



Commonwealth of Massachusetts  
Executive Office of Energy & Environmental Affairs

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# Department of Environmental Protection

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Response To Comments On:

310 CMR 7.72:  
Reducing Sulfur Hexafluoride Emissions from Gas-Insulated Switchgear

April 2014

Regulatory Authority:

M.G.L. c. 111, sections 142A through 142E, and M.G.L. c. 21N

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## I. Regulation History and Notes

Chapter 298 of the Acts of 2008, the Massachusetts Global Warming Solutions Act (GWSA), was passed by the legislature and signed into law by Governor Patrick in August 2008 to address the challenges of climate change. Subsequently, as required by GWSA, the Secretary of the Massachusetts Executive Office of Energy and Environmental Affairs issued the *Massachusetts Clean Energy and Climate Plan for 2020* (CECP) in 2010. One of the policies included in the plan is titled *Reducing SF<sub>6</sub> Emissions from Gas-Insulated Switchgear*. The provisions at 310 CMR 7.72 would implement the regulatory component of that policy and reduce emissions of a greenhouse gas (GHG) that contributes to climate change.<sup>1</sup>

SF<sub>6</sub> is of particular concern as a GHG because of its potency and long atmospheric lifetime. A commonly used metric to express the impact of a GHG on the Earth's climate is its global warming potential (GWP). By this measure, SF<sub>6</sub> is 23,900 times more potent than carbon dioxide, the most common GHG, which is assigned a GWP of 1. The term Gas Insulated Switchgear (GIS) refers to equipment that is used in high-voltage electrical systems to control the flow of electrical current. SF<sub>6</sub> is used in GIS because of its unique electrical and thermal properties that make it an excellent insulator; however, SF<sub>6</sub> routinely leaks from closures and joints in the equipment and is released into the atmosphere.

The final regulation described in this document requires companies that purchase new GIS to buy only GIS with a manufacturer's guaranty of 1% or less emission rate, to maintain such equipment using manufacturer-recommended procedures, and to appropriately handle SF<sub>6</sub> when GIS is removed from service. The regulation also requires the two companies that own, lease, operate, or control the largest amount of GIS in Massachusetts to comply with a declining emission rate standard until a rate of 1% or less is achieved by 2020. To minimize regulatory burden, the regulation allows flexibility with regard to choosing how the reductions are achieved. The technical support document that accompanied the regulatory proposal is available at <http://www.mass.gov/eea/agencies/massdep/air/regulations/310-cmr-7-00-air-pollution-control-regulation.html#2>.

## II. Public Comment Process

MassDEP held one public hearing and solicited oral and written comments on the proposed amendments to the 310 CMR 7.72 regulations in accordance with MGL Chapter 30A. On June 28, 2013, MassDEP published in two newspapers, the Boston Globe and the Springfield Republican, notice of the public hearing and public comment period on the proposed regulations and amendments, and notified interested parties via electronic mail on July 1, 2013. The public hearing notice was published in the Massachusetts Register on July 19, 2013. The public hearing was held at MassDEP's Boston office on Monday, July 29, 2013. The public comment period closed on August 8, 2013. Four commenters, listed at the end of this document, submitted comments.

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<sup>1</sup> The CECP is available at <http://www.mass.gov/eea/air-water-climate-change/climate-change/mass-clean-energy-and-climate-plan.html>. The SF<sub>6</sub> policy is described on pp. 77 - 78.

### III. Comments and Responses

#### A. Applicability, Definitions, and General Comments

**Comment:** One commenter suggested that the proposed definition of GIS is overly broad, and requested clarification of MassDEP's intent to limit applicability to GIS used in electric power systems. (Axcelis)

**Response:** MassDEP has clarified the definition of GIS as requested by adding the defined term "electric power system" to the definition of GIS.

