Microwave RF Repeaters and Off-Grid Site Power

Microwave RF Repeaters

Alternative Power

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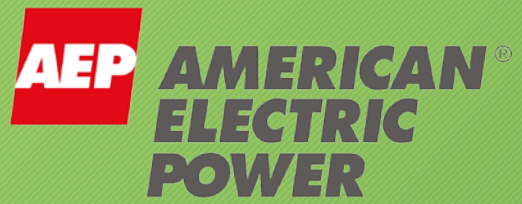
Who We Service

- Government
- Carriers
- Utilities
- Private Enterprise

Maryland.gov

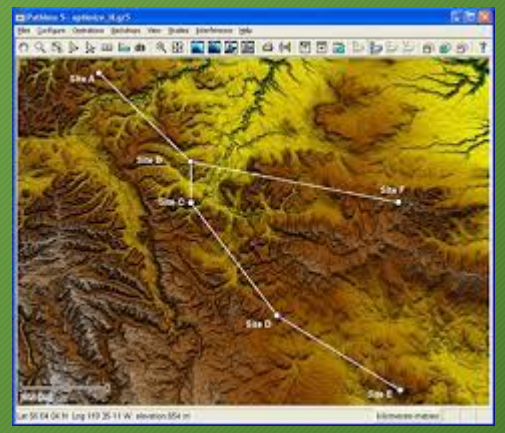
Calaveras County



verizon

Current Offerings and Activity

- Microwave System Design
- Microwave RF Repeater Solutions
- Off-Grid Power Solutions
- Microwave radio repair service on over 30 product lines
- Emergency microwave radio kitting and staging
- On-site repair and troubleshooting of microwave systems
- Project Management
- Inventory Management



Microwave RF Repeaters

Near the Grand Canyon, 5000 ft

- MW RF repeaters relay microwave signals over or around obstructions such as:
  - Mountains
  - Obstructing terrain
  - Buildings
- Low DC power consumption and outdoor installation are ideal for:
  - Off-Grid power, PV solar
  - Remote, unattended, reliable operation
- Non-dropping, through repeater, radio relay
  - No circuit access
  - Out of band supervision telemetry

Microwave RF Repeaters

Suitable for difficult locations:

No Roads, No Power, No Shelter

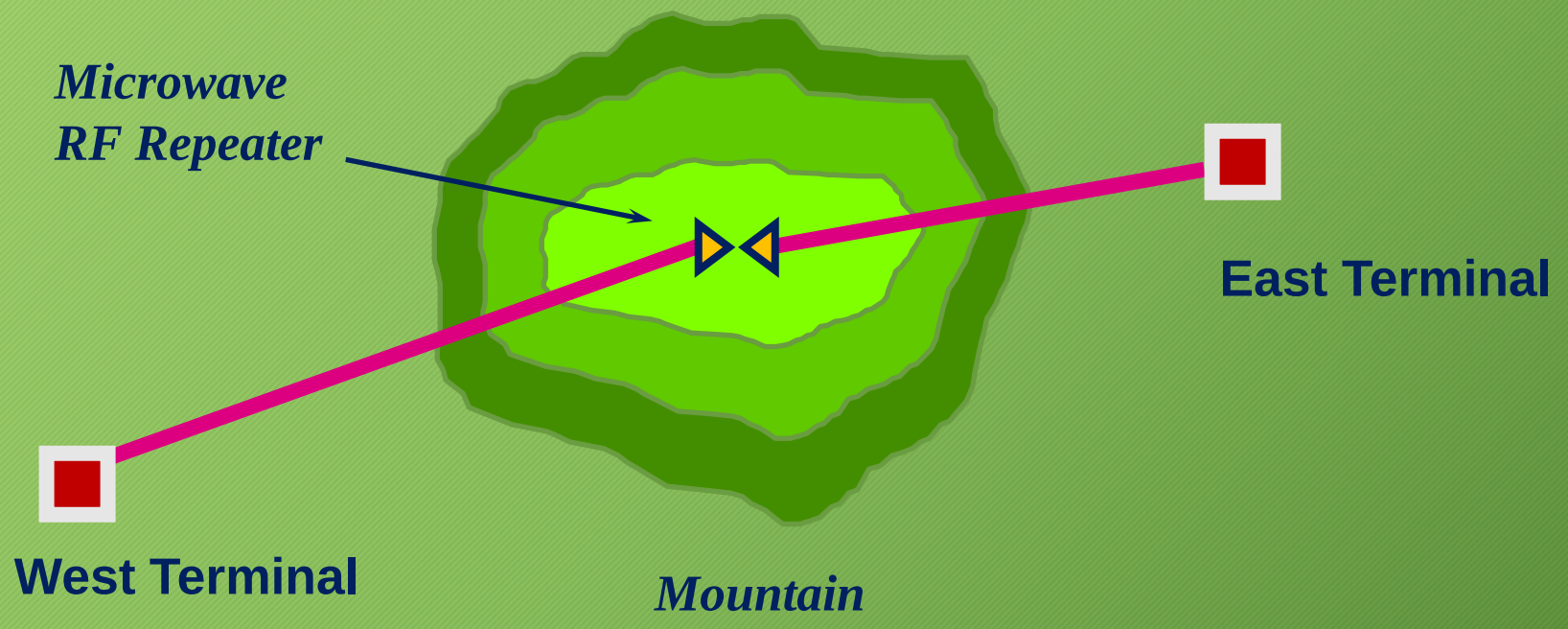
Mountain top in Chile, Pocas Penas

1200 m, 4000 ft elevation

Helicopter built,
serviced on horseback

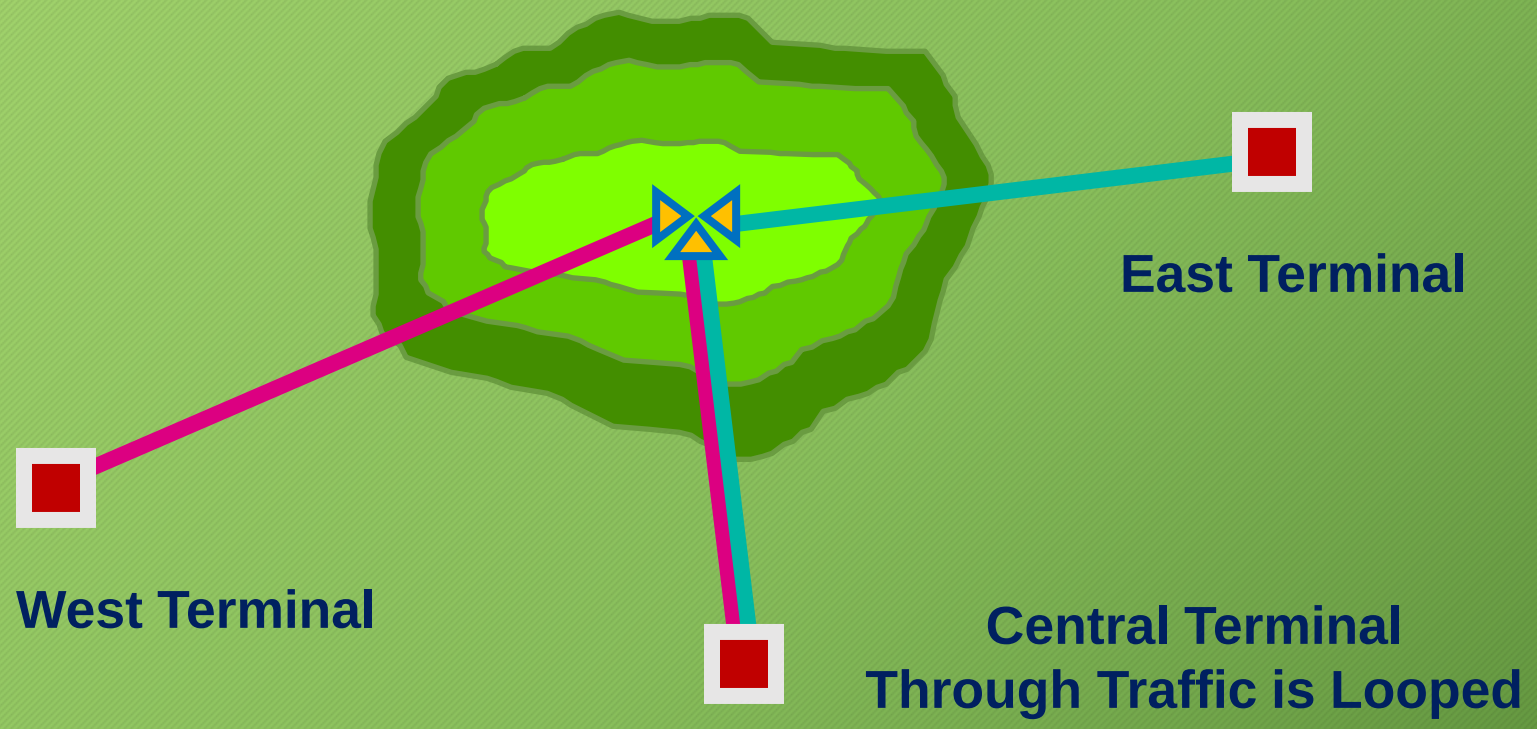
MW RF Repeater Applications

- Mountain Top Radio Relay Station

