



September 22, 2019

Honorable Chair Mary Nichols
Honorable Board Members, California Air Resources Board
California Air Resources Board
1001 I Street, Sacramento, CA 95814

RE: SCE Comments Regarding the Proposed Amendments to the Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear

Dear Chair Nichols and Members of the California Air Resources Board:

Southern California Edison (“SCE”) appreciates the opportunity to comment on the California Air Resources Board’s (“CARB”) Proposed Amendments to the Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear (“Proposed Amendments”) posted July 21, 2020.

SCE understands the importance of reducing greenhouse gas (GHG) emissions, specifically from high global warming potential gases, and supports the phase-out of sulfur hexafluoride (SF₆) from gas insulated switchgear. SCE is committed to a clean energy future and has an obligation to the 15 million people in the communities we serve to deliver safe, reliable, clean, and affordable energy.

SCE appreciates the dedication of the CARB Staff over the past several years to learn and understand the unique challenges of the individual utilities and the manufacturers producing gas insulated equipment (GIE). We recognize the substantial effort CARB Staff has taken to work with stakeholders to develop a regulation that will reduce GHG emissions and be achievable and cost-effective while preserving safety and reliability in the electricity grid. The Proposed Amendments continue to build a more feasible regulation. SCE has some remaining concerns about the practicability of some of the additional regulatory requirements which impact safety, reliability, and affordability.

One of the largest challenges SCE will face is the timeline of anticipated commercial availability of non-SF₆ GIE. Based on our ongoing discussions with non-SF₆ GIE manufacturers, we remain very concerned that non-SF₆ GIE that meets SCE’s specific engineering standards and system needs will not be available before the proposed phase-out dates listed in the regulation. The Proposed Amendments take this into account by utilizing a tiered approach, with phase out that would take effect in stages between 2025 and 2033. We support the tiered approach, however, a GIE owners’ ability to comply with the regulation will be heavily dependent upon manufacturers’ development of new technologies in line with their anticipated timelines over the next 10 years. Therefore, the SF₆ phase-out exemption process is an incredibly critical component of the regulation, and SCE supports an infeasibility exception process that

will allow SCE to maintain safety, reliability and affordability of the grid. To further support reliability of the grid, SCE must have the ability to immediately replace like-for-like equipment during unforeseen equipment failure through a notification process, as opposed to an approval process. It is also critical that SCE retains the ability to replenish spare SF₆ GIE inventory for unforeseen replacements. To help address these remaining concerns, SCE offers the following recommendations for your consideration.

I. Modify SF₆ Phase-out table dates to be consistent with commercial availability and minimum testing requirements of GIE.

SCE supports CARB's tiered phase-out schedule for new GIE purchases that is dependent upon the commercial availability of non-SF₆ equipment for each voltage class of equipment that is economically feasible and is linked to a robust SF₆ Phase-Out Exemption process to ensure SF₆ GIE phase-out does not compromise the safety, reliability, and integrity of the electrical system. The additional granularity that CARB has built into the phase-out schedules for kA rating and configuration in Table 1 and 2 in the Proposed Amendments is a helpful addition.

It is critical that phase-out dates consider not only commercial availability, but also allow necessary time for SCE to appropriately evaluate, test, install, and pilot new equipment for safe and reliable operation. CARB has proposed three years on top of commercial availability, which is helpful, but may not be sufficient, especially to pilot new technologies in real-world conditions at higher voltage levels. When executing a major technology change on the electrical system, time for careful testing is needed to understand how real-world application influences the new technology in terms of public and worker safety. For distribution GIE, the primary safety concerns include manhole explosion events and Arc Flash events. The additional time is necessary for each utility to gain operational experience to transition to new technology options which collectively have minimal proven operational performance as compared to the SF₆ GIE counterpart.

