

**ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
AIR PERMITS PROGRAM**

**TECHNICAL ANALYSIS REPORT**  
for  
Air Quality Control Minor Permit AQ0417MSS03

B.P. Exploration Alaska, Inc.  
Badami Development Facility

**EXTEND RESTART PERIOD AND REPLACE EMERGENCY  
GENERATOR UNIT ID 421**

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## ABBREVIATIONS/ACRONYMS

AAC.....	Alaska Administrative Code
ACMP.....	Alaska Coastal Management Program
ADEC.....	Alaska Department of Environmental Conservation
AS.....	Alaska Statutes
ASTM.....	American Society of Testing and Materials
BAE.....	Baseline Actual Emissions
CEMS.....	Continuous Emission Monitoring System
C.F.R.....	Code of Federal Regulations
EPA.....	Environmental Protection Agency
MACT.....	Maximum Achievable Control Technology
NA.....	Not Applicable
NAICS.....	North American Industry Classification System
NESHAPS.....	National Emission Standards for Hazardous Air Pollutants
NSPS.....	New Source Performance Standards
ORL.....	Owner Requested Limit
PAE.....	Projected Actual Emissions
PS.....	Performance Specification
PSD.....	Prevention of Significant Deterioration
PTE.....	Potential to Emit
RM.....	Reference Method
SIC.....	Standard Industrial Classification
SN.....	Serial Number
TBD.....	To Be Determined

### Units and Measures

bhp.....	brake horsepower or boiler horsepower
gr./dscf.....	grains per dry standard cubic feet (1 pound = 7,000 grains)
dscf.....	dry standard cubic foot
gph.....	gallons per hour
kW.....	kiloWatts
kW-e.....	kiloWatts electric <sup>1</sup>
lbs.....	pounds
mmBtu.....	million British thermal units
ppm.....	parts per million
ppmv.....	parts per million by volume
tph.....	tons per hour
tpy.....	tons per year
wt%.....	weight percent

### Pollutants

CO.....	Carbon Monoxide
HAPS.....	Hazardous Air Pollutants
H <sub>2</sub> S.....	Hydrogen Sulfide
NO <sub>x</sub> .....	Oxides of Nitrogen
NO <sub>2</sub> .....	Nitrogen Dioxide
NO.....	Nitric Oxide
PM-10.....	Particulate Matter with an aerodynamic diameter less than 10 microns
SO <sub>2</sub> .....	Sulfur Dioxide
VOC.....	Volatile Organic Compound

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<sup>1</sup> kW-e refers to rated generator electrical output rather than engine output

## 1.0 Introduction

This Technical Analysis Report (TAR) provides Alaska Department of Environmental Conservation's (Department's) basis for issuing Minor Air Quality Control Permit AQ0417MSS03 to B.P. Exploration (Alaska), Inc. (BPXA) for the Badami Development Facility (Badami) under 18 AAC 50.508(6). The Department received two applications under 18 AAC 50.508(6) for Badami, and because of subsequent delays in the approval process, decided to incorporate both applications into a single permit. The first application was received March 16, 2010 for the Restart Period extensions and the second was received June 22, 2010 for the replacement of Emission Unit (EU) 421, a standby generator. In this minor permit, the Department (with BPXA's approval) consolidated the extension of the Restart Period and the replacement of EU 421. This minor permit also rescinds and replaces Construction Permit AQ0417CPT05, Rev. 2 and Minor Permit AQ0417MSS01, Rev. 2.

### 1.1 Stationary Source Description

Badami is an existing, remote stationary source located on the North Slope. It is classified as a Prevention of Significant Deterioration (PSD) major source under 18 AAC 50.306. Badami is an oil and gas production facility that has intermittently produced oil over the life of the stationary source. The reservoir is complex and remote, and presents a number of operational challenges for BPXA.

After Badami began producing oil and gas, production dropped lower than BPXA had predicted, resulting in the use of up to nine megawatts of load banks to keep the two Solar Mars turbines in SoLoNO<sub>x</sub> mode and meet the NO<sub>x</sub> BACT limit. The Department found that the use of load banks for long term is an adverse energy impact and unacceptable Best Available Control Technology (BACT). The Department issued Construction Permit AQ0417CPT05 for the temporary Restart Period.