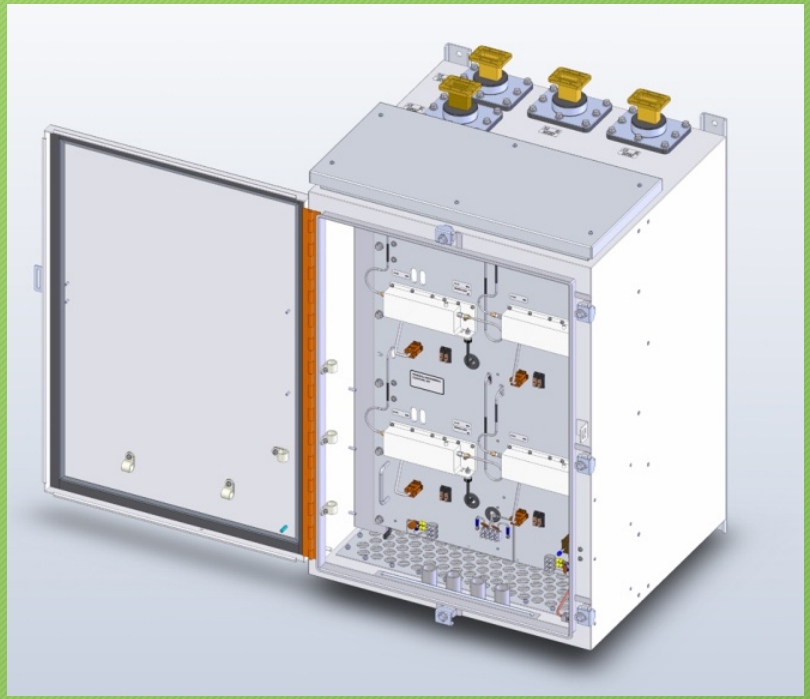


MW RF Repeater Applications

- “Y”-Junction RF Repeater Station



RF-6000E MW RF Repeater

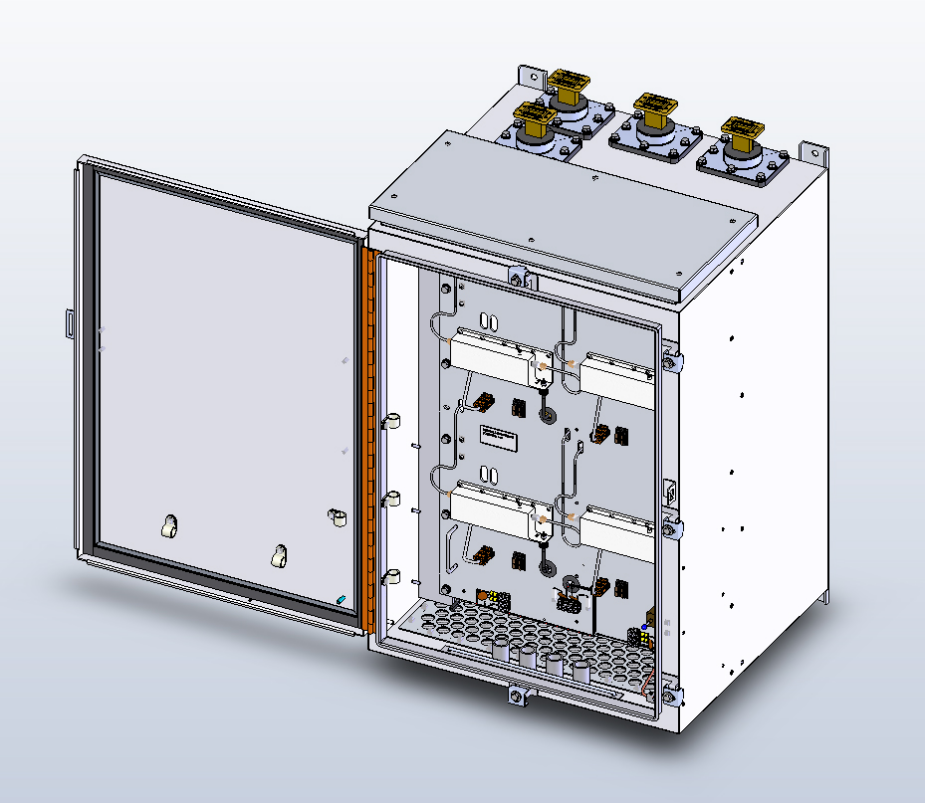


RF-6000E-099 4 Port 4 Amplifier

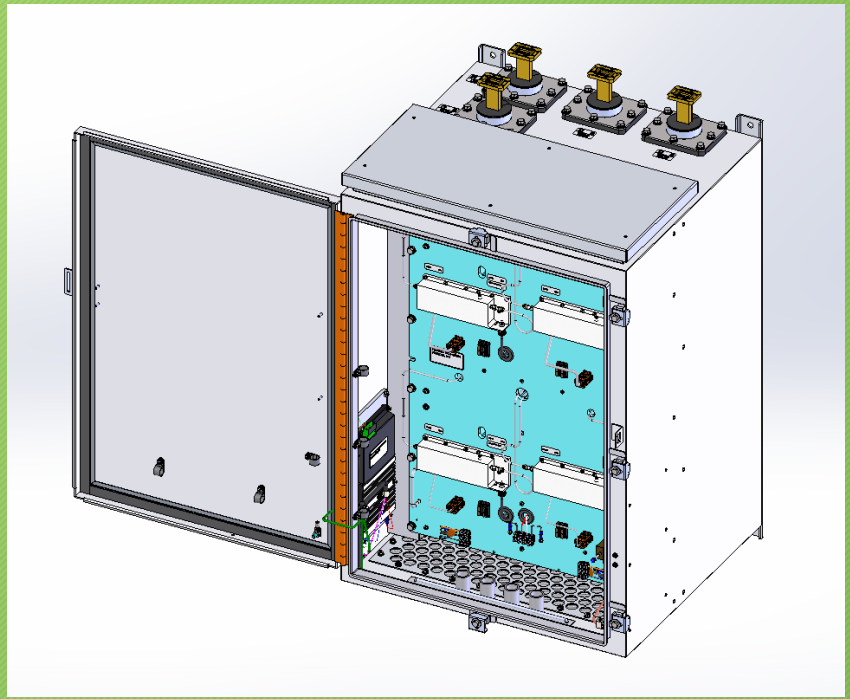
- 5925 ~ 7125 MHz, CPR137G waveguide flange
- Channel Bandwidths supported:
  - 30 MHz or less
  - 60 MHz in L6
  - 40 MHz in EU U6
- Modulations supported: QPSK to 2048QAM
- Low DC Power Consumption
  - +24 V typically
  - <40 W
    - 1+0 Configuration, 2 PA
  - <80 W
    - 2+0 Configuration, 4 PA

