Technical Support Document for Revision to State Implementation Plan – Consent Order No. 8383, Algonquin Gas Transmission, LLC

The Commissioner of the Department of Energy and Environmental Protection ("Department" or "DEEP") intends to issue Consent Order ("CO") No. 8383 to Algonquin Gas Transmission, LLC ("Algonquin") to establish enforceable operating standards for the control of volatile organic compound ("VOC") emissions from the facility at 252 Shunpike Rd, Cromwell, Middlesex County, Connecticut.

This SIP action is proposed to satisfy the requirements of Section 22a-174-32(e)(6) of the Regulations of Connecticut State Agencies ("Regulations" or "RCSA"). The order will be presented to the Administrator of the U.S. Environmental Protection Agency ("EPA") for approval in accordance with the provisions of Title 42, U.S. Code ("USC"), Section 7401, *et seq*.

I. Background

The Algonquin pipeline is the largest natural gas pipeline in New England. Natural gas is compressed along the 1,129-mile system at several compressor stations[1] on the pipeline. Algonquin owns and operates three compressor stations in Connecticut, in Chaplin, Cromwell, and Oxford. Each of these compressor stations operates under a Title V permit issued by the Department and is located in a serious (Chaplin) or severe (Oxford and Cromwell) ozone nonattainment area. At issue in this action, the Cromwell facility, which is located at 252 Shunpike Rd, Cromwell, Middlesex County, Connecticut, is a major source of nitrogen oxides ("NOx"), carbon monoxide ("CO"), and VOC and operates under DEEP-issued Title V Permit No. 043-0020-TV.

As Connecticut is nonattainment for various National Ambient Air Quality Standards ("NAAQS") for ozone and is located in the Ozone Transport Region, the Department is required under Sections 182 and 184 of the Clean Air Act ("CAA") to implement a reasonably available control technology ("RACT") program for major sources of ozone precursor pollutants NOx and VOC and for certain minor VOC sources covered by an EPA Control Techniques Guidelines ("CTG") document. NOx RACT is codified at Section 22a-174-22e of the Regulations for most fuel-burning source categories and at Section 22a-174-38 of the Regulations for municipal waste combustors; major source VOC RACT is codified at Section 22a-174-32 of the Regulations, and VOC RACT for CTG sources is codified at Section 22a-174-20 of the Regulations. RACT, in the context of Connecticut's rules, is "the lowest emission limitation that a particular stationary source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[2]

Algonquin maintains and operates both combustion and non-combustion air pollution sources at its compressor stations. The Cromwell facility, in particular, includes the following natural gas-

[1] Except where otherwise noted, any reference to "compressor station" herein applies to compressor stations in the natural gas transmission and storage segment, not to upstream/production or midstream/processing compressor stations.

[2] See: RCSA Section 22a-174-1(98)

fired combustion sources: five turbines, each of which operates under a New Source Review ("NSR") permit and drives a centrifugal turbine, and multiple small, ancillary fuel-burning units, including fuel gas and space heaters, a boiler, a water heater, and an emergency engine. Non-combustion sources at the Cromwell facility include the five aforementioned centrifugal compressors; multiple storage tanks and vessels; organic liquids truck loading; pneumatic controllers; fugitive emission components; compressor unit blowdowns; station blowdowns; and a parts washer.

With the exception of the parts washer, these non-combustion sources constitute "nonexcludable" emission sources for the purposes of major source VOC RACT applicability under RCSA Section 22a-174-32. The combustion sources and parts washer, on the other hand, are considered "excludable" emission sources and are not counted toward VOC RACT applicability under RCSA Section 22a-174-32. Most often, excludable emissions are those that result from fuel combustion or are subject to a Best Available Control Technology ("BACT") or Lowest Achievable Emission Rate ("LAER") limitation in an NSR permit; the National Emission Standards for Hazardous Air Pollutants ("NESHAP") at Title 40, Code of Federal Regulations ("CFR"), Parts 61 and 63; or one of Connecticut's CTG RACT rules.

In general, VOC RACT is triggered under RCSA Section 22a-174-32 when potential nonexcludable emissions exceed the applicable major source threshold for VOC, identified at RCSA Sections 22a-174-32(b)(1)(A) and (B).[3]

II. Applicability of VOC RACT to Algonquin's Cromwell compressor station

In November 2018, the Department received Title V operating permit renewal applications for Algonquin's three compressor stations. The applications for the Chaplin and Oxford stations indicated that potential nonexcludable VOC emissions were less than the applicable major source threshold. Potential nonexcludable VOC emissions at the Cromwell station, however, exceeded the 50 ton-per-year ("tpy") major source threshold.[4] Specifically, the Cromwell application showed that potential nonexcludable VOC emissions in 2014 were 61 tons. Consequently, the Cromwell station became subject to major source VOC RACT under Section 22a-174-32 of the Regulations.[5]

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[3] RACT applicability under RCSA Section 22a-174-32 is separately defined for the wood furniture manufacturing and aerospace manufacturing and rework source categories and is not necessarily tied to the applicable major source threshold in these cases; see: RCSA Sections 22a-174-32(b)(1)(C) and (D).

[4] On October 7, 2022, pursuant to CAA Section 181(b)(2), EPA issued a final rule (87 Federal Register ["FR"] 60926) to reclassify three Southwest Connecticut counties from "serious" to "severe" nonattainment for the 2008 NAAQS for ground-level ozone. This rule became effective on November 7, 2022. The redesignated nonattainment area ("NAA") includes Middlesex, New Haven, and Fairfield Counties. EPA's reclassification of the Southwest Connecticut NAA area from serious to severe nonattainment reduced the major source thresholds for NOx and VOC in such NAA from 50 to 25 tpy on a premises-wide potential-to-emit ("PTE") basis. The new federal major source thresholds took effect with the final reclassification rule on November 7, 2022. For context, Algonquin's Cromwell facility is located in Middlesex County, where the applicable major source threshold for VOC, as well as NOx, is 25 tpy. Ultimately, the reclassification had no bearing on the applicability of VOC RACT to the Cromwell facility as (i) RCSA Section 22a-174-32(b)(1)(B) was triggered prior to the reclassification, when the major source threshold for VOC in Middlesex County was 50 tpy; (ii) the VOC RACT applicability threshold has since decreased; and (iii) RCSA Sections 22a-174-32(c)(1)(A) through (C) create a "once in, always in" construct as to rule applicability.

[5] See: RCSA Section 22a-174-32(b)(1)(A)

Under Connecticut's major source VOC RACT rule, the owner or operator of an affected source shall submit a VOC RACT compliance plan within six months of becoming subject to the provisions of such rule.[6] Furthermore, the owner or operator of an affected source shall implement RACT to reduce VOC emissions from the premises no later than one year after becoming subject to the provisions of the rule or, alternatively, shall obtain a permit or order from the DEEP Commissioner to limit potential VOC emissions below the relevant applicability threshold at RCSA Sections 22a-174-32(b)(1) and (c)(1),[7] provided that actual VOC emissions from the premises have not exceeded the relevant applicability threshold since 1995.[8] In its 2016 emission statement, Algonquin reported that actual VOC emissions from the Cromwell facility were 69 tons, making Algonquin ineligible to obtain a permit or order from the DEEP Commissioner to limit VOC emissions in lieu of implementing RACT.

Algonquin failed to submit a VOC RACT compliance plan within six months after becoming subject to RCSA Section 22a-174-32 and failed to implement any RACT method at RCSA Section 22a-174-32(e)(1) within one year after becoming subject to the rule. Because Algonquin failed to timely submit a RACT plan and timely implement RACT, the Department determined that Algonquin violated Section 22a-174-32 of the Regulations. As a result, the Department issued Notice of Violation ("NOV") No. 18022 to Algonquin on December 5, 2019. To resolve these and other violations, the Department and Algonquin entered into administrative CO No. 2525 on September 2, 2021. CO No. 2525 (included in the record as Appendix A) required, in part, that Algonquin submit a VOC RACT compliance plan for the Department's review and approval within 30 days after the execution of such order and, upon receiving written notice that the VOC RACT compliance plan has been approved by DEEP Commissioner, effect the compliance plan in accordance with the implementation schedule therein.

In response to CO No. 2525, Algonquin provided information and data to the Department in submissions dated September 27, 2021; October 20, 2021; December, 2021 (no date); March 15, 2022; February 22, 2023; and April 28, 2023. These submissions collectively comprise Algonquin's VOC RACT compliance plan ("plan") and are included in the record as Appendices B through G.

III. Summary of major source RACT requirements; approval of Algonquin's alternative RACT compliance plan

RCSA Section 22a-174-32(e)(1) sets forth the allowable methods for implementing RACT:

- (subparagraph A) installation and operation of a system to capture and control VOC emissions, resulting in at least an 85 percent – and in some cases greater – reduction in uncontrolled emissions;

[6] See: RCSA Section 22a-174-32(d)(1)(C)

[7] Again, for the Cromwell facility, the relevant applicability threshold was the 50 tpy-VOC major source threshold until November 7, 2022.

