

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
Division or Section of APCD/Stationary Sources Program

INTER-OFFICE COMMUNICATION

PS Memo #: 98-007

TO: Permit Engineers

FROM: Jim King

DATE: (ver) August 16, 2011

RE: Turbine Alternate Operating Scenarios: **Turbines without CEM**

The attached Alternate Operating Scenario (AOS) permit conditions are intended to provide sources with the flexibility to make equipment changes in order to deal with a turbine breakdown or periodic maintenance and repair of an existing onsite turbine. It is the purpose of this AOS to provide flexibility while still maintaining practical enforceability of both construction and operating permits and meeting all state and federal regulatory requirements. The AOS will not be applied retroactively and may need to be amended as conditions warrant. Future changes in Federal or State rules may also require revisions.

Overview

This guidance covers two scenarios: 1) replacement of certain turbine parts, and 2) temporary or permanent replacement of the entire turbine unit. In both instances, the replacements must be of the same make, manufacturer, design, and capacity/horsepower. The replacement of an existing turbine with a new turbine constitutes construction of a new emissions unit, not “routine replacement” of an existing unit. Ordinarily, the source would have to go through the permitting process and obtain a construction permit or an operating permit modification prior to such construction. The AOS serves as an advanced permit for the new turbine, and therefore allows the source to replace an existing turbine without undertaking a separate permit review. The AOS cannot be used for additional new emission points for any site. In other words, a turbine that is being installed as an entirely new emission point and not as part of an AOS-approved installation related to an existing onsite turbine has to go through the regular CP/OP permitting process.

Note that none of the testing discussion relates to the NSPS or Reg 1 SO₂ limits or the Reg 1 fuel burning particulate limit. *Note to OP engineers:* The NSPS & Reg 1 limits can be handled with the natural gas fuel restriction (be sure to use the same phrasing as for the opacity)

NSPS and RACT Implications

- For any turbine located in a designated attainment/maintenance or non-attainment area the Temporary Replacement provisions can be used, but in those cases the definition of temporary for purposes of the AOS is changed from 90 days to 270 days in order to allow the Division the time required to process the request for a permanent replacement turbine. This is because as a “new” source it would have to undergo RACT. In the Denver Metropolitan PM₁₀ attainment/maintenance area, RACT applies to PM₁₀ at any level of emissions and to NO_x and SO₂, as precursors to PM₁₀, if the potential to emit of NO_x or SO₂ exceeds 40 tons/yr.
- There are two NSPS for combustion turbines: NSPS GG and NSPS KKKK.
- Since we view a permanent replacement turbine under the AOS as a new unit, they would be considered a new affected facility for NSPS purposes:
 - For GG, although it is possible that an existing NSPS turbine could be permanently replaced by a pre-NSPS turbine, it is not likely because 1) since the NSPS GG applicability date is 10/3/77 there are not too many non-GG turbines in service, and 2) a pre-1977 turbine would probably not be able to meet the emission limits in the permit for a NSPS GG turbine.
 - For KKKK, since the applicability date is 2/18/05 it is very possible that a source could move in a replacement turbine that was not subject to KKKK.
- Note that under the provisions of Regulation No. 6. Part B, Section I.B. that relocation of a source from outside the State into Colorado is considered to be a new source, subject to the requirements of Regulation No. 6 (i.e., the date that the source is first relocated to Colorado becomes equivalent to the commence construction date for purposes of determining the applicability of NSPS requirements).

Major Stationary Source Implications

The AOS **cannot be used** for the permanent replacement of a turbine at any source that is currently a major stationary source for purposes of nonattainment new source review or prevention of significant deterioration (NANSR/PSD) unless the turbine has emission limits that are below the significance levels in Regulation No 3, Part D, Section II.A.42. for the applicable pollutant (e.g. a 39 TPY NO_x limit).

For any turbine located at a major stationary source that does not have emission limits below the significance levels, only the Temporary Replacement provisions can be used, but in those cases the definition of temporary for purposes of the AOS is changed from 90 days to 270 days in order to allow the Division the time required to process the request for a permanent turbine replacement.

