State of California
AIR RESOURCES BOARD

PUBLIC HEARING TO CONSIDER THE PROPOSED AMENDMENTS TO THE REGULATION FOR REDUCING SULFUR HEXAFLUORIDE EMISSIONS FROM GAS INSULATED SWITCHGEAR

STAFF REPORT: INITIAL STATEMENT OF REASONS

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EXECUTIVE SUMMARY

California Air Resources Board (CARB or Board) staff is proposing to amend the Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear (Regulation; title 17, California Code of Regulations, sections 95350 et. seq.). The Regulation was originally enacted as an early action measure pursuant to the California Global Warming Solutions Act of 2006 (Assembly Bill 32 or AB 32; Chapter 488, Statutes of 2006) to reduce SF_6 emissions from the electricity sector's transmission and distribution system. AB 32 established an initial goal for California to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by 2020 and to maintain and continue GHG emissions reductions beyond 2020.

The Legislature reaffirmed California's commitment to take further action against climate change by adopting Senate Bill (SB) 32 (Chapter 250, Statutes of 2016), which further directs the State to reduce its GHG emissions to at least 40 percent below the 1990 level by 2030. In 2019, CARB initiated a process to explore achievable paths toward carbon neutrality and is working to implement direction provided in Board Resolution 17-46 to evaluate and explore opportunities to achieve additional significant cuts in GHG emissions from all sources.

In response to California's aggressive climate goals and the increasing availability of technology that does not use SF_6, CARB staff is proposing to amend the Regulation to clarify regulatory coverage, expand the scope to include other GHGs beyond SF_6, drive GHG emissions reductions, accelerate the transition to technologies that do not use SF_6, improve the ability of equipment owners with relatively small amounts of SF_6 to comply with the Regulation, specify reporting and accounting procedures to increase reporting accuracy and facilitate tracking of GHGs covered under the proposed Regulation, and improve CARB staff's ability to verify reported data. This report presents CARB staff's proposal to amend the SF_6 Regulation.

The proposed amendments would change the term "gas insulated switchgear" (GIS) to "gas-insulated equipment" (GIE) to clarify that more devices beyond switchgear are covered by the Regulation. This terminology change would not affect the types of devices covered under the Regulation, and the term GIE will be used throughout this document. Due to the expansion in the Regulation's scope to include other GHGs beyond SF_6, and the terminology change from GIS to GIE, CARB staff proposes to change the name of the Regulation to the "Regulation for Reducing Greenhouse Gas Emissions from Gas Insulated Equipment."

Significance of SF_6 and SF_6 GIE

SF_6 is an extremely powerful and long-lived GHG. The 100-year global warming potential (GWP) of SF_6, which indicates its heat-absorbing ability relative to that of carbon dioxide (CO_2) over a 100-year period, is 22,800, making it the most potent of the six main GHGs. Because of its extremely high GWP, small reductions in SF_6 emissions can have a large impact on reducing GHG emissions, which are the main drivers of

climate change. SF_6 has been used extensively in electrical power systems since the 1980s as a dielectric medium (insulator) and interrupter (arc quencher) in medium- and high-voltage GIE. SF_6 has become the dominant insulating and interrupting medium used today because the gas is non-flammable, non-corrosive to internal switchgear components, non-toxic in its pure form, and its thermal properties make it an excellent arc suppressant. While manufacturers of SF_6 GIE indicate that they develop GIE with the goal of minimizing leaks of SF_6, inevitably some of this gas leaks from these devices into the atmosphere, where it contributes to climate change.

Current SF_6 Regulation

The Regulation requires owners of gas-insulated switchgear (GIS) to report the following annually: SF_6 emissions, an inventory of their GIE that use SF_6 as an insulating gas, information related to containers that store SF_6 gas, and transfers of SF_6 into or out of GIE. The Regulation also requires reductions of SF_6 emissions from GIE over time, setting an annual emission rate limit that each GIE owner may not exceed. The maximum allowable emission rate started at ten percent in 2011, and has decreased one percent per year since then. In the absence of proposed changes to the Regulation, in 2020, the limit would reach one percent and would remain at that level going forward. Data reported under the Regulation show that statewide SF_6 capacity is growing by one to five percent per year, and projections provided by GIE owners indicate that this trend will continue into the future. Because, under the current Regulation, the emissions limit would remain equivalent to one percent of annual capacity, as capacity grows, so too would expected emissions.

Alternatives to SF_6

Due to the high GWP of SF_6, its long lifetime in the atmosphere, and the critical problem of climate change, manufacturers have started developing alternatives that perform comparably to SF_6 but with either no or lower GHG emissions. Considerable progress has been made in the past decade; across the voltage spectrum, manufacturers now either offer market-ready non-SF_6 GIE or have development plans for the foreseeable future. Three common types of alternative GIE that do not use SF_6 are vacuum-solid dielectric, vacuum-dry air, and alternative gases. Despite this progress, inventory data reported under the Regulation show that SF_6 capacity in the state has been growing, meaning that non-SF_6 technologies have not yet been widely adopted, and staff projects that SF_6 capacity will continue growing well into the future. This indicates that a regulatory change is necessary to drive the transition away from the use of SF_6 in GIE.

Proposed Amendments to the SF_6 Regulation

Staff Proposal

The proposed Regulation would establish a timeline for phasing out acquisition of SF_6 GIE in California that would take effect in stages between 2025 and 2033. The

proposed amendments would reduce total GHG emissions from GIE, improve the ability of small GIE owners to comply, improve accuracy in reported emissions, and improve CARB staff's ability to verify reported data. The proposed Regulation has been developed with the help of a robust informal public process, which included three publicly noticed workshops and one publicly noticed working group meeting from November 2017 through August 2019. The proposed amendments would:

- Expand the scope of the Regulation to cover emissions of all insulating gases with a GWP greater than one, and clarify terminology related to which GIE are covered by the Regulation;
- Establish a timeline for phasing out acquisition of SF_6 GIE in California and create an incentive to encourage GIE owners to acquire non-SF_6 GIE prior to the phase-out;
- Establish a process through which GIE owners could be granted a phase-out exemption to allow them to acquire SF_6 GIE after the phase-out, but only when certain conditions are met;
- Establish alternative emissions limits for small-capacity GIE owners to improve their ability to comply with the Regulation, assign each GIE owner an emissions limit in metric tons of CO_2 equivalent ($MTCO_2e$) (as opposed to the current SF_6-specific emission rate limit), and establish methods to minimize the growth of the emissions limit over time; and
- Revise reporting requirements to improve reporting accuracy, clarify requirements, close gaps in accounting for SF_6 and other covered insulated gases, and improve CARB staff's ability to verify reported data.

Staff analyzed the impacts of the amendments, in particular the installation of non-SF_6 GIE due to the phase-out, through 2036, the year after which all revisions in the proposed Regulation would come into effect. Absent the proposed amendments, staff estimates that SF_6 emissions in 2036 would be 364,000 $MTCO_2e$, a significant increase relative to estimated emissions of 286,000 $MTCO_2e$ in 2024, the year before the phase-out begins. By contrast, the proposed Regulation will reduce the 2036 emissions level to be approximately 283,000 $MTCO_2e$. Cumulative emissions reductions for the period 2020 to 2036 will be approximately 391,000 $MTCO_2e$. Because GIE lasts approximately 40 years, though, emissions reductions from non-SF_6 GIE acquired between 2025 and 2036 will continue through 2075, resulting in cumulative emissions reductions of approximately 3,143,000 $MTCO_2e$.

Evaluation of Regulatory Alternatives

Staff analyzed three alternatives to the proposed Regulation for Reducing Greenhouse Gas Emissions from Gas-Insulated Equipment; all three alternatives share the basis of the proposed Regulation but contain the following variations: (1) retain a one-percent emission rate limit, (2) do not phase out SF_6 GIE, and (3) do not implement differing emissions limits for small-capacity GIE owners. In evaluating these alternatives, CARB staff found that none were less burdensome and none were equally effective in achieving the goals of phasing out SF_6 and reducing GHG emissions from this source.

Environmental Analysis

When the Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear ("Regulation;" Title 17, California Code of Regulations, sections 95350 et. seq.) was proposed in 2010, CARB adopted a no impact environmental analysis (NIEA), which is the equivalent of a negative declaration, under its certified regulatory program (California Code of Regulations, title 17, sections 60000 through 60008) to comply with the requirements of the California Environmental Quality Act (CEQA; Public Resources Code section 21080.5). The NIEA, included as Section V. of the ISOR for that 2010 item, dated January 7, 2010, determined that, based upon available information, no significant adverse environmental impacts should occur as a result of adopting the Regulation. Staff has determined that no additional environmental review is required for the current proposed amendments to the Regulation because there are no changes proposed to the originally approved project that involve new significant environmental effects or a substantial increase in severity of previously identified significant effects than previously identified in the prior 2010 NIEA. The basis for reaching this conclusion is provided in Section VI. of this ISOR.

Economic Assessment

The proposed Regulation was evaluated based on the key provisions that would entail costs: the incremental costs of non-SF_6 GIE and additional processes associated phase-out of SF_6 GIE acquisition in California and costs associated with changes to annual reporting, which are negligible relative to phase-out costs. Provisions that incur cost savings include lower maintenance costs and eliminated reporting costs associated with some non-SF_6 GIE. The costs, cost savings, and emissions reductions calculated for the economic analysis are all based on the difference between the proposed amendments (or alternatives) and the business-as-usual (BAU) scenario. The BAU scenario retains the current Regulation with no amendments enacted.

The economic analysis found that there are fiscal impacts to the small businesses and local, State, and federal entities that are already subject to the current Regulation. Because existing GIE manufacturers are all located outside of California, the estimated economic impact of the proposed Regulation is not expected to result in considerable business creation or elimination in California, nor the creation or elimination of jobs in California.

Staff Recommendation

Staff recommends that the Board adopt the proposed amendments to the SF_6 Regulation. The proposed amendments will reduce GHG emissions pursuant to SB 32 and Board Resolution 17-46, principally as a result of the gradual phase-out of SF_6 over time. Revisions to the current Regulation will also provide flexibility to relatively small GIE owners who have documented their unique challenges in complying with the

current Regulation. The proposed amendments will also result in more accurate reporting of data related to SF_6 use and emissions in the State, will improve CARB staff's ability to verify reported data, and will facilitate tracking of GHG emissions and reductions from this source to assess achievement of California's climate targets and goals.

I. INTRODUCTION AND BACKGROUND

California Air Resources Board (CARB or Board) staff is proposing amendments to the Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear (Regulation, title 17, California Code of Regulations, sections 95350 et. seq.). The Regulation was originally enacted as an early action measure pursuant to the California Global Warming Solutions Act of 2006 (Assembly Bill 32 or AB 32; Chapter 488, Statutes of 2006) to reduce SF_6 emissions from the electricity sector's transmission and distribution system. AB 32 established an initial goal for California to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by 2020 and to maintain and continue GHG emissions reductions beyond 2020. The current Regulation requires owners of gas-insulated switchgear (GIS) to report the following annually: SF_6 emissions, an inventory of their GIS that use SF_6 as an insulating gas, information related to containers that store SF_6 gas, and transfers of SF_6 into or out of GIS. The Regulation also requires reductions of SF_6 emissions from GIS over time.

The Legislature reaffirmed California's commitment to take further action against climate change by adopting Senate Bill (SB) 32 (Chapter 250, Statutes of 2016), which further directs the State to reduce its GHG emissions to at least 40 percent below the 1990 level by 2030. In 2019, CARB initiated a process to explore achievable paths toward carbon neutrality and is working to implement direction provided in Board Resolution 17-46 to evaluate and explore opportunities to achieve additional significant cuts in GHG emissions from all sources.

In response to California's aggressive climate goals and the increasing availability of technology that does not use SF_6, CARB staff is proposing to amend the Regulation to clarify regulatory coverage, expand the scope to include other GHGs beyond SF_6, drive GHG emissions reductions, accelerate the transition to technologies that do not use SF_6, improve the ability of equipment owners with relatively small amounts of SF_6 to comply with the Regulation, specify reporting and accounting procedures to increase reporting accuracy and facilitate tracking of GHGs covered under the proposed Regulation, and improve CARB staff's ability to verify reported data.

The proposed amendments would also change the term "GIS" to "gas-insulated equipment" (GIE) to clarify that more devices beyond switchgear are covered by the Regulation. This terminology change would not affect the types of devices covered under the Regulation, and the term GIE will be used throughout this document. Due to the expansion in the Regulation's scope to include other GHGs beyond SF_6, and the terminology change from GIS to GIE, CARB staff is proposing to change the name of the Regulation to the "Regulation for Reducing Greenhouse Gas Emissions from Gas Insulated Equipment."

If enacted, the amendments will go into effect following the schedule described in the Proposed Regulation Order. Some changes will become effective the day the

Regulation is finalized and will impact each GIE owner's data year[1] 2020 annual report (due June 1, 2021). Other changes that require new data to be collected will become effective January 1, 2021 or after.

A. Significance of SF_6 and SF_6 GIE

SF_6 is an extremely powerful and long-lived GHG. The 100-year global warming potential (GWP) of SF_6, which indicates its heat-absorbing ability relative to that of carbon dioxide (CO_2) over a 100-year period, is 22,800 (IPCC 2007), making it the most potent of the six main GHGs. Because of its extremely high GWP, small reductions in SF_6 emissions can have a large impact on reducing GHG emissions, which are the main drivers of climate change. SF_6 also has an extremely long atmospheric lifetime, which is the result of its properties as a very stable chemical that is difficult to destroy.

SF_6 has been used extensively in electrical power systems since the 1980s as a dielectric medium (insulator) and interrupter (arc quencher) in medium- and high-voltage GIE. SF_6 has become the dominant insulating and interrupting medium used today because the gas is non-flammable, non-corrosive to internal switchgear components, non-toxic in its pure form, and its thermal properties make it an excellent arc suppressant. SF_6 GIE are found in a wide variety of locations today, including at power plants, universities, military bases, large industrial facilities, and throughout the electricity transmission and distribution system. In the electricity transmission sector, SF_6 GIE are used in areas where voltage capacity is being stepped up or down, such as electrical substations. Throughout the electricity distribution network, SF_6 GIE are present above ground in some areas and often times underground in densely populated urban areas.

While manufacturers of SF_6 GIE indicate that they develop GIE with the goal of minimizing leaks of SF_6, inevitably some of this gas leaks from these devices into the atmosphere where it contributes to climate change. In particular, numerous stakeholders have commented that GIE that utilizes SF_6 tends to leak more as they age. Though recycling of used SF_6 is common practice, it is usually not destroyed because of the difficulty and cost associated with destruction. Therefore, it can be expected that SF_6 that exists now and that is produced in the future will persist for thousands of years, whether in GIE equipment or, ultimately, in the atmosphere. It is therefore important to reduce the amount of SF_6 used and produced, and the Regulation aims to reduce SF_6 emissions from these devices.

[1] "Data year" means the calendar year for which a GIE owner must submit an annual GHG emissions data report.

B. Current SF_6 Regulation

In order to reduce emissions of this potent GHG, the current Regulation was adopted by the Board in 2010 and it went into effect in 2011. This Regulation applies to owners of SF_6 GIE and sets an annual emission rate limit that each GIE owner may not exceed. The emission rate is calculated by dividing SF_6 emissions by the GIE owner's average system nameplate capacity, which consists of all the SF_6 in GIE in active service each year. The maximum allowable emission rate started at ten percent in 2011, and has decreased one percent per year since then. In the absence of proposed changes to the Regulation, in 2020, the limit would reach one percent and would remain at that level going forward. Data reported under the Regulation show that statewide SF_6 capacity is growing by one to five percent per year, and projections provided by GIE owners indicate this trend will continue into the future. Because, under the current Regulation, the emissions limit would remain equivalent to one percent of annual capacity, as capacity grows, so too would expected emissions.

The Regulation requires GIE owners to report data related to the following annually: SF_6 emissions, emission rate, a complete inventory of GIE and containers that contain SF_6, and information on the containers' uses throughout the year. The Regulation also contains reporting requirements that allow CARB staff to verify GHG emissions reporting and track SF_6 used in the State, and specifies that GIE owners must keep all reported information and other records for three years.

Under the current Regulation, GIE include all electrical power equipment regardless of insulating medium. Types of equipment include, but are not limited to, switchgear, switches, circuit switchers, coupling capacitor potential devices, gas-insulated substations, and circuit breakers. Hermetically sealed GIE are pre-charged with insulating gas, sealed at the factory, and designed by the manufacturer to not be re-fillable by the purchaser or a third party. Non-hermetically sealed GIE are designed by the manufacturer to be fillable. Both types of devices are included in the annual inventory of GIE that GIE owners report as part of the annual reporting requirements. However, only non-hermetically sealed GIE are included in the required calculations to evaluate SF_6 emissions and emission rate limits.

C. Alternatives to SF_6 Use in GIE

Due to the high GWP of SF_6, its long lifetime in the atmosphere, and the critical problem of climate change, manufacturers have started developing alternatives that perform comparably to SF_6 but with either no or lower GHG emissions. At the time the current Regulation was enacted, while some of these emerging non-SF_6 technologies were becoming mainstream (e.g., use of vacuum devices in certain distribution-level applications), many others were still in their infancy. Considerable progress has been made in the past decade; across the voltage spectrum, manufacturers now either offer market-ready non-SF_6 GIE or have development plans for the foreseeable future. Three common types of alternative GIE that do not use SF_6 are vacuum-solid dielectric,

vacuum-dry air, and alternative gases. Alternative GIE that employ dry air or solid dielectric material as an insulation medium may not be insulated with gas; however, in this document and the proposed Regulation, staff use the term GIE broadly to include equipment insulated with a GHG as well as equipment that employs a non-gaseous insulating medium.

Both vacuum-solid dielectric and vacuum-dry air GIE utilize a vacuum bottle for fault interruption; while the former uses a solid dielectric material (e.g., epoxy) for insulation, the latter utilizes dry air (usually a mixture of nitrogen and oxygen) for insulation. Vacuum technology has been widely produced and used in medium voltage, distribution-level (up to 38 kV) GIE as an alternative to SF_6 (ABB 2019a; Eaton 2019; G&W Electric 2019; G&W Electric 2020; Huade 2015a; Lemke 2019; Meiden 2016, MEPPI 2016; Siemens 2019a; Siemens 2019b; Toshiba 2019). Several large electric utilities in California informed CARB staff that they use little to no SF_6 GIE in their distribution system, and instead use either vacuum-solid dielectric or vacuum-dry air in place of SF_6. While these technologies are mature, some manufacturers and GIE owners have expressed concerns that they do not work for all configurations (e.g., due to space constraints) or grounding requirements.

In recent years, manufacturers of vacuum-dry air GIE have scaled up to apply this technology to higher voltage, transmission-level circuit breakers and air-insulated switchgear or substation units. At 72.5 kV, hundreds of these devices are in active use in North America (Goodell 2019; Siemens 2019c), with thousands of installations worldwide (Huade 2015b; Siemens 2019c; Siemens 2019d). Vacuum-dry air GIE up to 145 kV will become available over the next several months (Murray 2020; Siemens 2018). Over the coming years, manufacturers believe they will be able to deploy vacuum-dry air technologies to even higher voltage levels (Meiden 2017; Paserba 2020; Roskilly 2019).

Alternative-gas GIE function similarly to SF_6 GIE except for using different gases for fault interruption and insulation. These GIE typically use a mixture of several gases including non-GHGs (e.g., oxygen) mixed with a GHG such as fluoro-nitrile, fluoro-ketone, and/or carbon dioxide. While these compounds are GHGs, their GWPs are much lower than that of SF_6, especially when they are mixed with a non-GHG gas for use. A fluoro-nitrile gas blend can achieve similar dielectric strength to SF_6, though its GWP is in the hundreds. A fluoro-ketone gas blend has a GWP less than one. Non-SF_6 GIE that employ these alternative gases perform similarly to SF_6 GIE for those applications (ABB 2019b; GE 2019a). Alternative-gas GIE are available now for some equipment types at 72.5 kV and 170 kV, with development for higher voltage levels in the near horizon (GE 2019b). Because the majority of the parts used to produce alternative-gas GIE is similar to those for SF_6 GIE, this technology tends to be more easily scalable to higher voltages without a technological breakthrough. In the coming years, GIE using alternative insulating gases are expected to become commercially available for all GIE voltage classes with a similar footprint (GE 2019b) to SF_6 GIE.

Despite this progress, inventory data reported under the Regulation show that SF_6 capacity in the State has been growing, meaning that non-SF_6 technologies have not been widely adopted, and staff projects that SF_6 capacity will continue growing well into the future. This indicates that a regulatory change is necessary to drive the transition away from the use of SF_6 in GIE.

D. Proposed Regulatory Amendments

Given California's aggressive GHG emissions reduction targets, the availability of non-SF_6 alternatives at some voltage levels, and the technological breakthroughs described above, CARB staff is proposing to amend the Regulation. The proposed Regulation would establish a timeline for phasing out acquisition of SF_6 GIE in California that would take effect in stages between 2025 and 2033. The proposed amendments would reduce total GHG emissions from GIE, improve the ability of small GIE owners to comply, improve accuracy in reported emissions, and improve CARB staff's ability to verify reported data. The proposed Regulation has been developed with the help of a robust informal public process (see section XI of this ISOR), which included three publicly noticed workshops and one publicly noticed working group meeting from November 2017 through August 2019. At the most recent public workshops in February and August 2019, staff provided informal drafts of the proposed Regulation in advance of the workshop to allow stakeholders to review and give staff specific feedback on the proposed changes. In addition, CARB staff had dozens of in-person meetings and conference calls with GIE manufacturers, individual GIE owners, and industry associations representing diverse perspectives. CARB staff has reviewed the comments provided by stakeholders and incorporated changes into the proposed amendments where appropriate.

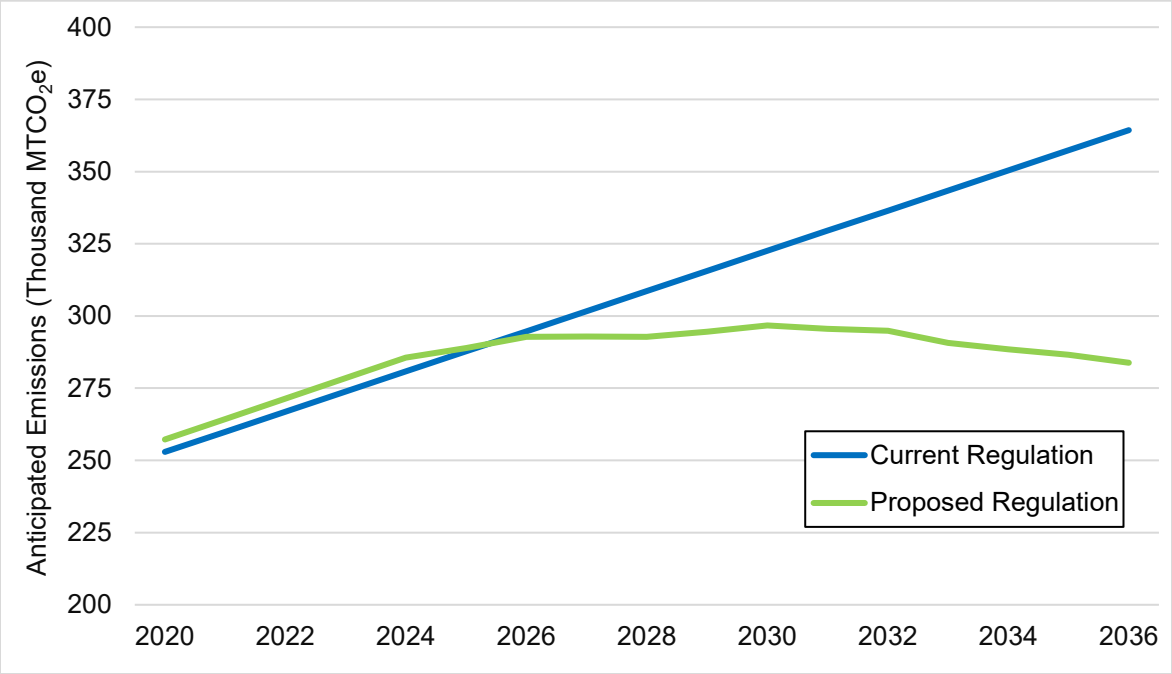
The result of this extensive stakeholder engagement is proposed regulatory amendments that would:

- Expand the scope of the Regulation to cover emissions of all insulating gases with a GWP greater than one, and clarify terminology related to which GIE are covered by the Regulation;
- Establish a timeline for phasing out acquisition of SF_6 GIE in California and create an incentive to encourage GIE owners to acquire non-SF_6 GIE prior to the phase-out;
- Establish a process through which GIE owners could be granted a phase-out exemption to allow them to acquire SF_6 GIE after the phase-out, but only when certain conditions are met;
- Establish alternative emissions limits for small-capacity GIE owners to improve their ability to comply with the Regulation, assign each GIE owner an emissions limit in metric tons of CO_2 equivalent ($MTCO_2e$) (as opposed to the current SF_6-specific emission rate limit), and establish methods to minimize the growth of the emissions limit over time; and

- Revise reporting requirements to improve reporting accuracy, clarify requirements, close gaps in accounting for SF_6 and other covered insulated gases, and improve CARB staff's ability to verify reported data.

As shown in Figure 1, staff analyzed the impacts of the amendments, in particular the installation of non-SF_6 GIE due to the phase-out, through 2036, the year after which all revisions in the proposed Regulation would come into effect. Absent the proposed amendments, staff estimates that SF_6 emissions in 2036 would be 364,000 $MTCO_2e$, a significant increase relative to estimated emissions of 286,000 $MTCO_2e$ in 2024, the year before the phase-out begins. By contrast, the proposed Regulation would reduce the 2036 emissions level to approximately 283,000 $MTCO_2e$. Cumulative emissions reductions for the period 2020 to 2036 will be approximately 391,000 $MTCO_2e$. Because GIE lasts approximately 40 years, emissions reductions from non-SF_6 GIE acquired between 2025 and 2036 will continue through 2075, resulting in cumulative emissions reductions of approximately 3,143,000 $MTCO_2e$.

Figure 1. Anticipated emissions under current and proposed Regulation.



E. Other Actions to Reduce SF_6 Outside of California

Throughout the public process, stakeholders have noted that non-SF_6 GIE have been developed that can replace SF_6 GIE in some applications today, and manufacturers have indicated that non-SF_6 GIE can be developed for use in a wider set of applications in the coming years. According to stakeholders, the limiting factor for broader deployment of non-SF_6 GIE is the size of the market has been insufficient for manufacturers to make the necessary investments to develop the products. To date, no other jurisdiction has established a timeline for phasing out acquisition of SF_6 GIE, but other jurisdictions have expressed interest in following California's lead should the

proposed amendments be adopted. According to stakeholders, the proposed amendments would generate a more certain market for non-SF_6 GIE, spurring manufacturers to complete product development. As more non-SF_6 GIE is produced and installed, it could lead to broader adoption, either voluntary or regulatory-driven, enabling the reduction of GHG emissions from GIE not just within California's borders but throughout the world. The rest of this section provides a summary of current and potential actions aimed at reducing GHG emissions from GIE in other jurisdictions.

The European Commission, which is the Executive Branch of the European Union (EU), has been regulating SF_6 use in GIE since 2006. The EU Regulation on Certain Fluorinated Greenhouse Gases (Regulation EC No. 842/2006) requires SF_6 gas in high-voltage switchgear to be recovered by trained and certified personnel for recycling, reclamation, or destruction purposes (European Parliament and of the Council 2006). All EU member states were required to adopt the regulations, and final implementation of all phases occurred in July 2009. The EU Regulation is intended to reduce fluorinated GHG emissions[2] to 33 percent of 2014 levels by 2030, but does not include a specific target for SF_6 emissions. Under the EU Regulation on Fluorinated Greenhouse Gases and Repealing Regulation *(EC) No. 842/2006*, the European Commission is developing a report, that was scheduled to be completed by July 1, 2020, assessing whether cost-effective, technically feasible, energy-efficient, and reliable alternatives to SF_6 equipment exist in new medium-voltage secondary switchgear (European Parliament and of the Council 2014). If deemed appropriate, a legislative proposal to the European Parliament to ban the sale of SF_6 GIE will be introduced.

At a federal level, the United States Environmental Protection Agency (U.S. EPA) manages a voluntary SF_6 emissions reduction program (U.S. EPA 2019a). U.S. EPA also requires emissions reporting (under 40 CFR Part 98, Greenhouse Gas Reporting Program) for GIE owners whose aggregate nameplate capacity of non-hermetically sealed GIE exceed 17,800 pounds (U.S. EPA 2010). While the data collected under 40 CFR Part 98 are useful for identifying the largest emissions sources and can inform future federal policies, U.S. EPA's regulation is not considered comparable to the proposed Regulation. One major difference between U.S. EPA's regulation and CARB's current and proposed Regulations is that U.S. EPA's regulation does not limit the amount of SF_6 covered GIE owners are allowed to emit. Further, in 2017, only ten operators in California filed an emissions report with U.S. EPA, while over 250 filed a report with CARB under the current Regulation.

One example of efforts at the state level similar to efforts in California can be found in Massachusetts, which in April 2014 enacted emissions limits for GIE under 310 CMR 7.72 (Massachusetts Department of Environmental Protection 2014). Under this regulation, all new GIE equipment are required to demonstrate a maximum annual SF_6 leak rate of one percent, and the state-imposed system-wide maximum leak rates on

[2] SF_6 is a fluorinated GHG.

large utilities (Eversource and National Grid) that decline to one percent in 2020. In August 2017, Massachusetts amended the regulation to include mass-based limits that decline annually in conjunction with the existing maximum leak rates. The state made this change because the mass-based limits prevent increases in SF_6 emissions that could otherwise occur due to deployment of additional GIE. They chose to retain the leak rate requirement in addition to maintaining the stringency of the existing program.

II. THE PROBLEM THAT THE PROPOSAL IS INTENDED TO ADDRESS

A. Description of the Public Problem

Climate scientists agree that global warming and other shifts in the climate system observed over the past century are caused by human activities. These recorded changes are occurring at an unprecedented rate (Cook et al. 2016). According to new research, unabated GHG emissions could result in sea levels rising up to ten feet by the end of this century—an outcome that could devastate coastal communities in California and around the world (California Ocean Protection Council 2017).

California is already feeling the effects of climate change, and projections show that these effects will continue and worsen over the coming centuries. The impacts of climate change have been documented by the Office of Environmental Health Hazard Assessment (OEHHA) in the Indicators of Climate Change Report (OEHHA 2018), which details the following changes that are occurring already:

- A recorded increase in annual average temperatures, as well as increases in daily minimum and maximum temperatures;
- An increase in the occurrence of extreme events, including wildfires and heat waves;
- A reduction in spring runoff volumes as a result of declining snowpack;
- A decrease in winter chill hours necessary for the production of high-value fruit and nut crops; and
- Changes in the timing and location of species sightings, including upslope migration of flora and fauna.

In addition to these trends, the State's current conditions point to a changing climate. California's recent historic drought led to land subsidence, pest invasions that killed over 100 million trees, and water shortages throughout the State. Recent scientific studies show that such extreme drought conditions are more likely to occur due to the changing climate (Diffenbaugh et al. 2015; Cayan et al. 2010). The total statewide economic cost of the 2013–2014 drought was estimated at $2.2 billion, with a total loss of 17,100 jobs (Howitt et al. 2014). In the Central Valley, this drought cost California agriculture about $2.7 billion and more than 20,000 jobs in 2015, which highlights the critical need for the development of drought resilience (Williams et al. 2015). Drought affects other sectors as well. An analysis of the amount of water consumed in meeting California's energy demand between 1990 and 2012 shows that, while California's energy policies have supported climate mitigation efforts, the performance of these policies are increasingly

vulnerable to climate impacts, especially increased hydrologic uncertainty (Fulton and Cooley 2015).

Several publications carefully examined the potential role of climate change in the recent California drought. One study that examined both precipitation and runoff in the Sacramento and San Joaquin River basins found that precipitation and runoff was below normal for ten of the 14 years between 2000 and 2014, and that recent years have been the driest and hottest in the full instrumental record from 1895 through November 2014 (Mann and Gleick 2015). In another study, the authors show that the increasing co-occurrence of dry years with warm years raises the risk of drought and highlights the critical role that elevated temperatures play in altering water availability and increasing the overall intensity and impact of droughts (Diffenbaugh et al. 2015). Generally, the risk of unprecedented drought in the western United States is growing, driven primarily by rising temperatures, regardless of whether or not there is a clear precipitation trend (Cook et al. 2015). Even more recently, California has been experiencing the deadliest wildfires in its history. Climate change is increasing the frequency, severity, and financial impacts of catastrophic events like these.

A warming climate also causes sea level to rise; first, by warming the oceans which causes the water to expand, and second, by melting land ice which transfers water to the ocean. Even if storms do not become more intense or frequent, sea level rise itself will magnify the adverse impacts of storm surges and high waves on the California coast. Some observational studies report that the largest waves are already getting higher and winds are getting stronger (National Research Council of the National Academy of Sciences 2012). Further, as temperatures rise and GHG concentrations increase, more carbon dioxide dissolves in the ocean, increasing its acidity. More acidic ocean water affects a wide variety of marine species, including species that people rely on for food. Recent projections indicate that, if no significant GHG mitigation efforts are taken, the San Francisco Bay Area may experience sea level rise between 1.6 and 3.4 feet. In an extreme scenario involving the rapid loss of the Antarctic ice sheet, sea levels along California's coastline could rise up to ten feet by 2100 (California Ocean Protection Council 2017). This change is likely to have substantial ecological and economic consequences in California and worldwide (Chan et al. 2016).

While more intense dry periods are anticipated under warmer conditions, extremes on the wet end of the spectrum are also expected to increase due to more frequent warm, wet atmospheric river events and a higher proportion of precipitation falling as rain instead of snow. In recent years, atmospheric rivers have been recognized as the cause of the large majority of major floods in rivers all along the U.S. West Coast and as the source of 30–50 percent of all precipitation in the same region (Dettinger 2013). These extreme precipitation events, together with the rising snowline, often cause devastating floods in major river basins (e.g., California's Russian River). It was estimated that the top 50 observed floods in the U.S. Pacific Northwest were due to atmospheric rivers (Warner et al. 2012). Looking ahead, the frequency and severity of atmospheric rivers on the U.S. west coast will increase due to higher atmospheric water

vapor content that occurs with rising temperature, leading to more frequent flooding (Hagos et al. 2016; Payne and Magnusdottir 2015).

Looking globally, climate change can drive extreme weather events, such as coastal storm surges, droughts, wildfires, floods, and heat waves, and disrupt environmental systems including our forests and oceans. As GHG emissions continue to accumulate and climate disruption grows, such destructive events will become more frequent. Several recent studies project increased precipitation within hurricanes over ocean regions (Easterling et al. 2016; National Academy of Sciences 2016). The primary physical mechanism for this increase is higher water vapor content in the warmer atmosphere, which enhances moisture convergence in a storm for a given circulation strength. Since hurricanes are responsible for many of the most extreme precipitation events, such events are likely to become more extreme. Anthropogenic warming by the end of the 21st century will likely cause tropical cyclones globally to become more intense on average. This change implies an even larger percentage increase in the destructive potential per storm, assuming no changes in storm size (Sobel et al. 2016; Kossin et al. 2016). Thus, the historical record, which once set expectations for the range of weather and other natural events, is becoming an increasingly unreliable predictor of the climate conditions we will face in the future. Consequently, the best available science must drive effective climate policy.

It is imperative that California continue its work to reduce GHG emissions in order to decrease the probability of these impacts. In 2005, Governor Schwarzenegger issued Executive Order S-3-05 (EO S-3-05), which set, among other things, targets of reducing statewide GHG emissions to 1990 levels by 2020 and to 80 percent below 1990 levels by 2050. In 2006, California enacted AB 32 to address this public problem by requiring cost-effective reductions in GHG emissions and by codifying the 2020 target. AB 32 directed CARB to continue its leadership role on climate change and to develop a scoping plan identifying integrated and cost-effective regional, national, and international GHG reduction programs. In 2015, Executive Order B-30-15 (EO B-30-15) set a goal of reducing statewide GHG emissions to 40 percent below 1990 levels by 2030. In 2016, California enacted SB 32, which codified the 40 percent reduction goal from 1990 levels by 2030.

In July 2017, California enacted a legislative package clarifying the role of the Cap-and-Trade Program in achieving the 2030 GHG reduction target (AB 398; Chapter 135, Statutes of 2017) and establishing a new program to improve air quality in local communities (AB 617; Chapter 136, Statutes of 2017). This legislation helps ensure that California continues to meet its ambitious climate change goals while addressing air pollution in communities with the dirtiest air. AB 398 also provided direction on the 2017 Scoping Plan Update and required its adoption by January 1, 2018. On December 14, 2017, the Board unanimously approved the 2017 Climate Change Scoping Plan (CARB 2017), which sets out specific measures to accomplish California's plan to reduce climate-changing gases an additional 40 percent below 1990 levels by 2030 pursuant to SB 32.

The revisions contained in the proposed Regulation will reduce SF_6 emissions and therefore contribute to achieving California's ambitious climate goals. These goals, the critical problem of climate change, and the impacts that California is already facing due to a changing climate create a sense of urgency to reduce emissions from all sources, in line with Board direction under Resolution 17-46.

B. Proposed Solutions to the Problems

The proposed amendments will help achieve the goals of SB 32 by reducing GHG emissions from this source category relative to business-as-usual, primarily through the phase-out of SF_6 GIE. The proposed revisions also clarify regulatory requirements, improve the ability of some regulated entities to comply with the Regulation, and make changes to improve the accuracy and comprehensiveness of reported data. More specifically, the proposed amendments would achieve the following:

- Expand the scope of the Regulation to cover emissions of all insulating gases with a GWP greater than one, and clarify terminology related to which GIE are covered by the Regulation;
- Establish a timeline for phasing out acquisition of SF_6 GIE in California and create an incentive to encourage GIE owners to acquire non-SF_6 GIE prior to the phase-out;
- Establish a process through which GIE owners could be granted a phase-out exemption to allow them to acquire SF_6 GIE after the phase-out, but only when certain conditions are met;
- Establish alternative emissions limits for small-capacity GIE owners to improve their ability to comply with the Regulation, assign each GIE owner an emissions limit in $MTCO_2e$ (as opposed to the current SF_6-specific emission rate limit), and establish methods to minimize the growth of the emissions limit over time; and
- Revise reporting requirements to improve reporting accuracy, clarify requirements, close gaps in accounting for SF_6 and other covered insulated gases, and improve CARB staff's ability to verify reported data.

Each of these proposed changes to the Regulation are explained here in further detail.

1. Expanding Scope and Clarifying Coverage of the Regulation

The purpose of the proposed Regulation is to further reduce emissions by phasing out SF_6 use (as discussed in section II.B.2. of this ISOR below) so that GIE owners will transition to use of non-SF_6 GIE, some of which may utilize GHGs other than SF_6 that have substantially lower GWPs than SF_6. The introduction of insulating gases that contain a GHG other than SF_6 necessitates expanding the scope of the Regulation to include GHGs with a GWP greater than one.

Staff proposes only to require the reporting and regulatory coverage of insulating gases with a GWP greater than one because the amount of GHGs with GWPs less than or equal to one that would be used in GIE would have a relatively small potential impact to

global warming (in $MTCO_2e$). Emissions of GHGs with a GWP of one have a climate warming impact commensurate with CO_2. Whereas CO_2 is released in large volumes from industrial processes, power generation, and transportation (among other sources), the volume of CO_2 and other gases with a GWP less than or equal to one contained in GIE through the State is anticipated to be very low. If all SF_6 in active, non-hermetically sealed GIE in California at present were converted to CO_2, the amount of CO_2 in GIE statewide would only be about 1,000 $MTCO_2e$. Annual CO_2 emissions in this case would be roughly ten metric tons (assuming a one-percent leak rate as required by the Regulation), which is roughly equivalent to the emissions from driving two passenger vehicles for a year.[3] Therefore, in response to this fact and suggestions from stakeholders, the amendments propose to exclude from reporting any GIE or containers that contain insulating gas with a GWP equal to or less than one.

Throughout the proposed Regulation and this document, the term "SF_6" was in many places replaced with "insulating gas with a GWP greater than one" or "covered insulating gas," except in cases where specific references to SF_6 are still needed. These replacements were made because the proposed Regulation is expanded to cover all GHGs with a GWP greater than one. To capture this and other changes, the name of the Regulation is also being changed from "Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear" to "Regulation for Reducing Greenhouse Gas Emissions from Gas-Insulated Equipment." This change also serves to clarify the devices covered under the Regulation, changing the term "gas insulated switchgear" to "gas-insulated equipment" in the title and throughout the regulatory text. The latter terminology change would not affect the types of devices covered under the Regulation.

