Title: **Enhanced Recovery Utilizing Variable Frequency Drives and a Distributed Power System Technical Progress Report**

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Abstract

This report describes the progress made during first six months of the project entitled "Enhanced Recovery Utilizing Variable Frequency Drives and a Distributed Power System". During this period, project plan, demonstration plan and project schedule were developed, equipment was ordered and baseline data was collected.

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Project Objectives:

The objective of the project is to develop an integrated power production/variable frequency drive system that can be easily deployed into the oil field that will increase production and decrease operating costs. This objective will be accomplished as described below:

a) Design an integrated micro turbine, variable frequency drive system.

b) Install an operational system in the field on actual producing wells for demonstration and validation.

c) Observe and record results from the working system.

d) Disseminate these results to others.

Project Scope:

This Project will demonstrate a 30-KW Microturbine Generator in a distributed mode at a well field site. The micro-turbine will take a slip stream of natural gas off of the production line and eliminate the need for power grid dependency. Many fields simply vent or flare natural gas as a wasted resource. The well field site that will be utilized for this project has two (2) producing wells. Electric cost for the proposed well field site is $850.00 per month from the grid. Current use of the power grid is hampered by weather problems. This monthly electric cost does not account for costs of burnt motors, switches, labor to get back on line, etc. due to grid outages. The cost of power using distributed power from a micro-turbine can reduce electrical cost by 30% to 50%. The natural gas production associated with this field is approximately 70,000 cubic feet per day which is more than a sufficient to run the proposed micro-turbine.

In conjunction with the micro-turbine, this project would install a variable frequency drive with a computerized pump off controller onto the pump jack that will adjust and vary the pumping speed of the well based upon downhole torque demand. The greater the torque the slower the pumping, as torque demand decreases, the pump speed increases. This pump control ability will accomplish the following:

- Will automatically adjust to match the well productivity and will automatically prevent pumping off and shutting down. By maximizing stroke speed during low torque demand, total strokes per minute are increased and can lead to a 10% or greater increase in oil production.
- With a variable speed drive, motors are started at minimum frequency (soft start, therefore reducing mechanical stress) and ramps smoothly to full power. Capital expenses can also be reduced as smaller horsepower motors can be used because of the soft start capability.
- By slowing the beam during peak power demand and increasing the speed during low torque demand on motors, an optimum matching of production capability and lowest power cost can be achieved. Through this process a small independent can reduce power demand, maintain minimal power usage per stroke, and realize energy savings of up to 50%.

Technical Progress:

- Peden Energy developed project plan, demonstration plan and project schedule and submitted them to DOE.
- Peden Energy conducted a project kick-off meeting at DOE-Tulsa on December 2, 2003 and discussed project objectives and scope with DOE.
- Peden Energy started collecting baseline data on December 2, 2003. The data being collected includes oil and gas production data and electric consumption data.
- Peden Energy ordered the variable frequency drives (2), and a 30-kw microturbine. The VFD's will be delivered early February, 2004 and the microturbine will be delivered by end of February, 2004.