Once non-SF₆ equipment is considered commercially available by a manufacturer, SCE must follow a strict process before installing new equipment on SCE's electric system:

- i. **Project design and specification writing (8 to 18 months lead time):** Substation Apparatus must create a specification with project-specific details for a vendor to begin to develop and manufacture compatible equipment for SCE's electrical system.
- ii. **Competitive bid, bid evaluation, and award (3 to 6 months lead time):** Once the specification is approved, it is then shared externally with other vendors through either a Request for Information or Request for Proposal.
- iii. **Manufacture of equipment (8 to 14 months lead time):** Time necessary to manufacture and deliver equipment.
- iv. **Utility pilot testing and evaluation (60 months lead time):** Substation Apparatus must then perform a full technical evaluation in parallel with Supply Chain Management's commercial evaluation.

| | Voltage Levels | Commercial Availability Date of Non-SF ₆ Equipment (Year) ² | Lead Time for Project Design & Apparatus Spec Writing (# of months) | Competitive Bidding & Selection Process (# of months) | Manufacture of non-SF ₆ Equipment (# of months) | Project Timing, Utility Pilot Testing & Evaluation of non-SF ₆ Equipment (# of months) | Phase Out Date = (Commercial Availability Date) + (Project Design & Spec Writing) + (Competitive Bidding) + (Manufacture of Equipment) + (Utility Pilot Testing & Evaluation) |
|------------|----------------|---|---|---|--|---|---|
| Substation | 72.5 kV | 1/1/2022 | 8 | 8 | 8 | 60 | 1/1/2029 |
| | 145 kV | 1/1/2022 | 8 | 8 | 8 | 60 | 1/1/2029 |
| | 245 kV | 1/1/2026 | 9 | 6 | 9 | 60 | 1/1/2033 |
| | 550 kV | 1/1/2028 | 16 | 6 | 14 | 60 | 1/1/2036 |

SCE's proposed edits to §95352, Sulfur Hexafluoride Phase Out, Table 1 and Table 2, are indicated below in underlined and ~~strikethrough~~ text:

§95352. Table 1, Phase-out Dates for SF₆ 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 2031 |
| Belowground | ≤38 | <25 | January 1, 2025 2031 |
| | | ≥25 | January 1, 2031 |

§95352. Table 2, Phase-out Dates for SF₆ 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 2029 |
| 145 < kV ≤ 245 | < 63 | January 1, 2027 2033 |
| | ≥ 63 | January 1, 2031 2033 |
| > 245 | All | January 1, 2033 2036 |

II. Allow a notification process in order to expedite like-for-like GIE replacement during unplanned failure, to support system reliability.

Situations may arise during failures or catastrophic/life-threatening incidents where equipment *must* be replaced immediately in order to protect system reliability and customer safety. Other essential public services rely upon the reliability of the electrical system, such as hospitals, water-treatment facilities, first responders, critical communication facilities, financial institutions, critical air-navigation systems, and medically sensitive residential customers. SCE must be able to act immediately to restore the grid after unplanned failures.

The Proposed Regulation requires the regulated party to seek an accelerated SF₆ phase-out exemption following a “Catastrophic Failure,” as defined. The term “catastrophe” implies the occurrence of an extreme, severe event, which is not necessarily the case when a given device (such as a circuit breaker) fails. Upon such a failure, the utility must act quickly to ensure system safety, reliability and integrity/resilience. A GIE may fail under different unplanned conditions, including extreme heat, cold, or lightning strike, and may not result in a release of SF₆ gas. An electricity surge or ‘flashover’ can cause the failure of a circuit breaker. If the breaker is a critical asset within the SCE substation or the larger network of substations, the failure creates an abnormal condition that directly affects system reliability in various forms (e.g. power flow). It will require expedited replacement of equipment where a non- SF₆ alternative may not be readily available. The replacement breaker may be secured through internal emergency inventory, a mutual aid agreement with a utility in California or another state, or directly from the supplier.

To assure that SCE can immediately respond to these unplanned events and meet its regulatory obligations to all federal and state agencies, including the Federal Energy Regulatory Commission (FERC) and the California Public Utilities Commission (CPUC), and customers, SCE recommends the following amendments:

Proposed edits to §95351, Definitions, and §95357, SF₆ Phase-Out Exemption are indicated below in underlined and ~~striketrough~~ text:

§95351, Definitions

~~“Catastrophic Failure”~~

§95357(h), SF₆ Phase-Out Exemption

(h) In the event of a GIE failure as specified in §95351, the GIE owner must notify the Executive Officer within 15 days of the failure event.