2. SF_6 Phase-Out and Early Action Credit

As described above in section I.C of this ISOR, manufacturers have made significant progress toward production of market-ready GIE that do not contain SF_6. When the current Regulation was enacted in 2010, these emerging technologies were not yet seen as technologically feasible across all voltage levels included in California's electrical transmission and distribution network. Therefore, at that time, the Regulation focused on reducing emissions of SF_6 from GIE currently in the field and GIE that would be installed over the next decade. Since 2011, GIE owners have made strides in reducing their SF_6 emission rate, but only so much can be done to control SF_6 emissions through best practices such as performing regular maintenance, leak detection, and repair. In the present day, as discussed previously in this document, non-SF_6 GIE are commercially available up to 145 kV, and non-SF_6 GIE at even higher voltages are expected to become commercially available over the coming decade. Additional emissions reductions from this source category are possible through the

[3] U.S. EPA Greenhouse Gas Equivalencies Calculator: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator . Last accessed November 20, 2019.

gradual replacement of SF_6 GIE with non-SF_6 GIE, and the proposed SF_6 phase-out is the main driver of the emissions reductions in the proposed Regulation.

The phase-out of SF_6 GIE will serve to drive down California's demand for SF_6, which should reduce production and ultimate emissions of this gas. Though recycling of used SF_6 is common practice, it is rarely destroyed because of the difficulty and cost associated with destruction. Outside of this regulatory amendment process, CARB staff intends to further analyze recycling and destruction trends to understand how to maximize incentives for recycling and ensure that SF_6 is ultimately destroyed instead of being released to the atmosphere.

Setting the Proposed Phase-Out Schedule

In Table 1 and Table 2 of the proposed Regulation, CARB staff proposes a schedule for the phase-out of the acquisition of new SF_6 GIE that is staggered by voltage capacity, short-circuit current rating, and configuration (i.e., above or below ground). In developing the phase-out schedule, CARB staff consulted with more than ten manufacturers currently developing non-SF_6 GIE to learn when their products are expected be commercially available. The most recent consultation happened in the last quarter of 2019. During this more-than-year-long process, manufacturers shared their product development schedule with CARB staff. CARB staff based all the phase-out dates proposed in the Regulation on manufacturers' existing or expected commercial availability dates, plus additional considerations as explained in the following paragraph. Some, but not all, manufacturers have publicly disclosed their product development schedules (details below).

In order to ensure that there is a competitive marketplace for non-SF_6 GIE, to reduce costs for these devices, and in response to stakeholder comments, CARB staff based the proposed phase-out schedule on the anticipated dates when two or more manufacturers have stated that non-SF_6 GIE will be available. Additionally, based on stakeholder comments about the amount of time their organizations generally require to ensure that new products are safe, reliable, and deployable, CARB staff included a three-year period between expected commercial availability and the phase-out date. This three-year delay between commercial availability and SF_6 GIE phase-out will allow for GIE owners to ensure that the equipment is deployed without causing unsafe or unnecessary downtime for GIE owners' systems. Furthermore, regulated entities have informed CARB that their capital planning cycle is typically three to five years. CARB staff proposes that the first phase-out date to be no sooner than January 1, 2025 to accommodate this timeline given that the proposed Regulation is likely to take effect in 2020 or 2021.

The following outlines the information CARB staff used to set the phase-out dates in Table 1 in the proposed Regulation:

- <u>Aboveground, < 38 kV, all short-circuit current ratings (kA)</u>: According to multiple manufacturers and GIE owners, medium-voltage (< 38 kV) non-SF_6 equipment have

been widely produced by a number of manufacturers (ABB 2019a; Eaton 2019; G&W Electric 2019; Huade 2015a; Lemke 2019; Meiden 2016; MEPPI 2016; Siemens 2019a; Siemens 2019b; Toshiba 2019) and used by utilities for more than a decade. Although non-SF_6 GIE at this range are already widely available and used, CARB staff proposes January 1, 2025 as the phase-out date for these GIE to allow sufficient planning to comply with the regulation to phase out SF_6.

- Aboveground, 38 kV, all short-circuit current ratings (kA): At the upper range of the distribution system (38 kV), non-SF_6 GIE that meet California utilities' requirements are either currently available (Meiden 2016) or under development. CARB staff propose January 1, 2028 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2025.

- Belowground, ≤ 38 kV, short-circuit current ratings < 25 (kA): Belowground, non-SF_6 GIE are available at this voltage and short-circuit current rating (Eaton 2019, G&W Electric 2020), and they do not have the same issues with space constraints in existing underground vaults described in the next bullet. Although non-SF_6 GIE at this range are already available, CARB staff proposes January 1, 2025 as the phase-out date for these GIE to allow sufficient planning to comply with the regulation to phase out SF_6.

- Belowground, ≤ 38 kV, short-circuit current ratings ≥ 25 (kA): As mentioned above, non-SF_6 GIE are commonly available at this voltage and short-circuit current rating. However, CARB has received stakeholder feedback that, due to space constraints in existing underground vaults that house this equipment, the available GIE do not generally work for belowground applications. CARB staff propose January 1, 2031 as the phase-out date for these GIE because of expected commercial availability (in response to regulated entity feedback) of non-SF_6 GIE with these specifications that will fit in existing underground vaults by 2028.

Table 1. Phase-out dates for SF_6 GIE with voltage capacity ≤ 38 kV.

Configuration	Voltage Capacity (kV)	Short-Circuit Current Rating (kA)	Phase-Out Date
Aboveground	< 38	All	January 1, 2025
	38	All	January 1, 2028
Belowground	≤ 38	< 25	January 1, 2025
		≥ 25	January 1, 2031

Similar to the process undertaken for Table 1, for higher voltage GIE, staff evaluated the planned commercial availability schedules from various manufacturers and developed the phase-out dates in Table 2 after adding three years for testing, or set the phase-out date as January 1, 2025, for non-SF_6 GIE that is currently available.

- 38 < kV ≤ 145, short-circuit current ratings < 63 (kA): At 72.5 kV, the majority of GIE are rated below 63 kA. There are at least four manufacturers (GE 2019b; Hitachi 2019; Paserba 2020; Roskilly 2019) that have non-SF_6 GIE available currently or will in the coming year. At voltage levels greater than 72.5 kV, and up to and including 145 kV, but with a short-circuit current rating less than 63 kA, GE (GE 2019b), Meiden (Murray 2020), and Siemens (Roskilly 2019) aim to have products available by 2020, with Mitsubishi Electric Power Products, Inc. (MEPPI)'s (Paserba 2020) planned release by 2022. CARB staff proposes January 1, 2025 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2022.

  Of note, very few SF_6 GIE in the State have a voltage capacity greater than 38 kV and less than 72.5 kV and, in general, devices with a voltage capacity of 72.5 kV should be deployable for needs in this voltage range; therefore, the phase-out date for these devices has been bundled with the appropriate phase-out date for 72.5 kV SF_6 GIE.

- 38 < kV ≤ 145, short-circuit current ratings ≥ 63 (kA): As mentioned, the majority of GIE at or below 72.5 kV are also rated below 63 kA, so the applicable GIE in this category (≥ 63 kA) are generally greater than 72.5 kV and up to and including 145 kV. CARB staff is aware of four manufacturers developing GIE at 145 kV, 63 kA; GE (GE 2019b), MEPPI (Paserba 2020), and Siemens (Roskilly 2019) have announced commercial availability no later than 2025. CARB staff proposes January 1, 2028 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2025.

- 145 < kV ≤ 245, short-circuit current ratings < 63 (kA): The information CARB staff received from manufacturers regarding availability of non-SF_6 GIE for this voltage and short-circuit current rating category has been dynamic. MEPPI (Paserba 2020) and Meiden (Murray 2020) have recently announced commercial availability dates for equipment with a voltage capacity of 245 kV, and short-circuit current rating of less than 63 kA, in 2024 and 2026, respectively. Siemens has also planned development at 245 kV but commented that release dates will be driven by market demand (Roskilly 2019). Although the latest information shows only one manufacturer meeting the expected commercial availability of non-SF_6 GIE with these specifications by 2024, GE's (GE 2019b) planned release in 2024 for non-SF_6 GIE at 245 kV and 63 kA is likely a technically feasible option for short-circuit current rating less than 63 kA. Based on this information and the evolving nature of this category's market with at least five manufacturers, CARB staff proposes January 1, 2027 as the phase-out date for these GIE.

- 145 < kV ≤ 245, short-circuit current ratings ≥ 63 (kA): Also at the 245 kV voltage level, for short-circuit current ratings of 63 kA and above, GE (GE 2019b) and MEPPI (Paserba 2020) aim to release their non-SF_6 alternative in 2024 and 2027, respectively. Meiden (Murray 2020) and Siemens (Roskilly 2019) also have plans to develop GIE in this category, although they have not yet announced a schedule.

Based on this information, CARB staff proposes January 1, 2031 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2028.

- > 245, all short-circuit current ratings (kA): GE (GE 2019b) and MEPPI (Paserba 2020) have published their plan to make non-SF_6 GIE in this category commercially available in 2025 and 2030, respectively. Based on this information CARB staff proposes January 1, 2033 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2030.

Table 2. Phase-out dates for SF_6 GIE with voltage capacity > 38 kV.

Voltage Capacity (kV)	Short-Circuit Current Rating (kA)	Phase-Out Date
38 < kV ≤ 145	< 63	January 1, 2025
	≥ 63	January 1, 2028
145 < kV ≤ 245	< 63	January 1, 2027
	≥ 63	January 1, 2031
> 245	All	January 1, 2033

As GIE devices in place today age and need to be replaced, the phase-out schedule will spur replacement of these devices with non-SF_6 GIE. Because non-SF_6 GIE will either not emit GHGs at all, or will emit GHGs with much lower GWPs than SF_6, the effect of the regulatory amendments will be to reduce GHG emissions from this source category in California. Additionally, by creating demand for these technologies in California consistent with the timelines provided in Table 1 and Table 2, GIE manufacturers can expect that a market for their non-SF_6 GIE will exist. The expectation of this market should create an incentive to complete product development as planned. Once the products have been developed, and are broadly deployable, GIE owners beyond California will have an opportunity to utilize these non-SF_6 devices, further reducing SF_6 emissions beyond California's borders.

Early Action Credit

Because the phase-out dates don't begin until 2024, certain types of non-SF_6 GIE are available now, and implementing that technology before the phase-out could negatively impact GIE owners' baseline capacity (explained in section II.B.4. of this ISOR below), the proposed regulatory amendments also include an early action credit. The early action credit would encourage GIE owners to place 72.5 kV or greater non-SF_6 circuit breakers into active service prior to the applicable phase-out date for those devices, excluding non-SF_6 circuit breakers that use oil as an insulating medium. This credit is not available for circuit breakers that use oil as an insulating medium because these types of GIE have been available for many years and, based on conversations with many GIE owners, are generally being replaced with SF_6 circuit breakers due to safety concerns associated with these type of devices.

GIE owners that place qualifying non-SF_6 circuit breakers into active service between January 1, 2021 and the phase-out date for an equivalent SF_6 circuit breaker will receive a credit toward their baseline emissions limit. The credit, as noted in Table 3 of the Proposed Regulation Order and Table 3 in this Staff Report, would be roughly equivalent to the amount of SF_6 in a comparable SF_6 circuit breaker. Effectively, a GIE owner who chooses to install a non-SF_6, non-oil circuit breaker at or above 72.5 kV prior to the phase-out of an equivalent SF_6 circuit breaker would be able to increase their baseline emissions limit by the amount of the credit without actually increasing the volume of SF_6 in their system. This is because they will be installing a circuit breaker that is either GHG free or contains a GHG whose GWP is much lower than that of SF_6. The installation of the new circuit breaker should have minimal impact on a GIE owner's annual emissions, so the impact of the early adoption of non-SF_6 circuit breakers means a slightly higher effective (or equivalent) emission rate when implementing their baseline, and greater flexibility to manage emissions once the baseline goes into effect.

The early action credit is limited to GIE with voltage capacity of 72.5 kV or greater. As mentioned above, non-SF_6 low- and medium-voltage equipment (38 kV and below) have been widely produced by a number of manufacturers and used by utilities for more than a decade, so these devices do not require any additional incentives for installation. Additionally, there are several manufacturers that already offer non-SF_6 circuit breakers at the 72.5 kV level, or will soon. However, staff analysis of available data shows that a relatively small percentage of 72.5 kV circuit breakers in the State are non-SF_6, so these devices are eligible for early action credit because it seems that widespread adoption at this kV level has not yet occurred. Finally, very few SF_6 GIE exist in California at voltage capacity levels between 38 and 72.5 kV, and so early action credit for equipment at this kV level was not included.

CARB staff only considered circuit breakers as eligible for early action credit because, at 72.5 kV and above, 82 percent of the reported GIE in 2018 were circuit breakers, and these circuit breakers represented 64% of total capacity. Most other devices reported at the 72.5 kV level or above (e.g., switches, transformers, circuit switchers) have considerably smaller capacity than that of a circuit breaker, and make up a relatively small proportion of statewide SF_6 capacity.

The early action credits included in Table 3 of the proposed Regulation and Table 3 in this Staff Report (below) were developed based on the average SF_6 capacity of non-hermetically sealed circuit breakers manufactured on January 1, 2016 or later as reported under the current Regulation, at the voltage capacity levels specified in the table. CARB staff only considered SF_6 circuit breakers manufactured on January 1, 2016 or later for this analysis because the SF_6 capacity of circuit breakers has evolved over time, and recently built circuit breakers should better reflect the capacity of new SF_6 circuit breakers acquired in the coming years. Circuit breakers reported to be hermetically sealed were excluded because it is CARB staff's understanding that circuit breakers are not hermetically sealed.

Staff followed the steps listed below to develop the early action credit value for each of the four voltage categories shown below in Table 3.

- Filter data reported to CARB for data year 2018 under the current Regulation to select those devices reported to be non-hermetically sealed, a “circuit breaker” or some variant thereof (e.g., CB), and manufactured on January 1, 2016 or later.
- Divide the resulting data into three voltage categories similar to those categories noted in Table 2 (above), with the exception that the lowest voltage considered is 72.5 kV (for reasons noted above). Devices with voltage of exactly 72.5 kV have their own separate category because reported data indicate these devices have significantly lower SF_6 capacity than 145 kV devices, making it inappropriate to provide all devices in this voltage range the same amount of credit.
- Removed duplicates and devices that appeared to be parts as opposed to a complete circuit breaker. This determination was made for GIE devices with relatively small SF_6 capacity that appear to be components of a circuit breaker as opposed to a circuit breaker itself.

CARB staff noted a rather large range in the SF_6 capacity of the remaining GIE devices at each voltage level and elected to remove from the dataset GIE devices whose capacity was more than one standard deviation from the mean value for each voltage category. This ensures the amount of early action credit provided is as representative as possible of the amount of SF_6 capacity avoided through the use of non-SF_6 circuit breakers. After excluding outliers as described above, CARB staff performed the following calculations to determine the early action credit for each voltage level, based on the GIE devices that had not been excluded from the dataset:

- Calculate the average (mean) SF_6 capacity (pounds of SF_6);
- Convert the result from pounds to metric tons of CO_2e; and
- Round this value to the nearest 100 $MTCO_2e$, which CARB staff believe to be an appropriate level to round the resulting values to given the range of values reported for the SF_6 capacity of individual GIE devices.

The results of this process are shown below in Table 3.

Table 3. Summary of data used to calculate the early action credit values (excluded outliers).

Voltage Capacity (kV)	Number SF_6 GIE Reported	Capacity Range (pounds SF_6)	Aggregate Capacity (pounds SF_6)	Average Capacity (pounds SF_6)	Average Capacity ($MTCO_2e$)	GHG Capacity of Equivalent SF_6 GIE ($MTCO_2e$) ($C_{e,k}$)
72.5	525	15-52	15,955	30.4	313	300
72.5 < x ≤ 145	146	48-95	9,326	63.9	660	700
145 < x ≤ 245	142	95-244	26,749	188.4	1,947	1,900
> 245	21	108-482	4,797	228.4	2,361	2,400

3. SF_6 Phase-Out Exemption Process

As described above in section II.B.2 of this ISOR, CARB staff developed the phase-out schedule after discussing non-SF_6 GIE availability dates with over ten manufacturers for over a year. As a result of that process, CARB staff believes that key non-SF_6 equipment types, including circuit breakers, distribution switches, and gas-insulated substations, will be available in advance of the phase-out dates, accounting for additional time GIE owners will need to test the new products. CARB staff, however, recognizes that, in some specific cases, GIE owners may need to install SF_6 GIE after the corresponding phase-out dates.

Therefore, the proposed Regulation adds a new exemption process that allows GIE owners to acquire SF_6 GIE after the applicable phase-out date under any of four conditions. The first circumstance, as described in more detail below, occurs when the GIE owner submits, and CARB approves, an SF_6 phase-out exemption request. The other circumstances under which acquisition of SF_6 GIE after the applicable phase-out date is allowed are when the SF_6 GIE device was present in the State for a prior data year, the SF_6 GIE device was purchased prior to the applicable phase-out date (provided the SF_6 GIE device enters California no later than 24 months after the purchase date), or the SF_6 GIE device is a replacement provided by the manufacturer under the terms of the manufacturer's warranty.

Each of these provisions allow for SF_6 GIE to be acquired after the applicable phase-out date during the course of standard business operations. For example, one GIE owner may wish to purchase a site that contains SF_6 GIE from another GIE owner after the applicable phase-out date. Under this provision, such an acquisition would be allowed. During the public process GIE owners demonstrated that once a GIE device has been "purchased," it may still take up to two years for the device to be manufactured and/or delivered to the purchaser. To allow for this standard industry practice to continue,

acquisition of SF_6 GIE after the phase-out is allowed so long as the SF_6 GIE were purchased prior to the phase-out and enter California no later than 24 months after the purchase date. Finally, during the public process, stakeholders noted that an SF_6 GIE device acquired prior to the applicable phase-out date may malfunction and be eligible for replacement under the terms and conditions of their agreement with the manufacturer, which would entail bringing a new SF_6 GIE device into the State after the phase-out. This provision allows the manufacturer to send a replacement SF_6 GIE device to the GIE owner after the phase-out, so long as the original device malfunctioned while under the terms of the manufacturer's warranty period. This addition is necessary to ensure that a GIE owner who happens to purchase a defective device is not subject to financial implications of being unable to acquire a replacement when they would otherwise be able to take advantage of the manufacturer warranty.

To obtain a phase-out exemption, the GIE owner must submit a phase-out exemption request to CARB that would explain and justify the need for the exemption. If the request is approved, the GIE owner could acquire the SF_6 GIE described in the request and install the SF_6 GIE in the location(s) described in the exemption request. There are four types of exemption requests:

1. Non-SF_6 GIE are unavailable from at least two suppliers.

This provision is included in the event that non-SF_6 GIE of the equipment type and characteristics necessary for the particular project(s) or application(s) is not available or is only available from one supplier by the phase-out date. In addition to the need for an exemption when non-SF_6 alternatives are completely unavailable, stakeholders have expressed to CARB staff the importance of having a choice of manufacturers for a given product, which ensures a more competitive marketplace. Per stakeholder feedback, many GIE owners have purchasing requirements that they must receive bids from at least two manufacturers to be able to purchase a product. Having two manufacturers also avoids a situation where a sole manufacturer could have undue influence on the market for a certain GIE device. Therefore, CARB staff is proposing GIE owners be eligible to use this exemption when a non-SF_6 alternative product is not available from any suppliers or is available from only one supplier.

2. Available non-SF_6 GIE cannot meet the size requirements.

Stakeholders have indicated to CARB staff that future purchases of SF_6 GIE may be required where non-SF_6 GIE do not fit the physical constraints—including three-dimensional area—of available space. The physical characteristics of alternative technologies relative to SF_6 are such that some non-SF_6 GIE may need to be larger than their SF_6 counterparts. While this does not inherently present an installation issue, and manufacturers have consistently stated to CARB that they intend to produce non-SF_6 GIE that occupy the same three-dimensional area of an equivalent SF_6 device, CARB staff acknowledges that, in some cases non-SF_6 GIE may not meet the size specifications required by the GIE owner. For example, some SF_6 GIE are housed in space-constrained areas like underground vaults, such that non-SF_6 GIE might not fit in the space or would not allow needed clearance for installation and/or maintenance. In

these cases, it may be impossible to retrofit the existing infrastructure to accommodate a non-SF_6 GIE device.

3. Available non-SF_6 GIE cannot be used due to incompatibility.
In some cases, non-SF_6 alternatives may be available, but unable to interface with the equipment and/or infrastructure at the site. For example, a set of existing SF_6 GIE may work in a series, and if an SF_6 GIE device in the middle of the series fails, the GIE owner may be unable to replace it with a non-SF_6 GIE device due to incompatibility with the other SF_6 GIE devices. Or, in a space-constrained area as described above, it may be possible to insert the non-SF_6 device, but not possible to establish the necessary connections to the device to power it and/or operate it safely.

4. Available non-SF_6 GIE are not suitable based on safety or reliability requirements.
It is critical that the electrical grid and other operations supported by GIE continue to function in a safe and reliable manner. As with the adoption of any new or different technology, operators will need to ensure that non-SF_6 GIE meet their own internal safety and reliability requirements. As stated above, at some voltage levels, non-SF_6 GIE are only recently being commercialized or are not yet available today. To the extent that available non-SF_6 GIE do not meet a GIE owner's safety or reliability requirements, owners could submit a phase-out exemption request. It should be noted that some stakeholders indicated that their current corporate policies may not allow installation of non-SF_6 equipment in the period directly after the phase-out because these equipment may not yet meet their minimum standards that govern testing and run-time of the equipment. However, GIE owners should not be allowed to take advantage of this exemption by refraining from testing non-SF_6 GIE and then postponing installation of non-SF_6 GIE on the basis that the non-SF_6 GIE has not met the GIE owner's safety or reliability testing requirements (because the owner has postponed completion of the testing). To prevent such a situation from occurring, if the GIE owner's justification cites a company-specific policy or procedure that available non-SF_6 GIE do not currently meet (for example, the company requires three years of testing for new equipment), the justification must also provide an explanation as to how the GIE owner will address the situation to enable transition to non-SF_6 alternatives in a timely manner.

If a GIE owner seeks an SF_6 phase-out exemption for any of the four reasons provided above, the GIE owner would submit an exemption request to CARB. Within seven days, CARB staff would acknowledge receipt. Within 45 days of the submittal, CARB would inform the GIE owner whether the application is complete or if additional information is required to complete the application. Within 45 days of the receipt of additional information, CARB would inform the GIE owner whether the application is complete. Within 30 days of the application being deemed complete, CARB would inform the GIE owner whether the request is approved or denied.

Stakeholders have noted that, in some relatively infrequent cases, a GIE device (SF_6 or non-SF_6) may have a "catastrophic failure" that impacts human safety and/or substantially impairs, damages or shuts down part or all of a system. Whenever a

"catastrophic failure," as defined in the proposed Regulation, occurs, the GIE owner may submit an expedited exemption request to CARB within 14 days of the event. CARB staff would then have 7 days to review the request and notify the submitter whether the application is complete or whether additional information is necessary to complete the application. Within 7 days of CARB's notification to the submitter that the application is eligible for expedited review, CARB must notify the submitter whether it is approved or denied.

4. Revisions to the Emission Rate Limit

The proposed Regulation transitions the basis for evaluating emissions compliance from an emission rate limit to an annual emissions limit measured in $MTCO_2e$. Further, the proposed Regulation contains revisions that would change the allowed emissions levels for GIE owners with smaller capacities of SF_6 and other covered insulating gases. As explained below, this change will enable small-capacity GIE owners to comply with the Regulation. The emissions limit will be structured to support the phase-out of SF_6, incentivize adoption of non-SF_6 GIE, and ensure continued emissions reductions despite the anticipated growth of GIE capacity.

Calculating the Emission Rate Limit in the Current Regulation

The current Regulation requires GIE owners to reduce their SF_6 emission rate by one percent per year over a ten-year period—from ten percent in 2011 to one percent in 2020. To determine their annual emission rate under the current Regulation, a GIE owner must calculate their annual SF_6 emissions and their average system nameplate capacity by summing the nameplate capacity of all active GIE, weighted by the number of days in the data year that the device was "active GIE." The average system nameplate capacity is equivalent to the average amount of SF_6 capacity that was in active service during the data year. The GIE owner divides their SF_6 emissions—as determined through the equation in section 95356(d) of the current Regulation—by the calculated average system nameplate capacity to determine their emission rate. GIE owners then compare the calculated SF_6 emission rate to the maximum value allowed by the Regulation to determine if they were in compliance (i.e., emissions were lower than the allowed rate) during the data year.

Transition to an Annual Emissions Limit

CARB staff seeks to accelerate adoption, and track the use of, non-SF_6 insulating gases that have significantly lower GWPs than SF_6. Because the SF_6 emission rate limit in the current Regulation does not capture these alternate gases, staff proposes the use of an emissions limit as the method for determining compliance with the Regulation. Rather than evaluating only SF_6 emissions as a percent of average system nameplate capacity, the Proposed Regulation Order would require GIE owners to calculate both their

emissions and average system capacity[4] for all insulating gases with a GWP greater than one. The proposed Regulation includes two methods, differentiated by a GIE owner's average system capacity, for calculating the specific emissions limit that applies to any individual GIE owner. GIE owners would calculate their applicable emissions limit in $MTCO_2e$ and then compare their calculated emissions to their emissions limit established pursuant to the Regulation to determine if they were in compliance (i.e., emissions were lower than the allowed emissions limit) during the data year. Both the calculated emissions and emissions limit would be reported to CARB. CARB staff will review reported activity data to ensure the GIE owner has calculated the emissions and emissions limit correctly. Establishment of an emissions limit, instead of an emission rate limit, would also allow for each GIE owner's limit to be set based on a baseline value, as described below.

Calculating the Annual Emissions Limit for GIE Owners with Different System Capacities

From 2020[5] to 2024, GIE owners with average system capacities of 10,000 $MTCO_2e$ or greater will have an annual emissions limit equivalent to one percent of average system capacity (considering all insulating gases with a GWP greater than one), maintaining equivalency with the current Regulation. For GIE owners with average system capacities less than 10,000 $MTCO_2e$, this emissions limit will be equivalent to two percent of average system capacity (considering all insulating gases with a GWP greater than one), or 50 $MTCO_2e$, whichever is greater.

As shown in Table 4, the impact of the change to the emissions limit for GIE owners with average system capacities below 10,000 $MTCO_2e$ would be that 196 of the 273 GIE owners who submitted a data year 2018 report would have an annual emissions limit initially equivalent to either a two-percent emissions rate or 50 $MTCO_2e$ (if the emissions rate would otherwise fall below 50 $MTCO_2e$), while the remaining 77 GIE owners would have an annual emissions limit initially equivalent to a one-percent emissions rate. In aggregate, the maximum allowable emissions from the 196 GIE owners that would have the equivalent of a two-percent emissions rate limit, based on information reported for data year 2018, would be approximately 8,600 $MTCO_2e$ per year instead of 4,300 $MTCO_2e$. The maximum allowable annual emissions from the 77 GIE owners who would have the equivalent of a one-percent emissions rate limit would be approximately 249,000 $MTCO_2e$ per year based on information reported for data year 2018. Therefore, the incremental potential emissions allowed under this provision would be equivalent to less than two-percent of total potential emissions allowed under the current Regulation.

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[4] In the proposed Regulation, the term "average system capacity" replaces "average system nameplate capacity" because of other changes that remove reliance on a GIE device's nameplate capacity as a proxy for the amount of covered insulating gas in the device.

[5] For data year 2020 only, the emissions limit considers SF_6 only. See the discussion in section III of this ISOR, Rationale for Section 95353(b)(1).

Table 4. Emissions Limits and Projections for GIE Owners by System Capacity

GIE Owner System Capacity ($MTCO_2e$)	Number of GIE Owners	Cumulative Emissions Limit – Current Regulation ($MTCO_2e$)	Cumulative Emissions Limit – Proposed Regulation ($MTCO_2e$)
≥ 10,000	77	249,000	249,000
< 10,000	196	4,300	8,600

The proposal to establish alternative emissions limits for small-capacity GIE owners is the result of discussions with stakeholders in recent years, through which CARB learned that it would be difficult for GIE owners with relatively small SF_6 capacities to meet a one-percent emissions rate on a consistent basis. This is because the pressure gauges installed on SF_6 GIE may not trigger a notification that there is a leak until after several pounds of SF_6 have already been emitted. For the smallest GIE owners, a single event such as this could release enough SF_6 to cause the GIE owner to exceed their annual emission rate limit before they were even aware of the leak.

CARB staff's goal for the proposed Regulation was to set emissions limits such that GIE owners of all sizes would be held to stringent but reasonable limits on emissions. In an early draft of the potential amendments released during the informal public process, CARB staff proposed a threshold value of 5,500 $MTCO_2e$ (~500 pounds of SF_6) average system capacity, below which level entities would be required to report emissions to CARB but would not be held to an emissions limit. Many stakeholders requested the value be increased to 10,000 $MTCO_2e$ (~1,000 pounds of SF_6), and provided information that demonstrated the challenge of maintaining an emission rate below one percent (~10 pounds of SF_6) on an annual basis.

Because it would be difficult for GIE owners with average system capacities below 10,000 $MTCO_2e$ to comply with a one-percent emission rate limit, and because these GIE owners are a relatively small source of SF_6 emissions (they make up less than two percent of statewide SF_6 capacity), staff proposes a threshold of 10,000 $MTCO_2e$, below which the emissions limit would be set at the equivalent of two percent of average system capacity. These GIE owners were already subject to a two-percent rate limit in 2019, and stakeholders have explained that a one-percent emissions rate limit would be problematic given that a single leak could put them over their emissions limit before the GIE even alarms. To address these concerns, CARB staff propose to retain the two-percent equivalent limit through 2034 for GIE owners below the 10,000 $MTCO_2e$ threshold.

CARB staff also proposes setting a minimum emissions limit that would prevent the emissions limit from falling below 50 $MTCO_2e$ (~5 pounds of SF_6). This minimum emissions limit is intended to prevent small-capacity GIE owners from falling out of compliance due to the one-percent tolerance for scale inaccuracy allowed for under the proposed Regulation. The 50 $MTCO_2e$ value was selected because reported data show that a GIE owner that uses a scale meeting the proposed Regulation's accuracy requirements should not see more than four pounds of variability in the amount of SF_6

they measure from year to year. As such, establishing a 50 $MTCO_2e$ mass-based emissions limit should enable the smallest GIE owners to comply with the Regulation on an annual basis.

Establishing a Baseline to Incentivize Adoption of Non-SF_6 GIE

As demonstrated in the section above, GIE owners with smaller capacities of SF_6 (and other covered insulating gases) may experience more difficulty complying with the emissions limit than GIE owners with larger capacity. Staff was therefore concerned that, as the proposed Regulation seeks to phase out SF_6 GIE, maintaining an emissions limit that decreases proportionally with decreases in capacity could actually disincentivize the replacement of SF_6 GIE with non-SF_6 GIE. That is, GIE owners may keep and operate their SF_6 GIE longer than they otherwise would have in order to maintain a higher capacity level and, thus, a higher emissions limit.

This potential tendency to retain SF_6 GIE longer could exacerbate the existing trend, evidenced by data reported under the Regulation, of statewide SF_6 capacity in active, non-hermetically sealed GIE growing by one to five percent per year. Further, in meetings with stakeholders during the informal public process to amend the Regulation, GIE owners noted that they anticipate a higher rate of growth of SF_6 capacity in the coming years compared to the historical rate. Reasons for the expected increase include replacement of oil circuit breakers with SF_6 breakers, growth in demand for electricity due to population growth and the State's goal of increasing electrification of the transportation sector, and changes in the electricity transmission and distribution system to accommodate the growth in renewables.

Because the proposed Regulation establishes an emissions limit that is the equivalent of one or two percent of average system capacity, as capacity grows, so too would the emissions allowed under the Regulation. To address this issue, the proposed Regulation mandates the use of a baseline emissions limit starting in data year 2025. This approach would "fix" average system capacity—and corresponding emissions limit—at a point in time, after which any reduction in actual SF_6 capacity would not result in a commensurate reduction in average system capacity used to evaluate compliance with the Regulation. An emissions limit with a fixed baseline would incentivize a GIE owner to replace SF_6 GIE with non-SF_6 GIE after the baseline is set because the transition to non-SF_6 GIE would decrease the actual amount of SF_6 in their system, which would reduce the risk of SF_6 emissions, without any corresponding decrease in average system capacity used to evaluate regulatory compliance. Because average system capacity will not decrease when SF_6 GIE are replaced with non-SF_6 GIE, the equivalent allowed emission rate will effectively grow over time, making it easier to comply with the Regulation.

GIE owners have indicated that a one-percent emission rate, or two-percent for small-capacity GIE owners, will be challenging to maintain year after year. The baseline method for calculating average system capacity, coupled with the early action credit, gives GIE owners flexibility to facilitate compliance with a challenging emissions limit by

replacing SF_6 GIE with non-SF_6 both before and after the phase-out. This incentive would encourage a faster turnover of the SF_6 GIE fleet, reducing GHG emissions in the long-run.

Per the proposed Regulation, each GIE owner would determine their baseline system capacity as of December 31, 2024, the last day before the phase-out of SF_6 begins, and would use that value as a starting point to determine their annual emissions limit moving forward. To establish the December 31, 2024 baseline, GIE owners will calculate the system capacity of "active GIE" on that day. This amount should represent the capacity of all GIE that use a covered insulating gas placed into active service prior to the first phase-out date, and will include the early action credit value discussed above.

Per Tables 1 and 2 of the Proposed Regulation Order and this Staff Report, though the phase-out for certain SF_6 GIE begins January 1, 2025, other SF_6 GIE will not phase out until later years (e.g., 2028, 2031). Therefore, GIE owners can continue to purchase those SF_6 GIE until their corresponding phase-out dates. If these SF_6 GIE are installed to expand existing operations, as opposed to replacing existing GIE, actual system capacity will increase by the capacity of the additional SF_6 GIE. Because the purchase of SF_6 GIE with a later phase-out date is not yet restricted by the Regulation, the GIE owner may be able to add the capacity of these SF_6 GIE to their baseline capacity, used to evaluate compliance with the emissions limit, in future years, as explained below.

The baseline approach can serve to balance future additions of SF_6 GIE that are purchased after the corresponding phase-out date with an approved phase-out exemption. While staff anticipates that non-SF_6 GIE will be available by the specified phase-out dates, the inclusion of the SF_6 phase-out exemptions acknowledges that installation of non-SF_6 GIE may not be possible in certain circumstances. Nevertheless, to incentivize the transition to non-SF_6 GIE, and to dis-incentivize over-reliance on SF_6 phase-out exemptions, SF_6 GIE acquired after the phase-out dates will not be eligible to be added to the baseline system capacity (SF_6 GIE acquired before the relevant phase-out date, however, could be eligible to be added). Therefore, every SF_6 GIE device acquired with a phase-out exemption will make the Regulation *harder* for a GIE owner to comply with, since their baseline system capacity will remain fixed despite the increase in the number of SF_6 devices. The existence of the early action credit and the ability of the GIE owner to implement non-SF_6 GIE in other parts of their system (that is, for applications and voltage levels where it is feasible for the GIE owner to do so) provide GIE owners with a number of planning tools and levers to balance their effective emission rate and ensure compliance.

After 2024, calculation of the annual emissions limit will be simpler in some ways than under the current Regulation. Under the current Regulation, the GIE owner must calculate their average nameplate system capacity (C_{avg}) by summing the capacity of all active GIE, weighted by the number of days in the data year that the device was "active GIE." Beginning in 2025, all devices that were previously "active GIE" will be accounted for in the "baseline capacity," and the C_{avg} term will only be calculated for newly active GIE devices that were not included in the calculation of their baseline capacity on

December 31, 2024, did not replace a GIE device included in the baseline capacity on December 31, 2024, and were not acquired with an SF_6 phase-out exemption. This change should reduce the amount of effort involved with calculating the annual emissions limit relative to the current Regulation.

Emissions Limit Step-Down

Due to the phase-out requirements for SF_6 GIE, which will begin January 1, 2025 and which culminate in the phase-out of all new, non-exempt SF_6 GIE by January 1, 2033, each GIE owner's actual SF_6 capacity should begin to decline as existing SF_6 GIE reach the end of their useful life and are replaced with non-SF_6 GIE. The baseline approach remains somewhat fixed, relative to decreases in actual capacity of covered insulating gases, so that each GIE owner's effective emission rate could increase after 2025 as their SF_6 GIE are replaced with non-SF_6 GIE without a corresponding drop in their baseline capacity. To ensure that the Regulation remains stringent, staff proposes to decrease, or step down, the emissions limit over time to maintain an effective emission rate limit near that imposed under the current Regulation.

Starting in 2033, after the final phase-out date, statewide SF_6 capacity should begin to decline more consistently relative to pre-2033 rates, when the purchase of SF_6 GIE at some voltage levels is still permitted. Beginning in 2033, CARB staff estimates that roughly $1/40^{th}$ (2.5 percent) of statewide SF_6 capacity should be replaced each year. As such, after two years (2035), statewide SF_6 capacity should have dropped by five percent (2.5 times two). (Note that, to be conservative, this calculation does not include the decrease in SF_6 capacity that is expected to occur between 2025 and 2032, given that the phase-out will not apply to all SF_6 GIE during that period.) Therefore, CARB staff propose that in 2035, each GIE owner's emissions limit will be reduced by five percent, and remain at that level going forward. This change will be made through a decrease in the annual emission factor, as shown in Tables 4 and 5 of the Proposed Regulation Order.

5. Changes to Required Procedures and Reported Elements

The proposed Regulation contains revisions that would change reporting requirements to improve reporting accuracy, clarify requirements, close gaps in accounting for SF_6 and other covered insulated gases, and improve CARB staff's ability to verify reported data.

The current Regulation includes the equation a GIE owner would use to determine their annual emissions. Values such as the amount of SF_6 inside active GIE and the nameplate capacity of these devices were required to be determined by the GIE owner to calculate annual emissions, but these values were not required to be reported to CARB. As a result, during the process of verifying annual report submissions, CARB staff often needed to ask GIE owners to provide these values. Under the proposed Regulation, all values that serve as inputs to the emissions calculation must be reported to CARB. Inclusion of these values in the annual report will facilitate CARB staff's ability

to verify that emissions were reported correctly without having to request additional information from the GIE owner, saving time both for the regulated community and for CARB staff.

Other provisions in the proposed amendments should improve the quality of reported data, such as those related to the inventory of containers used by the GIE owner in relation to GIE that uses a covered insulating gas. The proposed Regulation specifies that each GIE owner must develop a container tracking procedure that meets certain minimum standards. When followed, these procedures should reduce the number of containers left unaccounted for in annual reports and ensure that containers are weighed at the points in time required by the Regulation. The proposed amendments also specify the requirements that must be followed to determine the amount of covered insulating gas in containers that are owned by the GIE owner or those that are not owned by the GIE owner but are used by the GIE owner or stored on its property (such as those brought on-site by a third party when servicing GIE). This change clarifies what GIE owners must inventory by requiring that they account for the covered insulating gas in each container, which will improve the accuracy of the emissions reported. These changes are being proposed in response to significant data quality issues that CARB staff have identified when verifying reported data, and are critical to the Regulation given that these data serve as inputs to the calculation of annual emissions.

Staff also proposed changes to clarify or improve how covered insulating gas in GIE is to be accounted for. The proposed Regulation specifies a method that GIE owners must use to determine the amount of covered insulating gas in each device when it is initially placed into active service. This value would be determined by summing the amount of covered insulating gas initially added to the GIE device by the manufacturer and the amount of gas transferred into the device, if any, prior to initial activation by the GIE owner or their designee. Calculating this value will allow GIE owners and CARB staff to determine the amount of covered insulating gas in the GIE device at activation. This is important because this amount serves as an input to the emissions equation. The current Regulation estimates this value based on the nameplate capacity of the GIE device. However, CARB has heard from a number of GIE owners that an individual GIE device's nameplate capacity value may not accurately reflect the amount of covered insulating gas that a device actually contains, and can be off by as much as 20 percent. Thus, under the current Regulation, the possible inaccuracy of nameplate capacity values has led GIE owners to call into question whether emissions that are calculated at retirement are the result of inaccuracies in the nameplate capacity rather than actual emissions. The proposed amendments solve this issue by revising the emission equation to have GIE owners use the calculated covered insulating gas at activation value, rather than the nameplate value, when possible. This should result in more accurate accounting for any emissions from the device not already accounted for during additions of gas to the GIE device during the device's lifetime. Making use of this newly calculated value moving forward should more accurately reflect the actual emissions of covered insulating gas to the atmosphere during the GIE device's lifetime.