Summary of the AOS

The AOS allows a facility to *temporarily* (up to 90/270) operating days in any 12 month period) replace an existing turbine with the exact make and model turbine as long as the replacement

turbine complies with any limitations or other requirements applicable to the original turbine. The 90 (270) day period is the total number of operating days that the temporary replacement turbine may operate. If the temporary replacement turbine operates only part of a day, that day counts towards the 90 (270) day total. Portable monitoring using the Division-approved Protocol is required upon turbine replacement to monitor the compliance of the temporary replacement turbine with the original turbine's permitted emission limits (except that you can use AP42/Mfg emission factors instead of testing if the original turbine is grandfathered, permit exempt, or has no emission limits on their permit *and* is covered by an Operating Permit).

The AOS allows a facility (except as described above for certain NANSR/PSD sources and sources located in an attainment/maintenance or non-attainment area) to *permanently* (more than 90 total operating days in any 12 month period) replace an existing turbine with the exact make and model turbine as long as the permanent replacement turbine complies with any permit limitations and other requirements applicable to the existing turbine as well as any new applicable requirements for the replacement turbine.

Measurement of emissions from the permanent replacement turbine and compliance with the applicable emission limitations shall be made using a portable analyzer as set forth in section 2.2.

Miscellaneous

Any situation not covered by this AOS will require that the facility utilize the appropriate Regulation No. 3 permitting procedures to obtain a new or modified Permit, as appropriate.

FOR TEMPORARY REPLACEMENTS ONLY: In the case of a grandfathered or permit exempt turbine that is not covered by an Operating Permit, the facility would have to voluntarily seek a permit, thus losing their grandfathered or permit exempt status. If the facility is covered by an Operating Permit, the turbine may maintain its grandfathered or permit exempt status.

In regard to the permanent replacement of the entire existing turbine with the exact make and model turbine: since the dispersion characteristics of the turbines will not differ from those of the existing turbine, the permit review engineer may not need to conduct (or have the source conduct) appropriate modeling to demonstrate that operation of the permanent replacement turbine will not cause a violation of the NAAQS. A possible exception to this general rule would be a situation wherein the emissions from the existing turbines at a facility have not been previously modeled. In such cases, the review engineer may conduct/require such appropriate modeling for the permanent turbine replacement AOS.

Component Replacement Notes

Certain provisions of this guidance that deal with component replacements that do not trigger modifications can be used by any source even if the suggested language is not in their operating or construction permit. However, the language should be included in all new and revised permits for clarity. Note that if replacement of any of the components listed results in a change in serial number for the turbine, a letter explaining the action as well as a revised APEN and appropriate filing fee shall be submitted to the Division within 30 days of the replacement.

Note that the component replacement provisions apply **ONLY** to those turbines subject to NSPS GG. Neither pre-GG turbines nor post GG turbines (i.e. KKKK turbines) can use those provisions.

In 1977, EPA determined that certain physical or operational changes will not be considered as modifications to existing gas turbines for NSPS GG purposes, irrespective of any change in the emission rate.¹ These changes, therefore, would not trigger any regulatory review under NSPS. From the referenced document:

For NSPS Subpart GG purposes only, physical or operational changes that **might be** considered a modification are:

- A) Replacement of components with a different design than the original to permit firing a turbine with fuels for which it was not originally designed.
- B) Replacement of components with a different design than the original to increase the power output of the turbine.
- C) Sustained operation of a turbine at higher outputs than design.

For NSPS Subpart GG purposes only, physical or operational changes that **are not** considered a modification are:

- 1) Changes determined to be routine maintenance, repair, or replacement in kind. This will include repair or replacement of stator blades, turbine nozzles, turbine buckets, fuel nozzles, combustion chambers, seals, and shaft packings. (provided that they are of the same design as the original).
- 2) Changes in the type or grade of fuel used, if the original gas turbine installation, fuel nozzles, etc. were designed for its use.
- 3) An increase in the hours of operation. (unless limited by permit).
- 4) Variations in operating loads within the turbine design specification.