The construction permit authorized a 36-month evaluation period with different operational modes for Badami to remain warm and ready to go back into production. The Department extended the evaluation period under Minor Permit AQ0417MSS01, Rev. 2 for an additional 24 months to allow BPXA to drill and gain a better understanding of the reservoir. At the end of the five years, the permit requires BPXA to prepare and send to the Department a load demand demonstration. If the load demand (without load banks or other artificial loads) allows turbine operation at least 95% of the time in SoloNO<sub>x</sub> mode, then BPXA may continue to operate the stationary source in its (as described in Minor Permit AQ0417MSS01, Rev. 2) configuration. If not, then BPXA must submit to the Department

- a new construction permit application for either replacement of the turbines or post combustion CO controls; and
- a new BACT demonstration for both CO and NO<sub>x</sub>.

The five-year period ends September 30, 2010. BPXA met with the Department on October 1, 2009 to discuss options to extend the Restart Period, since they have yet to achieve optimal production. Production has been delayed due to inclement weather and equipment malfunction.

Badami currently operates in warm shutdown mode to reevaluate the well and wait for the reservoir to recharge. BPXA plans to switch to normal operations, or production, to run the

turbines and begin the load analysis. While BPXA is in warm shutdown, the turbines are non-operational. Instead, two large diesel-electric generators (EUs 421 and 422) provide the power needed for Badami. These generators will serve as backup emergency generators once the turbines are online and the stationary source returns to production.

## 1.2 Application Description

BPXA submitted an application under 18 AAC 50.508(6) to revise the Restart Period definition and references to the Restart Period in Minor Permit AQ0417MSS01, Rev. 2. The current minor permit lists the end of the Restart Period as September 30, 2010. BPXA is unable to meet this restart date due to inclement weather and equipment malfunction. During the 2008-2009 drilling season, BPXA lost an excess of 40 days, which has delayed the correct sizing of the turbines at Badami. Turbine sizing is essential to both oil production and correct BACT application, such that BPXA does not have a repeat of the BACT issues faced before Badami went into warm shutdown.

BPXA proposed to extend the Restart Period from the original September 9, 2005 date to 24 months after Normal Operations are first resumed, rather than end the Restart Period on a hard calendar date. BPXA cites the following advantages to this approach:

- Approach would preclude BPXA’s need to obtain additional extensions of the Restart Period should unforeseeable events delay the start of production.
- The two permitted diesel-fired generators would run for a longer period thus delaying the increase in emissions that would result from running the turbines.
- This provides enough time to ensure that the turbines are “right-sized” for minimal environmental impact.
- In the interim, new technology may become available to minimize emissions.

The Department expressed concern to BPXA’s March 16, 2010 proposed language that did not define a specific date for resuming normal operations. The Department’s concern was that an unspecified extension for the restart period would disturb the original BACT analysis that was based on a three-year warm shutdown period.

BPXA met with the Department on June 17, 2010 and explained the need for more time to collect production data. They submitted responses to the Departments questions on June 21, 2010. BPXA met again with the Department on August 18, 2010 and discussed their planned operations that were scheduled for September 2010 using new technologies. They explained their need for 24 additional months to collect load data and the permit language for the Restart Period.

BPXA submitted an addendum on August 31, 2010 with revised language to the Restart Period. The revised language included an expiration date of December 31, 2012 to the Restart Project. The expiration date will ensure that the warm shutdown period remains temporary as intended by the original construction permit.

In another application BPXA requested the replacement of EU 421, a 1,855 horsepower (hp) Cummins KTTA50-G2 generator with a new 1,971 hp Cummins QSK50-G4 NR2 generator, designated as EU 421a. BPXA submitted applicability analyses for both minor permit and PSD showing that the replacement of the emission unit will not cause a significant increase above the thresholds in 18 AAC 50.502(c)(3) and 18 AAC 50.306, respectively.

BPXA’s minor permit applicability analysis showed that the potential-to-emit (PTE) between the old generator (EU 421) and the new generator (EU 421a) results in a PTE emissions reduction.

For PSD applicability, BPXA noted that this new emission unit is a replacement unit as defined in 40 C.F.R. 52.21(b)(33). As stated in 40 C.F.R. 52.21(b)(33), a replacement unit is “an emissions unit [that] is functionally equivalent to the replaced unit” and “does not alter the basic design parameters of the process unit”. Additionally, “the replaced emissions unit is permanently removed from the major stationary source...If the replaced emission unit is brought back into operation, it shall constitute a new emissions unit.” It is therefore an existing emission unit under 40 C.F.R. 52.21(b)(7) for determining applicability. BPXA used the baseline actual emissions (BAE) to projected actual emissions (PAE) under 40 C.F.R. 52.21(a)(2)(iv)(c). This results in a small increase in NO<sub>x</sub> that is well below the significant levels.