Finally, the proposed Regulation addresses issues with inputs to the emissions calculation that reflect the end of a GIE device's active use. The current emissions calculation requires the nameplate capacity of a device be accounted for when the device is "retired," but the term "retired" is not defined. Therefore, a GIE device can be taken out of active service and left indefinitely without accounting for the gas, or lack thereof, in the device. Therefore, any emissions from the device that occurred during its lifetime would not have been accounted for, and gas could continue to be released from the device after it is taken out of active service. Also, the emissions equation in the current Regulation includes the SF_6 removed from a "retired" GIE device, along with the nameplate capacity of that device, but there is no requirement for when that gas must be extracted. As such, this creates an emissions imbalance if a GIE owner considers a device to be "retired" in one data year (that is, counted it as being removed from active capacity), and extracts the SF_6 in a different data year. This temporal disconnect could affect GIE owner compliance as it requires the reporting of emissions that didn't actually occur in one year while resulting in negative emissions, which could serve to offset actual emissions, in another year. These issues have been addressed in the proposed Regulation by adding requirements that, for any GIE device that has been active GIE at some point during ownership by the GIE owner, covered insulating gas must be removed prior to that device being taken out of the GIE owner's inventory and/or the covered insulating gas must be removed and accounted for after the GIE device is not active GIE for five consecutive years.

In summary, these changes will clarify for GIE owners what is required of them, ensure they make the required measurements at the proper points in time, and ensure all data required under the Regulation are collected. Additionally, the emissions calculated under the Regulation should more accurately reflect the GIE owner's actual emissions of covered insulating gas(es) to the atmosphere.

III. THE SPECIFIC PURPOSE AND RATIONALE OF EACH ADOPTION, AMENDMENT, OR REPEAL

Regulation Name: Regulation for Reducing Greenhouse Gas Emissions from Gas-Insulated Equipment

Purpose of Regulation Name "Regulation for Reducing Greenhouse Gas Emissions from Gas-Insulated Equipment"
The name of the Regulation is being changed from "Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear" to "Regulation for Reducing Greenhouse Gas Emissions from Gas-Insulated Equipment."

Rationale for Regulation Name "Regulation for Reducing Greenhouse Gas Emissions from Gas-Insulated Equipment"
The proposed change is necessary to expand the scope of the Regulation to cover not only SF_6 but all GHGs with a GWP greater than one, and to clarify the devices covered under the Regulation. The introduction of alternative insulating gases that contain a GHG other than SF_6 necessitates expanding the scope of the Regulation to include all

insulating gases that have a GWP greater than one, referred to as “covered insulating gas.” Coverage of these alternative gases in the Regulation ensures continued tracking of GHGs from the operation of GIE in the State. It also facilitates recognition of the transition from SF_6 GIE to non-SF_6 GIE. This transition is vital to the phase-out of SF_6 from GIE, as it will drive GHG emissions reductions from this sector, and is a key aspect of the proposed amendments.

Changing the term “gas insulated switchgear” or “GIS” to “gas-insulated equipment” or “GIE” in the title and throughout the regulatory text serves to clarify the equipment that is covered by the Regulation. “Switchgear” is a specific type of device, but its use is general enough that covered entities correctly included other devices in their reporting throughout the implementation of the Regulation. Still, staff is proposing to change to the more general “gas-insulated equipment” (GIE) term for the sake of clarity. This terminology change would not affect the types of devices covered under the Regulation and therefore would not affect the scope of the Regulation in any way.

These changes apply throughout the Proposed Regulation Order and are explained here in lieu of repeating the explanation in every instance that the changes are reflected in the sections described below.

Section 95350. Purpose, Scope, and Applicability.

Purpose of Section 95350(a).
This section has been revised to add the acronym “GHG” to abbreviate “greenhouse gas” and to replace “by reducing sulfur hexafluoride (SF_6) emissions from gas insulated switchgear” with “from the operation of electrical equipment that uses a GHG as an insulating medium.”

Rationale for Section 95350(a).
The proposed changes are necessary to clarify that “GHG” as used throughout the Regulation means greenhouse gas, and to remove the exclusive use of “SF_6” and “gas insulated switchgear” as discussed in the above section on the Regulation Name. The proposed changes do not otherwise change the meaning of this section.

Purpose of Section 95350(b).
This section has been revised to replace “gas insulated switchgear” with “gas-insulated equipment (GIE) that uses covered insulating gas,” and replace two instances of the word “person” with “GIE owner” or “GIE owners.”

Rationale for Section 95350(b).
The proposed change is necessary to clarify the “gas insulated switchgear” terminology, and to specify that the Regulation only applies to GIE that uses a covered insulating gas, as discussed in the above section on the Regulation Name. The changes from “person” to “GIE owner” or “GIE owners” are necessary to clarify to whom the Regulation applies, because the previous Regulation used these terms interchangeably in this section which may have been confusing to the regulated community. The

addition of the phrase “gas-insulated equipment (GIE) that uses covered insulating gas” clarifies that the requirements of the Regulation only apply to owners of GIE that use covered insulating gas.

Section 95351. Definitions and Acronyms.

Purpose of Section Name “Definitions and Acronyms.”
This section name has been revised to add “and Acronyms.”

Rationale for Section Name “Definitions and Acronyms.”
The proposed change is necessary for clarity because section 95351(b) was added to define acronyms used in the Regulation.

Purpose of Section 95351(a) Definition of “Active Gas-Insulated Equipment” or “Active GIE.”
This section has been revised to remove the designations of section (1) and sub-sections (A) and (B). “Active GIS Equipment,” the term being defined, is changed to “‘Active Gas-Insulated Equipment” or “Active GIE,” and the definition is changed from “non-hermetically sealed SF_6 gas insulated switchgear that is: (A) Connected through busbars or cables to the GIS owner’s electrical power system; or (B) Fully-charged, ready for service, located at the site in which it will be activated, and employs a mechanism to monitor SF_6 emissions. Active GIS equipment does not include equipment in storage.” to be “GIE that is non-hermetically sealed and is connected through busbars or cables to an electrical power system *or* that is fully charged, ready for service, and being prepared for connection to the electrical power system. This does not include spare GIE or GIE in storage, defined as GIE that has been acquired by the GIE owner, is intended for use by the GIE owner, but that is not being used or prepared for connection to the electrical power system.”

Rationale for Section 95351(a) Definition of “Active Gas-Insulated Equipment” or “Active GIE.”
Removing the designations of individual paragraph numbers from section 95351(a) is necessary to make tracking of future regulatory changes easier. Definitions can be easily identified by the name of the term being defined, and therefor don’t need individual numbers. With this change, any future addition of definitions does not result in a re-numbering of the entire section. The change from “Active GIS Equipment” to “Active Gas-Insulated Equipment” or “Active GIE” is necessary for clarity, as discussed in the above section on the Regulation Name. Re-defining the term “active GIE” is necessary to specify that a device connected to an electrical power system that is not owned by the GIS owner must be considered “active GIE” because the owner of the GIE device may be different than the owner of the electrical power system, but the GIE device is still in use, could be emitting covered insulating gas, and is therefore the responsibility of the GIE owner to report under the Regulation. The changes are also necessary to reduce confusion over the terms “site” and “storage,” which were not previously defined, and to indicate that “spare” devices are also not considered to be “active GIE.” These changes were made in response to stakeholder feedback and

should help clarify the intent of the Regulation that devices which are in use and could be emitting are considered to be “active GIE” and that devices which are not currently in use are not “active GIE.”

Changes to remove the numbered section (e.g., (1), (2), (3)) designations in section 95351(a) are reflected throughout the Proposed Regulation Order, and will not be explained in every instance of the change.

Purpose of Section 95351(a) New Definition of “Acquire.”
A new definition of “Acquire” is added.

Rationale for Section 95351(a) New Definition of “Acquire.”
This new definition is necessary to clearly articulate to GIE owners the actions that are forbidden after the phase-out dates contained in Tables 1 and 2. Since the phase-out date prevents acquisition of SF_6 GIE following the applicable dates in Tables 1 and 2 (absent an exemption), it is necessary to define “acquire” to provide certainty to GIE owners as to what conduct will be covered by the phase-out.

Purpose of Section 95351(a) New Definition of “ARB Identification Number” or “ARB ID.”
A new definition of “ARB Identification Number” is added.

Rationale for Section 95351(a) New Definition of “ARB Identification Number” or “ARB ID.”
This new definition is necessary because each GIE owner that submits an annual report through the Cal e-GGRT system is assigned an “ARB Identification Number” that is used to identify the GIE owner in CARB’s reporting database.

Purpose of Section 95351(a) New Definition of “Carbon Dioxide Equivalent” or “CO_2e.”
A new definition of “Carbon Dioxide Equivalent” or “CO_2e” is added.

Rationale for Section 95351(a) New Definition of “Carbon Dioxide Equivalent” or “CO_2e.”
This new definition is necessary to accommodate the expanded scope of the Regulation to regulate not only SF_6 but all other GHGs with a GWP greater than one used as insulating gases. The definition of CO_2e provides the basis for comparing the emissions of multiple gases based on their GWPs. This definition is the same as that used in other CARB regulations such as the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR).

Purpose of Section 95351(a) New Definition of “Catastrophic Failure.”
A new definition of “Catastrophic Failure” is added.

Rationale for Section 95351(a) New Definition of “Catastrophic Failure.”

This new definition is necessary to clearly articulate to GIE owners the characteristics of a "catastrophic failure" to establish the circumstances under which the GIE owner may file an expedited SF_6 phase-out exemption request pursuant to section 95357(h).

Purpose of Section 95351(a) New Definition of "Circuit Breaker."
A new definition of "Circuit Breaker" is added.

Rationale for Section 95351(a) New Definition of "Circuit Breaker."
This new definition is needed because the early action credit described in section 95353(d) uses this term so it is needed for clarity of the Regulation.

Purpose of Section 95351(a) New Definition of "Covered Gas Container."
A new definition of "Covered Gas Container" is added.

Rationale for Section 95351(a) New Definition of "Covered Gas Container."
This new definition is necessary to distinguish a "covered gas container" (one that contains or is designed to contain a covered insulating gas) from a "gas container," because GIE owners are required to comply with certain regulatory requirements for "covered gas containers." These requirements do not extend to "gas containers" that do not contain a covered insulating gas. The definition also indicates that removable containers attached to gas carts are also covered under this definition, which is necessary to clarify that entities who use these containers must comply with certain regulatory requirements.

Purpose of Section 95351(a) New Definition of "Covered Insulating Gas."
A new definition of "Covered Insulating Gas" is added.

Rationale for Section 95351(a) New Definition of "Covered Insulating Gas."
This new definition is necessary to distinguish a "covered insulating gas" as one with a "GWP greater than one" from an "insulating gas," because GIE owners are required to comply with certain regulatory requirements for "covered insulating gas" but not all "insulating gas." The new definition also provides a reference to section 95354(l), which defines how to calculate the quantity of covered insulating gas in a gas blend. This is necessary because some new lower-GWP insulating gas alternatives to SF_6 are mixed with other gases, so this provides clarity to GIE owners on how to quantify and account for that "covered insulating gas" that is part of a gas blend.

Purpose of Section 95351(a) New Definition of "Covered Insulating Gas at Activation."
A new definition of "Covered Insulating Gas at Activation" is added.

Rationale for Section 95351(a) New Definition of "Covered Insulating Gas at Activation."
This new definition is necessary to create a new term and method by which the GIE owner can more accurately quantify the amount of covered insulating gas in the GIE when it becomes "active GIE" for the first time. In the current Regulation, "nameplate capacity" as defined, is used as a proxy for this amount, but CARB staff has learned from GIE owners and GIE manufacturers that the nameplate capacity of a GIE device

may not accurately reflect the amount of insulating gas that was present in the device at activation. This discrepancy is problematic because the current Regulation uses the nameplate capacity to calculate a GIE owner's annual emissions and annual emissions limit. Therefore, a new methodology is necessary to more accurately represent the amount of gas inside an active GIE device at activation. The reference to section 95354(a)(10)(A)6. is necessary to direct GIE owners to details and applicability for calculating covered insulating gas at activation, which applies to GIE that are both acquired and made active GIE for the first time after December 31, 2020. For devices that are either acquired or made active GIE for the first time prior to December 31, 2020, GIE owners will continue to use the "nameplate capacity" value, since measurements of the amount of gas in the device when it was originally activated may be unavailable for GIE that have already been acquired or are already in active use.

Purpose of Section 95351(a) New Definition of "Data Year."
A new definition of "Data Year" is added.

Rationale for Section 95351(a) New Definition of "Data Year."
This new definition is necessary to specify activities required to be performed during the year for which an annual report is submitted (the data year), and the year for which emissions are calculated.

Purpose of Section 95351(a) New Definition of "Day."
A new definition of "Day" is added.

Rationale for Section 95351(a) New Definition of "Day."
This new definition is necessary to clarify that a day means one calendar day, as opposed to one business day, unless otherwise specified.

Purpose of Section 95351(a) New Definition of "Designated Representative."
A new definition of "Designated Representative" is added.

Rationale for Section 95351(a) New Definition of "Designated Representative."
This new definition is necessary to clarify the role and responsibility of the person submitting and certifying the annual emissions data report to CARB. This definition conforms with the Cal-eGGRT reporting system, which the majority of covered entities use to submit their annual reports under the Regulation. This term is used in place of "Responsible Official," which is being deleted in these amendments.

Purpose of Section 95351(a) Definition of "Emission rate" [deleted].
This definition has been deleted.

Rationale for Section 95351(a) Definition of "Emission rate" [deleted].
This deletion is necessary to transition to the new "annual emissions limit" compliance requirement from the "emission rate" requirement. The "emission rate" requirement, as defined to be limited to SF_6, restricts the integration of alternative insulating gases that

contain other GHGs and dis-incentivizes the phase-out of SF_6 GIE, thus the value is no longer required to be calculated and the term is removed in the proposed amendments.

Purpose of Section 95351(a) Definition of "Executive Officer."
This section has been revised to add "California" to the term "Air Resources Board," replace "(ARB)" with "(CARB)," and replace "his or her" with "her or his."

Rationale for Section 95351(a) Definition of "Executive Officer."
The proposed change is necessary to provide the proper name and abbreviation for the California Air Resources Board (CARB) and to place "her" before "his" to reflect the proper alphabetical order.

Purpose of Section 95351(a) New Definition of "Gas Cart."
A new definition of "Gas Cart" is added.

Rationale for Section 95351(a) New Definition of "Gas Cart."
This new definition is necessary to distinguish a "gas cart" from a "gas container." The proposed Regulation allows for use of a different procedure to determine the amount of covered insulating gas stored in a "gas cart" as opposed to a "gas container" so the terms must be independently defined, unlike the current Regulation which specifies the same procedure be used for a "gas cart" and a "gas container" to quantify the covered insulating gas it contains.

Purpose of Section 95351(a) Definition of "Gas Container."
This section has been revised to change "SF_6" to "a gas used as an insulating gas in GIE," add "any container that can be removed from a" to the term "gas cart," and add "but does not include GIE or the gas cart itself."

Rationale for Section 95351(a) Definition of "Gas Container."
The proposed change to specify that the "gas container" may contain any insulating gas in GIE is necessary as discussed in the above section on the Regulation Name. The proposed changes to specify that a "gas cart" will no longer be considered a "gas container," but that a removable container that could be attached to a gas cart is considered a "gas container" are necessary for the reasons discussed in the above section on the new definition of "gas cart" and to clarify that a "gas container" which can be removed from a "gas cart" will still be considered a "gas container" so that GIE owners are clear on how they must treat these specific vessels when quantifying the gas within the container as specified under the proposed Regulation. This clarification is necessary to ensure that all covered insulating gas is accounted for on an annual basis. Finally, the text added "but does not include GIE or the gas cart itself" is necessary to identify vessels that may contain insulating gas that are not "gas containers," for clarity.

Purpose of Section 95351(a) Definition of "Gas-Insulated Equipment" or "GIE."
This section has been revised to change "Gas-insulated switchgear or GIS" to "Gas-Insulated Equipment" or "GIE," change the types of equipment considered to be GIE by

changing “GIS means all electrical power equipment insulated with SF_6 gas,” to “GIE means all electrical power equipment, regardless of location and insulating medium (e.g., solid dielectric, vacuum, SF_6, alternative gas) that provide insulating and/or interrupting (arc quenching) functions related to the transmission of electric current in electrical power systems,” and change the examples of the types of devices that qualify to be “switchgear, switches, circuit switchers, coupling capacitor potential devices, gas-insulated substations, and circuit breakers.” Finally, “this definition includes hermetically sealed GIE and non-hermetically sealed GIE” has been added.

Rationale for Section 95351(a) Definition of “Gas-Insulated Equipment” or “GIE.”
The proposed change is necessary to clarify the “gas insulated switchgear” terminology, as described above in the section on Regulation Name. The changes also indicate a broader scope of insulating mediums for GIE beyond SF_6 such that it includes all devices that perform a similar function regardless of the insulating medium so that these types of devices can be discussed as appropriate throughout the proposed Regulation. The inclusion of a list of additional types of devices that are examples of GIE is necessary to provide additional clarity to GIE owners about the types of devices covered, and the removal of the extraneous text is necessary because some of the terms previously listed could be considered “replacement parts” which need to be distinguished from “GIE” because “replacement parts” are not subject to the phase-out requirement that is added in these regulatory amendments. Finally, the inclusion of the last sentence that specifies GIE include both hermetically sealed and non-hermetically sealed GIE is necessary for clarity.

Purpose of Section 95351(a) New Definition of “Gas-Insulated Equipment Characteristics” or “GIE Characteristics.”
A new definition of “Gas-Insulated Equipment Characteristics” or “GIE Characteristics” is added.

Rationale for Section 95351(a) New Definition of “Gas-Insulated Equipment Characteristics” or “GIE Characteristics.”
This new definition is necessary to describe in a succinct manner the combination of attributes that would determine the phase-out date for a specific type of GIE. Use of this term throughout the proposed Regulation, instead of listing these attributes individually in each instance, is necessary to clearly and efficiently communicate about this combination of attributes within the proposed Regulation.

Purpose of Section 95351(a) Definition of “Gas-Insulated Equipment Owner” or “GIE Owner.”
This section has been revised to change “GIS Owner” to “Gas-Insulated Equipment Owner” or “GIE Owner;” change “gas insulated switchgear” to “GIE that use covered insulating gas;” remove “original” from the term “original equipment manufacturer;” change “during GIS equipment transport of and installation at a customer’s site” to “during GIE transport for purposes of installation at a customer’s site or repair;” and add the sentence “each corporation or limited liability company which owns GIE that uses

covered insulating gas is considered to be a distinct GIE owner and is independently subject to this regulation."

Rationale for Section 95351(a) Definition of "Gas-Insulated Equipment Owner" or "GIE Owner."
The proposed change to the "gas insulated switchgear" and "insulating gas" terminology is necessary to clarify what equipment is covered under the Regulation and to indicate that additional insulating gases may be added to a GIE device beyond SF_6, as described above in the section on Regulation Name. Clarifying that the manufacturer does not necessarily need to be the original equipment manufacturer is necessary because the manufacturer that may be transporting the device may be different than the original equipment manufacturer. Broadening the scope to cover transport of an item for installation or repair is necessary to cover additional reasons for a manufacturer to transport a device. The addition of the last sentence is necessary to clarify that each individual corporation or limited liability company is a distinct GIE owner and is independently subject to the regulation. Therefore, each entity must submit a single report for all GIE they own throughout the State that use covered insulating gas. Additionally, limited liability companies that share the same parent company are considered to be individual "GIE owners," and are each independently subject to this regulation (and therefore must each submit their own an annual report). This latter addition was not specified in the current Regulation, but was addressed in guidance materials provided to address "Frequently Asked Questions" about the Regulation. The change is consistent with the manner in which the current Regulation has been implemented.

Purpose of Section 95351(a) New Definition of "Global Warming Potential" or "GWP."
A new definition of "Global Warming Potential" or "GWP" is added. This new definition also clarifies how the GIE owner shall determine the GWP of the insulating gases known as Novec-4710 and Novec-5110.

Rationale for Section 95351(a) New Definition of "Global Warming Potential" or "GWP."
This new definition is necessary to accommodate the expanded scope of the Regulation to cover all GHGs with a GWP greater than one that are used as insulated gases. The GWP provides a metric to compare emissions of multiple gases relative to one unit of a reference gas (carbon dioxide). This definition aligns with that in MRR. The new definition also clarifies how to determine the GWP of Novec-4710 and Novec 5110, which is necessary because those gases serve as non-SF_6 alternative insulating gases and are not listed directly in Table A-1 of Subpart A of Title 40 CFR Part 98, so an explanation is necessary for clarity.

Purpose of Section 95351(a) New Definition of "Greenhouse Gas" or "GHG."
A new definition of "Greenhouse Gas" or "GHG" is added.

Rationale for Section 95351(a) New Definition of "Greenhouse Gas" or "GHG."
This new definition is necessary to clarify the types of gases being regulated and discussed in the context of the Regulation, and aligns with the definition in MRR.

Purpose of Section 95351(a) Definition of "Hermetically Sealed Gas-Insulated Equipment" or "Hermetically Sealed GIE."
This section has been revised to change "Gas Insulated Switchgear" to "Gas-Insulated Equipment" or "GIE," and change "SF_6" to "covered insulating gas." The changes remove "is designed to be gas-tight and sealed for life," change "and is not refillable by its user" to "and designed by the manufacturer to not be fillable by the GIE owner or a third-party designee," and make other grammatical changes to accommodate the revised sentences.

Rationale for Section 95351(a) Definition of "Hermetically Sealed Gas-Insulated Equipment" or "Hermetically Sealed GIE."
The proposed change is necessary to clarify that the distinguishing feature between a hermetically sealed device and a non-hermetically sealed device is whether or not it was designed by the manufacturer to be fillable. Whether the device is designed to be gas-tight and sealed for life, or not, will not always allow the GIE owner to determine if it is "hermetically sealed." This is because the manufacturer may design the GIE device with the goal of it remaining gas-tight over its lifetime, but include a fill valve anyway, in case the GIE device loses pressure or leaks insulating gas, so that the GIE owner may refill it and continue to use the device. Also, even without a fill valve, the device still may leak, thus being "gas-tight" is not an appropriate qualifier. The proposed change also clarifies that if a device is designed to be non-hermetically sealed by the manufacturer (meaning it is fillable), the GIE owner cannot in turn modify the device to make it "hermetically sealed" by removing or disabling the fill valve. If a device were able to be transformed in this way, and thereby be considered "hermetically sealed," any emissions from the device would no longer be required to be reported under the Regulation.

Purpose of Section 95351(a) New Definition of "Insulating Gas."
A new definition of "Insulating Gas" is added.

Rationale for Section 95351(a) New Definition of "Insulating Gas."
This new definition is necessary to clarify the use of the term "insulating gas" in this Regulation for reporting and compliance purposes. SF_6 is an example of an "insulating gas," and the term "insulating gas" was not needed in the current Regulation because no other insulating gases were covered. As described above, new insulating gases are entering the marketplace, and CARB is expanding the scope of the Regulation such that emissions of these insulating gases must be reported if their GWP is greater than one.

Purpose of Section 95351(a) New Definition of "Non-Hermetically Sealed Gas-Insulated Equipment" or "Non-Hermetically Sealed GIE."
A new definition of "Non-Hermetically Sealed Gas-Insulated Equipment" or "Non-Hermetically Sealed GIE" is added.

Rationale for Section 95351(a) New Definition of "Non-Hermetically Sealed Gas-Insulated Equipment" or "Non-Hermetically Sealed GIE."

This new definition is necessary to distinguish “non-hermetically sealed” GIE from “hermetically sealed” GIE as described above in the section defining “hermetically sealed GIE.” When GIE owners account for the capacity of their GIE, and their annual emissions, they are only to consider non-hermetically sealed devices. Therefore, including both a definition of “hermetically sealed GIE” and “non-hermetically sealed GIE” is necessary to clarify which devices the GIE owner must consider when determining their capacity and annual emissions.

Purpose of Section 95351(a) New Definition of “Purchase.”
A new definition of “Purchase” is added.

Rationale for Section 95351(a) New Definition of “Purchase.”
This new definition is necessary to clearly articulate to GIE owners how a “purchase” will be defined pursuant to section 95352(a)(3), which allows a GIE owner to acquire SF_6 GIE after the phase-out so long as the device was “purchased” prior to the applicable phase-out date and the other conditions described in that paragraph are also met. This specification is necessary because several years may elapse between a GIE owner purchasing GIE and acquiring that GIE. The definition of purchase also includes clarifying terms related to financial commitment to further restrict its use and avoid over-reliance on having purchased SF_6 GIE prior to the phase-out dates.

Purpose of Section 95351(a) New Definition of “Replacement Parts.”
A new definition of “Replacement Parts” is added.

Rationale for Section 95351(a) New Definition of “Replacement Parts.”
This new definition is necessary to clearly articulate to GIE owners how a “replacement part” will be defined pursuant to section 95352(c), which allows a GIE owner to acquire “replacement parts” after the applicable phase-out date even if those parts contain SF_6.

Purpose of Section 95351(a) Definition of “Responsible Official” [deleted].
This definition has been deleted.

Rationale for Section 95351(a) Definition of “Responsible Official” [deleted].
This definition has been deleted because this term no longer appears in the proposed Regulation. All duties previously assigned to the “Responsible Official” have now been assigned to the “Designated Representative.” This change is necessary to improve consistency in the terminology used to describe this individual in the Regulation and the data reporting software (Cal e-GGRT) used by the majority of covered entities.

Purpose of Section 95351(a) New Definition of “Substantive Error.”
A new definition of “Substantive Error” is added.

Rationale for Section 95351(a) New Definition of “Substantive Error.”
This new definition is necessary to define the specific types of errors contained in annual emissions data reports that have already been submitted and that a GIE owner

must rectify upon their discovery or notification of such an error pursuant to section 95355(c).

Purpose of Section 95351(a) New Definition of "Sulfur Hexafluoride Gas-Insulated Equipment" or "SF_6 Gas-Insulated Equipment" or "SF_6 GIE."
A new definition of "Sulfur Hexafluoride Gas-Insulated Equipment" or "SF_6 Gas-Insulated Equipment" or "SF_6 GIE" is added.

Rationale for Section 95351(a) New Definition of "Sulfur Hexafluoride Gas-Insulated Equipment" or "SF_6 Gas-Insulated Equipment" or "SF_6 GIE."
This new definition is necessary so that this term may be used as shorthand throughout the proposed Regulation to allow for streamlined communication of regulatory requirements.

Purpose of New Section 95351(b).
A new section 95351(b) is added that defines the acronyms to be used throughout the proposed Regulation.

Rationale for Section 95351(b).
The new section is necessary to explain the acronyms listed in this section so that these acronyms may be used throughout the proposed Regulation to allow for streamlined communication of regulatory requirements.

Section 95352. Sulfur Hexafluoride Phase-Out

Purpose of Section Name "Sulfur Hexafluoride Phase-Out"
The name of this section is changed from "Maximum Annual SF_6 Emission Rate" to "Sulfur Hexafluoride Phase Out."

Rationale for Section Name Sulfur Hexafluoride Phase-Out
The section title "Maximum Annual SF_6 Emission Rate" is deleted because the proposed Regulation no longer requires the calculation of the maximum annual SF_6 emission rate to assess compliance with the regulatory requirements.

Purpose of Section 95352 [deleted].
The original content in this section is deleted.

Rationale for Section 95352 [deleted].
The deletion of the original content in this section is necessary to reflect the change in the way compliance with the Regulation is measured. Under the proposed Regulation, a GIE owner will no longer determine their compliance by comparing their calculated SF_6 emission rate to the maximum values provided in this section. Instead, under the proposed Regulation, GIE owners will compare their calculated GHG emissions to the emissions limit calculated pursuant to section 95353. As such, calculation of an annual emission rate is no longer necessary and this section has been deleted.

Purpose of New Section 95352(a).
New section 95352(a) prohibits any person from acquiring SF_6 GIE with the GIE characteristics described in Table 1 and Table 2 for use in California after the dates specified within those tables, unless one of the provisions provided in the underlying sections apply.

Rationale for New Section 95352(a).
This new section is necessary to enable CARB to implement the phase-out of SF_6 GIE in California by stating that after a date certain, in general, new SF_6 GIE shall not be brought into or created within the State. This new section is needed because it contains the detailed requirements that GIE owners must abide by to ensure the phase-out of SF_6 GIE in California. As described above in section I.C of this ISOR, manufacturers have made significant progress toward production of market-ready GIE that do not contain SF_6. As such, additional emissions reductions from this source category are possible through the gradual replacement of SF_6 GIE with non-SF_6 GIE, and achieving these additional emissions reductions is the main purpose of the regulatory amendments. As devices in the field today age and need to be replaced, the phase-out schedule will be necessary to ensure the majority of these devices are replaced with non-SF_6 GIE. Because the non-SF_6 GIE will either not emit GHGs at all, or will emit GHGs with a much lower GWP than SF_6, the effect of the regulatory amendments would be to reduce GHG emissions from this source category in California.

Purpose of New Section 95352(a)(1)-(a)(4).
New sections 95352(a)(1)-(a)(4) contain the special provisions through which a person may acquire SF_6 GIE for use in California after the applicable phase-out dates.

Rationale for New Section 95352(a)(1)-(a)(4).
New section 95352(a)(1) is necessary to allow for the acquisition of new SF_6 GIE after the phase-out when the available non-SF_6 options, if any, cannot serve the necessary need. New sections 95352(a)(2)-(a)(4) are necessary to ensure the transition from SF_6 GIE to non-SF_6 is as seamless as possible.

GIE are necessary to ensure the stable and safe flow of electricity. Restricting the ability of GIE owners to acquire SF_6 GIE in all cases could compromise the ability of those GIE owners to operate their electricity systems. These restrictions could have negative consequences for human health and the State's economy. Non-SF_6 GIE are becoming available that can serve the same function as SF_6 GIE without the negative environmental consequences described elsewhere in this ISOR. However, non-SF_6 alternatives may not be available for all applications by the dates specified in Table 1 and Table 2, or may otherwise not be appropriate for use at a GIE owner's facilities. In order to ensure GIE owners are able to continue to facilitate the flow of electricity after the phase-out, certain exemptions may be necessary as described further in section 95357. Section 95352(a)(1) is necessary to clarify that SF_6 GIE may be acquired after the phase-out if the GIE owner obtains an approved SF_6 phase-out exemption from the Executive Officer, pursuant to section 95357.

In order to minimize disruptions associated with the transition to non-SF_6 GIE, sections 95352(a)(2)-(a)(4) allow for acquisition of SF_6 GIE after the phase-out in several specific circumstances. Pursuant to section 95352(a)(2), SF_6 GIE that were present in the State prior to the phase-out may be transferred among GIE owners after the phase-out. This could become necessary, for example, should one corporation acquire another and take control of their SF_6 GIE which were legally obtained prior to the phase-out. Section 95352(a)(3) has been added due to information provided by stakeholders that demonstrated that, once a GIE device has been "purchased" as defined in section 95351(a), it may still take up to two years for the device to be manufactured and/or delivered to the purchaser. Because the phase-out bans acquisition of SF_6 GIE after the phase-out, to allow for this standard industry practice to continue, section 95352(a)(3) allows acquisition of SF_6 GIE after the phase-out so long as the SF_6 GIE were purchased prior to the phase-out and enter California no later than 24 months after the purchase date. Finally, stakeholders noted that an SF_6 GIE device acquired prior to the applicable phase-out date may malfunction and be eligible for replacement under the terms and conditions of their agreement with the manufacturer, which would entail bringing a new SF_6 GIE device into the State after the phase-out. Without the provision in section 95352(a)(4), the manufacturer would be unable to send a replacement SF_6 GIE device to the GIE owner in California after the applicable phase-out date, thus restricting execution of a lawful warranty. This section allows the manufacturer to send a replacement SF_6 GIE device to the GIE owner, after the phase-out, so long as the original device malfunctioned while under the terms of the manufacturer's warranty period. This addition is necessary to ensure that a GIE owner who happens to purchase a defective device is not subject to financial negative implications of being unable to acquire a replacement when they would otherwise be able to take advantage of the manufacturer warranty.

Purpose of New Section 95352(a), Table 1 and Table 2.

New section 95352(a), Table 1 and Table 2 contain the phase-out schedule for SF_6 GIE with voltage capacity less than or equal to 38 kV and greater than 38 kV respectively. Unique dates are provided for different types of SF_6 GIE which are categorized by their voltage capacity (kV), configuration (aboveground or belowground), and short-circuit current rating (kA).

Rationale for New Section 95352(a), Table 1 and Table 2.

These new tables are necessary to articulate to GIE owners the appropriate phase-out dates for each category of SF_6 GIE listed. To establish the phase-out dates contained in Table 1 and Table 2, CARB staff consulted with more than ten manufacturers currently developing non-SF_6 GIE to learn when their products are expected to be commercially available. As a result of this process, manufacturers have shared their product development schedule with CARB staff. Manufacturers' existing or expected commercial availability dates, plus additional considerations as explained below, serve as the primary driver of the phase-out schedule.

In order to ensure that there is a competitive marketplace for non-SF_6 GIE and to reduce costs for these devices, CARB staff based the proposed phase-out schedule on

the anticipated dates when more than one manufacturer have stated that the non-SF_6 GIE will be available. CARB staff also met with, and requested comments from, GIE owners to learn how much time they need to become sufficiently comfortable with a new product once it is commercially available and to begin incorporating significant quantities of that new product throughout their network. GIE owners consistently noted that they need approximately three years to evaluate a new product's performance in a non-critical environment before they deploy the product more broadly, including for use in more critical settings. Furthermore, regulated entities have informed CARB that their capital planning cycle is typically three to five years. CARB staff proposes that the first phase-out date to be no sooner than January 1, 2025 to accommodate this timeline given that the proposed Regulation is likely to take effect in 2020 or 2021.

Taking into consideration the factors described above, CARB staff developed the proposed phase-out schedule by identifying when a given product is expected to become available from at least two manufacturers and adding at least three years to allow for testing by GIE owners, or set the phase-out date as January 1, 2025 for non-SF_6 GIE that is currently available.

The information contained in Table 1 and Table 2 reflect the outcome of CARB's analysis, which is necessary information to convey to GIE owners to can ensure compliance with the phase-out requirements and avoid issues with non-compliance. The following outlines the information CARB staff used to set the phase-out dates in Table 1 in the proposed Regulation:

- Aboveground, < 38 kV, all short-circuit current ratings (kA): According to multiple manufacturers and GIE owners, medium-voltage (< 38 kV) non-SF_6 equipment have been widely produced by a number of manufacturers (ABB 2019a; Eaton 2019; G&W Electric 2019; Huade 2015a; Lemke 2019; Meiden 2016; MEPPI 2016; Siemens 2019a; Siemens 2019b; Toshiba 2019) and used by utilities for more than a decade. Although non-SF_6 GIE at this range are already widely available and used, CARB staff proposes January 1, 2025 as the phase-out date for these GIE to allow sufficient planning to comply with the regulation to phase out SF_6.

- Aboveground, 38 kV, all short-circuit current ratings (kA): At the upper range of the distribution system (38 kV), non-SF_6 GIE that meet California utilities' requirements are either currently available (Meiden 2016) or under development. CARB staff propose January 1, 2028 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2025.

- Belowground, ≤ 38 kV, short-circuit current ratings < 25 (kA): Belowground, non-SF_6 GIE are available at this voltage and short-circuit current rating (Eaton 2019, G&W Electric 2020), and they do not have the same issues with space constraints in existing underground vaults described in the next bullet. Although non-SF_6 GIE at this range are already available, CARB staff proposes January 1, 2025 as the

phase-out date for these GIE to allow sufficient planning to comply with the regulation to phase out SF_6.

- Belowground, ≤ 38 kV, short-circuit current ratings ≥ 25 (kA): As mentioned above, non-SF_6 GIE are commonly available at this voltage and short-circuit current rating. However, CARB has received stakeholder feedback that, due to space constraints in existing underground vaults that house this equipment, the available GIE do not generally work for belowground applications. CARB staff propose January 1, 2031 as the phase-out date for these GIE because of expected commercial availability (per regulated entity suggestions) of non-SF_6 GIE with these specifications that will fit in existing underground vaults by 2028.

Similar to the process undertaken for Table 1, for higher voltage GIE, staff evaluated the planned commercial availability schedules from various manufacturers and developed the phase-out dates in Table 2 after adding three years for testing, or set the phase-out date as January 1, 2025 for non-SF_6 GIE that is currently available.

- 38 < kV ≤ 145, short-circuit current ratings < 63 (kA): At 72.5 kV, the majority of GIE are rated below 63 kA. There are at least four manufacturers (GE 2019b; Hitachi 2019; Paserba 2020; Roskilly 2019) that have non-SF_6 GIE available currently or will in the coming year. At voltage levels greater than 72.5 kV, and up to and including 145 kV, but with a short-circuit current rating less than 63 kA, GE (GE 2019b), Meiden (Murray 2020), and Siemens (Roskilly 2019) aim to have products available by 2020, with Mitsubishi Electric Power Products, Inc. (MEPPI)'s (Paserba 2020) planned release by 2022. CARB staff proposes January 1, 2025 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2022.

  Of note, very few SF_6 GIE in the State have a voltage capacity greater than 38 kV and less than 72.5 kV and, in general, devices with a voltage capacity of 72.5 kV should be deployable for needs in this voltage range; therefore, the phase-out date for these devices has been bundled with the appropriate phase-out date for 72.5 kV SF_6 GIE.

- 38 < kV ≤ 145, short-circuit current ratings ≥ 63 (kA): As mentioned, the majority of GIE at or below 72.5 kV are also rated below 63 kA, so the applicable GIE in this category (≥ 63 kA) are generally greater than 72.5 kV and up to and including 145 kV. CARB staff is aware of four manufacturers developing GIE at 145 kV, 63 kA; GE (GE 2019b), MEPPI (Paserba 2020), and Siemens (Roskilly 2019) have announced commercial availability no later than 2025. CARB staff proposes January 1, 2028 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2025.

- 145 < kV ≤ 245, short-circuit current ratings < 63 (kA): The information CARB staff received from manufacturers regarding availability of non-SF_6 GIE for this voltage and short-circuit current rating category has been dynamic. MEPPI (Paserba 2020)

and Meiden (Murray 2020) have recently announced commercial availability dates for equipment with a voltage capacity of 245 kV, and short-circuit current rating of less than 63 kA, in 2024 and 2026, respectively. Siemens has also planned development at 245 kV but commented that release dates will be driven by market demand (Roskilly 2019). Although the latest information shows only one manufacturer meeting the expected commercial availability of non-SF_6 GIE with these specifications by 2024, GE's (GE 2019b) planned release in 2024 for non-SF_6 GIE at 245 kV and 63 kA is likely a technically feasible option for short-circuit current rating less than 63 kA. Based on this information and the evolving nature of this category's market with at least five manufacturers, CARB staff proposes January 1, 2027 as the phase-out date for these GIE.

- 145 < kV ≤ 245, short-circuit current ratings ≥ 63 (kA): Also at the 245 kV voltage level, for short-circuit current ratings of 63 kA and above, GE (GE 2019b) and MEPPI (Paserba 2020) aim to release their non-SF_6 alternative in 2024 and 2027, respectively. Meiden (Murray 2020) and Siemens (Roskilly 2019) also have plans to develop GIE in this category, although they have not yet announced a schedule. Based on this information, CARB staff proposes January 1, 2031 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2028.

- > 245, all short-circuit current ratings (kA): GE (GE 2019b) and MEPPI (Paserba 2020) have published their plan to make non-SF_6 GIE in this category commercially available in 2025 and 2030, respectively. Based on this information CARB staff proposes January 1, 2033 as the phase-out date for these GIE because of expected commercial availability of non-SF_6 GIE with these specifications from at least two manufacturers by 2030.

Purpose of New Section 95352(b).
New section 95352(b) states that, starting on the dates provided in Table 1 and Table 2, no GIE owner may convert non-SF_6 GIE to SF_6 GIE.

Rationale for New Section 95352(b).
This new section is necessary because a key goal of the Regulation is the phase-out of SF_6 GIE. SF_6 GIE could be acquired or they could be constructed. New section 95352(a) prohibits the acquisition of SF_6 GIE starting on the phase-out date. This new section will disallow construction or creation of SF_6 GIE after the applicable phase-out dates.

Purpose of New Section 95352(c).
New section 95352(c) states that replacement parts are not subject to the phase-out.

Rationale for New Section 95352(c).
This new section is necessary to help ensure the transition from SF_6 GIE to non-SF_6 GIE is as minimally disruptive as possible. The intention of the phase-out is that SF_6 GIE be replaced by non-SF_6 GIE gradually, over time, as the existing SF_6 GIE age.

This provision will allow GIE owners to make repairs to their SF_6 GIE after the phase-out, including the ability to install "replacements parts" as defined in section 95351(a). This provision is necessary to ensure that SF_6 GIE are not forced into retirement early due to the need to perform relatively minor repairs. Without such a provision, the cost to GIE owners to comply with this Regulation could be significantly higher in the near-term.