7 & 8 GHz MW RF Repeaters, US Federal band

- RF-7000E
  - 7125 ~ 7900 MHz, CPR112G waveguide flange
- RF-8000E
  - 7700 ~ 8500 MHz, CPR112G waveguide flange
- Bandwidths supported: ≤30 MHz, 40 MHz
- Modulations supported: QPSK ~ 2048QAM
- Low DC Power Consumption
  - +24 V typically
  - <40 W
    - 1+0 Configuration, 2 PA
  - <80 W
    - 2+0 Configuration, 4 PA



RF-11000E MW RF Repeater



RF-11000E-099 4 Port 4 Amplifier

- 10,700 ~ 11,700 MHz, CPR90G waveguide flange
- Channel Bandwidths supported:
  - 40 MHz or less
  - 60 MHz
  - 80 MHz
- Modulations supported: QPSK to 2048QAM
- Low DC Power Consumption
  - +24 V
  - <75 W
    - 1+0 Configuration, 2 PA
  - <150 W
    - 2+0 Configuration, 4 PA

11 GHz MW RF Repeater, Hydroelectric Dam

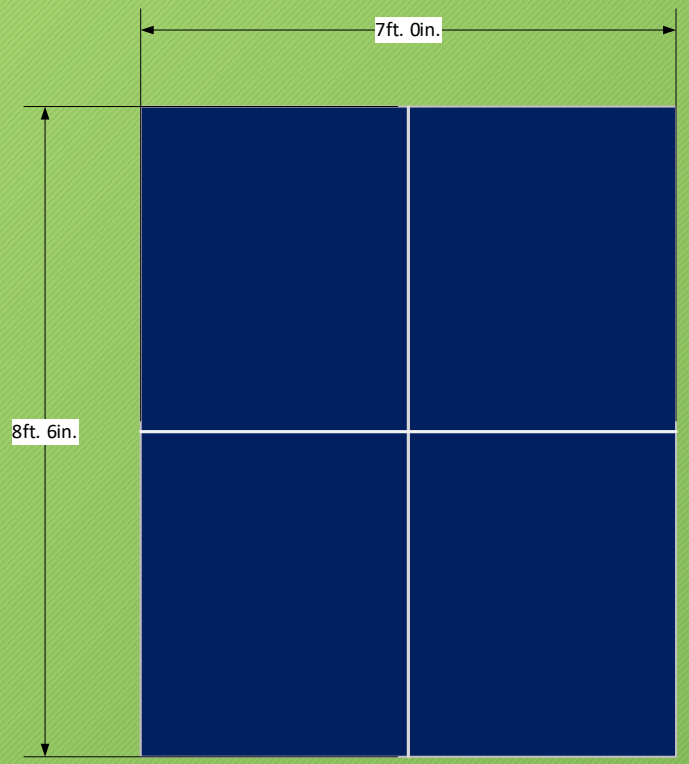
RF-11000E-099 4 Port 4 Amplifier

- RF-11000E Repeater at Sechelt, BC
- Helicopter build
- 4.2 kW PV Solar, 250 W TEG
- 150 W DC Load
- Shelter Mounted
- 16-DS1 Capacity, 16QAM
- SD + FD Hybrid Diversity
- 43 km over water, 73 km total path
- Passive Reflector on 1.7 km leg to dam
- Reliability: 99.999880%, 38 seconds outage

