded of:**
  - fuel usage via a non-resettable fuel flow metering device (all generators)
  - operating hours via a non-resettable hour metering device (all generators)
  - testing/maintenance hours & a brief description (emergency generators)

# Comments

- Can owners send out the fuel they receive to be certified?



- As an alternative to receiving supplier certification on liquid fuels, a provision was added to allow the owner to have the fuel in their tank certified, after each shipment of liquid fuel, prior to its use by the generator.

# Comments

- Incorporate by reference the EPA's regulation relating to sulfur content of on-road diesel.



- **Instead of incorporating by reference, the exact sulfur-content limits from 40 CFR Part 80, Subpart I, Motor Vehicle Diesel Fuel, are included in the DG regulation.**
- **The dates referenced have been changed from 7/1/06 to 1/1/07 to allow the 15 ppm-sulfur diesel to be available at the pumps.**

# Comments

- Why is there a biodiesel blend requirement of B5 or greater?



- B5 limit is required under “Rental retrofit” program, thus it only applies to existing generators seeking the exemption under 3.2.1.2.
- Voluntary biodiesel use may be of any blend (B2, B5, B20, B100, *etc.*).

# Comments Still Being Evaluated

- PM emission limits should only apply to liquid fuel-fired generators.
- Allow alternative fuels to be burned as back-ups via fuel specific emission requirements.
- Detailed definitions of *emergency* and *distributed generation*.

# New Stuff

- First draft of regulation excluded combustion turbines from being subject to the regulation.



- Second draft of regulation states that all generators powered by internal combustion engines are subject to the regulation, including compression-ignition & spark-ignition engines, combustion turbines, and microturbines.

# New Stuff

- Applicability



- A generator covered by a permit which imposes a NO<sub>x</sub> emission limitation established to meet Best Available Control Technology (BACT) or Lowest Achievable Emission Rate (LAER) is exempt from this regulation.

# New Stuff

- Definitions



- Due to added/changed language, new definitions were added for:

- Combined heat and power
- Design system efficiency
- Distributed generation
- Power to heat ratio
- Testing
- Maintenance
- Prime power rating

# New Stuff

- Existing Emergency Generator



- First draft contained no emissions requirements.
- Second draft states that an existing *emergency generator* shall be operated in conformance with the manufacturer's instructions and good air pollution control practices.

# New Stuff

- New Emergency Generator



- Due to inclusion of combustion turbines in regulation, language was added to specify:
  - New emergency combustion turbines must comply with the EPA standard for gas turbines, and
  - Microturbines must be verified by the EPA's Environmental Technology Verification Program.

# New Stuff

- Emissions Certification



- New section added to *ALLOW suppliers* to certify that their generators comply with this regulation.

- However.....



# Comments

- Requiring manufacturers to certify generators to 15,000 hours or 3 years is beyond current industry standard and technical capabilities.



- Certification of a generator by a supplier or manufacturer is optional. There is no requirement that they **HAVE** to certify their generators. If a non-certified generator is purchased, the owner is required to prove that it meets the applicable requirements of this regulation.



# New Stuff

- Emissions Certification



- New section added to allow an owner to certify his/her generator by submitting sufficient documentation to prove the generator complies with the applicable requirements.

# New Stuff

- Emissions Certification



- IF a generator cannot be certified by either of the two methods just discussed, THEN emissions testing (using applicable methods) will be required.

# New Stuff

- Emissions Certification



- To ensure continuing compliance with the emissions limitations, a generator shall be re-certified every 20,000 hours of operation, or every five years, whichever comes first.

# New Stuff

- Credit for Concurrent Emissions Reductions



- If a generator is operated on “flared fuels,” the emissions that WOULD have been produced by the flaring can be deducted from the actual emissions of the generator.

# New Stuff

- Credit for Concurrent Emissions Reductions



- Any generator operated “simultaneously” with a non-emitting resource may take credit for the generating capacity of the non-emitting resource.