Section 95353. Emergency Event Exemption [New Section 95357.1. Emergency Event Exemption].

Purpose of Section 95353 [New Section 95357.1].
Section 95353 is renumbered to be new section 95357.1.

Rationale for Section 95353 [New Section 95357.1].
This change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections.

Purpose of Section 95353(a) [New Section 95357.1(a)].
Section 95353(a) is renumbered to be new section 95357.1(a), and "maximum allowable emission rate if it is demonstrated to the Executive Officer's satisfaction that the release of SF_6" is changed to "GIE owner's annual emissions as calculated pursuant to section 95354.1 if it is demonstrated to the Executive Officer's satisfaction that the release of covered insulating gases."

Rationale for Section 95353(a) [New Section 95357.1(a)].
The re-numbering change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections, and the change from "SF_6" to "covered insulating gas" is necessary to clarify coverage of the proposed Regulation, as discussed in the section on the Regulation Name. The other changes are necessary to reflect that the maximum allowable emission rate is being removed from the Regulation and replaced by an emissions limit, and to clarify that the emissions from the emergency event will be subtracted from the emissions calculated under section 95354.1 prior to the GIE owner's determination of whether they exceeded the emissions limit.

Purpose of Section 95353(b)(2)(D) ([New Section 95357.1(b)(2)(D)].
Section 95353(b)(2)(D) is renumbered to be new section 95357.1(b)(2)(D) and "GIS equipment" is changed to "manufacturer serial number pursuant to section 95354(a)(3) of all GIE."

Rationale for Section 95353(b)(2)(D) ([New Section 95357.1(b)(2)(D)].
The re-numbering change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections. The change from "GIS equipment" to "manufacturer serial number pursuant to section 95354(a)(3) of all GIE" is necessary to accommodate the terminology change from GIS to GIE, and to clarify how the equipment will be identified in the emergency event exemption

submission. The previous requirement that the "GIS equipment" be reported was not clear, as it did not provide an indication of how to distinguish which GIS device was damaged, so this change was necessary to increase clarity.

Purpose of Section 95353(b)(2)(E) ([New Section 95357.1(b)(2)(E)].
Section 95353(b)(2)(E) is renumbered to be new section 95357.1(b)(2)(E), "type and" is added and "SF_6" is changed to "covered insulating gas."

Rationale for Section 95353(b)(2)(E) ([New Section 95357.1(b)(2)(E)].
The re-numbering change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections. The addition of "type and" and change from "SF_6" to "covered insulating gas" are necessary to reflect the change of regulatory coverage from SF_6 only to GHGs, and to reflect that with this change the type of covered insulating gas should be specified because there could be more than one option.

Purpose of Section 95353(b)(4) [New Section 95357.1(b)(4)].
Section 95353(b)(4) is renumbered to be new section 95357.1(b)(4), and "a signed and dated statement, under penalty of perjury, provided by the appropriate responsible official that the statements and information contained in the submitted request are true, accurate, and complete" is changed to "the appropriate attestation statement from section 95355(d)."

Rationale for Section 95353(b)(4) [New Section 95357.1(b)(4)].
The re-numbering change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections. The other change is necessary due to the fact that attestations statements have been added to the Proposed Regulation Order, and those attestations have changed the terminology presented previously, so the change ensures internal consistency and the use of the correct attestation statement for the purpose of submitting an emergency event exemption.

Section 95353. Annual Emissions Limit

Purpose of New Section 95353.
This new section specifies the new regulatory requirements to meet an annual emissions limit, outlines the process a GIE owner must follow to calculate their annual emissions limit, and discusses how the emissions limit shall be established if multiple GIE owners combine operations or split into multiple GIE owners.

Rationale for New Section 95353.
This new section is necessary to specify the necessary elements to allow for the transition from an emission rate limit to an emissions limit in $MTCO_2e$, as discussed in Section II.B.4 of this ISOR.

Purpose of New Section 95353(a).

This new section states that a GIE owner's annual emissions shall not exceed their emissions limit.

Rationale for New Section 95353(a).
This new section is necessary to establish the new regulatory requirement that GIE owner must now assess their emissions relative to an emissions limit that they must not exceed.

Purpose of New Section 95353(b).
This new section describes the process a GIE owner must follow to determine the average system capacity for covered insulating gas (*j*) in a given data year (*i*) "$C_{avg,j,i}$" which is one of the values that will be needed to calculate the annual emissions limit. The calculation is similar in many respects to the calculation of "C_{avg}" contained as part of section 95356(e) of the current Regulation, with the principal change being to expand from the use of "nameplate capacity" in the current Regulation to "covered insulating gas at activation" for the proposed amendments. In addition, numerous changes were made to clarify the terms in the equation so that they conform with the requirements in the proposed Regulation. As a result of the fact that this equation was both moved and significantly updated (in terminology, but not structure), for the purposes of this Staff Report, the change is described as an addition of section 95353(b) and removal of section 95356(e).

Rationale for New Section 95353(b).
This new section is necessary to specify the method that the GIE owner must use to calculate the average amount, in pounds, of each covered insulating gas (*j*) that was contained in "active GIE" during the data year (*i*). This value, for each covered insulating gas *j*, is converted from pounds to $MTCO_2e$ per section 95353(c), where a GIE owner determines their *average* CO_2e *capacity*$_i$, which is a key value used to determine the GIE owner's emissions limit. As mentioned above, this calculation retains the elements in section 95356(e) of the current Regulation, but updates the subscripts and descriptions of the terms to improve clarity, and makes the calculation applicable to all covered insulating gases. The replacement of "nameplate capacity" with "covered insulating gas at activation" is necessary to utilize the new term and method, as defined in section 95351(a), by which the GIE owner is to assess the amount of covered insulating gas in GIE.

Purpose of New Section 95353(b)(1).
This new section specifies that, for data year 2020, the value of "$C_{avg,j,i}$" shall be calculated for SF_6 only.

Rationale for New Section 95353(b)(1).
This new section is necessary to specify that the GIE owner should not include any insulating gases other than SF_6 when calculating the value of "$C_{avg,j,i}$" in data year 2020. This is necessary because the Regulation is expected to become effective during calendar year 2020, and this new section ensures that the requirements for calculation

of $C_{avg,j,i}$ are consistent with the requirements for the calculation of C_{avg} in the current Regulation.

Purpose of New Section 95353(b)(2).
This new section specifies that for data years 2021 to 2024, the value of "$C_{avg,j,i}$" shall be calculated for each covered insulating gas used in GIE.

Rationale for New Section 95353(b)(2).
This new section is necessary because, beginning with data year 2021, GIE owners will be required to account for GIE insulated with a covered insulating gas in the same way that they previously accounted for SF_6 GIE only.

Purpose of New Sections 95353(b)(3) and 95353(b)(3)(A)-(C).
These new sections specify that, for data years 2025 to 2032, the value of "$C_{avg,j,i}$" shall be calculated for each covered insulating gas used in GIE, as before, but that it will only be calculated for GIE that meet specific criteria. Section 95353(b)(3)(A) clarifies that the GIE device should only be accounted for if it was not included in the calculation of *BL CO_2e capacity$_{12/31/2024}$* (calculated pursuant to section 95353(e)). Section 95353(b)(3)(B) clarifies that the GIE device should only be accounted for if it has not replaced a GIE device that was accounted for under *BL CO_2e capacity$_{12/31/2024}$*. Section 95353(b)(3)(C) clarifies that the GIE device should only be accounted for if it was not acquired with an SF_6 phase-out exemption.

Rationale for New Sections 95353(b)(3) and 95353(b)(3)(A)-(C).
These new sections are necessary to accommodate the change that will occur in the calculation of the annual emissions limit beginning for data year 2025 and lasting through data year 2032. As described in section 95353(f), for those data years, the only GIE devices whose covered insulating gas at activation must be accounted for are those GIE devices that meet the requirements of section 95353(b)(3)(A)-(C). The reason for this is the establishment of the *BL CO_2e capacity$_{12/31/2024}$*, calculated per section 95353(e), which establishes a point-in-time emissions limit for the last calendar day in 2024, prior to the first SF_6 phase-out date in 2025. The calculated *BL CO_2e capacity$_{12/31/2024}$* will carry forward as an input to calculate emissions for data years 2025 to 2032. Therefore, any GIE that were already included in, or replace another GIE already included in, *BL CO_2e capacity$_{12/31/2024}$* should not be counted in $C_{avg,j,i}$ (which is converted to *average CO_2e capacity$_i$* and used as an input to the calculation of the annual emissions limit, pursuant to sections 95353(c) and 95353(f)), because that would serve to "double count" those GIE for data years 2025 to 2032.

Finally, section 95353(b)(3)(C) clarifies that, in order for the GIE device to be accounted for in this term, it must not have been acquired with an SF_6 phase-out exemption. This is necessary to restrict what may be added to the baseline emissions limit in order to provide the right incentives to encourage GIE owners to use non-SF_6 GIE wherever possible. The availability of the phase-out exemption process allows GIE owners considerable flexibility to use non-SF_6 GIE when possible, but disallowing the addition of these GIE purchased after the phase-out date to the calculation of the annual emissions

limit will incentivize GIE owners to minimize their reliance on the phase-out exemption process to ensure that the Regulation achieves the gradual transition away from SF_6 GIE.

Purpose of New Section 95353(b)(4).
This new section specifies how a GIE owner should account for any GIE devices that they own only a portion of in the calculation performed in this new section.

Rationale for New Section 95353(b)(4).
This new section is necessary to clarify how GIE owners should account for devices that are jointly owned, and refers to the method the GIE owner must use to determine their share for each jointly owned device in section 95354(a)(7)(B).

Purpose of New Section 95353(c).
This new section specifies the method a GIE owner must follow to calculate the value of *average CO_2e capacity$_i$* on an annual basis by converting $C_{avg,j,i}$ from pounds to $MTCO_2e$. The calculation involves multiplying the value of $C_{avg,j,i}$ (pounds) by the GWP of the covered insulating gas, converting the result from pounds to $MTCO_2e$, and then summing the values for each individual gas.

Rationale for New Section 95353(c).
This new section is necessary to provide the GIE owner a method to calculate *average CO_2e capacity$_i$*, which is the average amount, in $MTCO_2e$, of all covered insulating gas that was "active GIE" during the data year, summed across all covered insulating gases, converting from values in pounds calculated for $C_{avg,j,i}$. This value is necessary to serve as an input to the calculation in section 95353(f) for 2025–2032 (*BL CO_2e capacity$_i$*), or section 95353(g) for 2020–2024 (*emissions limit$_i$*).

Purpose of New Section 95353(d).
This new section specifies the method a GIE owner must follow to calculate their early action credit on an annual basis, beginning with data year 2021. The early action credit is a credit that would allow a GIE owner which places a non-SF_6, non-oil circuit breaker with voltage capacity of 72.5 kV or greater into active service prior to the phase-out date for an equivalent SF_6 circuit breaker to receive a credit toward their baseline emissions limit, which will be set in 2024. The credit would be roughly equivalent to the amount of SF_6 in a comparable SF_6 circuit breaker (see Table 3 of the Proposed Regulation Order). The GIE owner sums these values, and adds the result to the early action credit value calculated in the prior year.

This new section also contains Table 3, which provides the capacity of equivalent SF_6 circuit breakers, in $MTCO_2e$, at four voltage levels.

Finally, this new section clarifies how GIE owners should account for circuit breakers that are jointly owned.

Rationale for New Section 95353(d).

This new section is necessary to provide an incentive for GIE owners to acquire non-SF_6 GIE prior to the phase-out dates listed in Table 1 and Table 2. Because the phase-out dates don't begin until 2024, implementing that technology before the phase-out could negatively impact GIE owners' baseline capacity (explained in section II.B.4. of this ISOR), so the early action credit is necessary to incentivize early adoption of this technology.

The use of 2021 as a start date is necessary to balance two competing goals. On one hand, stakeholders have provided feedback to CARB staff that acquisitions of GIE can take approximately two years, so CARB staff elected not to grant an early action credit for non-SF_6 GIE devices that become active GIE in 2020, or a prior year, to avoid rewarding installations of non-SF_6 GIE that were part of a GIE owner's business-as-usual operations. On the other hand, CARB staff wants to begin awarding early action credits as soon as possible so that GIE owners taking steps to reduce their reliance on SF_6 get the benefit of this credit. Awarding early action credits for non-SF_6 GIE that became active GIE for the first time in 2021 or a subsequent year balances these factors.

It was necessary to limit the early action credit to those GIE with voltage capacity of 72.5 kV or greater because non-SF_6 medium-voltage equipment (38 kV and below) has been widely produced by a number of manufacturers and used by utilities for more than a decade, so these devices do not require any additional incentives for installation. The inclusion of GIE with a voltage capacity of 72.5 kV is necessary because, though there are several manufacturers that already offer non-SF_6 circuit breakers at the 72.5 kV level, or will soon, staff analysis of available data shows that a relatively small percentage of 72.5 kV circuit breakers in the State do not contain SF_6. It is therefore necessary to include these devices in the early action credit because widespread adoption at this kV level has not yet occurred. Finally, because very few SF_6 GIE exist in California at voltage capacity levels between 38 and 72.5 kV, it was not necessary to include an early action credit for equipment at this kV level.

GIE that use oil as an insulating medium do not qualify for the early action credit. This exclusion is necessary because these types of GIE have been available for many years and, based on conversations with many GIE owners, are generally being replaced with SF_6 GIE due to safety concerns associated with these type of devices.

Limiting the early action credit to circuit breakers is necessary because, at 72.5 kV and above, 82 percent of the reported GIE in 2018 were circuit breakers, and these circuit breakers represented 86 percent of SF_6 capacity at and above this voltage level. CARB staff therefore focused on the GIE device for which we have the most data and which could have the biggest impact on incentivizing non-SF_6 GIE.

The value of the early action credit varies by the voltage capacity of the non-SF_6 GIE device being installed, as shown in Table 3 of the Proposed Regulation Order. These values were developed based on the average SF_6 capacity of circuit breakers manufactured on January 1, 2016 or later as reported under the current Regulation, at

the voltage capacity levels specified in the table. For each of the four voltage levels included in Table 3, CARB staff used the same methodology to determine the values of the GHG capacity ($MTCO_2e$) of each equivalent SF_6 GIE device *($C_{e,k}$).* This value represents the amount of SF_6 that would have been present in the device if the GIE owner had elected to install SF_6 GIE instead of non-SF_6 GIE.

Staff followed the steps listed below to develop the early action credit value for each of the four voltage categories shown in Table 3.

- Filter data reported to CARB for data year 2018 under the current Regulation to select those devices reported to be non-hermetically sealed, a "circuit breaker" or some variant thereof (e.g., CB), and manufactured on January 1, 2016 or later.
- Divide the resulting data into three voltage categories similar to those categories noted in Table 2 (above), with exception that the lowest voltage considered is 72.5 kV (for reasons noted above). Devices with voltage of exactly 72.5 kV have their own separate category because reported data indicate these devices have significantly lower SF_6 capacity than 145 kV devices, making it inappropriate to provide all devices in this voltage range the same amount of credit
- Removed duplicates and devices that appeared to be parts as opposed to a complete circuit breaker. This determination was made for GIE devices with relatively small SF_6 capacity that appear to be components of a circuit breaker as opposed to a circuit breaker itself.

CARB staff noted a rather large range in the SF_6 capacity of the remaining GIE devices at each voltage level and elected to remove from the dataset GIE devices whose capacity was more than one standard deviation from the mean value for each voltage category. This ensures the amount of early action credit provided is as representative as possible of the amount of SF_6 capacity avoided through the use of non-SF_6 circuit breakers. After excluding outliers as described above, CARB staff performed the following calculations to determine the early action credit for each voltage level, based on the GIE devices that had not been excluded from the dataset:

- Calculate the average (mean) SF_6 capacity (pounds of SF_6);
- Convert the result from pounds to metric tons of CO_2e; and
- Round this value to the nearest 100 $MTCO_2e$, which CARB staff believe to be an appropriate level to round the resulting values to given the range of values reported for the SF_6 capacity of individual GIE devices.

The results of this process are shown in Table 3.

It is necessary to set the value of the early action credit using this methodology in order to provide the appropriate amount of incentive for a GIE owner to install non-SF_6 GIE instead of SF_6 GIE.

The equation for calculating the value of the early action credit in each data year includes the amount of the early action credit earned during that data year and the

amount earned during prior years (2021 and on), making it a cumulative credit. This is necessary because non-SF_6 GIE devices are expected to last at least 40 years, so each additional non-SF_6 GIE device installed will contribute to emissions reductions for approximately 40 years. Due to the extended time period over which emissions reductions may be expected following acquisition of non-SF_6 GIE, it is appropriate for the benefits of obtaining an early action credit to extend beyond the first year when the equipment is acquired.

Finally, this new section clarifies how GIE owners should account for circuit breakers that are jointly owned, which is necessary to codify this requirement in the Regulation and provide a reference to the method the GIE owner must use to determine their share for each jointly owned circuit breaker in section 95354(a)(7)(B).

Purpose of New Section 95353(e).

This new section specifies the method a GIE owner must follow to calculate their baseline CO_2e capacity on December 31, 2024 (*BL CO_2e capacity$_{12/31/2024}$).* The calculation itself involves identifying all GIE insulated with covered insulating gas that were active on December 31, 2024, which is something each GIE owner is required to do anyway to determine the value of $C_{avg,j,i}$. The covered insulating gas at activation, in pounds, of each device is multiplied by the GWP of the covered insulating gas, and then converted to metric tons, resulting in a value in units of $MTCO_2e$. After determining this value for each covered insulating gas, the GIE owner sums these values for all covered insulating gases to determine their *BL CO_2e capacity$_{12/31/2024}$*.

Rationale for New Section 95353(e).

This new section is necessary to specify the methodology GIE owners must follow to determine their *BL CO_2e capacity$_{12/31/2024}$*, which will be used to calculate their *baseline CO_2e capacity$_i$*, and subsequently *emissions limit$_i$*, pursuant to sections 95252(f) and 95252(g), in data year 2025 and beyond. Any GIE device insulated with covered insulating gas that is in active service on December 31, 2024 will count toward a GIE owner's emissions limit moving forward, which is necessary to establish a point-in-time baseline prior to the enactment of the first phase-out date on January 1, 2025. After the baseline date of December 31, 2024 is reached, GIE owner's will be limited in what GIE devices they can add to their baseline, and will thus be incentivized to replace their SF_6 GIE with alternatives because the replacement would reduce their emissions, but their emissions limit will remain fixed, as described in section II.B.4 of this ISOR.

Purpose of New Section 95353(f).

This new section specifies the method a GIE owner must follow to calculate their data years 2025–2032 baseline CO_2e capacity (*BL CO_2e capacity$_i$*), which will be used in section 95353(g)(2) to calculate their emissions limit. Each GIE owner will calculate their *BL CO_2e capacity$_i$* by summing three values: any early action credit earned since data year 2021, capped at ten percent of the GIE owner's *average CO_2e capacity* for data year 2021; the GIE owner's *BL CO_2e capacity$_{12/31/2024}$*, and the *average CO_2e capacity$_i$* for data year *i*.

Rationale for New Section 95353(f).

This new section is necessary to provide the methodology GIE owners must follow to calculate their *BL CO_2e capacity$_i$*, which will serve as the basis for their emissions limit for data year 2025 to 2032. The inclusion of the early action credit is necessary to encourage early adoption of non-SF_6 GIE, and capping the early action credit value at ten percent of the GIE owner's *average CO_2e capacity* for data year 2021 is necessary to balance the dual goals of providing an incentive to GIE owners for taking early action, but to limit the value so that GIE owners are still incentivized to convert to non-SF_6 GIE after the phase-out. The inclusion of the GIE owner's *BL CO_2e capacity$_{12/31/2024}$* is necessary to allow for all SF_6 GIE acquired and made active prior to the phase-out to count toward the GIE owner's emissions limit after the phase-out. Finally, the inclusion of *average CO_2e capacity$_i$* for data year *i* is necessary so that any SF_6 GIE acquired on January 1, 2025 or later, that have not yet met their phase-out date and are not a replacement for SF_6 GIE that were included in the *BL CO_2e capacity$_{12/31/2024}$* count toward the GIE owner's emissions limit.

Purpose of New Sections 95353(g) and 95353(g)(1).

These new sections specify how a GIE owner will calculate their emissions limit in data year 2020 through 2024. The GIE owner will take their *Average CO_2e capacity$_i$* for the data year, which will be representative of their system capacity in $MTCO_2e$, and multiply it by the value of the annual emission factor (*AEF_i*) applicable to a GIE owner of their capacity in a specific data year from Table 4 or Table 5 of the Proposed Regulation Order, then divide the result by 100. Table 4 of the Proposed Regulation Order indicates that GIE owners with capacity greater than or equal to 10,000 $MTCO_2e$ shall determine their emissions limit by multiplying the relevant capacity value by (1/100). For these same years, Table 5 indicates that GIE owners with a capacity less than 10,000 $MTCO_2e$ shall determine their emissions limit by multiplying the relevant capacity value by (2/100). For both sets of GIE owners, the value of *AEF_i* will decline by five percent in 2035, from 1.0 to 0.95 for larger GIE owners and from 2.0 to 1.9 for small GIE owners respectively.

Rationale for New Sections 95353(g) and 95353(g)(1).

These new sections are necessary to explain how a GIE owner shall calculate their emissions limit in data years 2020 through 2024. The *AEF_i* values of 1.0 and 2.0 are necessary to create an emissions limit that is equivalent to one percent or two percent of covered insulating gas capacity for GIE owners with *Average CO_2e capacity$_i$* greater than or equal to 10,000 $MTCO_2e$ or less than 10,000 $MTCO_2e$, respectively. These values are necessary to maintain for the years before the phase-out (2021 to 2024) an equivalent stringency relative to the current regulation's emission rate limit in 2020 (one percent) for GIE owners with *Average CO_2e capacity$_i$* greater than or equal to 10,000 $MTCO_2e$, and to maintain a stringency equivalent to the current regulation's emission rate limit in 2019 (two percent) for GIE owners with *Average CO_2e capacity$_i$* less than 10,000 $MTCO_2e$. As described in section II.B.4 of this ISOR, decline in the value of *AEF_i* by five percent in 2035, from 1.0 to 0.95 for larger-capacity GIE owners and from 2.0 to 1.9 for smaller-capacity GIE owners, is necessary in the context of a baseline that stays fixed when actual capacity of covered insulating gas reduces to ensure the

Regulation remains equally ambitious going forward, once installed SF_6 capacity begins to decline as a result of the phase-out.

Purpose of New Section 95353(g)(1), Table 4 and Table 5.
These new tables contain the values of AEF_i that GIE owners will use to determine their emissions limit pursuant to section 95353(g)(1), 95353(g)(2), or 95353(g)(3).

Rationale for New Section 95353(g)(1), Table 4 and Table 5.
These new tables are necessary to provide GIE owners with the values of AEF_i that they must use to calculate their emissions limit pursuant to section 95353(g)(1), 95353(g)(2) or 95353(g)(3).

Purpose of New Sections 95353(g)(2)-(3).
These new sections specify how a GIE owner will calculate their emissions limit in data year 2025 and beyond.

Rationale for New Sections 95353(g)(2)-(3).
New sections 95353(g)(2) and 95353(g)(3) are necessary to specify the method a GIE owner must follow to calculate their emissions limit for data year 2025-2032 and 2033 and beyond, respectively. For data year 2025-2032, the calculation is identical to that performed for data year 2020-2024 except that the *BL CO_2e Capacity$_i$* will be used, instead of *Average CO_2e Capacity$_i$*, in conjunction with AEF_i, which is necessary to reflect the implementation of the emissions baseline concept beginning for data year 2025. For data year 2033 and beyond, the GIE owner will calculate their emissions limit based on their *BL CO_2e Capacity* value from data year 2032. This is necessary because, starting January 1, 2033, the phase-out will be complete and SF_6 capacity should begin to decline, meaning there would be no need for a GIE owner's emissions limit to grow. Instead, the emissions limit will actually decline, in 2035, by five percent when the value of AEF_i declines, for the reasons described in section II.B.4 of this ISOR and to be consistent with new section 95353(g)(1).

Purpose of New Section 95353(h).
This new section specifies that GIE owners who calculate an emissions limit below 50 $MTCO_2e$ shall use 50 $MTCO_2e$ as their emissions limit.

Rationale for New Section 95353(h).
This new section is necessary to provide a reasonable emissions limit for GIE owners with a very small capacity so that they may comply with the Regulation. This is because requiring them to emit no more than a small percentage of their capacity on an annual basis could be very challenging. Given their smaller capacity, by the time a leak was detected, it could be that more covered insulating gas had been emitted than allowed under the Regulation. This amount was determined by considering scales used by GIE owners to calculate the amount of covered insulating gas in a gas container, which are required to be accurate to within one percent. The equation GIE owners use to calculate emissions would require that any decrease in the amount of covered insulating gas in containers from one year to the next be reported as emissions, meaning that if

the scale gave a measurement one percent below the value from the previous year, a small amount of emissions could be reported, even if there was no actual change to the amount of covered insulating gas in the container. CARB staff reviewed the amount of covered insulating gas in containers owned by relatively small GIE owners to see how many pounds of "emissions" they may report solely due to imprecision of a scale and found that all relatively small GIE owners should have no more than five pounds of change in the weight of their containers from year to year. As a result, CARB staff have set a minimum emissions limit for the smallest GIE owners of five pounds of SF_6, roughly equivalent to 50 $MTCO_2e$.

Purpose of New Sections 95353(i)-(j).
These new sections specify the process a GIE owner must follow to determine their emissions limit either after two individual GIE owners combine (95353(i)) or split (95353(j)), and to provide proper notification to CARB. The methods specified in these sections allow for GIE owners that combine to sum their individual emissions limits and use the combined value going forward. The methods also explain that when a split occurs, the original GIE owner's emissions limit should be divided among the resulting GIE owners based on each new GIE owner's share of the original GIE owner's capacity.

Rationale for New Sections 95353(i)-(j).
These new sections are necessary because GIE owners may undergo these changes (combining or splitting) and the Regulation does not have a mechanism for that value to change, even though the GIE owner's capacity could change dramatically if multiple GIE owners were to combine or one GIE owner were to split into multiple. These new sections are necessary to ensure the level of ambition under the Regulation is maintained when such an event occurs. In both cases, the GIE owners must notify CARB of the event within 30 days, provide the names and contact information for the prior and new owner(s) and each GIE owner's new emissions limit so that CARB staff will know who to contact if any questions arise, or if an annual report is not submitted on time during the next data year, and what each resulting GIE owner's emissions limit will be for the year in order to ensure each GIE owner continues to comply with the Regulation.

Section 95354. Inventory and Insulating Gas Procedures.

Purpose of Section Name "Inventory and Insulating Gas Procedures."
This section name has been revised from "SF_6 Inventory Measurement Procedures" to "Inventory and Insulating Gas Procedures."

Rationale for Section Name "Inventory and Insulating Gas Procedures."
The proposed change is necessary to clarify that the section explains the procedures a GIE owner must follow to manage all covered insulating gases, not just SF_6, as specified by the previous title, and to clarify that the section contains the procedures a GIE owner must follow when managing their GIE and insulating gas inventory.

Purpose of Section 95354(a)-(b) [Deleted].

Sections 95354(a) and 95354(b) are deleted.

Rationale for Section 95354(a)-(b) [Deleted].
These sections are deleted to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. While the concepts presented in these sections are moved to other parts of the proposed Regulation, they are changed so extensively that those changes plus the movement of the content create complexities that warrant the wholesale deletion of this section.

Purpose of New Sections 95354(a)(1)-(5).
These new sections establish the requirement that GIE owners establish and maintain a current and complete GIE inventory for each data year, and describe some of the parameters that a GIE owner must record for each GIE device that uses covered insulating gas. The data elements "equipment manufacturer name," "date equipment was manufactured," "manufacturer serial number," and "equipment voltage capacity (in kilovolts)" are moved from sections 95355(a)(1), and 95355(a)(4)-(6) in the current Regulation. "Equipment type (e.g., circuit breaker, transformer, etc.)" is moved from section 95355(a)(2) in the current Regulation, with the additional change that "(e.g., circuit breaker, transformer, etc.)" was deleted. Additional direction is added in new sections 95354(a)(2)(A) and 95354(a)(3)(A)-(B) to address the process if the "date equipment was manufactured" cannot be determined, or if the determination of "manufacturer serial number" is not possible or otherwise problematic.

Rationale for New Section 95354(a)(1)-(5).
The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. The phrase "(e.g., circuit breaker, transformer, etc.)" was deleted from section 95354(a)(4) because the examples provided are only a few examples of the types of GIE covered under this Regulation, and CARB staff believe GIE owners will be able to interpret the reporting requirement without any provided examples. New sections 95354(a)(2)(A) and 95354(a)(3)(A) are necessary to provide GIE owners with a methodology for determining the parameters required to be recorded when the information cannot be readily determined. The methodology provided in these sections is consistent with guidance previously provided by CARB under the current Regulation. New section 95354(a)(3)(B) is necessary because CARB staff has learned of several instances in which a GIE owner owns several GIE with the exact same serial number. In order to allow both GIE owners and CARB staff to distinguish between such devices for purposes of verifying reported data and/or to perform field inspections, the GIE owner must provide unique serial numbers for such devices. This new section describes how the unique serial numbers shall be determined and specifies that the GIE owner must retain records that allow for each GIE device to be readily identifiable.

Purpose of New Section 95354(a)(6).
This new section specifies that GIE owners must record the name and GWP of each covered insulating gas used in each GIE device.

Rationale for New Section 95354(a)(6).
This new section is necessary to ensure that GIE owners report the type of covered insulating gas and GWP used in each GIE device, which is necessary given the proposed Regulation's coverage of non-SF_6 covered insulating gases. Non-SF_6 insulating gases are becoming more common, and one of the main purposes of the amendments is to broaden the scope of the Regulation to capture emissions of non-SF_6 GHGs.

Purpose of New Sections 95354(a)(7) and 95354(a)(7)(A)-(B).
These sections specify the information that must be recorded by each GIE owner for a jointly owned GIE device, and provide a methodology for each GIE owner to determine their "share" of a jointly owned GIE device. The equation provided requires that each GIE owner multiply the total capacity or emissions from the GIE device by their equity share, expressed as a decimal value, to determine their share of the GIE device's capacity or emissions.

Rationale for New Sections 95354(a)(7) and 95354(a)(7)(A)-(B).
These new sections are necessary to clarify how GIE owners should account for devices that are jointly owned, for the reasons described in the write up on section 95353(b)(4). Section 95354(a)(7)(A) requires each GIE owner to report the names, ARB IDs (if known), and equity share of each co-owner so that CARB staff can review the reported data provided by those co-owners to ensure that no more or less than 100 percent of the capacity or emissions from the device are collectively reported from all joint owners of the GIE device. The equation provided in section 95354(a)(7)(B) is necessary to provide GIE owners with a methodology for determining their reportable share of the values described in that section.

Purpose of New Section 95354(a)(8).
This new section requires the GIE owner to record the nameplate capacity of each GIE device that uses covered insulating gas. The new section encompasses section 95355(a)(7) of the current Regulation with the removal of "equipment SF_6" and "charge in."

Rationale for New Section 95354(a)(8).
This new section is necessary to widen the scope of the previous requirement, which only required the nameplate capacity of SF_6 GIE devices be recorded. Non-SF_6 insulating gases are becoming more common, and one of the main purposes of the amendments is to broaden the scope of the Regulation to capture emissions of non-SF_6 GHGs, as discussed on the section on the Regulation Name.

Purpose of New Section 95354(a)(9).
This new section requires that a GIE owner record the last active date of a GIE device that was once (but not longer is) active.

Rationale New Section 95354(a)(9).

This new section is necessary to allow CARB staff to determine the amount of time that a GIE device has been out of active use. This date will be used to ensure that the GIE owner follows the requirement of section 95354(c)(1)(A), that covered insulating gas be removed from a GIE device if it has not been active GIE for five consecutive years, which also feeds in to determining the data year in which the GIE device must be considered "removed from regular use" when calculating annual emissions in section 95354.1(a).

Purpose of New Sections 95354(a)(10), 95354(a)(10)(A) and 95354(a)(10)(A)1.-5.
New section 95354(a)(10) specifies that "seal type" must be recorded. The remaining subsections specify additional information that must be recorded for non-hermetically sealed GIE, incorporating content that has moved from section 95355(a)(3) ("seal type (hermetic or non-hermetic)") and 95355(a)(10) ("equipment status (active or inactive)") in the current Regulation. New section 95354(a)(10)1. requires a GIE owner to record the number of days in the data year when the GIE device was and was not active. New sections 95354(a)(10)(A)2.-3. specify that, for each GIE device acquired after December 31, 2020, a GIE owner must record both the amount of covered insulating gas in the GIE device when acquired, and the amount of covered insulating gas that is added to the device to make it active GIE for the first time, and date that the covered insulating gas was added to the GIE device. New sections 95354(a)(10)(A)4. and 95354(a)(10)(A)5. require a GIE owner to record whether the device was active or not on January 1 and December 31, respectively, of the data year.

Rationale for New Sections 95354(a)(10), 95354(a)(10)(A) and 95354(a)(10)(A)1.-5.
The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. While section 95355(a)(10) in the current Regulation required that the status of each GIE device be reported as active or inactive in each data year, the Regulation was unclear as to how devices that were active for a portion of the data year should be considered. In order to clarify this requirement, new Section 95354(a)(10)(A)1. will require GIE owners to the number of days during the data year that each non-hermetically sealed GIE device was active and inactive. While GIE owners collect this information (number of days during the data year that each non-hermetically sealed GIE device was active and inactive) under the current Regulation in order to determine the value of C_{avg}, it is not required to be reported. Reporting of these data is necessary to allow CARB staff to verify that devices that were active GIE for a portion of the data year are accurately accounted for when determining a GIE owner's emissions limit. Sections 95354(a)(10)(A)4. and 95354(a)(10)(A)5. require the GIE owner to record whether the device was active GIE or not on January 1 of the data year and December 31 of the data year, respectively, starting on January 1, 2021. These data elements need to be recorded and reported so that CARB staff can track changes to each GIE owner's inventory over the course of the year for purposes of verifying compliance with the phase-out and other data elements.

New sections 95354(a)(10)(A)2. and 95354(a)(10)(A)3.b. are necessary so that the amount of covered insulating gas at activation, as described in new section

95354(a)(10)(A)6., can be determined and eventually reported to CARB. Some GIE devices contain covered insulating gas when they are shipped to the GIE owner from the manufacturer, and the GIE owner may need to add covered insulating gas to GIE prior to initial activation, so including both of these data elements is necessary to determine the total amount of covered insulating gas in a device at activation. Because covered insulating gas at activation (which is calculated as the sum of these two values pursuant to section 95354(a)(10)(A)6.) is one of the values used to calculate annual emissions pursuant to section 95354.1(a), ensuring that covered insulating gas at activation has been calculated correctly will allow CARB to verify that reported emissions are accurate. The date(s) covered insulating gas was added are required to be recorded pursuant to section 95354(a)(10)(A)3.a. so that CARB staff can verify that the reported values align with records of transfers of covered insulating gas retained by the GIE owner.

Purpose of New Section 95354(a)(10)(A)6.
This new section specifies the method each GIE owner must follow to calculate "covered insulating gas at activation" for each GIE device that is both acquired and made active GIE for the first time after December 31, 2020.

Rationale for New Section 95354(a)(10)(A)6.

New section 95354(a)(10)(A)6. is necessary to specify the applicability and method GIE owners must use to calculate covered insulating gas at activation, which is a new term introduced in section 95351(a). The proposed Regulation will require that each GIE owner calculate the amount of covered insulating gas in the device at activation for new GIE which are both acquired and made active GIE for the first time after December 31, 2020. Covered insulating gas at activation shall be calculated by adding the amount of covered insulating gas in the GIE device when acquired (section 95354(a)(10)(A)2.) and the amount added to the GIE device to make it active GIE for the first time(section 95354(a)(10)(A)3.b.), both of which are necessary to more accurately calculate the total amount of covered insulating gas within the GIE device at activation. Covered insulating gas at activation is only required to be calculated for GIE acquired and made active GIE after December 31, 2020 because the terms used in the calculation are not required in the current Regulation, and so may not be available for GIE acquired or made active prior to this date.

Purpose of New Sections 95354(a)(10)(B) and 95354(a)(10)(B)1. and 2.
These new sections specify values that must be recorded for hermetically sealed GIE, incorporating content that has moved from section 95355(a)(3) ("seal type (hermetic or non-hermetic)") and 95355(a)(10) ("equipment status (active or inactive)") in the current Regulation.

Rationale for New Sections 95354(a)(10)(B) and 95354(a)(10)(B)1. and 2.
The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. While section 95355(a)(10) of the current Regulation

required the status of each GIE device be reported as active or inactive in each data year, the Regulation was unclear as to how devices that were active for a portion of the data year should be considered. Also, while this requirement applied to both hermetically sealed and non-hermetically sealed GIE in the current Regulation, the detail around the number of days it is active, described in the previous section, is not needed for hermetically-sealed GIE only because hermetically sealed GIE are not included in a GIE owner's emissions calculation. For hermetically sealed GIE, only the information specified in sections 95354(a)(10)(B)1.-2. are required to be recorded and eventually reported by the GIE owner, which is necessary so that CARB staff can collect information on the prevalence of and use of hermetically sealed GIE. As such, the GIE owner must now indicate if the device was in active use on January 1 and December 31 of the data year to resolve ambiguity over how to report a device that was in active use for a portion of the data year.

Purpose of New Section 95354(a)(11) and 95354(a)(11)(A)-(C).
These new sections specify information that each GIE owner must record whenever they acquire a GIE device after December 31, 2020.

Rationale for New Sections 95354(a)(11) and 95354(a)(11)(A)-(C).
These sections are necessary to require GIE owners to record, and eventually report, the purchase date, acquisition date and short-circuit current rating of each newly acquired GIE device, as well as whether the device is or will be used above or below ground. It is necessary that these data elements be reported because they are characteristics of a GIE device that govern the phase-out date for the device as listed in Table 1 and Table 2 of the Proposed Regulation Order. CARB staff will need these data elements to gather additional information on the quantity of GIE devices in each category in advance of the phase-out to better understand the number of SF_6 phase-out exemption requests that may be submitted and, after the initial phase-out date, to ensure that GIE owners are complying with the phase-out requirements. GIE owners that acquire SF_6 GIE after the applicable phase-out date will be subject to enforcement action, so CARB staff need a way to identify these devices.

Purpose of New Section 95354(a)(12) and 95354(a)(12)(A)-(B).
These new sections require GIE owners record whether each non-hermetically sealed SF_6 GIE device acquired between December 31, 2024 and January 1, 2033 (exclusive) replace a device that was included in the December 31, 2024 baseline capacity and, if applicable, the serial number of the device being replaced.

Rationale for New Sections 95354(a)(12) and 95354(a)(12)(A)-(B).
These new sections are necessary for GIE owners to record and eventually report the specified data elements so that CARB staff can verify if the baseline capacity value each GIE owner uses to determine their emissions limit was calculated correctly. Per section 95353(b), only those GIE acquired during the time period specified that do not replace an existing GIE device that was accounted for in the GIE owner's baseline are allowed to count toward the GIE owner's baseline, to avoid double counting. Reporting of these data elements will allow CARB staff to verify that each GIE owner followed this

requirement correctly and also allow CARB staff to identify the GIE device being retired and replaced. This will also allow CARB staff to verify that the device being replaced was removed from the GIE owner's inventory and that the covered insulating gas it contained has been extracted and accounted for, per requirements outlined in sections 95354(c)(1)(A), 95354(c)(1)(B), and 95354(d).

Purpose of New Sections 95354(a)(13) and 95354(a)(13)(A-C).
These new sections specify information that each GIE owner are required to record for SF_6 GIE acquired after the phase-out under certain conditions.

Rationale for New Sections 95354(a)(13) and 95354(a)(13)(A)-(C).
These new sections are necessary to require that each GIE owner record and eventually report information that can be used to justify the acquisition of an SF_6 GIE device after the phase-out, so that CARB staff can verify there was a permissible reason for the acquisition and that no enforcement action should be taken against the GIE owner. Sections 95354(a)(13)(A)-(C) provide the data elements necessary to justify the acquisition of SF_6 GIE pursuant to sections 95352(a)(1)-(2) and (4), respectively. For SF_6 GIE acquired pursuant to section 95352(a)(1), GIE owners must report the SF_6 phase-out exemption request identification number issued by CARB to the GIE owner to allow for such an acquisition. For SF_6 GIE acquired pursuant to section 95352(a)(2), GIE owners must report the name and ARB ID (if known) of the previous GIE owner so that CARB staff can review the previous owner's GIE inventory to ensure they owned the device in the prior data year. For SF_6 GIE acquired pursuant to section 95352(a)(3), no additional data elements need to be recorded because the relevant data are already required to be reported pursuant to section 95354(a)(11)(A). Finally, for SF_6 GIE acquired pursuant to section 95352(a)(4), GIE owners must report the serial number of the SF_6 GIE device returned to the manufacturer so that CARB staff can verify that an SF_6 GIE device previously in the GIE owner's possession was in fact removed from the GIE owner's inventory and that the age of the device is such that it could still be covered by the manufacturer's warranty.