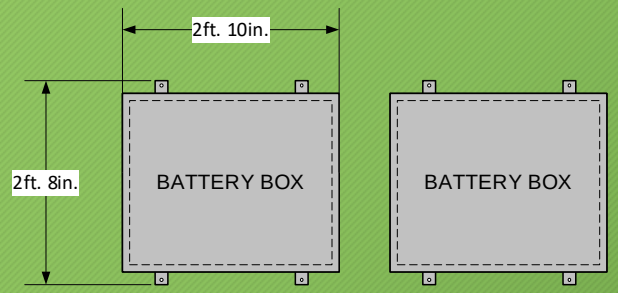
Off-Grid Site Power

- Ideally located telecommunications sites may not have mains power easily available
- Off-Grid Power Choices - *practical*
  - Photovoltaic Solar
  - Wind Turbines
  - Fuel Cell Electric Generators
  - Thermal Electric Generators
  - Motor Generators
  - Battery Storage
  - Hybrid combinations of power sources

Power for 100W Site Load



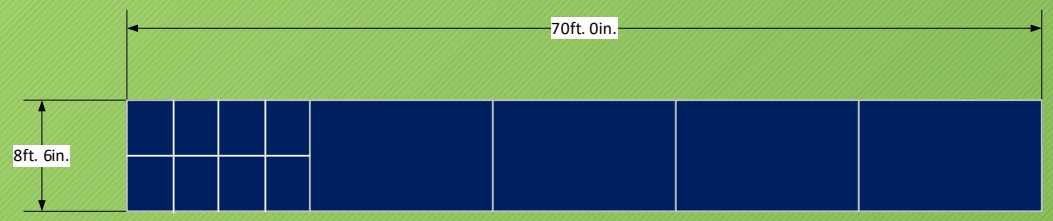
SCENARIO 1
1.16 kW Solar PV Array



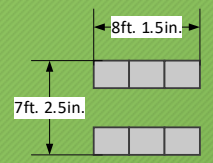
BATTERY A&B
+24V 1640 Ah

- Annual Load: 872 kWh/yr
- Solar: 1.16 kW, 55° tilt
  - Ground Space: 60 Sq Ft
- Battery: +24V A&B
- Storage: 1,640 Ah, 38 kWh
- Autonomy: 12.7 days, 20% SOC
- Budgetary Estimate, EF&I: $72,150

