

**SACRAMENTO METROPOLITAN
AIR QUALITY MANAGEMENT DISTRICT**

STAFF REPORT

**RULE 413
STATIONARY GAS TURBINES**

**PROPOSED AMENDMENTS
February 18, 2005**

Prepared by: Kevin J. Williams, Ph.D.
Associate Air Quality Engineer

Reviewed by: Aleta Kennard
Program Supervisor

Approved by: Brigette Tollstrup
Division Manager

BACKGROUND

Rule 413, STATIONARY GAS TURBINES, was adopted by the Sacramento Metropolitan Air Quality Management District (“District”) in April of 1995 and amended in May of 1997. The rule establishes Reasonably Available Control Technology (RACT) and Best Available Retrofit Control Technology (BARCT) limits for nitrogen oxides (NOx) emissions from gas turbines.

As new technology is developed and rules are enforced, circumstances can arise that were not considered in developing a rule. At the time Rule 413 was adopted, the largest gas turbine operating within the District was a simple cycle turbine with a capacity of approximately 50 MW. More recently, larger, combined cycle power plants with gas turbines having capacities greater than 100 MW have been constructed or are under construction within the District.

At the time Rule 413 was adopted, a startup period of 1 hour was sufficient for gas turbines within the District to achieve the NOx limits of Rule 413. However, larger combined cycle units, equipped with dry, low-NOx combustors and selective catalytic reduction (SCR) systems, require significantly longer startup periods to achieve the NOx limits.

In addition, larger, combined cycle systems require longer periods of time to stabilize NOx emission rates following periods of rapid load changes or other disturbances to steady state operation. These so-called “short-term excursions” were not considered at the time Rule 413 was adopted.

LEGAL MANDATES

Federal Mandates

The District has been designated as a severe nonattainment area for the federal 1-hour ozone standard and as a serious nonattainment area for the federal 8-hour ozone standard by the United States Environmental Protection Agency (U.S. EPA). There are legal mandates that directly resulted from these classifications. Section 182(c) of the federal Clean Air Act Amendments of 1990 required all ozone nonattainment areas classified as “serious” and above to submit a State Implementation Plan (SIP) revision by November 15, 1994 which described, in part, how the area will achieve: (i) the National Ambient Air Quality Standard for ozone, and (ii) actual VOC emission reductions of at least three percent per year (with NOx emission reductions substituted for some of the required VOC emission reductions) averaged over each consecutive 3-year period beginning November 1993. Section 182(d) requires the District to adopt the control measures proposed in the SIP. Section 172(c)(1) requires the District to adopt Reasonably Available Control Technology (RACT) for major stationary sources. Rule 413 is a NOx control measure required by the 1994 Sacramento Area Regional Ozone Attainment Plan.

State Mandates

The District is designated serious nonattainment for the state ozone standard. The California Clean Air Act requires areas with this designation to adopt control measures required in Sections 40913, 40914, and 40919 of the California Health and Safety Code (HSC):

- HSC Section 40913 requires districts to develop a plan to achieve California’s ambient air quality standards by the earliest practicable date.
- HSC Section 40914(b)(2) requires every nonattainment district which cannot achieve a reduction of 5% or more per year in district wide emissions to adopt “every feasible measure” to reduce the emission of nonattainment pollutants and their precursors. Rule 413 is a “feasible measure” that imposes limitations comparable to the most stringent of the California air district rules. A

comparison of Rule 413 with other California air district rules for stationary gas turbines is included in Attachment B.

- HSC Section 40919(a)(3) requires districts with serious nonattainment for ozone to adopt Best Available Retrofit Control Technology (BARCT) for all existing sources. BARCT means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of sources (HSC Section 40406). Rule 413 satisfies the BARCT requirement for gas turbines, and is a NOx control measure required by the Sacramento 1991 Air Quality Attainment Plan.

Transport Mitigation Emission Control Requirements: Districts within the area of origin of transported air pollutants, as identified in the California Code of Regulations (CCR) Section 70500(c), shall include sufficient emission control measures in their attainment plans for ozone adopted pursuant to Part 3, Chapter 10 (commencing with Section 40910) of Division 26 of the HSC, to mitigate the impact of pollution sources within their jurisdictions on ozone concentrations in downwind areas commensurate with the level of contribution. An upwind district shall comply with the transport mitigation planning and implementation requirements set forth in this section regardless of its attainment status, unless the upwind district complies with the requirements of CCR Section 70601. At a minimum, the attainment/transport mitigation plans for districts within the air basins specified below shall conform to the following requirements:

- (1) Broader Sacramento Area [as defined in CCR Section 70500(b)(3)] shall:
 - (A) require the adoption and implementation of all feasible measures as expeditiously as practicable.
 - (B) require the adoption and implementation of BARCT, as defined in HSC Section 40406, on all existing stationary sources of ozone precursor emissions as expeditiously as practicable.
 - (C) require the implementation, by December 31, 2004, of a stationary source permitting program designed to achieve no net increase in the emissions of ozone precursors from new or modified stationary sources that emit or have the potential to emit 10 tons or greater per year of an ozone precursor.
 - (D) include measures sufficient to attain the state ambient air quality standard for ozone by the earliest practicable date within the Upper Sacramento Valley and that portion of the Mountain Counties Air Basin north of the Calaveras-Tuolumne County border and south of the Sierra-Plumas County border, except as provided in HSC Section 41503(d), during air pollution episodes which the state has determined meet the following conditions:
 - (i) are likely to produce a violation of the state ozone standard in the Upper Sacramento Valley or that portion of the Mountain Counties Air Basin north of the Calaveras-Tuolumne County border and south of the Sierra-Plumas County border; and
 - (ii) are dominated by overwhelming pollutant transport from the Broader Sacramento Area; and
 - (iii) are not measurably affected by emission of ozone precursors from sources located within the Upper Sacramento Valley or that portion of the Mountain Counties Air Basin north of the Calaveras-Tuolumne County border and south of the Sierra-Plumas County border.

