

Source Specific Benchmarking for Oil and Gas Operations from Large Scale Aerial Methane Measurements

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Objective: Evaluate a practical methane benchmarking framework that directly supports emission reduction by leveraging measurement-driven data from source-resolved aerial technologies.

Background: Accurate and comparable quantification of methane emissions remains a persistent challenge in the oil and gas (O&G) sector. Many OGMP 2.0 operators report company-wide methane intensity normalized by gas production or energy output. While useful for internal target setting, this metric has limited value for inter-operator benchmarking, as it is strongly influenced by variability in reservoir characteristics, asset portfolios, facility scale, and measurement methodologies.

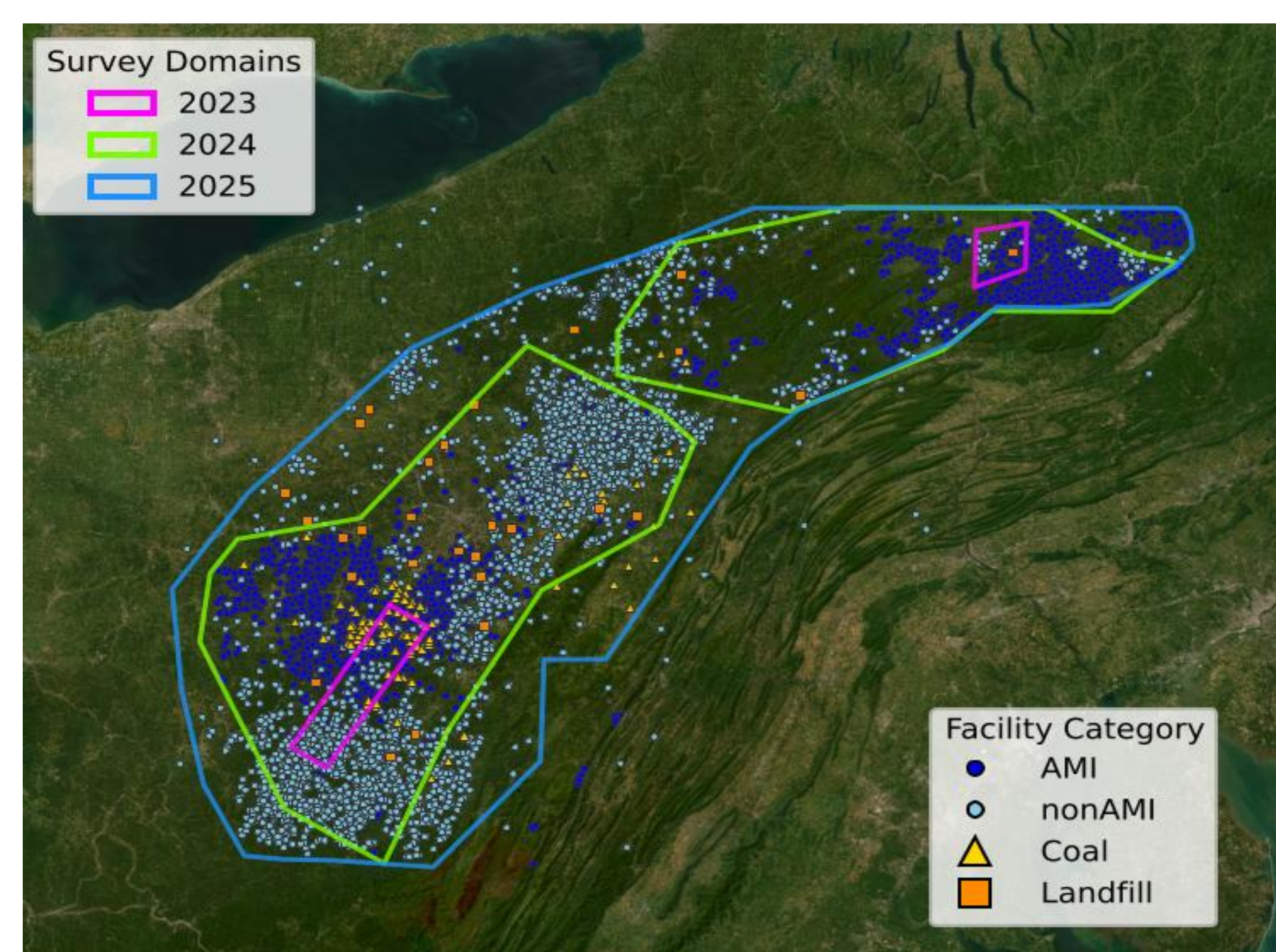


Figure 1: Survey regions for Appalachian Methane Initiative (AMI) aerial campaigns (2023–2025) covering up to 82,360 km² across PA, WV and OH.

Approach: This study leverages extensive empirical data from the Appalachian Methane Initiative (AMI), including quarterly, source-resolved aerial surveys conducted in 2024–2025. These measurements enable evaluation of emission patterns, operator performance, and mitigation opportunities. We introduce a basin- and segment-specific benchmarking framework based on source-level emission rates, designed to minimize biases associated with facility size or throughput. Benchmarking is derived from “as-measured” emission rates, independent of operator-reported inventories or post survey cause analyses. The methodology is applied across key equipment groups in upstream and midstream assets within the Appalachian Basin, covering both AMI participants and non-participating operators.

