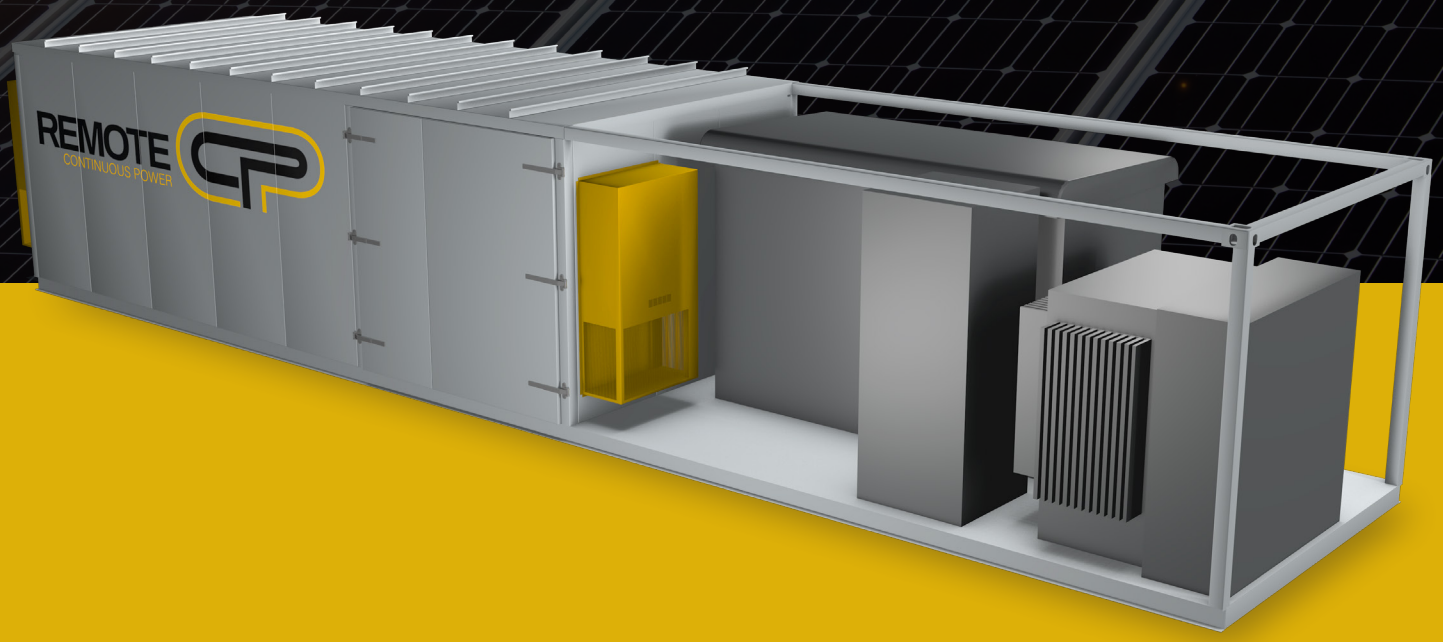
REMOTE CP™

CONTINUOUS POWER



PINE CREEK POWER SYSTEMS

Turnkey Remote Continuous Power Solution

Utility Support • Microgrid • Oil & Gas • Agriculture

www.PineCreekPower.com

Turnkey Solutions

Pine Creek Power Systems™ Proven Track Record

Pine Creek Power Systems™, LLC is well known for consistently providing intelligent solutions to complex critical infrastructure problems. Identifying common requirements among our portfolio of projects has lead to the development of the Remote CP™. Pine Creek Power Systems™' remote continuous power solutions provide additional power capacity when and where it's needed while protecting critical equipment against the nine most common power problems encountered on a modern distributed power network. With many years of development, engineering, construction and commissioning experience, Pine Creek Power Systems™' solutions integrate with your existing power network and provide the additional capacity and capabilities where you need it most.