Senate Bill (SB) 656: SB 656 (Sher, 2003) requires the California Air Resources Board (ARB) to adopt a list of feasible and most effective control measures to make progress toward state and federal PM10 and PM2.5 standards. Districts are then required to adopt an implementation schedule for measures by July 31, 2005. Because NOx contributes to particulate matter problems in certain areas, the measures on ARB's list of district measures that reduce particulate matter (Staff Report, Proposed List of Measures to Reduce Particulate Matter – PM10 and PM2.5, ARB, October 18, 2004) include District Rule 413 as well as San Joaquin Valley Air Pollution Control District Rule 4703, and South Coast Air Quality Management District Rule 1134. An ARB technical report (Characterization of Ambient PM10 and PM2.5 in California,

ARB, December 2001) estimates that 37% of wintertime PM_{2.5} concentrations in the Sacramento area are due to nitrates from motor vehicles and other combustion sources.

All turbines within the District with capacities ≥ 0.3 MW have been permitted with BACT requirements (5 ppmv or less) that are more stringent than the Rule 413 emission limits. Because the existing turbines all have state-of-the-art emission controls, it is not possible to impose more stringent limits for Rule 413 that would reduce emissions from any existing (or future) turbines within the District at this time.

NECESSITY OF AMENDMENTS

On October 21, 2002, the District issued a Final Determination of Compliance (FDOC) for the Sacramento Municipal Utility District (SMUD) Cosumnes Power Plant (CPP), to be located adjacent to the former Rancho Seco Nuclear Power Plant. Phase I will consist of two General Electric 7FA turbines, approximately 170 MW each, equipped with heat recovery steam generators and operating in a combined cycle with a condensing steam turbine. Total generating capacity for Phase I will be approximately 500 MW. NO_x emissions from the gas turbines will be controlled to 2 ppmv at 15% oxygen (O₂) using dry, low-NO_x combustors and an ammonia-based SCR system.

Condition 26 of the FDOC allows the turbines a 3-hour period during startup to achieve the 2 ppmv NO_x emission limit. This condition is in conflict with Rule 413, which allows a 1-hour period for startup to achieve 9 ppmv NO_x for a turbine with a capacity greater than or equal to 10 MW and equipped with SCR. In addition, Condition 26 of the FDOC also allows 1-hour average NO_x concentrations for periods that include “short-term excursions” to meet a limit of 30 ppmv. This condition is also in conflict with Rule 413, which provides no exemption for short-term excursions.

SMUD currently operates a combined cycle power plant, the Sacramento Power Authority (SPA), with a total generating capacity of 158 MW. The plant consists of a Siemens V84.2 turbine with a capacity of 103 MW, equipped with a heat recovery steam generator and a duct burner, and operating in a combined cycle with a steam turbine. NO_x emissions from the gas turbine are controlled to 3 ppmv at 15% O₂ using dry, low-NO_x combustors and an ammonia-based SCR system.

Condition 15 of the Permit to Operate for SPA allows 3-hour average NO_x concentrations for periods that include short-term excursions to meet a limit of 30 ppmv. This condition is in conflict with Rule 413.

SMUD has requested that the District amend Rule 413 on the basis that the current rule imposes requirements that are technologically infeasible for large, combined cycle turbines. Specifically, SMUD has requested that the start-up exemption be extended for units similar to CPP, and that an exemption for short-term excursions be provided for units similar to SPA and CPP.

Within the District, there are 11 other stationary gas turbines that are subject to the requirements of Rule 413. These turbines, with capacities ranging from 24 to 77 MW, are able to comply with the current version of Rule 413.

Technical Evaluation

Staff performed an evaluation to determine (1) whether the current rule requirements are technologically infeasible, and (2) if so, the appropriate parameters for amending the exemptions.

In response to a staff request concerning the startup period, SMUD provided data showing NO_x concentration vs. time from startup for four recently constructed, combined cycle plants in California. These plants employ state-of-the-art turbine technology and emission control, using F Class gas turbines similar in design and capacity to CPP.

The startup data from the Moss Landing Power Plant in Monterey County are most representative of the operation expected at CPP. The data showed that a 4-hour period was required for cold startups and a 3-hour period was required for warm startups before a NO_x concentration below 9 ppmv was attained.

Due to thermal stress constraints, especially for the heat recovery steam generator (HRSG) and steam turbine, large combined cycle plants require longer than one hour to achieve thermal stability such that the systems can be operated in compliance with the NO_x limits of Rule 413. In general, the startup of a combined cycle power block consists of the following steps:

- Purge the gas path of the combustion turbine.
- Initiate fuel flow and ignition.
- Operate at synch idle speed.
- Synchronize the gas turbine generator with the grid.
- Ramp up the electrical load, at the manufacturer's recommended ramp rate, to the hold point where the HRSG is brought to the minimum operating temperature.
- Warm up the HRSG.
- Begin steam production.
- Introduce steam to the steam turbine to bring it up to temperature.
- Synchronize the steam turbine generator with the grid.
- Ramp up the combustion turbine and the steam turbine to full load.