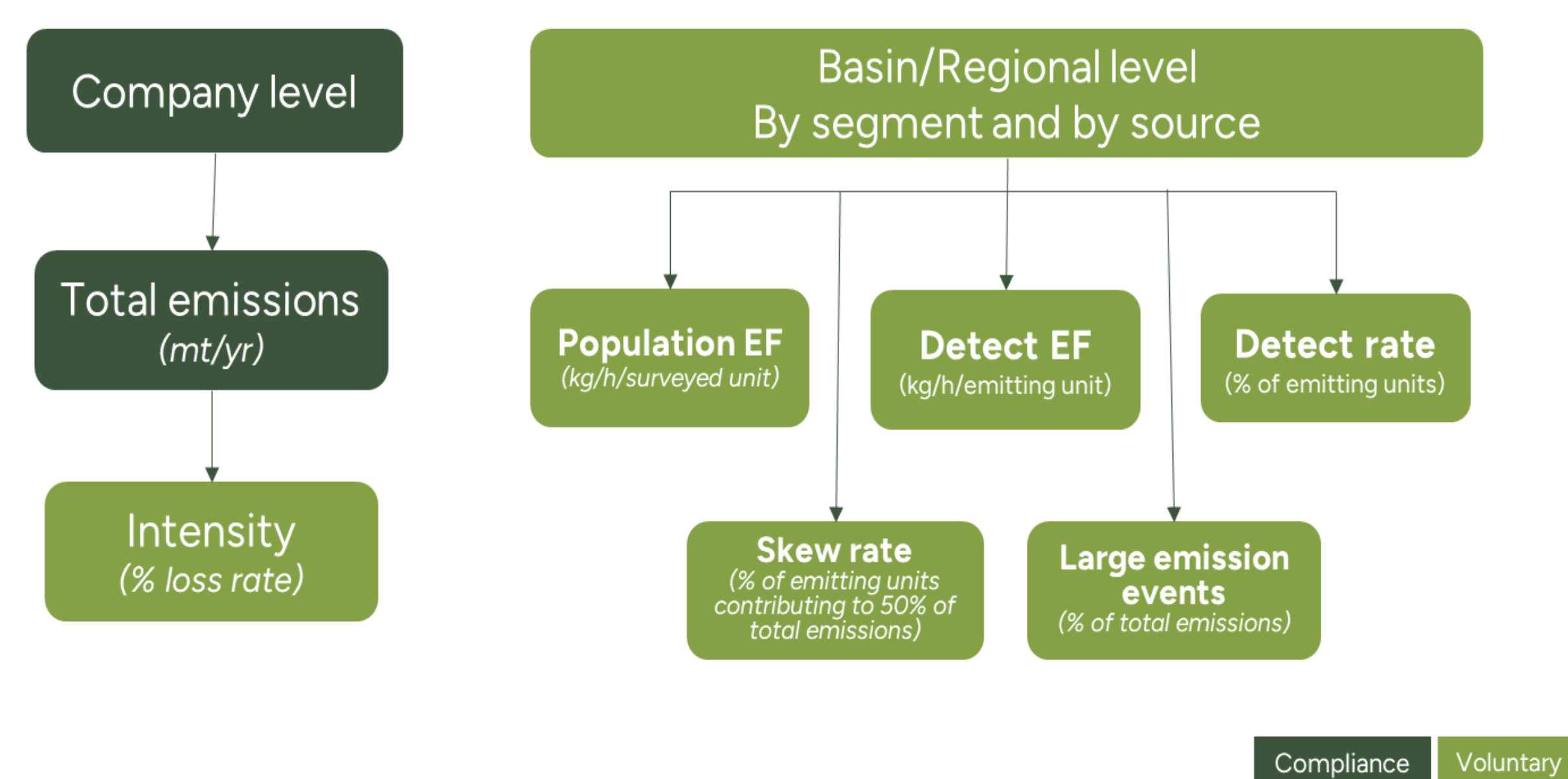


Figure 2: Comparison of traditional company-level intensity based benchmarking metrics to segment- and source-level metrics.

Results: Source-resolved methane measurement data demonstrates the advantages of segment and equipment-specific benchmarking, as shown in the figures below. All results are derived from aerial measurements collected by Bridger during the AMI campaigns.

