U.S. Department of Agriculture Forest Service Pacific Southwest Region (Region 5)

Customer Story

Challenge

The U.S. Forest Service (USFS), an agency of the U.S. Department of Agriculture, stewards 193 million acres across the country's 154 National Forests and 20 National Grasslands. However, forests and grasslands are greatly imperiled by wildfires. According to the State of California, wildfires destroyed over 4.2 million acres of land in the state, and damaged or destroyed nearly 10,500 structures in 2020.

The USFS selected five fire facilities in five National Forests in California for a solar-energy and lighting-upgrade project. Each site is remote and off-grid, and had been relying on truck-delivered propane or diesel for generators that provided electricity and directly powered on-site equipment.

Having most sites operating aging and often over-sized generators 24 hours per day, 7 days per week during seasonal operation created problems ranging from rising fuel costs to escalating maintenance expenses. Also, unexpected generator breakdowns, with no backup in some cases, jeopardized the fire stations' mission, while burning fossil fuels increased greenhouse gas (GHG) emissions.

Solution

Trane® off-grid mobile solar photovoltaic (PV) systems and LED lighting met the unique energy needs for the Region 5 project at the following five fire facilities:

- Cleveland National Forest – Pine Hills Fire Station
- Los Padres National Forest – Pacific Valley Ranger Station
- Mendocino National Forest – Soda Creek Fire Station
- Plumas National Forest – Frenchman Fire Station and Work Center
- Sequoia National Forest – Blackrock Fire Station and Work Center

The project, which was performed from May 2018 to November 2019, was the first USFS project to receive a Department of Energy Assisting Federal Facilities with Energy Conservation Technologies (DOE AFFECT) grant. It was also the second Energy Savings Performance Contract (ESPC) ENABLE project for Region 5, and the first General Services Administration (GSA) ENABLE project for Trane.

Building Momentum Through Teamwork

The project was a model for collaboration, knowledge-sharing and motivation across the more than 50-member USFS and Trane team spanning the State of California. Thirty-one buildings, including fire stations, living quarters, administrative offices and recreational facilities, were included, occupying nearly 32,000 square feet.

The project also benefited from the Department of Energy's upfront budgeting and site-auditing support, as well as the National Renewable Energy Laboratory's evaluation of system performance and battery technologies.

Moving Beyond the One-Size-Fits-All Model

The project – off-grid mobile solar PV systems, battery backup and LED lighting across multiple locations – was a first-of-its-kind undertaking for the USFS and Trane. It was also a type of project, in terms of magnitude, that had yet to be successfully completed by any other company or organization.

United States Forest Service
Region 5 Regional Office
Vallejo, CA 94592

Project Highlights

CHALLENGE

- Sustainably powered electricity and on-site equipment
- Greenhouse gas (GHG) emissions
- Federal sustainability goals
- Protection of National Forests and Grasslands

SOLUTION

- Public- and private-sector partnership
- Adaptable, self-sustaining and customized off-grid mobile solar photovoltaic (PV) systems and LED lighting
- Collaboration, knowledge-sharing and cross-team motivation

RESULTS

- Improved power-system function and independence
- Reduced health, safety and environmental risks
- Nearly $3.8 million total guaranteed cost savings over a 22-year performance period
- GHG-emission declines to barely zero
- Progress toward federal-sustainability and similar targets

Trane's cross-team collaboration and blend of complementary resources resulted in systems customized to site needs and requirements. They also paved the way to project goals being achieved without interrupting day-to-day site operations.

Remote site locations and inclement weather made system design, construction and timing for each site high priorities. Systems needed to be resilient and easily transportable for assembly and installation. They also needed to be able to be quickly disassembled and removed should a fire threaten the site.

Key to the on-site assembly feature and lower installation costs was Trane's proactive approach that included providing as much pre-fabricated, factory-tested and assembly-ready equipment as possible before transportation to the sites. Lighting upgrades at each site were also made. They consisted of replacing inefficient florescent fixtures and incandescent bulbs with LED lighting, resulting in lower energy use.

Placing a Premium on Performance

Functionality in remote locations, energy and cost efficiencies, and mobility were advantages that made off-grid mobile solar PV systems the best solution for this subset of Region 5 facilities.

Rather than having generators operating 24 hours per day, 7 days per week, the systems rely on batteries to store electricity generated by solar panels when the sun is out and electricity demand is low. Electricity is then banked in the batteries for use when the system is not generating enough power to sustain facility functions, such as at night. The self-sustaining system is also ideally suited for remote locations, where grid-tied connections are either limited, unstable or not accessible.

Customized core system components for all five facilities include PV panels, batteries, charge controllers and inverters. Each site is equipped with a backup propane- or diesel-fueled generator. Since the project was completed, systems have operated successfully.

> "We are no longer dependent on generators as primary power sources for the stations. Using generators only as a backup eliminates a significant amount of fuel-delivery trips to remote locations and reduces their higher delivery costs."
>
> - **Phillip Hoover,** Engine Captain, Upper Lake Ranger District, Mendocino National Forest

Results

Partnerships between the public and private sectors, each with their own unique skills, approaches and resources, produce exceptional results – and the resilient PV/battery system and LED lighting project was no exception. From allowing the USFS to pursue its core mission more effectively to helping preserve the environment for future generations, the USFS Region 5 project is helping to set a new standard for sustainable facilities management in the U.S.

Operational

- Enhanced system function, reliability and resilience
- Decreased health and safety risks
- Energy independence

Environmental

- Declines in GHG emissions to barely zero
- Fewer fuel-transport deliveries and lower risk of spills
- Progress toward federal-sustainability, renewable-electricity and third-party contracting targets

Financial

- Nearly $3.8 million total guaranteed cost savings over the performance period, (under 14-year performance period, with AFFECT grant applied to 22-year simple payback)
  - 3,023 MMBtu projected annual energy savings
  - Approximately 82% renewable energy use
  - Conservatively estimated 70% or greater reduction in generator fuel at each site (depending on weather conditions and other factors), and service and replacement costs
- Improved data-monitoring and analysis

The project also supported U.S. businesses and products through compliance with the Buy American Act – 98.6% of total contract funds were paid to U.S. businesses.

About U.S. Forest Service (USFS)

The mission of the Forest Service, an agency of the Department of Agriculture, is to sustain the health, diversity and productivity of the nation's forests and grasslands to meet the needs of present and future generations.

The agency manages 193 million acres of public land, provides assistance to state and private landowners, and maintains the largest forestry research organization in the world. Public lands the Forest Service manages contribute more than $13 billion to the U.S. economy each year through visitor spending alone. Those same lands provide 20% of the nation's clean water supply, a value estimated at $7.2 billion per year.

The agency also has either a direct or indirect role in stewardship of approximately 80% of the 850 million forested acres within the U.S., of which 100 million acres are urban forests where most Americans live.

Awards and Recognition

- 2020 Federal Energy Management Program's (FEMP) Federal Energy and Water Management Award
- 2019 FEMP FEDS Spotlight Award
- 2019 Forest Service Region 5 Regional Forester's Honor Award

Contact the Trane Federal Team at 651-407-4000 or TraneFederalTeam@trane.com for more information.

GSA Contract Holder

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STRY-SLX002-EN
12/02/2024