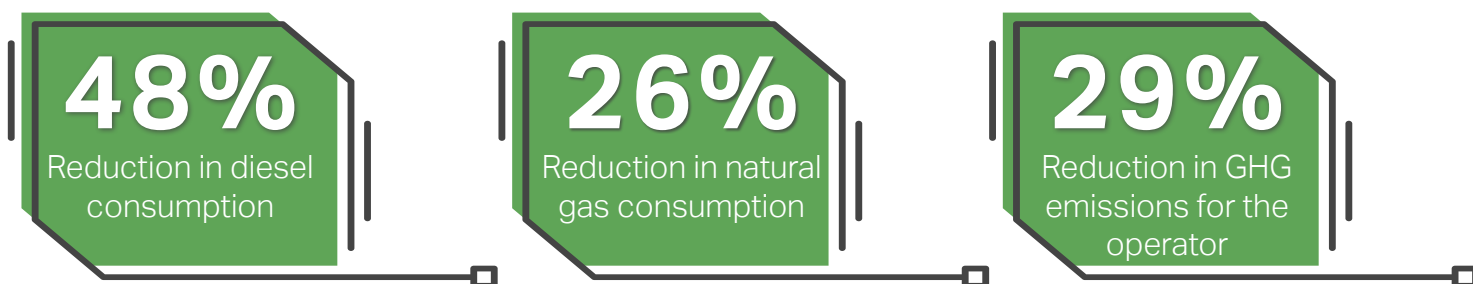


CASE STUDY

EverGreenEnergy™

Battery Energy Storage System (BESS) Reduces Fuel Consumption and Greenhouse Gas (GHG) Emissions For The Operator



CASE STUDY OVERVIEW

An operator in Colorado initially used one diesel and two natural gas engines to produce electricity in drilling operations. In consultation with Precision Drilling and based on an offset analysis, the operator decided to integrate a Battery Energy Storage System (BESS) into the rig to reduce their fuel consumption and GHG emissions by managing the engines efficiently.

The BESS uses artificial intelligence (AI) to automatically launch and shut down generators while ensuring the rig's electricity demand is always met. It handles high transient loads by supplying electricity from the battery modules reducing the number of generators online. The system charges its batteries when the electricity demand is low.

BESS PERFORMANCE RESULTS

Using a BESS reduces the number of generators online, and the engines run more efficiently at a higher load. The diesel generator was brought online only when the load was high, and two natural gas generators were insufficient to handle that load. One gas generator and the BESS were sufficient to satisfy the transient load in tripping (Figure 2). As a result, overall diesel and natural gas consumption has reduced significantly, resulting in lower GHG emissions.

The highlights of overall well results (Figure 3) are:

- » **37-48% reduction in diesel consumption**
- » **19-26% reduction in natural gas consumption**
- » **26-29% lower GHG emissions for the operator**

CONCLUSION

The battery energy storage system (BESS) automatically controls the generator launch and shutdown. Also, it allows the engines to run at an optimal load, which results in reduced diesel and natural gas consumption by up to 48% and 26%, respectively. Overall GHG emissions are reduced by up to 29% for the operator.

FIGURE 1

Figure 1 compares two similar load profiles for pre-BESS and BESS **Drilling**. While pre-BESS drilling used three generators, BESS drilling is done with two generators and the BESS. It eliminates the use of the diesel generator.