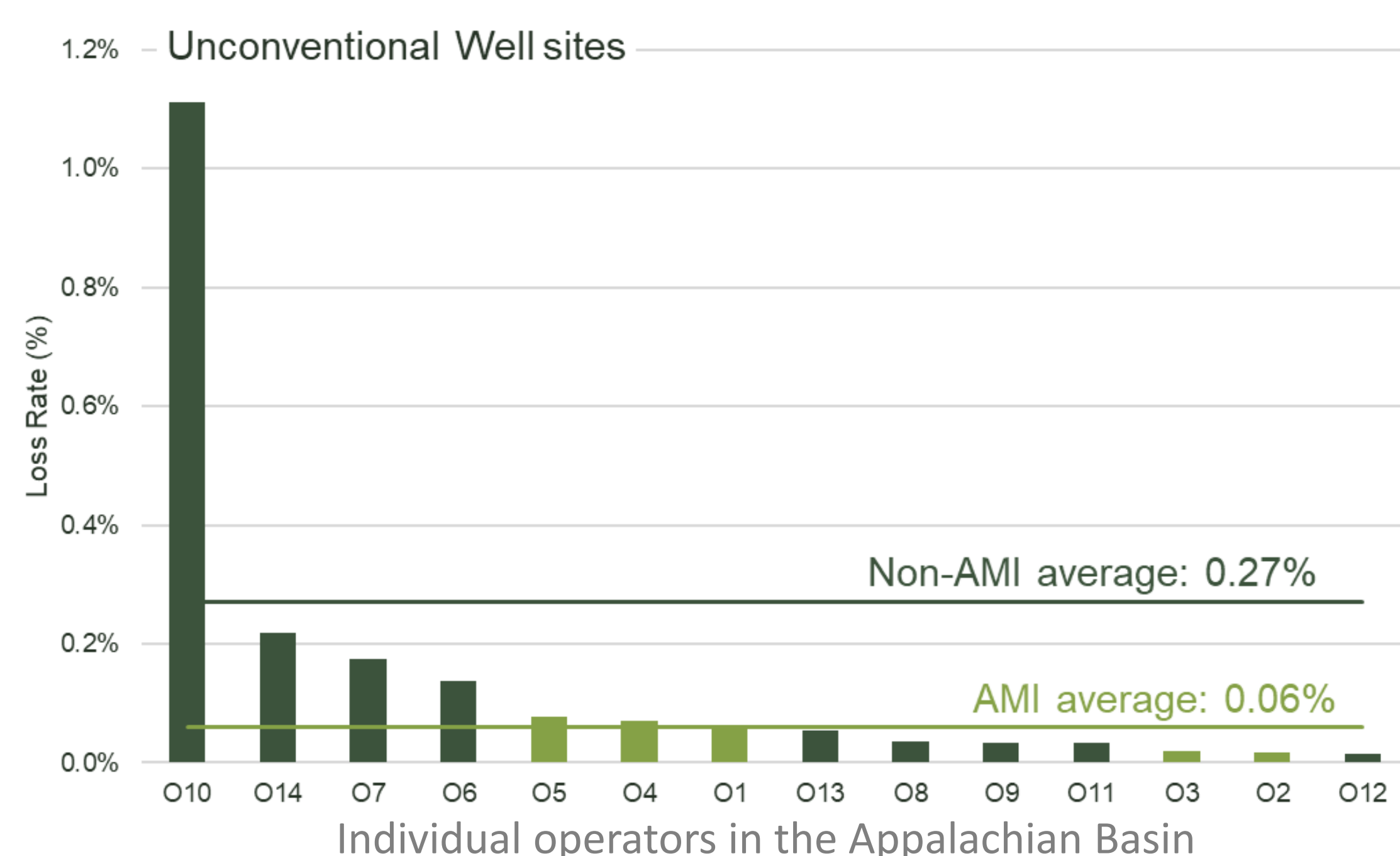


Figure 3: Methane intensity (production-normalized loss rates) for unconventional well sites in the Appalachian Basin, comparing AMI and non-AMI averages for various operators.

- Traditional methane intensity metrics—even within a single basin—can obscure performance differences due to variation in facility type and gas throughput.
- AMI facilities contain a higher average equipment count per site, suggesting larger infrastructure and higher throughput relative to non-AMI facilities. These structural differences limit the comparability of production-normalized or per site- based metrics.

- In contrast, equipment-level emission rates provide a more robust basis for benchmarking, as they are less sensitive to facility size and operational scale.
- More importantly, they help operators focus on mitigation – both in identifying high emitting fugitives but also above average emissions from normal operations.
- Using vendor-reported “as-measured” provides faster results over model-based inventories, reducing dependence on operator input and complex cause analyses.

