

Proposed Amendments to the Regulation for Reducing Sulfur Hexafluoride (SF₆) Emissions from Gas Insulated Switchgear



JULY 13, 2020 WEBINAR

Today's Webinar

- This presentation is posted at <https://ww2.arb.ca.gov/our-work/programs/elect-tandd/meetings-workshops>
- CARB will soon release regulatory amendments for a 60-day comment period
- Purpose of today's webinar is to describe key amendments being proposed, including changes between August Discussion Draft and 60-day proposed regulatory amendments
- All participants will be muted during this webinar
- During the webinar, e-mail questions to Carey.Bylin@arb.ca.gov; staff will address as many questions as possible during the Q&A session
 - If we are not able to respond to your question, or if you have additional questions, please follow up after the webinar

Current SF₆ Regulation

- Regulation for Reducing SF₆ Emissions from Gas Insulated Switchgear adopted in 2010 as early action measure; Regulation effective 2011
 - Applies to owners of SF₆ gas-insulated equipment (GIE)
 - Sets an annual emission rate limit for SF₆ as a percentage of an owner's SF₆ capacity
 - Allowable emission rate started at 10 percent in 2011, decreased by 1 percent per year until 2020. Remains at 1 percent from 2020 onwards
- CARB is proposing regulatory amendments to phase out use of SF₆ in GIE, further reduce GHG emissions, and clarify regulatory requirements

Nov 2017: Public workshop and release of draft revisions

May 2018: Public working group meeting

Feb 2019: Public workshop and release of discussion draft

August 2019: Public workshop, release of 2nd discussion draft

July 2020: Public workshop in advance of formal 60-day comment period

Proposed Amendments

- Phase out use of gas-insulated equipment (GIE) that use SF₆
- Add SF₆ GIE phase-out exemption
- Changes to emission rate limit:
 - Convert to emissions limit (MTCO₂e)
 - Alternative emissions limit for small GIE owners *
 - Baseline *
 - Early action credit *
- Other provisions that streamline and improve Regulation *

* Significantly changed or newly proposed since August 2019

Phase-Out of SF₆ GIE

- Phase out GIE owners' ability to acquire new SF₆ GIE without an approved SF₆ phase-out exemption
- Dates reflect latest information from manufacturers and other stakeholders
- Schedule based on expected availability of key non-SF₆ GIE and stakeholder input, with at least three years for testing
- While some non-SF₆ GIE are available now, phase-out will not begin until 2025 to accommodate capital planning cycles, per stakeholder feedback
- Changes to phase-out dates resulted in pushing the dates farther out in most cases, in response to stakeholder feedback

Phase-Out of SF₆ GIE: Schedule

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 *

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 *

* Changed since August 2019

SF₆ Phase-Out Exemption

- Establishes a process for GIE owners to request permission from CARB to acquire SF₆ GIE, after the phase out, under specified conditions:
 - Available non-SF₆ GIE cannot meet size requirements; incompatible with existing equipment, wiring or connectors; or not suitable based on safety or reliability requirements
 - August Draft allowed for exemption when non-SF₆ GIE meeting the specifications are unavailable, now specifies “unavailable from two suppliers,” per stakeholder feedback
- Single request may cover multiple locations with same or similar justification
- Application must include: project description, amount/type of SF₆ GIE needed, justification for exemption, manufacturers contacted, and recent information that supports request

SF₆ Phase-Out Exemption: Catastrophic Failure

- Expedited process may be used for catastrophic failure (as defined) if SF₆ GIE must be acquired on a faster timescale than possible with standard process
 - GIE owner must submit expedited exemption request within 14 days of event
 - Request must justify acquisition of SF₆ GIE and why request must be expedited
- CARB review time (if initial request is considered complete):
 - Standard process: 75 calendar days
 - Expedited process: 14 calendar days
- If request is approved, GIE owner must acquire SF₆ GIE within specified period
 - Standard process: 24 months
 - Expedited process: 3 months

Annual Emissions Limit and Threshold (1 of 2)

- Change emission *rate* limit (%) to *emissions* limit (MTCO₂e)

$$Emissions\ Limit_i = \frac{AEF_i}{100} * Average\ CO_2e\ capacity_i$$

- AEF_i = annual emission factor for each year (i)
- Average CO₂e capacity* based on average system capacity
- Keep 2019 emission limit for GIE owners <10,000 MTCO₂e (<2% of State capacity)

