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Mixing process parameterization of a building wake impact on a turbulent jet into a crossflow[1] BO YANG, KHALED HASHAD, ALBERT GEORGE, MAX ZHANG, Cornell University — As the important components of the modern microgrid system, hydrocarbon-fueled distributed generation (DG) units are usually located near population centers, which requires the assessment of air pollutant concentrations near the DG unit. A common DG unit is a building with short chimneys. The plume from a DG chimney is a turbulent jet into the ambient crossflow and would be disturbed by the wake of the building. This scenario includes two classic fluid dynamics topics, a turbulent jet into a crossflow (TJIF) and a blunt body wake. In this study, we conducted computational fluid dynamics (CFD) of the flow field and the concentration field around a series of box-shape building with a short chimney. The CFD results were evaluated using the USEPA wind tunnel measurement. We proposed a concentration field parameterization method, named the Mixture Model, which is the aggregation of different Gaussian-based distributions. The model parameters were determined by the building and chimney dimensions, plume properties, ambient wind features, and the atmospheric boundary layer stabilities. The new method was evaluated by using the USEPA wind tunnel measurement and the field measurement data of the American Gas Association.

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