



The Electric Transmission & Distribution SF₆ Coalition

Carey Bylin, Energy Section Manager
Project Assessment Branch
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Ms. Bylin,

The Electric Transmission & Distribution SF₆ Coalition (the Coalition) respectfully submits the following comments in response to the California Air Resources Board's (CARB) February 2019 DISCUSSION DRAFT of Potential changes to the Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear.

Nameplate Adjustment Responses

Does the proposed methodology minimize the risk of emissions?

The proposed methodology involves transferring gas from GIE to gas cylinders via a gas recovery system. Any time gas is transferred from one vessel to another there is a risk of error, such as an improperly connected hose or an incompletely evacuated recovery system, which could result in emissions. However, if the procedure is done properly there will not be any emissions; and if a mass flow meter or cylinder scale is used during the procedure, the amount of SF₆ to be handled is minimal, which further reduces the risk of emissions. Additionally, SF₆ detection equipment can be used in conjunction with the handling equipment to further reduce the risk of emissions.

Which non-hermetically sealed SF₆ GIE should be required to go through the process (e.g. non-hermetic, equipment of a specific type, equipment manufactured by a certain manufacturer, equipment manufactured before a certain date, equipment above a certain capacity or above a certain percentage of the GIE owner's total capacity)?

The nameplate adjustment process should be voluntary; no GIE should be required to undergo the process. This is a time-consuming task and utilities should be allowed to determine where they spend their resources. To our knowledge, there is no specific class of GIE, rating of GIE, or GIE supplied by a specific manufacturer (OEM) that is more or less likely than any other to contribute to emissions.

Should all GIE owners be required to complete the process (e.g. GIE owners not subject to the emissions limit, grant GIE owners a choice)?

The nameplate adjustment process should be voluntary; no GIE owner should be required to complete the process. Further, only GIE owners that are subject to the emissions limit (i.e. mandatory reporters) should be *allowed* to adjust their nameplates. We do not see a benefit to the environment, to CARB or to the non-reporting entity by allowing non-reporting entities to adjust their nameplates. Mandatory nameplate adjustment potentially introduces the risk of more leaks of SF₆ into the atmosphere with increased SF₆ handling.

When should the process be performed (e.g. end of GIE life, as part of routine maintenance schedule)?

GIE owners should be allowed to perform the nameplate adjustment process at a date/time of their choosing. We anticipate that the process will most likely occur at commissioning/installation, during routine maintenance, or decommissioning/end-of-life, since these are the times when the GIE is planned to be taken out of service. We do not see a benefit to the environment, CARB or the reporting entities in requiring or limiting the process to a specific window (e.g. date range) or a particular phase in the GIE life-cycle. We do believe, however, that GIE owners should only be allowed to perform the process on a given piece of equipment once, unless the OEM issues a new nameplate resulting from GIE repairs or unless warranted by replacement parts (see next section). In either case the reporting entity should be allowed to verify and adjust the new nameplate figure.

What should the cut-off date be after which the process can no longer be performed?

We recommend that the cut-off date correlate to the life-cycle phase during which the nameplate adjustment process is performed. If the process is performed at decommissioning, then CARB should allow enough time for all currently installed SF₆-insulated GIE to reach the anticipated end of life: 40 years¹. Assuming the regulation takes effect on January 1, 2020, the cut-off date would be January 1, 2060. Alternatively, CARB may consider only allowing nameplate adjustment on a certain percentage of currently installed SF₆-insulated GIE (i.e. 80%).

Reporting entities may prefer to perform the nameplate adjustment process on some equipment prior to end-of-life in order to assume the emission rate calculation benefits sooner. We recommend reporting entities be allowed to do this during the first five years after the regulatory revisions take effect (i.e. January 1, 2025 assuming a January 1, 2020 effective date.)

We recommend there be no cut-off for nameplate adjustment to occur if performed during equipment commissioning. Much of the nameplate imprecision is a result of manufacturing tolerances (differences between the precise dimensions of parts and components) that are outside the OEMs' control. So, continued imprecision is a market reality and reporting entities should be allowed to adjust for it. Further, a common and current industry practice for high voltage circuit breakers is for the OEM to ship the GIE only partially filled. Given that the reporting entity will be required to fill the GIE anyway, this is a very convenient time to undergo the nameplate adjustment process and should not be restricted.

