

University of Alaska Anchorage Matanuska-Susitna

CNT A275



Raspberry Pi Sky Stream Analytics Project

Project Proposal

March 25, 2015

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## **Summary**

The purpose of this project update is to report project health, collect additional product owner feedback, verify project milestones/timeline, and address any issues or concerns with the currently proposed program.

This project team set out to determine the implementation methods required to establish a connection between the Sky Stream wind Turbine and an intermediary device. This device would transmit information pertaining to the turbine's power generation and forward it to OPEN EI's Wind for Schools program. Currently, no solution is in place for this purpose. A long term solution is required to send this information from one SkyStream wind turbine to be collected by a database under the management of OPEN EI.

Currently, no resources are required for this project beyond the time required to research information available online and communicated through vendors. A budget may be assessed when research justifies such purchases are pivotal to project success.

## **Opportunity**

Mark Mastellar, head of UAA MSC's Sustainable Energy Department; along with the coordinated efforts of Open EI, Wind for Schools, and Kansas' Department of Energy; are interested in collecting analytical data from the installed Sky Stream Wind Turbine located on the University of Alaska Anchorage – Matanuska-Susitna's (UAA MSC) campus.

This project would assess the methods to transfer analytical information from the Wind Stream wind turbine and propagate this information to the Wind for Schools program.

## **Proposed Program**

The proposed program will include deploying one Raspberry Pi B model, provided by OPEN EI's Wind for School program, to room FSM 116. This Raspberry Pi will utilize one XBEE Pro2 2.4 GHz radio transceiver to connect to the XBEE gateway installed within the nacelle of the Skystream wind turbine.

The Raspberry Pi will operate on a custom Debian distribution created by David Schall and Justin Leis of Kansas State University's Wind Applications Center. This operating system is preconfigured to submit turbine data to Open EI's Wind for School Wiki portal.

The Wind for Schools Open EI Wiki currently accepts data from Skystream wind turbines. To report the turbine data to Open EI, the project team will need to register the turbine ID with Jay Huggins, the Open EI administrator at the National Renewable Energy Laboratory. A wiki account will be created which will generate a page which hosts an organization description and a method to view/download captured data.

This wiki page provides the following information:

- Facility – Program Name and Organization name
- Facility Type

- Number of Turbines
- Location – Via Google Maps
- Download link of collected data – Currently, Comma delineated format.
- Histogram of Kilowatt hours and wind speeds

### **Implementation Constraints**

- XBee radio must be located within 300ft. of wind turbine nacelle
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### **Timeline**

Research is segmented into six sprints. The time represented in the provided Gantt chart attached reflects the projected times of each phase. These phases have been broken into time lengths of one to two weeks.

### **Budget**

Currently, no resources are required for this project beyond the man-hours required to research information available online and communicated through vendors. A budget may be assessed when research justifies such purchases are pivotal to project success.

Assets currently owned by the University of Alaska Anchorage – Matanuska-Susitna pertaining to this project include One Raspberry Pi B+ model, one XBee 2.4 GHz Wireless transceiver, and one Xzeres Sky Stream Wind Turbine. While these items are already under the ownership of UAA MSC, for documentation purposes, these assets are approximately itemized to the following amounts:

| Name                         | Cost               |
|------------------------------|--------------------|
| Sky-Stream Wind Turbine      | \$18,000           |
| Raspberry Pi B+ Model        | \$40.00            |
| XBee Pro 2.4 GHz Transceiver | \$40.00            |
| <b>Sum</b>                   | <b>\$18,080.00</b> |

Research indicates that

## **Appendices**

### **Appendix A: Clarifications**

#### **What is Open EI?**

Open Energy Information (OpenEI) is an organization started by the United States Department of Energy in 2009. It is a website for policymakers, researchers, technology investors, venture capitalists, and market professionals with energy data, information, analyses, tools, images, maps, and other resources.

#### **What is a Raspberry Pi?**

Raspberry Pi is a low cost, credit-card sized computer. It has the capabilities of a desktop computer including network capabilities. It may be used in a wide array of digital application projects, including servers and weather stations. The Raspberry Pi will be purposed to connect to the Sky Stream wind turbine wirelessly.

#### **What is an XBee Pro?**

XBees are a family of form factor compatible radio modules. The XBee Pro is a 2.4 GHz module which uses Digi Mesh, a sleeping mesh networking protocol developed by Digi International.

#### **What is Sky Stream?**

The Sky Stream is a wind-powered electricity generator containing an integral AC power inverter. It is designed to supplement the electrical power provided by the local electrical utility company in residential applications by connecting directly to the main AC utility panel. Sky-Stream may also be utilized to provide power with battery-based residential electrical systems or utility grid-connected systems with battery backup.

#### **What is Debian?**

Debian is a free operating system (OS) for your computer. An operating system is the set of basic programs and utilities that make your computer run. Debian provides more than a pure OS: it comes with over 37,500 packages; precompiled software bundled up in a nice format for easy installation on machines.