**Comment:** One commenter identified an incorrect reference to 40 CFR Part 98, Subpart NN in the proposed regulation (Axcelis)

**Response:** MassDEP has replaced the incorrect reference with the correct reference, to Subpart DD.

**Comment:** One commenter requested that MassDEP add a threshold to the applicability provisions to exempt facilities that have small GIS inventories. The commenter also noted that the addition of SF<sub>6</sub> to their GIS is rarely necessary. (Equipower)

**Response:** As noted in the technical support document published with the proposed regulation, MassDEP is exempting facilities that are not federal reporting GIS owners from the requirement to comply with the declining annual emission rate. The only provisions that apply to these facilities are requirements related to the purchase of, and monitoring of leak rates for, newly manufactured GIS, and a provision that will prevent SF<sub>6</sub> releases when GIS is taken out of service. The monitoring requirements are triggered by the addition of SF<sub>6</sub>, which, according to the commenter, is rare. MassDEP also notes that these requirements include an exemption for emissions that occur prior to the first addition of SF<sub>6</sub> after equipment is placed in service. MassDEP believes these requirements are not burdensome for the large power plants that would be affected by the proposed exemption; the requirements will provide valuable information for facilities and MassDEP regarding the performance of new GIS over time. In response to this comment, MassDEP has made minor edits to clarify that the requirements for GIS owners that are not federal reporting GIS owners only apply to newly manufactured equipment, and that, even if a leak rate in excess of 1% occurs, compliance with the reporting requirements of 310 CMR 7.72(4)(c) is sufficient, regardless of the actual leak rate. However, MassDEP is not adding a threshold to the applicability provisions to further exempt facilities that have small GIS inventories.

**Comment:** One commenter asserted that, because SF<sub>6</sub> emissions from GIS account for a small fraction of statewide GHG emissions, regulating SF<sub>6</sub> emissions from GIS is not consistent with MassDEP's regulatory reform efforts. (Northeast Utilities)

**Response:** MassDEP refers the commenter to the Executive Office of Energy and Environmental Affairs' *Massachusetts Clean Energy and Climate Plan for 2020* (CECP) for information about SF<sub>6</sub> emissions from GIS in the context of Massachusetts's broad effort to implement the 2008 Global Warming Solutions Act. Regulating SF<sub>6</sub> emissions from GIS is one of the strategies identified explicitly in the CECP, and implementation of the CECP is a core requirement of the 2008 Global Warming Solutions Act.

**Comment:** One commenter requested that the effective date of maximum annual emission rate requirement be postponed until January 1, 2015, with a first reporting date of April 15 of the following year. According to the commenter, this postponement would allow reporters time to establish the necessary tracking systems. This commenter noted that, because US EPA's GHG reporting regulation does not require state-by-state reporting, additional tracking beyond that required by US EPA will be required to isolate emissions that occur in Massachusetts. (National Grid)

**Response:** MassDEP agrees with the commenter and has revised the effective date for federal reporting GIS owners as requested. MassDEP notes that the allowable emission rate for 2015 and subsequent years has not changed.

## **B. General Requirements for GIS Owners**

**Comment:** One commenter expressed support for the requirement that all new GIS be represented by the manufacturer as compliant with a 1% annual leak rate. (National Grid)

**Response:** MassDEP agrees with this comment, and is finalizing this limit as proposed.

**Comment:** One commenter suggested that the emergency event exemption provisions should apply to all GIS owners, not just federal reporting GIS owners. (Equipower)

**Response:** The intent of the emergency exemption provisions is to allow GIS owners subject to a declining annual leak rate requirement to exempt certain emergency emissions from calculation of the annual leak rate. As federal reporting GIS owners are the only GIS owners that are required to comply with the declining annual leak rate, it is appropriate that the emergency exemption provisions apply only to federal reporting GIS owners. The emergency exemption provisions include additional reporting requirements that are not required of GIS owners that are not federal reporting GIS owners, such as the amount of SF<sub>6</sub> emitted and the nature of the emergency event. Even if an emergency event causes a release in excess of 1% from a particular piece of newly manufactured GIS, the only requirements that would apply for these GIS owners would be the requirement to demonstrate that the equipment was represented by the manufacturer to be compliant with a 1% maximum annual leak rate, and the requirement to demonstrate compliance with appropriate maintenance practices. MassDEP believes that these requirements are reasonable, and that, because of the need to provide additional documentation, applying the emergency exemption provision to all GIS owners would unnecessarily complicate the requirements for GIS owners that are not federally reporting GIS owners.

**Comment:** The requirement to maintain equipment in accordance with procedures recommended by the manufacturer was questioned by two commenters. According to these commenters, there are industry best practice methods that are different from manufacturer-recommended procedures and result in lower leak rates. These commenters recommended that these practices be allowed. (Northeast Utilities, National Grid)

**Response:** MassDEP agrees with this comment, and has revised regulatory language to clarify that the only manufacturer recommendations that GIS owners must follow are those that have the effect of reducing SF<sub>6</sub> emissions. Industry best practice methods are allowed provided that they do not conflict with manufacturer recommendations that would better control SF<sub>6</sub> emissions.