We also recommend that the cut-off date not apply to scenarios where replacement parts and components impact the amount of gas needed to properly insulate the GIE. For example, sometimes GIE maintenance involves replacement of parts which can change the volume of the GIE tank and/or bushings. The need for this type of maintenance can occur as a result of a fault or arc that damages the equipment. In such an instance, acceptable manufacturing tolerances may result in significant dimensional variations between the prior and replacement parts. For example, the internal volume of a 230 kV porcelain bushing may increase approximately 19% from the minimum to maximum tolerance condition as allowed by the product standard. In the interest of accurate reporting, replacement of any or all components due to maintenance should trigger an allowance for nameplate adjustment. These tolerances originate from industry standards based upon well-established manufacturing processes and capabilities.

¹ The Coalition actually believes the end-of life for some equipment exceeds 40 years, but we are willing to stipulate to the greater of CARB's two estimates. See slide 17 of the February 25 presentation for *Draft Amendments to the Regulation for Reducing sulfur Hexafluoride (SF₆) Emission from Gas Insulated Switchgear*.

Should CARB require that a consistent method be used for calculating revised nameplate capacity? If not, how can CARB be assured of consistent results?

We believe that the most accurate method to identify the precise nameplate is the one currently proposed in the 2019 Discussion Draft. We are open to considering limited variances from the proposed method, one of which would be to allow reporting entities to follow the OEM procedures for the Torr values since 3.5 Torr is difficult to achieve. That said any such method allowed by CARB should require use of a calibrated mass flow device or calibrated cylinder scales. To accommodate this level of flexibility we recommend moving the formula from the regulation itself to an appendix or separate guidance document.

1% Accuracy Requirement

The proposed requirement contained in §95352.3 that all new GIE nameplates be within 1% accuracy or within one pound of gas is overly-burdensome. In order to accomplish this, every GIE would have to be weighed by the OEM when it reaches full rated pressure (temperature compensated due to factory temperature). Once the weighing is done, then either a unique nameplate will have to be made or the unique nameplate capacity will have to be referenced in another document containing product specifications, which would also have to be updated on a custom basis. This adds time and resources to an already complicated process; we anticipate at least a few days of additional production time for most GIE and up to an additional month for some GIE for the following reasons.

First, OEM's typically do not provide custom nameplates. The nameplate drawings and values are approved by the user long in advance of the production of the GIE. This process would need to be adjusted, with special equipment procured for unique user nameplate creation.

Second, when SF₆ gas expands to fill the GIE in the factory, the gas cools, causing temperature differences along the GIE enclosure. Before weighing can occur, these different temperatures must equalize throughout the entire gas chamber so that the measured density is accurate, which can take 3 – 5 hours and result in an unproductive “clog” at the manufacturing site.

Finally, large GIE and gas insulated substations (which are included under the definition of GIE), consist of many individual gas compartments, each of which would need to be measured at least once to ensure 1% accuracy. For example, when a gas insulated substation (GIS) is filled, each compartment is filled as a series of partial fills (i.e. initially to five psig, then to half pressure, then to full pressure, then again just before turnover to the customer). This is to provide safety for those assembling adjacent compartments, and to allow for temperature equalization. This could mean four measurements per compartment times the quantity of gas compartments (most GIS can have between 20 and 300 compartments). OEMs and/or utilities would have to weigh each compartment to determine accuracy of the overall nameplate, extending the process time by a multiple of the number of compartments that need to be weighed.

We also request that CARB clarify whether “transfer” as used in this section applies to movement of GIE from one site to another while remaining under the same ownership, or only to scenarios where ownership changes. And in the case of the latter, who would be responsible for ensuring the accuracy – the previous owner or the new owner?

Phase-Out Dates

We recommended a tiered phase-out for SF₆-insulated equipment in prior comments and are glad to see this approach employed in the current DISCUSSION DRAFT. That notwithstanding, we believe that the proposed dates and corresponding voltage ranges do not allow for enough depth in market availability and, in some case, raise safety issues. Accordingly, we propose the following schedule for phase-out:

	Voltage (kV)	Phase-out Date
Distribution (aboveground)	≤ 17.5	1/1/2025
	17.5 < kV ≤ 38	1/1/2031
Distribution (subsurface)	≤ 38	1/1/2031
Substation	≤ 72.5	1/1/2025
	72.5 < kV ≤ 145	1/1/2029
	145 < kV ≤ 245	1/1/2033
	245 < kV ≤ 550	1/1/2036
All	> 550	Exempt

As indicated, we recommend adding an exemption for GIE that operates at a max voltage range above 550kV. To our knowledge, no industry participant has even begun to analyze or test the implications of non-SF₆ insulation technologies for this range. We recognize that California does not currently use transmission voltages at this level, but this may change with future expansions. Including this exemption now will avoid having to revise the regulation at a later date.