During the startup sequence, the F Class combustion turbines are designed to operate in pre-mix mode with higher fuel/air ratios than at steady state. Compliant NO_x emissions are achieved only when the final pre-mix state is reached. The gas turbine load at which this occurs varies somewhat between turbine manufacturers and models, and depends to an extent on site conditions. In general, the General Electric 7FA turbines to be used at CPP will reach this level between 50% and 60% of gas turbine full load.

Staff has determined that a startup period of 1 hour is technologically infeasible for CPP and other large, combined cycle turbines with capacities of 160 MW or greater, using the current state-of-the-art technology. Staff recommends that, for these turbines, the startup period be extended to 4 hours for a cold startup and 3 hours for a warm startup. The startup period for a hot startup should remain at 1 hour. (Cold, warm, and hot turbine startups are distinguished by the length of time that the associated steam turbine has been shut down.)

In response to a staff request concerning short-term excursions, SMUD provided data obtained from the SPA facility over a 30-month period from May 2002 through September 2004. During this period, 8 short-term excursions occurred, due to transient operating conditions that resulted in short-duration spikes in the NO_x concentration. Although the steady-state NO_x concentration at SPA is normally 3 ppmv or less, these brief spikes caused the 1-hour average NO_x concentration to exceed the Rule 413 limit of 9 ppmv. Averaging times as long as 6 hours for periods including short-term excursions were necessary for the average NO_x concentration to fall below 9 ppmv. Similar performance is expected for excursions at CPP.

There are several possible causes of increased NO_x concentrations during short-term excursions. In the case of SPA, the most common causes have been related to fuel pressure variations (pressure pulses) that cause one of the plant safety systems to switch the combustor from pre-mix (dry low-NO_x) mode to diffusion mode. When this occurs, the primary air/fuel mixture becomes less fuel-lean, resulting in higher combustion temperatures and greater NO_x formation. Other causes of short-term excursions, in which the combustor either switches to diffusion mode (in the case of turbines such as the Siemens V84.2 at SPA) or to a richer air/fuel mixture in pre-mix mode (in the case of turbines such as the General Electric 7FA at CPP), or lags in the responsiveness of the SCR system, include rapid turbine load changes,

(either operator-induced or automatic), initiation of duct burner operation, and initiation or suspension of inlet air chilling, inlet air misting, or power augmentation steam injection (for units so equipped).

Staff has determined that a 1-hour average NO_x concentration of 9 ppmv during short-term excursions is technologically infeasible for SPA, CPP, and other large, combined cycle turbines with capacities greater than 100 MW, using state-of-the-art technology. Although steady-state operation is the norm, a certain amount of transient operation is unavoidable. Staff recommends that, for these turbines, a 6-hour averaging period be allowed for compliance with the NO_x limit during periods that include short-term excursions, and that these excursions be limited to a total of 10 hours per year.

SUMMARY OF AMENDMENTS

The proposed amendments address both the startup period and short-term excursions. Section 113 will be revised to extend the startup period for large gas turbines at combined cycle plants. A new Section 114 will be added to allow large gas turbines at combined cycle plants a 6-hour averaging period to comply with NO_x limits during short-term excursions.

Section 113

Section 113 provides an exemption from the NO_x limitations during periods of startup and shutdown of a gas turbine. The proposed amendments extend the startup exemption for a gas turbine with a rated output greater than or equal to 160 MW, which is part of a combined cycle process, to:

- Up to 4 hours following a shutdown of the associated steam turbine of 72 hours or more; and
- Up to 3 hours following a shutdown of the associated steam turbine of between 8 hours and 72 hours.

In all other cases, the startup period is not to exceed 1 hour. The shutdown period in all cases will remain at 1 hour.

Section 114

A new Section 114 will be added to provide a 6-hour averaging period for compliance with Rule 413 NO_x limitations for a gas turbine with a rated output greater than 100 MW, which is part of a combined cycle process, during a short-term excursion. The following conditions are covered by this exemption:

- Combustion turbine load changes at a rate which exceeds the turbine manufacturer's recommended ramp rate, and which are initiated by the control area system operator when the plant is operating under automatic generation control, or are the result of activation of a plant automatic safety or equipment protection system.
- Fuel pressure variations, or the activation of a plant automatic safety or equipment protection system, that force the turbine control system to modify the air/fuel mixture for reasons of safety.
- Initiation or shutdown of an evaporative cooler, inlet air chiller, or inlet air misting system.
- Initiation or shutdown of duct burners.
- Initiation or shutdown of power augmentation water or steam injection.
- Conditions resulting from technological limitations as identified by the operator and approved in writing by the Air Pollution Control Officer, the California Air Resources Board, and the U.S. Environmental Protection Agency.

Each short-term excursion shall not include more than four consecutive 15-minute periods when the 15-minute average NOx concentration exceeds the limits of Rule 413. The maximum 6-hour average NOx concentration for periods that include short-term excursions shall not exceed the NOx limits. The cumulative total of all 15-minute periods when the average NOx concentration exceeds the limits shall not exceed 10 hours per year per gas turbine.

