

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



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Sulfur Hexafluoride (SF₆) is an Extremely Potent Greenhouse Gas

- SF₆ is more potent than any other greenhouse gas
- Gas insulated switchgear is the largest source of SF₆ emissions in the State
- SF₆ can be recycled, but any releases will stay in the atmosphere over 3,000 years



SF₆ Gas Insulated Substation
Source: CARB

Greenhouse Gas	Global Warming Potential ¹
Sulfur Hexafluoride	22,800
Nitrous Oxide	298
Methane	25
Carbon Dioxide (CO ₂)	1

¹A measure of the heat trapping ability of a gas relative to CO₂ (IPCC AR4)

Gas Insulated Switchgear Use in California

- Used in electricity transmission and distribution system
- Approx. 55,000 devices in California
 - Size can be very small to very large
 - Aboveground and underground applications
- ~40 year operational lifetime
- Manufacturers have developed non-SF₆ equipment for some applications, other non-SF₆ applications available in near future



SF₆ Dead Tank
Circuit Breaker
Source: Hitachi

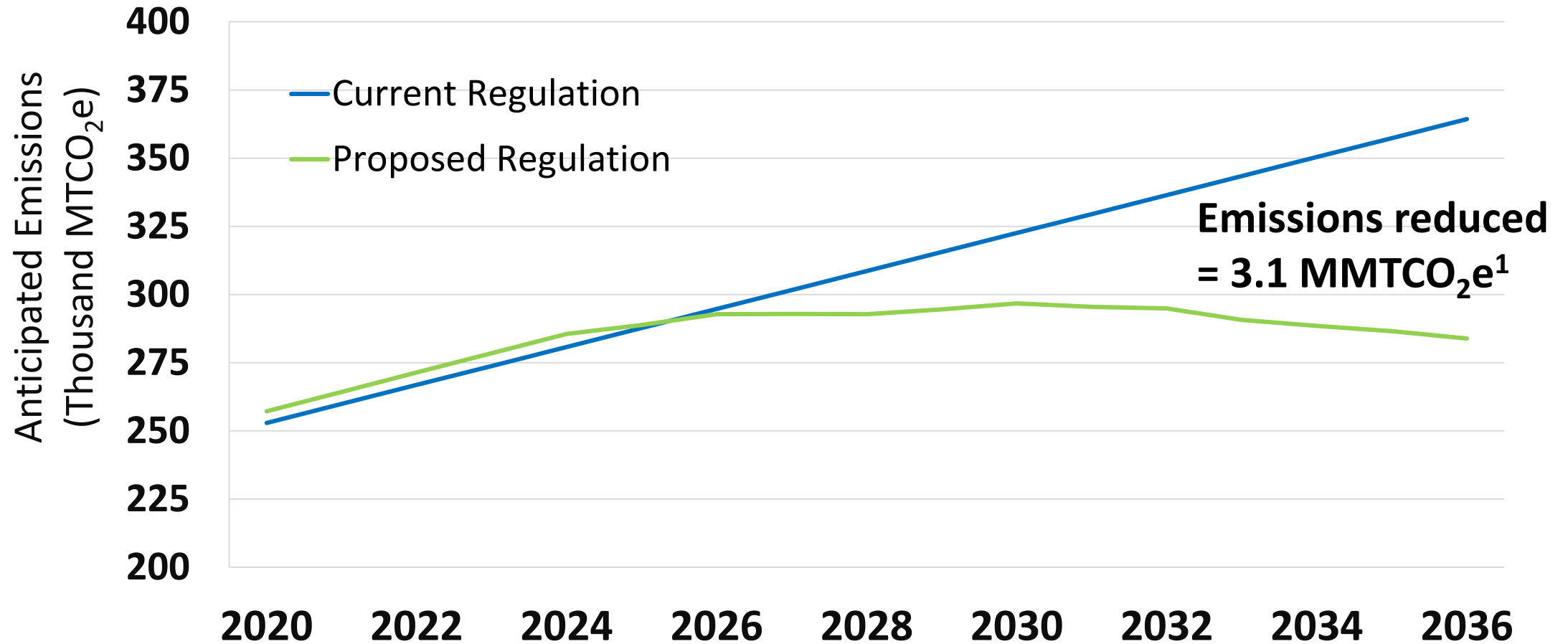


Non-SF₆ Dead
Tank Circuit
Breaker
Source: Hitachi

Current Regulation vs. Proposed Regulation

- Current Regulation sets annual SF₆ emission rate limit
 - With growth in SF₆ capacity emissions will increase
- Driving down SF₆ emissions is technically feasible and cost-effective
- Proposed amendments, developed through an extensive public process, would:
 - Require a first-of-its-kind phase-out of equipment that uses SF₆
 - Change from a rate limit (%) to emissions limit (MTCO₂e)
 - Improve ability of small GIE owners to comply
 - Improve staff's ability to verify reported data
 - Serve as a model for other jurisdictions looking to phase out SF₆