Our in-house engineering and construction teams work seamlessly to coordinate with and create projects of the highest standard. With our installed base of electrical grid and island-supplied power systems, we are the experts in renewable energy, transmission, and battery storage solutions. Our resources enable us to control and safely manage all aspects of wind, solar, transmission, and battery storage construction projects. Pine Creek Power Systems™' engineering and design team can quickly provide solutions for your needs.

Working to ensure cooperation from local communities, municipalities, and energy companies, Pine Creek Power Systems™ balances commercial needs with environmental and social responsibilities to develop cost-effective, sustainable projects. Our products are designed for continuous, high-reliability power applications in both islanded microgrid and grid-tied configurations. Our multi-input systems are configured with fast-reacting lithium-ion battery storage, generator inputs, and single or multiple Solar PV inputs to support a strong or weak utility grid input and deliver continuous managed power. The system is supplied with remote monitoring and controls including automated alerts, data logging, and data storage.

Nine Common Power Problems

1. **Power Failure** — Loss of utility power due to weather, utility outage or source circuit switching
2. **Voltage Sag** — Short-term reduction in voltage often caused by the start-up of large load equipment
3. **Power Surge** — Commonly caused by lightning strikes that damage electrical equipment
4. **Undervoltage** — Undersized or overloaded utility and facility infrastructure causing premature equipment failure
5. **Overvoltage** — Fluctuations with increased voltage triggered by rapid reductions in power demand causing premature equipment failure
6. **Electrical Noise/Interference** — Created from transmitters, large electrical motors loads which can cause intermittent equipment problems
7. **Frequency Variation** — Changes in supply frequency from generators
8. **Power Factor** — Excessive reactive power in a distribution system can cause premature equipment failure and increased utility costs.
9. **Harmonic Distortion** — Distortion in the supply waveform causing errors and overheating in sensitive equipment

How it Works

Building a Remote CP™ system requires a comprehensive understanding of the customer's requirements and installation site. We consider a range of inputs, including customer requirements, land use, ecology, solar resource, wind speed, terrain, utility grid coordination, ease of access and a host of other criteria. Then, with our knowledgeable team, we design and build the optimal solution to meet our customers' expectations.

Power Applications

- Suitable for island microgrid and grid-tied configurations
- Multi-system input — generator, solar, wind, weak or strong grid
- Lithium or sealed (VRLA) battery storage solutions
- Single or multi MPPT (maximum power point tracking) solar inputs
- Remote monitoring and controls for automated alerts, data logging and data storage
- Capacity resource — utility & islanded microgrid
- Backup-power resource to the interconnected grid
- Radial line support — line hardening
- Peak shaving
- Power quality correction — VAR correction, frequency response & voltage-ride through
- Photovoltaic smoothing
- Battery arbitrage
- Black start capable

Applications

Peak Load Management

Integrating dispatchable battery storage assets and intelligent controls with our customer's distribution networks insures our systems are able to regulated demand from the utility service provider. This approach can reduce or eliminate peak energy costs, eliminate downtime and provide system resiliency.

Microgrid

With knowledge, data, and experience in the development of microgrids, Pine Creek Power Systems™ ensures the ultimate in efficiency and reliability. We have an extensive database of real-time site data along with the site analysis data. We also know what it means to operate a fully independent microgrid based on multi-sourced energy inputs, deferrable loads and intelligent controls.