The proposed phase-out language also does not take into account scenarios where defective GIE is returned to the OEM and a replacement is provided. In this scenario it is possible that the GIE will be shipped prior to a phase-out date and returned or replaced subsequent to the applicable phase-out date. We recommend that CARB account for this in the regulatory language by adding new language under §95352(a)(1)(A)3:

This provision does not apply to SF₆ GIE intended to replace defective GIE that was present in the State and reported to CARB pursuant to section 95353(f) for a data year prior to the appropriate phase-out date listed in Table 1.

Finally, the proposed phase-out language does not take into account scenarios where SF₆-insulated equipment already in the State prior to the phase-out date require a replacement part (such as a new tank or bushing) after the phase-out date. Utilities should not be required to decommission an entire GIE just because one replacement part is required. Nor is it possible to replace the SF₆ tank or bushing with a tank or bushing that is insulated by another material. We recommend that CARB add language to the phase-out requirement clarifying that the provision does not apply replacement parts or components for SF₆ GIE already in the State.

Technical Infeasibility Exemptions

We support the inclusion of exemptions to the SF₆ GIE phase-out requirement that would allow utilities to purchase and install new SF₆-insulated equipment under certain conditions, as identified in §95355.3. To reflect current procurement business practices, we recommend that CARB make the following changes to the DISCUSSION DRAFT.

First, we recommend that CARB clarify that the ‘unavailable’ threshold under §95355.3(a)(1) be met when non-SF₆ GIE is not available from at least two independent OEMs.

Second, we recommend that CARB allow for case-by-case exemptions to the 75-day lead time requirement for submitting a technical infeasibility exemption when doing so is not possible, for example, in emergency situations.

Third, we recommend that CARB allow reporting entities to be exempted from requirement (b)(5) in the event there was no bid solicitation or response from vendors. Many utilities, for example, have ongoing contracts with GIE suppliers/trusted partners that contain purchasing obligations. Undergoing a competitive bidding process could violate such agreements.

Fourth, the requirement under (b)(3) to identify a project location does not take into account the common business practice of procuring GIE as a standby replacement. We recommend that CARB clarify in the DISCUSSION DRAFT that “standby replacement” (or similar) constitutes an acceptable “project.”

In addition, we request that CARB clarify that the exception is valid for the lifetime of the GIE.

New Nameplate Provisions

In §95355.2(j) the DISCUSSION DRAFT would require reporting entities to submit documentation supporting the calculations and measurements associated with the nameplate adjustment to the “Executive Officer” within 30 days of the date on which the measurements were taken. We recommend that CARB develop a standardized template for reporting entities to use to complete this process. A standardized template would provide regulatory certainty for reporting entities and ease of review for CARB. We also request that CARB facilitate this submission via a secure, online submission platform.

The requirement to notify CARB of the intent to determine a new nameplate capacity seven (7) days prior to performing the nameplate adjustment process is unnecessarily restrictive and counter-intuitive. It is overly restrictive because it seems to add little, if any, regulatory value; if CARB wants to be notified when this process is used, then reporting entities should simply be required to report to CARB after its use. It also presupposes that reporting entities will know seven (7) days in advance and with 100% certainty when and where the nameplate adjustment process will be utilized, which often is not the case. Operational realities requiring unexpected removal of old GIE, installation of new GIE, and servicing of current GIE occur routinely, and may result in a need for nameplate adjustment as well.

The seven-day notice requirement is also counter-intuitive because it assumes that reporting entities know in advance that a new nameplate capacity will be required. This is impossible, since it is this very process that reporting entities will use to know if an adjustment is necessary. In other words, reporting entities are unable to notify CARB of an “intent to determine a new nameplate capacity” until they know that the current nameplate requires adjustment. And reporting entities are unaware that the current nameplate requires adjustment until they undertake the steps outlined in the process.

We have concerns with the proposed requirement to permanently affix the new nameplate figure to the GIE and associated parameters for several reasons. First, we are concerned with CARB’s use of the word “permanent” to describe how the new nameplate should be affixed to the GIE. Under a strict definition of the term, no manner of affixation is truly permanent because no matter what method is used to affix the new nameplate, it can be reversed. We recommend the following language:

The new nameplate capacity shall be continuously affixed to the device until permanent decommissioning.

