Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Deep Reinforcement Learning for Control of Fuel Injection in Compression Ignition Engines[1] NICHOLAS WIMER, MARC HENRY DE FRAHAN, SHASHANK YELLAPANTULA, RAY GROUT, National Renewable Energy Laboratory — Compression ignition (CI) engines have long offered high thermal efficiencies and torque across a wide range of loads, but come at the cost of high quantities of NOx and soot. One strategy to decrease harmful emissions from CI engines is to split the fuel injection into a series of smaller injections. In this talk, we explore a new way of discovering optimal injection strategies for the next generation of compression ignition engines using deep reinforcement learning (DRL). An overview of the DRL algorithm and training procedure are outlined and the resulting new injection schedules are discussed. We demonstrate the use of transfer learning (TL) across hierarchies of physical models to accelerate the learning process, making this approach feasible for a range of complex scientific problems. Using a well-trained DRL agent as a controller, NOx emissions from a zero-dimensional model are reduced three-fold while only decreasing net work by 2%.

[1]This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by U.S. Department of Energy Office of Science and National Nuclear Security Administration. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government.

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Date submitted: 03 Aug 2020 Electronic form version 1.4