[8] See: RCSA Sections 22a-174-32(e)(1) and (c)(1); note that this actual emission threshold encompasses all emissions from the premises, including emissions that are excludable for rule applicability determination purposes.

- (subparagraph B) implementation of a program of reformulation or process change that results in at least an 80 percent reduction in VOC emissions over a designated baseline year;
- (subparagraph C) the use of alternative emission reductions pursuant to RCSA 22a-174-20(cc) or emission reduction credits ("ERCs"); or
- (subparagraph D) the implementation of an alternative RACT compliance plan.

Algonquin's plan proposed an alternative VOC RACT compliance demonstration pursuant to Section 22a-174-32(e)(1)(D) of the Regulations.

The standards governing the preparation of an alternative RACT compliance plan are at RCSA Section 22a-174-32(d)(6) and include:

- (subparagraph A) "an examination of the technological and economic feasibility of additional VOC control devices or equipment on all sources of VOCs, including those sources identified in subdivision (b)(3) of this section," i.e., excludable emission sources;
- (subparagraph B) "an examination of the feasibility of changing to low VOC-emitting processes including establishing a leak detection program";
- (subparagraph C) "the proposed amount of VOC reduction from all subject VOC-emitting equipment at the premises";
- (subparagraph D) "an examination of the feasibility of obtaining [ERCs] pursuant to section 22a-174-20(cc) of the [Regulations], or of the feasibility of using alternative emission reductions to achieve equivalent levels of control as required by subparagraphs (A) or (B) of subdivision (e)(1) of this section";
- (subparagraph E) "a description of any research that will be conducted by the owner or operator to further reduce VOC emissions beyond the level of emissions proposed"; and
- (subparagraph F) "any other information the commissioner may require."

Furthermore, any RACT compliance plan must include the following elements pursuant to RCSA Section 22a-174-32(d)(2):

- (subparagraph A) "a description of the Reasonably Available Control Technology method that the owner or operator shall perform pursuant to subdivision (e)(1) of this section";
- (subparagraph B) "a description of each and every piece of VOC-emitting equipment at such premises";
- (subparagraph C) "the maximum rated capacity of each piece of VOC-emitting equipment";
- (subparagraph D) "the total amount of potential emissions of VOCs, expressed in tons per year"; and
- (subparagraph E) "a certification, signed by the person who prepared the compliance plan, the owner of the premises, and the operator of the premises, each of whom shall examine and be familiar with the information submitted in the document and all attachments thereto, and shall make inquiry of those individuals responsible for obtaining the information to determine that the information is true, accurate and complete… "

Approval of an alternative RACT compliance plan, if warranted, is to be granted by the Commissioner through the issuance of a permit or order.[9] The Department has historically approved alternative RACT compliance plans via order.

The enclosed draft CO No. 8383 represents the Commissioner's intended approval of Algonquin's alternative RACT compliance plan. The technical basis of and justification for the Department's approval of Algonquin's plan is presented in sections III and IV of this document.

IV. Framework for technical RACT evaluation

RCSA Section 22a-174-32(e)(6) authorizes the Commissioner to issue a permit or order to implement an alternative RACT compliance plan under certain conditions: "The commissioner may issue a permit or order to the owner or operator of a premises requiring the implementation of an alternative compliance plan when it is demonstrated, to the commissioner's satisfaction, through the information submitted pursuant to subdivision (d)(2) and (d)(6) of this section, that compliance with subparagraphs (1)(A) through (1)(C) of this subsection [VOC capture and control system, program of reformulation or process change, or use of alternative emission reductions or ERCs], inclusive, is not technologically or economically feasible."

Infeasibility of compliance options under RCSA Section 22a-174-32(e)(1)(A) through (C). In Connecticut, natural gas transmission facilities have not traditionally been subject to major source VOC RACT, nor are they subject to a CTG rule. Given the uniqueness and diversity of VOC-emitting equipment/processes present at any natural gas compressor station – many of which have heretofore gone unregulated in the context of VOC emissions – subparagraphs (1)(A) through (1)(C) are generally infeasible to implement in this sector, for the reasons outlined below.

- RCSA Section 22a-174-32(e)(1)(A) provides for the installation and operation of a system to capture and control VOC emissions that (i) reduces VOC emissions to the atmosphere from "any" VOC-emitting equipment that is subject to the provisions of the rule (i.e., nonexcludable emission sources) by at least 85 percent of uncontrolled emissions; (ii) if designed to destroy VOC by incineration, oxidizes into carbon dioxide ("CO_2") and water at least 95 percent of VOC, as total combustible carbon, entering the incinerator each hour; and (iii) if designed to recover or otherwise remove VOC, be operated so that the VOC mass emission rate at the outlet of the capture-and-control system does not exceed 10 percent, in the aggregate, of the VOC mass emission rate at the inlet to such system.[10] This compliance option is impractical, as the required margin of emission reduction cannot realistically be achieved when accounting for emissions from certain nonexcludable sources:
    - First, this compliance option specifically calls for the installation and operation of an air pollution capture-and-control system. This is problematic because a significant share of Algonquin's nonexcludable VOC emissions are fugitive in

[9] See: RCSA Section 22a-174-32(e)(1)(D)

[10] The use of the term "any" is inherently ambiguous as to whether the required margin of emission reduction is required on an individual emission unit basis or, alternatively, whether premises-wide reductions in nonexcludable VOC emissions may be aggregated to meet such margin. As discussed, however, each approach is impractical in the context of this VOC RACT order.

nature (e.g., from piping components), and as discussed in section IV.C of this document, these emissions are generally managed by way of a leak detection and repair ("LDAR") program as opposed to add-on control equipment. The Department is not aware of any achieved-in-practice, add-on capture-and-control system that could be installed and operated to further reduce emissions from fugitive components at a natural gas compressor station.

  - Second, this compliance option calls for quantitative reductions over uncontrolled emissions. However, one particular and potentially significant source of nonexcludable VOC emissions – blowdowns – may occur on an urgent basis with minimal if any notice, and as discussed in section IV.F of this document, there is only limited regulatory precedent under the CAA to control or restrict such blowdown emissions from natural gas transmission facilities. The Department believes that it would be inappropriate, in the context of this VOC RACT order, to mandate a quantitative control efficiency with respect to this type of activity. Likewise, for other categories of VOC-emitting equipment/processes (e.g., storage vessels), the Department asserts in section IV of this document that a RACT level of control is far less than an 85 percent reduction over uncontrolled emissions.

- RCSA Section 22a-174-32(e)(1)(B) provides for the implementation of a program of reformulation or process change to "achieve, for each coating or VOC-emitting equipment used and on each day that VOCs are emitted, an [80 percent] reduction in VOC emissions from the weighted arithmetic mean during calendar year 1990 or another year the Commissioner deems as more representative of the actual operating conditions or actual emissions calculated pursuant to [RCSA Section 221-174-32(d)(4)(B)]."[11] This compliance option is impractical, as the required emission reductions cannot realistically be achieved when accounting for emissions from certain nonexcludable sources:
  - The "reformulation" compliance option has traditionally been applied to coatings and other VOC-containing products used in a manufacturing setting. Reformulation of pipeline-quality natural gas is clearly not on the table here.
  - A "process change" that achieves the required level of emission control is, at least in theory, possible. However, as contemplated in the Department's discussion of the RCSA Section 22a-174-32(e)(1)(A) compliance option immediately above, it would be inappropriate to mandate a quantitative control efficiency with respect to certain individual categories of VOC-emitting equipment/processes at a natural gas compressor station (e.g., station blowdowns), and for other categories of VOC-emitting equipment/processes (e.g., storage vessels), the Department asserts in section IV of this document that a RACT level of control is far less than an 80 percent reduction over baseline year emissions.
- RCSA Section 22a-174-32(e)(1)(C) provides for the use of alternative emission reductions, pursuant to RCSA Section 22a-174-20(cc), which result in emission reductions at least as great as those otherwise required by RCSA Section 22a-174-32(e)(2)(B), i.e., a 95 percent

[11] RCSA Section 22a-174-32(e)(3), which governs the compliance option at RCSA Section 22a-174-32(e)(1)(B), further specifies that emissions be reduced over baseline year emissions by the requisite amount from "each coating or VOC-emitting equipment used," i.e., on an individual emission unit basis.

reduction in nonexcludable VOC emissions, as total combustible carbon. Notably, RCSA Section 22a-174-20(cc) does not allow the consideration of "decreases in emissions resulting from requirements of other applicable air pollution regulations."[12] The use of alternative emission reductions is, therefore, impractical in the context of this VOC RACT order given (i) the aforementioned unpredictability of blowdown emissions and implausibility of restricting such emissions here and (ii) the fact that the VOC reductions upon which Algonquin relied from non-blowdown VOC sources are already required pursuant to other regulatory programs that provide for at least a RACT level of control, which is examined in much greater detail in section IV of this document.