Utility Capacity Constraint

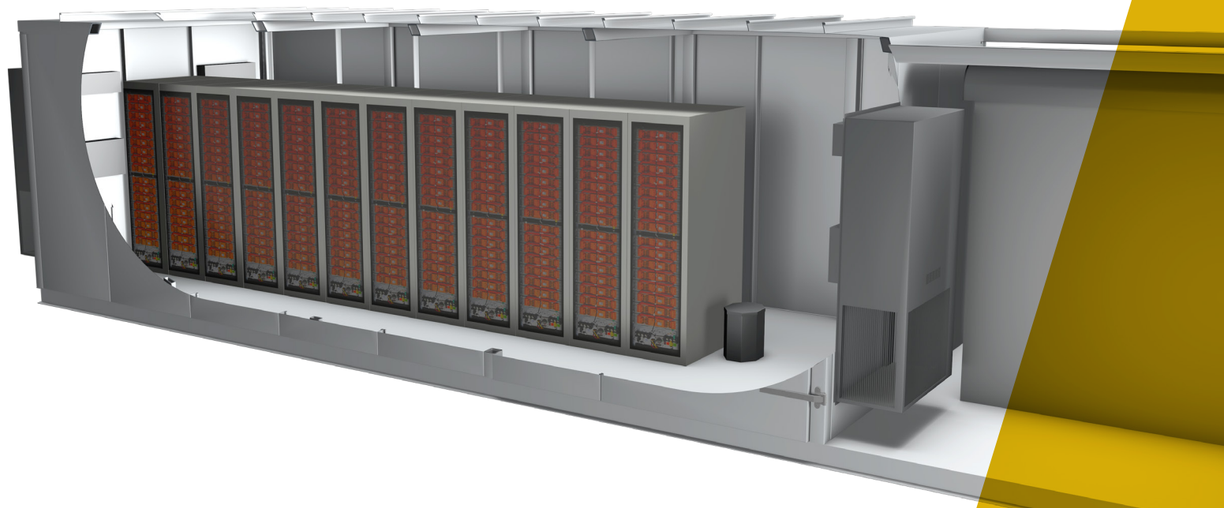
Pine Creek Power Systems™ has the experience in augmenting the available grid supply with auxiliary power, either as an alternative to provide increased reliability or to provide additional capacity in a grid constrained environment, to deliver uninterrupted and cost-effective power for the data center environment.

Telecommunications

Pine Creek Power Systems™' Remote CP™ provide localized supply capabilities to remote telecommunication towers in isolated regions with limited or no access to the electrical grid. Employing best in class Lithium-Ion battery storage, solar arrays and diesel or gas generators, our solutions provide the necessary power for year-round continuous operation and reliable communications.

Industrial – Drilling

Combining Lithium-Ion battery storage with a traditional gas or diesel generator and/or utility grid supply enables drilling operations to maximize efficiencies, eliminate downtime, reduce peak loads on the grid, and reduce emissions, while providing a friendlier solution to the environment. Control algorithms allow flexibility in the use of battery storage during lower power demand operations to shift energy demand from the utility grid to the battery, while also reducing the need for oversized generators. This allows the drilling operation to continue during "quiet periods" or low demand periods, reducing the need for a high-noise generator.



Technology

Electrochemical Battery Storage

- Lithium-ion
- Lead acid (VRLA)

Thermal Generation

- Diesel
- Heavy fuel oil
- NG, LPG, methane

Renewable Generation

- Solar photovoltaic
- Wind

Modular Design

- Mobile units
- Plug & play
- Self-contained
- Factory constructed
- 120 mph wind rating
- 12 Gauge walls
- Integrated electrical switchgear
- Top and bottom lift

Bi-directional Inverter Architecture

- Rapid transfer from grid to microgrid mode
- Frequency and voltage grid / microgrid support
- Active and reactive power management
- Critical and deferrable load control

intelligentRE

Pine Creek Power Systems™ has developed Intelligent RE™ to operate various sites that it has under management. Intelligent RE™ monitors and controls power generation equipment in a utility grid or microgrid environment using data supplied by the power system to make resource usage decisions. This functionality results in increased reliability and lower overall operating costs for the power system.

Intelligent RE™ is designed for utility grids and microgrids from a few hundred Kilowatts to multiple Megawatts. The algorithms implemented are designed to minimize renewable power curtailment while finding an optimal balance between battery storage, major grid assets, where appropriate, grid-imported energy costs, and grid-exported energy revenues. Intelligent RE™ is responsible for optimally managing the grid assets and controllable loads, minimizing the need for operators to manage a power system grid or microgrid operation on a daily basis.