For purposes of this guidance, the Division is extending the NSPS modification exemptions for physical or operational changes to NSPS GG turbines as set forth above to also apply to modifications under major stationary source NSR/PSD and Regulation No. 3, Part B minor source permitting requirements.

Note that the repair or replacement of the components listed under (1) above must be genuinely the same design. The Division does not consider that this section of the guidance allows for the entire replacement or reconstruction of an existing emissions unit with an identical new one or one similar in design or function. Rather, the guidance considers the repair or replacements

¹ Standards Support and Environmental Impact Statement Volume 1: Proposed Standards of Performance for Stationary Gas Turbines. EPA-450/2

provision to encompass the repair or replacement of certain components at an emissions unit with the same components.

Note that the term “combustion chambers” used under (1) above may be called by different names by different manufacturers, e.g. “gas combustor” or “power unit”.

The following **will not be eligible** for coverage under this guidance and will have to undergo the appropriate review under the NSPS, NSR/PSD, or Regulation No. 3 requirements:

- 1) Replacement of components with a different design than the original to permit firing a turbine with fuels for which it was not originally designed.
- 2) Replacement of components with a different design than the original to increase the power output of the turbine.
- 3) Sustained operation of a turbine at higher outputs than design.
- 4) Permanent replacement of the entire existing turbine at any source that is currently major for NSR/PSD purposes unless all turbines onsite have permits limiting their PTE to below the PSD significance levels. Temporary replacement (up to 270 days) is allowed.

Turbine AOS - no CEM

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Permit Engineer User Notes:

- The use of 8760 hours to “ramp up” test results comes from PS Memo 98-3, Short Term Limits Policy:

In the case of permits issued under the new policy, monitoring results, such as those from stack testing, will be projected out for comparison to the emissions limits in the permit. If the reference test method lasts one hour and there are monthly and annual limits in the permit with no restriction on hours of operation, the test data will be multiplied by the number of hours in a month or hours in a year to determine compliance.

- There are two NSPS for combustion turbines: NSPS GG and NSPS KKKK. The AOS makes a generic reference to NSPS applicability.
- Note that under the provisions of Regulation No. 6, Part B, Section I.B. that relocation of a source from outside the State into Colorado is considered to be a new source, subject to the requirements of Regulation No. 6 (i.e., the date that the source is first relocated to Colorado becomes equivalent to the commence construction date for purposes of determining the applicability of NSPS requirements).
- For any turbine located in a designated attainment/maintenance or non-attainment area only the Temporary Replacement provisions can be used, but in those cases the definition of temporary for purposes of the AOS is changed from 90 days to 270 days in order to allow the Division the time required to process the request for a permanent replacement turbine. This is because as a “new” source it would have to undergo RACT. For those situations, do a Word search for “90” and then replace it with “270”.
- In regard to MACT rules, combustion turbines that burn gas only or that burn oil for less than 1000 hrs/yr are not subject to the substantive requirements of Subpart YYYY - National Emission Standards for Stationary Combustion Turbines, although they do have some initial notification requirements.

Major Stationary Source Implications

- The AOS cannot be used for the permanent replacement of an entire turbine at any source that is currently a major stationary source for purposes of non-attainment area new source review and/or prevention of significant deterioration (NANSR/PSD) unless the turbine has emission limits that are below the significance levels in Reg 3, Part D, II.A.42. (e.g. a 39 TPY NO_x limit). Note that a permit would not necessarily need specific limits for all of the pollutants listed in Part D, II.A.42. For example, they would not need a TPY limit for Hydrogen Sulfide or even Sulfur Dioxide since the combination of emission factors and fuel limits could serve as effective limits.

- For any turbine located at a major stationary source that does not have emission limits below the significance levels, only the Temporary Replacement provisions can be used, but in those cases the definition of temporary for purposes of the AOS is changed from 90 days to 270 days in order to allow the Division the time required to process the request for a permanent turbine replacement. So for major stationary sources, do a Word search for “90” and then replace it with “270”.

