

DNS of Flame-Wall Interactions for Fuel-flexible Hydrogen/Natural Gas Combined Heat and
Power Reciprocating Engines
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Fuel and load flexible H₂/natural gas reciprocating direct injection engines will provide small-medium size combined heat and power (CHP) in the 0.3-2 MW range. Increasing percentages of hydrogen in the blend can be used to respond rapidly to variable load demands. However, the high reactivity and broad flammability limits of hydrogen translate into both increased thermal efficiency and higher heat fluxes to the piston and cylinder walls. Notably, hydrogen has shorter flame-wall distances causing flame quenching, and flame-wall interaction (FWI) creates a negative impact on thermal efficiency and affects wall heat transfer. Direct numerical simulations results will be presented of flame-wall interactions (FWI) resulting from direct injection of a hydrogen/natural gas blend ignited by hot vitiated products from prechamber combustion for evaluation of flame quenching processes and heat transfer to surfaces.