Purpose of New Section 95354(a)(14).
This new section describes the requirement that GIE owners record whether they were no longer the owner of a GIE device on December 31 of the data year.

Rationale for New Sections 95354(a)(14).
This new section is necessary to require GIE owners to record and eventually report whether they got rid of a device during the data year so that CARB staff will know whether to expect the GIE device to be reported in the following year. This is necessary because, through data quality checks performed on previous annual reports, CARB staff found inconsistencies that prompted CARB staff to ask the GIE owner whether the device was disposed of during the prior year or erroneously excluded from their report. This data element should reduce the need for such follow up.

Purpose of Sections 95354(b) and 95354(b)(1).

These sections specify when covered insulating gas may be added to a GIE device that has never previously been in the GIE owner's inventory as active GIE or that was considered "removed from regular use" in a prior data year pursuant to section 95354(c)(1). Section 95354(b) requires the GIE owner to record the amount of covered insulating gas transferred to the GIE device, and section 95354(b)(1) specifies the method to determine this value.

Rationale for Sections 95354(b) and 95354(b)(1).
These sections are necessary to prohibit GIE owners from adding covered insulating gas to inactive GIE devices prior to the data year in which it will first become active GIE. Inactive GIE devices are not performing any function, and placing a covered insulating gas into these devices could cause emissions to the atmosphere if they were to leak. Additionally, the requirement that the covered insulating gas being placed into a device being activated be accounted for (by weighing the containers in which it was housed) in the same data year as the capacity (covered insulating gas at activation) of the device was accounted for (the data year in which the device became active GIE) is necessary for the annual emissions calculation to balance properly. The GIE owner must record the amount of covered insulating gas added to a device being activated, and eventually report it, so that CARB staff may verify that annual emissions were reported correctly.

Purpose of New Sections 95354(c), 95354(c)(1)-(2), and 95354(c)(1)(A)-(B).
These new sections specify when a GIE device that has been active GIE at some point during ownership should be considered "removed from regular use" or "transferred while in use." A GIE device must be considered "removed from regular use" either five years after it was last active GIE or when it is being removed from active use for purposes of removal from the GIE owner's inventory. A GIE device must be considered "transferred while in use" when it is removed from a GIE owner's inventory without being taken out of active service. This could occur when the device is acquired by a new owner while remaining in place and continuing operation.

Rationale for New Sections 95354(c), 95354(c)(1)-(2), and 95354(c)(1)(A)-(B).
These new sections are necessary to add clarity and specificity to the Regulation and to close gaps that existed in the accounting of emissions in the current Regulation. The current Regulation requires the capacity of a device be accounted for in the emissions calculation when the device was "retired," but did not provide a definition of this term. New sections 95354(c)(1)-(2) and 95354(c)(1)(A)-(B) effectively define when a GIE device is considered to be "retired" or, as it is now known, either "removed from regular use" or "transferred while in use," for purposes of emissions accounting. The requirement that the device be considered either "removed from regular use," or "transferred while in use" once either of the circumstances described in new sections 95354(c)(1)(A)-(B), or, new section 95354(c)(2), respectively, occur is necessary to close a loophole in the emissions calculation that allowed GIE owners to exclude GIE devices that were no longer in active service from their emissions calculations for an indefinite amount of time until the GIE owner considered the device to be "retired." New sections 95354(c)(1)(A)-(B), and 95354(c)(2) close this loophole by defining when these devices shall be considered "removed from regular use" or "transferred while in use."

The two distinct terms are necessary because, in some cases GIE will be removed from service in order to be sold, transferred, or disposed of. Conversely, when an entire facility (e.g., a substation) is sold or transferred to another GIE owner, this typically happens without the GIE being taken out of active service.

Purpose of New Sections 95354(d) and 95354(d)(1).
These new sections specify that covered insulating gas must be removed from each GIE device to which the provisions of sections 95354(c)(1)(A)-(B) apply, specify that this gas must be accounted for in the same data year that the GIE device is "removed from regular use," and provide a methodology for accounting for the covered insulating gas that is removed from these GIE.

Rationale for New Sections 95354(d) and 95354(d)(1).
These new sections are necessary in combination with the provisions of section 95354(c)(1)(A)-(B) to close a loophole that allowed for a GIE device to go unaccounted from an emissions accountability perspective for an indefinite amount of time until the GIE owner considered the device to be "retired." New section 95354(d) requires that, once either of the conditions in new section 95354(c)(1)(A) or 95354(c)(1)(B) are met, covered insulating gas must be extracted from the GIE device and included in the emissions equation. The difference between the value determined pursuant to section 95354(c)(1)(A) or 95354(c)(1)(B) and the amount of covered gas extracted pursuant to section 95354(d) will be reported as emissions of covered insulating gas.

This change will ensure that GIE owners can no longer extract the covered insulating gas from a device in a different year than the year in which they consider the device to be "removed from regular use" (formerly "retired"). Ensuring that the covered insulating gas in a device being removed from regular use is accounted for in the same year that the device was removed from regular use is important because a temporal disconnect between these two actions would lead to the calculation of negative emissions in one data year, and positive emissions that didn't necessarily actually occur in the other data year. While these values may offset each other when viewed across the two data years, this temporal disconnect could affect GIE owner compliance with the emissions limit in each individual year. New section 95354(d)(1) is necessary to specify how GIE owners determine the amount of covered insulating gas transferred out of the GIE device. This detailed information matches other similar sections in the proposed Regulation to ensure that GIE owners are conducting measurements in an accurate and consistent manner.

Purpose of New Section 95354(e).
This new section specifies the accuracy requirements for a scale used to determine the amount of covered insulating gas in a gas container. This requirement appears in section 95354(a)(2) of the current Regulation, and was modified to add "whenever a gas container is required to be weighed," and to change "all containers" to "the container."

Rationale for New Section 95354(e).

The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. The section was moved from 95354(a)(2) of the current Regulation for clarity, so that it is listed alongside the requirements describing when gas containers are required to be weighed. This new section is necessary to ensure the amount of covered insulating gas measured meets the minimum accuracy requirements of the Regulation, and to specify that these requirements apply when a gas container is required to be weighed.

Purpose of New Sections 95354(f), 95354(f)(1)-(2), and 95354(f)(1)(A)-(B).
These new sections specify the points in time that a GIE owner must weigh their covered gas containers to determine annual emissions of covered insulating gas, both for covered gas containers owned by or stored on the property of the GIE owner (section 95354(f)(1)(A)-(B)) and other covered gas containers (section 95354(f)(2)). These new sections are based on section 95355(b)(4) in the current Regulation, which was removed and replaced with the new sections. New section 95354(f)(1)(A) requires that each GIE owner determine, and eventually report, the amount of covered insulating gas in each covered gas container at the end of each calendar year by weighing each container on a scale. New section 95354(f)(1)(B) specifies that each covered gas container must also be weighed whenever it is added to, or removed from, the GIE owner's gas container inventory, so that the amount of gas in these containers can be accounted for in the annual emissions calculation. New section 95354(f)(2) specifies the points in time when covered gas containers that are neither owned by nor stored on the property of the GIE owner must be weighed. The new section specifies that each covered gas container of this type must be weighed both immediately before and after use at the GIE owner's facilities. The weight of the covered gas container at these points in time must be recorded, and eventually reported, as if it were a covered gas container owned by the GIE owner that was weighed when "added to inventory" and "removed from inventory." Pursuant to section 95354(f), each time the amount of covered insulating gas in a container is determined at the specific points in time described above, the GIE owner must record the amount of covered insulating gas, the date the measurement was made, and the reason why the container was weighed.

Rationale for New Sections 95354(f), 95354(f)(1)-(2), and 95354(f)(1)(A)-(B).
These new sections are necessary to ensure GIE owners account for all their covered insulating gas in containers on an annual basis so that annual emissions can be properly calculated. In addition to housing some of the content previously included in section 95355(b)(4) of the current Regulation, section 95354(f)(1)(A) is necessary to clarify the period of time that is considered to be the "end of the calendar year" and explains to the GIE owner when the measurements must be made. These changes incorporated into section 95354(f)(1)(A) are necessary because the current Regulation lacks specific guidance in these areas, but are not needed in section 95354(f)(1)(B) because the current Regulation sufficiently identified the points in time in which the measurements described in this section are required. New section 95354(f)(2) is necessary to clarify the current Regulation with regard to how covered insulating gas in containers neither owned by nor stored on the property of the GIE owner should be

accounted for. New section 95354(f) is necessary because these requirements were ambiguous in the current Regulation, and GIE owners did not interpret the requirements for determining covered insulating gas in these containers consistently. It is necessary that GIE owners report all information required to be collected pursuant to these sections to CARB so that CARB staff can verify that each covered gas container was weighed at the proper points in time and so that CARB staff can verify that the annual emissions reported by the GIE owner are accurate.

Purpose of New Sections 95354(g) and 95354(g)(1)-(5).

These new sections specify parameters that a GIE owner must record for each covered gas container that they own, is stored on their property, or was used during the data year and each gas cart the GIE owner has decided to weigh using the "scale method." New section 95354(g) is based on the text under section 95355(b) in the current Regulation but has changed sufficiently that it is considered new text in this section and deleted text in the previous section. Section 95354(g)(2) is identical to previous section 95355(b)(1), and sections 95354(g)(1) and 95354(g)(3)-(5) are new.

Rationale for New Sections 95354(g) and 95354(g)(1)-(5).

The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. These new sections are necessary to require that each GIE owner record, and eventually report, the required information for each covered gas container and each gas cart the GIE owner has determined they will weigh using the "scale method," which is necessary for CARB staff to review and verify that reported emissions are correct. GIE owners must record, and eventually report, whether each covered gas container or applicable gas cart is required to be weighed pursuant to section 95354(f)(1) or section 95354(f)(2)under section 95354(g)(1), which is necessary to allow CARB staff to verify that each container or applicable gas cart was weighed at the proper points in time. GIE owners must continue to report a unique identification number for each container or applicable gas cart under section 95354(g)(2), as required under section 95355(b)(1) in the current Regulation, to enable CARB staff to track the container over multiple data years and to ensure it is weighed at all the proper times. Under section 95354(g)(3), the GIE owner must record and eventually report the name and GWP of the covered insulating gas so that CARB staff may verify that annual emissions, reported in units of $MTCO_2e$, are accurate. Under section 95354(g)(4), the GIE owner is required to record, and eventually report, all information described in section 95354(f) for the reasons described in the write up on that section. Finally, section 95354(g)(5) requires each GIE owner record, and eventually report, the amount of covered insulating gas in each covered gas container or applicable gas cart at the beginning of the data year, which must be identical to the value reported at the end of the prior data year. This information is necessary so that CARB staff may verify that reported emissions are correct, without relying on data submitted for a prior year, which complicates the process of checking and verifying reported data.

Purpose of New Sections 95354(h) and 95354(h)(1)-(5).

These new sections specify information that must be recorded each time covered insulating gas is transferred into or out of a GIE device. New Sections 95354(h)(1) and 95354(h)(4) are based on sections 95355(a)(8) and 95355(a)(9) in the current Regulation, but have changed sufficiently that they are considered a new addition in this section and a deletion from the previous section. Sections 95354(h)(2)-(3) and 95354(h)(5) are completely new. Under these new sections, GIE owners will be required to report the serial number of each GIE device that covered insulating gas is transferred into or out of, the container from/to which the gas was transferred, the type of covered insulating gas, and the date of the transfer.

Rationale for New Sections 95354(h) and 95354(h)(1)-(5).
These new sections are necessary to require GIE owners to record and eventually report to CARB additional information will help CARB staff verify that reported emissions are correct and for CARB staff to understand the movement of covered insulating gas in the field. GIE owners will no longer be required to report the volume of insulating gas transferred; this change is necessary because the volume of insulating gas transferred is not used to verify that a GIE owner's emissions were reported correctly. Because each GIE owner is required to determine the amount of covered insulating gas in each covered gas container at the end of each calendar year, and when removed from or added to the gas container inventory, the cumulative amount of covered insulating gas transferred into and out of covered gas containers is accounted for on an annual basis, without requiring the reporting of this data element. Further, the current Regulation did not specify a method by which the GIE owner should determine the volume transferred. For all of these reasons, this provision is no longer necessary in the proposed Regulation.

Purpose of New Sections 95354(i) and 95354(i)(1)-(3).
These new sections specify how a GIE owner must account for covered insulating gas in gas carts. New section 95354(i)(1) specifies that, by January 1, 2021, each GIE owner must determine, for each gas cart, if they will weigh the cart (the so-called "scale method"), or if they will use a new alternative method (the "container method") to determine the amount of covered insulating gas in the cart. Once a method is selected, the GIE owner must continue to use that methodology for as long as they own that gas cart. The GIE owner must also specify a pressure that they will bring each gas cart to prior to making each required measurement. New section 95354(i)(1) also specifies that a GIE owner who acquires a gas cart after December 31, 2020 must select a method at the time the gas cart is acquired. The "container method" is described in new sections 95354(i)(2)(A) and 95354(i)(3)(A). New sections 95354(i)(2)(B) and 95354(i)(3)(B) allow the GIE owner to determine the amount of covered insulating gas in the cart by weighing the cart, if the GIE owner chooses to do so.

Rationale for New Sections 95354(i) and 95354(i)(1)-(3).
These new sections are necessary to clarify how a GIE owner should account for, record, and report the amount of covered insulating gas in gas carts, and to provide GIE owners with an alternative method for determining the amount of covered insulating gas in gas carts. Under the current Regulation, each gas cart is considered a gas container,

and the amount of covered insulating gas in the gas cart must be quantified and reported at the end of the calendar year and whenever the gas cart is added to or removed from the inventory. During the informal public process to present potential revisions to the Regulation, GIE owners noted that gas carts weigh in excess of 1,000 pounds and not all GIE owners have a scale that can be used to weigh the gas cart and accurately account for the amount of covered insulating gas within the cart. Retention of this method is appropriate because some GIE owners indicated they are able to follow the "scale method."

However, because of challenges associated with weighing gas carts, the proposed Regulation includes an additional methodology GIE owners could choose to quantify covered insulating gas in gas carts: the container method. New sections 95354(i)(1), 95354(i)(2)(A) and 95354(i)(3)(A) specify the steps involved with the container method. This method requires the GIE owner to specify by January 1, 2021 (or, for gas carts acquired on or after this date, the date the cart is acquired) a pressure to which they will bring the gas in each cart when they undertake each measurement. This section is necessary because GIE owners have noted that it is impossible to remove all gas from a gas cart without pulling it to a vacuum using a second gas cart, which would then itself be unable to be fully emptied. By requiring the GIE owner to specify a pressure that they will bring the gas cart to prior to making the measurements, roughly an equivalent amount of covered insulating gas will remain in the cart each time covered insulating gas is accounted for. Therefore, any changes to the amount of covered insulating gas in possession of the GIE owner will be reflected in changes to the amount of covered insulting gas in gas containers. The amount of residual covered insulating gas that remains in the gas cart should not be accounted for, as it is expected that the amount of gas would remain nearly the same from measurement to measurement.

For each measurement cycle, pursuant to section 95354(i)(2)(A) and 95354(i)(3)(A), the GIE owner must pump covered insulating gas stored in the gas cart out of (or into) the cart and into (or out of) a covered gas container until the pressure in the gas cart reaches the value specified under section 95354(i)(1). The resulting covered gas container would then be weighed at the end of the calendar year (section 95354(i)(2)(A)) or whenever the gas cart is being added to or removed from the property of the GIE owner (section 95354(i)(3)(A)). It is necessary that each GIE owner employ a consistent methodology for all measurements of covered insulating gas for each gas cart because the "scale method" would allow the GIE owner to account for all covered insulating gas in the gas cart and the "container method" would not quantify any residual gas below the pressure selected under section 95354(i)(1). Therefore, if the GIE owner were to change methods, there would be an accounting error as the methods do not measure the same quantity and covered insulating gas would either be counted as an emission or as negative emissions, when in reality covered insulating gas was neither added to nor removed from the atmosphere. This added flexibility in how covered insulating gas in a gas cart should be accounted for should allow all GIE owners to determine the amount of covered insulating gas in a gas cart at the required points in time, which will yield more accurate accounting of annual emissions.

Purpose of New Sections 95354(j) and 95354(j)(1)-(4).
These new sections specify the requirement that each GIE owner establish and adhere to written procedures to track all covered gas containers included in their inventory. The new section is based on section 95354(a)(1) of the current Regulation, with the addition of "included in the inventory compiled pursuant to section 95354(g)." The GIE owner must review the procedures annually and revise them as needed to ensure that the information is current and the requirements of section 95354(e)-(h), are met. The procedures must require the recording of the following information: the covered gas container's identification number (new section 95354(j)(2)), the date it is moved from one location to another (new section 95354(j)(1)), the name and address of the location (if applicable) (new section 95354(j)(3)), and the name of the person receiving the covered gas container at the location (new section 95354(j)(4)).

Rationale for New Sections 95354(j) and 95354(j)(1)-(4).
These new sections are necessary to establish requirements and provide guidance to GIE owners on what key components are needed for a robust container tracking procedure. Robust procedures are necessary to ensure all employees understand what values must be measured and recorded each time a covered gas container is added to the inventory, removed from the inventory, or used to transfer covered insulating gas into or out of GIE. Previous section 95354(a)(1) in the current Regulation required GIE owners to establish procedures for tracking gas containers as they are leaving and entering storage; however, CARB staff have reviewed some of the procedures established by GIE owners and found that these additional information should be included in procedures to ensure that all necessary data are collected by the GIE owner to account for the GIE owner's annual emissions more accurately.

Purpose of New Sections 95354(k) and 95354(k)(1)-(3).
These new sections specify scale calibration requirements that each GIE owner must adhere to. New section 95354(k)(1) requires that a scale be calibrated prior to its initial use to measure quantities reported under this subarticle. This section incorporates information contained in sections 95354(a)(3) and 95354(a)(4) in the current Regulation, which require that, in order to calibrate a scale, the GIE owner shall use procedures specified by the scale manufacturer, or alternative methods, as described. New section 95354(k)(2) requires scales be recalibrated at the frequency specified, which incorporates information contained in section 95354(a)(5) of the current Regulation, with one key change. New section 95354(k)(2) requires scales be recalibrated every three years or at the minimum frequency specified by the manufacturer, whichever is more frequent. New section 95354(k)(3) is added, which incorporates content from section 95354(b)(2) of the current Regulation and requires the GIE owner maintain a log of measurements and calibrations required by this section including the methods used to calibrate the scales.

Rationale for New Sections 95354(k), and 95354(k)(1)-(3).
The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. These new sections are necessary to clarify the existing

requirements related to calibration of scales so all requirements are housed under the same section of the Regulation. Additionally, staff made change to the existing calibration requirements to specify that a scale must be calibrated prior to its initial use to measure quantities reported under this subarticle, versus the current Regulation which required scales be calibrated prior to the first reporting year. This change is necessary because it will require a GIE owner that acquires a new scale to calibrate the scale prior to its initial use. The same requirement would apply to an existing scale that the GIE owner wishes to begin to use to determine quantities reported under this subarticle. New section 95354(k)(1) also incorporates information from section 95354(a)(3) of the current Regulation, the requirements of which are necessary to ensure that the scales used to determine weights reported under this Regulation yield accurate results. The change to reduce the frequency at which scales are required to be recalibrated from section 95354(a)(5) of the current Regulation to what is now specified in section 95354(k)(2) aligns recalibration requirements with MRR. New section 95354(k)(3) is necessary so that CARB staff can review the recalibration procedure, if necessary, to ensure each GIE owner has complied with these requirements.

Purpose of New Section 95354(l).
This new section specifies the methodology a GIE owner must follow to determine the amount of covered insulating gas contained within a gas blend. Whenever such a value must be calculated, this new section explains that the GIE owner must calculate the amount of covered insulating gas within a gas blend by multiplying the total amount of gas in the mixture by the ratio of the mass of covered insulating gas within the mixture relative to the total amount of insulating gas in the mixture. The GIE owner must also record the values used in this calculation.

Rationale for new Section 95354(l).
This new section is necessary to provide GIE owners with a methodology for determining the amount of covered insulating gas within a gas blend whenever such a value must be calculated, recorded, and/or reported under the Regulation. Some of the new insulating gases are a mixture of multiple gases, but the GIE owner is only responsible for reporting the portion of those insulating gases comprised of each covered insulating gas, so this section is necessary to ensure that GIE owners use a consistent method to determine this value, and the resulting accuracy will carry over to reported emissions values. The GIE owners are required to record the values used in the calculation so that they would be subject to reporting requirements in section 95355.

Section 95354.1. Calculating Annual Emissions.

Purpose of New Section 95354.1(a).
This new section specifies the formula a GIE owner must follow to determine their annual emissions. It is based largely on the equation contained in section 95356(d) of the current Regulation and contains key changes, which include specifying that GIE owners must do the calculation for covered insulating gases (instead of just SF_6), clarifying requirements related to covered gas containers and gas carts, and revising

terminology and principles contained in the equation to match revisions to the proposed Regulation. Finally, a section of text has been added to explain how emissions from jointly owned GIE shall be accounted for.

Rationale for New Section 95354.1(a).

The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. This new section is necessary to provide GIE owners with a clear methodology to calculate annual emissions, and the revisions relative to the current Regulation clarify requirements and terms in the calculation, and conform to other changes throughout the proposed Regulation. For example, references to "SF_6" in the current Regulation have been changed to "covered insulating gas *j*" to reflect the broadened scope of the proposed Regulation. Additionally, references to "containers" in the current Regulation have been changed to "gas containers and gas carts included in the gas container inventory" to reflect the change to the definition of a "gas container," which now excludes gas carts. References to "equipment" or "GIS equipment" have been changed to "GIE" for consistency with the change to the definition of this term. Throughout the equation, references to "year" have been changed to "data year" or "data year *i*". The name of the value calculated has also been changed from "user emissions" to "$annual\ emissions_{j,i}$" for consistency with the terminology used in other equations in the proposed Regulation.

It is necessary to change "purchased" to "obtained" in "*Acquisitions of covered insulating gas j*," because covered insulating gas may be obtained via a method other than a "purchase." Within the same term, "purchased from equipment manufacturers, distributors, or other entities with or inside active GIS equipment" has been re-written, which is necessary to remove the unnecessary specification of who the gas may be obtained from, and to clarify that covered insulating gas obtained inside GIE is only to be accounted for in the data year in which the GIE becomes active GIE for the first time. Finally, the term "covered insulating gas *j* at activation for GIE transferred while in use from another entity during the data year pursuant to section 95354(c)(2)" has been added. This change is necessary for consistency with the terminology in new section 95354(c)(2) to ensure that GIE sold or transferred while in use (that is, while in active service) is properly accounted for in the emissions equation.

Within the definition of "*Disbursements of covered insulating gas j*," the term related to active GIS equipment sold to other entities has been replaced with "covered insulating gas *j* at activation in GIE transferred while in use during the data year pursuant to section 95354(c)(2)." This change is necessary for consistency with the terminology in new section 95354(c)(2) to ensure that GIE sold or transferred while in use (that is, while in active service) is properly accounted for in the emissions equation.

Within the term "*Net increase in total capacity of active GIE owned and filled with covered insulating gas j*," the term "nameplate capacity" has been changed to "covered insulating gas *j* at activation," which is necessary to reflect new methods and terminology introduced in the proposed Regulation. The term "new active GIS" has

been replaced with “GIE whose status changed from inactive GIE to active GIE,” which is necessary to capture all GIE that became “active GIE” during the data year. The term “retiring active GIS” from the current Regulation has been replaced with “removed from regular use,” which is necessary for clarity (given that “retiring” was not defined in the current Regulation) and consistency with the new methods and terminology specified in section 95354(c)(1)(A)-(B). The term “covered insulating gas *j* at activation for GIE transferred while in use to another entity during the data year pursuant to section 95354(c)(2)” has been added to the equation for consistency with the new methods and terminology specified in section 95354(c)(2). The two terms distinguish between GIE devices that are taken out of service for long-term storage, disposal, sale, or transfer (“removed from regular use”) and those that are part of in-place operations that are sold or transferred to another GIE owner (“transferred while in use”). This is necessary to specify that covered insulating gas does not need to be removed from the GIE and accounted for when GIE are transferred while in use. Finally, the term “covered insulating gas *j* at activation for GIE transferred while in use from another entity during the data year pursuant to section 95354(c)(2)” has been added to the equation for consistency with the new methods and terminology specified in section 95354(c)(2). When viewed holistically, these changes are necessary to ensure accurate accounting of each GIE owner’s actual emissions during the data year and to assess compliance with emissions limit requirements.

Finally, the addition of the text after the emissions equation is necessary to explain to GIE owners how they should account for devices that are jointly owned.

Purpose of New Section 95354.1(b).

This new section specifies the method GIE owners must follow to calculate their annual emissions across all covered insulating gases in units of $MTCO_2e$. The equation simply has the GIE owner multiply the emissions of each covered insulating gas calculated using the method in section 95354.1(a) by the respective GWP of the covered insulating gas, convert the value from pounds to metric tons, and then sum across all covered insulating gases.

Rationale for New Section 95354.1(b).

This new section is necessary to determine each GIE owner’s annual emissions in units of $MTCO_2e$, which is necessary to compare the reported emissions to the GIE owner’s emissions limit, which will be determined in units of $MTCO_2e$. The ability to compare the GIE owners’ emissions to the emissions limit is necessary to determine compliance with the Regulation.

Purpose of New Section 95354.1(c).

This new section specifies the equation GIE owners must use to deduct emissions associated with emergency events from their total emissions calculated under section 95354.1(b). This new section provides an equation through which the GIE owner will determine their emissions from emergency events by multiplying the emissions of each GHG emitted from such an event, in pounds, by the respective GWP of that GHG, and convert the value from units of pounds to metric tons. The GIE owner would

subsequently subtract this value from the total CO_2e emissions calculated in section 95354.1(b).

Rationale for New Section 95354.1(c).
This new section is necessary to specify the method for subtracting GHG emissions associated with emergency events from the total GHG emissions value used to determine whether the GIE owner is in compliance with the annual emissions limit. As specified in section 95357.1, and following a similar principal in the current Regulation, emissions from emergency events shall not be counted against the GIE owner for compliance purposes, so this method is necessary to ensure conformance with this provision of the Regulation.

Purpose of New Sections 95354.1(d) and 95354.1(e).
These new sections specify that, for data year 2020, only emissions of SF_6 should be calculated, but for all other data years, emissions of all covered insulating gases should be calculated.

Rationale for New Sections 95354.1(d) and 95354.1(e).
These new sections are necessary because, starting in 2021, the Regulation will cover all covered insulating gases, so emissions of all covered insulating gases must be calculated. Since the Regulation is intended to become effective during data year 2020, and only monitoring of SF_6 and SF_6 emissions are required under the current Regulation, this requirement is necessary to ensure consistency with the current Regulation for data year 2020.

Section 95355. Reporting Requirements.

Purpose of Section Name "Reporting Requirements."
This section name has been revised from "Recordkeeping" to "Reporting Requirements."

Rationale for Section Name "Reporting Requirements."
The proposed change is necessary to clarify that the section explains the Regulation's reporting requirements, and to move "Recordkeeping" content in section 95355 in the current Regulation to section 95356 in the proposed Regulation to keep a logical flow to the regulatory requirements.

Purpose of Section 95355(a)-(f) [Deleted].
Sections 95355(a) through 95355(f) are deleted.

Rationale for Section 95355(a)-(f) [Deleted].
These sections are deleted to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. While the concepts presented in these sections are moved to other parts of the proposed Regulation, they are changed so extensively that those changes plus the movement of the content create complexities that warrant the wholesale deletion of this section.

Purpose of New Section 95355(a).
This new section provides the deadline by which each GIE owner must submit their annual GHG emissions data report, which is unchanged from the current Regulation, where the deadline is provided in section 95356(a). This section also explains that each person who was a GIE owner at any point during the previous calendar year must submit an annual report, the concept of which is consistent with the current Regulation. New text has also been added to clarify how a GIE owner is defined under the proposed Regulation. This section draws from section 95356(a) and 95356(b) of the current Regulation with additional text added.

Rationale for New Section 95355(a).
This new section is necessary to retain the reporting deadline from the current Regulation and to add additional clarity and specificity to how a "GIE owner" is to be defined. This additional clarity is necessary because the scope of what is considered to be a single "GIE owner," for reporting purposes, in this Regulation is different than the way in which a "facility" is defined for reporting purposes in some other GHG emissions regulations that cover stationary sources. Historically under this Regulation, some GIE owners that should submit a single annual report covering all their activities have divided themselves into multiple GIE owners and submitted several individual reports. Conversely, some GIE owners have aggregated themselves into a higher-level GIE owner that the Regulation requires. The new text that has been added in this section should help clarify for GIE owners which components of their operations are considered to be a single "GIE owner" that is subject to this Regulation and must submit an annual report. Finally, the content of section 95356(b) of the current Regulation has been incorporated into this section to improve clarity.

Purpose of New Sections 95355(a)(1)-(4).
These new sections specify some of the required elements of a GIE owner's annual GHG emissions report. Sections 95355(a)(1)-(4) are similar to sections 95356(b)(1)-(4) in the current Regulation, though each has been modified.

Rationale for New Sections 95355(a)(1)-(4).
The re-organization of content in the Regulation is necessary to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. These new sections are necessary to improve clarity and add some details related to data elements that the GIE owner must report. These data elements are necessary so that CARB staff has the needed information to be able to contact the GIE owner.

Purpose of New Section 95355(a)(5).
This new section specifies that the GIE owner must report data elements required to be recorded pursuant to section 95354, and specifies that recorded data elements in sections 95354(a), (d), (g), (h), and (l) must be reported.

Rationale for New Section 95355(a)(5).

This new section is necessary because CARB staff will need to review these data elements annually in order to ensure that each GIE owner's annual emissions have been reported correctly, that they are in compliance with the emissions limit, and that each GIE owner is in compliance with the phase-out.

Purpose of New Sections 95355(a)(6) and 95355(a)(6)(A)-(C).
These new sections specify the information each GIE owner must provide related to each non-SF_6 GIE device they acquire that qualifies for the early action credit.

Rationale for New Sections 95355(a)(6) and 95355(a)(6)(A)-(C).
These new sections are necessary to provide CARB staff with details about each non-SF_6 GIE device acquired that qualifies for the early action credit. This information enables CARB staff to verify that the non-SF_6 GIE device acquired does in fact meet the requirements of section 95353(d) and that the GIE owner has correctly calculated the value of the early action credit. This information is also necessary for CARB staff to gain more visibility into the emerging non-SF_6 GIE market to inform decisions related to phase-out exemption requests after the applicable phase-out date for each type of SF_6 GIE device.

Purpose of New Sections 95355(a)(7) and 95355(a)(7)(A)-(I).
These new sections specify data elements required to be reported related to a GIE owner's annual emissions and emissions limit. More specifically, the data elements described in sections 95355(a)(7)(A)-(D) serve as inputs to calculate the emissions limit, required to be reported under section 95355(a)(7)(E), and the data elements described in sections 95355(a)(7)(F)-(H) serve as inputs to calculate emissions, reported under section 95355(a)(7)(I).

Rationale for New Sections 95355(a)(7) and 95355(a)(7)(A)-(I).
These new sections are necessary to be reported so that CARB staff can verify that each GIE owner has accurately reported data and calculations related to their emissions and emissions limit. The information reported will allow CARB staff to determine whether the GIE owner was in compliance with their emissions limit for the data year. Under the current Regulation, while GIE owners were required to report their annual emissions, they were not required to report all the values that were used to calculate the emissions, and CARB staff often needed to contact GIE owners to request these values so that the reported emissions could be verified. Requiring these values to be reported is necessary to reduce the number of GIE owners that CARB must contact to verify that emissions were reported correctly, reducing the amount of time CARB staff spend verifying reported data and the amount of time GIE owner staff spend responding to questions from CARB staff.

Purpose of New Section 95355(a)(8).
This new section specifies that a GIE owner must include an attestation statement, containing the text from section 95355(d), along with their annual report.

Rationale for New Section 95355(a)(8).

New section 95357(a)(8) is necessary to be consistent with section 95356(b)(5) of the current Regulation and section 95355(d) of the proposed Regulation, and to clarify that, in order for an annual report to be considered complete, the appropriate attestation statement from section 95355(d) must be included. As explained below, an attestation statement is necessary so that the designated representative can be held accountable, under penalty of perjury, for any intentional submission of false statements or information or any omissions of required information.

Purpose of New Sections 95355(b), 95355(b)(1)-(2) and 95355(b)(2)(A)-(B).
These new sections contain the content from sections 95356(c) and 95356(c)(1)-(2) in the current Regulation, with a few minor changes. These changes include Cal e-GGRT being specifically named as the reporting tool that most GIE owners must use to submit their annual reports, clarifications to the text that specifies the GIE owners that must use Cal e-GGRT, and a new requirement that states any GIE owner who does not submit their report through Cal e-GGRT must do so through electronic mail.

Rationale for New Sections 95355(b), 95355(b)(1)-(2) and 95355(b)(2)(A)-(B).
The change that specifies Cal e-GGRT as the reporting tool that most GIE owners must use to submit their report is necessary to clarify requirements that already exist in the current Regulation. Other changes to this section are necessary to clarify which GIE owners are required to submit their reports through Cal e-GGRT. Because a "facility" (as defined by MRR) that must report is not the same as the definition of a "GIE owner", the current Regulation is ambiguous, and the revised language will clarify the requirement. Additionally, in order to prevent GIE owners from shifting the method through which they submit their annual GHG emissions data report from year to year, which may lead challenges for CARB staff to manage reported data, the revised text clarifies that, once a GIE owner begins reporting through Cal e-GGRT, they should continue to report through Cal e-GGRT. Finally, the change that specifies all future reports not submitted through Cal e-GGRT must be submitted through electronic mail is necessary to improve CARB's ability to manage the data and perform comprehensive analyses.

Purpose of New Sections 95355(c) and 95355(c)(1).
These new sections specify the circumstances in which a GIE owner must submit a revised annual GHG emissions data report, and the time frame, after a substantive error is identified, within which the GIE owner must correct all substantive errors and submit the revised report or provide additional information to CARB staff to demonstrate that the identified errors are not errors, or, are not substantive errors. The new sections also specify a process by which a GIE owner may request one 30-day extension to the 45-day period.

Rationale for New Sections 95355(c) and 95355(c)(1).
These new sections are necessary to establish a required time frame within which a GIE owner must resolve any substantive errors identified in a previously submitted report. While the current Regulation states that "each day or portion thereof that any report contains inaccurate information shall constitute a single, separate violate of this

subarticle," and similar language remains in section 95359(b) of the proposed Regulation, it does not set requirements for correcting the data issues. The addition of this language is necessary to set an enforceable timeframe for correcting errors. This is important so that CARB can maintain accurate records regarding use and emissions of covered insulating gas in the State. The language regarding providing additional information to CARB staff in lieu of correcting the annual report is necessary because some potential errors identified by CARB staff may not be actual errors, or not substantive errors. In either case, the GIE owner must explain why the identified errors are not actually errors or why the errors are not substantive instead of submitting a revised report. The ability to request a single extension to the 45-day period is appropriate because it is reasonable to expect that in certain cases, a GIE owner may be unable to resolve potential issues within 45 days (e.g., during periods of time where the GIE owner's staff is out of the office for an extended period of time, or the errors are extensive and time-consuming to correct).

Purpose of New Sections 95355(d), 95355(d)(1), and 95355(d)(2).
These new sections specify that any statement or information submitted to CARB must include an attestation statement, signed by the designated representative, that the information submitted is "true, accurate and complete." The exact text of the statement to be used for GIE owners that submit data through Cal e-GGRT, and those that do not submit data through Cal e-GGRT, are included in sections 95355(d)(1) and 95355(d)(2).

Rationale for New Sections 95355(d), 95355(d)(1), and 95355(d)(2).
These new sections are necessary to provide GIE owners with the language they should use for their attestation statements. An attestation statement is necessary so that the designated representative can be held accountable, under penalty of perjury, for any intentional submission of false statements or information or any omissions of required information. The requirement that each piece of information submitted to CARB under this subarticle be attested to in this way will help ensure that data are reported accurately and completely. Accurate and complete data are necessary for CARB staff to identify GIE owners that are in compliance, and those that are not in compliance, with the Regulation, and to perform analyses of reported data that could be used to inform future amendments to the Regulation.

Purpose of New Section 95355(e).
This new section specifies the timeframe within which a GIE owner must update the designated representative's name and contact information whenever the prior designated representative is relieved of their duties.

Rationale for New Section 95355(e).
This new section is necessary because CARB staff may have questions for a GIE owner regarding the content of previously submitted reports at any time, and needs each GIE owner to keep the name and contact information of the designated representative current should contact need to be initiated. This section specifies that, whenever a change is made to the designated representative, the GIE owner must notify CARB within 30 days. The section specifies the necessary contact information

that the notification must contain. It further specifies that GIE owners who report through Cal e-GGRT must provide the notification through Cal e-GGRT, which is necessary to ensure that the Cal e-GGRT system is up to date.

Purpose of New Sections 95355(f), 95355(f)(1)-(5), 95355(f)(4)(A)-(C), and 95355(f)(4)(B)1.-2.
These new sections specify the content of notifications that must be provided to CARB within 30 days of the date that a GIE owner relinquishes ownership of all GIE that use covered insulating gas.

Rationale for New Sections 95355(f), 95355(f)(1)-(5), 95355(f)(4)(A)-(C), and 95355(f)(4)(B)1.-2.
These new sections require that the GIE owner notify CARB whenever a GIE owner relinquishes ownership of all GIE that use covered insulating gas. This requirement is necessary because, after such an event, the original GIE owner will no longer be subject to the Regulation, and the recipient(s) of the GIE may become subject to the Regulation. Thus, CARB staff need to know the names of GIE owners that will be required to submit annual reports by the next reporting deadline. Notifications of retirement or change in ownership must include, as specified in sections 95355(f)(1)-(3) and 95355(f)(5), the GIE owner name, phone number, physical address, designated representative's name and contact information, the final date the entity was a GIE owner, and an attestation statement, all of which allow CARB staff to identify which data year(s) the GIE owner is required to report for, who to contact should any of the reports not be submitted, and be assured that the information contained in the notification are correct. Additionally, as specified in section 95355(f)(4), the GIE owner must include in the notification the method by which the GIE were relinquished from the provided list, and any additional information required pursuant to sections 95355(f)(4)(A)-(C). This information is necessary so that CARB staff can identify whether the GIE that were relinquished will be included in another GIE owner's report in future data years, or if the GIE have been disposed of in such a manner that reporting for those GIE will no longer be required. CARB staff need this information in order to ensure that all GIE required to be reported in future years are in fact reported, and that no GIE go unaccounted for due to a transition in ownership. Finally, sections 95355(f)(4)(B)1.-2. are necessary to notify the GIE owner that they, too must notify CARB of the change in possession of the GIE devices, the contents of the notification, and the manner through which future reports must be submitted. These sections are necessary so that CARB staff can identify the new GIE owner and have contact information for the new GIE owner should contact need to be initiated. Additionally, the requirement that the new GIE owner submit future reports through Cal e-GGRT is consistent with the write up on section 95355(b), and is necessary for the reasons described there.

Section 95356. Recordkeeping.

Purpose of Section Name "Recordkeeping."
This section name has been revised from "Annual Reporting Requirements" to "Recordkeeping."

Rationale for Section Name "Recordkeeping."
The proposed change is necessary to clarify that the section explains the Regulation's recordkeeping requirements, and to move "Annual Reporting Requirements" content in section 95356 in the current Regulation to section 95355 in the proposed Regulation to keep a logical flow to the regulatory requirements.

Purpose of Section 95356(a)-(e) [Deleted].
Sections 95356(a) through 95356(e) are deleted. In the current Regulation, these sections housed the methodology for calculating emissions, which has been moved to 95354.1(a) in the proposed Regulation, and the methodology for calculation of the annual SF_6 emission rate, which has been removed in proposed Regulation.

Rationale for Section 95356(a)-(e) [Deleted].
These sections are deleted to accommodate a restructuring of the Regulation so that it follows a logical flow in terms of laying out the requirements for GIE owners. The concepts presented in these sections are either moved to other parts of the proposed Regulation or deleted, and those that are revised and moved are changed so extensively that those changes plus the movement of the content create complexities that warrant the wholesale deletion of this section.

