

## **Advantages of Shipping Gas-Insulated Equipment with Dry Air**

### Background

Three jurisdictions (California, Massachusetts, and U.S. EPA) currently require SF<sub>6</sub> emissions tracking and reporting by regulated entities, with more to potentially follow in light of state efforts to reduce greenhouse gas emissions. Regulations have historically relied, and will likely continue to do so, on equipment nameplates to establish the mass of SF<sub>6</sub> that should be in gas-insulated equipment (GIE) assuming a zero-emission scenario. According to the prescribed regulatory method for calculating emissions, any negative variance from this figure constitutes an emission. In reality, there are several other likely explanations for such a variance (i.e. between actual mass and nameplate), one of which is that the nameplate does not (nor was it intended to) reflect the precise mass required for proper density. In other words, the purpose of nameplate on GIE is not to inform the user how much SF<sub>6</sub> is required to fill the GIE to proper density (i.e. how much gas should be in the GIE). In fact, industry experts charged with filling GIE regularly ignore the SF<sub>6</sub> mass figure on the nameplate when filling. Rather, the nameplate value is salient only for logistical purposes so that purchasers and managers can ensure inventory adequacy.

For the last several years, the SF<sub>6</sub> & Alternatives Coalition has worked to educate utilities and create awareness of this issue and, to address it, has proposed a methodology for GIE users to determine nameplate accuracy (i.e. precise density) in existing GIE. The Coalition has further advocated for regulatory authorities to allow (though not require) reporting entities to adjust the nameplate, where appropriate, to a more precise figure and use the new figure to calculate emissions.

To be sure, the nameplate accuracy calculation method proposed by the Coalition requires users to closely follow multiple steps and use the proper equipment at proper calibration. It also takes time and requires system-level coordination inasmuch as GIE must be disconnected. Some users have reported difficulties in doing this without purchasing new gas measuring and handling equipment. Other potential users may not have the expertise in-house. In the end, it is up to each user to determine whether the resources required to perform and implement the proposed methodology are justified by the benefit of more accurate reporting. Clearly, in jurisdictions that require reporting but do not allow nameplate adjustment, these efforts would be of minimal value.

### Recommendation

To address some of the issues above – namely the complexity of the nameplate accuracy verification procedure and the inability to revise nameplates in some jurisdictions – the Coalition recommends that original equipment manufacturers (OEMs) ship GIE filled only with dry air, nitrogen or another similar gas. This recommendation only applies to GIE that is non-hermetically sealed and is intended to be filled in the field upon installation. As detailed below, the recommended process has several advantages: 1) it reduces the amount of SF<sub>6</sub> under management by the OEM (who may also have emissions reporting requirements); 2) it eliminates any potential SF<sub>6</sub> leakages while the equipment is being shipped; 3) it allows users to identify proper gas mass simply by filling the GIE during installation.

Current practice for manufacture and delivery of non-hermetically sealed equipment is for the OEM to ship GIE partially filled with SF<sub>6</sub>. The Coalition recommends simply changing a few steps in the associated process. Though OEMs may implement differently, a general description of the process is depicted in Annex I, including the recommended changes:

As mentioned above, there are several advantages to the recommended approach. First, because OEMs do not fully or even partially fill the GIE with SF<sub>6</sub> for shipping, that reduces the amount of SF<sub>6</sub> needed for inventory at the OEM facility, which leads to a potential reduction in emissions and greater ease in tracking. To be sure, OEMs may still need to maintain an SF<sub>6</sub> inventory for testing purposes, as well as for hermetically-sealed equipment. But the reduction in SF<sub>6</sub> used for shipping should result in a logistical benefit.

Another benefit of shipping with dry air or nitrogen is that it eliminates the risk of SF<sub>6</sub> leakages while the GIE is in transit. Commercial practices vary, but it is common for an OEM to ship SF<sub>6</sub> GIE with an “as-filled” value. In the event the end-user, upon receipt, discovers the GIE to contain less SF<sub>6</sub> than indicated on the “as-filled” value, this would be considered an emission. The recommended approach eliminates this risk.

Finally, the recommended approach makes it possible for the end-user to determine the proper gas mass (i.e. the precise nameplate) simply by filling and commissioning the GIE, assuming this is done properly. There is an added value to this process when the resulting fill value can be used as the nameplate figure for emissions tracking and reporting purposes. In jurisdictions that allow nameplate adjustment, the user would follow proper procedure for approval of the use of the filled value as the new nameplate. In jurisdictions that do not allow nameplate adjustment, we recommend that the user stipulate in the purchase contract that it will accept GIE that does not contain the SF<sub>6</sub> value on the nameplate. This would allow the user to etch, stamp or otherwise append the filled value on the nameplate where none previously existed, as opposed to replacing or adjusting a current figure.

### Summary

In conclusion, the SF<sub>6</sub> & Alternatives Coalition recommends that OEMs and their customers consider the logistical advantages of shipping non-hermetically sealed GIE (e.g., GIE that is intended to be filled in the field) with dry air or another gas other than SF<sub>6</sub>. If subject to regulatory reporting, this will help all parties reduce, track and accurately report emissions.

### About the Coalition

The SF<sub>6</sub> & Alternatives Coalition is comprised of 16 members who are producers and distributors of SF<sub>6</sub> and SF<sub>6</sub> alternatives, manufacturers of gas-insulated equipment (GIE), California utilities using GIE, and other SF<sub>6</sub> stakeholders. Our mission is to: 1) provide a forum for equipment manufacturers using SF<sub>6</sub>, SF<sub>6</sub> producers and distributors, and transmission and distribution equipment owners for discussion of environmental concerns of SF<sub>6</sub> as a greenhouse gas; 2) develop best practices and recommendations related to sustainable SF<sub>6</sub> usage in electric power transmission and distribution; 3) advocate the Coalition positions to federal, state, and local policymakers; 4) educate public and private stakeholders on SF<sub>6</sub> alternatives; and 5) maintain liaisons with government and industry groups such as U.S. EPA, IEEE, EEI, IEC, CIGRE, and EPRI.

Please contact Jonathan Stewart for further information at 703-841-3245 or [jonathan.stewart@nema.org](mailto:jonathan.stewart@nema.org).

# Annex I