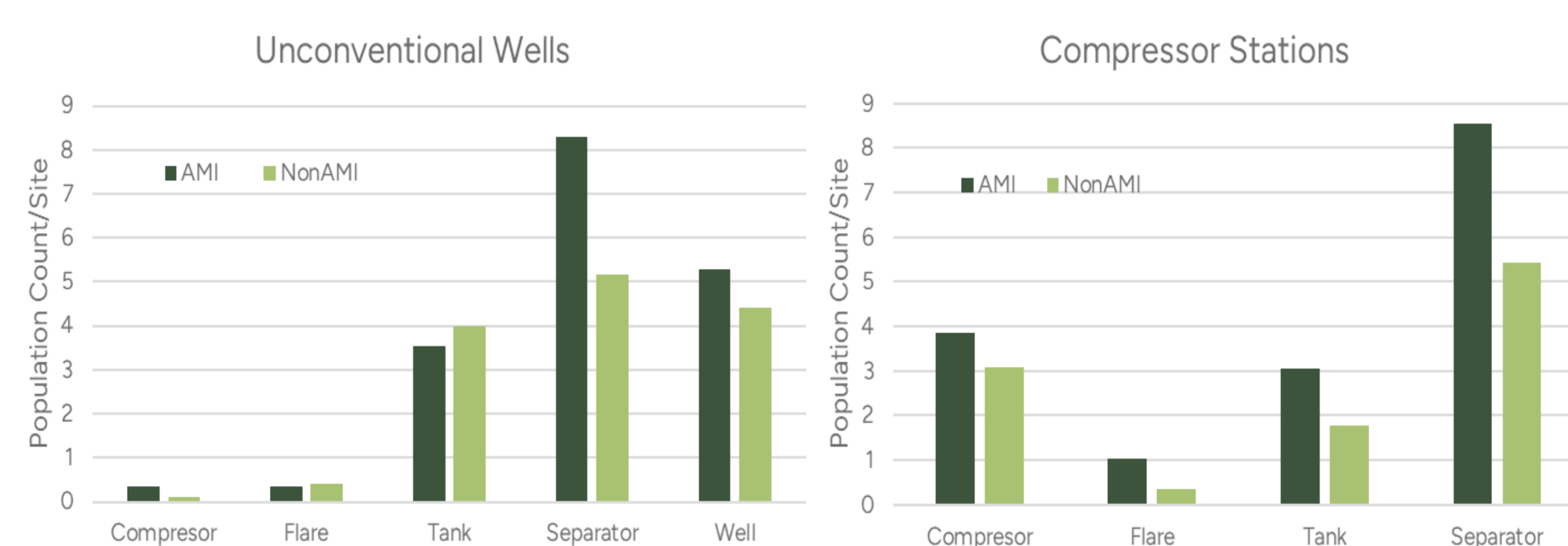


Figure 4: Average equipment counts per surveyed site across unconventional and compressor stations from the campaigns.