- RCSA Section 22a-174-32(e)(1)(C) also allows for the use of ERCs to offset the emission reductions required under RCSA Section 22a-174-32(e)(2)(B), i.e., a 95 percent reduction in nonexcludable VOC emissions, as total combustible carbon. In this case, however, it is difficult to discern how this compliance option could be implemented, especially in a way that meets the environmental objectives of the Department's RACT program. Under the NOx RACT program at RCSA Section 22a-174-22e, the Department allowed sources to use ERCs to offset the emission reductions otherwise required under the rule;[13] in order to implement this compliance option, the Department established a mechanism for trading discrete (i.e., mass-based) ERCs via administrative CO. Many sources participated in both generating and expending discrete ERCs, resulting in a robust trading program. No such mechanism is in place for the trading of discrete VOC ERCs. The only VOC ERCs authorized under Connecticut's State Implementation Plan ("SIP") are continuous (i.e., mass rate-based) ERCs under the major source nonattainment NSR program.

  It would be impractical to allow Algonquin to use continuous ERCs to meets its VOC RACT obligation. First, it is unclear how many continuous ERCs Algonquin would need to obtain given that the emission reductions required under RCSA Section 22a-174-32(e)(1)(C) and (e)(2)(B) are in constant flux, which greatly complicates the idea of trading a "mass rate." Second, Connecticut has only 16 tons of VOC ERCs in the bank, which were serialized in 1999; for the purposes of this RACT demonstration, the Department would rather not favor the capitalization of 24-year-old nonattainment NSR ERCs over the opportunity to implement RACT in a manner that secures tangible emission reductions from the Cromwell compressor station.

Given the unique circumstances of this RACT demonstration that obviate the utility of the aforementioned default compliance options and the resultant infeasibility of the RACT methods at RCSA Section 22a-174-32(e)(1)(A) through (C), the Department is able to issue an order "specify[ing] that the implementation of the approved alternative compliance plan shall be Reasonably Available Control Technology for such premises," pursuant to RCSA Section 22a-174-32(e)(1)(D).

Three-step RACT analysis for each category of VOC-emitting equipment/process. In reviewing Algonquin's alternative RACT compliance plan, the Department conservatively chose to evaluate

[12] See: RCSA Section 22a-174-20(cc)(1)(B)
[13] The trading provisions of the Department's NOx RACT rule sunset on May 31, 2023.

RACT individually for each category of VOC-emitting equipment/process at the Cromwell compressor station. In its evaluation, the Department used a three-step test to determine whether Algonquin's proposed control measure(s) relative to each category of VOC-emitting equipment/process fully satisfy RACT.

- Step 1: compare RACT as proposed by Algonquin with the presumptive RACT standards in EPA's 2016 oil and gas CTG;[14]
- Step 2: compare RACT as proposed by Algonquin with the best system of emission reduction ("BSER") for VOC and methane for new, modified, and reconstructed sources, as set forth in the 2016 oil and gas New Source Performance Standards ("NSPS") (codified at 40 CFR Part 60, Subpart OOOOa[15]); and
- Step 3: compare RACT as proposed by Algonquin with BSER for VOC and methane for new, modified, and reconstructed sources and BSER for methane for existing sources as set forth in the 2023 NSPS (codified at 40 CFR Part 60, Subpart OOOOb) and the 2023 Emission Guidelines ("EG") (codified at 40 CFR Part 60, Subpart OOOOc).[16] For additional context, in certain cases where further analysis is needed, survey other states' standards and compare the emission reduction measures therein with Algonquin's proposed RACT measures, and survey EPA's RACT/BACT/LAER Clearinghouse ("RBLC") to ensure that the emission reduction methods identified in Algonquin's plan are not materially less stringent than any analogous RACT determination in the RBLC.

Discussion on step 1. The 2016 CTG does not contain presumptive RACT standards for natural gas compressor stations; it focuses, instead, on more VOC-intensive segments the oil and gas sector, such as oil and natural gas production and processing. Nevertheless, transmission sources are discussed in the CTG document, and the equipment at these sources is often similar in nature to the equipment at production and processing sources. It stands to reason that if the CTG satisfies presumptive RACT, as established in 2016, for the equipment/processes in more VOC-intensive ends of the industry, then it also should also satisfy RACT for the same equipment/processes in the less VOC-intensive natural gas transmission and storage segment.

Discussion on step 2. The 2016 NSPS sets forth BSER for VOC and methane for new, modified, and reconstructed sources in the oil and gas sector, including the natural gas transmission and storage segment. It stands to reason that BSER, as promulgated in 2016, for new, modified, and reconstructed sources should be at least as stringent as – and likely more stringent than – RACT for existing sources.

Discussion on step 3. The 2023 NSPS sets forth BSER for VOC and methane for new, modified, and reconstructed sources in the oil and gas sector, including the natural gas transmission and storage segment. The 2023 EG sets forth BSER for methane for existing sources in the oil and gas sector, including the natural gas transmission and storage segment. It stands to reason that BSER, as proposed in 2021/2022 and finalized in 2023, for new, modified, and reconstructed sources should be at least as stringent as – and likely more stringent than – RACT for existing sources. It

[14] See: https://www3.epa.gov/airquality/ctg_act/2016-ctg-oil-and-gas.pdf
[15] See: 40 CFR 60.5360a, *et seq.*
[16] See: 89 FR 16820

also stands to reason that BSER, as proposed in 2021/2022 and finalized in 2023 for methane only, for existing sources should be at least as stringent as – and likely more stringent than – RACT for existing sources in the natural gas transmission segment, given that (i) this segment is largely methane-, as opposed to VOC-, intensive and (ii) EPA did not propose VOC standards for existing sources in this segment.

Therefore, in its evaluation of Algonquin's alternative RACT compliance plan, the Department considered RACT to have been met or exceeded for each category of VOC-emitting equipment/process if (i) the proposed emission reduction method for such category met presumptive RACT as outlined in step 1; BSER as outlined in step 2; and, in certain cases, BSER as outlined in step 3.

This three-step test represents a reasonable, if overly conservative, test of RACT compliance. Provided that at least the first two steps (and sometimes the third step) of this test were met, the Department did not require that Algonquin further evaluate the technological or economic feasibility of additional VOC controls. In cases where potentially significant nonexcludable emission sources were not covered by the CTG, 2016 NSPS, 2023 NSPS, or 2023 EG, and where a review of other states' SIP requirements and the RBLC yielded no applicable emission standards, the Department concluded that no further control is necessary to satisfy RACT.

V. Technical RACT evaluation

At its Cromwell station, Algonquin maintains and operates the following equipment and activities, which are subject to this alternative RACT demonstration:

- Two centrifugal compressors with dry seals, each driven by a 4,700 horsepower ("hp") Solar Centaur 40-T4702S gas turbine
- One centrifugal compressor with dry seals, driven by a 15,900 hp Solar Mars 100-16002 gas turbine
- One centrifugal compressor with dry seals, driven by a 7,700 hp Solar Taurus 60-7802 gas turbine
- One centrifugal compressor with dry seals, driven by a 6,130 hp Solar Centaur 50-6102 gas turbine
- Fugitive emission components
- Pneumatic controllers
- Organic liquids storage vessels

Algonquin also maintains and operates the following equipment and activities, which are not subject to this alternative RACT demonstration for reasons discussed in this section.

- One gas-powered starter serving a compressor identified above
- Compressor unit blowdowns
- Station blowdowns
- Five natural gas turbines, which drive the centrifugal compressors referenced above
- Multiple small natural gas-fired combustion units, including two fuel gas heaters, one boiler, one emergency generator, one water heater, and five space heaters
- One parts washer

- Truck loading of organic liquids

In its plan, Algonquin generally proposed to implement VOC RACT as established in EPA's 2016 CTG, to incorporate applicable provisions of the 2016 NSPS, and to develop and implement practices to reduce VOC emissions from blowdowns and the gas-powered starter. Specifically, Algonquin proposed the following measures as RACT:

- For its centrifugal compressor units, to utilize dry seals
- For its sole compressor equipped with a gas-powered starter, to retrofit such starter with an electric starter
- For its fugitive emission components, to carry out an LDAR program consistent with its Title V permit and the 2016 NSPS
- For its pneumatic controllers, to use intermittent-bleed, in lieu of continuous-bleed, controllers
- For its organic liquid storage vessels, to maintain potential VOC emissions below the control threshold in the 2016 CTG
- For compressor unit blowdowns, to perform pressurized holds of its compressors, in lieu of venting gas, during unit shutdowns under certain circumstances further described in section V.F of this document
- For station blowdowns, to (i) implement a gas recompression and injection system, in lieu of venting gas, under certain circumstances further described section in V.F of this document and (ii) implement best management practices, including the use of isolation valves to minimize the length of pipe that needs to be vented as well as coordination of maintenance and inspection activities to minimize the frequency of blowdowns