**Comment:** One commenter objected to the requirement to provide for the re-use, recycling, or destruction of the SF<sub>6</sub> no later than six months after GIS is taken out of service. According to the commenter, the deadline serves no purpose and could complicate operations, and the requirement should acknowledge the reality that SF<sub>6</sub> may be removed and stored for an extended period prior to re-use. (National Grid)

**Response:** MassDEP acknowledges that a six month deadline to re-use, recycle, or destroy SF<sub>6</sub> could complicate operations, especially if SF<sub>6</sub> removed from multiple GIS is normally mixed together in storage containers after removal. Therefore, MassDEP is removing the proposed six month deadline and adding “secure storage” to the list of acceptable options for ensuring that SF<sub>6</sub> is not released when GIS is removed. However, MassDEP is retaining a general requirement to ensure the re-use, recycling, destruction, or secure storage of SF<sub>6</sub> when a GIS is taken out of service, and notes that the general documentation provisions require documentation of how removed SF<sub>6</sub> has been handled.

### **C. Declining Maximum Annual Leak Rate Requirement**

**Comment:** Two commenters questioned whether the requirement for federal reporting GIS owners to achieve a 1% annual leak rate by 2020 is feasible. (National Grid, NSTAR) These commenters noted that members of US EPA’s voluntary SF<sub>6</sub> Emissions Reduction Partnership achieved an average leak rate of 3.8% in 2010, and that new equipment manufacturers only guarantee leak rates for the first five years of use. One commenter cited these facts in support of an assertion that a 1% annual leak rate is “not consistent with current technology or best management practices,” and suggested that the regulation could interfere with their obligation to provide “safe and reliable electric service,” and therefore violate the 2008 Global Warming Solutions Act. (NSTAR) One commenter that achieved a reduction from a 15.7 % emission rate in 2000 to a 2.2% rate in 2012 suggested 2% as an appropriate maximum leak rate for 2020 (National Grid). The other suggested “using a rate that is in keeping with national best management practices and known technologies.” (NSTAR) Neither commenter submitted an alternative schedule with supporting technical data.

**Response:** MassDEP acknowledges the commenters’ obligation to provide “safe and reliable electric service.” As described below, MassDEP has added language to the emergency exemption provision that allows federal reporting GIS owners to exempt any emissions necessary to avoid immediate electric system outages from the calculation of the annual leak rate. This provision will ensure that there is no conflict between the annual leak rate requirement and the imperative to provide safe and reliable electric service. In addition, the technical support document that MassDEP published with the regulatory proposal included the following direction: “Commenters who believe that the proposed schedule may not be appropriate and achievable are encouraged to propose a specific alternative schedule and submit supporting technical data.” As no commenter submitted a specific proposal with supporting technical data, MassDEP is finalizing the annual reduction schedule, including the 1% annual leak rate to apply beginning in 2020, as proposed. As described in the technical support document, MassDEP believes that a 1% annual leak rate is consistent with current technology and best management practices.

**Comment:** Two commenters commented on the potential costs of the regulation, and MassDEP’s published estimate of those costs. (National Grid, NSTAR) One commenter stated

that achieving the 1% emission rate by 2020 “could be” cost prohibitive, and that “not enough information is available” to estimate the likely costs of the regulation. The same commenter requested that MassDEP publish updated cost studies. (NSTAR) The other commenter asserted that the cost estimate included in the CECP, which was the basis for the cost estimate included in the regulatory proposal, included reporting costs but not compliance costs. This commenter also described an example in which GIS leaks \$80 worth of SF<sub>6</sub> annually and could be repaired for \$22,000 or replaced for \$300,000, but did not provide any information regarding whether these costs would be typical, or how many such repairs would be required to comply with the regulation. (National Grid)