GIE Owners with <i>Average CO₂e Capacity</i> ≥10,000 MTCO ₂ e	
Year	AEF_i
2020-2034	1.0
2035 and beyond	0.95 *

GIE Owners with <i>Average CO₂e Capacity</i> <10,000 MTCO ₂ e	
Year	AEF_i
2020-2034	2.0 *
2035 and beyond	1.9 *

* Or 50 MTCO₂e, whichever is greater

Annual Emissions Limit and Threshold (2 of 2)

- 2020-2024: emissions limit equivalent to one or two percent of capacity
- 2025: Establish baseline, in conjunction with start of SF₆ GIE phase-out, that covers all GIE activated by the end of 2024 (*BL CO₂e capacity_{12/31/2024}*)

$$BL\ CO_2e\ capacity_i = BL\ CO_2e\ capacity_{12/31/2024} + Average\ CO_2e\ capacity_i$$

Average CO₂e capacity_i

- New GIE acquired after 12/31/2024 *except*:
 - SF₆ GIE acquired with phase-out exemption
 - GIE that replace GIE included in 2024 baseline

- Baseline will *not* decrease when SF₆ GIE replaced with non-SF₆ GIE
 - This will encourage non-SF₆ GIE where possible
 - Allows flexibility for GIE owners to balance need for SF₆ GIE in some circumstances

Early Action Credit

- Early action credit for non-SF₆ circuit breakers activated between Jan. 1, 2021 and equivalent SF₆ GIE phase-out date
- Credit based on number of circuit breakers activated and voltage
 - Voltage-specific values based on reported capacity of new SF₆ GIE
 - Credit included in baseline (max 10% of GIE owner's 2021 capacity)

Voltage Capacity (kV)	Credit Per Device (MTCO ₂ e)
72.5	300
72.5 < kV ≤ 145	700
145 < kV ≤ 245	1,900
> 245	2,400

Covered Insulating Gas at Activation

- Covered Insulating Gas at Activation (CIGAA) is new term and method for quantifying GIE capacity to reduce reliance on nameplates moving forward
- CIGAA must be calculated for all GIE acquired and made active for the first time after December 31, 2020 by summing covered insulating gas:
 - In GIE when acquired
 - Transferred into GIE during activation process
- If CIGAA is not required to be calculated (i.e., for GIE acquired prior to January 1, 2021), CIGAA equals nameplate capacity
- New method avoids issues with nameplate capacity accuracy so calculated emissions will be more accurate moving forward
- GIE owners can work with OEM to revise nameplate capacity under current Regulation, so nameplate capacity adjustment process no longer needed

Aligning Gas Handling with GIE Activation and Removal

- Section 95354(b) prohibits addition of gas in data year prior to year of activation
- Section 95354(d) requires gas be extracted same year device “removed from regular use,” defined as
 - Not active for five consecutive years
 - Taken out of active service for purpose of removal from GIE owner’s inventory
- These provisions are meant to
 - Reduce potential GHG emissions from inactive GIE
 - Improve accuracy of calculated emissions by recognizing addition/removal of gas in data year GIE device is activated/removed from regular use

Other Provisions to Clarify and Streamline Regulation

- Two methods are available to account for insulating gas in gas carts:
 - Scale method: weigh the cart
 - Container method: pump gas into a container, weigh the container
- New provision for GIE “transferred while in use” when removed from GIE owner’s inventory without being taken out of active service
- Insulating gas with $GWP \leq 1$ exempt from reporting requirements

Revised Emissions Equation

Annual Emissions =	Summary of Components	Changes from Current Regulation
Decrease in covered insulating gas j inventory	Change in gas stored in containers and carts from beginning to end of year	Gas carts now separated from containers
(+) Acquisitions of covered insulating gas j	Gas acquired in GIE, containers, carts	Clarified that gas acquired in GIE is accounted for in the data year the device is activated for the first time
(-) Disbursements of covered insulating gas j	Gas disbursed in GIE, containers, carts	Gas must be removed from GIE prior to disbursement unless transferred while in use
(-) Net increase in total capacity of active GIE owned and filled with covered insulating gas j	CIGAA of new GIE activated for the first time (including those acquired while in use) minus CIGAA of GIE removed from regular use or transferred while in use	CIGAA replaces nameplate capacity. Replaced “retired” with more specific terminology