Figure 1

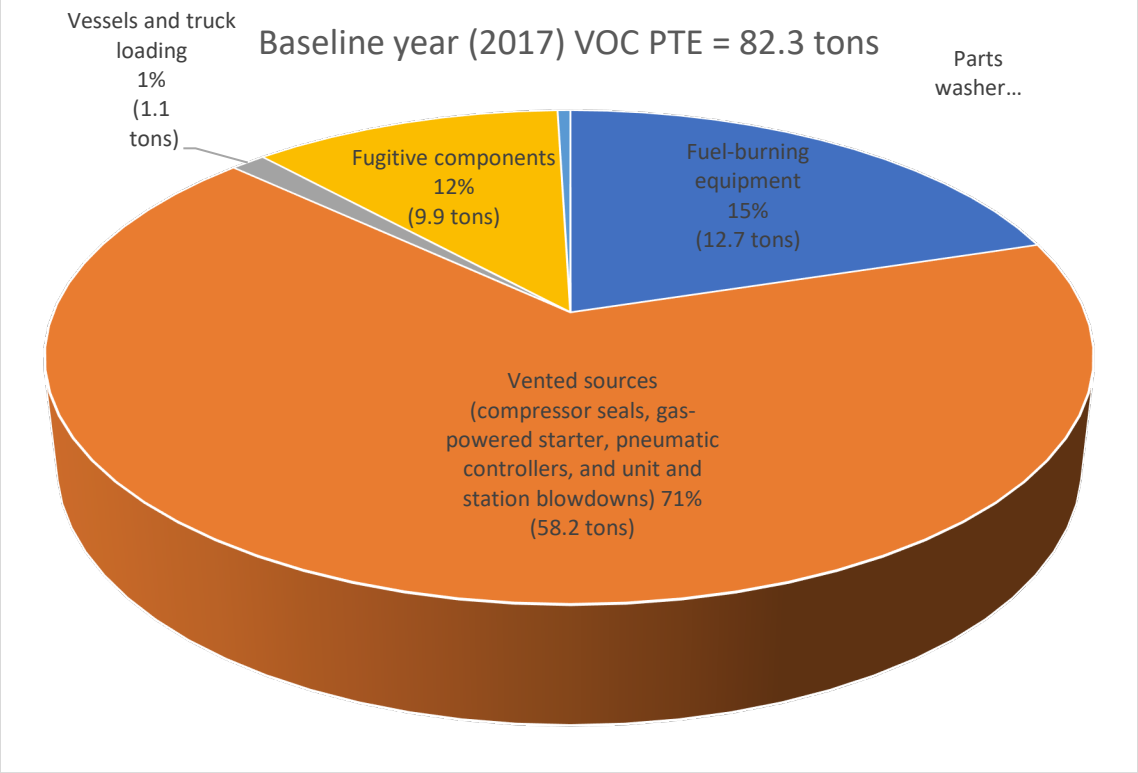
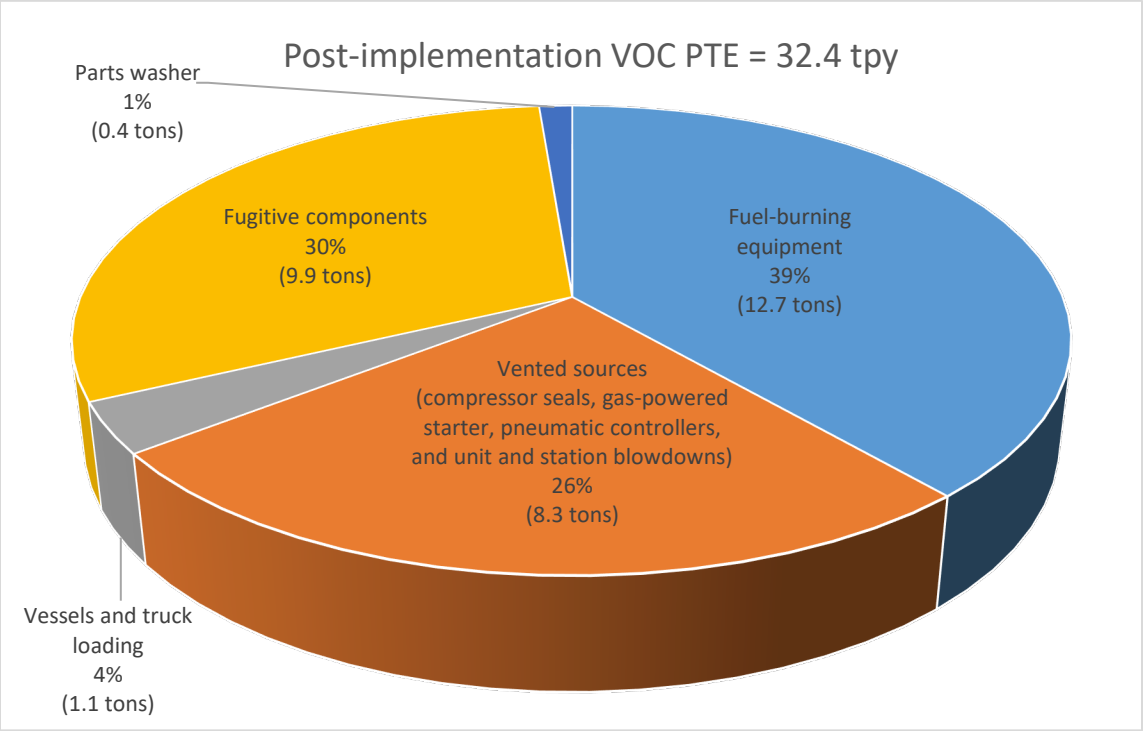


Figure 2



The 2016 CTG[17] and 2016 NSPS[18] measures that Algonquin proposed as RACT cover the following VOC-emitting equipment/processes: compressor seals, fugitive emission components, pneumatic controllers, and storage vessels. According to Algonquin, for these equipment/processes, emission reduction measures consistent with the CTG and NSPS had already been implemented prior to submission of the plan, with one exception discussed below. To satisfy RACT for equipment/processes not covered by the CTG and NSPS, Algonquin proposed emission reduction measures applicable to the gas-powered starter, compressor unit blowdowns, and station blowdowns; these emission reduction measures had not yet been implemented upon submission of the plan, according to Algonquin. Algonquin did not propose emission reduction measures with respect to its fuel-burning equipment, parts washer, or organic liquids truck loading process. Algonquin indicated that, upon implementation of its plan, the control measures outlined therein would reduce potential VOC emissions from the compressor seals, gas-powered starter, pneumatic controllers, and compressor unit and station blowdowns (i.e., with the exception of the pneumatic controllers, the equipment/activities for which Algonquin's proposed emission reduction measures had not yet been executed upon submission of the plan) by 86 percent over 2017 "baseline year"[19] emissions, from 58.2 to 8.3 tpy. These potential emission reductions, as illustrated in Figures 1 and 2 above, come from a three-phased control strategy: (i) a 24.1 tpy-VOC reduction from

[17] As noted earlier, the 2016 CTG does not contain presumptive RACT standards for natural gas compressor stations like Algonquin's, instead targeting more VOC-intensive segments the oil and gas sector like oil and natural gas production and processing.

[18] Also of note, Algonquin has been subject to applicable provisions of NSPS Subpart OOOOa since at least 2018, when it installed new compressors; these requirements were incorporated into Algonquin's November 21, 2018, Title V permit.

[19] Algonquin was not required to select a baseline year under the alternative compliance plan provisions of RCSA Section 22a-174-32. References to baseline year emissions are for illustrative purposes only.

controls on unit blowdown emissions and the replacement of wet seals[20] on one compressor unit with dry seals in "phase 1", (ii) a 17.3 tpy-VOC reduction from controls on station blowdowns and the replacement of the gas-powered starter with an electric starter in "phase 2"; and (iii) an 8.5 tpy-VOC reduction from controls on compressor unit and station blowdowns in "phase 3." Algonquin indicated that the replacement of wet seals with dry seals on the centrifugal compressor referenced in phase 1 resulted in a reduction in potential VOC emissions of 17.5 tpy. Furthermore, Algonquin reported that potential VOC emissions from the gas-powered starter amount to 2.4 tpy; therefore, upon implementation of the plan, there would be a 2.4 tpy-VOC decrease in potential emissions. This leaves 30.0 tpy of potential emission reductions apportioned to blowdown controls.

Algonquin indicated that, after implementing the plan, premises-wide potential VOC emissions would decrease by the same margin, from an 82.4 tpy baseline to 32.5 tpy.

Under Algonquin's PTE calculation methodology, potential VOC emissions from the natural gas transmission and storage segment may be higher than actual VOC emissions (see Table 1) by virtue of the variable non-methane/ethane hydrocarbon content of natural gas. According to Algonquin, the VOC content of utility-grade natural gas in the Enbridge system can fluctuate by more than an order of magnitude. When determining potential emissions (both pre- and post-implementation of its RACT plan), Algonquin used the system-wide 90th percentile natural gas VOC content (2.20 percent by weight) in its calculations. This methodology resulted, for instance, in the calculation of a post-implementation VOC PTE of 8.3 tpy from the compressor seals, gas-powered starter, pneumatic controllers, and unit and station blowdowns. Had Algonquin used the annual-average VOC content of 0.12 percent by weight instead of the 90th percentile value, it would have calculated a post-implementation VOC PTE of 0.39 tpy from the same emission sources (assuming all other variables remain constant).

