The Problem

DRS Foment operates generator sets (‘gauging the facility’) which provides a checkout test at 100% units shipped in addition to more extensive testing of suicidal units. This testing process is performed at Foment’s location for the end of each quarter. The testing requires that the generator be tested under simulated and actual loads at various power outputs and various failure conditions to ensure that the generator remains stable and operational.

Following the Energy Recovery From Generator Testing

The first step is to tackle the problem of tracking energy as it flows through the system. The system is then followed by generator testing to include the generator and load bank. The only energy in the system, which is a chemical stored in the battery, is used to follow this energy as it flows through the system. It then enters the generator set where it is converted into electricity with some losses. These losses are the system in the form of waste heat. The energy converted into electricity then passes through the load bank where it is converted from electrical energy to waste heat.

Waste Heat From Load Banks

The second waste energy stream to be examined is the waste heat from the load banks. Again the energy being utilized is 100% of load with high demand, but it is in a different management system currently on the load banks which is designed to keep them near ambient temperature throughout the testing process. The solution is to use such waste heat to cool the facility in the winter and cool it in the summer.

The Solution: Regenerative Load Banks

The solution we found or recovering economic value from the generator testing process is Regenerative Electronic Load Banks. Regenerative Load banks operate by producing a virtual load of energy which is used to power the generator or to provide energy to the facility.

Waste Heat From Generators

The first waste energy stream to be examined was the waste heat from the generator. The energy was actually consumed as the entire testing to its attributes of very high quality but not high quality. As a result, the team attempted to find ways of leaving the stream of waste heat. The solution is to use such waste heat to cool the facility during the summer.

Deployment

The overall structure of the system is based around ease of implementation using external sources for each component. The system is designed to have a regenerative load bank, a certified grid connect inverter, and certified transfer switch. The architecture of the system is an external one that can be phased in and allows for smooth transition during use. The system must also be able to interface with the grid and the AC bus of the system. Additionally, a battery storage system can be connected to the grid and the AC bus for a smooth transition.

Vendors

Several companies have been identified and contacted with regard to supplying electronic regenerative load banks. None of these vendors offer an electronic regenerative load bank or a product that currently exists. Several areas in the process of developing a product would be willing to work on such a product.

Testing and Qualification

Military Specifications require that each load bank meet certain requirements that ensure a high level of accuracy. These specifications ensure that the load bank can accurately simulate the actual power output of the generator.

The testing system uses an NI data acquisition card to take differential voltage inputs and sends them to the software. Voltage values within 0.1% of set point are used to detect any discrepancies with the waveform. Data points are then compared to the actual waveforms to ensure accuracy.

Modeling Economic Benefits

Quantifying the economic return of utilizing an electronic load bank recovery system required thorough analysis of the model to determine its benefits. This model would include the various costs and benefits associated with the regenerative load bank. The model would need to be altered to reflect any changes in the system.

Other parts of the economic benefits section involved looking at matching incentives which DRs can utilize to help implement a regenerative load bank. The team researched various programs which would help offset the cost of creating the system. The incentives found were in different forms offering different benefits in terms of savings. Grants and tax credit incentives were the most common incentives identified.