Operating Permits vs. Construction Permit Implementation

- There are a few instances where OP and CP language differs. See **bolded language** on the first page and in 2.1 and 2.1.1.
- Please put the version date at the top of the AOS language in the permit.

Permit Language Starts Here (Section I of OP's)

1. Routine Turbine Component Replacements

The following physical or operational changes to the turbines in this permit are not considered a modification for purposes of NSPS GG, major stationary source NSR/PSD, or Regulation No. 3, Part B. Note that the component replacement provisions apply ONLY to those turbines subject to NSPS GG. Neither pre-GG turbines nor post GG turbines (i.e. KKKK turbines) can use those provisions.

- 1) Replacement of stator blades, turbine nozzles, turbine buckets, fuel nozzles, combustion chambers, seals, and shaft packings, provided that they are of the same design as the original.
- 2) Changes in the type or grade of fuel used, if the original gas turbine installation, fuel nozzles, etc. were designed for its use.
- 3) An increase in the hours of operation (unless limited by a permit condition)
- 4) Variations in operating loads within the engine design specification.
- 5) Any physical change constituting routine maintenance, repair, or replacement.

Turbines undergoing any of the above changes are subject to all federally applicable and state-only requirements set forth in this permit (including monitoring and record keeping), **and shall be subject to any shield afforded by this permit** (*use bolded for OP's only*). If replacement of any of the components listed in (1) or (5) above results in a change in serial number for the turbine, a letter explaining the action as well as a revised APEN and appropriate filing fee shall be submitted to the Division within 30 days of the replacement.

Note that the repair or replacement of components must be of genuinely the same design. Except in accordance with the Alternate Operating Scenario set forth below, the Division does not consider that this allows for the entire replacement (or reconstruction) of an existing turbine with an identical new one or one similar in design or function. Rather, the Division considers the repair or replacements to encompass the repair or replacement of components at a turbine with the same (or functionally similar) components.

2. Alternative Operating Scenarios

The following Alternative Operating Scenario (AOS) for the temporary and permanent replacement of combustion turbines and turbine components has been reviewed in accordance with the requirements of Regulation No. 3., Part A, Section IV.A, Operational Flexibility-Alternative Operating Scenarios, Regulation No. 3, Part B, Construction Permits, and Regulation No. 3, Part D, Major Stationary Source New Source Review and Prevention of Significant Deterioration, and it has been found to meet all applicable substantive and procedural requirements. This permit incorporates and shall be considered a Construction Permit for any turbine or turbine component replacement performed in accordance with this AOS, and the

permittee shall be allowed to perform such turbine or turbine component replacement without applying for a revision to this permit or obtaining a new Construction Permit.

2.1 Turbine Replacement

The following AOS is incorporated into this permit in order to deal with a turbine breakdown or periodic routine maintenance and repair of an existing onsite turbine that requires the use of a temporary replacement turbine. “Temporary” is defined as in the same service for 90 operating days or less in any 12 month period. “Permanent” is defined as in the same service for more than 90 operating days in any 12 month period. The 90 days is the total number of days that the turbine is in operation. If the turbine operates only part of a day, that day shall count as a single day towards the 90-day total. The compliance demonstrations and any periodic monitoring required by this AOS are in addition to any compliance demonstrations or periodic monitoring required by this permit.

Any permanent turbine replacement under this AOS shall result in the replacement turbine being considered a new affected facility for purposes of NSPS and shall be subject to all applicable requirements of that Subpart including, but not limited to, any required Performance Testing.

All replacement turbines are subject to all federally applicable and state-only requirements set forth in this permit (including monitoring and record keeping), **and shall be subject to any shield afforded by this permit.** *(use bolded for OP’s only)*

The results of all tests and the associated calculations required by this AOS shall be submitted to the Division within 30 calendar days of the test or within 60 days of the test if such testing is required to demonstrate compliance with the NSPS requirements. Results of all tests shall be kept on site for five (5) years and made available to the Division upon request.

The permittee shall maintain a log on-site and contemporaneously record the start and stop date of any turbine replacement, the manufacturer, date of manufacture, model number, horsepower, and serial number of the turbine (s) that are replaced during the term of this permit, and the manufacturer, model number, horsepower, and serial number of the replacement turbine.