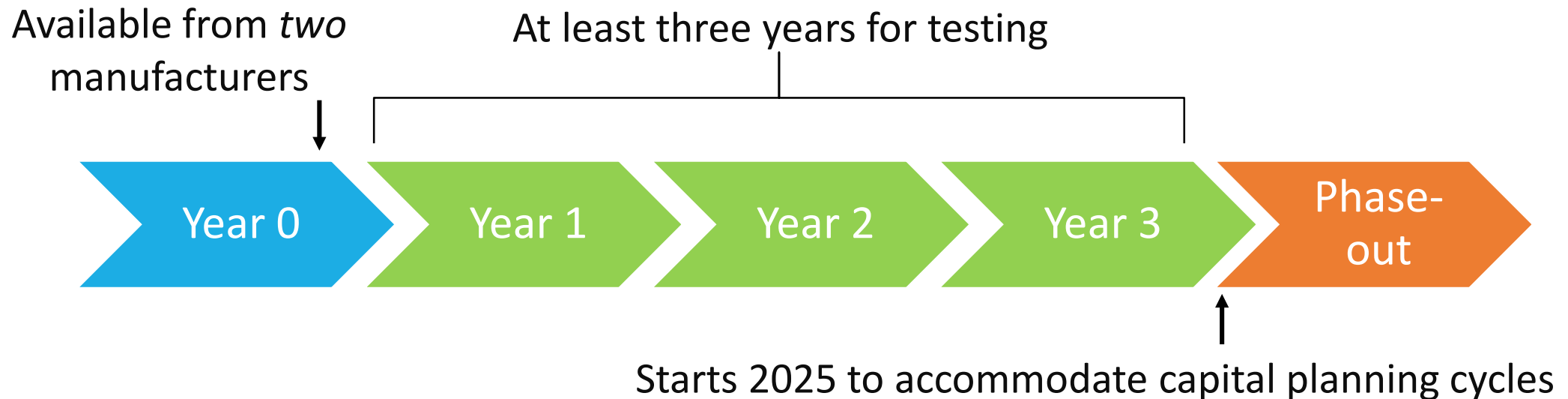
Current Regulation vs. Proposed Regulation



¹Emissions reduced through the 40-year life of non-SF₆ equipment installed 2020-2036

Phase-Out of SF₆ Equipment

- Requires that new equipment not use SF₆
- Phase-out dates staggered 2025 to 2033, based on expected availability of non-SF₆ equipment
- Based on research and discussions with over ten manufacturers
- Allows time for entities to test and procure equipment



SF₆ Phase-Out Exemption

Phase-out exemption possible if non-SF₆ equipment is:

Unavailable from
at least *two*
suppliers

or

Cannot meet size
requirements

or

Incompatible with
existing equipment,
wiring, or
connectors

or

Not suitable based on
safety or reliability
requirements

- Standard (75 days) and expedited (14 days) processes available
 - Expedited process may be used in wake of catastrophic failure

Balanced Approach Limits Emissions Growth

- New baseline calculation restricts emissions growth starting in 2025
- Amendments incentivize acquisition of non-SF₆ equipment and allow for compliance flexibility
 - Early action credit
 - Emissions from equipment acquired via SF₆ exemption process not included in emissions limit
 - Emissions limit stays the same when SF₆ equipment replaced with non-SF₆ equipment
 - Revised emissions limit for relatively small equipment owners

System Capacity (MTCO _{2e})	Number of Equipment Owners	% of Statewide Capacity	Emissions Limit (% of Capacity)
≥ 10,000	77	98%	1%
< 10,000	196	2%	2%

Next Steps

- Continued engagement with stakeholders, especially to discuss technically sound and consistently applied methodologies to measure equipment capacity
- Second public comment period with revisions to proposed amendments, including:
 - Converting phase-out exemption request to a notification in the case of catastrophic failure
 - Revising and clarifying terminology and processes as appropriate
 - Reflecting effective date of amendments in 2021
- If adopted, revised Regulation expected to be in effect by the end of 2021

Thank You
