# Executive Summary

This draft final report is part of a research project aimed at identifying features and solutions that can be used to mitigate fire spread between and within PV arrays installed on roofs. This report contains a brief introduction to rooftop PV array technology, describes several recent large-loss fires involving roof-mounted solar PV arrays, and presents the results of the first three tasks of the project.

Task 1 of this project is the identification of previous fire testing on PV systems installed on building roofs. This report presents data on the current state of standardized testing of roofing assemblies and PV modules, full scale test data on roofing assemblies with solar PV arrays, and testing of mitigation solutions to prevent flame spread on roofs with solar PV arrays.

Task 2 of this project is the establishment of general parameters for large-scale tests, including the array geometry, ignition source, and air flow conditions. Test arrays of 4 by 5 modules and target arrays of 4 by 1 and 1 by 5 modules are expected to satisfy the test objectives. These arrays are expected to allow for appropriate fires to be initiated and the effectiveness of mitigation measures to be evaluated. A gas burner with a gas output that corresponds to a heat release rate that is similar to the fire exposure used for the ASTM E108 spread of flame test is expected to satisfy the test objectives. An air supply comprised of an array of fans with louvers to direct a stream of air towards the test array at a velocity of 12 mph is expected to satisfy the test objectives. This ignition source and these air flow conditions have been shown to be capable of spreading flames across Class A fire rated roofs with PV modules installed.

Task 3 of this project is the establishment of the roof assemblies that will be tested. Roof assemblies constructed from polyisocyanurate insulation on a steel roof deck with single-ply TPO and EPDM membranes are expected to satisfy the test objectives. A review of current industry practices has shown that these assemblies represent the most common low-slope roof being installed.

Task 4 of this project is the development of a test plan to evaluate potential mitigation solutions for limiting flame spread on low-slope commercial building roofs. A test matrix has been developed to evaluate mitigation solutions that include walkways, non-combustible cover board, vertical barriers, gravel ballast, and non-combustible module backing layers. The test plan that is developed in this report will be implemented in a later phase of the project.