Washington University in St. Louis
School of Engineering & Applied Science

Energy, Environmental & Chemical Engineering

EECE Department Seminar

Friday, March 31, 2017

11:00am

Brauer Hall, Room 12

Can Global Temperature Rise be Limited to 2 Degrees? The Cold Turkey Experiment

ABSTRACT

The 2015 Paris Agreement stipulates that the signatory nations take collective action to reduce carbon dioxide emissions so as to limit the increase in global mean surface temperature to 2˚C. How much would CO_2 emissions have to be reduced to achieve this, or can this even be achieved at all? These questions are examined using a global energy balance model to carry out a "cold turkey" experiment in which emissions from fossil fuel combustion are abruptly set equal to zero; this is a limiting case for any practically feasible, gradual reduction in emissions. Such emission reductions would not only reduce CO_2 emissions but would also reduce emissions of atmospheric aerosols, microscopic particles suspended in air, and their precursor gases. By scattering solar radiation and by increasing cloud reflectivity these aerosols are thought to be offsetting a substantial but highly uncertain fraction of radiative forcing by anthropogenic carbon dioxide. In contrast to carbon dioxide, which would persist in the atmosphere, aerosols would be removed almost immediately after cessation of emissions. Consequently, and contrary to general expectation, the net forcing and global temperature would likely increase, not decrease. This study examines the amount of the resultant temperature rise within present uncertainty estimates of Earth's climate sensitivity and current aerosol forcing. Within this uncertainty, future global CO_2 emissions consistent with achieving the 2 ˚C target range from as much as 100 years at current emission rates to essentially zero.

Stephen E. Schwartz, Senior Scientist
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Stephen E. Schwartz is a senior scientist at Brookhaven National Laboratory. His current research interest centers on the influence of energy related emissions on climate, with a focus on the role of atmospheric aerosols.. In his research at Brookhaven National Laboratory, Schwartz developed methods to describe the rate of reactions in clouds that lead to production of acid rain. Schwartz's research exerted a major influence on the drafting of the acid deposition section of the 1990 Clean Air Act Amendments. More recently, Schwartz has been focusing on microscopic and submicroscopic aerosol particles, which influence a variety of atmospheric processes, from precipitation to climate change. Schwartz received his bachelor's degree in chemistry from Harvard University, in 1963, and his Ph.D. in chemistry from the University of California, Berkeley, in 1968. After postdoctoral research at the University of Cambridge, England, Schwartz joined the Chemistry Department at Stony Brook University. He joined Brookhaven National Laboratory in 1975.

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