Table 1 – Historical actual VOC emissions (tpy)

	2017	2018	2019	2020	2021	2022
Fuel-burning equipment	29.2	26.6	13.9	1.8	1.1	2.2
Vented sources (compressor seals, gas-powered starter, pneumatic controllers, and unit and station blowdowns)	1.7	2.7	2.7	0.8	1.3	0.9

A. Centrifugal compressors

All compressors (in total, five centrifugal compressors and zero reciprocating compressors) at the Algonquin facility currently utilize dry seals. According to section 5.3 of the 2016 CTG, dry seal

[20] The wet seals were replaced with dry seals in 2019, prior to submission of the plan in 2021 but following the 2017 baseline year. The potential emission reductions calculated by Algonquin incorporate the reductions realized upon the replacement of these seals.

systems offer an 87 percent reduction in VOC emission over wet seal systems; additionally, centrifugal compressors with dry seals vent considerably less gas than reciprocating compressors.

According to Algonquin, the 2019 replacement of wet seals with dry seals (two each) on what was then the sole remaining compressor with wet seals reduced potential VOC emissions from 19.1 to 1.6 tpy from that compressor alone.

As all of Algonquin's compressors currently utilize dry seals, Algonquin determined that no additional controls are necessary to satisfy RACT.

The Department agrees that dry seal systems are RACT for centrifugal compressors. Unlike reciprocating compressors and centrifugal compressors with wet seals, centrifugal compressors with dry seals are not addressed under the 2016 CTG and are not an affected facility under NSPS Subpart OOOOa. It should be noted that, in NSPS Subpart OOOOb and EG Subpart OOOOc, EPA included a 3 standard cubic foot per minute ("scfm") vent rate limit for dry seals as well as associated monitoring, recordkeeping and reporting. Given that this requirement lacks regulatory precedent outside a recently promulgated NSPS and EG, the latter of which only addresses methane, the Department believes that it would be prudent to allow the NSPS/EG rulemaking to remain the sole regulatory basis of this new vent rate standard, instead of requiring that Algonquin evaluate the feasibility of a vent rate limit as RACT for VOC.

In this order, the Department will identify dry seal systems as RACT for the centrifugal compressors.

It should also be noted that, under this order, fugitive emission components associated with Algonquin's compressors will be subject to LDAR; see section IV.C of this document.

B. Gas-powered starter

One turbine/compressor unit on site (identified in the Title V permit as emission unit ["EU"] no. 8) uses a gas-powered starter. According to Algonquin's plan, gas-powered starters "expand high-pressure gas across the turbine" when the turbine/compressor unit is starting up and, consequently, vent excess/uncombusted natural gas to atmosphere after the turbine/compressor has been started up. The other four turbine/compressor units employ electric starters, which do not vent gas. According to Algonquin, potential VOC emissions from the gas-powered starter amount to 2.4 tpy.

In its plan, Algonquin indicated that electric starters are RACT and that the gas-powered starter on EU no. 8 would be replaced with an electric starter within 18 months after approval of the plan.

Gas-powered starters are not addressed under the 2016 CTG, 2016 NSPS, 2023 NSPS, or 2023 EG. Given the lack of regulatory context with respect to VOC or methane emissions from gas-powered starters on either the federal or state level, the Department believes that it would be inappropriate, for the purposes of this VOC RACT order, to explicitly mandate the installation of an electric starter on EU no. 8. Likewise, the Department believes that it would be inappropriate to impose as RACT any other specific work practices, control requirements, or quantitative

limitations with respect to VOC emissions from Algonquin's gas-powered starter. The Department concludes that RACT for VOC is no further control.

C. Fugitive emission components

Fugitive emissions from the Algonquin facility are subject to LDAR pursuant to NSPS Subpart OOOOa and the facility's Title V permit. The LDAR frequency is quarterly; the allowable leak threshold is 500 ppmv, as methane; and the applicable test method is EPA Reference Method 21.

Potential emissions from fugitive emission components are 9.87 tpy-VOC, according to Algonquin. In deriving this PTE, Algonquin used the emission factors in table 2-4 (oil and gas production) of EPA's Protocol for Equipment Leak Emission Estimates[21] for all components except for pumps, for which it used the emission factor for synthetic organic chemical manufacturing industry ("SOCMI") components in table 2-1. In its PTE calculations, Algonquin did not apply an LDAR control effectiveness to any component emission factors, assumed 8,760 hours per year of operation, and utilized the aforementioned 90th percentile natural gas VOC content for components in natural gas service.

Algonquin indicated in its plan that the existing LDAR program satisfies RACT for fugitive emission components.

The Department agrees with Algonquin's position, as quarterly LDAR with a 500 ppmv, as methane, leak limit satisfies the presumptive RACT standard under the 2016 CTG as well as BSER under NSPS Subpart OOOOa, proposed NSPS Subpart OOOOb, and proposed EG Subpart OOOOc. (In proposed NSPS Subpart OOOOb and EG Subpart OOOOc, Method 21 LDAR is an alternative to optical gas imaging ["OGI"].) In the NSPS Subpart OOOOa rulemaking, EPA indicated that quarterly LDAR with a 500 ppmv leak limit yields a fugitive emission component control efficiency of 83 percent.[22]

In reviewing Algonquin's plan, the Department observed that, in proposed NSPS Subpart OOOOb and EG Subpart OOOOc, EPA included a monthly audio/visual/olfactory ("AVO") inspection requirement for fugitive emission components in the natural gas transmission and storage segment. The Department believes that it is reasonable to include monthly AVO inspections as an element of this RACT order, in addition to the previously proposed Method 21 LDAR. Routine AVO inspections can lead to the discovery of significant leaks that originate between quarterly LDAR surveys and might otherwise go undetected for an extended period of time. Therefore, this RACT order will incorporate both quarterly Method 21 LDAR, with optional use of OGI in lieu of Method 21, and monthly AVO inspections, with a requirement that any indication of leakage discovered during an AVO inspection be treated as a fugitive emission and that such fugitive emission be repaired, recorded, and reported according to the applicable provisions of NSPS Subpart OOOOa.

D. Pneumatic controllers

[21] See: https://www3.epa.gov/ttnchie1/efdocs/equiplks.pdf

[22] See: section 4.4.2.2 of Technical Support Document ("TSD"), at https://www.regulations.gov/document/EPA-HQ-OAR-2010-0505-7631

Per Algonquin, the Cromwell compressor station has 68 intermittent-bleed natural gas-actuated controllers, with a collective VOC PTE of 0.5 tpy. Algonquin does not have continuous-bleed pneumatic controllers on site. By design, intermittent-bleed controllers only release gas when they actuate; they do not otherwise vent gas to atmosphere. The whole gas emission factor for intermittent-bleed pneumatic controllers – as presented in table 22 of the preamble to the 2022 supplemental NSPS/EG rulemaking[23] and based upon proposed revisions to the Greenhouse Gas Reporting Program ("GHGRP") rule at 40 CFR Part 98, Subpart W[24] – is approximately three times lower than the low-bleed controller emission factor and 14 times lower than the high-bleed controller emission factor.

In its plan, Algonquin proposed intermittent-bleed natural gas-actuated controllers as RACT for pneumatic controllers. Algonquin acknowledged that zero-emission alternatives, like instrument air-actuated controllers and "mechanical controls," are "potentially" technologically feasible but did not elaborate on the technological feasibility of these options or evaluate their economic feasibility.

Intermittent-bleed natural gas-actuated controllers are not addressed under the 2016 CTG and are not an affected facility under NSPS Subpart OOOOa; the CTG and NSPS contain standards only for continuous-bleed controllers. Meanwhile, in the 2023 NSPS and EG, EPA identified zero-emission controllers as (i) BSER for VOC and methane for new, modified, and reconstructed natural gas transmission facilities and (ii) BSER for methane for existing natural gas transmission facilities.

The Department recommended that Algonquin evaluate the use of zero-emission controllers as RACT given (i) the inclusion of such technology in the 2021/2022 EG rulemaking (before the final EG rule was promulgated in 2023), pursuant to which the Cromwell compressor station may be an affected facility under a resultant state or federal plan, and (ii) the potential for improperly operating intermittent-bleed controllers – which are not readily identified – to emit more than expected. Zero-emission alternatives to natural gas-actuated pneumatic controllers may include, but are not limited to, electrically actuated controllers or controllers actuated on instrument air. In response to the Department's recommendation, Algonquin noted that the 2021/2022 rulemaking has not been finalized and that, even after its finalization, its requirements would need to be implemented through a state or federal plan – a process that would take years. Algonquin further indicated that it found certain aspects of EPA's proposed rules problematic and that its trade group commented on the docket to this effect: "The Interstate Natural Gas Association of America submitted significant substantive comments on NSPS OOOOb/c which detail extensive revisions that need to be addressed prior to finalization of the regulation. Algonquin staff members contributed to the development of these comments, and it is evident that significant changes to the regulation are likely to occur before promulgation. Due to the uncertainty of the final NSPS OOOOc requirements, as well as the expected timeline for implementation, requiring compliance with draft NSPS OOOOc requirements through the VOC RACT plan could potentially result in costly compliance issues when the final version of the regulation takes effect. Therefore, Algonquin respectfully requests that any NSPS OOOOc draft requirements be omitted from the

[23] See: 87 FR 74702
[24] See: 87 FR 36920

RACT recommendation." In summary, Algonquin indicated that it would be premature to require compliance with the 2021/2022 proposed EG as a VOC RACT measure for pneumatic controllers.