Purpose of New Sections 95356(a) and 95356(a)(1)-(11).
These new sections specify records that are required to be retained by the GIE owner for the time period specified in section 95356(b) and describe the situations when these records must be provided to CARB staff, including the time frame within which the records must be provided. Section 95356(a) is based upon sections 95355(e) and 95355(f) of the current Regulation; section 95356(a)(3) is consistent with sections 95355(a)(11) and 95355(b)(3) of the current Regulation; and section 95356(a)(4) is consistent with section 95355(c) of the current Regulation, with the addition that any information used to justify the acquisition of SF_6 GIE after the applicable phase-out date be recorded pursuant to this section. Sections 95356(a)(1)-(2) and 95356(a)(5) clarify recordkeeping requirements for all data, measurements, and documentation required pursuant to sections 95354, 95355, 95353(b)-(g), and 95353(i)-(j). Sections 95356(a)(6)-(8) and 95356(a)(10) provide documentation related to correspondence with CARB, including for phase-out exemption requests, emergency exemption requests, revisions to annual reports, and any other needed correspondence. Sections 95356(a)(9) and 95356(a)(11) require recordkeeping related to methodologies used to create new manufacturer serial numbers and to calculate the amount of covered insulating gas in gas carts.

Rationale for New Sections 95356(a) and 95356(a)(1)-(11).
These new sections are necessary to clearly articulate to GIE owners their responsibilities with regard to recordkeeping and ensure that CARB staff is able to access these records within 30 days of a request. Such requests are necessary to, for example, verify that reported emissions under this Regulation are correct, which could impact a GIE owner's compliance with the Regulation. Much of the content of these

sections is consistent with the current Regulation, but has been re-arranged, which is necessary for clarity and so that all recordkeeping requirements are housed within a single section. Additional recordkeeping requirements have also been specified that are consistent with the new requirements of the proposed Regulation. The addition of a 30-day period in which a GIE owner must comply with CARB staff's request for records is necessary to set reasonable expectations for when a GIE owner must answer requests for records. New sections 95356(a)(1)-(2) are necessary to clarify recordkeeping requirements for all data, measurements, and documentation required pursuant to section 95354, and all data reported pursuant to section 95355. New section 95356(a)(3) is necessary so that CARB staff can locate the GIE devices, gas containers, and gas carts in the event that they conduct an inspection. Information related to the acquisition of covered insulating gas and/or GIE acquired pursuant to section 95352(a)(2)-(4) (as required pursuant to new section 95356(a)(4)) after the applicable phase-out date is necessary so that CARB staff will have the ability to verify the details of each transaction to ensure that covered insulating gas and GIE have been accurately accounted for and reported in each data year and that, when GIE are acquired pursuant to section 95352(a)(2)-(4), GIE owners remain in compliance with the phase out. The information in new section 95356(a)(5) is necessary so that CARB staff will be able to access data used to perform the calculations required under the specified portions of section 95353 to ensure the calculations were performed correctly. New sections 95356(a)(6)-(8) and 95356(a)(10) are necessary to ensure that GIE owners retain records of communication between the GIE owner and CARB staff in order to maintain accurate and complete records regarding actions taken to comply with the Regulation. Retention of materials that describe methodologies used for serial numbers and gas carts, pursuant to new sections 95356(a)(9) and 95356(a)(11), are necessary so that CARB may verify, if needed, the data that results from the use of these methodologies.

Purpose of New Sections 95356(b) and 95356(b)(1)-(2).
New Sections 95356(b) and 95356(b)(1)-(2) have been moved from sections 95355(d) and 95355(d)(1)-(2) of the current Regulation, and the requirement that the records be retained for three years is changed to five years, the term "in other states" has been changed to "elsewhere," and "may" has been changed to "must."

Rationale for New Sections 95356(b) and 95356(b)(1)-(2).
The changes to the section numbers are necessary for clarity and to keep all requirements related to recordkeeping in the same section. Additionally, the proposed amendments increase the amount of time that records must be retained from three years to five years. This change is necessary because CARB staff have identified systemic reporting errors in previously submitted reports filed by GIE owners that go back many years. Other CARB GHG programs require records be maintained for five years, and given that the level of data quality in previously submitted reports has been found to be problematic, it is necessary to increase the amount of time records must be retained to be commensurate with those programs and to be able to go back farther in time and fix historical data that has been reported incorrectly. This should yield higher quality data across all data years. Additionally, the change from "in other states" to

“elsewhere” is necessary to specify that a GIE owner who is based internationally must follow the requirements of section 95356(b)(2) and the change from “may” to “must” is necessary to clarify the requirement.

Purpose of New Section 95356(b)(3).
This new section explains that records generated prior to January 1, 2021 only need to be retained for a minimum of three calendar years.

Rationale for New Section 95356(b)(3).
This new section is necessary to clarify for GIE owners that any records generated prior to January 1, 2021, at which time records were only required to be retained for three years, will continue to be required to retained for only three years, and the new requirement to retain records for five years only applies to records generated after this date. This is necessary because GIE owners have been retaining records for three years under the current Regulation, and there must be a transition period because some records may already have been disposed of at the conclusion of the previous three-year requirement.

Section 95357. Treatment of Confidential Information [New Section 95358. Treatment of Confidential Information].

Purpose of Section 95357 [New Section 95358].
Section 95357 is renumbered to be new section 95358.

Rationale for Section 95357 [New Section 95358].
This change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections.

Section 95357. SF_6 Phase-Out Exemption.

Purpose of New Section 95357.
This new section “SF_6 Phase-Out Exemption” describes the process and timing by which GIE owners must submit the SF_6 phase-out exemption requests (referred to herein as “exemption request” or “request”), pursuant to section 95352(a)(1).

Rationale for New Section 95357.
This new section is necessary to establish the process by which an exemption to the phase-out requirements in the proposed Regulation is requested by a GIE owner and how that request is subsequently evaluated by CARB. It explains the process and timing for submitting a request for an exemption as well as the documentation a GIE owner must submit. It describes the process and timing for CARB’s evaluation and approval or disapproval of the request and sets forth the requirements and timing for the acquisition of SF_6 GIE once an exemption is approved.

Purpose of New Section 95357(a).

This new section specifies that GIE owners must submit the SF_6 phase-out exemption requests described in section 95352(a)(1) electronically, and that SF_6 GIE described in the exemption request may only be acquired after they are approved by the Executive Officer.

Rationale for New Section 95357(a).
This new section is necessary to clarify the mechanism through which exemption requests are to be submitted and to clarify that the GIE owner may only acquire the SF_6 GIE described in the exemption request after approval from the Executive Officer. This information is necessary to convey to the GIE owner, since any acquisition of SF_6 GIE after the applicable phase-out date without an approved exemption request is considered a violation of this Regulation (unless an exception under section 95352(a)(2)-(4) applies). For example, it would be a violation of this Regulation if a GIE owner has submitted an exemption request and acquired the SF_6 GIE described in the exemption request prior to the Executive Officer's approval of that request.

Purpose of New Sections 95357(b) and 95357(b)(1)-(4).
These new sections specify the date when GIE owners may begin to submit exemption requests and sets forth the four types of exemption requests that CARB staff will consider.

Rationale for New Sections 95357(b) and 95357(b)(1)-(4).
New section 95357(b) establishes September 1, 2024 as the first date when a GIE owner may submit an exemption request. This date is necessary to include in the Regulation as it strikes the appropriate balance between two competing factors. On one hand, starting on January 1, 2025, some SF_6 GIE will reach their phase-out date. As described in sections 95357(e)-(g), it may take up to 75 days for CARB staff to process a phase-out exemption request.[6] So, if a GIE owner needs to acquire SF_6 GIE shortly after January 1, 2025, because available non-SF_6 GIE cannot be used at the location(s) specified in the exemption request, the GIE owner will need to file the exemption request with CARB at least 75 days prior to their intended acquisition date. On the other hand, the non-SF_6 GIE market is continually evolving, and new non-SF_6 GIE products are expected to become available on a rolling basis. Were the exemption request submitted too early, the application and evaluation may fail to consider non-SF_6 GIE that become available after submission of the application, and prior to January 1, 2025. Given these competing priorities, it is necessary to establish an initial day on which GIE owners may begin to submit applications, and require that the applications consider all non-SF_6 GIE alternatives commercially available prior to that date. Given the 75-day CARB processing time, September 1, 2024 was selected as a reasonable date that balances the factors listed above.

[6] The 75 days assumes the initial phase-out exemption request submitted is considered to be "complete" pursuant to section 95357(f). Processing the request may take additional time in the event that the request is not considered to be "complete" when initially submitted.

New sections 95357(b)(1)-(4) describe the four situations in which a GIE owner may be eligible to receive an exemption. These new sections are necessary to clearly articulate to stakeholders when they may be eligible for an exemption, and when they are not, so that the GIE owner can understand the phase-out exemption scope within the proposed Regulation. Each of the new sections are necessary to address concerns raised by stakeholders during the public process that identified certain situations that could exist after the phase-out that would prevent a GIE owner from using non-SF_6 GIE for a particular project. See section II.B.3 of this ISOR for a detailed explanation regarding why the exemption process is necessary, and the rationale for including each of the four categories of exemption request included in new sections 95357(b)(1)-(4).

Purpose of New Section 95357(c).

This new section specifies the circumstances under which a GIE owner may "bundle" into a single application multiple separate exemption requests that would allow for acquisition of multiple SF_6 GIE devices. As described in this new section, each SF_6 GIE device the GIE owner includes in the "bundled application" must be of the same equipment type (e.g., switch, circuit breaker), and each SF_6 GIE device included in the "bundled application" must have the same "GIE characteristics" (as defined in section 95351(a) (e.g., voltage capacity, short-circuit current rating). Further, the new section requires that the GIE owner specify the number of SF_6 GIE needed, and list the individual locations where the SF_6 GIE will be installed.

Rationale for New Section 95357(c).

This new section is necessary because allowing a GIE owner to bundle requests will reduce the amount of time the GIE owner must spend preparing, submitting, and tracking their requests, and save CARB staff time in reviewing the request, so long as the exemption requests submitted in the bundle are substantially related to one another. Allowing for dis-similar requests to be bundled into a single request could increase the amount of time GIE owners and CARB staff need to review exemption requests beyond the timeframes specified in the proposed Regulation. It could also create cases in which a request was partially approved, and partially disapproved, which would require a more sophisticated tracking system, or could delay approvals of straight-forward applications while the more complex portions of the applications are reviewed. New section 95357(c) establishes the parameters under which requests can be bundled, and is necessary to clearly articulate these requirements to stakeholders so that they submit applications properly the first time, reducing the amount of the GIE owner's time needed to amend previously submitted applications and the amount of time CARB staff need to spend reviewing applications that are not bundled correctly.

Purpose of New Sections 95357(d) and 95357(d)(1)-(7).

These new sections specify the data elements that must be included in an exemption request, which includes information about the GIE owner, designated representative, the projects being undertaken and SF_6 GIE needed under the exemption, the name of the manufacturers contacted about the availability of non-SF_6 GIE that might be appropriate for the use(s) for which the exemption request is being submitted, the

attestation statement, and the section number under which the exemption is being submitted.

Rationale for New Sections 95357(d) and 95357(d)(1)-(7).
These new sections are necessary to provide GIE owners with a list of data elements that CARB will need to evaluate an exemption request, including contact information to facilitate CARB communications with the GIE owner about the request. New sections 95357(d)(1)-(2) are necessary so that CARB staff can identify the GIE owner submitting the application to ensure that, at a subsequent point in time, if the exemption request is approved, the newly acquired SF_6 GIE in the GIE owner's annual report match the exemption request. Additionally, the required contact information will inform CARB staff whom to contact should additional information be requested, or to inform the GIE owner of approval or denial of the application. New section 95357(d)(3) requires the GIE owner to provide a description of the projects to which the exemption request would apply, which is necessary to provide CARB staff needed context for the application in evaluating conformance against exemptions allowed pursuant to the proposed Regulation. New section 95357(d)(4) requires GIE owners provide a description of the SF_6 GIE to be exempted; these data elements are necessary so that CARB staff can determine if any comparable non-SF_6 GIE exist that the manufacturer should consider using instead of the requested SF_6 GIE, which if not discussed in the exemption request could be grounds for the request to be denied. Additionally, if the exemption request is approved, CARB staff will use this information to help identify the new SF_6 GIE device when it subsequently appears in the GIE owner's annual report, which should reduce the need for CARB staff to contact the GIE owner to question about the rationale for the acquisition of the device.

New section 95357(d)(5) requires GIE owners to provide the names of manufacturers contacted with regard to non-SF_6 alternatives that might be appropriate for use in the project(s) for which the exemption request is being submitted. This is necessary so that CARB staff can identify whether the GIE owner contacted the known manufacturers of non-SF_6 GIE that may have been able to perform the necessary function to determine whether available non-SF_6 GIE could be used in the particular circumstances at issue. New section 95357(d)(6) is necessary so that GIE owners submit the correct attestation statement required in section 95355(d), and to ensure that the GIE owners submit information that is true, accurate, and complete. New section 95357(d)(7) is necessary for the GIE owner to identify for CARB staff which of the four types of exemption requests is being submitted, which is necessary so CARB staff can ensure the justification provided in section 95357(d)(8) is appropriate for the type of exemption request being requested.

Purpose of New Sections 95357(d)(8) and 95357(d)(8)(A)-(D).
These new sections specify the minimum requirements a GIE owner must include in an exemption request, for each of the four categories of allowed exemptions.

Rationale for New Sections 95357(d)(8) and 95357(d)(8)(A)-(D).

New section 95357(d)(8) is necessary to require the GIE owner to justify the exemption request, following the specific requirements of sections 95357(d)(8)(A)-(D). These new sections are necessary to clearly articulate to GIE owners the information that they must include in the justification for each type of exemption so that CARB staff have the information necessary to allow them to accept or deny the request. Articulating this information in the Regulation should reduce the number of times that CARB staff need to request additional information from the GIE owner, saving staff time both for the GIE owner and for CARB.

New section 95357(d)(8)(A) states that a GIE owner submitting an exemption request due to unavailability from at least two suppliers of non-SF_6 GIE of the needed type and GIE characteristics (section 95357(b)(1)) must specify the characteristics that cannot be met by at least two suppliers. This information is necessary so that CARB staff can cross-reference the information provided with their knowledge of available non-SF_6 GIE devices and ensure the GIE owner has considered all available non-SF_6 alternatives. Should the GIE owner fail to have considered a non-SF_6 GIE device that CARB staff know to be available, CARB staff may deny the exemption request or request the GIE owner contact the supplier to determine if their product could be used in the application needed by the GIE owner.

New section 95357(d)(8)(B) states that a GIE owner submitting an exemption request because available non-SF_6 GIE are unable to meet the size requirements for the particular project(s) or application(s) (section 95357(b)(2)) must include the complete dimensions of each space within which the requested SF_6 GIE would reside in their exemption request. This new section also requires the GIE owner to include the complete dimensions of each available non-SF_6 GIE that meet the necessary "GIE characteristics." This information is necessary so that CARB staff can verify whether the available non-SF_6 GIE can, in fact, fit in the available space or not. A picture of the location where each SF_6 GIE would be installed is also necessary to provide CARB staff with the proper context of the space constraints encountered by the GIE owner. CARB staff understands that, in some cases, the dimensions of the space within which the GIE device must be installed could exceed the dimensions of at least one of the available non-SF_6 alternatives, but it may be impossible to install the non-SF_6 alternative within the space for some other reasons (e.g., the space lacks the necessary clearance or another obstacle prevents transport of the device to the space). As such, this new section also specifies that, if the dimensions of at least one of the available non-SF_6 GIE are less than the dimensions of the available space provided, the GIE owner must include a description of the constraint that clearly demonstrates why the available non-SF_6 GIE device cannot be placed in the available space. This information is necessary to provide CARB staff with the proper context should it appear that the available non-SF_6 GIE device could fit within the space, based on dimensions alone.

New section 95357(d)(8)(C) states that a GIE owner submitting an exemption request because available non-SF_6 GIE are incompatible with existing wiring or connectors (section 95357(b)(3)) must include both a list of available non-SF_6 GIE that meet the "GIE characteristics" necessary, a justification that clearly explains why all available

non-SF_6 GIE identified are incompatible, and how the SF_6 GIE described in section 95357(d)(4) are compatible. The justification described in this new section is necessary so that CARB staff can review the merits of the GIE owner's claim that all available non-SF_6 GIE devices are incompatible and determine whether to approve or deny the exemption request.

New section 95357(d)(8)(D) states that a GIE owner submitting an exemption request because available non-SF_6 GIE are unsuitable based on safety or reliability requirements (section 95357(b)(4)) must include a list of available non-SF_6 GIE that meet the "GIE characteristics" necessary and a justification that clearly explains why all available non-SF_6 GIE identified fail the safety or reliability requirements. The justification described in this new section is necessary so that CARB staff can review the merits of the GIE owner's claim that all available non-SF_6 GIE devices fail the safety or reliability requirements and determine whether to approve or deny the exemption request. Additionally, this new section also specifies that, should the justification include failure rates or other indicators of reliability for certain GIE, specific details must be provided. This information would be necessary both so that CARB staff can learn about any issues prevalent in specific types of non-SF_6 GIE devices which could inform future decisions on exemption requests, and so that CARB staff can verify the veracity of the claim with other data. During the informal public process that led up to the release of the proposed Regulation, CARB staff learned that certain companies have their own specific policies or procedures that govern the amount of testing that must be performed on new equipment prior to installation. While CARB staff recognizes that such policies may be grounds to submit an exemption of this type, CARB staff is concerned that GIE owners could use this justification in perpetuity should they elect not to perform the testing required under their company-specific policy or procedure. As such, this new section also requires that, if the GIE owner relies on a company-specific policy or procedure as the justification for their exemption request, they must also provide, as part of the justification, an explanation as to how the GIE owner will address the situation to enable eventual transition to non-SF_6 alternatives. This portion of the new section is necessary to grant near-term flexibility to GIE owners that would allow for acquisition of SF_6 GIE until they can perform the necessary testing of non-SF_6 GIE to meet their company-specific policy or procedure, while ensuring that the GIE owner ultimately performs the necessary testing to allow for transition to non-SF_6 GIE devices in the longer term.

Purpose of New Section 95357(d)(8)(E).

This new section specifies that, if a GIE owner submits an exemption request whose justification is insufficient for the Executive Officer to make a determination as to whether or approve or deny the request, the Executive Officer may request additional information and/or clarification from the applicant within the timeframe specified in section 95357(f). The additional information and/or clarification requested by the Executive Officer could be related to information provided by the applicant pursuant to sections 95357(c) and 95357(d).

Rationale for New Section 95357(d)(8)(E).

This new section is necessary so that, should the GIE owner fail to clearly provide all the necessary information required pursuant to sections 95357(c) and 95357(d) in their exemption request, the Executive Officer may request additional information and/or clarification from the GIE owner before the application is deemed complete. This information and/or clarification could be necessary in order for the Executive Officer to make an informed decision on whether to accept or deny the request. The alternative would be that CARB staff deny the request, and the GIE owner would need to re-submit the request again, likely requiring more staff time (on behalf of both CARB and the GIE owner) than would be necessary to simply respond to the Executive Officer's request for additional information and/or clarification.

Purpose of New Section 95357(d)(9).
This new section specifies that the information submitted pursuant to section 95357(d)(8) that relies on documentation provided by an equipment manufacturer be less than 180 days old at the time the exemption request is submitted.

Rationale for New Section 95357(d)(9).
New section 95357(d)(9) is necessary because the non-SF_6 GIE alternative market is continually evolving, and CARB staff wish to ensure that the justification provided by the GIE owner as to why existing non-SF_6 alternatives cannot be used by the GIE owner reflects current information available from manufacturers of non-SF_6 GIE. The 180-day timeframe is necessary because stakeholders provided feedback that manufacturer quotes often expired within three to six months, so it can be reasonably expected that GIE owners would initiate the phase-out exemption process before that period passes and the quote expires.

Purpose of New Sections 95357(e)-(g).
These new sections describe the process that CARB staff will complete upon receipt of an exemption request, including the maximum amount of time that CARB staff will have to complete each step. New section 95357(e) describes the first step in CARB's review process: within seven days of the submittal of the request, the GIE owner will receive a notification that the request has been submitted. New section 95357(f) describes the second step in CARB's review process: within 45 days of the submittal of the request, the Executive Officer shall notify the submitter whether their application is complete, or if additional information and/or clarification is necessary either to complete the application or ensure the Executive Officer has sufficient information upon which to base their approval or denial of the request. New section 95357(g) describes the third and final step in CARB's review process: within 30 days of CARB's acknowledgment to the GIE owner that the exemption request is complete, the Executive Officer shall notify the submitter of the approval or denial of the exemption request or, if the Executive Officer has not responded to the submitter within 30 days of the acknowledgement that the exemption request is complete, the exemption request is automatically approved

Rationale for New Sections 95357(e)-(g).
These new sections are necessary to set expectations for GIE owners with regard to the time frame within which CARB staff will review the exemption requests. Because the

schedule is included in the Regulation, GIE owners will be able to determine when they must submit their exemption requests to ensure they avoid project delays that could manifest during CARB staff review.

New section 95357(e) is necessary so that the GIE owner receives a receipt of their submittal in a timely manner, reducing the risk of a project delay. The GIE owner is also required to contact CARB staff if they do not receive a receipt within seven days, so that CARB staff and the GIE owner can discuss the status of the exemption request, and ensure that it is processed in a timely fashion. This new section also specifies that CARB staff will provide the GIE owner with an exemption request identification number, which can be used by both the GIE owner and CARB staff in any future discussion of the request, and which will be especially useful in cases where a GIE owner has submitted multiple requests that are being reviewed concurrently by CARB staff.

New section 95357(f) is necessary to specify the timeframe CARB staff will need to determine that the application is complete or that the Executive Officer requires additional information and/or clarification pursuant to section 95357(d)(8)(E) to deem the application complete. CARB staff believes that 45 days is necessary to ensure adequate time to review the application for completeness, especially if it is complex or includes a significant amount of information to review. Additionally, this new section states that once additional information and/or clarification, if requested, is received by the Executive Officer, the Executive Officer shall notify the GIE owner within 45 days whether the application is complete, or if additional information and/or clarification is still needed. This requirement is necessary to clarify to GIE owners the amount of time that CARB staff will spend reviewing the additional information and/or clarification prior to proceeding to the next stage of the process. The 45-day time frame is the same as the time frame for a new application because the additional information and/or clarification may significantly alter the request, requiring it to be re-evaluated.

New section 95357(g) is necessary to give assurance to the GIE owner that this final step of the process will take no more than 30 days so they can plan accordingly.

Purpose of New Section 95357(h).

This new section specifies special circumstances that would allow the GIE owner to submit an expedited SF_6 phase-out exemption request (herein referred to as “expedited exemption request”). Submittal of an expedited exemption request would be allowed when a “catastrophic failure” occurs that, in the estimation of the GIE owner, may only be resolved through the acquisition of SF_6 GIE on a faster timescale than possible under the exemption request schedule described in sections 95357(e)-(g). This new section also specifies that the request must be submitted within 14 days of the beginning of the catastrophic event, and states that, when submitting an expedited exemption request, the GIE owner must follow the steps described in sections 95357(a)-(g) with some exceptions as described in the following sections.

Rationale for New Section 95357(h).

This new section is necessary because, as stakeholders have noted during the public process, in some relatively infrequent cases, a GIE device (SF_6 or non-SF_6) may have a failure that impacts human safety and/or substantially impairs, damages or shuts down part or all of a system. Whenever a "catastrophic failure," as defined in section 95351(a), occurs it is in the best interest of all parties for the situation to be resolved as quickly and safely as possible, which may require the GIE owner to acquire SF_6 GIE. Absent this new section, the GIE owner would need to wait up to 75 days[7] for CARB staff to review and approve the exemption request that would allow them to acquire the needed SF_6 GIE, which could exacerbate the problems outlined in the definition of the term "catastrophic failure." As such, this new section is necessary so GIE owners have a process to notify CARB of the critical nature of a particular exemption request, and to clarify the process for an expedited exemption request so the failure can be resolved more quickly than otherwise possible.

Purpose of New Sections 95357(h)(1)-(6).
These new sections describe the content that a GIE owner must provide to describe the need for, and to request, an expedited SF_6 phase-out exemption process.

Rationale for New Sections 95357(h)(1)-(6).
These new sections are necessary because, in order for the exemption request to be considered eligible for expedited review, the GIE owner must justify that a catastrophic event has occurred, and that they are unable to resolve the situation without acquisition of SF_6 GIE. This necessitates the submission of additional information to CARB above and beyond the information required to be included in any other exemption request.

New section 95357(h)(1) is necessary to clarify that the GIE owner must inform CARB staff that they are requesting an expedited review. Additionally, because the justification for expedited review involves the GIE owner demonstrating that a "catastrophic event" has occurred, the GIE owner must provide the information described in sections 95357(h)(1)(A)-(D), and section 95357(h)(2), so that CARB staff can review whether the event qualifies as a catastrophic failure and can identify the GIE impacted by the failure. The date and time that the failure occurred (section 95357(h)(1)(B)) is necessary so that CARB staff can verify the expedited exemption request has been submitted within 14 days of the beginning of the event, as required pursuant to section 95357(h).

Pursuant to section 95357(h), an exemption request is only eligible for expedited review if both a catastrophic failure has occurred and, in the estimation of the GIE owner, the failure may only be resolved through the acquisition of SF_6 GIE on a faster timescale than possible under the schedule described in sections 95357(e)-(g). New sections 95357(h)(3) and 95357(h)(4) are therefore necessary so the GIE owner is required to justify the need for the expedited request. More specifically, the GIE owner must justify

[7] The 75 days assumes the initial phase-out exemption request submitted is considered to be "complete" pursuant to section 95357(f).

that they will be able to resolve the catastrophic failure more quickly using the expedited process than using the standard process. Because some SF_6 GIE devices can take more than 75 days to manufacture and ship to the purchaser, it may be the case that CARB's 75-day review time will have no impact on the amount of time needed by the GIE owner to resolve the issue. When this is the case, the exemption request should be submitted following the standard protocol. Additionally, the GIE owner must justify that they can resolve the catastrophic failure more quickly by acquiring SF_6 GIE than non-SF_6 GIE suited to perform the same function. If the lead time necessary to acquire either type of device is the same, or the non-SF_6 GIE device can be acquired more quickly, non-SF_6 GIE should be acquired to resolve the catastrophic failure.

New section 95357(h)(5) requires the GIE owner include a statement certifying that they have no GIE in their possession (SF_6 or otherwise) that is not already in use that could be installed to resolve the catastrophic failure, which is necessary to ensure the expedited process is utilized only for true emergencies that cannot be resolved through any means other than the expedited acquisition of SF_6 GIE. A catastrophic failure that can be resolved by installing a spare part should be resolved as such, and if the GIE owner subsequently needs to submit a separate exemption request to acquire a new spare SF_6 GIE device, they can do so following the standard protocol.

Finally, new section 95357(h)(6) is necessary so that GIE owners submit the correct attestation statement required in section 95355(d).

<u>Purpose of New Sections 95357(i), 95357(i)(1)-(3), and 95357(i)(2)(A)-(C).</u>
These new sections specify the process that CARB staff will complete upon receipt of an expedited exemption request. New section 95357(i)(1) describes the first step in CARB's review process: within two days of the submittal of the request, the GIE owner will receive a notification that the request has been submitted. New sections 95357(i)(2) and 95357(i)(2)(A)-(C) describe the second step in CARB's review process: within seven days of the submittal of the request, the Executive Officer shall notify the submitter whether their application is complete, if additional information is necessary either to complete the application or ensure the Executive Officer has sufficient information upon which to base their approval or denial of the request, and whether the information provided demonstrates that the application is eligible for expedited review.

New section 95357(i)(2)(B) states that, in addition to reviewing whether the application is complete within seven days, the Executive Officer shall notify the submitter within seven days as to whether the application is eligible, based on the justification provided pursuant to section 95357(h), for expedited review or not, or if additional information is necessary to justify expedited review. Should the Executive Officer find the exemption request is not eligible for expedited review, the GIE owner must submit the exemption request through the standard process. Additionally, new section 95357(i)(2)(C) states that, once additional information, if requested, is received by the Executive Officer, the Executive Officer shall notify the GIE owner within seven days whether the application is complete or if additional information is needed.

New section 95357(i)(3) describes the third and final step in CARB's review process: within seven days of CARB's acknowledgment to the GIE owner that the expedited exemption request is both complete and eligible for expedited review , the Executive Officer shall notify the submitter of the approval or denial of the exemption request. Further, the new section specifies that, if the Executive Officer has not responded to the submitter within seven days of the acknowledgement that the expedited exemption request is complete, the exemption request is automatically approved.

Rationale for New Sections 95357(i), 95357(i)(1)-(3) and 95357(i)(2)(A)-(C).
These new sections are necessary to set expectations for GIE owners with regard to the time frame within which CARB staff will review expedited exemption requests. Because the schedule is included in the Regulation, GIE owners will be able to determine when they must submit their expedited exemption requests. While the process steps are similar to those described in sections 95357(e)-(g), CARB staff will have less time to complete each step of the process than under the normal process, which will lead to the GIE owner receiving a decision faster, and enabling resolution of the catastrophic failure more quickly than would have otherwise been possible.

New section 95357(i)(1) is necessary so that the GIE owner receives a receipt of their submittal in a timely manner, reducing the risk of a project delay. The GIE owner is also required to contact CARB staff if they do not receive a receipt within two days, so that CARB staff and the GIE owner can discuss the status of the exemption request, and ensure that it is processed in a timely fashion. This new section also specifies that CARB staff will provide the GIE owner with an exemption request identification number, which can be used by both the GIE owner and CARB staff in any future discussion of the request, which will be especially useful in cases where a GIE owner has submitted multiple requests that are being reviewed concurrently by CARB staff.

New sections 95357(i)(2) and 95357(i)(2)(A-B) are necessary to specify the timeframe CARB staff will need to determine that the application is complete and that it is eligible for expedited review, or that the Executive Officer requires additional information to deem the application complete and/or find that it is eligible for expedited review. CARB staff believes that seven days is necessary to balance the need to act quickly, given the urgency of the request, while also ensuring adequate time to review the application. CARB staff also believe it will be reasonable to make a completeness determination within seven days, given that the amount of expedited exemption requests submitted is expected to be low. If the request is incomplete in some way, notifying the GIE owner of this fact within seven days should reduce the probability that the issue will result in a project delay for the GIE owner. .

New section 95357(i)(2)(C) states that, once additional information, if requested, is received by the Executive Officer, the Executive Officer shall notify the GIE owner whether the application is complete and eligible for the expedited process, or if additional information is still needed, within seven days. This requirement is necessary to clarify to GIE owners the amount of time that CARB staff will spend reviewing the additional information prior to proceeding to the next stage of the process. The seven-

day time frame for reviewing a request is the same as the time frame for a new expedited exemption request because the additional information may significantly alter the request, requiring it to be re-evaluated.

New section 95357(i)(3) is necessary to give assurance to the GIE owner that this final step of the process will take no more than seven days so they can plan accordingly.

Purpose of New Section 95357(j).
This new section specifies the timeframe within which the GIE owner may acquire (upon CARB's approval) the SF_6 GIE described in the exemption request. It also clarifies that the SF_6 GIE acquired may only be used in the project(s) identified in the exemption request, and that there is no date by which the SF_6 GIE acquired must be placed into, or removed from, active service.

Rationale for New Section 95357(j).
This new section is necessary for several reasons. With regard to the timeframe within which the approved SF_6 GIE must be acquired, CARB staff have attempted to strike a balance between two competing factors. On one hand, CARB staff have heard that the manufacturer lead time to develop and deliver an SF_6 GIE product can be over one year; as such, were the GIE owner to order an SF_6 GIE after getting approval from CARB (as required) it could take up to 24 months for the SF_6 GIE to arrive at the GIE owner's requested address. On the other hand, the non-SF_6 GIE market is evolving, and the longer the GIE owner waits to acquire the SF_6 GIE after getting CARB's approval, the higher the chance that a non-SF_6 product could become available that could have served the same purpose as the SF_6 GIE being acquired. As such, in this new section, CARB has specified that an SF_6 GIE device approved through an exemption must be acquired within 24 months of approval. Should the GIE owner not acquire the SF_6 GIE within this timeframe, they must submit a new application to request approval to acquire the previously approved SF_6 GIE. This request must include an updated justification that reflects any changes to non-SF_6 GIE availability since the previous exemption request was submitted.

In the case of an expedited exemption request, one of the qualifications for using the expedited process is that the SF_6 GIE needed to resolve the catastrophic failure can be acquired more quickly using the expedited process than the standard process. Since the standard process can take up to 75 days before the GIE owner is approved to acquire the SF_6 GIE device, CARB staff believe three months to be a reasonable limit within which the SF_6 GIE device should be acquired. If acquisition would take longer than three months, the GIE owner should use the standard exemption request process.

This new section is also necessary to clarify that the SF_6 GIE device, once acquired pursuant to an approved exemption request, can only be used in the project(s) specified in the application. This new section is necessary so that a GIE owner cannot justify acquisition of SF_6 GIE using a legitimate example and then, once acquired, use the SF_6 GIE for another project for which the GIE owner did not receive an exemption.

Finally, this new section clarifies that there is no time limit by which the SF_6 GIE, once acquired, must be put into active use or removed from active use. This provision provides certainty to the GIE owner that, as long as they use the device in the location(s) specified in the application, the proposed Regulation will allow them to use the device for as long as they choose.

Purpose of New Section 95357(k).
This new section specifies that all emissions from SF_6 GIE acquired with an exemption must be included in the GIE owner's annual emissions reported to CARB.

Rationale for New Section 95357(k).
This new section is necessary to clarify for GIE owners that, even though an approved exemption allows for acquisition and installation of SF_6 GIE, any emissions from the device are to be reported pursuant to section 95354.1.

Section 95358. Enforcement [New Section 95359. Enforcement].

Purpose of Section 95358(a) [New Section 95359(a)].
Section 95358(a) is renumbered to be new section 95359(a).

Rationale for Section 95358(a) [New Section 95359(a)].
This change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections.

Purpose of Section 95358(b) [New Section 95359(b)].
Section 95358(b) is renumbered to be new section 95359(b). Additionally, the original sentence has been broken into several sentences that individually specify how a violation of this subarticle will be defined in cases where a report remains unsubmitted, is submitted late, is incomplete, or contains inaccurate information. The sentence "the Executive Officer shall take into consideration the materiality of any incomplete or inaccurate information when penalties are assessed" has been added.

Rationale for Section 95358(b) [New Section 95359(b)].
This change in section number is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections. The creation of separate sentences covering reports that are unsubmitted or submitted late, that are incomplete, and that contain errors is necessary to clearly articulate to GIE owners that each of these circumstances represents an individual violation under the Regulation. The sentence that was added is necessary to grant the Executive Officer additional considerations with regard to the assessment of penalties. The changes to the original sentence, coupled with the addition of the new sentence, are necessary so that the Executive Officer may scale any penalties appropriately based on the number and of materiality of the violations, ensuring penalties are assessed in a more equitable and consistent manner among GIE owners that violate the Regulation.

Purpose of Section 95358(c) [New Section 95359(c)].

Section 95358(c) is renumbered to be new section 95359(c). Additionally, the new section has been changed to "each $MTCO_2e$ exceedance of the emission rate limit for a data year prior to 2020 or to the emissions limit for data year 2020 or beyond shall constitute a single, separate violation of this subarticle for each day of the calendar year."

Rationale for Section 95358(c) [New Section 95359(c)].
This change in section number is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections. The revisions to the new section are necessary for a few reasons. First, the way in which compliance will be determined has changed from an "emission rate limit" to an "emissions limit" in data year 2020. As such, the proposed change is necessary to clarify that an exceedance of the emissions limit for data year 2020 and beyond shall be a violation of this subarticle in the same manner as the current Regulation which specified that any exceedance of the emission rate limit was a violation. While the transition to the emissions limit has been acknowledged, the proposed Regulation still specifies that an exceedance of the emission rate limit for a data year prior to 2020 is a violation. This information is necessary because GIE owners may need to re-submit reports for 2019, or prior years, after these regulatory amendments have been finalized, and should the revised report indicate an exceedance of the emission rate limit occurred, CARB staff need the ability to hold the GIE owner accountable for the violation. Additionally, the proposed Regulation specifies that each $MTCO_2e$ exceedance of the limit shall constitute a separate violation. This is necessary so that the Executive Officer may scale any penalties appropriately based on the magnitude of the exceedance, ensuring penalties are assessed in a more equitable and consistent manner among GIE owners that violate the Regulation.

Purpose of New Section 95359(d).
This new section specifies that any unauthorized acquisition an SF_6 GIE device after the applicable phase-out date shall constitute a violation of this subarticle for each day the GIE owner is in possession of the device and for each $MTCO_2e$ of covered insulating gas at activation in that device, or that the device is designed to contain.

Rationale for New Section 95359(d).
This new section is necessary because one of the key changes in the proposed Regulation is the phase-out of SF_6 GIE. As such, any unauthorized acquisition of SF_6 GIE after the applicable phase-out date would be considered a violation, and CARB staff must specify this fact in the Regulation. The new section specifies that unauthorized acquisition of SF_6 GIE shall be considered a separate violation for each day the GIE owner is in possession of the device and for each $MTCO_2e$ of covered insulating gas at activation because the cost of acquiring non-SF_6 GIE is high, and the magnitude of the penalty that CARB is able to assess must be sufficiently high relative to the cost differential between a non-SF_6 and SF_6 GIE device to encourage GIE owners to comply with this requirement.

Purpose of Section 95358(d) [New Section 95359(e)].

Section 95358(d) is renumbered to be new section 95359(e).

Rationale for Section 95358(d) [New Section 95359(e)].
This change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections.

Section 95359. Severability [New Section 95359.1. Severability].

Purpose of Section 95359 [New Section 95359.1].
Section 95359 is renumbered to be new section 95359.1.

Rationale for Section 95359 [New Section 95359.1].
This change is necessary to accommodate the addition of new content to the Regulation while keeping a logical order to the Regulation sections.

IV. BENEFITS ANTICIPATED FROM THE REGULATORY ACTION, INCLUDING THE BENEFITS OR GOALS PROVIDED IN THE AUTHORIZING STATUTE

Government Code section 11346.2(b)(1) requires enumeration of the anticipated benefits of the regulatory action, including the benefits and goals of the authorizing statute. The benefits that accrue from the proposed action include reducing GHG emissions, improving the ability of small-capacity GIE owners to comply with the Regulation, and improving data accuracy and CARB staff's ability to verify reported data. These benefits are described in more detail below:

Reducing GHG emissions: A key goal of the proposed Regulation is to achieve GHG emissions reductions. The phase-out of SF_6 GIE is expected to yield significant GHG emissions reductions by prohibiting GIE owners from acquiring SF_6 GIE after the dates provided in the phase-out schedule unless an exception applies or an exemption is granted. Because non-SF_6 GIE either do not contain a GHG, or use an insulating gas with a significantly lower GWP than SF_6, the turnover of the existing fleet from SF_6 GIE to non-SF_6 GIE is anticipated to yield significantly lower annual emissions from this source category. To ensure that this turnover occurs, CARB staff introduced several concepts (early action credit and emissions baseline, as explained in sections II.B.2. and II.B.4.) to incentivize GIE owners to replace their SF_6 GIE with non-SF_6 GIE in a timely manner. The emissions baseline, which sets a limit to allowed emissions as of December 31, 2024, will stay fixed over time, only increasing for SF_6 GIE purchased without a phase-out exemption. Therefore, it will restrict allowed emissions, set to the equivalent of one or two percent of active, non-hermetically sealed system capacity so that, though capacity is expected to grow over this period, the emissions allowed under the Regulation will stay relatively fixed. In total, these revisions are expected to yield GHG emissions reductions of approximately 3,143,000 $MTCO_2e$.

- Improving the ability of small-capacity GIE owners to comply: The proposed Regulation also improves the ability of small GIE owners to comply. As discussed in section II.B.4 of this ISOR, it will be challenging for GIE owners with relatively small

capacity to comply with the current Regulation on an annual basis after the emissions limit decreases to one percent in 2020. The amendments accomplish this goal by increasing the amount of GHGs a small GIE owner is allowed to emit relative to their capacity. Under the proposed Regulation, GIE owners with less than 10,000 $MTCO_2e$ of total capacity will be allowed to emit no more than two percent of their capacity. These changes will ensure that small GIE owners are not disproportionately burdened by the proposed Regulation due to the relative difficulty they would face if they were required to meet the stringent one-percent limit applicable to larger entities. Further, the proposed Regulation sets a minimum emissions limit of 50 $MTCO_2e$ for all GIE owners, regardless of their size. As such, all GIE owners will be allowed to emit at least 50 $MTCO_2e$ even if their limit would otherwise have been below 50 $MTCO_2e$ based on the calculations discussed above. While allowing small GIE owners to have higher GHG emissions limits than allowed under the current Regulation may seem to run contrary to the goal of reducing GHG emissions, setting an emissions limit that is too low for GIE owners to comply with is an ineffective way to reduce GHG emissions. GIE owners that feel they have no chance to comply with the Regulation may choose to forego certain activities that could reduce their emissions, feeling any reductions they are able to achieve would be moot. Setting a realistic target for these GIE owners could help incentivize these GIE owners to reduce their emissions, where possible, to ensure compliance, which should be achievable under the revised limits.