The definitions of four terms used in Section 114 will be also be added to Section 200. For the purposes of Rule 413, the following definitions will apply:

- The “control area system operator” is the organization that regulates electrical power generation within a specified region (the control area) in order to balance electrical loads and maintain planned interchange schedules with other control areas.
- “Automatic generation control” is the computer link between the control system area operator and an electrical power generating plant, by which the control area system operator can control adjustments, upward or downward, in the electrical power output of the generating plant.
- “Ramp rate” is the rate of change in the electrical power output of a generating unit over time, typically expressed as megawatts per minute.
- “Short-term excursion” will be defined as a period of time in which the 15-minute average concentration of NOx emitted from a stationary gas turbine exceeds the limits of Sections 301 and 302 in response to transient operating conditions as specified in Sections 114.1 through 114.6.

Within the District, the SMUD Power Systems Operator is the control area system operator. A gas turbine would be subject to a ramp rate in excess of the manufacturer’s recommended ramp rate only in the event of an accelerated shutdown triggered to protect the plant or its equipment, or by the control area system operator in response to conditions unknown to the plant operator, such as a system-wide emergency.

The firing of duct burners is controlled by local plant operators under the direction of the control area system operator when extra power generation is required. Because duct firing is a less efficient means of augmenting power generation, duct burners are shut down as soon as the specific need is no longer present.

Section 502

A new Section 502.4 will be added to require the owner or operator of any gas turbine for which the startup period is extended beyond 1 hour, per Section 113, to record, for each gas turbine startup, the length of time that the associated steam turbine has been shut down prior to startup. This will establish whether the startup period allowed by Section 113 is 1 hour, 3 hours, or 4 hours.

A new Section 502.5 will be added to require the owner or operator of any unit to which the exemption for short-term excursions applies, per Section 114, to record the following information for each short-term excursion: the number of consecutive 15-minute periods when the 15-minute average NOx concentration exceeded the limits of Sections 301 and 302; the qualified condition(s) under which the short-term excursion occurred; and the maximum 6-hour average NOx concentration during the period of time that includes the short-term excursion. In addition, for each stationary gas turbine to which Section 114 applies, the owner or operator will be required to record the cumulative total, per calendar year, of all 15-minute periods when the 15-minute average NOx concentration exceeded the limits of Sections 301 and 302. These added recordkeeping requirements will aid in the assessment of compliance with Section 114.

EMISSIONS IMPACT

The proposed amendment to the startup exemption will not result in any increase in emissions from existing stationary gas turbines within the District. The extension of the startup period will affect only the gas turbines yet to be installed at CPP, and will not affect any turbines currently operating within the District.

The proposed exemption for short-term excursions will affect only the gas turbines to be installed at CPP and the existing turbine at SPA. In the past 30 months, there have been 8 short-term excursions that have resulted in an average of 50 pounds each of NO_x emissions in excess of what is allowed by Rule 413. These excursions were in compliance with the Permit to Operate and the emissions were fully offset as required by Rule 202, New Source Review; however, the excursions were in violation of Rule 413. Based on this prior operating experience, it is estimated that there would be an increase of approximately 160 lb/year of NO_x emissions allowed from SPA due to the proposed exemption for short-term excursions. Theoretically, the worst-case increase in emissions from SPA that would be allowed to occur under the proposed exemption would be 180 pounds of NO_x per excursion or 1,800 lb/year.

SIP APPROVABILITY

The proposed amendments are necessary to allow normal, expected operation of large gas turbines at combined cycle plants, and are consistent with EPA guidelines for SIP-approved rules.

The extension of the startup exemption is crafted such that it applies only to CPP and does not apply to any existing source within the District. It should be noted that other California district rules contain startup exemptions of between 2 and 3 hours; only Rule 413 requires a 1-hour startup period for all gas turbines. Although the extension of the startup period for CPP will result in higher emissions during startup than previously allowed, a 1-hour startup period has been shown to be technologically infeasible for CPP. Furthermore, all startup emissions from CPP have been fully offset as required by Rule 202 – New Source Review.

The exemption for short-term excursions is worded such that it applies only to CPP and SPA. This exemption extends the averaging period for NO_x concentration to 6 hours during short-term excursions. EPA's guidance on SIP approval [*Issues Relating to VOC Regulation Cutpoints, Deficiencies, and Deviations (a.k.a., "The Bluebook")*], EPA, May 25, 1988, revised January 11, 1990, and *Guidance Document for Correcting Common VOC & Other Rule Deficiencies (a.k.a., "The Little Bluebook")*, EPA, April 1991, revised August 21, 2001] indicates that averaging periods of 24 hours or less are acceptable in SIP-approved rules.

SOCIOECONOMIC IMPACT

California HSC Section 40728.5 requires a district to perform an assessment of the socioeconomic impacts before adopting, amending, or repealing a rule that will significantly affect air quality or emission limitations. The district board is required to actively consider the socioeconomic impact of the proposal and make a good faith effort to minimize adverse socioeconomic impacts.

HSC Section 40728.5 defines "socioeconomic impact" to mean the following:

1. The type of industry or business, including small business, affected by the rule.
2. The impact of the rule on employment and the economy of the region.
3. The range of probable costs, including costs to industry or business, including small business.
4. The availability and cost-effectiveness of alternatives to the proposed rule.

5. The emission reduction potential of the rule.
6. The necessity of adopting the rule to attain state and federal ambient air standards.

Types of Affected Business and Industry Including Small Business

The proposed amendments to Rule 413 will affect only SMUD. SMUD is a municipal utility and is not a small business. No other businesses or industries will be affected.

Employment and Economy Impacts

The proposed amendments provide the SMUD CPP and SPA facilities needed relief from requirements that impede safe operation of the turbines, prevent the turbines from meeting electrical system demand requirements, or penalize SMUD for infrequent, normal operational glitches such as fuel pressure pulses. No impacts to employment and the regional economy are expected.