- (1) The GIE owner must indicate that the SF₆ phase-out exemption request is in response to a ~~catastrophic~~-failure pursuant to section 95357(h) and include a detailed description of the ~~catastrophic~~-failure, including, but not limited to the following:

~~§ 95357(i)~~ (Delete section (i), which would no longer be applicable)

III. There should be a clear process to maintain spare SF₆ inventory for reliability purposes, including after phase-out.

Maintaining 12,635 miles of transmission lines and 91,375 miles of distribution lines across 50,000 square miles of SCE service area¹ requires a robust and flexible inventory of spare equipment for like-for-like replacements to facilitate quick repair of unanticipated equipment failures in order to maintain grid reliability and redundancy.

SCE recognizes and appreciates that the Staff Report: Initial Statement of Reasons supports the concept of an SF₆ Phase-Out Exemption to acquire a new spare GIE device:

*“New section 95357(h)(5) requires the GIE owner include a statement certifying that they have no GIE in their possession (SF₆ 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 SF₆ 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 SF₆ GIE device, they can do so following the standard protocol.**”²*

However, the purchase of GIE to be placed back into spare inventory does not appear to fall clearly into any of the four identified exemption categories within the standard protocol (§95357(b)(1), (2), (3) or (4)).

Due to the unpredictable nature of equipment failures, it is critical that the spare GIE be allowed to be placed at any location across SCE service territory, and not tied to a specific project location, especially pertaining to distribution-level GIE. Requiring that spare inventory be tied to a specific project location would be impracticable, as it would essentially require that a spare unit be maintained for each location in order to retain the ability to quickly restore the system in the case of failed GIE. Conversely, allowing replenishment of spare GIE inventory that is available to be deployed to any failure location across SCE territory would allow SCE to maintain an acceptable level of reliability without the need for a massive spare fleet.

For clarity, SCE proposes adding a new category, Section 95357(5). Proposed edits to §95357(b), SF₆ Phase-Out Exemption, are indicated below in underlined and ~~strikethrough~~ text:

§95357(b), SF₆ Phase-Out Exemption

(b) Beginning September 1, 2024, a GIE owner may submit an SF₆ phase-out exemption request if either:

(1) Non-SF₆ GIE of the equipment type and GIE characteristics necessary for the particular project(s) or application(s) are unavailable from at least two suppliers; or

¹ <https://www.sce.com/about-us/who-we-are>

² <https://ww3.arb.ca.gov/regact/2020/sf6/isor.pdf>, page 100.

(2) Available non-SF₆ GIE cannot meet the size requirements for the particular project(s) or application(s), taking into consideration the physical size of the GIE, the physical constraints of the project location(s), including required clearance; or

(3) Available non-SF₆ GIE cannot be used for the specific project(s) or application(s) due to incompatibility with existing equipment, wiring, or connectors; or

(4) Available non-SF₆ GIE is not suitable based on safety or reliability requirements; or

(5) Available non-SF₆ GIE cannot be used to replenish inactive spare GIE inventory.

IV. *The mechanism to acquire multiple SF₆ GIE of the same equipment type and GIE characteristics should be streamlined.*

SCE supports the newly added Section 95357(c), which allows the GIE owner to submit a single request to cover all associated SF₆ GIE. However, the process as described by reference under §95357(d)(8) still requires the identification of a specific location at the time of submittal, including a picture showing the location where the SF₆ GIE would be installed. SCE has a population of 43,000+ belowground distribution structures which can generally be categorized into 19 distinct sizes that SCE has standardized over the years. The need to provide individual information and pictures on a location-by-location basis with the exemption request would require an excessive number of crew hours and disruptive traffic control because so many structures are located in belowground vaults under in lanes of traffic. The pictures would provide little to no tangible benefit because all requests for the same structure size would look nearly identical and have the same information supplied.

Grouping similar exemptions by structure size/type as proposed will streamline the exemption process and significantly reduce labor costs for both CARB and SCE associated with procurement processes (i.e. going to bid for each exemption), application, review, and approval.