The Department, in turn, offered that Algonquin conduct a top-down RACT analysis (similar to a top-down BACT analysis) or, alternatively, utilize the technical and cost data contained in the preamble to the 2021/2022 NSPS/EG rulemaking to evaluate the feasibility of retrofitting/replacing its intermittent-bleed natural gas-actuated pneumatic controllers with zero-emission controllers.

Algonquin chose the latter approach and, in April 2023, submitted a memorandum in support of its position that intermittent-bleed natural gas-actuated controllers – as opposed to zero-emission controllers – are RACT for the pneumatic controller subcategory. Algonquin stated that "Table 25 in EG OOOOc supplemental proposal indicates electric grid operated controllers are the only cost-effective pneumatic controller system for VOC emissions at large, new transmission and storage facilities. However, the Facility is an existing source and Table 28 in EG OOOOc supplemental proposal indicates that the replacement of pneumatic controllers at existing facilities is only cost-effective for control of methane and not VOC. Therefore, the replacement of existing pneumatic controllers with zero emission controllers would not be considered RACT for VOC at the Facility."

While the Department does not necessarily agree with all aspects of Algonquin's rationale here, the Department agrees with the conclusion that the use of zero-emission pneumatic controllers should not be pursued as a VOC control measure in this RACT order, for the reasons reviewed below.

The basis of Algonquin's reasoning that zero-emission controllers are not RACT appears to be two-pronged: that, in the preamble to proposed NSPS Subpart OOOOb and EG Subpart OOOOc, (i) EPA identified electrically actuated controllers as cost-effective for VOC at large transmission and storage facilities *for new sources only* and (ii) for existing sources, EPA identified zero-emission controllers as cost-effective for methane only, not for VOC, which is the pollutant under review in this action. As Algonquin's pneumatic controllers are existing, Algonquin concluded that retrofitting/replacing such controllers with zero-emission controllers must not be cost-effective for VOC.

The first prong of Algonquin's reasoning is consistent with the analysis set forth by EPA in the preamble to the 2021/2022 NSPS/EG supplemental proposal. Using a cost-effectiveness threshold of $5,540/ton-VOC-reduced, EPA evaluated grid- and solar-powered electric controllers and compressed air-actuated controllers as potential BSER for new sources at large transmission and storage facilities and found that only grid-powered electric controllers were cost-effective for VOC (using the "single pollutant" approach). (Note that the Cromwell compressor station best fits the description of a "large," as opposed to "medium" or "small," transmission and storage facility in the 2021/2022 NSPS/EG rulemaking based on its population of pneumatic controllers.) With respect to the second prong of Algonquin's reasoning, the Department offers an alternative approach to interpreting the cost-effectiveness data set forth in the preamble to and TSD for the 2021/2022 proposed NSPS/EG. This interpretation does not rely on the absence of a discussion on VOC cost-effectiveness, in the preamble to a proposed rule that does not directly address VOC

emissions, to assert that the retrofitting/replacement of existing pneumatic controllers with zero-emission controllers at large transmission and storage facilities is not cost-effective for VOC. This interpretation is warranted because the proposed BSER and emission standards under EG Subpart OOOOc only govern methane, not VOC; accordingly, only methane cost-effectiveness, not VOC cost-effectiveness, is discussed in the preamble.

A review of the 2021/2022 proposed NSPS/EG rulemaking and supporting documentation provided by Algonquin reinforces Algonquin's conclusion that zero-emission pneumatic controllers should not be required as a VOC RACT measure.

- Cost effectiveness = total annual costs ("TAC") / annual emission reductions
- The TAC associated with zero-emission controllers is presented in table 27 of the preamble. (The TAC associated with retrofitting/replacing existing natural gas-actuated controllers is greater than the new source TAC.) It is important to note that TAC is independent of the pollutant under consideration, i.e., TAC is not a function of VOC vs. methane emissions/reductions.
- The VOC and methane emission reductions, in tons per year, associated with retrofitting/replacing natural gas-actuated controllers equals the annual VOC and methane emissions from such controllers, since the potential BSER measures entail no VOC or methane emissions. For existing sources, the preamble to Subpart OOOOc presents only the methane emission reductions associated with the potential BSER measures, as the proposed EG does not directly address VOC emissions from pneumatic controllers. (Existing source methane emissions are greater than new source methane emissions; see tables 23 and 26 of the preamble.) However, in the TSD for the subpart OOOOc rulemaking, EPA indicates that baseline VOC emissions from the collection of pneumatic controllers at large, existing facilities is 0.28 tpy.
    - Alternatively, the baseline methane emissions for large, existing facilities in table 26 of the preamble (15.9 tpy) can be multiplied by the weight ratio of VOC:methane presented in the TSD (0.0276 – rounded) to get baseline VOC emissions of 0.439 tpy-VOC.
    - Alternatively, in its February 2023 memorandum, Algonquin offered a site-specific pneumatic controller VOC PTE of 0.5 tpy.
    - Alternatively, the number of intermittent-bleed controllers (66) at the Cromwell compressor can be multiplied by EPA's VOC emission factor for individual intermittent-vent controllers in table W-3B of 40 CFR Part 98, Subpart W and as referenced in table 8-3 of the Subpart OOOOc TSD (2.35 scf-whole gas/hr = 0.011 tpy/VOC) to get baseline VOC emissions of 0.726 tpy.
    - For the purposes of this RACT analysis, and in consideration of significant figures, we will use baseline emissions and consequently emission reductions of 0.44 tpy-VOC. Using Algonquin's site-specific pneumatic controller population or proposed PTE would yield a higher baseline VOC emission value; however, a site-specific TAC would also need to be used. The site-specific TAC would likely be higher than the default TAC for large, existing facilities in table 27 of the preamble, given that TAC is population-dependent and the model plant population of pneumatic controllers is smaller than the Cromwell population. Therefore, using a site-specific baseline emission value would likely not substantially alter the cost-effectiveness value.

- The lowest TAC for large, existing plants is electric controllers, at $3,709/year. Therefore, the cost-effectiveness for VOC for electric controllers is $3,709/year / 0.439 tpy = $8,448/ton. Since the other BSER options have a higher TAC, the cost-effectiveness of such options will be higher.

The Department has not promulgated a cost-effectiveness threshold for VOC RACT, as it has for NOx RACT.[25]

- The NOx RACT threshold is $13,635/ton. As Connecticut's nonattainment areas are NOx-limited, it stands to reason that an appropriate VOC RACT cost threshold may or may not be lower than the adopted NOx RACT cost threshold.
- EPA's BSER threshold in the Subpart OOOOc rulemaking is $5,540/ton. It stands to reason that an appropriate VOC RACT cost threshold in a severe ozone nonattainment area may be higher than a nationally applicable VOC BSER cost threshold.
- $8,448/ton is higher than the cost-effectiveness values associated with Connecticut's CTG rules, in cases where cost-effectiveness has been determined; however, this consideration does not, in and of itself, mean that the $8,448/ton value is too high to be cost-effective.
- Therefore, $8,448/ton could be construed as cost-effective for VOC RACT.

Nevertheless, VOC emissions from the Cromwell compressor station's collection of pneumatic controllers are nominal (in this case, less than 1 tpy). The magnitude of methane emissions from these controllers is much greater; however, methane emission reductions are not contemplated in this VOC RACT order. This VOC RACT order does not appear to be an appropriate venue to require the replacement/retrofitting of intermittent-bleed natural gas-actuated pneumatic controllers with zero-emission technology given (i) the minimal emission reductions that could be achieved via such a measure; (ii) the questionable cost-effectiveness associated with such a measure, and (iii) the inherent ambiguity in the cost-effectiveness calculations associated with such a measure. The Department believes that it would be prudent to allow the 2023 NSPS/EG rulemaking to remain the sole regulatory basis for requiring zero-emission controllers.

Given the minimal VOC emissions from the Cromwell compressor station's collection of pneumatic controllers, and to avoid a scenario where this VOC RACT order would impose substantially different control requirements than the proposed NSPS/EG, the Department will not require that Algonquin evaluate control options for pneumatic controllers that were not identified as potential BSER (e.g., routing emission to a control device). Furthermore, the 2021/2022 NSPS/EG rulemaking did not include cost data or a BSER analysis on two particular proposed compliance options: routing controller emissions to a process or using self-contained controllers. Since the utility of such options may be limited by factors like pressure differential and the need to further compress the collected gas, the Department again believes that it would be prudent to allow the 2023 NSPS/EG rulemaking to remain the sole regulatory basis of these compliance options instead of requiring that Algonquin evaluate these compliance options in the context of VOC RACT at this time.

In this order, the Department will identify intermittent-bleed natural gas-actuated pneumatic controllers as RACT for VOC.