Range of Probable Costs

No costs will be incurred by SMUD as a result of the proposed amendments.

Availability and Cost Effectiveness of Alternatives

The alternative to the proposed amendments is not to amend the rule. This could prevent larger, more efficient and economical combined cycle plants from operating within the District. Modern, F Class combined cycle systems routinely achieve thermal efficiencies of 50-55%, compared to the 40-45% thermal efficiency that was typical of combined cycle systems 20 years ago. A typical utility base load power plant has a thermal efficiency of about 35%.

Emission Reduction Potential of the Rule

The proposed amendments do not provide for reductions in NOx emissions.

Necessity of Adopting the Rule

The proposed amendments to Rule 413 are necessary because the current rule contains provisions that are technologically infeasible for large, combined cycle plants.

ENVIRONMENTAL REVIEW AND COMPLIANCE

The District's Environmental Coordinator finds that the approval of the proposed action is exempt from CEQA under Section 15061(b)(3) of the State CEQA Guidelines because it can be seen with certainty that there is no possibility that the activity in question may have a significant adverse effect on the environment.

PUBLIC COMMENTS

A public workshop on the proposed rule was held on February 14, 2005. A public notice was mailed to interested parties and was posted on the District web site. The draft rule and staff report were made available for public review at that time.

No comments on the proposed amendments were received from the general public. A comment letter dated February 11, 2005, was received from Mr. Alex Krichevsky of the ARB. Mr. Krichevsky stated that it would improve clarity and ensure enforceability of the rule if the terms “ramp rate,” “automatic generation control,” and “area system operator” were defined. Staff has addressed this comment by adding these definitions to the rule and staff report.

Mr. Krichevsky also stated that the District should include justification for the operation of a combustion turbine above the manufacturer’s recommended ramp rate or for the shutting down of a duct burner. Staff has addressed this comment by adding a discussion of these conditions to the staff report.

TABLE OF FINDINGS

According to Section 40727(a) of the California Health & Safety Code, prior to adopting or amending a rule or regulation, an air district’s board must make findings of necessity, authority, clarity, consistency, nonduplication, and reference. The findings must be based on the following:

1. Information presented in the District’s written analysis, prepared pursuant to Health and Safety Code Section 40727.2,
2. Information contained in the rulemaking records pursuant to Section 40728 of the Health and Safety Code, and
3. Relevant information presented at the Board’s hearing for the rule.

The following table shows the required findings for proposed Rule 413.

Rule 413 – Required Findings

Finding	Definition	Finding Determination
Authority	The District is permitted or required to adopt, amend, or repeal the rule by a provision of law or a state or federal regulation.	The District is authorized to amend Rule 413 by California Health and Safety Code (HSC) Sections 40001, 40702, and 41010. [HSC Section 40727(b)(2)].
Necessity	The District has demonstrated that a need exists for the rule, or for its amendment or repeal.	The amendments to Rule 413 are necessary because the current rule contains provisions which are technologically infeasible for large, combined cycle plants. [HSC Section 40727(b)(1)].
Clarity	The rule is written or displayed so that its meaning can be easily understood by the persons directly affected by it.	The District has reviewed the proposed amendments and determined that they can be understood by the affected industries. In addition, the record contains no evidence that people directly affected by the rule cannot understand the rule. [HSC Section 40727(b)(3)].
Consistency	The rule is in harmony with, and not in conflict with or contradictory to, existing statutes, court decisions, or state or federal regulations.	The District has found that the proposed rule does not conflict with, and is not contradictory to, existing statutes, court decisions, or state or federal regulations. [HSC Section 40727(b)(4)].

Finding	Definition	Finding Determination
Non-Duplication	The rule does not impose the same requirements as an existing state or federal regulation, unless the District finds that the requirements are necessary or proper to execute the powers and duties granted to, and imposed upon the District.	There are federal requirements that also apply to stationary gas turbines: Subpart GG of 40 CFR Part 60 (NSPS) and Parts 72-78 of 40 CFR (Acid Rain). Rule 413 contains requirements that are more stringent than the federal requirements and does not duplicate them. [HSC Section 40727(b)(5)].
Reference	Any statute, court decision, or other provision of law that the District implements, interprets, or makes specific by adopting, amending, or repealing the rule. An example of this would be the 1988 EPA State Implementation Plan call to revise District rules.	In adopting the proposed rule, the District is implementing Sections 182(c) and (d) of the federal Clean Air Act Amendments of 1990, and Section 40919(a)(3) of the California Health and Safety Code. [HSC Section 40727(b)(6)].
Additional Informational Requirements (HSC Section 40727.2)	In complying with HSC Section 40727, the District must identify all federal requirements and District rules that apply to the same equipment or source type as the proposed rule or amendments.	Exempt from this requirement by HSC Section 40727.2(g) because the proposed amendments do not impose a new emission limit or standard, make an existing limit or standard more stringent, or impose new or more stringent monitoring, reporting, or recordkeeping requirements.