Finally, we anticipate that a material number of the nameplate adjustments will occur at decommissioning of the GIE. The current language would require that the utility affix a new nameplate to retiring GIE, only to discard the GIE shortly thereafter. The language should be amended to clarify that this requirement does not apply to nameplate adjustments that occur during decommissioning.

Fixed Average CO₂e Capacity

The DISCUSSION DRAFT'S use of the 2019 average CO₂e capacity (or value for the first data year after 2018 in which the reporting requirement is activated) as a permanent baseline against which the annual emission limit is calculated in §95352.2 is overly stringent. This requirement does not take into account the likelihood that some reporting entities 1) currently have plans to expand their distribution assets to meet load growth, and 2) that those expansions involve installation of SF₆ GIE, particularly in high-voltage applications where SF₆ alternatives are unavailable and where GIE is likely to contain the greatest mass of SF₆.

Utilities, for example, often make expansion plans 3-5 years in advance; in the case of 2019, plans may have been finalized as early as 2014, long before utilities had notice of the enhanced emissions reduction goals. Up until February 2019, utilities had been planning for a 1% emission rate based on a dynamic annual nameplate capacity. It would be inequitable to now, with relatively little notice, hold them to effectively the same emissions level in terms of mass year-over-year, with further reductions planned.

If CARB is intent on holding reporting entities to an annual emissions limit each year based on average CO₂e capacity of 2019 (or the first data year after 2018 in which the reporting requirement is activated), we recommend that the average CO₂e capacity expand each *phase-out* year to incorporate the nameplate of equipment phased out that year. For example, according to the table above, the 2019 average CO₂e capacity would expand in 2025 to include all SF₆ equipment phased-out that year. We feel that this is an equitable solution that takes into account planned expansions that will include acquisition of SF₆ equipment during periods prior to the phase-out.

Alternatively, CARB could allow a reasonable percentage increase, based on utility expansions already planned, from the average annual CO₂e capacity calculated in 2019 (or the first data year after 2018 in which the reporting requirement is activated).

Shipping Products For Repair

The proposed phase-out language does not take into account scenarios where defective GIE is returned to the OEM and a replacement is provided. In this scenario it is possible that the GIE will be shipped prior to a phase-out date and returned or replaced subsequent to the applicable phase-out date. We recommend CARB account for this in the regulatory language by adding new language under §95352(a)(1)(A)3: This provision does not apply to SF₆ GIE intended to replace defective GIE that was present in the State and reported to CARB pursuant to section 95353(f) for a data year prior to the appropriate phase-out date listed in Table 1.

Requirement to Weigh Gas Carts

The DISCUSSION DRAFT definition of “gas container” found in §95351 includes a gas cart and, accordingly, the reporting requirements regarding gas containers in §95353(g) would apply to gas carts. This causes several issues for reporting entities. Weighing the gas inside a gas cart is extremely burdensome. Gas carts are used to fill and evacuate GIE and cylinders with gas; they are not intended to store gas. Often times some gas remains trapped inside a gas cart after a filling or evacuation event. But that gas is spread throughout the cart, located in different compartments within the piping and valving. The most practical way to weigh that gas would be to evacuate it into a cylinder and weigh it, which would necessarily involve removing the gas from the cart and defeats the purpose of the requirement. The only way to weigh the gas while it is still in the cart would be to put the entire cart on a scale and compare that figure to the weight of the cart when empty. Large carts can often weigh 2,800lbs to 4500lbs; reporting entities do not typically own scales large enough and accurate enough to accommodate this.

Most gas carts have temporary storage containers that are removable and can be weighted outside the cart. We recommend that CARB clarify in its definition of “gas container” that it includes removable cylinders installed as temporary storage on gas carts, but that the gas carts themselves not be considered containers.

Thank you for your time in reviewing these comments, which we feel will make the propose regulatory changes more equitable for reporting entities by reducing unnecessary regulatory burden, while still preserving anticipated environmental benefits. Please do not hesitate to contact me with questions or for further discussion.

Thank you,



Jonathan Stewart

(703) 841-3245

Jonathan.stewart@nema.org

Cc: Mary Jane Coombs (Maryjane.coombs@arb.ca.gov)
Rosa Lopez (rosalva.lopez@arb.ca.gov)
Brian Cook (brian.cook@arb.ca.gov)
Lan Ma (lan.ma@arb.ca.gov)

About the Coalition

The Electric Transmission & Distribution SF₆ Coalition is comprised of 16 members who are producers and distributors of SF₆ and SF₆ alternatives, manufacturers of gas-insulated equipment (GIE), California utilities using GIE, and other SF₆ stakeholders.