- Improve data accuracy and CARB staff's ability to verify reported data: Another key goal of the proposed Regulation is to revise reporting requirements to improve reporting accuracy, clarify requirements, close gaps in accounting for SF_6 and other covered insulated gases, and improve CARB staff's ability to verify reported data. The amendments accomplish this in several ways, as described in detail in section II.B.5 of this ISOR. Improvements to the reporting process and clarification of the requirements include the following: requiring each GIE owner to develop a container tracking procedure that meets certain minimum standards, providing a method that GIE owners must use to determine the amount of covered insulating gas in each device when it is initially placed into active service, and specifying how the GIE owner must determine the amount of covered insulating gas in containers that are not owned by the GIE owner. To achieve a more accurate accounting of annual emissions and to close gaps in emissions accounting, the proposed Regulation replaces the calculations involving "nameplate capacity" with calculations based on the actual amount of covered insulating gas a GIE device contains, and changes requirements related to accounting for covered insulating gas in GIE when a device is removed from the GIE owner's inventory. The Regulation does not require third-party verification, so CARB staff must verify the reported data each year. Staff has found that, in some instances, GIE owners have misinterpreted the reporting requirements and reported annual emissions in a manner inconsistent with the Regulation's requirements. Specifically, the current Regulation contains the equation a GIE owner must use to determine their annual emissions, but certain inputs to that equation are not required to be reported to CARB. As a result, CARB staff often needed to ask GIE owners to provide these values to verify that emissions

were reported correctly. Under the proposed Regulation, all values that serve as inputs to the emissions calculation will be reported, which can increase the ability of CARB staff to independently verify emissions and other data provided in the annual reports.

V. AIR QUALITY

The Regulation would not directly result in any improvement or decline in air quality in California. The Regulation is not anticipated to provide any direct criteria or toxic pollutant emissions reduction benefits because neither the current fleet of SF_6 GIE nor the emerging non-SF_6 GIE that will eventually replace SF_6 GIE are/will be a source of criteria or toxic emissions. While some manufacturing will shift from facilities that produce SF_6 GIE to those that produce the alternative devices, neither production of SF_6 GIE or non-SF_6 GIE currently occurs, or is expected to occur, in California.

VI. ENVIRONMENTAL ANALYSIS

A. Environmental Review Process

This chapter provides an environmental analysis for the proposed amendments to the Regulation, as described throughout this ISOR. CARB is the lead agency for the proposed amendments to the Regulation. This environmental analysis was prepared under CARB's regulatory program certified by the Secretary of the Natural Resources Agency (14 CCR 15251(d); 17 CCR 60000-60007). Under Public Resources Code ("PRC") section 21080.5 of the California Environmental Quality Act (CEQA), public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to preparing environmental impact reports (EIR), negative declarations, and initial studies (14 CCR 15250). A document used as a substitute for an EIR or negative declaration in a certified program shall include at least: (1) a description of the proposed activity; and (2) either a statement that the agencies review of the project showed the project would not result in any significant adverse impacts and therefore no alternative or mitigation measures are proposed, or alternatives to the activity and mitigation measures to avoid or reduce any significant impacts to the environment (14 CCR 15252). The statement of no impact must be supported by a check list or other documentation showing the possible impacts the agency examined in reaching this conclusion (14 CCR 15252).

When the Board first approved the Regulation in 2010, the Staff Report included a chapter that was the substitute equivalent of a negative declaration, which analyzed the reasonably foreseeable environmental impacts of the methods of compliance (PRC 21159, 14 CCR 15187). The environmental analysis concluded the adoption of the Regulation, and the reasonably foreseeable methods of compliance with the Regulation, would not result in any significant adverse environmental impacts.

When an agency proposes changes to a project for which a negative declaration has previously been adopted, the agency must determine whether the changes are

substantial and will require major revisions to the previous negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects (14 CCR 15162(a)(1)). CARB staff has determined no major revisions to the prior negative declaration equivalent documents are required nor is the equivalent of an EIR required for these amendments because the proposed changes do not lead to any new significant environmental effects or a substantial increase in the severity of previously identified significant effects. This chapter, therefore, presents an addendum to the previously adopted negative declaration equivalent document that explains the agency's decision to not prepare a subsequent negative declaration equivalent document or substitute for an EIR. CARB used the resource areas from the CEQA Guidelines Environmental Checklist as a framework for analyzing the changes and determining they do not involve new significant environmental effects or a substantial increase in the severity of previously identified effects, including no adverse impact to GHG emissions. This chapter is supported by data and information in the rest of the Staff Report and information and data in the Staff Report from CARB's original adoption of the Regulation in February 2010.

If comments received during the public review period raise significant environmental issues, staff may, but is not required to, summarize and respond to the comments in the Final Statement of Reasons prepared for the proposed amendments to the Regulation. Written responses to environmental comments on this chapter, if any, may be considered by the Board as part of its action on the proposed amendments. If amendments that are responsive to environmental comments are adopted, a Notice of Decision will be posted on ARB's website and filed with the Secretary of the Natural Resources Agency for public inspection.

B. PROPOSED AMENDMENTS

In order to reduce emissions of this potent GHG, the Board adopted the current Regulation in 2010 and it went into effect in 2011. This Regulation applies to owners of SF_6 GIE and sets an annual emission rate limit that each GIE owner may not exceed. The emission rate is calculated by dividing SF_6 emissions by the GIE owner's average system nameplate capacity, which consists of all the SF_6 in GIE in active service each year. The maximum allowable emission rate started at ten percent in 2011 and has decreased one percent per year since then. In the absence of proposed changes to the Regulation, in 2020, the limit would reach one percent and will remain at that level going forward.

The Regulation requires GIE owners to report data related to the following annually: SF_6 emissions, emission rate, a complete inventory of GIE and containers that contain SF_6, and information on container uses throughout the year. The Regulation also contains reporting requirements that allow CARB staff to verify GHG emissions reporting and track SF_6 used in the State, and specifies that GIE owners must keep all reported information and other records for three years.

1. Summary of Proposed Changes

In response to California's aggressive climate goals, and the increasing availability of technology that does not use SF_6, CARB staff is proposing to amend the Regulation to help achieve the goals of SB 32 by reducing GHG emissions from this source category relative to business-as-usual, primarily through the phase-out of SF_6 GIE. The proposed revisions also clarify regulatory requirements, improve the ability of some regulated entities to comply with the Regulation, and make changes to improve the accuracy and comprehensiveness of reported data. More specifically, the proposed amendments would achieve the following:

- Expand the scope of the Regulation to cover emissions of all insulating gases with a GWP greater than one, and clarify terminology related to which GIE are covered by the Regulation;
- Establish a timeline for phasing out acquisition of SF_6 GIE in California and create an incentive to encourage GIE owners to acquire non-SF_6 GIE prior to the phase-out;
- Establish a process through which GIE owners could be granted a phase-out exemption to allow them to acquire SF_6 GIE after the phase-out, but only when certain conditions are met;
- Establish alternative emissions limits for small-capacity GIE owners to improve their ability to comply with the Regulation, assign each GIE owner an emissions limit in $MTCO_2e$ (as opposed to the current SF_6-specific emission rate limit), and establish methods to minimize the growth of the emissions limit over time; and
- Revise reporting requirements to improve reporting accuracy, clarify requirements, close gaps in accounting for SF_6 and other covered insulated gases, and improve CARB staff's ability to verify reported data.

2. Methods of Compliance

The determination that a change to a project will not result in new significant environmental effects or a substantial increase in the severity of previously identified significant effects is based on analyzing the changes in reasonably foreseeable methods of compliance taken under the proposed amendments compared to what was previously analyzed in the prior documents for the adopted regulations (PRC 21159; 14 CCR 15187, 14 CCR 15162). Please refer to the summary of proposed amendments in Chapter II of this ISOR for a full description of each proposed change. Changes that are more administrative in nature and undertaken to improve implementation of the Regulation, but have no potential to affect the physical environment, are summarized only at a high level. This section focuses in more detail on the amendments that could lead to changes in compliance actions that have the potential to affect the physical environment (e.g., changes affecting GHG emissions).

1. Expanding Scope and Clarifying Coverage of the Regulation

The purpose of the proposed Regulation is to further reduce emissions by phasing out SF_6 use (as discussed in section II.B.2. of this ISOR) so that GIE owners will transition to use of non-SF_6 GIE, some of which utilize GHGs other than SF_6. The introduction of insulating gases that contain a GHG other than SF_6 necessitates expanding the scope of the Regulation to include most GHGs. Coverage of these alternative gases in the Regulation ensures continued tracking of GHGs from the operation of GIE in the State. It also facilitates recognition of the transition from SF_6 GIE to non-SF_6 GIE, as discussed in the next section.

2. SF_6 Phase-Out and Early Action Credit

In Table 1 and Table 2 of the proposed Regulation, CARB staff proposes a schedule for the phase-out of the acquisition of new SF_6 GIE. The phase-out dates differ according to voltage capacity, short-circuit current rating, and configuration (i.e., above or below ground). In developing the phase-out schedule, CARB staff consulted with more than ten manufacturers currently developing non-SF_6 GIE to learn when their products are expected be commercially available. Additionally, based on stakeholder comments about the amount of time their organizations generally require to ensure that new products are safe, reliable, and deployable, CARB staff included a three-year period between expected commercial availability and proposed phase-out dates.

Because the phase-out dates would not begin until 2024, certain types of non-SF_6 GIE are available now, and implementing that technology before the phase-out could negatively impact GIE owners' baseline capacity (explained in section II.B.4. of this ISOR), the proposed regulatory amendments also include an early action credit. The early action credit would encourage GIE owners to place 72.5 kV or greater non-SF_6 circuit breakers into active service prior to the applicable phase-out date for those devices, excluding non-SF_6 circuit breakers that use oil as an insulating medium. The proposed credit, as noted in Table 3 of the Proposed Regulation Order and Table 3 in this Staff Report, is roughly equivalent to the amount of SF_6 in a comparable SF_6 circuit breaker.

Effectively, a GIE owner who chooses to install a non-SF_6, non-oil circuit breaker at or above 72.5 kV, prior to the phase-out of an equivalent SF_6 circuit breaker would be able to increase their baseline emissions limit by the amount of the credit without actually increasing the volume of SF_6 in their system. This is because they will be installing a circuit breaker that is GHG free, or because it contains a GHG whose GWP is much lower than SF_6. The installation of the new circuit breaker should have minimal impact on their annual emissions, so the impact of the early adoption of non-SF_6 circuit breakers means a slightly higher effective (or equivalent) emission rate when implementing their baseline, and greater flexibility to manage emissions once the baseline goes into effect.

3. SF_6 Phase-Out Exemption Process

As described above in section II.B.2 of this ISOR, CARB staff developed the phase-out schedule after discussing non-SF_6 GIE availability dates with over ten manufacturers for over a year. CARB staff recognizes that, in some specific cases, GIE owners may need to install SF_6 GIE after the corresponding phase-out dates. The proposed Regulation allows GIE owners to acquire SF_6 GIE after the applicable phase-out date under certain specified conditions. To obtain a phase-out exemption, the GIE owner must submit a phase-out exemption request that explains and justifies the need for the exemption. If the request is approved, the GIE owner could acquire the SF_6 GIE described in the request and install the SF_6 GIE in the location(s) described in the exemption request.

Since this is an option available to GIE owners and not a requirement, it is speculative to establish a concrete compliance response related to this proposed provision. As such, since the compliance responses for optional regulatory provisions are speculative and speculation is not a basis for establishing substantial evidence, compliance with this provision will not result in a significant impact since substantial evidence is required to find such an impact.

4. Revisions to the Emission Rate Limit

The proposed Regulation contains revisions that would change the allowed emissions levels for GIE owners with smaller capacities of SF_6 and other covered insulating gases. As explained below, this change will enable small-capacity GIE owners to comply with the Regulation. Further, the proposed Regulation transitions the basis for evaluating emissions compliance from an emissions rate limit to an emissions limit measured in $MTCO_2e$. The emissions limit will be structured to support the phase-out of SF_6, incentivize adoption of non-SF_6 GIE, and ensure continued emissions reductions despite the anticipated growth of GIE capacity in this sector.

Transition to an Annual Emissions Limit

The proposed Regulation includes a new method for GIE owners to calculate their emissions limit in terms of $MTCO_2e$ rather than percent of average system capacity. From 2020[8] through 2024, GIE owners with average system capacities of 10,000 $MTCO_2e$ or greater will have an emissions limit equivalent to one percent of average system capacity (considering all insulating gases with a GWP greater than one), maintaining equivalency with the Regulation.

The proposed Regulation increases the emissions limits for the smallest GIE owners. CARB staff's goal for the proposed Regulation was to set emission limits such that GIE owners of all sizes would be held to stringent but reasonable limits on emissions. Given

[8] For data year 2020 only, the emissions limit considers only SF_6. See the discussion in section III of this ISOR, Rationale for Section 95353(b)(1).

the difficulty in achieving a one-percent emission rate for GIE owners with average system capacities below 10,000 $MTCO_2e$, and the fact that these owners make up less than two percent of statewide SF_6 capacity, staff proposes a threshold of 10,000 $MTCO_2e$, below which the emissions limit would be set at the equivalent of two percent of average system capacity from 2020 to 2034, or 50 $MTCO_2e$, whichever is greater.

As shown in Table 4 earlier in this document, the impact of this change would be that 196 of the 273 GIE owners who submitted a data year 2018 report would have an annual emissions limit initially equivalent to a two-percent emissions rate (or 50 $MTCO_2e$), while the remaining 77 GIE owners would have an annual emissions limit initially equivalent to a one-percent emissions rate. In aggregate, the maximum allowable emissions from the 196 GIE owners that would have the equivalent of a two-percent emissions rate limit would be approximately 8,600 $MTCO_2e$ per year instead of 4,300 $MTCO_2e$. The maximum allowable emissions from the 77 GIE owners who would have the equivalent of a one-percent emissions rate limit would be approximately 249,000 $MTCO_2e$ per year. Therefore, the incremental potential annual emissions allowed under this provision would be equivalent to less than two-percent of total potential annual emissions allowed under the current Regulation.

Establishing a Baseline to Incentivize Adoption of Non-SF_6 GIE

Because smaller capacities of SF_6 and other covered insulating gases can make compliance with the emissions limit more challenging, staff was concerned that establishing an emissions limit that is equivalent to one or two percent of active, non-hermetically sealed system capacity, could actually disincentivize the replacement of SF_6 GIE with non-SF_6 GIE. That is, GIE owners may keep and operate their SF_6 GIE longer to maintain a higher capacity level. To address this issue, the proposed Regulation includes a baseline approach which would fix the average system capacity at a point in time, after which any reduction in actual SF_6 capacity would not result in a commensurate reduction in average system capacity used to evaluate compliance with the Regulation.

An emissions limit with a fixed baseline would incentivize a GIE owner to replace SF_6 GIE with non-SF_6 GIE after the baseline is set because the implementation of non-SF_6 GIE would decrease the actual amount of SF_6 in their system, which would reduce the risk of SF_6 emissions without any corresponding decrease in average system capacity used to evaluate regulatory compliance. Because average system capacity will not decrease when SF_6 GIE are replaced with non-SF_6 GIE, the equivalent allowed emission rate will effectively grow over time, making it easier to comply with the Regulation.

Per the proposed Regulation, each GIE owner would determine their “baseline” system capacity as of December 31, 2024, the last day before the phase-out of SF_6 begins, and would use that value as a starting point to determine their annual emissions limit moving forward. To establish the December 31, 2024 baseline, GIE owners will calculate the system capacity of “active GIE” on that day. This amount should represent the capacity

of all GIE that use a covered insulating gas placed into active service prior to the first phase-out date, and will include the early action credit value discussed above. Per Tables 1 and 2 of the Proposed Regulation Order, after December 31, 2024, GIE owners can continue to purchase SF_6 GIE for which the phase-out date has not arrived. Because the purchase of these SF_6 GIE is not yet restricted by the Regulation, the GIE owner may add the capacity of these SF_6 GIE to their baseline capacity, used to evaluate compliance with the emissions limit, in future years.

Emissions Limit Step-Down

Due to the phase-out requirements for SF_6 GIE, which will begin January 1, 2025 and be fully complete by January 1, 2033, each GIE owner's actual SF_6 capacity should begin to decline as existing SF_6 GIE reach the end of their useful life and are replaced with non-SF_6 GIE. The baseline approach keeps baseline capacity somewhat "fixed" relative to decreases in actual capacity of covered insulating gases, so that each GIE owner's effective emission rate could increase after 2025. To ensure that the Regulation remains equally ambitious over time, CARB staff propose that, in 2035, each GIE owner's emissions limit will be reduced by five percent to maintain an effective emission rate limit near one or two percent.

5. Changes to Required Procedures and Reported Elements

The proposed Regulation contains revisions that would change the process and reporting requirements to improve reporting accuracy, clarify requirements, close gaps in accounting for SF_6 and other covered insulated gases, and improve CARB staff's ability to verify reported data. These changes are discussed in detail in section II.B.5 of this ISOR.

C. Analysis

Based on the description of the changes in foreseeable methods of compliance described above for the Regulation, it can be seen that many of the changes are administrative in nature and do not lead to foreseeable changes in compliance that could adversely affect the physical environment. These changes include clarifications and revisions necessary due to the increased scope of the Regulation, establishing the phase-out schedule and early action credit option, optional procedural exemptions that will not result in higher emissions from GIE owners, and updates to the record keeping/reporting requirements. These changes, therefore, are not analyzed any further.

The primary change in the reasonably foreseeable method of compliance that arises from the amendments is the allowed increase in the emissions limit for the smallest GIE owners. For GIE owners with average CO_2e capacity below 10,000 $MTCO_2e$, the proposed amendments specify that the reported emissions must be below an amount equivalent to two percent of their capacity. Because these GIE owners were already subject to a two-percent rate limit in 2019, and the feedback received from stakeholders

was that the rate limit became problematic at one percent, CARB staff proposes to retain the two-percent equivalent limit. In an early draft of the potential amendments released during the informal public process, CARB staff proposed a threshold value of 5,500 $MTCO_2e$ (~500 pounds of SF_6) be used. Many stakeholders requested the value be increased to 10,000 $MTCO_2e$ (~1,000 pounds of SF_6), and provided information that demonstrated the challenge of maintaining an emission rate below one percent (~10 pounds of SF_6) on an annual basis. Given the reasonable difficulty in achieving a one-percent emission rate for GIE owners with capacities below 10,000 $MTCO_2e$, and the fact that these make up less than two percent of statewide SF_6 capacity, staff proposes a threshold of 10,000 $MTCO_2e$, below which the emissions limit would be set at the equivalent of two percent of active, non-hermetically sealed covered insulating gas capacity. The analysis below considers the potential for new significant environmental effects or substantial increase in severity of impacts based on CEQA Guidelines Environmental Checklist arising from these changes.

1. Aesthetics, agriculture resources, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, or utility and service systems.

The allowed increases in the emissions limits for the smallest GIE owners do not lead to any changes in the reasonably foreseeable methods of compliance in any way that could affect any of these resource areas. This provision causes no construction or other type of physical landscape level actions that could relate to any physical change, either directly or indirectly, to any of these resources. The amendments affect only how long GIE owners with an average CO_2e capacity of less than 10,000 $MTCO_2e$ may continue to emit SF_6 at two percent of their capacity in line with 2019 requirements. Since SF_6 is a GHG and not a criteria or toxic air pollutant, there is only the potential to affect GHG emissions from these GIE owners, which is discussed in more detail below.

2. Greenhouse Gas Emissions

    a. SF_6 Emissions Reductions Background

As explained above, CARB staff determined that GIE owners with relatively small average CO_2e capacities (10,000 $MTCO_2e$ or less) will have difficulty meeting a one-percent emissions rate on a consistent basis. The current Regulation requires GIE owners to reduce their SF_6 emission rate by one percent per year over a ten-year period—from ten percent in 2011 to one percent in 2020. To determine their annual emission rate under the current Regulation, a GIE owner must calculate their annual SF_6 emissions and average system nameplate capacity following methodologies specified therein. The average system nameplate capacity effectively provides the average amount of SF_6 capacity that was in active service during the data year. The GIE owner divides their SF_6 emissions—as determined through the equation in section 95356(d) of the current Regulation—by the calculated average system nameplate

capacity to determine their emissions rate. GIE owners then compare the calculated SF_6 emission rate to the maximum value allowed by the Regulation to determine if they were in compliance during the data year.

While manufacturers endeavor to construct SF_6 GIE that have minimal leaks, it is not possible to ensure that a device will never leak. SF_6 GIE are installed with a pressure gauge that will notify the GIE owner if the pressure in the device falls below the recommended limit, and this notification will often occur following development of a leak in the GIE device. However, decreases in the pressure may not trigger a notification that there is a leak until after several pounds of SF_6 have already been emitted. For the smallest GIE owners, a single event such as this could release enough SF_6 to cause the GIE owner to exceed their annual emission rate limit before they were even aware of the leak. This could make it very challenging for small GIE owners to comply with the Regulation in years in which such an event occurs.

Therefore, the emission reductions originally projected from the existing standards for the final year for small GIE owners is not consistently attainable, and therefore not reasonably foreseeable, meaning the reductions could not and would not occur regardless of whether the Board approves the proposed amendments. However, since the Board did not analyze this change in expected emission reductions in the previous environmental documents for the existing regulation, the analysis below considers the potential for a significant new change in GHG emissions.

b. Impact Analysis

The existing physical environmental conditions, at the time of the environmental analysis, normally constitute the baseline conditions by which the agency determines whether an impact is significant. The existing environmental conditions for SF_6 emissions for purposes of these amendments are the current SF_6 emissions from GIE covered by the Regulation and the operational SF_6 emissions that would occur under the existing regulatory framework through 2036. For 2020, these emissions are estimated to be 252,943 $MTCO_2e$ as shown in in Table 5 below.

The proposed regulatory amendments do not change the 2010 environmental analysis finding of no significant impact. The Staff Report accompanying the regulation adopted in 2010 provided that the average annual SF_6 emissions reductions from the regulation would be 25,300 $MTCO_2e$ per year over the 2011–2020 period. If the 2010 regulation had not been adopted, staff estimated that emissions from GIE in 2020 would be higher by approximately 23,000 $MTCO_2e$.[9] While the Staff Report accompanying the Regulation adopted in 2010 did not estimate annual reductions for years beyond 2020, for purposes of this exercise, CARB staff has assumed reductions would remain at

[9] CARB, Proposed Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear, Staff Repot: Initial Statement of Reasons, pgs. ES-3 and ES-4. https://ww3.arb.ca.gov/regact/2010/sf6elec/sf6isor.pdf. Accessed on January 13, 2020.

23,000 $MTCO_2e$ per year thereafter because the emission rate limit does not change after 2020 under the current Regulation.

As shown in Table 5, below, CARB staff has determined that by allowing small GIE owners to stay at two percent of their capacity, the 23,000 $MTCO_2e$ in SF_6 emissions reductions that would occur in each year between 2020–2025, as identified in the ISOR from the 2010 rulemaking, will be reduced by between 1,113 and 4,772 $MTCO_2e$, depending on the year. In other words, because of the proposed Regulation, the anticipated annual SF_6 emissions reductions that the original rulemaking identified for 2020–2025 will actually be between 18,228 and 21,887 $MTCO_2e$ instead of the originally estimated 23,000 $MTCO_2e$. While the proposed Regulation decreases the anticipated emission reductions for 2020–2025 from the original estimate, there is still an annual reduction because the proposed Regulation only allows small-capacity GIE owners to emit SF_6 at two percent of their capacity while the GIE owners that represent the vast majority of SF_6 capacity in the State must comply with the one-percent standard in 2020. Further, all GIE owners must eventually phase-out the use of SF_6 equipment soon thereafter. Despite the fact that the proposed Regulation would allow greater emissions from small GIE owners than the current Regulation, the proposed Regulation, which constitutes the "project" for CEQA analysis purposes, will have no new significant environmental effects or substantial increase in the severity of previously identified environmental effects than those in the 2010 rulemaking because the "project," in its entirety (2020–2036 regulatory period), will achieve more SF_6 emissions reductions from the GIE sector, as a whole, relative to the SF_6 emissions that would occur from the same GIE sector regulated by the existing Regulation.

The environmental benefits of the proposed regulatory amendments far exceed the short-term delay in SF_6 emissions reductions relative to the current Regulation. While the proposed Regulation will allow small-capacity GIE owners to stay at the equivalent of the 2019 standard for the 2020–2036 compliance years, the proposed Regulation also requires a complete phase-out of SF_6 GIE, which will result in significant GHG emissions reductions over time. While the SF_6 emissions limit set at two percent for small-capacity GIE owners will continue to result in more emissions between 2020 and 2025 than would occur without the proposed Regulation, the overall effect of the proposed Regulation is a beneficial one for GHG emissions impacts. As seen in the table below, the anticipated cumulative emissions reductions over time will self-mitigate the cumulative emissions increases from 2020–2025 by late 2028 after the second phase-out date for SF_6 GIE has occurred. Therefore, the proposed amendments to the Regulation will not result in any new adverse impacts on the environment and, as such, CARB staff does not need to prepare a subsequent negative declaration or environmental impact report substitute document for these amendments.

Table 5. Anticipated emissions and emissions reductions with proposed amendments.

Year	BAU Emissions (No Amendments)	Anticipated Emissions with Amendments	Emission Reductions (for year(s) indicated)	Cumulative Emission Reductions (Across all years)
2020	252,943	257,242	-4,299	-4,299
2021	259,905	264,322	-4,417	-8,716
2022	266,866	271,402	-4,535	-13,251
2023	273,828	278,482	-4,654	-17,905
2024	280,790	285,562	-4,772	-22,677
2025	287,751	288,864	-1,113	-23,790
2026	294,713	292,804	1,909	-21,881
2027	301,675	292,904	8,771	-13,110
2028	308,637	292,809	15,827	2,717
2029	315,598	294,585	21,014	23,731
2030	322,560	296,726	25,834	49,565
2031	329,522	295,510	34,012	83,577
2032	336,484	294,932	41,552	125,128
2033	343,445	290,725	52,720	177,848
2034	350,407	288,501	61,906	239,754
2035	357,369	286,612	70,757	310,511
2036	364,330	283,849	80,481	390,992
2037-2075[10]			2,751,855	3,142,848
** All Values in metric tons of carbon dioxide equivalent ($MTCO_2e$)[11]				

[10] This estimate accounts for the additional emissions reductions that will occur over the 40-year lifetime of the non-SF_6 GIE installed between 2025 and 2036 as a result of the proposed regulation.
[11] To calculate BAU emissions, CARB staff took total reported SF_6 capacity in active, non-hermetically sealed GIE (capacity) for data year 2017, assumed this value would grow 3 percent per year (consistent with the historical rate), and assumed that 1 percent of this value would be emitted annually (consistent with the 2020 emission rate limit in the current Regulation).

CARB staff calculated "anticipated emissions with amendments" for 2020–2024 using the same method, but, assumed GIE owners with capacity below 10,000 $MTCO_2e$ will emit 2 percent of their capacity annually. For 2025 onwards, CARB staff also estimated "anticipated emissions with amendments" to be either 1 or 2 percent of each GIE owner's capacity (as was done for 2020–2024). Capacity was estimated following a similar approach to the BAU scenario, with a few additional considerations:

1. Inclusion of the SF_6 phase-out (which decreases statewide capacity relative to BAU),
2. Inclusion of SF_6 GIE acquired after the phase-out (exemptions),

c. Consistency with California's Climate Change Goals

In 2005, Governor Schwarzenegger issued Executive Order (EO) S-3-05, which set targets for the State to reducing statewide GHG emissions to 1990 levels by 2020 and to 80 percent below 1990 levels by 2050. In 2006, California enacted AB 32 to address this public problem by requiring cost-effective reductions in GHG emissions and by codifying the 2020 target. AB 32 directed CARB to continue its leadership role on climate change and to develop a scoping plan identifying integrated and cost-effective regional, national, and international GHG reduction programs. In 2015, EO B-30-15, set a goal of reducing statewide GHG emissions to 40 percent below 1990 levels by 2030. In 2016, California enacted SB 32, which codified the 40 percent reduction goal from 1990 levels by 2030.

In July 2017, legislation clarified the role of the Cap-and-Trade Program in achieving the 2030 GHG reduction target (AB 398; Chapter 135, Statutes of 2017) and established a new program to improve air quality in local communities (AB 617; Chapter 136, Statutes of 2017). This legislation helps ensure that California continues to meet its ambitious climate change goals while addressing air pollution in communities with the dirtiest air. AB 398 also provided direction on the 2017 Scoping Plan Update and required its adoption by January 1, 2018. On December 14, 2017, the Board unanimously approved the 2017 Climate Change Scoping Plan (CARB 2017), which sets out specific measures to accomplish California's plan to reduce climate-changing gases an additional 40 percent below 1990 levels by 2030 pursuant to SB 32.

As mentioned earlier, SF_6 is the most potent of the six main GHGs with a GWP 22,800 times that of CO_2 over a 100-year period (IPCC 2007). Because of its extremely high GWP, small reductions in SF_6 emissions can have a large impact on reducing GHG emissions, which are the main drivers of climate change.

The proposed amendments to the Regulation are consistent with California's long-term climate goals. Since the anticipated overall effect of the proposed Regulation is emissions reductions of nearly 400,000 $MTCO_2e$ from GIE in California during the period 2020–2036 (i.e., the period of analysis of effects of the proposed Regulation), there will be no degradation of California's climate change goals resulting from the proposed Regulation, only a change in the pace of GHG emissions reductions. As such, the proposed Regulation's temporary uptick in SF_6 emissions for six years will not have a reasonably foreseeable new significant adverse cumulative impact on California's long-term climate goals or strategies under SB 32. Notably, without these

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3. SF_6 GIE are replaced earlier than their typical lifespan after the baseline is set (see section 2.B.4 of this ISOR), and
4. Note that this estimate does not include reductions achieved through the early action credit.

"Emissions reductions" and "cumulative emissions reductions" may not equal the difference between "BAU emissions" and "anticipated emissions with amendments" due to independent rounding.

proposed amendments to the Regulation, the rate of SF_6 emissions would not comply with the State's long-term climate goals since the allowance of ongoing emissions of one percent of total SF_6 capacity under the current standards would result in steadily increasing SF_6 emissions, assuming growth in SF_6 capacity in the State continues (see table, above). This conflicts with the stated climate change goals identified earlier. With the phase-out of the SF_6 emissions in the proposed Regulation, it's anticipated that the SF_6 emissions from GIE sources will continue to decrease, helping the State achieve the SB 32 goal of statewide GHG emissions 40 percent below 1990 levels by 2030. Therefore, the proposed amendments are consistent with the State's long-term climate goals and, as such, would not cause any adverse GHG impacts over the period of analysis (2020–2036).

D. Conclusion

In sum, there are GHG emissions benefits caused by the proposed amendments through the improved implementation, enforceability, credits, and incentives. There would be some delay in GHG emissions reductions in the coming years compared to what CARB initially projected when the standards were first adopted. However, as described above, those projected emissions reductions by small-capacity GIE owners cannot be achieved due to cost and technological feasibility concerns. Nonetheless, the proposed regulatory amendments do not cause new significant adverse GHG emissions impacts due to the change in the existing standards for small GIE owners because GHG emissions reductions will continue to be achieved during the period of analysis of the proposed regulatory amendments, albeit at a slower rate than originally expected for 2020–2025. Further, the proposed Regulation will achieve significant SF_6 emissions reductions relative to the current Regulation after 2025 and thereafter during the period of analysis (2020–2036) of the proposed amendments. The proposed amendments are needed to ensure successful, technologically feasible implementation of the program to achieve GHG emissions reductions from what would have occurred without this regulatory program.

VII. ENVIRONMENTAL JUSTICE

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Government Code, section 65040.12, subdivision (e)). CARB is committed to making environmental justice an integral part of its activities. The Board approved its Environmental Justice Policies and Actions (Policies) on December 13, 2001, to establish a framework for incorporating environmental justice into CARB's programs consistent with the directives of State law (CARB 2001). These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The reduction of GHG emissions is included among the stated reasons and goals for the proposed regulatory amendments. Per section V of this ISOR, the proposed

amendments are not anticipated to have any impacts (positive or negative) on criteria or toxics emissions. It is unknown if any GIE owners operate facilities in low-income and minority communities; however, given that insulating gases covered by the proposed Regulation are not know to have criteria pollutant or toxic air contaminant emissions, the proposed Regulation should cause no negative health effects in low-income and minority communities.

VIII. ECONOMIC IMPACTS ASSESSMENT

Legal Requirements

Section 11346.2 of the Government Code requires an economic impact assessment for non-major regulations or a standard regulatory impact analysis (SRIA) for major regulations to be included in the ISOR when proposing to adopt, amend, or repeal a regulation. A major regulation is one that has "an estimated economic impact to business enterprises and individuals located in or doing business in California exceeding $50 million in any 12-month period between the date the major regulation is estimated to be filed with the Secretary of State through 12 months after the major regulation is estimated to be fully implemented." CARB has determined that the proposed Regulation does not meet the major regulation threshold because the economic impact is below $50 million, and thus, a SRIA is not required.

For non-major regulations, sections 11346.2 and 11346.3 of the Government Code require State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed Regulation or amendments on California jobs; business expansion, elimination, or creation; the ability of California businesses to compete; and benefits of the regulation to the health and welfare of California residents, worker safety, and the state's environment.

Introduction and Scope of Analysis

The economic analysis focuses on four of the provisions in the proposed Regulation: the phase-out of SF_6 GIE acquisition in California; an exemption process that would allow entities to acquire SF_6 GIE after the phase-out when certain conditions are met; a requirement to report emissions from GIE, gas containers, or gas carts containing insulating gases with a GWP greater than one; and other changes to the annual report. The costs, cost savings, and emissions reductions calculated for this economic analysis are all based on the difference between the proposed amendments (or alternatives) and the BAU scenario. The BAU scenario retains the current Regulation with no amendments enacted; under this scenario, regulated entities are expected to continue to acquire and operate SF_6 GIE.

Under the SF_6 phase-out requirement, GIE owners will no longer be able to acquire new SF_6 GIE after the phase-out dates. The cost analysis is based on differential

costs of purchasing, operating, maintaining, and reporting for non-SF_6 GIE in place of SF_6 GIE. This requirement in the proposed Regulation drives the majority of the costs and cost savings in this analysis. GIE owners will, however, be able to acquire SF_6 GIE after the phase-out under certain conditions and with an approved exemption. For these owners, staff estimates the cost associated with filing for an SF_6 phase-out exemption. Lastly, there are a number of changes made to reporting requirements where staff estimates the costs and cost savings from recordkeeping and reporting.

The bulk of the costs are expected to occur starting in 2025, the first year of the SF_6 GIE acquisition phase-out, and will continue over time. The phase-out dates vary for different voltage classes, interrupting current classes, and locations of equipment, with the final year being 2033. Although the phase-out provision will be fully implemented by 2034, the turnover of SF_6 GIE in the State will continue beyond that date due to the approximately 40-year lifespan of the equipment.

As mentioned, not every provision in the proposed Regulation will incur additional or quantifiable costs relative to the current Regulation, but some may have an impact on emissions reduction and, consequently, cost-effectiveness calculations. Switching from the current SF_6 emission rate limit to an $MTCO_2e$ emissions limit allows for the inclusion of GHGs other than SF_6 which are used as insulators in non-SF_6 GIE. Starting in 2020, GIE owners with average system capacities of 10,000 $MTCO_2e$ or greater will have an emissions limit equivalent to one percent of their average system capacity (taking into account all insulating gases with a GWP greater than one), maintaining equivalency with the Regulation. When the phase-out requirement begins in 2025, GIE owners' total SF_6 capacity will decrease. Smaller capacities of SF_6 and other covered insulating gases can make compliance with the emissions limit more challenging. Under this model, GIE owners may be incentivized to keep their SF_6 GIE longer (since, in general, a larger SF_6 capacity makes it easier to comply with emissions limit requirements), and delay replacement with non-SF_6 GIE. Because older equipment tends to leak more, this could result in increasing overall emissions.

To address this disincentive, staff proposed setting an emissions baseline, resulting in an emissions limit that does not decrease when SF_6 GIE is replaced with non-SF_6 GIE. The baseline approach would incentivize a GIE owner to replace SF_6 GIE with non-SF_6 GIE after the baseline is established, because replacement would decrease the amount of SF_6 in their system, reducing the risk of SF_6 emissions, without any corresponding decrease in their emissions limit. When GIE owners replace SF_6 GIE with non-SF_6 GIE, the emissions baseline provision creates an emissions limit that represents an emission rate higher than the one or two percent specified in the regulatory amendments, making it easier to comply with the Regulation. The switch from an emission rate limit to an emissions limit and setting an emissions baseline are revisions to the calculation used to determine if a GIE owner's emission levels are in or out of compliance, hence this provision is not expected to incur any additional cost, though it does impact emissions reductions. This is because the combination of the phase-out requirement and emissions baseline create an incentive for GIE owners to accelerate the replacement of SF_6 GIE with non-SF_6 GIE since this approach would

reduce the amount of SF_6 in an owner's inventory without reducing the emissions limit, effectively making it easier to comply with the Regulation.

Also tied to the baseline, GIE owners may elect to utilize the early action credit incentive by acquiring non-SF_6 GIE before the phase-out dates. The early action credit will allow GIE owners to get credit—not to exceed ten percent of their covered insulating gas capacity—for these GIE devices when establishing their emissions baseline in 2025. Because this is a voluntary provision, not a requirement, the costs of acquiring non-SF_6 GIE prior to the phase-out dates are not considered in this cost analysis.

After the last phase-out year (2033), SF_6 capacity is expected to steadily decrease since no new SF_6 GIE can be acquired without an exemption, and end-of-life SF_6 GIE will continue to be replaced by non-SF_6 GIE. Because the emissions limit will not decrease when SF_6 GIE are replaced with non-SF_6 GIE, the emission rate will effectively grow over time, making it easier to comply with the Regulation. Stepping down the emissions limit in 2035 from one-percent equivalent to 0.95-percent equivalent (for GIE owners with a larger capacity) ensures that the Regulation will remain ambitious in reducing emissions in the future as the SF_6 GIE inventory decreases. GIE owners are not expected to invest in extra maintenance measures to comply with the lower emissions limit; therefore, staff does not anticipate any additional cost.

Finally, the provision that would change the emissions limit for small-capacity GIE owners (i.e., owners with less than 10,000 $MTCO_2e$ capacity) re-calibrates their compliance level to a more feasible threshold so that smaller entities will have a comparable ability to comply with the proposed Regulation as do larger entities. Although SF_6 gas is sealed inside the GIE devices, leaks do occur over time. Due to technical limitations related to leak detection and notification systems, small-capacity GIE owners have demonstrated difficulty in complying with a one-percent emission rate limit on an annual basis. For example, one leak in a GIE device owned by a small-capacity GIE owner could result in noncompliance because the volume of SF_6 that would trigger the leak detection and notification system would exceed the emissions limit. On the other hand, larger-capacity GIE owners have sufficient capacity to absorb such events without necessarily resulting in an exceedance of their limit. Hence, staff has proposed to increase the emissions limit for small-capacity GIE owners to the equivalent of two percent of their capacity from 2020 through 2034. In 2035, the emissions limit for small-capacity GIE owners would step down to 1.9-percent equivalent, a decrease proportional to the corresponding decrease for larger-capacity GIE owners that also occurs in 2035. Because these GIE owners are not expected to alter maintenance behavior, staff does not anticipate any costs or cost savings resulting from this adjustment to the emissions limit.

The year 2035 is the final year of implementation of the proposed Regulation. For this economic analysis, staff evaluates the impact from 2020 (when the provision regarding the alternative emissions limit for small-capacity GIE owners takes effect) through 2036 (12 months after full implementation of the Regulation).

Costs to Businesses

A. Capital Cost of Purchasing Non-SF_6 GIE Instead of SF_6 GIE

Equipment Inventory, Age, and Attrition
Data year 2017 annual reports submitted under the current Regulation provide the most recent statewide inventory of GIE available at the time of this analysis. This inventory provides the number of GIE devices by voltage and by age, which is used to determine the turnover schedule for equipment replacement.