# New Stuff

- New Distributed Generator



- Standards for new *non-emergency generators* in first draft are now the standards for new *distributed generators* BELOW 15 MW.
- New standards for new *distributed generators*  $\geq$  15 MW, by fuel type (gas or liquid).

# Growth in Electric Demand

- The EPA forecasts Delaware's total electric demand to grow at a rate of 1.55% per year from 2001 to 2030.
- DOE's Energy Information Administration (EIA) forecasts Delaware's total electric demand to grow at a rate of 1.74% from 2001 to 2030.
- The Fuel Diversity Workgroup of the Governor's Energy Task Force forecasts the Delmarva Peninsula's (including all of Delaware) summer peak demand to grow at a rate of 2.1 % from 2002 to 2010. This equals a total growth from 2002 to 2010 of about 18%, from 3,800 MW in 2002 to 4,500 MW in 2010.

# Growth in Electric Demand

- The growth of Delaware electric energy usage, including estimated losses, is forecast for 2010 at 18.5%, a 2.1% average annual growth rate. \*
- Another peak load forecast for Kent and Sussex counties predicts a 5.6% winter growth rate, with total energy requirements growing at 5.4% annually. \*\*

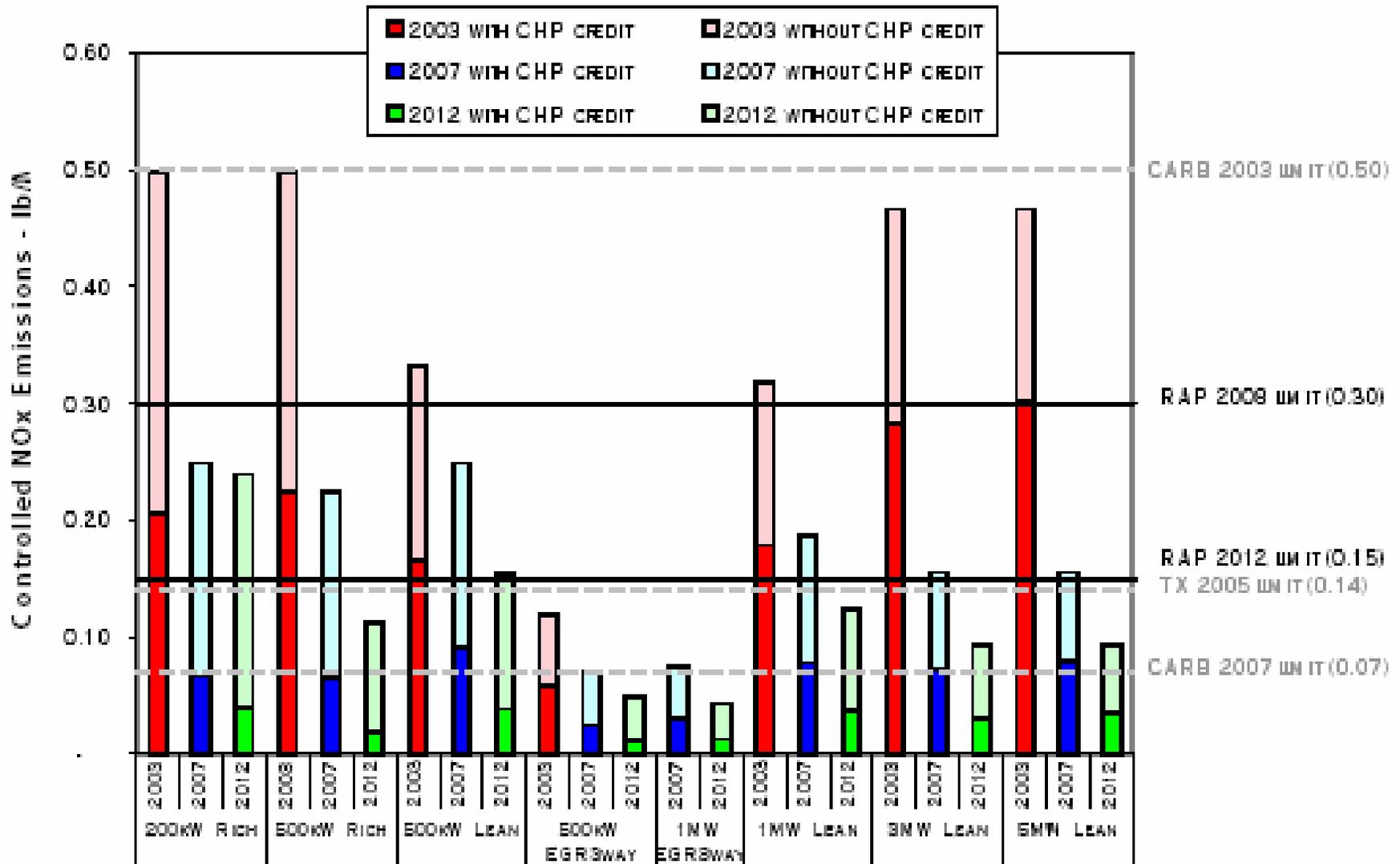
\* Applied Energy Group, Inc. "Delaware Non-Transportation Energy Supply Forecasts", dated November 2002