**Response:** As neither commenter provided any technical or financial information that would help MassDEP choose a reduction schedule different from the one proposed, MassDEP is finalizing the annual reduction schedule, including the 1% annual leak rate to apply beginning in 2020, as proposed. Regarding the example of the GIS that leaks \$80 worth of SF<sub>6</sub> annually, MassDEP appreciates the commenter’s willingness to provide specific information regarding costs, and agrees that repair and replacement costs will not be fully offset by reduced need to purchase SF<sub>6</sub>. However, MassDEP notes that the example does not necessarily support a suggestion that the regulation is not cost-effective: First, in order to comply with the regulation, the federal reporting GIS owner could repair the equipment for \$22,000, not replace it for \$300,000. Second, assuming that the amount of SF<sub>6</sub> that leaks annually is 10 pounds (roughly consistent with the cost estimate provided, and with previously submitted survey results), the amount of carbon dioxide-equivalent emissions released annually from the GIS could be approximately 100 metric tons (adjusting for the global warming potential of SF<sub>6</sub>, which is approximately 24,000). Many researchers have attempted to estimate the aggregate cost of damage associated with emitting one ton of carbon dioxide; estimates covering the time period during which the leak described in the example would likely persist were recently published by US EPA and ranged from approximately \$10 - \$150.<sup>2</sup> Given these estimates, the leak could cause environmental damage of \$10,000 or more per year if allowed to persist. Therefore, replacement of the GIS may be cost effective when potential environmental damage is considered. MassDEP also notes that the example appears to illustrate that, absent regulation, GIS owners will not choose to repair such leaks for economic reasons, illustrating the necessity of the regulation. As to the claim that the California cost estimates cover only the cost of reporting remissions, not the cost to achieve a 1% leak rate, MassDEP suggests the commenter review <http://www.arb.ca.gov/regact/2010/sf6elec/appd.pdf>, which indicates that recordkeeping, reporting and measure costs were included in the estimates.

**Comment:** One commenter suggested that the emergency exemption provisions, which allow federal reporting GIS owners to exempt certain unavoidable emissions from the annual emission rate calculation, should be broadened to cover “vandalism,” “accident,” or emissions that were “necessary to avoid immediate electric system outages.” (Northeast Utilities)

**Response:** MassDEP agrees with the commenter regarding the additional reference to emissions that were “necessary to avoid immediate electric system outages,” and has added this language to the regulation, as discussed above. MassDEP is also adding “vandalism” to the list of potential emergency situations, and is adding the phrase “including, but not limited to” as suggested by the

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<sup>2</sup> These estimates of the “social cost of carbon” are published at <http://www.epa.gov/climatechange/EPAactivities/economics/scc.html>.

commenter to clarify that the regulation allows some flexibility for MassDEP to consider emergency exemptions on a case-by-case basis.

**Comment:** One reporter requested that one of its subsidiaries that is a federal reporting GIS owner be exempted from compliance with the declining emission rate because of the small size of its Massachusetts operations. (Northeast Utilities)

**Response:** In the technical support document published with the regulatory proposal, MassDEP provided several reasons for applying the declining emission rate requirement to federal reporting GIS owners. In addition to the size of the reporter, which is the basis for the federal reporting requirement, these reasons were related to the ability of these reporters to track and manage emissions, and apply to all federal reporting GIS owners, regardless of size. Therefore, MassDEP is not revising the regulation in response to this comment.

**Comment:** One commenter noted that including stored SF<sub>6</sub> in the leak rate calculation would create a perverse incentive to stockpile SF<sub>6</sub> in cylinders.

**Response:** MassDEP agrees, and notes that neither the proposed nor final regulation allows for inclusion of stored SF<sub>6</sub> in the leak rate calculation; therefore, no perverse incentive is created.

**Comment:** One commenter stated that the mass balance approach to determining emissions required by the regulation yields results that vary over time. (Northeast Utilities)

**Response:** MassDEP agrees that this could occur, but believes that the gradually declining emission rate allows sufficient time for federal reporting GIS owners to develop tracking systems that allow for compliance with the required emission rates.

#### **D. Enforcement**

**Comment:** One commenter requested that clarifying language be added to the enforcement section of the regulation stating that: “Any exceedance of the maximum annual SF<sub>6</sub> emission rate for a calendar year shall constitute a single, separate violation of 310 CMR 7.72 for the calendar year.” (Northeast Utilities)

**Response:** The suggested language accurately describes MassDEP’s current view regarding how violations of the annual SF<sub>6</sub> emissions rate would likely be enforced. However, MassDEP is not adding the suggested language to the regulation because the intent of that section of the regulation is to provide information about MassDEP’s authority to enforce the regulation, not to provide detailed information about how this authority would be applied to this regulation.

## **IV. List of Commenters**

Axcelis  
Equipower  
National Grid  
Northeast Utilities