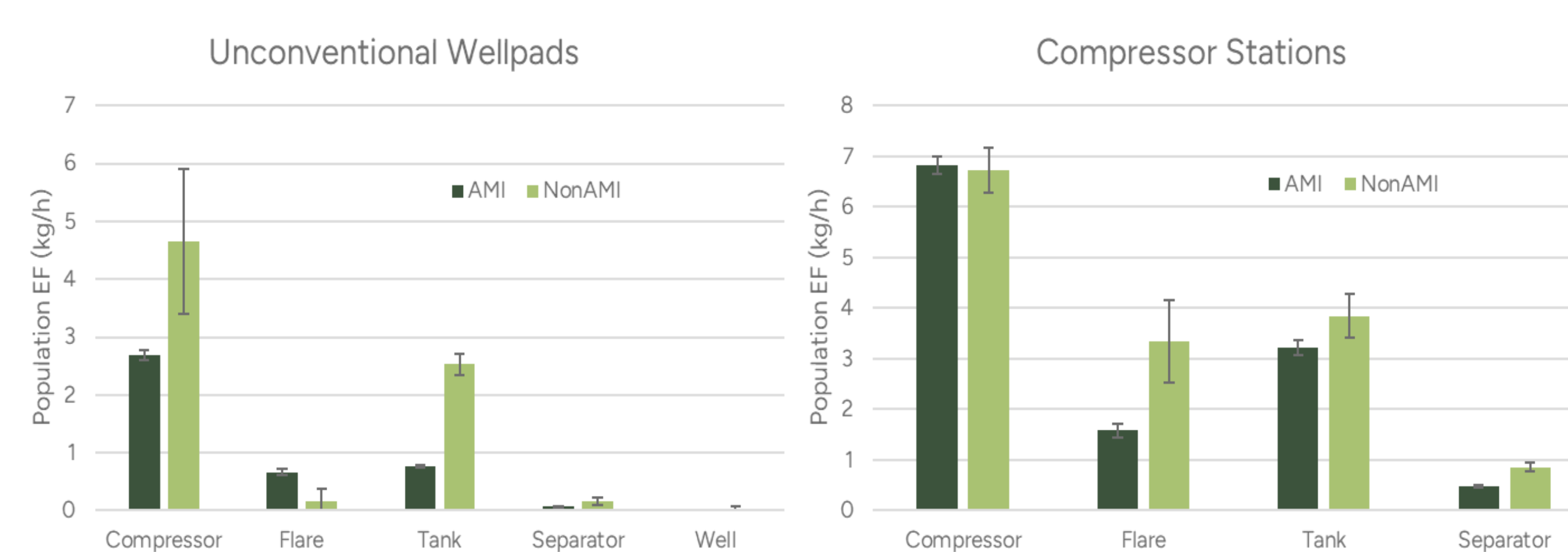


Figure 5: Segment-specific equipment-level population emission factors (EFs) for AMI and non-AMI operators.