Power for 1 kW Site Load



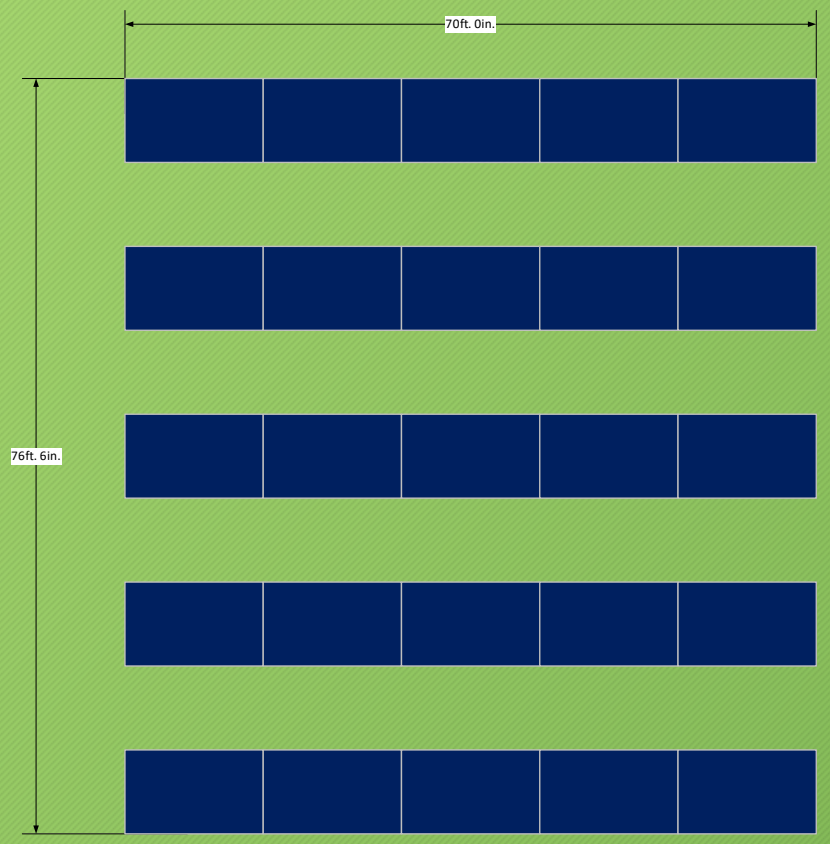
SCENARIO 2
11.60 kW Solar PV Array



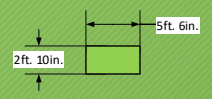
BATTERY A&B
-48V 7570 Ah

- Annual Load: 8,450 kWh/yr
- Solar: 11.6 kW, 55° tilt
  - Ground Space: 595 Sq Ft
- Battery: -48V A&B
- Storage: 7,570 Ah, 350 kWh
- Autonomy: 12.1 days, 20% SOC
- Budgetary Estimate, EF&I: $377,200

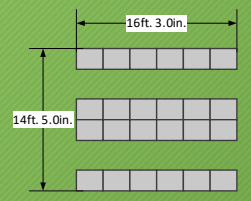
Hybrid Power for 10 kW Site Load



SCENARIO 5
58.00 kW Solar PV Array



GENSET
20 kW



BATTERY A&B
-48V 30,310 Ah

- Annual Load: 88,461 kWh/yr
- Solar: 58 kW, 55° tilt
  - Ground Space: 5,355 Sq Ft
- GenSet: 20 kW, Propane fuel
  - Run Time: 609 hrs
  - Fuel: 5,175 L
- Battery: -48V A&B
- Storage: 30,310 Ah, 1,401 kWh
- Autonomy: 3.9 days, 35% SOC
- Budgetary Estimate, EF&I: $1,651,990

PV Array Example, use of available space

11.75 kW PV Solar Array

15° tilt

Elevated platform over shelter

PESI Experience

- Stateline Pk, NV, 8,000 Ft AMSL
- PESI 6 GHz RF Repeater, 1+0, 50W
- PV Solar: 1.1 kW
- Battery: +12V, A&B
- Storage: 2,050 Ah
  - Minimum Temperature: -10°C
- Autonomy: 15.7 Days

PESI Experience

- Sechelt Pk, BC, 3,650 Ft AMSL
- PESI 11 GHz RF Repeater, 1+1, SFD, 150 W
- PV Solar: 4.2 kW
- Battery: +24V, A&B
- Storage: 2,560 Ah
  - Minimum Temperature: -5°C
- Autonomy: 13.7 Days

PESI Experience

- VZ Onyx, CA, 4,460 Ft AMSL
- DLC RTU T-1 POTS, 120 W
- PV Solar: 1.4 kW
- Battery: -48V, A-Only
- Storage: 630 Ah
  - Minimum Temperature: 0°C
- Autonomy: 7.3 Days

PESI Experience

- VZ Pine Mtn, CA, 4,550 Ft AMSL
- PESI 11 GHz RF Repeaters, 2+0, 3-Way, 150 W
- PV Solar: 1.2 kW on elevated platform
- Battery: +24V, A&B
- Storage: 2100 Ah
  - Minimum Temperature: -5°C
- Autonomy: 12 Days

Thank You!

- Visit us at our table
- Ask questions
- Discuss projects