[25] See: RCSA Section 22a-174-22e(h)(1)(A)(iii)

E. Storage vessels

In its plan, Algonquin identified the following vessels (to include tanks and separators): one 2,940-gallon pipeline condensate tank, one 1,000-gallon oil storage tank, one 750-gallon oil storage tank, one 1,000-gallon oily water storage tank, one 2,790-gallon coolant storage tank, one 350-gallon coolant storage tank, and five process separators. "Oil" here does not refer to unrefined petroleum (crude oil) but rather to lubricating oil as well as liquids recovered during pig runs having a consistency similar to heavy oil. Likewise, oily water refers to the types of "oil" described above when comingled with condensed water.

Of the vessels identified in Algonquin's plan, several are understood to meet the traditional definition "storage vessel," as found in the 2016 CTG and 2016 NSPS: "a tank or other vessel that contains an accumulation of crude oil, condensate, intermediate hydrocarbon liquids, or produced water, and that is constructed primarily of nonearthen materials (such as wood, concrete, steel, fiberglass, or plastic) which provide structural support."[26] This definition generally excludes process vessels such as knockout vessels, which Algonquin conservatively identified in its plan. (Process vessels are, however, subject to the requirements for fugitive emission components established in this RACT demonstration, as are the fugitive emission components associated with *bona fide* storage vessels.)

The 2016 CTG generally requires that any storage vessel with potential emissions greater than or equal to 6 tpy-VOC be served by a VOC capture and control system, unless uncontrolled actual VOC emissions have remained below 4 tpy, as calculated monthly, for 12 consecutive months and such emission rate is maintained. The 2016 NSPS also generally requires controls on any storage vessel with potential and actuals emissions at the same thresholds. The 2023 NSPS and EG introduce a separate PTE threshold of 20 tpy-methane on a tank battery basis, while the 2023 NSPS retains the 6 tpy-VOC applicability threshold.

According to its plan, Algonquin does not have any storage vessels with a VOC PTE greater than or equal to 6 tpy. Per Algonquin, the aggregate potential VOC emissions of all storage vessels identified in its plan (including the vessels that do not meet the traditional definition of "storage vessel") is 1.16 tpy. Therefore, Algonquin indicated that a VOC capture and control system is not needed to meet RACT.

The Department requested that Algonquin provide calculations to support Algonquin's PTE determination. Algonquin, in turn, provided results from EPA's TANKS model indicating that aggregate potential emissions from all vessels on site were significantly below 6 tpy-VOC.

The Department concurs that no emission controls are necessary to satisfy VOC RACT since the aggregate VOC PTE of the storage vessels is significantly less than the 6 tpy threshold in the 2016 CTG, 2016 NSPS, and 2023 NSPS and EG.

[26] See: section 4.1 of CTG, 40 CFR 60.5430a

In this RACT order, the Department will require that Algonquin maintain the potential emissions of each affected storage vessel below 6 tpy-VOC, calculated in accordance with the methodology set forth in NSPS Subpart OOOOa, and keep documentation to this effect.

Alternatively, Algonquin may maintain the actual uncontrolled VOC emissions of each affected storage vessel at a rate less than 4 tpy, as determined monthly. This compliance option may be exercised if and only if Algonquin demonstrates that actual uncontrolled VOC emissions have remained less than 4 tpy, as determined monthly, for the 12 consecutive months prior to exercising this compliance option. After making such demonstration, Algonquin would need to determine and make records of the actual uncontrolled VOC emission rate each month.

Alternatively, Algonquin may install a VOC capture and control system that reduces VOC emissions from each affected storage vessel by at least 95 percent. The Commissioner may require, at her discretion, performance testing to demonstrate the efficacy of such VOC capture and control system.

Should Algonquin become ineligible to operate under the first two compliance (PTE less than 6 tpy-VOC or actual emissions less than 4 tpy-VOC), Algonquin would need to comply with the VOC capture and control requirement within 60 days after loss of eligibility.

The 6 and 4 tpy-VOC thresholds identified above will not constitute a practicably enforceable emission limitation. Given the inherently low PTE of the affected storage vessel(s), monitoring and recordkeeping to support practicable enforceability would be unnecessary.

F. Blowdowns

VOC emissions from compressor unit and station blowdowns at the Cromwell compressor station have historically been minimal. Nevertheless, on a PTE basis, blowdown emissions are considerably higher due to variability in (i) the VOC content of natural gas and (ii) the frequency and duration of blowdown events. To illustrate this point, in its plan, Algonquin identified a 30 tpy reduction in potential blowdown VOC emissions by virtue of the emission reduction measures that Algonquin indicated it would implement. However, actual emissions have remained in the range of 0.8 to 2.7 tpy-VOC since 2017.

On both the federal and state levels, there is virtually no history of regulating VOC or methane emissions from compressor unit and station blowdowns in the natural gas transmission segment. The Department is aware of one exception that is very limited in scope: a BACT determination out of Louisiana, which is discussed in section IV.J of this document. The 2016 CTG, 2016 NSPS, and 2023 NSPS and EG do not contain standards for blowdown emissions from any segment of the oil and gas sector. In the preamble to proposed NSPS Subpart OOOOb and EG Subpart OOOOc (2021), EPA indicated that it would consider introducing standards for blowdowns, to include pigging operations, in its 2022 supplement proposal: "The EPA is soliciting comment for potential NSPS and EG under consideration that include addressing emissions from pipeline pigging and related blowdown activities. Should the EPA receive information through the public comment process that would help the Agency evaluate BSER, the EPA may propose NSPS and

EG through a supplemental proposal." However, the 2022 supplemental proposal contained no specific blowdown emission minimization measures.

For additional context, the Department reviewed California's and Colorado's oil and gas air emission regulations[27] and did not find any VOC or methane standards for blowdown emissions from the natural gas transmission and storage segment. Colorado's oil and gas rule does contain blowdown capture and control standards for midstream compressor stations, but not for downstream (transmission pipeline, compressor station, and storage) stations like Algonquin's Cromwell facility.

Compressor unit blowdowns. Compressor unit blowdown emissions occur when gas is released from the compressor after it shuts down in order to relieve system pressure and, to a lesser extent, when air (containing some gas) is purged from the system prior to unit startup. Such blowdown emissions, therefore, are largely a function of the frequency of unit startups and shutdowns, and the frequency of unit startups and shutdowns is largely a function of customer demand. Historically, Algonquin indicated, unit blowdowns at the Cromwell compressor station have ranged from 32 to 168 events per unit per year (see Table 2); emissions from unit blowdowns, depending on the characteristics of the natural gas, could range from 0.8 to 45 lbs-VOC per blowdown.

Table 2 – Historical frequency of unit blowdowns

EU #	2017	2018	2019	2020	2021
EU-07	12	48	59	44	17
EU-08	12	57	72	0	24
EU-09	8	15	20	25	12
EU-10	0	0	9	65	44
EU-11	0	0	8	30	43

In its plan, Algonquin proposed to perform pressurized holds of its compressors during unit shutdowns, in lieu of venting gas. According to Algonquin, to facilitate these pressurized holds, "enhancements to the dry seal systems" and "program changes" would be needed. Algonquin further indicated that each compressor unit would still need to be depressurized on occasion, but that the number of depressurization events "is anticipated to be less than 20 events per unit per year."

Given the lack of regulatory context with respect to VOC or methane emissions from unit blowdowns on either the federal or state level, the Department believes that it would be inappropriate, for the purposes of this VOC RACT order, to mandate the performance of pressurized holds of Algonquin's compressor units. Likewise, the Department believes that it would be inappropriate to impose as RACT any other specific work practices, control requirements, or quantitative limitations with respect to VOC emissions from unit blowdowns. The Department concludes that RACT is no further control.

[27] See: Title 17, California Code of Regulations, Section 95665, *et seq.* and Volume 5, Code of Colorado Regulations, Section 1001-9, respectively

Station blowdowns. Station blowdowns (including pigging operations) generally occur when maintenance, repair, or equipment inspection is required in a specific portion of the compressor station or during emergency events. According to Algonquin, the frequency of station blowdowns has ranged from 0 to 3 events per year; emissions from station blowdowns, depending on the characteristics of the natural gas, could range from 35 to 902 lbs-VOC per event.

In its plan, Algonquin proposed to implement a gas recompression and injection system as RACT in lieu of venting gas during certain circumstances. A gas recompression and injection system would reduce VOC emissions from, but not the frequency of, station blowdowns. Gas recompression and injection is a system designed to extract gas from a portion of station piping where work is planned and to recompress and inject such gas into a different portion of station piping. Some gas, however, would remain in the portion of station piping where work is to be performed, resulting in much reduced but still some venting of natural gas. According to Algonquin, "This equipment is designed to remove pressurized natural gas from a section of station piping where maintenance is planned to occur and inject it into another section of the compressor station. In most cases, recompression is successful in reducing the pressure of the natural gas in the station piping down to approximately 50 pounds per square inch. In doing so, a much smaller amount of gas is released to atmosphere than if it were to be released at operating pressure." Algonquin indicated that gas recompression and injection may not be feasible in portions of the plant with inadequate connection points.

Furthermore, Algonquin proposed to implement best management practices ("BMP") to reduce blowdown emissions – including the use of isolation valves to minimize the length of pipe that needs to be vented and coordination of maintenance and inspection activities to minimize the frequency of station blowdowns.