\*\* Delaware Electric Cooperative, 2002 Power Requirements Study, 2002 – 2016, Completed in November 2002

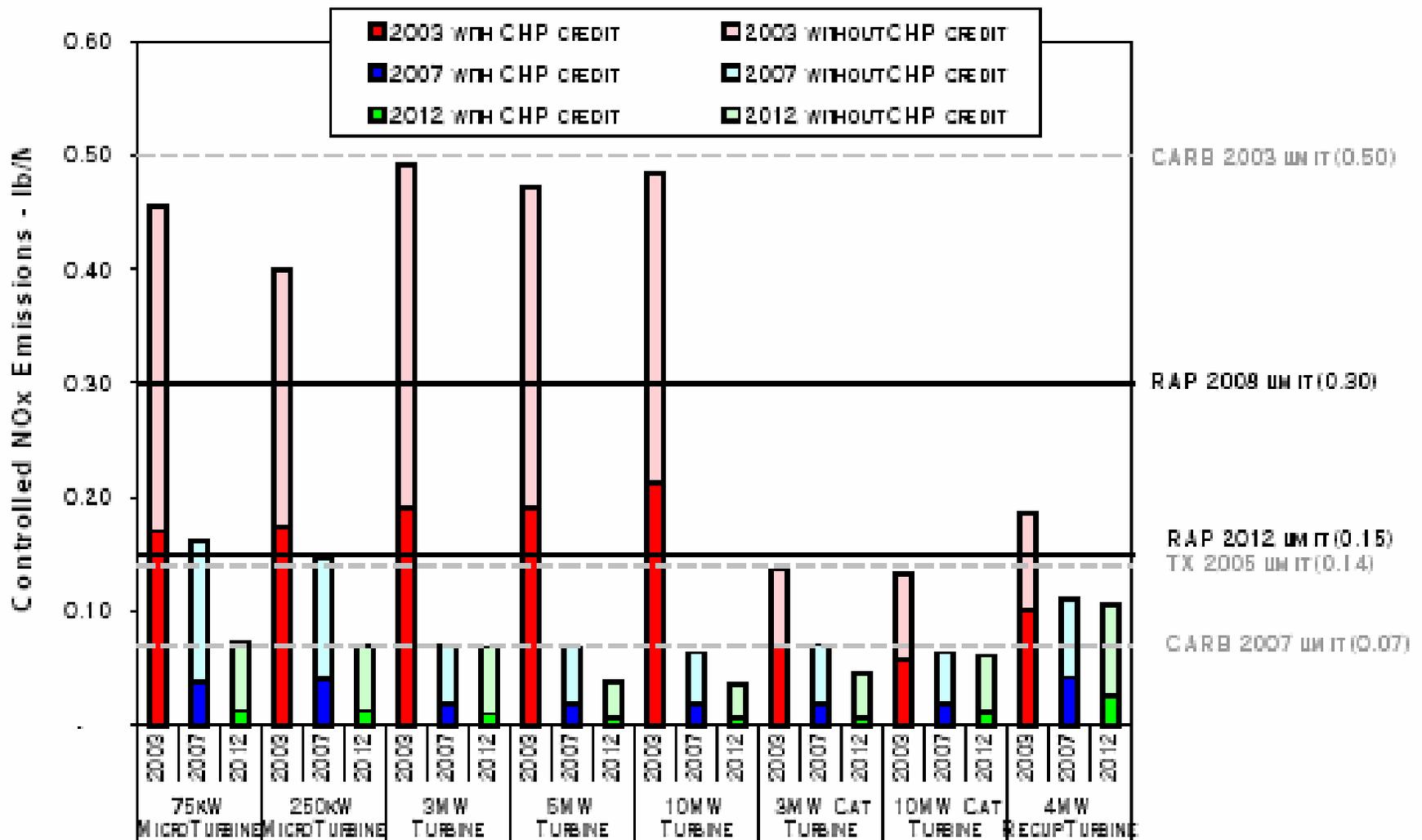
# “Clean Distributed Generation Performance and Cost Analysis”