ATTACHMENT A LIST OF CHANGES TO RULE 413

Section 113	Revised to extend the startup period for a gas turbine with a rated output greater than or equal to 160 MW, which is part of a combined cycle process, to 4 hours following a shutdown of the associated steam turbine of 72 hours or more, and 3 hours following a shutdown of the associated steam turbine of between 8 hours and 72 hours.
<u>Section 114</u>	Added paragraph to allow a 6-hour averaging time for compliance with NOx limits during short-term excursions for a gas turbine with a rated output greater than 100 MW which is part of a combined cycle process.
<u>Section 201</u>	Added definition of the term “automatic generation control.”
<u>Sections 2042, 2024, 2035, 2046, 2057, 2068, 20710, 20811, 20912, 2103, 2145, 2126</u>	Sections renumbered.
<u>Section 2035</u> , Sections 302.1(b), (c), and (d), and Sections 302.2(b) and (c)	Corrected typographical error: calender <u>calendar</u> .
<u>Section 203</u>	Added definition of the term “control area system operator.”
<u>Section 209</u>	Added definition of the term “ramp rate.”
<u>Section 214</u>	Added definition of the term “short-term excursion.”
<u>Section 502.4</u>	Added recordkeeping requirements for gas turbine startups to aid in assessing compliance with revised Section 113.
<u>Section 502.5</u>	Added recordkeeping requirements for short-term excursions to aid in assessing compliance with new Section 114.

ATTACHMENT B ALL FEASIBLE MEASURES COMPARISON

The following table shows a comparison of the requirements of Rule 413 with those adopted by other districts for stationary gas turbines.

Element of Comparison	SMAQMD Rule 413	SCAQMD Rule 1134 (8/8/1997)	SJVAPCD Rule 4703 (4/25/2002)	VCAPCD Rule 74.23 (1/8/2002)	BAAQMD Rule 9-9 (9/21/1994)
Applicability	New and existing stationary gas turbines with ratings ≥ 0.3 MW output or ≥ 3 MMBtu/hr input and operated on gaseous or liquid fuel	New and existing stationary gas turbines with ratings ≥ 0.3 MW output	New and existing stationary gas turbines with ratings ≥ 0.3 MW output and/or > 3 MMBtu/hr input	New and existing stationary gas turbines with ratings ≥ 0.3 MW output and operated on gaseous and/or liquid fuel	New and existing stationary gas turbines with ratings ≥ 0.3 MW output
Conclusion – Rule Applicability	The applicability of SMAQMD Rule 413 is equivalent to the other district rules.				
Exemptions	<ul style="list-style-type: none"> • Laboratory units used in research and testing • Units used to provide emergency electrical power, emergency water pumping for flood control or firefighting, emergency potable water pumping, or emergency sewage pumping, provided: (1) operation for maintenance is limited to 100 hours per year; (2) operation is limited to 200 hours per year; (3) operation is not for supplying power to a utility grid; and (4) operation other than for maintenance is limited to 	<ul style="list-style-type: none"> • Laboratory units used in research and testing • Units used exclusively for firefighting and/or flood control • Chemical processing gas turbine units • All existing pipeline gas turbine units located in the Southeast Desert Air Basin • Emergency standby and 	<ul style="list-style-type: none"> • Laboratory units used in research and testing • Units limited by permit condition to be used exclusively for firefighting and/or flood control • Emergency standby units limited by permit condition to operate less than 200 hours per year for maintenance and testing • Units with ratings $<$ 	<ul style="list-style-type: none"> • Laboratory units used in research and testing • Units operated exclusively for firefighting and/or flood control • Units operated less than 200 hours per calendar year • Emergency standby units operated during an emergency or for maintenance. Maintenance operation is 	<ul style="list-style-type: none"> • Testing of aircraft turbine engines for flight certification • Units used solely for firefighting and/or flood control • Emergency standby gas turbines • Units with ratings < 4 MW and operated less than 877 hours per calendar year • Emission limits do not apply during

Element of Comparison	SMAQMD Rule 413	SCAQMD Rule 1134 (8/8/1997)	SJVAPCD Rule 4703 (4/25/2002)	VCAPCD Rule 74.23 (1/8/2002)	BAAQMD Rule 9-9 (9/21/1994)
	<p>actual emergency purposes</p> <ul style="list-style-type: none"> • Units removed from service prior to 5/31/1997 • Emission limits do not apply during startup and shutdown periods, not to exceed 1 hour for startup and 1 hour for shutdown, except for a combined cycle turbine \geq 160 MW output, startup may not exceed 4 hours following shutdown of the steam turbine of 72 hours or more and startup may not exceed 3 hours following a shutdown of the steam turbine of between 8 and 72 hours • A turbine > 100 MW output is allowed a 6-hour averaging period for compliance with NO_x limits during a short-term excursion under specific circumstances 	<p>peaking gas turbines operating less than 200 hours per calendar year and equipped with a non-resettable hour meter</p> <ul style="list-style-type: none"> • All existing gas turbines operating in the Southeast Desert Air Basin or San Clemente Island and rated below 4 MW and operated less than 877 hours per year • Emission limits do not apply during startup periods, not to exceed 2 hours each 	<p>4 MW limited by permit condition to operate less than 877 hours per calendar year</p> <ul style="list-style-type: none"> • Emission limits do not apply during startup or shutdown periods, not to exceed 2 hours each 	<p>limited to 104 hours per calendar year</p> <ul style="list-style-type: none"> • Emission limits do not apply during startup or shutdown periods. A startup period shall not exceed 2 hours for units utilizing steam injection and 1 hour for all other units. A shutdown period shall not exceed 1 hour • Emission limits do not apply during unplanned load changes, not to exceed 2 hours for units utilizing steam injection and 1 hour for all other units 	<p>inspection and maintenance periods, provided:</p> <p>(1) inspection and maintenance periods are limited to a total of 48 hours between May 1 and October 31 in a calendar year;</p> <p>(2) in a calendar year when an inspection required by California Labor Code Section 7682 is not performed, total maintenance and inspection time shall be limited to 144 hours; and</p> <p>(3) in a calendar year when an inspection required by California Labor Code Section 7682 is performed, total maintenance and inspection time shall be limited to 144 hours plus</p>