BPXA verified in an information request on July 15, 2010 that the increase in horsepower rating from the new emergency generator would not cause an increase in emissions from other existing emission units at Badami.

Because BPXA’s proposed replacement does not affect significant impact levels for minor permitting or PSD, it is classified as a revision to Construction Permit AQ0417CPT05, Rev. 2 under 18 AAC 50.508(6).

### **1.3 Emissions Summary and Permit Applicability**

**Table 1** and **Table 2** show the permit applicability and emission effects of installing the replacement unit. The extension of the Restart Period does not result in a change of emissions. The installation of the unit does not affect the emissions from other emission units, so this section only represents the changes in emissions resulting from the generator replacement. Calculation assumptions in **Table 1** and **Table 2** include:

- 1) Worst-case emission factors based on load;
- 2) Vendor data for both engines for NO<sub>x</sub>, CO, PM-10, and VOC;
- 3) Mass balance assuming 15 parts per million by weight (ppmw) diesel sulfur content for SO<sub>2</sub>;
- 4) For minor permit applicability:
  - a) Assumes full 800,000 gallon per year owner requested limit (ORL) (In the construction permit, this limit applies to both generators).
- 5) For PSD applicability:
  - a) For BAE,
    - i) actual fuel usage of 227,493 gal/yr; and
    - ii) actual fuel sulfur 0.058% weight.
  - b) For PAE,
    - i) project fuel usage of 400,000 gal/yr (BPXA is assuming that EU 421a will operate in conjunction with EU 420 at approximately the same fuel consumption rate, thus using half of the 800,000 gal/yr ORL); and
    - ii) fuel sulfur content listed above in List Item 3).

**Table 1 – 18 AAC 50.502(c)(3) Minor Permit Applicability for EU 421/421a, tpy**

Parameter	NO <sub>x</sub>	CO	SO <sub>2</sub>	PM/PM-10/PM-2.5	VOC
EU 421 PTE	156.5	40.7	0.08	2.2	2.4
EU 421a PTE	98.6	17.3	0.08	0.7	0.9
Emissions Change	-67.0	-23.4	0.0	-1.5	-1.5
<b>Minor Permit Required?</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>

**Table 2 – PSD Permit Applicability for EU 421/421a, tpy**

Parameter	NO <sub>x</sub>	CO	SO <sub>2</sub>	PM/PM-10/PM-2.5	VOC
EU 421 BAE	47.1	11.6	0.9	0.6	0.7
EU 421a PAE	49.3	8.7	0.0	0.4	0.4
EU 421/421a Emissions Change	2.2	-2.9	-0.9	-0.2	-0.3
<b>PSD Review Required?</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>

**Table 3** shows the stationary source’s potential emissions with this project, used to calculate assessable emissions. Emission fee requirements are required for a minor permit issued under 18 AAC 50.542, as described in 18 AAC 50.544(a).

**Table 3 – New Assessable Emissions, tpy**

Parameter	NO <sub>x</sub>	CO	SO <sub>2</sub>	PM/PM-10/PM-2.5	VOC	Total Assessable
AQ0417MSS01, Rev. 2	921	523.2	105.1	44.1	48	1,641.4
Revised PTE	854	499.8	105.1	42.6	46.5	1,548.0

## 1.4 Department Findings

Based on the review of the application, the Department finds that:

1. Badami is classified as a PSD major stationary source under 18 AAC 50.306 for NO<sub>x</sub>, CO, SO<sub>2</sub>, and PM-10.
2. BPXA is currently operating Badami under Operating Permit AQ0417TVP01, Rev. 4. BPXA also operates under AQ0417MSS01, Rev. 2 and AQ0417CPT05, Rev. 2.
3. This project is classified under 18 AAC 50.508(6) because
  - a. BPXA is requesting a revision to Construction Permit AQ0417CPT05, Rev. 2 to remove and replace a generator; and
  - b. BPXA is requesting a revision to Minor Permit AQ0417MSS01, Rev. 2 to change the definition of and extend the Restart Period.
4. The generator replacement does not exceed the thresholds for a minor permit under 18 AAC 50.502(c)(3) for any pollutant.
5. BPXA does not need to revise the ambient air quality analysis because the change in emissions between EU 421 and EU 421a do not trigger either a minor permit under 18 AAC 50.502(c)(3) or a PSD major modification under 40 C.F.R. 52.21.