From conversations with manufacturers and GIE owners, staff has learned that the lifespan of GIE varies depending on usage, with GIE typically lasting about 30–50 years. Manufacturers of alternative technologies also claim that non-SF_6 GIE will achieve a similar, if not longer, lifespan. Hence, staff is using 40 years as the average lifespan of GIE equipment for determining the replacement schedule prior to the phase-out requirements. As discussed in the Overview section above, the combination of the phase-out requirement and emissions baseline create an incentive for GIE owners to accelerate the replacement of SF_6 GIE with non-SF_6 GIE since this approach would reduce the amount of SF_6 in an owner's inventory without reducing the emissions limit, effectively making it easier to comply with the Regulation.

To model this behavior, staff analyzes a case in which GIE owners would replace a fraction of their SF_6 GIE two years early. Since GIE typically last between 30 and 50 years, replacing equipment at 38 years of age instead of 40 years is a reasonable assumption. Staff assumes that, for every initial phase-out year (see schedule in Table 7), all SF_6 GIE reaching 40 years of age would be replaced with non-SF_6 GIE; in addition, one-third of SF_6 GIE reaching 39 years of age and one-third reaching 38 years of age would also be replaced. During the second year of phase-out, the remaining (two-thirds) SF_6 GIE that were 39 years old in the initial phase-out year but now are 40 years old are replaced, along with one-third of GIE that were 38 years old in the initial phase-out year but now are 39 years old and one-third of GIE reaching 38 years old in the second year of the phase-out. From the third year and on, GIE owners would replace SF_6 GIE on a rolling basis according to the following schedule: remaining one-third of GIE that reach 40 years old, one-third of GIE reaching 39 years old, and one-third reaching 38 years old. The replacement schedule is summarized in Table 6 below.

Table 6. Equipment replacement schedule by age of equipment.

Year	Fraction of SF_6 GIE Replaced with Non- SF_6 GIE		
	GIE Turning 40	GIE Turning 39	GIE Turning 38
Initial Phase-Out Year	1 (all)	1/3	1/3
2nd Year after Phase-Out	2/3	1/3	1/3
3rd Year after Phase-Out	1/3	1/3	1/3

Phase-Out Schedule

The proposed Regulation specifies dates after which SF_6 GIE can no longer be acquired within the State. The proposed phase-out schedule is categorized by voltage rating, interrupting current rating, and location, as shown in Table 7. Because the data reported under the Regulation only contain information on equipment voltage, staff distributed the equipment population into interrupting current ratings and locations based on conversations with manufacturers and GIE owners about actual equipment produced and installed. Where no information is available, staff applied an equal-split assumption. For example, the population of GIE less than or equal to 17.5 kV is assumed to be divided equally between the categories of above-ground and below-ground applications. For the interrupting current ratings split, staff learned that the majority of equipment in this voltage category is less than 25 kA, and assigned a greater fraction in the corresponding rating to reflect this finding.

Table 7. Proposed phase-out schedule for new SF_6 GIE acquisition.

Voltage Class	Interrupting Current	Location	% Equipment in Voltage Class	Phase-Out Date: January 1 of
≤ 17.5 kV	All	Above ground	50	2025
	< 25 kA	Below ground	45	2025
	≥ 25 kA		5	2031
17.5 < kV < 38	All	Above ground	50	2025
	< 25 kA	Below ground	45	2025
	≥ 25 kA		5	2031
38 kV	All	Above ground	50	2028
	< 25 kA	Below ground	25	2025
	≥ 25 kA		25	2031
38 < kV ≤ 72.5	< 63 kA	All	90	2025
	≥ 63 kA		10	2028
72.5 < kV ≤ 145	< 63 kA		60	2025
	≥ 63 kA		40	2028
145 < kV ≤ 245	< 63 kA		50	2027
	≥ 63 kA		50	2031
> 245 kV	All		100	2033

GIE Inventory Growth

Based on data reported under the Regulation, in recent years, the statewide installed SF_6 capacity has grown between one percent and five percent per year. Staff is using the capacity growth as a proxy for equipment growth, and staff assumes a three-percent linear annual growth from the 2017 inventory. To be conservative, the three-percent annual growth rate is carried through all the analysis years through 2036.

Non-SF_6 GIE Replacement, Acquisition, and SF_6 GIE Exemption
The combination of the age of the equipment from the 2017 inventory and the lifespan assumption yield a natural replacement schedule for existing equipment. A three-percent growth is then added as new installations to each analysis year. Staff overlays this equipment population by year with the SF_6 phase-out schedule in the proposed Regulation to establish a non-SF_6 GIE replacement and acquisition schedule.

The proposed Regulation also includes a provision to file an SF_6 phase-out exemption request if the GIE owner can demonstrate the unavailability of suitable non-SF_6 GIE for the specific application. Staff anticipates that GIE owners will submit phase-out exemption requests for ten percent of the equipment in the initial year of the phase-out, and this fraction linearly decreases to one percent over one equipment lifetime (40 years).

Under the BAU scenario, the total number of SF_6 GIE devices for all businesses is estimated to be 55,774 in 2024, one year before the phase-out, and projected to be 72,368 by 2036. With the proposed amendments, the number of SF_6 GIE devices would decrease relative to 2024 levels, to 53,192 by 2036. Table 8 shows the numbers of non-SF_6 GIE that would be acquired each year, either as a replacement for end-of-life SF_6 GIE or as new installations to account for expected growth of GIE volumes, excluding the GIE devices estimated to receive a phase-out exemption.

Table 8. Projected count of non-SF_6 GIE acquired by year and by voltage class.

Year	≤ 17.5 kV	17.5 < kV ≤ 38	38 < kV ≤ 72.5	72.5 < kV ≤ 145	145 < kV ≤ 245	> 245 kV	Total
2020	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0
2024	0	0	0	0	0	0	0
2025	1406	66	241	96	0	0	1809
2026	1147	53	196	76	0	0	1472
2027	917	47	167	69	107	0	1307
2028	956	95	181	155	94	0	1482
2029	975	96	181	139	48	0	1439
2030	1003	96	159	112	49	0	1420
2031	1144	111	170	108	138	0	1671
2032	1163	101	174	114	127	0	1680
2033	1114	88	175	108	105	66	1657
2034	1087	88	173	99	99	42	1588
2035	1137	89	200	109	108	31	1675
2036	1316	90	251	143	144	32	1976

Equipment Replacement Unit Cost
Staff surveyed various manufacturers and equipment owners for cost data and presented cost assumptions in public workshops in February 2019 and August 2019. Staff received feedback from a dozen manufacturers and GIE owners, but the data provided vary considerably both in level of detail (from prices for one specific configuration to a general percentage increase without providing a baseline) and in the cost value. Almost all of the feedback focused on equipment up to 72.5 kV, presumably because non-SF_6 GIE already exist or are close to being available and cost data were more readily available. The cost information for higher voltage equipment is less readily available, and staff extrapolated the estimates based on manufacturer estimates and the average voltage of the equipment in those categories.

Costs primarily vary by the size of the equipment, so staff chose to estimate differential costs between SF_6 GIE and non-SF_6 GIE by voltage class, which is a proxy for size. Costs were not broken down by non-SF_6 technology type due to limited input and concerns over data confidentiality. Table 9 shows the average cost difference between purchasing a non-SF_6 and an SF_6 GIE device. Although some manufacturers have projected the cost difference to decrease or approach zero over time due to more mature technology development and market demand and competition, staff has chosen to conservatively assume the cost differences to remain the same across all analysis years.

Table 9: Average per-device cost of SF_6 GIE and cost differential between SF_6 GIE and non-SF_6 GIE.

kV Class	SF_6 GIE Base Cost	Median Cost Difference
kV ≤ 17.5	$16,000	$7,000
17.5 < kV ≤ 38	$23,000	$7,000
38 < kV ≤ 72.5	$54,000	$9,000
72.5 < kV ≤ 145	$80,000	$16,000
145 < kV ≤ 245	$135,000	$27,000
kV > 245	$276,000	$55,000

Under the BAU scenario, entities would replace SF_6 GIE at the end of its life with SF_6 GIE; therefore, there is no cost differential. With the proposed Regulation, there will be an incremental capital cost of purchasing non-SF_6 GIE instead of SF_6 GIE. The total incremental cost is estimated by multiplying the unit cost differential (Table 9) by the total number of non-SF_6 GIE from the matching voltage class acquired to replace SF_6 GIE at the end of its useful life (Table 8). The total number of non-SF_6 GIE includes both replacements due to the phase-out schedule and new installations due to growth.

The installation of non-SF_6 GIE are assumed to be similar to the practice for SF_6 GIE and is not assumed to result in additional costs. In cases in which a major

reconfiguration is needed to switch to non-SF_6-GIE, entities may instead apply for an SF_6 phase-out exemption.

B. SF_6 Phase-Out Exemption Cost

As mentioned earlier, staff anticipates that ten percent of the equipment to be replaced by non-SF_6 GIE in the initial year of the phase-out will receive an SF_6 phase-out exemption. As non-SF_6 technologies mature, this fraction would decrease linearly to one percent over one equipment lifetime (40 years). The cost associated with filing for an SF_6 phase-out exemption is estimated as the unit cost per application multiplied by the number of applications expected. Staff assumes that an engineer working at a rate of $50 per hour (Bureau of Labor Statistics 2019) will take two hours to complete a phase-out exemption request. Although the proposed Regulation allows for bundling of similar equipment into a single exemption application, this analysis conservatively assumes each GIE device will require its own application.

C. Operation and Maintenance Cost

Operation and maintenance of equipment include but are not limited to inspection, repair, and insulating gas purchase and refills. The costs associated with operation and maintenance are different for non-SF_6 GIE under the following groups of technologies: GIE that use an alternative gas (i.e., do not use SF_6), and GIE that use vacuum technology (for example, vacuum-dry air and vacuum-solid dielectric as introduced earlier). Staff expects that non-SF_6 GIE using alternative gases will require similar levels of maintenance as for SF_6 GIE, hence the cost differential is negligible to minimal. Both manufacturers and GIE owners have informed staff that vacuum technology requires less maintenance in terms of inspection frequency and level of repair work. The cost savings from using vacuum technology are discussed in the Total Cost Savings section below.

D. Recordkeeping and Reporting Cost

The proposed Regulation include changes to reporting requirements, including adding and removing certain data elements, but the overall time and expense associated with reporting are not expected to differ significantly from current practice. Under the proposed Regulation, reporting is required for equipment that use a GHG with a GWP greater than one. This includes all current SF_6-containing GIE as well as alternative gas-containing GIE that use a gas or gas mixture with a GWP greater than one. Because the reporting procedure will be similar to current practice, the cost differential is expected to be negligible to minimal. GIE that use zero-GWP insulating medium such as dry air or solid dielectric materials are exempt from reporting requirements and are expected to produce a cost benefit discussed in the Total Cost Savings section below.

E. Total Costs of Proposed Regulation

Table 10 below presents the estimated statewide costs for businesses under the proposed Regulation. The costs include both the incremental capital purchase costs and the cost of filing for an exemption. The costs also vary from year to year depending on the number and size of non-SF_6 GIE acquired and the number of SF_6 phase-out exemptions approved. The total cost across 17 years is approximately $180 million. Because GIE owners are not required to use non-SF_6 GIE until 2025, there are no incremental costs during the first five years (2020–2024) of the analysis period. Therefore, the average cost over the 12 years (2025–2036) with non-zero costs is approximately $15 million per year.

Table 10. Cost differential for businesses between Baseline and proposed Regulation, by year.

Year	Cost		
	Equipment Purchase	SF_6 Phase-Out Exemption	Total
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$14,013,214	$20,103	$14,033,317
2026	$11,381,535	$15,942	$11,397,477
2027	$12,237,084	$13,840	$12,250,924
2028	$14,019,314	$15,258	$14,034,572
2029	$12,647,011	$14,391	$12,661,403
2030	$12,247,529	$13,801	$12,261,330
2031	$15,768,807	$15,817	$15,784,624
2032	$15,688,853	$15,439	$15,704,292
2033	$18,202,595	$14,904	$18,217,499
2034	$16,373,917	$13,800	$16,387,718
2035	$16,779,000	$14,073	$16,793,073
2036	$20,013,402	$16,052	$20,029,454
Total	**$179,372,262**	**$183,421**	**$179,555,683**

Total Cost Savings

Despite having to pay a higher capital cost for non-SF_6 GIE, GIE owners may see cost savings in the long run due to lower maintenance and the reporting exemption associated with some non-SF_6 GIE. According to feedback received from GIE manufacturers and GIE owners, many non-SF_6 GIE can have a lower total cost of

ownership over the lifetime, creating financial incentives for businesses to transition to non-SF_6 GIE. Staff have shared cost savings calculation assumptions at both the February 2019 and August 2019 workshops and shared preliminary cost savings estimates at the latter workshop. Seven stakeholders have provided input about maintenance costs at various levels of detail for both SF_6 GIE and non-SF_6 GIE, and staff has incorporated this feedback into the values used in the economic analysis. Both GIE owners and manufacturers have informed staff that GIE that use vacuum technology generally require less maintenance in terms of inspection frequency and repair work. Such savings have prompted one large utility to use all non-SF_6 GIE at the distribution level (Rak 2019) and begin the process of switching all 72 kV level SF_6 GIE to vacuum GIE (Rak 2020). New GIE that use an alternative gas as an insulator are designed to operate similarly to SF_6 GIE, therefore the incremental operational and maintenance cost is expected to be zero. Moreover, under the proposed Regulation, equipment that uses an insulating medium with a GWP less than or equal to one are exempt from reporting, which further lowers GIE owners' staff time and cost. Because the cost savings are technology-dependent, staff estimated the market share and the anticipated savings in maintenance costs for each non-SF_6 GIE technology.

A. Operation and Maintenance Cost Savings

Technology Market Share

There are many variants of non-SF_6 GIE technologies, and they can be grouped into three common types: vacuum-solid dielectric, vacuum-dry air, and alternative gases. Based on an assessment of technology development and constraints that was informed by manufacturers and GIE owners, staff estimated the anticipated market share for each non-SF_6 GIE technology for all analysis years. For GIE 38 kV and below, vacuum-solid dielectric technology has been widely applied and will likely dominate the non-SF_6 market. For GIE greater than 38 kV and up to 145 kV, vacuum-dry air technology is either available now or will be available in the near future and is assumed to take a larger share (80 percent) of the non-SF_6 market compared to alternative gases (20 percent). This is also consistent with GIE owners' expressed inclination to use vacuum-dry air technology because it likely requires less maintenance and is exempt from reporting. At the higher voltages, the ability of vacuum GIE to meet technical requirements is still unclear. Therefore, GIE using alternative gas are expected to take a larger share of this market due to their scalability. Table 11 below summarizes the anticipated technology market share for the initial year of the phase-out by voltage range. Staff shared the estimated market fractions and the rationale outlined above at the August 2019 public workshop and received no opposing comments.

During the initial year of the phase-out, staff expects that ten percent of the newly acquired GIE will use SF_6, acquired using the SF_6 phase-out exemptions. As non-SF_6 technologies mature and become more widely adopted over time, staff assumes that this fraction will decrease linearly to one percent over 40 years (one equipment lifetime).

Table 11. Anticipated technology market share for initial year of phase-out.

Voltage Range	SF_6	Vacuum-Dry Air	Alternative Gases	Vacuum-Solid Dielectric
≤ 38 kV	10%	0%	0%	90%
38 < kV ≤ 145	10%	72%	18%	0%
145 < kV ≤ 245	10%	45%	45%	0%
> 245 kV	10%	18%	72%	0%

Equipment Maintenance Unit Cost

To understand the cost savings from reduced maintenance in non-SF_6 GIE, staff itemized the types of maintenance required for each technology and compared their cost-per-unit of service and frequency of service. These services include monitoring, basic visual inspection, gas leak detection, gas refill, detailed diagnostics and maintenance, and retirement and disposal. Like the capital purchase cost, the maintenance cost input from manufacturers and GIE owners was sparse and the level of detail varies. Staff presented preliminary cost savings estimates at the August 2019 workshop and have since incorporated stakeholder feedback. Table 12 summarizes the annual cost savings from using non-SF_6 GIE compared to SF_6 GIE.

Table 12. Annual operation and maintenance cost savings per piece of equipment per year.

	SF_6	Vacuum-Dry Air	Alternative Gases	Vacuum-Solid Dielectric
Annual cost savings per piece of equipment	$0	$656	$0	$916

The total incremental cost savings from operation and maintenance for each type of non-SF_6 equipment (i.e., vacuum-dry air, alternative gases, and vacuum-solid dielectric) is estimated by multiplying the unit cost differential for that type of non-SF_6 GIE (Table 12) by the total number of non-SF_6 GIE acquired and the anticipated technology market share by year (Table 11). The sum of operation and maintenance cost savings for all non-SF_6 equipment is shown in Table 13 below for each analysis year.

B. Recordkeeping and Reporting Cost Savings

Because the reporting entities vary considerably in size, the level of effort to keep an annual inventory of GIE and gas cylinders and to report to CARB also varies widely. To assess reporting cost and cost savings, staff divided up the reporting entities into three size categories based on their total SF_6 capacity, tabulated the number of equipment owned by entities in each category, and assigned different numbers of engineer-hours to complete the annual recordkeeping and reporting. Large, medium, and small entities are assumed to require 800, 300, and 40 hours per year, respectively. These values are based on the economic analysis for the 2010 Regulation but increased significantly to address stakeholders' feedback and what CARB staff anticipated to be a realistic amount of work associated with reporting. Using a typical engineer rate of $50 per hour

(Bureau of Labor Statistics 2019), staff estimated the average cost to inventory and report one GIE device per year to be approximately $14.

The fraction of GIE, from the anticipated technology market share, that use an insulating medium with a GWP less than one—namely, vacuum-dry air, vacuum-solid dielectric, and some alternative gases with a GWP less than or equal to one—will be exempt from reporting requirements under the proposed Regulation. GIE owners that acquire these low-GWP GIE to replace SF_6 GIE will benefit from reporting cost savings.

The total cost savings from operation and maintenance of and recordkeeping and reporting for non-SF_6 GIE are summarized in Table 13 below.

Table 13. Cost savings from proposed Regulation by year.

Year	Cost Savings		
	Operation & Maintenance	Recordkeeping & Reporting	Total
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$1,783,108	$28,617	$1,811,725
2026	$3,249,915	$52,168	$3,302,082
2027	$4,484,100	$72,278	$4,556,378
2028	$5,943,412	$96,250	$6,039,662
2029	$7,378,573	$119,676	$7,498,248
2030	$8,829,506	$143,179	$8,972,685
2031	$10,532,333	$170,824	$10,703,157
2032	$12,238,677	$198,459	$12,437,136
2033	$13,859,565	$224,784	$14,084,349
2034	$15,440,613	$250,380	$15,690,993
2035	$17,102,598	$277,386	$17,379,984
2036	$19,013,318	$308,534	$19,321,852
Total	**$119,855,717**	**$1,942,534**	**$121,798,251**

Emissions Reduction and Cost-Effectiveness

The proposed Regulation is expected to reduce approximately 38,000 pounds of SF_6, or 391,000 $MTCO_2e$ of GHG emissions, during the analysis years 2020–2036. Staff analyzed the impacts of the amendments, in particular the installation of non-SF_6 GIE due to the phase-out, through 2036, the year after which all revisions in the proposed Regulation would come into effect. Absent the proposed amendments, staff estimates that SF_6 emissions in 2036 would be 364,000 $MTCO_2e$, a significant increase relative to

estimated emissions of 286,000 $MTCO_2e$ in 2024, the year before the phase-out begins. By contrast, the proposed Regulation will reduce the 2036 emissions level to be approximately 283,000 $MTCO_2e$. Cumulative emissions reductions for the period 2020 to 2036 will be approximately 391,000 $MTCO_2e$. Because GIE lasts approximately 40 years, emissions reductions from non-SF_6 GIE acquired between 2025 and 2036 will continue through 2075, resulting in cumulative emissions reductions of approximately 3,143,000 $MTCO_2e$.

Table 14 shows the GHG emissions under the BAU scenario and the proposed Regulation as well as the emissions reductions by year. Through 2036, the reduction is the difference in GHG emissions calculated according to the proposed Regulation and the BAU scenario. After 2036, the emissions reductions from the non-SF_6 GIE installed through 2036 are carried forward for the anticipated 40-year life of the GIE. The BAU scenario retains the current Regulation with no amendments enacted; under this scenario, emissions are expected to grow linearly with SF_6 capacity under a one-percent emission rate limit.

Under the proposed Regulation, small-capacity GIE owners are allowed a higher emissions limit equivalent to two percent of the capacity of covered insulating gas. This provision results in slightly higher allowable emissions than those of the BAU scenario in the early years (2020–2025); thus, the GHG emissions reductions are negative. As the phase-out requirement progressively rolls out beginning in 2025, the rate of SF_6 capacity growth slows, and the projected emissions plateau for a few years before trending downwards as non-SF_6 replacements catch up with growth. This is in contrast to the emissions under the BAU scenario, in which emissions will still grow steadily after 2025 because there would be no phase-out provision driving emission reductions. Therefore, the GHG emissions reductions (difference between BAU and proposed Regulation) turn positive after the phase-out starts and increases each year after.

Table 14. Expected GHG emissions reductions for proposed Regulation.

Year	GHG Emissions ($MTCO_2e$)		GHG Reduced ($MTCO_2e$)
	BAU	Proposed Regulation	GHG Emissions of BAU Minus GHG Emissions of Proposed Regulation
2020	252,943	257,242	-4,299
2021	259,905	264,322	-4,417
2022	266,866	271,402	-4,535
2023	273,828	278,482	-4,654
2024	280,790	285,562	-4,772
2025	287,751	288,864	-1,113
2026	294,713	292,804	1,909
2027	301,675	292,904	8,771
2028	308,637	292,809	15,827
2029	315,598	294,585	21,014
2030	322,560	296,726	25,834
2031	329,522	295,510	34,012
2032	336,484	294,932	41,552
2033	343,445	290,725	52,720
2034	350,407	288,501	61,906
2035	357,369	286,612	70,757
2036	364,330	283,849	80,481
2037-2075*			2,751,855
Total	**5,246,823**	**4,855,831**	**3,142,848**

* This estimate accounts for emissions reductions from non-SF_6 GIE installed between 2025 and 2036 through their 40-year lifetime.

To determine the overall cost-effectiveness of the proposed Regulation, staff first calculated the net cost to all regulated entities (private businesses and local, State, and federal governments) by subtracting the total cost savings ($121,798,251; Table 13) from the total costs ($224,704,927). This net cost is then divided by the cumulative CO_2e emission reductions anticipated from the implementation of these proposed amendments through 2036, which includes emissions reductions that extend through 2075 (3,142,848$MTCO_2e$; Table 14) to calculate the cost-effectiveness. Of note, the cost savings from operating non-SF_6 GIE are also realized over the 40-year lifetime of the GIE. However, this economic analysis conservatively accounts only for cost savings that occur during 2025–2036. The cost-effectiveness of the proposed Regulation is estimated to be $33 per $MTCO_2e$ reduced. .

Potential Impacts on Businesses

A. Impacted Businesses

Staff calculated that 200 businesses[12] will be impacted by the proposed amendments. These businesses are all GIE owners in California and are subject to the current Regulation. The same GIE owners will be subject to the SF_6 phase-out and emissions limit requirements of the proposed amendments. A major fraction (84 percent) of these businesses are electric power generation, transmission, and distribution companies, followed by nine percent in manufacturing, three percent in mining, quarrying, and oil and gas extraction, and the remaining four percent are classified into other sectors. Ten of the 200 GIE owners are considered small businesses.

The average annual cost for small businesses is calculated by multiplying the total costs (2020–2036) in Table 10 by the small-business fraction (six percent) of the statewide GIE inventory, dividing that by the number of GIE owners that are considered small businesses (ten), and dividing by the number of years (12) with non-zero costs. Staff estimated the average annual cost for a small business to be approximately $85,000 per year. Following similar methods, the cost for a typical (non-small) business is approximately $74,000 per year. Note that one of the ten small businesses owns a large number of low-voltage GIE devices, which skews the average cost for a small business to be considerably higher than that for a typical business.

B. The Creation or Elimination of Jobs Within the State of California

The operation and maintenance requirements of alternative-gas GIE are designed to be similar to those for conventional SF_6 GIE. Technicians familiar with handling SF_6 GIE may need to receive additional training to operate and maintain non-SF_6 GIE, and they are expected to be able to perform the job as they have with SF_6 GIE. Therefore, staff does not expect there to be a significant increase or decrease in jobs due to workers' ability to perform the job. However, vacuum GIE are expected to require significantly less maintenance. Staff expects a decrease in jobs related to maintenance crews at sites that use vacuum technology, though it is anticipated that this decrease will be relatively small.

C. The Creation of New Business or the Elimination of Existing Businesses Within the State of California

Because all existing GIE manufacturers are located outside of California, the proposed Regulation is not expected to result in considerable business creation or elimination in California.

[12] "Businesses" do not include local, State, and federal government entities, which are covered in later sections.

Non-SF_6 GIE are generally more expensive upfront than SF_6 GIE; however, the cost savings from less maintenance and reporting are expected to compensate for the higher purchase cost and potentially lower the lifetime ownership cost. Most of the GIE owners in the State are electric power generation, transmission, and distribution and large industrial companies. CARB staff expects that these entities will be able to cover the higher upfront cost with little financial impact, especially when they can anticipate cost savings over the long term.

D. The Expansion of Businesses Currently Doing Business Within the State of California

No significant impacts to the expansion of businesses due to the proposed Regulation are anticipated. While the proposed Regulation is intended to increase demand for non-SF_6 GIE, this will be in place of SF_6 GIE that would have been acquired in the absence of the proposed Regulation. The proposed Regulation is therefore not expected to drive an overall increase in demand for GIE and expansion of businesses for GIE owners. There may be some expansion of business to manufacturers of non-SF_6 GIE, but all currently known GIE manufacturers are located outside of California.

E. Significant Statewide Adverse Economic Impact Directly Affecting Business, Including Ability to Compete

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons. Most of the affected businesses in the State are electric power generation, transmission and distribution, and large industrial companies. CARB staff expects that these entities will be able to absorb the higher upfront cost of non-SF6 GIE with little financial impact, especially with the projected cost savings over the long term. The proposed regulatory action would not significantly affect these utilities' ability to compete with other out-of-State companies. This is due to the oligopolistic nature of the electricity sector, wherein consumers typically patronize whichever utility services the location of their residence or business. Thus, the proposed regulatory action would not significantly affect these utilities' ability to compete with other out-of-State companies.

F. The Benefits of the Regulation to the Health and Welfare of California Residents, Worker Safety, and the State's Environment

Benefits such as reduced GHG emissions and reduced operating costs could result from implementation of non-SF_6 GIE. The proposed Regulation is expected to reduce approximately 3,143,000 $MTCO_2e$ of GHG emissions during analysis years 2020–2036. Because GHGs are global pollutants, both California's residents and the world's population would benefit from the reduction in these emissions and the associated mitigation of global climate change. Therefore, these amendments may also directly

improve the health and welfare of California residents, worker safety, and the State's environment.

Fiscal Impact to Local and State Government

Because the phase-out requirement will not be implemented until 2025, there will be no costs to government agencies in the fiscal year that the proposed Regulation will be effective (2020–2021) and the two subsequent fiscal years. However, there will be costs and cost savings to 49 local agencies and ten State agencies across California.

a. Local Government

The majority of the 49 local government agencies considered in this analysis are publicly owned utilities. Staff estimated the cumulative cost to local government to be $37 million over the period 2020–2036, or approximately $3.1 million per year on average over the 12 years with non-zero costs. There is also a cumulative cost savings of $17 million over the period of 2020–2036, or approximately $1.4 million per year on average over the 12 years with non-zero costs.

Any cost to local government is not reimbursable by the State because the proposed Regulation does not mandate local agencies to provide a service to the public. Further, the requirements are of general applicability because they apply to all GIE owners regardless of whether the owners are local agencies or private businesses.

Sales taxes are levied in California to fund a variety of programs at the State and local level. The average sales tax rate in California is 8.6 percent (CDTFA 2020). In addition, local governments also collect about 54 percent of the total sales tax revenue (i.e., approximately 4.7 percent out of 8.6 percent sales tax rate). The tax revenue to local governments from 2025 through 2036 totals to $10.5 million with an average of $875,000 per year during the 12 years of non-zero costs.

b. State Government

All ten State government agencies considered in this analysis are public universities. Staff estimates the cumulative cost to State government to be $2.1 million over the period 2020–2036, or approximately $176,000 per year on average over the 12 years with non-zero costs. There is also a cumulative cost savings of $1.7 million over the period 2020–2036, or approximately $138,000 per year on average over the 12 years with non-zero costs.

Sales taxes are levied in California to fund a variety of programs at the State and local level. State government collects about 46 percent of the total sales tax revenue (i.e., approximately 3.9 percent out of 8.6 percent sales tax rate) based on established precedent. The sales tax revenue to State government from 2025 through 2036 totals to ~$8.8 million with an average of $737,000 per year during the 12 years of non-zero costs.

The implementation and enforcement of the proposed Regulation would not have an impact on staff resources at CARB. The workload will be absorbed by staff using similar processes to those currently in place.

IX. EVALUATION OF REGULATORY ALTERNATIVES

Government Code section 11346.2, subdivision (b)(4) requires CARB to consider and evaluate reasonable alternatives to the proposed regulatory action and provide reasons for rejecting those alternatives. This section discusses alternatives evaluated and provides reasons why these alternatives were not included in the proposal. As explained below, no alternative proposed was found to be less burdensome and equally effective in achieving the purposes of the regulation in a manner than ensures full compliance with the authorizing law. The Board has not identified any reasonable alternatives that would lessen any adverse impact on small business.

CARB staff identified three alternative approaches to the current proposal and determined that none of the alternatives would be less burdensome and equally effective, as described below.

Retain One-Percent Emission Rate Limit

A "Retain One-Percent Emission Rate Limit" alternative would maintain the Regulation's one-percent emission rate limit rather than replacing it with an emissions limit measured in $MTCO_2e$. The impact of this alternative would be that SF_6 emissions from this source would continue to grow with system GIE capacity. The data reported to CARB under the Regulation demonstrate that the amount of SF_6 in active GIE—that is, the GIE capacities used to determine emission rate limits—has grown in the last several years at an annual rate between one and five percent. In meetings with GIE owners during the public process to amend the Regulation, GIE owners have noted that the rate at which SF_6 capacity is expected to grow statewide in the coming years may be greater than the historical rate and, for certain GIE owners, the rate of growth could be significantly greater than for the sector overall. Reasons for the expected increase include replacement of old oil circuit breakers with SF_6 breakers, growth in demand for electricity due to population growth and the State's goal to increase electrification of vehicles and other infrastructure, and the changing nature of the electric grid to include the growth in renewables.

Because SF_6 capacity is expected to grow after 2020, and the maximum emissions allowed are proportional to SF_6 capacity, under the Regulation, emissions from this source category would be expected to increase after 2020. The one-percent rate limit also fails to encourage adoption of new GIE that do not contain SF_6, and would not capture GIE devices that use a GHG other than SF_6 as an insulating gas. The non-SF_6 GIE alternatives present an opportunity to reduce GHG emissions from this source category, consistent with the State's aggressive GHG emissions reduction targets described earlier in this document.

Under this alternative, the goal of accelerating the transition to non-SF_6 technologies and reducing GHG emissions would be more difficult to achieve. With an emission rate limit, any decrease in a GIE owner's capacity also decreases the amount of SF_6 the GIE owner is allowed to emit on an annual basis. This creates somewhat of a disincentive to replace SF_6 GIE with non-SF_6 GIE. Though this could mean delayed purchases of (currently more expensive) non-SF_6 GIE, or increased maintenance costs from operating older SF_6 GIE devices, these are indirect rather than direct outcomes of this option. Therefore, this alternative could increase SF_6 emissions with neither a cost increase nor decrease. For these reasons, staff has rejected the "Retain One-Percent Emission Rate Limit" alternative.

Do Not Phase out SF_6 GIE

A "Do Not Phase out SF_6 GIE" alternative would consist of removing the phase-out requirements and corresponding SF_6 phase-out exemption process. This alternative would not achieve the goals of accelerating the transition to non-SF_6 technologies and realizing the corresponding GHG emissions reductions. Through conversations with GIE owners and GIE manufacturers as part of the public process, it became clear that non-SF_6 GIE are being developed and these emerging technologies over time have the ability to replace SF_6 GIE in many, if not all, applications. Though some non-SF_6 alternatives are in use today, their adoption is somewhat limited and supply varies by company. As with many emerging or alternative technologies, the cost of non-SF_6 GIE is expected to be higher than SF_6 GIE in the near-term, though over the long-term costs are expected to come down as production volumes increase. GIE owners are also extremely comfortable with their long-standing practice of using SF_6 GIE. These factors could make it difficult for the non-SF_6 to get a foothold without further incentives.

By establishing a phase-out schedule, CARB is establishing a market and driving demand for these products, particularly for the higher-voltage options that are anticipated to be developed at a later point in time. CARB has been told by manufacturers and GIE owners that the proposed SF_6 phase-out would be a key factor driving near-term development work to commercialize additional non-SF_6 GIE. If these technologies are not adopted, it is conceivable that SF_6 use and emissions will continue to grow. Also, with no phase-out of SF_6 GIE, these emerging technologies will likely become commercially available at a later point in time, if they are developed at all, due to lack of demand. This could have impacts both in California and globally, and further GHG emissions reductions from this source category beyond those mandated by the Regulation would be very difficult to achieve without use of these alternative GIE. Implementing this alternative would yield significant cost savings relative to the proposed Regulation, but it would also result in SF_6 emissions growth over time, an option that is untenable from a climate impacts and a policy perspective given California's GHG emissions reduction goals. For these reasons, staff has rejected the "Do Not Phase out SF_6 GIE" alternative.

Do Not Implement Differing Emissions Limits for Small-Capacity GIE Owners

The "Do Not Implement Differing Emissions Limits for Small-Capacity GIE Owners" alternative would keep the emissions limit for small-capacity GIE owners (that is, GIE owners with capacity of less than 10,000 $MTCO_2e$) at one percent. Small-capacity GIE owners have explained to CARB staff the challenge in complying with a one-percent emission rate limit on an annual basis. GIE owners of this size may have a small number of SF_6 GIE devices. Typically, a pressurized SF_6 GIE device will notify the owner of a drop in pressure (leak) only when the pressure drops below a certain threshold. Because that threshold may be several percent of the device's capacity, by the time the GIE owner is made aware that a leak has occurred, more SF_6 may have been lost than allowable under the one-percent emission rate limit. While leaks are an issue for larger GIE owners as well, because these events occur relatively infrequently for individual GIE devices, larger GIE owners have sufficient capacity to allow for several of these events per year while maintaining an overall emission rate below one percent.

Under the proposed Regulation, CARB staff proposed increasing the allowable emission rate for these small-capacity GIE owners. Under this alternative where the emission rate remains at one percent for all GIE owners, small-capacity GIE owners may be unable to comply on a regular basis. This could result in additional costs to the small-capacity GIE owners due to possible enforcement penalties. This could also result in significant program and enforcement staff time to address emissions exceedances, many of which may be dismissed if deemed beyond the control of the GIE owner. Because of these physical limits, small-capacity GIE owners could incur these additional costs without any corresponding GHG emissions reductions. For these reasons, staff has rejected the "Do Not Implement Differing Emissions Limits for Small-Capacity GIE Owners" alternative.

Small Business Alternative

The Board has not identified any reasonable alternatives that would lessen any adverse impact on small business.

Performance Standards in Place of Prescriptive Standards

CARB is not setting prescriptive standards in this Regulation.

Health and Safety Code section 57005 Major Regulation Alternatives

CARB estimates the proposed Regulation will have an economic impact on the state's business enterprises of more than $10 million in one or more years of implementation. CARB will evaluate alternatives submitted to CARB and consider whether there is a less costly alternative or combination of alternatives that would be equally as effective in achieving increments of environmental protection in full compliance with statutory

mandates within the same amount of time as the proposed regulatory requirements, as required by Health and Safety Code section 57005.

X. JUSTIFICATION FOR ADOPTION OF REGULATIONS DIFFERENT FROM FEDERAL REGULATIONS CONTAINED IN THE CODE OF FEDERAL REGULATIONS

In 2017, ten of the GIE owners subject to the Regulation also filed an emissions report to U.S. EPA under 40 CFR Part 98 (Greenhouse Gas Reporting Program or GHGRP) Subpart DD (U.S. EPA 2019b). U.S. EPA's GHGRP requires reporting of GHG emissions data and other relevant information from GIE owners whose aggregate nameplate capacity of non-hermetically sealed GIE exceed 17,820 pounds of SF_6 or perfluorinated compounds (U.S. EPA 2018). U.S. EPA states that these data can be used by businesses and others to track and compare facilities' GHG emissions and identify opportunities to reduce pollution, minimize wasted energy, and save money (U.S. EPA 2019c). U.S. EPA's GHGRP does not require emissions be reduced, only reported. This stands in contrast to CARB's Regulation, which was enacted as an early action measure under AB 32 for the purpose of achieving GHG emissions reductions. As such, more granular data are required to be reported under CARB's Regulation, which requires that all GIE owners in California report emissions and ensure that they do not exceed the applicable emissions limit.

U.S. EPA's GHGRP is not a comparable federal regulation because it has a high reporting threshold and lacks any emissions limit. CARB's Regulation is needed to support mandated GHG emissions reductions, as set by SB 32, and follow the direction provided in Board Resolution 17-46 to evaluate and explore opportunities to achieve additional significant cuts in GHG emissions from all sources.

After conducting a comparison of U.S. EPA's requirements to those in the proposed Regulation, CARB staff has found that the differing State regulations are authorized by law and the cost of differing State regulations is justified by the benefit to human health, public safety, public welfare, or the environment.

XI. PUBLIC PROCESS FOR DEVELOPMENT OF THE PROPOSED ACTION (PRE-REGULATORY INFORMATION)

Consistent with Government Code sections 11346, subdivision (b), and 11346.45, subdivision (a), and with the Board's long-standing practice, CARB staff held public workshops and had other meetings with interested persons during the development of the proposed Regulation. These informal, pre-rulemaking discussions provided staff with useful information that was considered during development of the Regulation that is now being proposed for formal public comment.

The public process for the proposed amendments began with a workshop on November 28, 2017. A total of three publicly noticed workshops and one publicly noticed working group meeting were held from November 2017 through August 2019. In addition,

CARB staff held dozens of informal meetings with stakeholders to discuss specific topics related to the proposed amendments. These forums provided CARB staff and stakeholders opportunities to present and discuss initial regulatory language and concepts and potential alternatives. The workshops, working group meeting, and other meetings allowed CARB staff to consider stakeholder feedback and to incorporate it into the proposed amendments where appropriate. CARB staff will continue to consider stakeholder feedback throughout the formal regulatory process.

At the three publicly noticed workshops and one working group meeting, CARB staff gave presentations on specific amendment topics, provided draft regulatory text for consideration, included "text box" discussions for certain topics that required more stakeholder input, and solicited comments and feedback from affected stakeholders. Details on these workshops and working group meeting are as follows:

- Nov. 28, 2017: A public workshop to discuss proposed regulatory amendments to CARB's Regulation governing SF_6 emissions from GIS. At the workshop, CARB staff released a 'strawman' version of potential SF_6 regulatory changes and made a presentation that summarized some of the major changes discussed in the strawman.

- May 3, 2018: A working group meeting to discuss the possible inclusion of a program inclusion threshold, current record keeping and reporting requirements, and the phase-out of sulfur hexafluoride use in new equipment. The working group meeting served as a forum at which the topics described above were discussed. No revised draft of the potential regulatory changes or formal staff presentation were provided.

- Feb. 25, 2019: This workshop presented additional regulatory changes under consideration. Prior to this workshop, staff released a Discussion Draft of possible amendments which built upon the previously released strawman and reflected some of the feedback received from stakeholders at the prior workshop and working group meeting. Staff also gave a presentation which provided a summary of the major changes and staff's rationale.

- Aug. 15, 2019: A workshop to discuss stakeholder comments on possible amendments to the Regulation. Prior to this workshop, staff released a second Preliminary Discussion Draft with additional potential changes to the Regulation. CARB's presentation summarized key comments received from stakeholder in response to the February Discussion Draft, offered CARB reactions to the feedback, raised additional questions for stakeholders, and discussed the modifications staff had made to the Discussion Draft as a result of comments received.

Each of these workshops was announced approximately two weeks prior to its occurrence by posting a notice to the "SF_6 from GIE" public email service list, which currently has over 3,000 recipients. Each workshop and working group meeting was open to all members of the public and was also made available for participation via

webcast. Workshop information and materials, along with written public comments that were submitted during the informal public comment period, are posted on the Electricity Transmission and Distribution Greenhouse Gas Emissions: Meetings and Workshops webpage: https://ww2.arb.ca.gov/our-work/programs/elect-tandd/meetings-workshops. All of the workshop materials, including presentations, are also included in Appendix E: Public Process.

XII. REFERENCES

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XIII. APPENDICES

Appendix A: Proposed Regulation Order

Appendix B: Public Process