CASE STUDY

A Doorbell Hidden in Plain Sight - Solar-Enabled Seismic Data Acquisition Platform

OVERVIEW

A new BDRCK client required a custom, remote, grid-independent, and stealthy platform for gathering, storing, and transmitting critical seismic data to analysts hundreds of miles away. The project required packaging telecommunications, solar energy, and extremely sensitive seismic measurement devices (geophones) together into a robust system that operates 24/7 through all weather conditions. The system also operates in plain sight with hidden capabilities that go far beyond the original form factor.

PROJECT SNAPSHOT

CLIENT
Confidential

INDUSTRY
Seismic Research and Development

SERVICES
Systems Design

TIMELINE
April 2022 through November 2022

CONTRACT TYPE
Commercial Sub-Contractor

THE CHALLENGE

The primary challenge was to take an existing piece of construction equipment – an engine-driven light-tower trailer – and completely transform it into a state-of-the-art technological platform for capturing sensitive seismic data. The result looks similar to the original equipment, masking the true intent of the device and ensuring continued operation.

A key constraint was the existing size of the starting trailer. The engine, generator, and supporting hardware were completely dismantled and removed. A new panel that tied into the trailer frame engine mounts was designed and fabricated to provide space to install an industrial computer, lithium-ion battery set, solar inverter, geophone data acquisition platform, and cellular router.

BDRCK's design team, the lead principal investigator (PI), and the manufacturing team were geographically separated and worked from three time zones.

> *"BDRCK convinced us our concept was manufacturable and provided transformative insight over and over again to get the project done."*
>
> — Client Confidential, Lead Principal Investigator

KEY RESULTS

24/7/365 Operation
99% uptime with no breaks in data flow

0% Custom Hardware
All devices sourced quickly from open marketplace

100% Design Configuration Management
All models and drawings are secured and managed to enable decades of adaptation and delivery

HOW WE SOLVED IT

01 We Evaluated the System

BDRCK worked closely with the project principal investigator to fully understand the technically complex geophone interfaces and provide a custom-tailored installation solution that fit into the existing packaging. The geophones presented a unique set of electrical engineering requirements that required development of new cable assemblies.

02 We Designed the Solution

BDRCK utilized a sophisticated computer-aided-engineering toolchain to ensure that all of the discrete system equipment pieces fit together and were able to be connected and assembled within the trailer packaging constraints.

03 We Executed and Delivered

BDRCK was there every step of the way while the prototype trailer was being assembled. The supply chain presented several complexities with component availability and end-of-life details that were easily resolved by developing form, fit, and functionally equivalent alternatives verified using the design models developed by BDRCK. The existing trailer was quickly dismantled, modified, and new components installed and connected without any surprises. Maintainability was guaranteed by verifying repair operations using human model simulations. The geophones worked correctly the first time they were connected despite the technical interface complexity.