Features/Benefits

- Grid management and control with a central Linux based controller
- A fully automated supervisory system monitors and controls power equipment in grid or microgrid applications
- Uses local and cloud-based stored data (historian) to make resource usage decisions that result in lower operating costs
- Interfaces with the supervisory control and data acquisition system (SCADA) to acquire telemetry data including local weather
- Forecasts are continuously run against operating ranges to ensure the system maintains high reliability and uptimes
- Soft warnings generate alerts in the event that human intervention is required

Base Configurations

Power Output

kW based on 1.0 PF	250kW	500kW	750kW	1000kW	1500kW
SKU #	RPC250NSTD	RPC500NSTD	RPC750NSTD	RPC1000NSTD	RPC1500NSTD
AC Current (Nom)	485 Amps	965 Amps	1434 Amps	1930 Amps	2900 Amps
Output Voltage	300V(Various options with transformer)	300V (Various options with transformer)	400V (Various options with transformer)	400V (Various options with transformer)	480V (Various options with transformer)
Efficiency	98.0%	98.6%	98.7%	98.7%	98.7%
Auxiliary Inputs	Modbus, PROFIBUS, Ethernet	Modbus, PROFIBUS, Ethernet	Modbus TCP	Modbus TCP	Modbus TCP

Frequency	**THD (Current)**	**Power Factor Compensation**	**Auxiliary Inputs**	**Grid Support**
50 / 60 Hz	< 3%	YES	Solar, Wind Turbine	Reactive Power Compensation, Power Reduction, Low Voltage Ride Through

Power Electronics

	250kW	500kW	750kW	1000kW	1500kW
Max Input Power (DC)	300kW	600kW	1200kW	1200kW	1450kW
DC Voltage Range	450V to 750V	450V to 750V	620V to 820V	620V to 820V	620V to 820V
Max DC Current	600 Amps	1145 Amps	1935 Amps	1935 Amps	2338 Amps
AC Ripple	<3%	<3%	<3%	<3%	<3%

Battery

	250kW	500kW	750kW	1000kW	1500kW
Modules Per Rack	14	14	17	17	17
Number of Racks (30 mins)	3 racks (138kWh)	6 racks (277kWh)	4 racks -High Density (370kWh)	5 racks -High Density (461kWh)	8 racks -High Density (738kWh)
Number of Racks (60 mins)	6 racks (277kWh)	6 racks -High Density (554kWh)	8 racks -High Density (738kWh)	10 racks -High Density (923kWh)	16 racks -High Density (1477kWh)
DC Bus	721 V nominal	721 V nominal	816 V nominal	816 V nominal	816 V nominal

