The tabulated Premixed Conditional Moment Closure (Tâ€“PCMC) method has shown the capability to predict turbulent, premixed methane flames with detailed chemistry and reasonable run times in a RANS environment. Here the Tâ€“PCMC method is extended in a Large Eddy Simulation (LES) framework for nonâ€“adiabatic premixed flames, allowing heat loss to occur in the mixture before, during and after combustion. It is proposed that the LES framework is a more suitable representation for both chemical and turbulent scales in premixed combustion. The LES Tâ€“PCMC model is implemented using the open source CFD software OpenFOAM for its open access to C++ source code and large library of turbulence and thermoâ€“physical models. The proposed model is validated with PIV and Raman laser measurements of a turbulent, enclosed reacting jet from the DLR experimental group. The DLR data sets provide both unity (E.g.Methane) and nonâ€“unity (E.g.Hydrogen) Lewis number fuels, allowing for the proposed numerical model to be validated with the inclusion of differential diffusion effects in the reacting mixture. Velocity, temperature and major/minor species are compared to the experimental data. LES results match the experimental data better than the Reynolds Averaged Navierâ€“Stokes (RANS/URANS) solution and is able to better resolve the transient features of the flame with an increase in run time of only 50%, when compared to URANS. The inclusion of heat loss in the Tâ€“PCMC model is introduced from first principles and provides better predictions of temperature and species mass fractions when compared to experimental data sets.

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The public is welcome to attend.