GENERATOR REDUCTION

1

BESS and two generators handle the drilling load

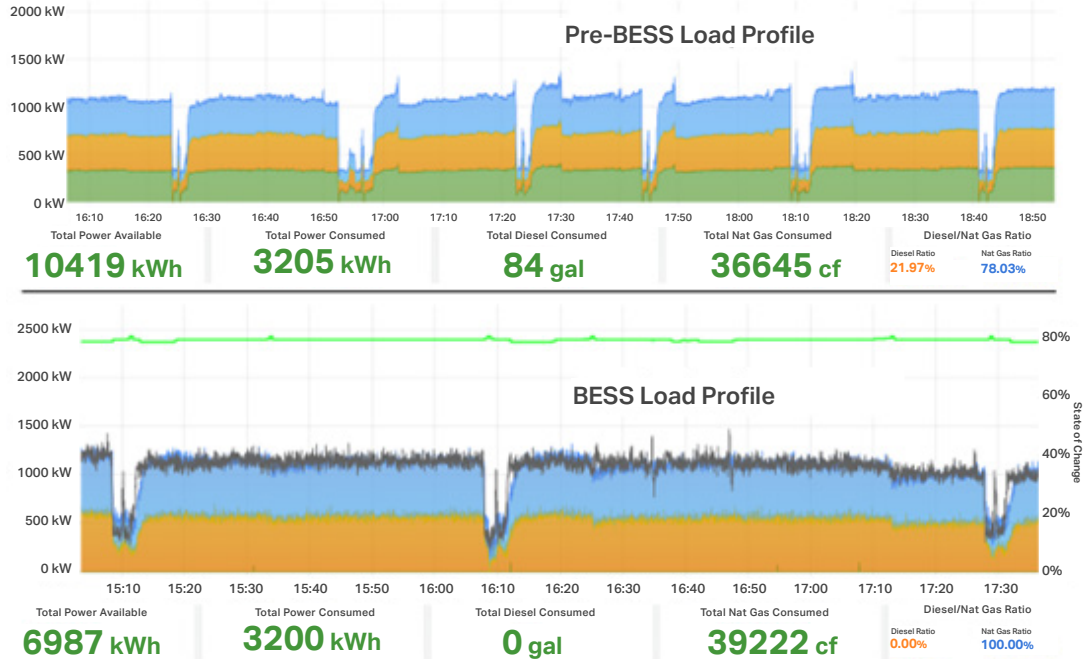


FIGURE 2

Figure 2 compares two similar load profiles for pre-BESS and BESS **Tripping**. While pre-BESS tripping used three generators, BESS tripping is done with only one generator and the BESS that supplies the load spikes. It eliminates the use of one diesel and one natural gas generator.