Proposed edits to §95357(c) and (d) are indicated below in underlined and ~~strikethrough~~ text:

§95357(c) Whenever a GIE owner wishes to acquire multiple SF₆ GIE of the same equipment type and GIE characteristics, for which the justification provided under section 95357(d)(8) is identical, the GIE owner may submit a single request to cover all associated SF₆ GIE. In this case, the GIE owner must specify the number of SF₆ GIE it is requesting to acquire under the exemption and list the locations or dimensions of each structure type where the SF₆ GIE ~~would~~ could be installed, but does not need to identify which specific SF₆ GIE device would be installed at each location or structure type.

§95357(d)(3) For aboveground GIE exemptions only, a A description of the specific project(s) to which the SF₆ phase-out exemption would apply, including location(s); whether it is an existing or new facility, or if it has been subject to a process that significantly changes the in-place infrastructure (e.g., overhaul, re-powering); and the number of each type of GIE device described in section 95357(d)(4) that would be installed there;

VIII. Include GIE acquired with an SF₆ phase-out exemption in average system capacity

GIE acquired with an SF₆ Phase-out Exemption should be included in the Average System Capacity. The Annual Emission Limit is calculated as 1% of the annual average GIE capacity. However, the Proposed Amendments would exclude GIE acquired with a SF₆ phase-out exemption from the “average system capacity” for each covered insulating gas (C_{avg,j,i}). We recommend that the capacity of all GIE be included when calculating the annual emission limit, regardless of whether the GIE was acquired before or after the phase-out date. This is appropriate since the exemption applies when alternatives are unavailable for technical reasons and the GIE owner has no other alternatives.

Proposed edits to §95353(b)(3)(C), Annual Emissions Limit, are indicated below in ~~strikethrough~~ text:

~~§95353(b)(3)(C) The GIE device was not acquired with an SF₆ phase-out exemption, either by the GIE owner or by a previous owner of the GIE device.~~

IX. GIE device should be considered “removed from regular use” on the date when the gas is extracted.

SCE recognizes CARB’s objective to account for movement of covered insulating gas between containers and GIE in the mass balance calculation per data year. However, GIE taken out of service later in the year will not meet the deadline to remove gas. When distribution-level equipment is removed from active service in the field, it is taken to the nearest SCE Service Center until it can be collected for flat-bed shipment to SCE’s central processing facility. This is the only location throughout SCE’s 50,000-square-mile service territory where gas can be removed from distribution equipment, so it can take days or weeks to reach the facility. At this location, the equipment goes through an evaluation process and the GIE is either: (1) put in storage (without gas removal); or (2) gas is removed in order to send the equipment to be salvaged; or (3) the equipment is returned to the manufacturer. Units returned to the manufacturer are typically returned fully charged with gas. When GIE is returned to the manufacturer for repair, SCE still considers that GIE to be part of our inventory because we retain ownership of the GIE during the repair process. The manufacturer will almost always remove gas from the equipment, either for repair or before salvaging. If GIE is repaired and sent back, the GIE comes back with an “R”, which stands for “refurbished” at the end of the serial number. If these units are included in the “removed from regular” use definition, there could be phantom emissions associated with these returned to manufacturer (RTM) units if they are removed and/or added back to the inventory in different calendar years. We recommend that CARB provides guidance in the regulation for how to account for RTM units.

To address the logistical challenges and added expenses associated with expedited end-of-year transport and removal of gas while also avoiding phantom emissions, we propose that a GIE device be considered “removed from regular use” on the date when the gas is extracted before unit is salvaged. Also, it is reasonable for the GIE owner to extract the gas from GIE within one year of the GIE being removed from active use.

Proposed edits to §95354(c)(1)(B) and §95354(d), Inventory and Insulating Gas Procedures, are indicated below in ~~strikethrough~~ text:

§95354(c)(1)(B) When the GIE device is taken out of active service for the purpose of removing the device from a GIE owner's inventory (~~e.g., to be disposed of, sold, transferred to a new GIE owner, sent to the manufacturer for repair~~) and the covered insulating gas has been extracted.