Module Voltage	**Design Life**
48 Vdc	8 years

Power Container

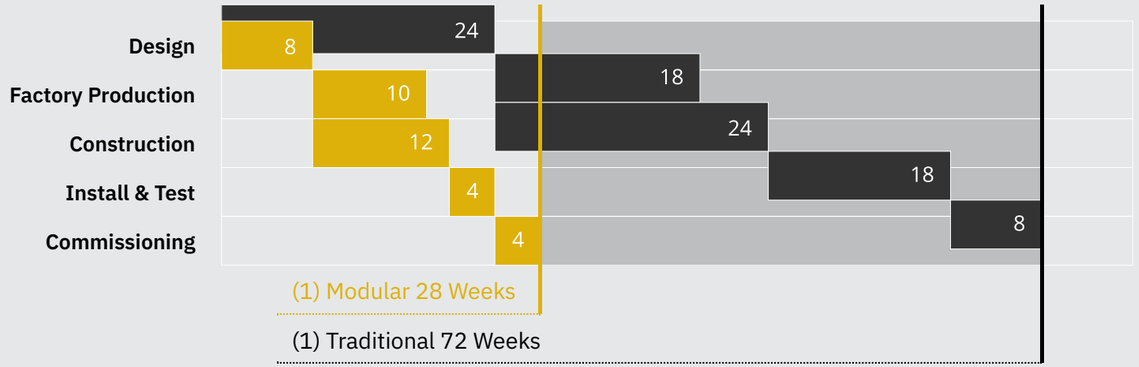
	250kW	500kW	750kW	1000kW	1500kW
Dimensions L X W X H (Typical)	20' X 10' X 10'	25' X 10' X 10'	30L' 10' X 10'	35L' 10' X 10'	40' X 10' X 10'
Cooling System	3 X 3 Ton (N+1redundant)	3 X 3 Ton (N+1redundant)	3 X 3 Ton (N+1redundant)	3 X 4 Ton (N+1redundant)	3 X 4 Ton (N+1redundant)
Weight (Estimated)	60,000 lbs (60 mins)	68,000 lbs (60 mins)	74,000 lbs (60 mins)	90,000 lbs (60 mins)	110,000 lbs (60 mins)

Color	**Doors**	**Safety**
White (standard) Options upon request	Double width entry / exit	Fire Detection (standard)

Benefits of Modular

Scalable • Saves Time & Money • Improved Quality • Reduced Site Work Complexity

Pine Creek Power Systems™ is one of the first suppliers to make available a standard set of remote continuous power solutions with proven designs. These fully integrated power modules expedite the delivery process by taking a large part of the power construction offsite to a dedicated ISO 9001 manufacturing facility. This allows site preparation work to focus on the critical site elements and reduce the risks associated with building the power element on site. When the site preparation work is completed, the fully tested Remote CP™ can be delivered to the site and a final test and startup procedure performed.



Environmental

	250kW	500kW	750kW	1000kW	1500kW
Max Noise level	< 75dBA	< 75dBA	< 55dBA	< 55dBA	< 55dBA

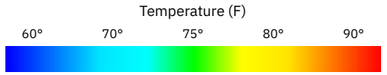
Temperature	**Outside Humidity**	**Altitude**	**Wind Velocity**	**HVAC**
-40 to +120 F (container design)	100%	2000m (without derating)	120 mph (with tie down kit)	Self contained, redundant, cooled and heated

