

The following technical paper abstract information was recently submitted in connection with session DOD103,Electrics, Electrical

Offer Number: 14DOD-0026

Paper Title: Energy Savings from Old Motor Generators to Solid State Frequency Converters

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Abstract: Robins AFB has 30 old motor generator units that cannot be maintained due to obsolescence of the parts. These generators are used to test avionics parts as well as distribute load along 400Hz depending on the application. Some applications also use a 28VDC output for avionics parts testing as well. Instead of replacing these old motor generators with newer models, we propose to go with the newer solid state technology.

Solid state technology for these applications provides huge savings in both efficiency and utility costs. Motor generators are approximately 75% efficient at full load, while solid state units are 95% for full load. However, under light or no loading conditions, the difference between the technologies becomes more stark as motor generators become 30-50% efficient, while solid state loses very little efficiency at low load or no load conditions. Solid state technology also does not require the amperage and electrical footprint that motor generators do, which can yield utility savings in excess of \$25,000 per year per unit depending on runtimes and kWh costs from the utility. Just the utility savings alone can yield a ROI in as little as 2-3 years.

Solid state units also generally are cheaper than their motor generator counterparts for the same power rating, with added technology that allows load sensing to know whether it is needed or not. This load sensing is a key factor in supplying distributed power as/when needed. Most of the distributed power application for the old style motor generators run 24/7, while the load sensing of the solid state units would allow for partial shutdown during weekends, holidays, and any other non-usage times. With a cheaper initial cost as well as fast ROI, putting redundancy into the distributed power application would allow for load sharing as well as maintained running in the case of an outage or maintenance issue.

Solid state units also do not have the moving parts that motor generators do, which means very little annual maintenance. The old motor generators need maintenance for the brushes, windings, and other moving parts. Solid state units have little maintenance requirements, and with redundancies in the system, any downtime would not be critical as the systems would continue to run.

Conservative estimates on cost savings for the 30 units to be converted to solid state would be approximately \$20,000 difference between the cost of a solid state unit to a motor generator. For 30 units, the startup savings would be approximately \$600,000, and the savings per year due to utility savings, better efficiency, and less maintenance needs would conservatively be \$35,000 or just over \$1,000,000 per year.