§95354(d) For any GIE device meeting the specifications in sections 95354(c)(1)(A) and 95354(c)(1)(B), covered insulating gas must be removed and evacuated into a covered gas container or containers, and accounted for following the requirements of section 95354(d)(1) ~~in the same year that the GIE device is counted as "removed from regular use."~~ within one year from the date that the GIE device has been removed from active use. The amount of covered insulating gas transferred out of the GIE device (pounds) must be recorded. GIE devices that are sold or transferred to a new GIE owner or returned to the manufacturer for repair do not require the covered gas to be extracted unless necessary to comply with Department of Transportation requirements.

X. *Add SF₆ alternative gases with low maximum incremental reactivity VOC-exempt compounds lists*

SCE anticipates significant implementation and annual operating costs for GIE owners associated with local air district permitting for equipment containing SF₆ alternative gases (NOVEC, etc.) that CARB may not have considered in the economic analysis.

A Permit to Construct/Operate is required prior to building, erecting, installing, altering, or replacing any equipment that has a potential to emit air contaminants. SF₆ alternative gases contain volatile organic compounds (VOC). South Coast Air Quality Management District Rule 102 defines VOC as any volatile compound of carbon, excluding exempt compounds and a list of excluded compounds⁴. For example, NOVEC 4710 is volatile, contains carbon, and its main component (2,3,3,3-tetrafluoro-2-(trifluoromethyl)-Propanenitrile [CAS 42532-60-5; C₄F₇N]) is not specified as an exempt compound. The relevant federal regulation (40 CFR 51.100) clarifies the definition of VOC to specify such compounds must participate in atmospheric photochemical reactions. As a heptafluoro-iso-butyronitrile, it is likely that the main component of NOVEC 4710 has negligible photochemical reactivity; however, since it has not been listed as an exempt compound by CARB⁵, the U.S. Environmental Protection Agency or local air districts, it would be considered a VOC and would therefore be subject to local air district permitting requirements.

The costs associated with permitting each GIE unit can vary widely among local air districts. Depending on how each air district decides to categorize the unit, the fees to obtain a Permit to Construct could be between \$1,850 to \$4,700 per unit, plus staff or consultant labor hours to prepare and submit the permit to construct. After that, there are annual fees associated with the Permit to Operate.

These local permitting costs could add to the mounting costs associated with switching to new, technologies versus the existing, proven SF₆ technologies on the electric grid (such as the costs of pilot programs, labor for retrofit, premium costs over existing technologies, training employees on new technologies, etc.). The cost burden will fall on the shoulders of customers.

⁴ <https://www.aqmd.gov/docs/default-source/rule-book/reg-i/rule-102-definition-of-terms.pdf?sfvrsn=4>

⁵ https://ww3.arb.ca.gov/ei/speciate/voc_rog_dfn_1_09.pdf

To minimize barriers to adoption of alternative SF₆ technologies and to minimize cost impacts to customers, we request that CARB, in close collaboration with GIE owners and manufacturers, work with U.S. EPA and the air districts to add SF₆ alternative gases to their VOC-exempt compounds lists.

XI. *Revise the definition of “substantive error” to exclude minor administrative errors that do not impact emissions.*

SCE recommends a change to the definition of ‘Substantive Error’ to be consistent with other CARB GHG regulations such as the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR) and the Low Carbon Fuel Standard. This change adds a materiality threshold for the imposition of liability.

Proposed edits to §95351, Definitions and Acronyms, are indicated below in underlined and ~~strikethrough~~ text:

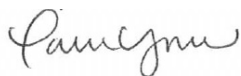
§95351, Definitions and Acronyms.

“Substantive Error” means an error that affects calculated emissions, data used to calculate emissions, or any other data element required to be reported pursuant to section 95353(a), (b), (e), (f), (g), (h), (i) and (j) of the annual report, resulting ~~from a nonconformance of this regulation.~~ in a change in emissions greater than 5%.

Conclusion

SCE thanks CARB for the opportunity to provide comments on the Proposed Amendments. We look forward to continuing to work with you to reduce GHG emissions while maintaining safety and reliability in the electricity grid.

Respectfully,



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