7. Abstract of work completed **during the quarter**

General Vortex Entergy, Inc. has proven and quantified the efficiency and the clean burning claims of the Jirnov Vortex Turbine. The engine is operating at greater than 54% thermal efficiency and it produces emissions less than 25 ppm of carbon-monoxide and less than 39 ppm of NOX. The grant from the TCET allowed General Vortex Energy, Inc. of Missouri City, TX to design, build and test it Vortex Combustor and combine this burner with the other components of the engine resulting in the demonstration of the Jirnov Vortex Turbine Engine. This Vortex Combustor burns multiple fuels such as diesel, natural gas, alcohol and vegetable oil. The combustion is very stable and easily ignited.

Last quarter we completed the design and completed the building of the pre-combustion chamber and combustion chamber. Initial testing of its expected environmental benefits are exciting to say the least. The combustion chamber is designed as a 22 kW unit. At present we are operating the combustion chamber at about 1300 Kelvin, and about 5 bar. The flame is very stable and virtually no odor to the exhaust gas. We improved the fuel and air delivery systems. The flame is contained within the "Vortex" combustion chamber and the test for NOX are running less than 39 ppm and less than 25 ppm CO on standard diesel with no detectable particulate matter. Fuel is burned at greater than 95% efficiency.

The turbine or expander design was reworked adding ceramic bearings to the vane followers and some modification to the exhaust orifices. These changes simplified the design and improved the completeness of the combustion. We have purchased with the TCET grant a gas analyzer and are using it daily in test under different parameters.

The expander was run to failure approximately 10 hours. The rotor seized in the stator. Upon disassembly it was found that one of the ceramic bearings had disintegrated. The damage was minimal and minor machining operations corrected the problem. This failure is believed to have been the result of fracturing the bearing on assembly. The assembly procedure was revised and the turbine has run smoothly since.

We have added a pressurized lubrication system to the turbine (expander) and activated the air-cooling. Our next task is to improve our power measurement capabilities. We are seeking a dynamometer at this time.

Currently we are continuing our marketing study to determine applicable markets for the combustion chamber as a standalone product. Foundry furnaces, rapid production of heated fluids using the heat exchanger, an alternative to flaring stacks, possibly ceramic or brick kilns. And of course our original concept, when used as a component of the total JVE engine, as a direct replacement for less efficient standard turbines. We have a pending related project with the U.S. Navy. Licensing negotiations are in process with one company.

We continue the testing, gathering data using various fuels, measure the emissions over a breadth of parameters, and run the engine over periods of time to prove the reliability and improve the emissions and power results. Based on the testing we will be working towards the design of a 150 kW engine.