6. The change in horsepower rating between EU 421 and EU 421a will not affect the emissions from other existing emission units at Badami.
7. EU 421a is a replacement unit under 40 C.F.R. 52.21(b)(33) and is therefore an existing unit under 40 C.F.R. 52.21(b)(7). BPXA used the correct applicability test of PAE-BAE as described in 40 C.F.R. 52.21(a)(2)(iv)(c). Therefore, the replacement will not constitute a modification.
8. BPXA has been operating in warm shutdown since February 10, 2005.
9. This is BPXA's second request to extend the Restart Period. The first request was to extend it from 24 months after permit issuance to September 30, 2010.
10. BPXA has definite plans to start operations and requested the Restart Period from a hard date to a period based off the acquisition of production data. Extending the Restart Period will not change the original BACT determination that assumed a three-year operation period for the turbine. The CO BACT at the time, was determined to be good operational practice and it is highly doubtful that CO BACT will change in the next two years.
11. Extension of the Restart Period is a good environmental tradeoff; it allows for better control technologies to become available for turbine BACT and it allows for longer operation of the lower-emitting diesel-electric generators, which produce roughly a tenth of the turbine emissions (64.6 tpy as compared to 642.4 tpy).
12. BPXA's application for a minor permit for Badami Generator Replacement contains the elements listed in 18 AAC 50.540.
13. Badami is located in the North Slope Borough coastal district. The project is consistent with the Alaska Coastal Management Program (ACMP) through AS 46.40.040(b)(1). This minor permit will decrease the emissions at the stationary source. Therefore, the modification is not subject to further consistency review as described in 11 AAC 110.820(k)(3).

## 2.0 Permit Requirements

State regulations in 18 AAC 50.544 describe the elements that the Department must include in minor permits. This section of the TAR provides the technical and regulatory basis for the permit requirements in Minor Permit AQ0417MSS03, which is classified under 18 AAC 50.508(6).

### 2.1 General Requirements for all Minor Permits

As described in 18 AAC 50.544(a)(1), this minor permit identifies the stationary source, the project, the Permittee, and contact information.

Emission fee requirements are required for each minor permit issued under 18 AAC 50.542, as described in 18 AAC 50.544(a)(2). The Department is rescinding the fee requirements established in AQ0417MSS01 and replacing it with the new fee requirements established by this minor permit. **Table 3** shows the assessable emissions are 1,548 tpy.

As required under 18 AAC 50.544(a)(5), the Department is including the standard permit conditions listed in 18 AAC 50.345. These requirements are listed in the minor permit under “Standard Conditions”.

## **2.2 Requirements for a Permit Classified under 18 AAC 50.508(6)**

As required in 18 AAC 50.544(i), this minor permit contains terms and conditions as necessary to ensure that the Permittee will construct and operate the stationary source in accordance with 18 AAC 50. BPXA is not requesting to change any limits to avoid preconstruction review or to avoid a Title V permit requirement under 18 AAC 50.544(i).

The Department revised Construction Permit AQ0417CPT05, Rev. 2 and Minor Permit AQ0417MSS01, Rev. 2 to reflect BPXA’s requested changes. Both permits are rescinded and replaced with this minor permit.

### **2.2.1 Restart Period Extension**

In the minor permit, the Department revised the definition of the Restart Period. The revisions to Permit AQ0417MSS01 Rev. 2 are as follows:

- Condition 12.X.A: The Badami restart project (restart period) is the period from September 9, 2005 to 24 month after Normal Operations are first resumed but in no case later than December 31, 2010 through September 30, 2010. BPXA shall report the date that Normal Operations are first resumed in the operating report for the reporting period as described in the applicable operating permit issued for the source under AS 46.14.130(b) and AAC 50. The Badami restart project operational modes are defined as follows: (Condition 15 in Permit AQ0417MSS03)
- Condition 13.XI.D.2: If the stationary source does not operate in Normal Operation mode during the first 105 days after the restart period<sup>8a</sup>, the Permittee shall submit to the Department construction permit application...(Condition 16.4b in Permit AQ0417MSS03). The footnote that stated “105 days after September 30, 2010 is January 13, 2011” is deleted.
- Condition 14.XII.A: The Permittee shall within 60 days the end of the restart period and no later than December 31, 2012, ~~after September, 2010~~ submit to the Department a power generation ....(Condition 17.1 in Permit AQ0417MSS03)

The requests above allow BPXA to base the restart date on an operational mode rather than a hard date. The requests change all references to the previous restart date in the minor permit.