Again, given the lack of regulatory context with respect to VOC or methane emissions from unit blowdowns on either the federal or state level, the Department believes that it would be inappropriate, for the purposes of this VOC RACT order, to mandate the implementation of gas compression and injection or the aforementioned BMPs. Likewise, the Department believes that it would be inappropriate to impose as RACT any other specific work practices, control requirements, or quantitative limitations with respect to VOC emissions from unit blowdowns. The Department concludes that RACT is no further control.

G. Combustion sources

In its plan, Algonquin identified the following combustion sources: two 4,700 hp Solar Centaur 40-T4702S gas turbines, each driving a centrifugal compressor; one 15,900 hp Solar Mars 100-16002 gas turbine driving a centrifugal compressor; one 7,700 hp Solar Taurus 60-7802 gas turbine driving a centrifugal compressor; one 6,130 hp Solar Centaur 50-6102 gas turbine driving a centrifugal compressor; one 1,175 brake horsepower ("bhp") Waukesha VGF48GL emergency generator; one 0.438 million British thermal unit per hour ("MMBtu/hr") Gas Tech natural gas-fired fuel gas heater; one 2.946 MMBtu/hr Hurst natural gas-fired boiler; two 0.385 MMBtu/hr Cameron natural gas-fired fuel gas heaters; two 0.125 MMBtu/hr Modine space heaters; one 0.100

MMBtu/hr Modine space heater; one 0.075 MMBtu/hr Modine space heater; one 0.030 MMBtu/hr Modine heater; and one 0.036 MMBtu/hr State Industries water heater.

According to Algonquin, these sources are exempted from RACT review as excludable fuel-burning equipment.

Through RCSA Section 22a-174-32 generally exempts excludable emission sources, like fuel-burning equipment, from RACT review,[28] entities that submit an alternative RACT compliance plan are required to examine the technological and economic feasibility of additional emission controls on all sources of VOC, including fuel-burning equipment.[29] Algonquin did provide commentary in its plan representing that (i) any additional VOC controls on the gas turbines would not be cost-effective and (ii) emissions from the non-turbine combustion sources are nominal. For the reasons set forth below, the Department will not require further analysis in this regard.

The primary fired VOC emission sources at the Cromwell compressor station are the five simple-cycle turbines. The two smaller turbines (each 4,700 hp) were construed in 1982 and are subject to NSPS Subpart GG and NOx RACT. The three larger turbines (15,900, 6,130, and 7,700 hp) were constructed between 2015 and 2019 and are subject to NSPS Subpart KKKK and NOx RACT. The turbines were constructed under individual NSR permits, which contain practicably enforceable short-term VOC limitations and cap annual VOC emissions to 1.5, 1.5, 3.58, 2.64, and 2.51 tpy, respectively; actual emissions are far less. The three larger turbines are each equipped with an oxidation catalyst for CO BACT compliance; the catalyst also controls for VOC, with a design control efficiency of approximately 50 percent.

While it is conceivable that an oxidation catalyst could be installed on the smaller, older turbines, the resultant reductions in VOC emissions would be nominal and would not be considered cost-effective given the relatively high TAC and minimal potential for emission reductions below the 1.5 tpy-VOC annual emission limit already in effect.

Furthermore, the 2016 CTG does not include stack VOC standards for turbines or engines that drive compressors in the oil and gas sector. Likewise, the 2016 NSPS and 2023 NSPS and EG do not include stack VOC standards for turbines or engines. These source categories are separately listed and are subject to emission limitations in other NSPS (though, to be certain, NSPS Subpart KKKK and GG do not regulate VOC emissions) and NESHAPs.

Finally, the Department is not aware of any regulatory precedent for applying VOC RACT (major source or CTG) to natural gas turbines in the oil and gas sector.

Given that (i) any further VOC reductions from Algonquin's turbines would be minimal and likely cost-ineffective, (ii) the turbines are already subject to practicably enforceable VOC limitations in their respective NSR permits, and (iii) there is no apparent regulatory precedent for applying VOC RACT to natural gas turbines in the oil and gas sector, further review of these emission sources is not warranted at this time. (The compressors that these turbines drive, however, are subject to

[28] See: RCSA Section 22a-174-32(b)(4)
[29] See: RCSA Section 22a-174-32(d)(6)(A)

other requirements established in this RACT demonstration, including those pertaining to the venting of gas from compressor seals and fugitive emission components.)

As for the non-turbine fuel-burning equipment at the Cromwell compressor station, potential VOC emissions from these sources are nominal (according to Algonquin, 1.07 tpy in aggregate), and actual emissions are far less. Any further VOC reductions from these emission units would be minimal and cost-ineffective. Therefore, these emission units would not benefit from further RACT review.

H. Parts washer

Parts washers are used for the solvent-cleaning of tools and other equipment. According to Algonquin, potential emissions of its parts washer are nominal – 0.41 tpy-VOC. Actual emissions are far less. Furthermore, the parts washer is an excludable emission source for the purposes of determining VOC RACT applicability as it is subject to the CTG rule at RCSA Section 22a-174-20(l).

As discussed in section IV.G of this document, through RCSA Section 22a-174-32 generally exempts excludable emission sources from RACT review, entities that submit an alternative RACT compliance plan are required to examine the technological and economic feasibility of additional VOC control devices or equipment on all sources of VOCs, including sources already subject to a CTG rule.

Nevertheless, because (i) emissions from this source are nominal, (ii) any add-on controls would certainly be cost-ineffective, and (iii) the parts washer is already subject to a RACT level of control, the Department does not believe that further RACT review is needed.

I. Truck loading

Truck loading emissions occur when mobile tanker trucks load product contained in the aforementioned storage vessels. In its plan, Algonquin indicated that VOC emissions from truck loading are negligible, with potential and actual emissions less than 0.01 tpy.

Truck loading is not addressed under the 2016 CTG, the 2016 NSPS, or 2023 NSPS and EG. In the 2021 NSPS/EG proposal, EPA indicated that it would consider the inclusion of truck loading standards in a supplemental proposal: "The EPA is considering including emission standards and EG for tank truck loading operations; however, additional information is needed to evaluate BSER and propose NSPS or EG for this emissions source. The EPA is therefore soliciting comment on adding tank truck loading operations as an affected facility in both the NSPS and EG. Depending on the information received through the public comment process, the EPA may propose NSPS and EG for this source through a supplemental proposal."[30] However, no such truck loading emission minimization measures were included in the 2022 supplemental proposal.

Therefore, this emission source would not benefit from further RACT review.

[30] See: 86 FR 63110

J. RBLC consistency review

The Department reviewed the RBLC and found no case-by-case VOC RACT determinations in the natural gas transmission and storage segment, or the oil and gas sector at large. Across the oil and gas sector, the Department generally found that the only BACT/LAER determinations relevant to Algonquin's alternative RACT demonstration were for fugitive emissions, where BACT or LAER was considered to be LDAR. For the reasons articulated in the "fugitive emissions components" narrative above, the Department believes that the LDAR frequency and leak threshold established in this RACT order are appropriate.

The Department did find a carbon dioxide equivalent ("CO2e") Prevention of Significant Deterioration ("PSD") BACT determination[31] out of Louisiana for a natural gas compressor station. This determination included the (i) use of dry seals on the facility's centrifugal compressors; (ii) use of no-bleed or low-bleed pneumatics; (iii) use of low-leak technologies for valves, flanges, and connectors; (iv) minimization of the number of flanges and connectors on site; and (v) limitation on frequency of compressor blowdowns to no more than 110 per year per compressor.

The discussion above demonstrates that Algonquin's alternative RACT demonstration meets or exceeds the first three elements of the Louisiana PSD BACT. Regarding element (iv), it would be impractical to minimize the number of flanges and connectors on site at Algonquin's Cromwell compressor station, as reducing component counts at an existing facility would require some degree of reconstruction. Regarding element (v), the number unit blowdowns at Algonquin's Cromwell facility is already far lesser than the limit in the PSD BACT determination, and for the reasons articulated in section IV.F of this document, the Department does not believe this VOC RACT order is an appropriate venue to stipulate an allowable number of blowdowns.

K. Monitoring, recordkeeping, and reporting

The Department will require sufficient monitoring, recordkeeping, and reporting to facilitate compliance with the terms of this VOC RACT order. The Department will require that Algonquin keep each record required by this order at the premises for no fewer than five years after the date that such record is made.

L. Respondent's obligations under law

Nothing in this order will relieve Algonquin of its obligations under applicable federal, state, and local law.

VI. Conclusion

Proposed CO No. 8383 implements VOC RACT for the subject source.

[31] See: RBLC identification no. LA-0287, also available at https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=28153&Process_ID=110828&Pollutant_ID=348&Per_Control_Equipment_Id=158899

The draft, unsigned order and the SIP revision to incorporate such order, once it is executed, will be publicly noticed for 30 days pursuant to the provisions of 42 USC 7401, *et seq.,* with an opportunity for a public hearing if one is so requested. The administrative record for the SIP revision will include a copy of the draft order, this TSD, and copies of Algonquin's alternative RACT compliance plan and supporting technical information and documentation furnished by Algonquin in response to the Department's inquires.