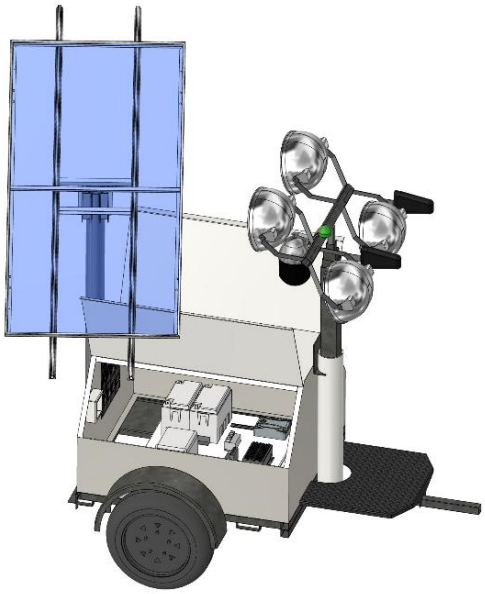

Figure 1- Doorbell Trailer CAE Model

PROJECT IN FOCUS

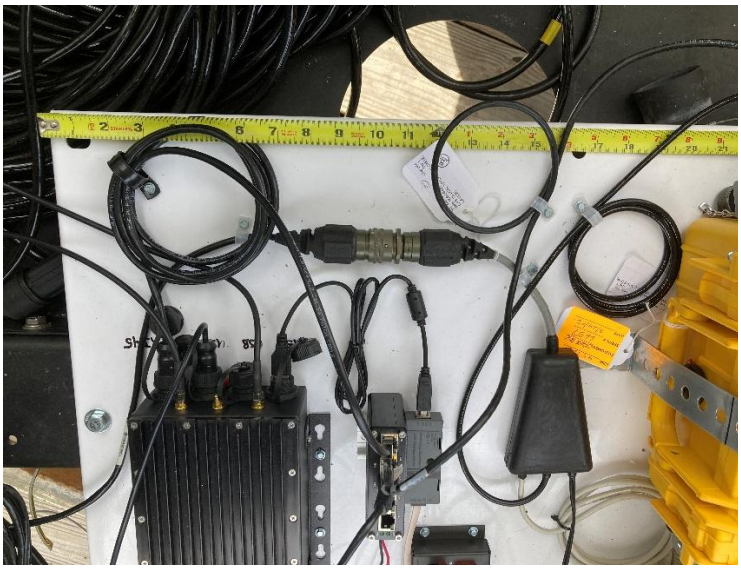

Figure 2 – Focus on Sub-Panel Component Layout

Figure 3 - Solar Tower Installation

Figure 4 - Pan Tilt Zoom Camera, GPS Antenna, and Cellular Antenna Integration with Trailer Light Tower

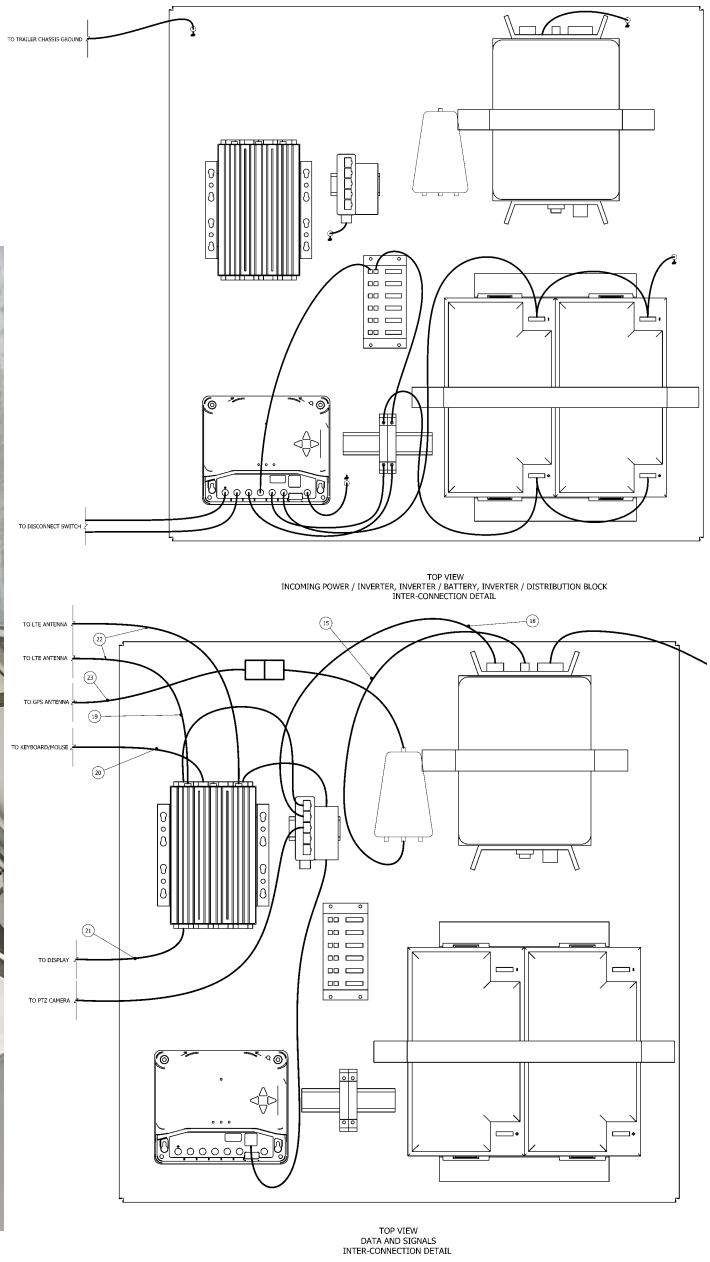

Figure 5 – Sub-Panel Interconnection Detail Drawings

Senior Expertise Without Headcount Cost

20+ years of electro-mechanical and systems engineering depth — engaged as needed, without the overhead.

Autodesk CAE & PLM Toolset

Enterprise-grade design and data management tools applied to every project.

Concept to Deployment

We own the full lifecycle — from initial design through manufacturing and field delivery.