- April 2004 report prepared for the Oak Ridge National Laboratory and U.S. Department of Energy.
- Examined ultra-low emissions CHP technologies.
- This study finds that plausible technology paths to ultra-clean levels either have been demonstrated or are being pursued by CHP technology options.
- The main issues are timing, the size of the ultra-clean CHP market, availability of resources and ultimate cost to the consumer for ultra-low emissions.

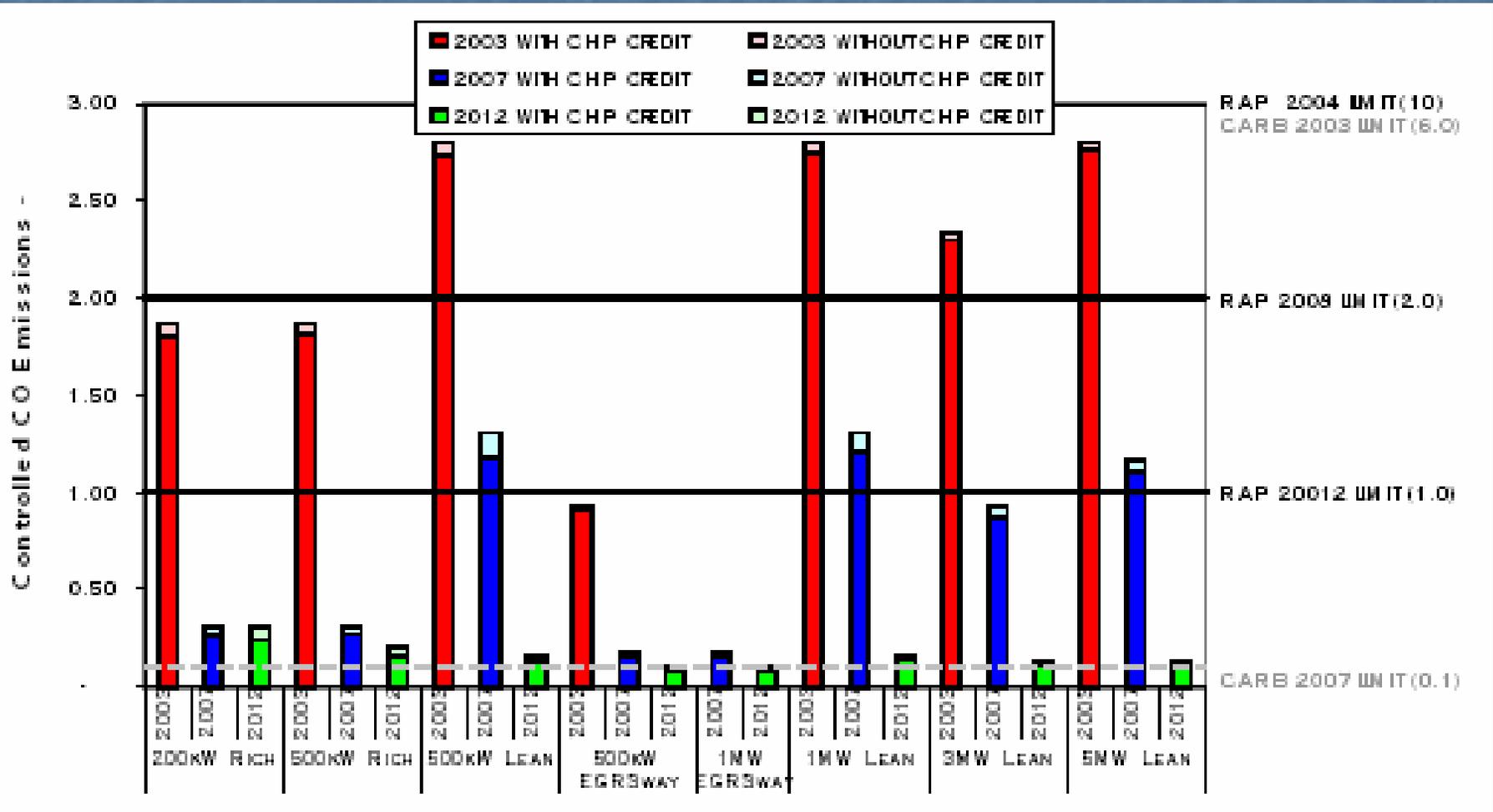
# NOx Emissions for Reciprocating Engines (with aftertreatment)



