

**North Portland Neighborhood Services Grant
BikeNET: Solar-powered Neighborhood Communications**



Introduction:

This BikeNet proposal provides AC power, communications and public signage in North Portland in a bike trailer. This third draft of the BikeNET proposal features additional power, including 100 watts of solar power, a 100 amp/hr battery, and a 1000 watt AC inverter to provide neighborhood and Emergency Team communications. Easily stored and moved by bike, it provides events in North Portland with USB phone charging, wireless hotspot service and live social media signage.

It increases solar and power capacity but eliminates Karaoke as an engagement tool. We are seeking comment and feedback before submission to the North Portland grant committee on November 15.

2. Objectives:

- Mobile power and communications at North Portland events.
- Digital signage for news and events.
- Easily stored, moved and setup.
- Sustainable power and communications in an emergency.

3. System Description:

Stored in an ordinary bike trailer, and available to multiple NET teams in North Portland, the solar-charged BikeNET delivers community outreach, social media, NET communications and power, 24/7.

- Two 50 watt solar panels (\$100 each), charge a 12 volt, Sealed Lead Acid battery (\$200) for power
- DC power includes eight, 2.4 amp USB ports, 8 Anderson Powerpole 12 volt sockets, and a female cigarette outlet. Device charging is available via USB ports.
- AC power is provided with a 1000 watt pure sine wave inverter.
- A free public hotspot is available for live streaming and internet access.
- News and event information are displayed by an Acer Chrome Flipbook (\$200) which transforms into a tablet. It runs Google Docs, Apps and Drive (free), allowing managers to create and share documents in an open format.
- A Baofeng (ham) radio (\$30) and a TERA TR-505 walkie-talkie (\$99) provide radio communications.
- Two, Ed Fong J-pole antennas (\$30 each) are suspended on an 18 ft painter's pole, one for each radio.

With an average power draw of 50-60 watts, this system should provide up to 24 hours of power and the ability to recharge the 12 volt, 100 a/h battery in 4-5 hours. The main advantage of the Chromebooks over Mac and Windows laptops is lower power draw and compatibility with Android apps. Here's more: <http://zipso.net/chromebook-specs-comparison-table/>

4. Materials List:

- One, Aosom Bicycle Trailer (\$120)
<https://amzn.com/B0083JHEG8>
- Two, flexible 50 watt solar panels (\$200)
<https://amzn.com/B017TPHTLG>
- One, Genasun GV-10 MPPT Charge Controller (\$120)
goo.gl/spQorY
- One, Smart Battery Box (\$60)
goo.gl/PkwyKa
- One, 12v 100 AH Deep Cycle Sealed AGM Battery (\$200)
<https://amzn.com/B003HIUF9I>
- One, 8 port 40A Anderson Powerpole Splitter with fuses (\$60)
<https://amzn.com/B01KBTF7C0>
- Two, 4-Port USB Chargers (for 12V socket), 48W, 9.6A output (\$30)
<https://amzn.com/B00VK1NHVC>
- One, Pure Sine Wave Inverter (1500W Cont/3000W Peak) (\$190)
<https://amzn.com/B01COA0UTE>
- One, USB powered Mobile WiFi Router (\$30)
goo.gl/TA5yVS
- One, Acer Flip Chromebook with 12 hr battery (\$250)
<https://amzn.com/B00ZS4HK0Q>
- One, Baofeng (ham) radio (\$30)
<https://amzn.com/B007H4VT7A>
- One, TERA TR-505 GMRS radio (\$100)
<http://goo.gl/85AmkW>
- Two, Ed Fong, DBJ-2 VHF/UHF Base Station Antennas (\$60)
<http://edsantennas.weebly.com/about.html>
- One, Carry On Case with Wheels and Foam (\$150)
<https://amzn.com/B00XVZYRU0>
- Misc tool, wires, mounting gear (\$150)

The total for all of the above:~ \$1800. In-kind equipment donations current are ~ \$300, so we are asking ~ \$1500.

5. Power budget.

The 12 volt, 100 a/h AGM battery should deliver 1200 watt/hrs ($P=I \times E$). If the typical power draw is 60 watts, then the battery could last about 20 hours.

BikeNET might draw:

1. 20 watts (4 amps at 5 volts) for the laptop.
2. 10 watts (2 amps at 5 volts), for the mobile hotspot
3. 15 watts (3 amps at 5 volts), for USB charging
4. 10 watts (1 amp at 12 volts) for Tera GMRS radio
5. 10 watts (1 amp at 12 volts) for Ham radio.
6. 10 watts (2 amps at 5 volts) for lights & misc.

A typical load might total 75 watts, but not continuous. We calculate an average power

draw (including power losses) around 60 watts/hr. That means a 1200 watt/hr battery might be capable of 20 hrs total. However, the AGM batteries shouldn't be discharged more than 50-70% so a typical daily work load might be 10 hrs/day (600 watt/hrs).

Two batteries might be ideal, one to power the equipment and one getting solar charged. After 10-12 hours, the batteries would be swapped. This proposal uses only one battery to first determine the real-world need. Another marine battery may be provided by a marine supply store on Hayden Island.

Since maximum sunlight lasts about 5 hours, we need to pump in 600 watts in 5 hours. That's 125 watts/hr. The two, 50 watt panels produce (100 watts) , so 6 hours (with good sun) may be required (but only available in the summer). The flexible 12 volt panels would be wired in series (24 volts). A Genasum MPPT charge controller maximizes the power transfer to the battery. Output from the 12 volt battery includes two cigarette lighter sockets and the Anderson Powerpoles.

6. Outreach:

BikeNET has a dedicated Facebook page. It could deliver live 10 minute interviews during events using Facebook Live (which is automatically archived). The Chromebook also creates text and photo documentation. It would be used as a platform to raise awareness of preparedness in the community, deployed at numerous neighborhood events, providing live social media.

7. Matching funds:

Some \$300 of donated equipment has already been committed to, including a bike trailer, a 50 watt flexible solar panel, and a Tera 505 radio with J-Pole antenna. Additional in-kind contributions may be available from local marinas and Home Depot. Some 20 hours of volunteer labor (@ \$20/hr or \$400) are anticipated for construction and operation of BikeNET. That would bring matching funds and in-kind contributions to some 30%.

8. Summary:

The highly mobile BikeNET is anticipated to engage the public while preparing citizens for the worst. It provides emergency communications for both walkie talkies and ham radios, document creation and sharing (using Google docs and Google Drive), a Facebook page with a live camera, and digital signage to keep the community informed (and entertained).

Budgeted at \$1,800, we already have \$300 committed in equipment donations, leaving just \$1500 to raise. With positive feedback from North Portland NETs, we hope to gather additional in-kind donations and letters of community support before the deadline of November 15th.

All comments and suggestions are welcome.

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