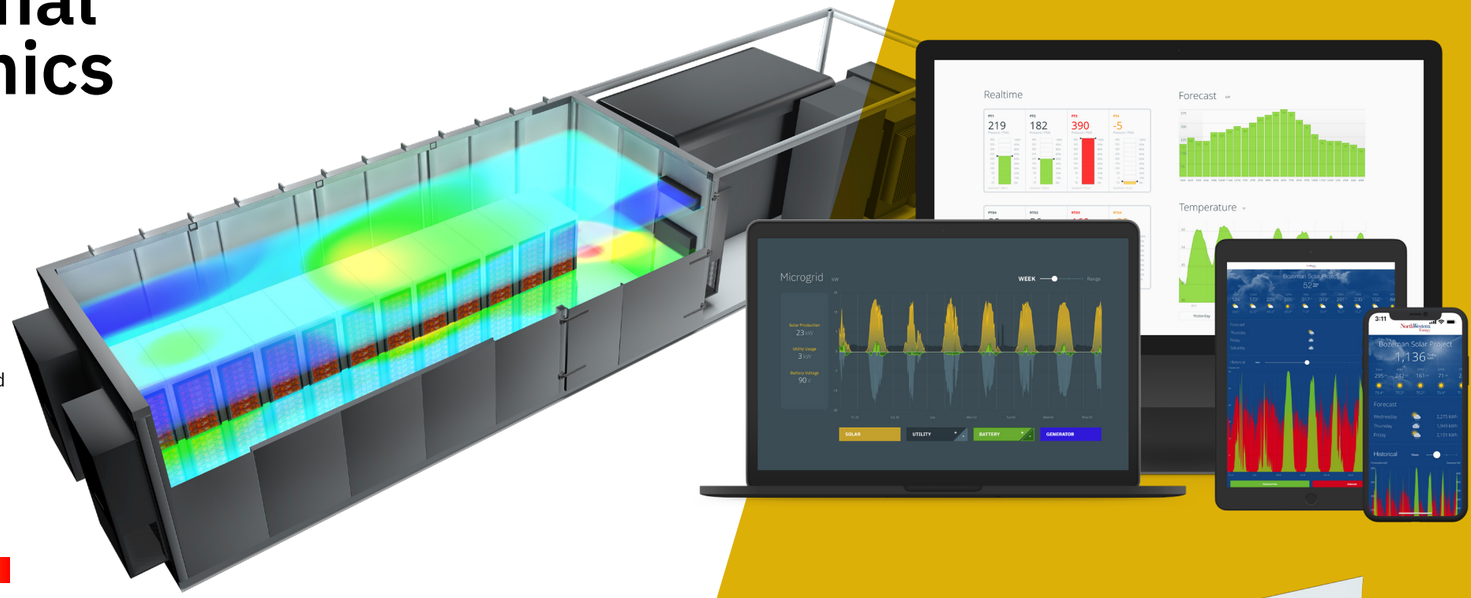
Certifications

Power Electronics	**Saftey and EMC**	**Modular Container**	**Transformerers**
VDE, CEI, UNE, RD, EDF, BDEW	NEC and CE Conformity	UL 1741 (designed to meet)	UL or CE
Switch Gear	**Fire Detection**	**Fire Supression**	
UL or CE	UL Listed and /or FM Approved	UL Listed and /or FM Approved	

Computational Fluid Dynamics

To ensure each Remote CP™ operates optimally under the site's thermal conditions, we perform a CFD (computational fluid dynamics) simulation on all custom system configurations. We computer simulate airflow dynamics, including the battery, switchgear, and electrical equipment in the container. This ensures the appropriate level of cooling and heating to maintain equipment reliability and to meet the requirements in any environment.





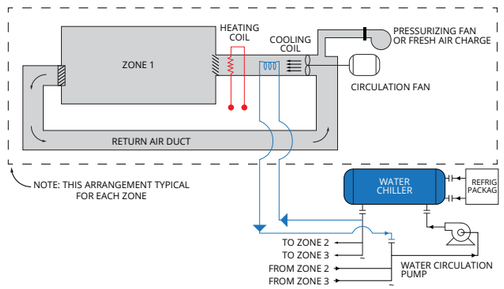
intelligentRE

Data, Monitoring, Forecasting, Web Dashboards, Mobile Apps, Consumer & Utility Interface

At Pine Creek Power Systems™ we know how important it is to have up to the minute data available at your fingertips. That's why we developed Intelligent RE™ for iPhone, Android, and Web Application interfaces to support our Remote CP™ system. These applications provide instantaneous real-time data that can be used to monitor performance at single or multiple locations. No other manufacturer has these advanced tools available that can be customized to your specific needs.

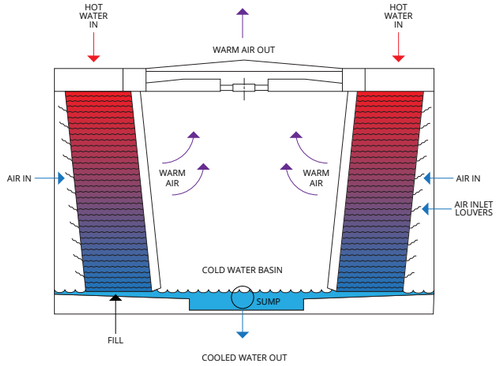
Thermal Management

Direct Expansion



- Does not require water on site
- Simplest method to cool the container
- Minimal size impact — side mounted
- Air handling unit design optimized according to location and temperature parameters