BPXA also requested to change Condition 13.XI.A, of Permit AQ0417MSS01 Rev. 2, a change indirectly related to the Restart Period. This condition states the submittal timeframe for the load demand demonstration on the turbines. As it reads, the condition requires the Permittee to submit the load demand demonstration upon the *earliest* of 60 days after the end of the Restart Period, 60 days after the beginning of Normal Operation within the Restart Period, or 60 days after permit issuance if Badami is Normal Operations. BPXA requested to remove the last two conditions for submittal.

Construction Permit AQ0417CPT05, Rev. 2 has a condition written as BPXA has requested it, but lists the Restart Period as a set 36-month period. In Minor Permit AQ0417MSS01, Rev. 2, the Department changed this condition to extend the Restart Period. The condition under Minor

Permit AQ0417MSS01, Rev. 2 has effectively shortened the required period for data collection from nearly a 36-month period under any operation mode to 60 days after Normal Operation first commences. The load demand demonstration requires an analysis of the electrical load during each operational mode to ensure that BPXA can operate the turbines with sufficient load to comply with the current BACT. BPXA notes that they need to collect at least a year's worth of data for the turbine operation to account for variations in electrical load.

To provide BPXA enough time to do a proper analysis, the Department revised the permit as requested. Given that the original construction permit gave a 36-month period for data acquisition and that Badami has been in warm shutdown for several years, the Department does not find this to be an adverse environmental impact.

Though the Department granted BPXA the revisions, the Department also included an expiration date under the restart period definition should BPXA not resume production at Badami within a reasonable timeline. This was included for the following reasons:

- Construction Permit AQ0417CPT05, Rev. 2 assumed a three-year CO BACT analysis for the two turbines. Extending the restart period by two years would not change the CO BACT determination. An indefinite prolonged period would require re-evaluation of BACT;
- The Restart Project is a temporary project. BPXA's proposed definition suggests that the project may be ongoing should Badami never enter into production; and
- Restarting the turbines after an indefinite shutdown may imply that there was no intent to operate the turbines. If subsequently, BPXA operates the turbines, it may imply a change in the method of operation for PSD applicability. BPXA would have to evaluate baseline actual emissions to future actual emissions that would result in emissions increase above the PSD thresholds for one or more pollutants. The resulting emissions increase would require Badami to undergo PSD review based on EPA's 1999 *Monroe Electric* decision.

BPXA and the Department agreed upon the project expiration date during a meeting on August 18, 2010 and BPXA submitted an addendum on August 31, 2010. BPXA submitted the date of December 31, 2012 as the expiration date for the Restart Project. BPXA has planned activities to begin as early as September 2010. The Department finds this expiration date for the project is necessary since Badami's remote location makes drilling and transportation highly weather-dependent and difficult. With the additional two years for the restart, the Department does not believe there will be a new outcome for the CO BACT determinations that is different to the analysis conducted in 2005. Should BPXA not resume production by December 31, 2012, the restart period shall end and BPXA will be required to submit documentation as noted in the minor permit.

### **2.2.2 Generator Replacement**

In this minor permit, the Department revised conditions in Construction Permit AQ0417CPT05, Rev. 2 and conditions in Minor Permit AQ0417MSS01, Rev. 2 to change the reference to EU 421 to EU 421a. This also includes replacing the engine model and horsepower rating information with the information relevant to EU 421a. This change does not constitute a modification to the stationary source.

### **3.0 Permit Administration**

BPXA is currently operating under the expired Operating Permit AQ0417TVP01, under a permit shield after submitting a timely permit renewal.

The permit changes made by the minor permit are Clean Air Action Section 502(b)(10) changes for the purposes of Title V permitting. Section 502(b)(10) changes are defined in 40 CFR 71.2 as *changes that contravene an express permit term. Such changes do not include changes that would violate applicable requirements or contravene federally enforceable permit terms and conditions that are monitoring (including test methods), recordkeeping, reporting, or compliance certification requirements.*

There are no changes to monitoring required of the Permittee. BPXA will continue to monitor the new generator as with the replaced unit and monitor the restart period as before. The old limits will no longer be an applicable requirement under the definition of Applicable Requirement in 40 CFR 71.2 because it is replaced by the new condition.

40 CFR 71.6(a)(13)(i) allows the Permittee to make Section 502(b)(10) changes without a permit revision if the changes are not Title I modifications, and the changes do not exceed allowable emissions under the permit.

Since the emissions do not exceed allowable emissions, this change at Badami qualifies for the operational flexibility provisions of 40 CFR 71.6(a)(13). Therefore, the changes do not require a Title V permit revision before BPXA can operate under the provisions of Permit AQ01417MSS03.