Element of Comparison	SMAQMD Rule 413	SCAQMD Rule 1134 (8/8/1997)	SJVAPCD Rule 4703 (4/25/2002)	VCAPCD Rule 74.23 (1/8/2002)	BAAQMD Rule 9-9 (9/21/1994)
					additional time for the required inspection, not to exceed an overall total of 312 hours. <ul style="list-style-type: none"> Emission limits do not apply during the startup or shutdown period, not to exceed 3 hours for a startup or 1 hour for a shutdown
Conclusion – Exemptions	The exemptions for SMAQMD Rule 413 are as stringent as the other district rules, except for the startup period and short-term excursions. For large, combined cycle turbines, the extended startup period and extended averaging period during short-term excursions proposed for Rule 413 are necessary to accommodate technological limitations. These technological limitations also exist in the other districts, although they have not yet been addressed.				
Emission Limits	NOx limits corrected to 15% O ₂ , dry basis <u>Gaseous Fuel Firing</u> <ul style="list-style-type: none"> 42 ppmv for units ≥ 0.3 MW and < 2.9 MW 42 ppmv for units ≥ 2.9 MW and operated < 877 hours per year 25 ppmv for units ≥ 2.9 MW and < 10 MW and operated ≥ 877 hours per year 15 ppmv for units ≥ 10 MW, operated ≥ 877 hours per year, w/o SCR 9 ppmv for units ≥ 10 	NOx limits corrected to 15% O ₂ , dry basis <ul style="list-style-type: none"> 25 ppmv for units ≥ 0.3 MW and < 2.9 MW 15 ppmv for units ≥ 2.9 MW and < 10 MW, w/o SCR 12 ppmv for units ≥ 10 MW, w/o SCR 9 ppmv for units ≥ 2.9 MW, w/ SCR 15 ppmv for combined cycle units ≥ 60 MW, 	NOx limits corrected to 15% O ₂ , dry basis <u>Tier 1 Limits</u> <ul style="list-style-type: none"> 42 ppmv for gaseous fuel and 65 ppmv for liquid fuel for units ≥ 4MW and operated < 877 hours per year 42 ppmv for gaseous fuel and 65 ppmv for liquid fuel for units > 0.3 MW and < 10 MW and operated ≥ 877 hours per 	NOx limits corrected to 15% O ₂ , dry basis <u>Gaseous Fuel Firing</u> <ul style="list-style-type: none"> 42 ppmv for units ≥ 0.3 MW and < 2.9 MW 42 ppmv for units ≥ 4 MW and operated < 877 hours per year 25 ppmv* for units ≥ 2.9 MW and < 10 MW 15 ppmv* for units ≥ 10 MW, w/o SCR 	NOx limits corrected to 15% O ₂ , dry basis <ul style="list-style-type: none"> 42 ppmv for units ≥ 0.3 MW and < 10 MW (55 ppmv for refinery fuel gas firing and 65 ppmv for liquid fuel firing during natural gas curtailment or short testing periods) 15 ppmv for units > 10 MW, w/o SCR (42 ppmv for liquid fuel firing)

Element of Comparison	SMAQMD Rule 413	SCAQMD Rule 1134 (8/8/1997)	SJVAPCD Rule 4703 (4/25/2002)	VCAPCD Rule 74.23 (1/8/2002)	BAAQMD Rule 9-9 (9/21/1994)
	<p>MW, operated ≥ 877 hours per year, w/ SCR</p> <p><u>Liquid Fuel Firing</u></p> <ul style="list-style-type: none"> 65 ppmv for units ≥ 0.3 MW and < 10 MW 65 ppmv for units ≥ 10 MW and operated <877 hours per year 42 ppmv for units ≥ 10 MW, operated ≥ 877 hours per year, w/o SCR 25 ppmv for units ≥ 10 MW, operated ≥ 877 hours per year, w/ SCR 	<p>w/o SCR</p> <ul style="list-style-type: none"> 25 ppmv for units ≥ 2.9 MW and < 10 MW using fuel w/ a minimum of 60% sewage digester gas <p>Turbines with efficiencies greater than 25% have limits adjusted by the ratio (efficiency/25%)</p>	<p>year, w/o SCR</p> <ul style="list-style-type: none"> 15 ppmv* for gaseous fuel and 42 ppmv* for liquid fuel for units ≥ 10 MW and operated ≥ 877 hours per year, w/o SCR 9 ppmv* for gaseous fuel and 25 ppmv* for liquid fuel for units ≥ 10 MW and operated ≥ 877 hours per year, w/ SCR 18 ppmv* for gaseous fuel and 42* ppmv for liquid fuel for General Electric Frame 7 turbines with Quiet Combustors 50 ppmv for gaseous and liquid fuels for Solar Saturn 1,100-hp turbine powering centrifugal compressor <p><u>Tier 2 Limits</u></p> <ul style="list-style-type: none"> 50 ppmv for gaseous and liquid fuels for Solar Saturn turbine, < 2 	<ul style="list-style-type: none"> 9 ppmv* for units ≥ 10 MW, w/ SCR <p><u>Liquid Fuel Firing</u></p> <ul style="list-style-type: none"> 65 ppmv for units ≥ 0.3 MW and < 10 MW 65 ppmv for units ≥ 4 MW and operated < 877 hours per year 42 ppmv* for units ≥ 10 MW, w/o SCR 25 ppmv* for units ≥ 10 MW, w/ SCR <p>*Indicates that turbines with efficiencies greater than 25% have limits adjusted by the ratio (efficiency/25%)</p>	<p>during natural gas curtailment or short testing periods)</p> <ul style="list-style-type: none"> 9 ppmv for units > 10 MW, w/ SCR (25 ppmv for liquid fuel firing during natural gas curtailment or short testing periods) 42 ppmv for gaseous fuel and 65 ppmv for liquid fuel for units ≥ 4 MW and operated < 877 hours per year 18 ppmv for units permitted prior to 5/5/1993 with a BACT limit of 25 ppmv or below and using a control technology other than SCR (42 ppmv for liquid fuel firing during natural gas curtailment or short testing periods)