Adiabatic



- Requires a readily available supply of clean water on site or from refillable tanks
- Higher efficiency / lower overall cost of operation
- Optimized end of module air handling unit — zero roof penetration
- Air handling unit design optimized for location and temperature parameters

Custom Enclosure

Designed for Reliability and Sustainability of the Mobile Modular Architecture

- Custom-built mobile unit constructed for robustness and severe use conditions, with top-lift and bottom-lift capabilities prior to full loadout
- 12-Gauge exterior metal walls
- 20-Gauge galvanized interior lining panels
- 3/8" A36 floor plate with non-skid floor
- Redundant HVAC units (N+1 configuration) for air circulation, filtration, cooling, and heating

Options & Customizations

At Pine Creek Power Systems™ we understand the importance of designing a modular system that meets your requirements from a performance and aesthetics perspective. That is why we retain a level of customization capability. We have selected components and subsystems from leading manufacturers that can deliver long-term quality and reliability even in the most extreme locations. We ensure that each Remote CP™ undergoes rigorous testing at our manufacturing facility in Texas to ensure minimal startup and commissioning time onsite.

Levels of Customization

- Air handling and environmental controls designed for the location and local environment
- Size of container module (dependent on power requirements)
- Fire detection and suppression options (dependent on location and local fire codes)
- Ballistic resistant option (additional steel plating for remote locations)
- Color & graphics
- Customized wraps designed to minimize/maximize visual impact
- Site built system if required

Battery Storage

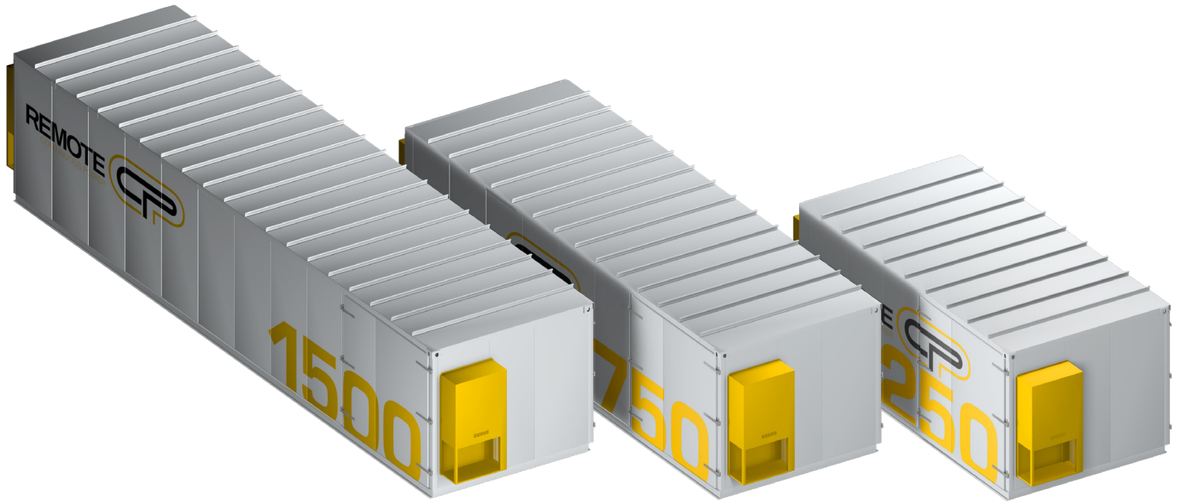
- Back up / battery storage time (30 min and 60 min options in standard configurations) contact sales office for longer runtime options

Certifications

- Full UL certification (additional charge)
- Factory witness testing

Software & Controls

- Software controls and customization to meet application needs
- Multiple interface options
- Upstream data and analytics