2.1.1 The permittee may temporarily replace an existing turbine that is covered by this permit with a turbine that is the exact same make and model as the existing turbine without modifying this permit, so long as the temporary replacement turbine complies with the emission limitations for the existing permitted turbine and other requirements applicable to the original turbine. Measurement of emissions from the temporary replacement turbine shall be made as set forth in section 2.2.

(Paragraph in bold below for OP’s only)

The permittee may temporarily replace a grandfathered or permit exempt turbine or a turbine that is not subject to emission limits without modifying this permit. In this circumstance, potential annual emissions of NO_x and CO from the temporary replacement turbine must be less than or equal to the potential annual emissions of NO_x and CO from the original grandfathered or permit exempt turbine or for the turbine that is not subject to emission limits, as determined by applying appropriate emission factors (e.g. AP-42 or manufacturer's emission factors)

- 2.1.2 The permittee may permanently replace the existing turbine that is covered by this permit with a turbine that is the exact same make and model as the existing turbine without modifying this permit so long as the permanent replacement turbine complies with the emission limitations and other requirements applicable to the original turbine as well as any new applicable requirements for the replacement turbine. Measurement of emissions from the temporary replacement turbine shall be made as set forth in section 2.2.
- 2.1.3 An Air Pollutant Emissions Notice (APEN) that includes the specific manufacturer, model and serial number and horsepower of the permanent replacement turbine shall be filed with the Division for the permanent replacement turbine within 14 calendar days of commencing operation of the replacement turbine. The APEN shall be accompanied by the appropriate APEN filing fee, a cover letter explaining that the permittee is exercising an alternative operating scenario and is installing a permanent replacement turbine.

This AOS cannot be used for permanent turbine replacement of a grandfathered or permit exempt turbine or a turbine that is not subject to emission limits.

The permittee shall agree to pay fees based on the normal permit processing rate for review of information submitted to the Division in regard to any permanent turbine replacement.

(these two paragraphs shall only be included for major stationary sources)

The AOS cannot be used for the permanent replacement of an entire turbine at any source that is currently a major stationary source for purposes of Prevention of Significant Deterioration or Non-Attainment Area New Source Review ("PSD/NANSR") unless the existing turbine has emission limits that are below the significance levels in Reg 3, Part D, II.A.42.

Nothing in this AOS shall preclude the Division from taking an action, based on any permanent turbine replacement(s), for circumvention of any state or federal PSD/NANSR requirement. Additionally, in the event that any permanent turbine replacement(s) constitute(s) a circumvention of applicable PSD/NANSR requirements, nothing in this AOS shall excuse the permittee from complying with PSD/NANSR and applicable permitting requirements.

2.2 Portable Analyzer Testing

Note: In some cases there may be conflicting and/or duplicative testing requirements due to overlapping Applicable Requirements. In those instances, please contact the Division Field Services Unit to discuss streamlining the testing requirements.

Note that the testing required by this Condition may be used to satisfy the periodic testing requirements specified by the permit for the relevant time period (i.e. if the permit requires quarterly portable analyzer testing, this test conducted under the AOS will serve as the quarterly test and an additional portable analyzer test is not required for another three months).

The permittee may conduct a reference method test, in lieu of the portable analyzer test required by this Condition, if approved in advance by the Division.

The permittee shall measure nitrogen oxide (NO_x) and carbon monoxide (CO) emissions in the exhaust from the replacement turbine using a portable flue gas analyzer *within seven (7) calendar days of commencing operation of the replacement turbine.*

All portable analyzer testing required by this permit shall be conducted using the most current version of the Division's Portable Analyzer Monitoring Protocol as found on the Division's website. Results of the portable analyzer tests shall be used to monitor the compliance status of this unit.

For comparison with an annual (tons/year) or short term (lbs/unit of time) emission limit, the results of the tests shall be converted to a lb/hr basis and multiplied by the allowable operating hours in the month or year (whichever applies) in order to monitor compliance. If a source is not limited in its hours of operation the test results will be multiplied by the maximum number of hours in the month or year (8760), whichever applies.