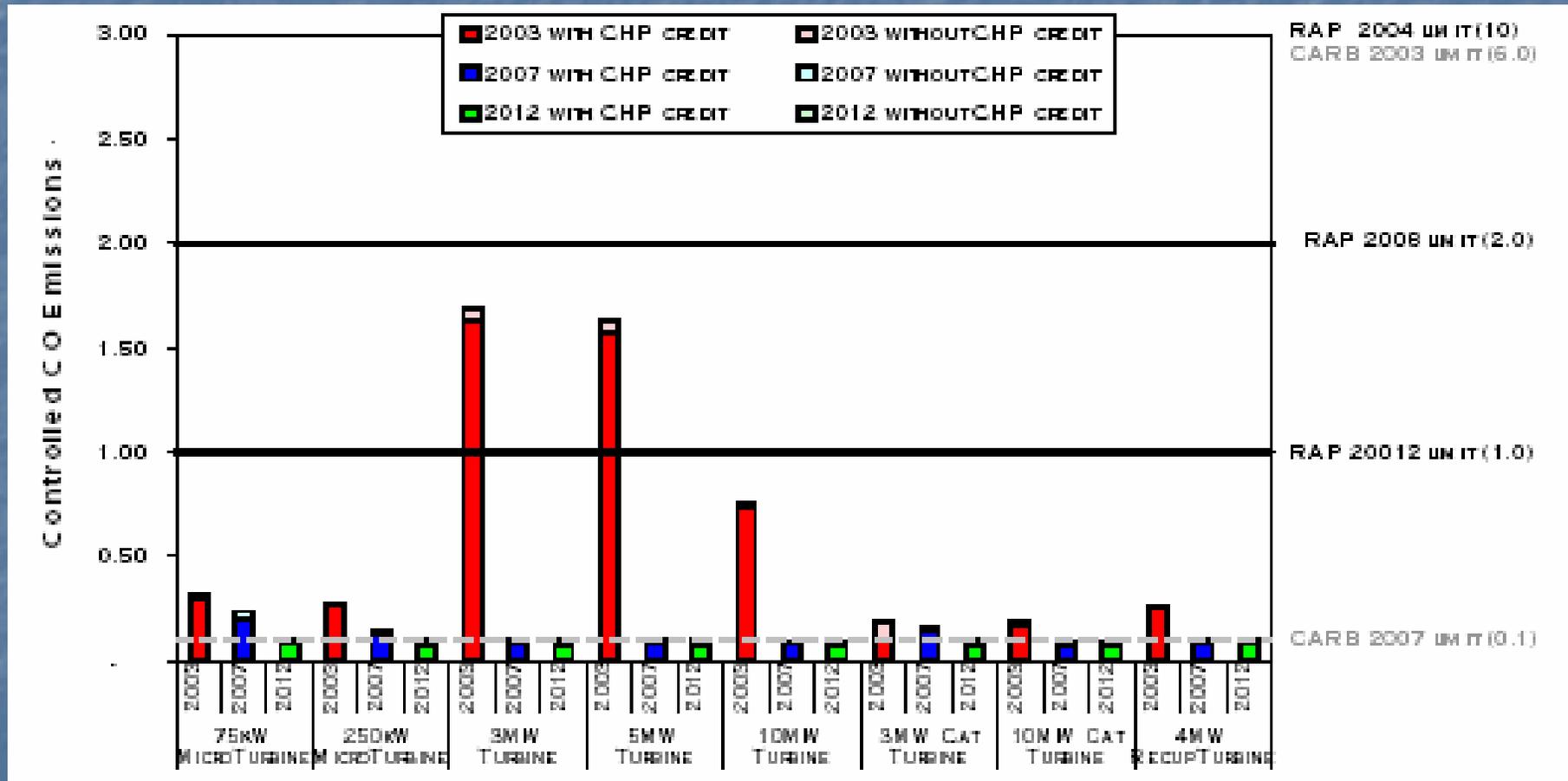
# NOx Emissions for Gas Turbines and Microturbines