1500kW
40ft

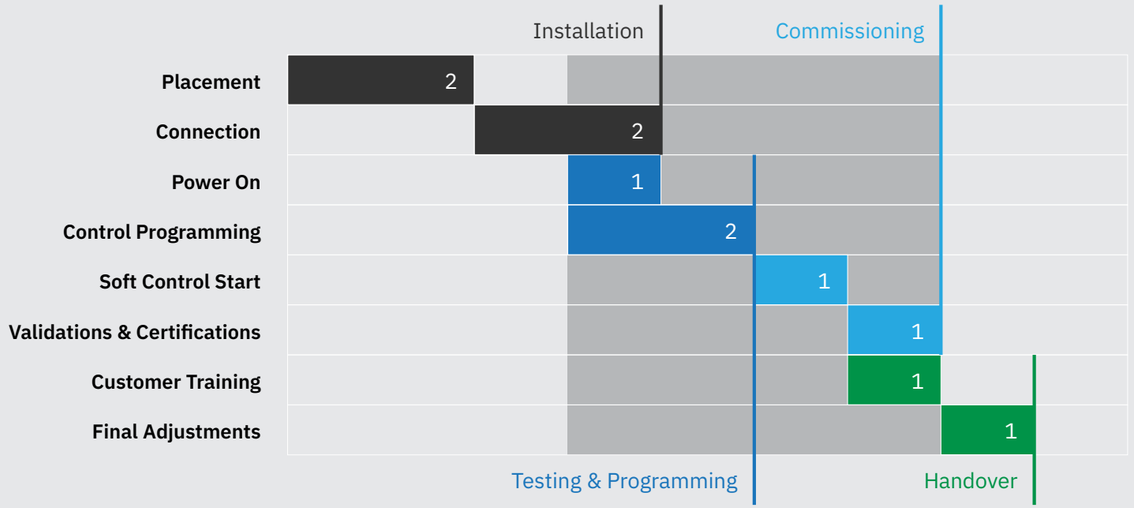
750kW
30ft

250kW
20ft

Site Deployment

Installation, Testing, and Commissioning of Remote CP™ Systems

The Site deployment phase typically covers the installation, test, and commissioning of the Remote CP™ systems. The Pine Creek Power Systems™ team allows approximately 8 weeks for this process, however, many of the activities can take place in parallel thus reducing the actual on-site time depending on the construction requirements and the design of the overall system. We perform all critical functional pretests at the factory, reducing the site commissioning work.



Maintenance & Service

- 7 X 24 monitoring and callout available
- Tailored service offerings — customized to your specific needs
- Fully trained technicians available to support site maintenance and repair needs
- Advanced service and engineering for applications support and upgrades
- Training — basic operator and maintenance training of site operators included as standard
- Service teams are 100% backed by the Pine Creek Power Systems™ advanced engineering team

PINE CREEK POWER SYSTEMS

Building, Owning and Operating Conventional and Renewable-Based Power Generation Systems

Pine Creek Power Systems™, LLC is dedicated to the research, development, and commercialization of conventional and renewable energy technologies, including automated asset control systems, project simulation and design and project enhancement for existing assets. The Pine Creek Power Systems™' solution addresses a growing global demand for distributed power by using islanded and microgrid power systems to increase reliability and lower operating costs.

Pine Creek Power Systems™ focus is on developing, building, owning and operating conventional and renewable-based power systems in the Western United States, although it has power systems under management in the Caribbean Basin that have served and continue to serve as research and development sites.

Utah

(801) 203-4491

111 East Broadway, Suite 150

Salt Lake City, Utah 84111 – USA

Pine Creek Power Systems™ Background

As energy generation transitions from large centralized to smaller local distributed generation systems, Pine Creek Power Systems™ is addressing the growing global demand for decentralized, reliable, high-efficiency, low-carbon power using islanded and microgrid power systems to increase reliability and lower operating costs.

The companies' focus is on developing, building, owning and operating distributed, reliable, efficient conventional and renewable-based power systems in the Western United States, although it they have power systems under management in the Caribbean Basin that have served and continue to serve as research and development sites.