For comparison with a short-term limit that is either input based (lb/mmBtu), output based (g/hp-hr) or concentration based (ppmvd @ 15% O₂) that the existing unit is currently subject to or the replacement turbine will be subject to, the results of the test shall be converted to the appropriate units as described in the above-mentioned Portable Analyzer Monitoring Protocol document.

If the portable analyzer results indicate compliance with both the NO_x and CO emission limitations, in the absence of credible evidence to the contrary, the source may certify that the turbine is in compliance with both the NO_x and CO emission limitations for the relevant time period.

Subject to the provisions of C.R.S. 25-7-123.1 and in the absence of credible evidence to the contrary, if the portable analyzer results fail to demonstrate compliance with either the NO_x or CO emission limitations, the turbine will be considered to be out of compliance from the date of the portable analyzer test until a portable analyzer test indicates compliance with both the NO_x and CO emission limitations or until the turbine is taken offline.

2.3 Applicable Regulations for Permanent Turbine Replacements

2.3.1 NSPS for Stationary Gas Turbines: 40 CFR 60, Subpart GG

§60.330 Applicability and designation of affected facility.

(a) The provisions of this subpart are applicable to the following affected facilities: All stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel fired.

(b) Any facility under paragraph (a) of this section which commences construction, modification, or reconstruction after October 3, 1977, is subject to the requirements of this part except as provided in paragraphs (e) and (j) of §60.332.

A Subpart GG applicability determination as well as an analysis of applicable Subpart GG monitoring, recordkeeping, and reporting requirements for the permanent turbine replacement shall be included in any request for a permanent turbine replacement

Note that under the provisions of Regulation No. 6. Part B, Section I.B. that Relocation of a source from outside of the State of Colorado into the State of Colorado is considered to be a new source, subject to the requirements of Regulation No. 6 (i.e., the date that the source is first relocated to Colorado becomes equivalent to the commence construction date for purposes of determining the applicability of NSPS GG requirements).

2.3.2 NSPS for Stationary Combustion Turbines: 40 CFR 60, Subpart KKKK

§60.4305 Does this subpart apply to my stationary combustion turbine?

(a) If you are the owner or operator of a stationary combustion turbine with a heat input at peak load equal to or greater than 10.7 gigajoules (10 MMBtu) per hour, based on the higher heating value of the fuel, which commenced construction, modification, or reconstruction after February 18, 2005, your turbine is subject to this subpart. Only heat input to the combustion turbine should be included when determining whether or not this subpart is applicable to your turbine. Any additional heat input to associated heat recovery steam generators (HRSG) or duct burners should not be included when determining your peak heat input. However, this subpart does apply to emissions from any associated HRSG and duct burners.

(b) Stationary combustion turbines regulated under this subpart are exempt from the requirements of subpart GG of this part. Heat recovery steam generators and duct burners regulated under this subpart are exempted from the requirements of subparts Da, Db, and Dc of this part.

A Subpart KKKK applicability determination as well as an analysis of applicable Subpart KKKK monitoring, recordkeeping, and reporting requirements for the permanent turbine replacement shall be included in any request for a permanent turbine replacement

Note that under the provisions of Regulation No. 6. Part B, Section I.B. that Relocation of a source from outside of the State of Colorado into the State of Colorado is considered to be a new source, subject to the requirements of Regulation No. 6 (i.e., the date that the source is first relocated to Colorado becomes equivalent to the commence construction date for purposes of determining the applicability of NSPS KKKK requirements).

2.4 Additional Sources

The replacement of an existing turbine with a new turbine is viewed by the Division as the installation of a new emissions unit, not “routine replacement” of an existing unit. The AOS is therefore essentially an advanced construction permit review. The AOS cannot be used for additional new emission points for any site; a turbine that is being installed as an entirely new emission point and not as part of an AOS-approved replacement of an existing onsite turbine has to go through the appropriate Construction/Operating permitting process prior to installation.