# CO Emissions for Reciprocating Engines (with aftertreatment)



# CO Emissions for Gas Turbines and Microturbines



# Reciprocating Engines

- With technology investments, rich-burn engines with 3-way catalysts should be able to approach the ultra-low levels in CHP applications.
- Lean-burn engines with after-treatment face the biggest challenge and will require big advances in combustion and SCR technology.
- The best path to ultra-low emissions looks to be EGR with 3-way catalyst. The combination of using EGR, for lower engine-out emission levels and higher efficiency with lower cost, and very effective 3-way catalyst to treat exhaust emissions should achieve ultra-low emissions without seriously compromising efficiency or economics.

# Gas Turbines

- The most stringent out-year requirements can be achieved today with SCR and Oxidation catalysts.
- DLE technology for simple cycle turbines should better the 10-ppm NO<sub>x</sub> level (0.47 lb/MWh) without after-treatment.
- Catalytic combustors and other surface combustion techniques show promise for < 2 ppm NO<sub>x</sub> (0.07 lb/MWh) without after-treatment, a level that meets the most stringent future requirements.

# Microturbines

- **DLE combustors are showing good promise to reach ultra-low levels at full load operating conditions.**
- **Catalytic combustors serve as a backup approach but are not now receiving serious financial support.**

# Thus...

New distributed generators with a prime power rating greater than or equal to 15 MW shall meet the following emission standards:

	Emission Standards in lbs/MWh	
	Installed on or After [Effective Date]	
Pollutant	Gaseous Fuels	Liquid Fuels
Nitrogen Oxides:	0.08	0.2
Nonmethane Hydrocarbons	0.04	0.1
Particulate Matter	0.7	0.7
Carbon Monoxide	2.0	2.0
Carbon Dioxide:	1,900	1,900