Element of Comparison	SMAQMD Rule 413	SCAQMD Rule 1134 (8/8/1997)	SJVAPCD Rule 4703 (4/25/2002)	VCAPCD Rule 74.23 (1/8/2002)	BAAQMD Rule 9-9 (9/21/1994)
			MW, driving centrifugal compressor <ul style="list-style-type: none"> • 25 ppmv for gaseous fuel and 65 ppmv for liquid fuel for units \leq 10 MW if a dry low-NOx system is commercially available for specific unit as of April 30, 2003 • 35 ppmv for gaseous fuel and 65 ppmv for liquid fuel for units \leq 10 MW if a dry low-NOx system is not commercially available for specific unit as of April 30, 2003 • 5 ppmv (standard) or 3 ppmv (enhanced) for gaseous fuel and 25 ppmv for liquid fuel for combined cycle units > 10 MW • 5 ppmv (standard) or 3 ppmv (enhanced) for gaseous fuel and 		Turbines with efficiencies greater than 25% can have limits adjusted by the ratio (efficiency/25%)

Element of Comparison	SMAQMD Rule 413	SCAQMD Rule 1134 (8/8/1997)	SJVAPCD Rule 4703 (4/25/2002)	VCAPCD Rule 74.23 (1/8/2002)	BAAQMD Rule 9-9 (9/21/1994)
			25 ppmv for liquid fuel for simple cycle units > 10 MW and operated > 877 hours per year <ul style="list-style-type: none"> • 25 ppmv (standard) or 5 ppmv (enhanced) for gaseous fuel and 42 ppmv (standard) or 25 ppmv (enhanced) for liquid fuel for simple cycle units > 10 MW and operated ≤ 877 hours per year *Indicates that turbines with efficiencies greater than 25% have limits adjusted by the ratio (efficiency/25%)		
Conclusion – Emission Limits	All turbines within SMAQMD with capacities ≥ 0.3 MW have been permitted with BACT requirements (5 ppmv or less) that are more stringent than any of the district rules. Because the existing turbines all have state-of-the-art emission controls, it is not possible to impose more stringent limits for Rule 413 that would reduce emissions from any existing (or future) turbines within the District at this time.				
Monitoring and Source Testing Requirements	<ul style="list-style-type: none"> • For units ≥ 10 MW and operated more than 4,000 hours per year, a continuous emission monitoring (CEM) system is required • Annual source test 	<ul style="list-style-type: none"> • For cogeneration and combined cycle units ≥ 2.9 MW, a CEM is required • For units emitting ≥ 25 tons per year 	<ul style="list-style-type: none"> • For units ≥ 10 MW and operated more than 4,000 hours per year, a CEM is required • For units with exhaust gas NOx 	<ul style="list-style-type: none"> • For units ≥ 10 MW and operated more than 4,000 hours per year, a CEM is required • Annual source test 	<ul style="list-style-type: none"> • For units ≥ 10 MW and operated more than 4,000 hours per year, a CEM is required • Initial source test

Element of Comparison	SMAQMD Rule 413	SCAQMD Rule 1134 (8/8/1997)	SJVAPCD Rule 4703 (4/25/2002)	VCAPCD Rule 74.23 (1/8/2002)	BAAQMD Rule 9-9 (9/21/1994)
		of NOx, annual source test. For all other units, source testing within 90 days after every 8,400 hours of operation	control devices, a CEM is required <ul style="list-style-type: none"> • Biennial source test for units operated < 877 hours per year. Annual source test for all other units 		
Conclusion – Monitoring and Source Testing Requirements	SCAQMD also requires units between 2.9 and 10 MW to have a CEM, but SMAQMD has no sources in this range. SJVAPCD specifically requires units with exhaust gas NOx control to have CEMs, but adopting this provision would have no effect on turbines within SMAQMD. All turbines within SMAQMD which are subject to the NOx emission limits of Rule 413 are already equipped with CEMs.				
Equipment Requirements	Non-resettable totalizing hour meter	Non-resettable totalizing hour meter for emergency standby and peaking units operated < 200 hours per year	None	Non-resettable totalizing hour meter for units operated < 200 hours per year or emergency standby units with maintenance operation limited to 104 hours per year	None
Conclusion – Equipment Requirements	SMAQMD Rule 413 requires a non-resettable totalizing hour meter for all turbines subject to the rule and is the most stringent of the district rules				
Overall Rule Feasibility Conclusion	Based on the analysis of rules for stationary gas turbines that have been adopted by other districts, staff has concluded that the proposed amendments to SMAQMD Rule 413 will satisfy the “all feasible measures” requirement.				