Project Title: ONAMI Tactical Energy Systems Development

Project Funding: $1,050,000 Grant from Department of Defense

Project Description: This project is focused on developing tactical energy systems that can be applied to military applications. Tactical energy systems refer to a class of energy production, storage and utilization technologies that are small, modular and can be deployed in the field with the Army, Navy, Air Force or Marine Corp. It is expected that successful tactical energy systems will also have significant commercial potential and in many cases can lead to significant improvements in energy efficiency of commercial energy systems. Tactical energy systems are often either intended for mobile applications in vehicles or soldier portable applications. Examples of tactical energy systems include:

- Sulfur Removal – Sulfur is in many fossil fuels and sulfur, even in very low concentrations, will prevent fuel cell systems from functioning. ONAMI technology can lead to a compact portable system for removing sulfur from fossil fuels to a level that will prevent catalyst poisoning in reformers and fuel cells, thus allowing the wide spread use of high efficiency fuel cells in cars, homes and other portable systems.

- Devices for producing electric power from small heat sources – A fuel such as butane contains 50 to 100 times more energy that a battery. If we could efficiently convert this chemical energy into electricity we could operate portable electronics (laptops and cell phones etc.) for 10 to 20 times longer then is allowed by batteries. ONAMI technology can lead to the development of systems (particularly lightweight systems for producing 1 to 20 watts) that can combust the fuel producing thermal energy that is then converted to produce electric power. Examples include thermoelectric generation materials coupled with microcombustors and small heat engines

- Systems for production of fuels from indigenous resources – ONAMI technology will lead to compact systems for producing fuels from agricultural products. Technologies being demonstrated at OSU can convert vegetable oil to biodiesel in small systems suitable for individual farms while other microchannel technology can efficiently convert starches and sugars to hydrogen.

- Advanced Reformers – Reformers are devices that convert fuel like gasoline or diesel to hydrogen for use in a fuel cell. For many applications, including fuel cell cars, a suitability sized reformer is not currently available. ONAMI technology, particularly high temperature microchannel reformers can reduce the size and cost of the reformer to the point where fuel cell powered vehicles may be attractive.

Student Involvement: This is a new project; however, we anticipate that 7 to 10 graduate students will be involved in the research.

Natural Resource Utilization: The development of compact processing systems for fuel production from indigenous resources could revolutionize the processing of agricultural

products and significant improve the financial return to the farmer. ONAMI technology will result in the development of small modular systems that produce bio products which can be economically located on an individual farm rather then in a central facility. Consequently, the value added by processing will be returned to the farmer. Compact biodiesel production is an example. Currently biodiesel is produced in large refineries. ONAMI technology will enable compact and economical biodiesel production systems that will be sized for an individual farmer.

Innovations, new companies and jobs: While the systems described above are being developed for military applications all have a strong potential for commercial products. The market for sulfur removal systems, portable power supplies for electronics, modular biodiesel production and advanced reformers is between $500 million and $2 billion per year. Some of these technologies are within 1 to 3 years of commercialization resulting in multiple new companies in Oregon with substantial business volume.

Graphics: Schematic diagram of a modular "farm-sized" biorefinery for the production of biodiesel for vehicles and hydrogen for fuel cells