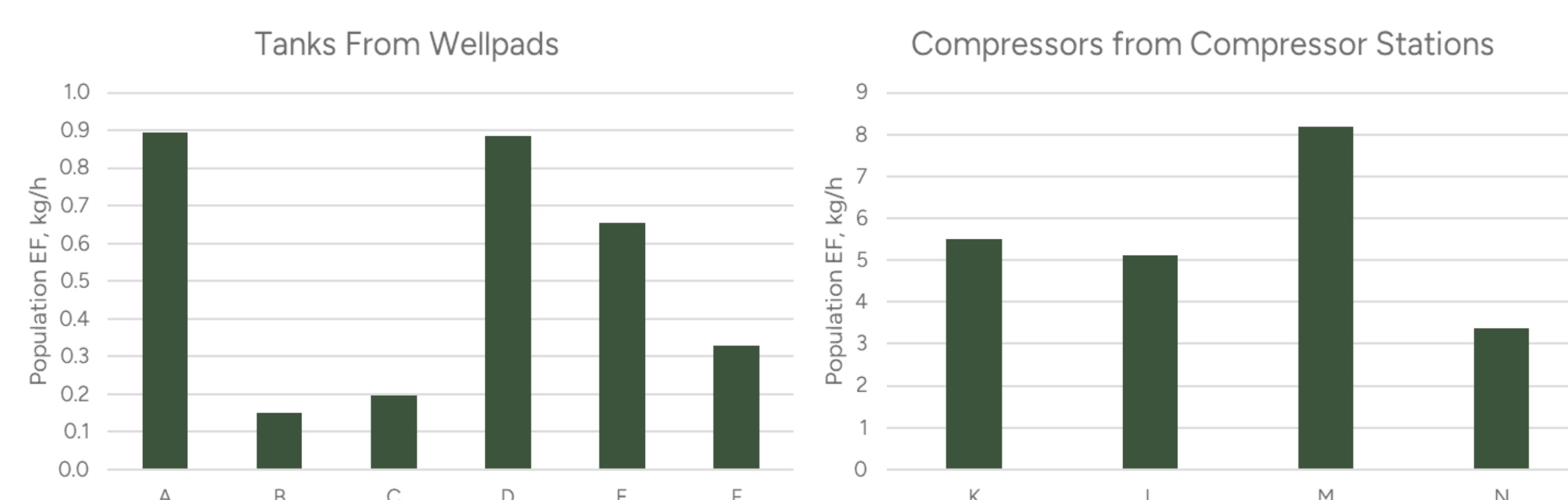


Figure 6: Example of benchmarking using source-specific population emission factors: (left) tank emissions at well pads across six AMI operators; (right) compressor emissions at four AMI operators of compressor stations.

Conclusions

- Segment- and source-specific benchmarking enables rapid identification of high-emitting equipment and targeted mitigation opportunities.
- Equipment-level benchmarking helps operators prioritize both large fugitives and above average emissions from normal operations.
- Source-level metrics function as diagnostic tools rather than performance rankings, guiding operational improvements where reductions are most effective.
- Source resolved benchmarking derived from consistent “as-measured” data provides a scalable, fast, and actionable framework for emissions management across diverse asset portfolios.

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Reference: “Lessons from the Appalachian Methane Initiative 2025 Campaign: Results from the Multi-scale Methane Measurements in the Appalachian Basin” March 13, 2026. <https://www.ceesa.utexas.edu/ami>