GENERATOR REDUCTION

2

BESS and one generator handle the drilling load

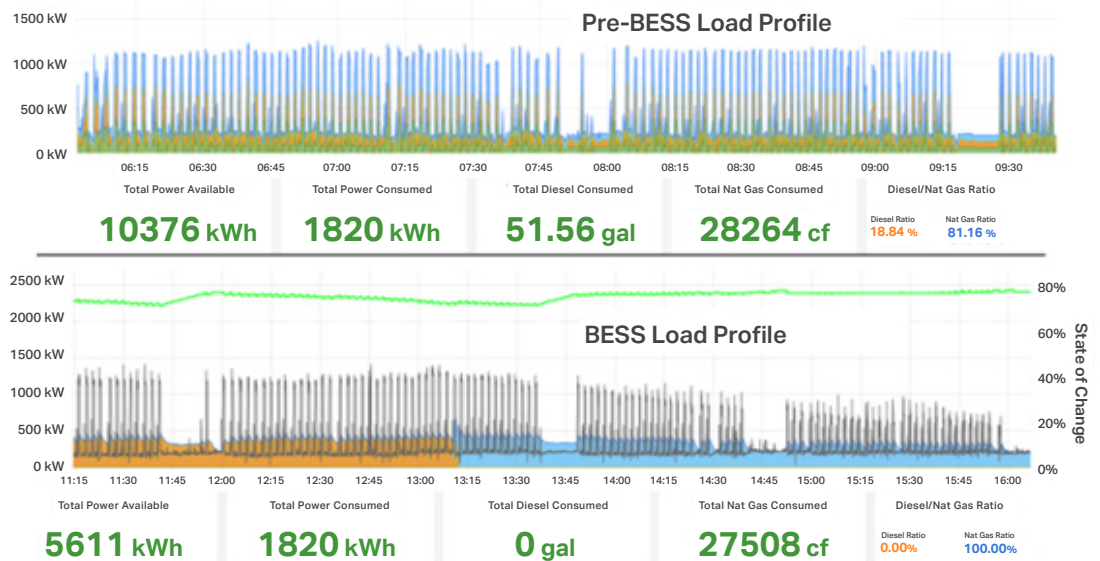


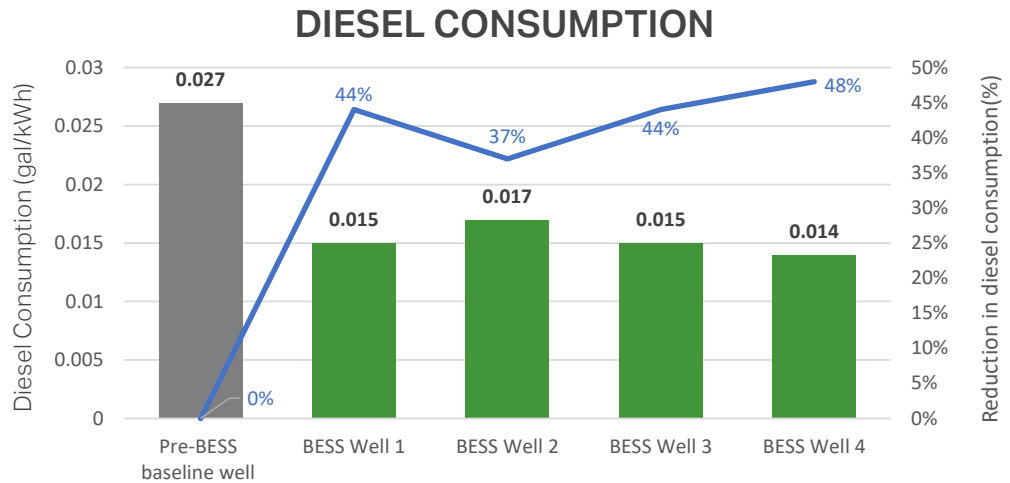
FIGURE 3

Figure 3 shows the reduction in diesel and natural gas consumption and GHG emissions for the BESS wells compared to the pre-BESS baseline well. Diesel and natural gas consumption decreased by up to 48% and 26%, respectively. GHG emissions are reduced by up to 29% for the operator.

DIESEL USAGE

48%

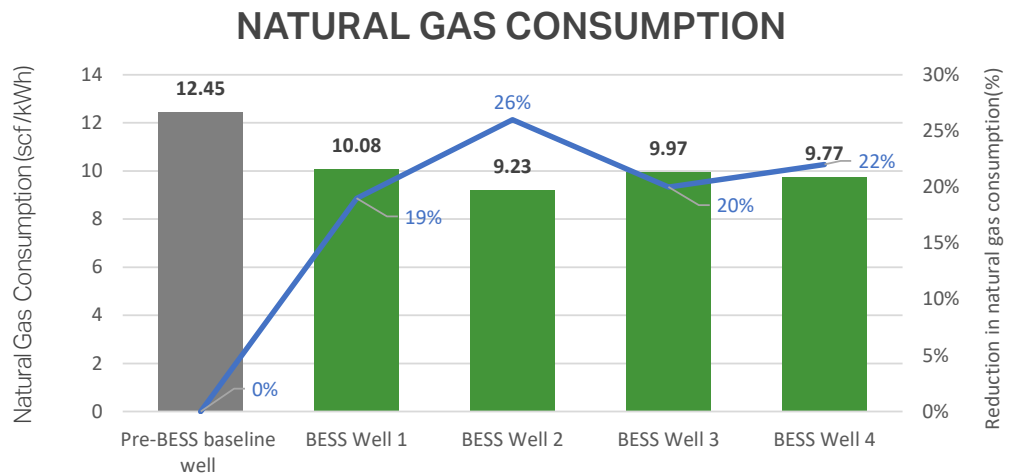
Reduction due to decreased operating time



NATURAL GAS USAGE

26%

Reduction due to improved fuel economy



GHG EMISSIONS

29%

Reduction for the operator due to lower diesel and natural gas usage

