Comparison of Communications Equipment Power Consumption

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Polar Technology Conference
Menlo Park, California
26 & 27 April 2007
Website on Power Systems for Polar Deployment

OBJECTIVE

PolarPower.org is funded by the National Science Foundation with the goal of providing a useful working resource for researchers in choosing, designing, implementing, and maintaining remote power systems in polar environments. This site allows the polar research community to establish a foundation of knowledge, share experiences, and stay current on technological developments.

TECHNOLOGIES FOR REMOTE POWER APPLICATIONS

This section offers basic information regarding the various technologies available for remote power systems and their applicability for both small and large implementations, as well as practical information regarding choosing, designing, and implementing them.

The content draws on the design and field experiences of both VFR's team of experts and the polar research community. This information is presented as white papers, product reviews, and (in the future) engineering calculators.

The basic technology sections are:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="link" alt="Engine" /></td>
<td><strong>Engine</strong> - Internal combustion engines are a proven technology used worldwide. A wide selection of fuels are usable, depending on the application. <a href="link">link</a></td>
</tr>
<tr>
<td><img src="link" alt="Fuel Cell" /></td>
<td><strong>Fuel Cell</strong> - A fuel cell is an electrochemical device that combines hydrogen and oxygen to produce electricity. The process is clean, quiet, and efficient. A byproduct of the process is water, however, which can be a problem for deployments in a polar environment. The technology is still in its infancy, but commercial products are becoming available. <a href="link">link</a></td>
</tr>
<tr>
<td><img src="link" alt="Hydroelectric" /></td>
<td><strong>Hydroelectric</strong> - Small scale turbines can provide a source of electricity at sites where water can be found in a liquid state for at least part of the year. <a href="link">link</a></td>
</tr>
<tr>
<td><img src="link" alt="Solar Electric (Photovoltaic)" /></td>
<td><strong>Solar Electric (Photovoltaic)</strong> - Cells made up from two or more layers of semiconductor material can produce electric power when excited by photons. The sun is a major source for such photons, but the process also works for other sources of light. Cells may be stacked into arrays to meet different voltage and power requirements. <a href="link">link</a></td>
</tr>
<tr>
<td><img src="link" alt="Storage" /></td>
<td><strong>Storage</strong> - Primary and rechargeable batteries are often used as a site's sole source of power or in conjunction with one or more of the available power generation technologies to provide a reservoir of continuous power to the load. Flywheels and ultracapacitors are new technologies that are finding their way as a replacement for rechargeable batteries. <a href="link">link</a></td>
</tr>
<tr>
<td><img src="link" alt="Wind" /></td>
<td><strong>Wind</strong> - Wind-powered turbines are a clean source of power. Special problems arise with a moving mechanical device in polar regions prone to ice formation and high wind velocities. Mounting structures also provide challenges for systems that may be located on ice fields well above solid ground. <a href="link">link</a></td>
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</tbody>
</table>
Iridium Transceivers

9505

A3LA-D
Inmarsat BGAN – Nera WorldPro 1000/1010

- Good data rates for background Internet service
  - 60 kbps uplink
  - 120 kbps downlink

- Cost effective
  - $2,800 purchase cost
  - $35/month
  - $0.90/minute voice
  - $6.47/MB data
    (1/10th cost of Iridium)

- Tested with PC and Mac

- Nera needs manual intervention. Hughes and Thrane & Thrane do not.
Nera WorldPro 1000/1010 Features

- Rugged. Specified for cold climates (-20° to + 55° C)
- Separable antenna unit. 3-, 10- or 20-meter interconnecting cable option.
- 5 hr Transmit on internal battery. Runs from 12-V ext. battery.
- Standby mode for “always on” connectivity
- Interface: USB (1000), USB & Ethernet (1010)
Inmarsat BGAN Coverage – Spot Beams

The map depicts Inmarsat's expectations of coverage but does not represent a guarantee of service. The availability of service at the edge of coverage areas fluctuate depending upon a variety of conditions. The launch of the F-3 satellite will be determined in due course.
Power Consumption – 103 kB file transfer

Iridium 9505
0.461 W-hr

Nera WorldPro 1000
0.214 W-hr
Power Consumption – 0.103 & 1.03 MB file transfers

**Iridium 9505**
- 5.2 W-hr (estimated)
- 65 minutes (estimated)
- $78 commercial rate

**Nera WorldPro 1000**
- 0.431 W-hr
- 4.2 minutes
- $7.50 commercial rate
Power Consumption – Lenovo T60p

Power Consumption

31 W
Power Consumption – Lenovo T40p

Power (Watts)

Time (minutes)

Windows bootup
Lid closed (screen off)
Lid open - max bright
Lid open - min bright
WLAN on
WLAN off
Defragment hard drive
USB Drive installed
USB file transfer
Simple computer ops
Hibernate
Standby
Simple computer ops

25 W
Power Consumption – Panasonic CF-30 Toughbook

Power Consumption

17 W