**F. Project Manager Qualifications and Organizational Description**

**Robert Gardner, Principle Investigator and Project Manager:**

Dr. Gardner is an Assistant Professor of Renewable Energy at the University of Minnesota West Central Research and Outreach Center and has a Ph.D. in Chemical Engineering from Montana State University. Dr. Gardner's research focuses on the interface between microbiology and chemical engineering. Microbes have naturally evolved through adaptation to their respective niche environments, and thus developed unique metabolic processes that can be utilized for production applications. Examples include the use of photosynthetic microbes for bioenergy production or anaerobes for bioremediation of toxic chemicals. This is an interdisciplinary area of research. However, microbial processes are controlled at a fundamental level by mass and energy balances, thermodynamics, mass transport and chemical reaction kinetics, and these topics are at the core of bioproducts and biosystems engineering -- especially since microorganisms (single species or complex communities) have unique and adaptive behavior that can manifest a diverse spectrum of responses, which is in contrast to most abiotic chemical engineering applications. Dr. Gardner's research strength is on elucidating fundamental microbial metabolic processes and strategically enhancing them for useful applications. These processes are very similar to shrimp production as it is necessary to manage beneficial microbial populations, water conditions, and provide adequate nutrients for efficient growth of shrimp. In addition to Dr. Gardner’s research interests, he co-teaches one of the most popular on-line classes at the university titled BBE 2201 – Renewable Energy and the Environment to approximately 400 students per semester.

The West Central Research and Outreach Center (WCROC) is a century-old agricultural experiment station located near Morris, MN. The research facility consists of approximately 1,100 acres of pasture and farmland, administration office complex, grain and livestock facilities, and supporting research facilities. The WCROC also houses the regional extension office for western Minnesota. WCROC has five primary areas of research including Crop, Dairy, Horticulture, Swine, and Renewable Energy. Staff at the WCROC have significant experience in researching novel and complex agricultural production systems including organic crop and dairy production, alternative swine systems, and leading edge renewable energy systems such as nitrogen fertilizer production using renewable energy. Dr. Gardner leads the algal and other microbial production systems research at the WCROC. His research lab is located at the nearby USDA ARS North Central Soils Conservation Lab. The lab consists of analytical equipment including a mass spectrometer. The lab can perform a number of analysis related to identifying microbial populations, chemical assay, and characterization of minerals and other nutrients and waste products. Dr. Gardner’s field experiments are conducted at the WCROC research farm where there is adequate space and support infrastructure. From a clean energy standpoint, the WCROC hosts a variety of energy production systems including a 1.65 MW Vestas V-82 wind turbine, two 10 kW wind turbines, an evacuated tube solar thermal system, two flat-plate solar thermal systems, and five solar PV systems totaling 131 kW.