A Green Energy Plan for Alfred & Campuses Nationwide

Alfred University
Outside of Ordinary

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AUenergy

Introduction

Alfred University is constantly in a state of repair to maintain safety and efficacy in its power delivery systems. Rather than struggling to catch up, our university should strive to be the paramount example in effective and sustainable energy. Alfred University would serve as the test subject in an experiment consisting of two parts. First would be an overhaul of electrical subsystems serving the university. The second would be the expansion of renewable energy resources campus-wide. Actions such as installing solar panels on residence and academic buildings, or utilizing the area's natural airflow dynamics to install a large turbine up the hill. A green energy plan for mindful consumption would reduce the overall electrical usage.

Image Credit: Hanbury architectural firm

Initiating similar plans across the country would require tailoring to fit the individual needs of each university. However, Alfred would serve as a blueprint for nationwide revitalization of college campuses.

Campus Upgrades

Three Phase Power

The current standard for Alfred University and the country and general is single-phase voltage. However, three-phase power is a more viable alternative that safely delivers higher voltage with increased efficiency. Three electrical signals are delivered to a system offset by a 120° phase angle, eliminating the drop to zero power between cycles seen in single-phase systems. This provides a steadier stream of current to demanding systems. In general, this improves efficiency, and reduces strain caused by power drops between cycles[1].

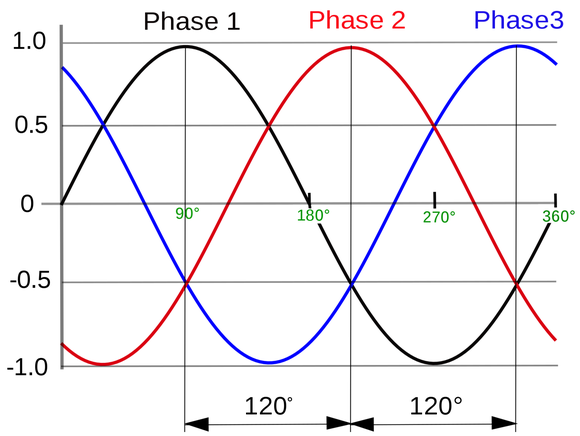


Image credit: User J_Jmesserly Wikimedia Commons

Energy Conservation

Alfred University's energy consumption has a large portion dedicated to wasteful utilities. Various changes such as those listed below would cut out inefficient energy use.

- Implementation of motion detectors on interior lighting in public spaces
- Switching over interior and exterior lighting to LED systems from fluorescent and sodium lamps.
- Replacing radiative water heating in older buildings with electrical heaters or central heating.

Green Energy

Assuming Alfred has similar usage stats as a similarly sized institution, the school uses approximately 11 GWh of electrical power a year[2]

Solar[3,4]

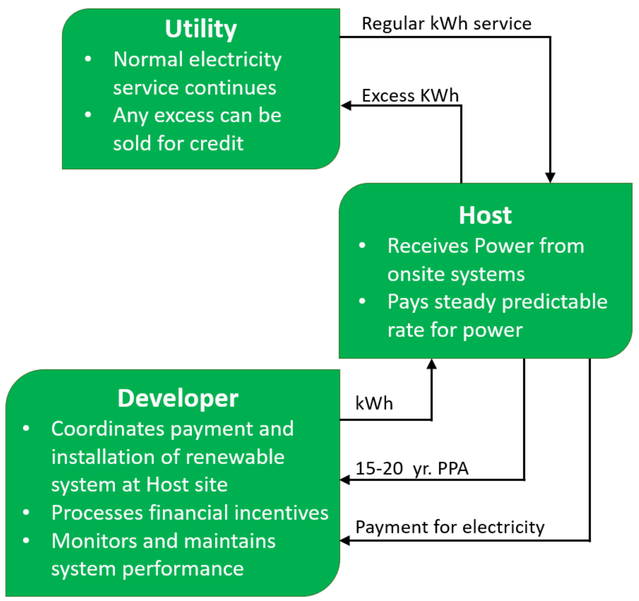
- Approximately 380 3.5 x 5.5 ft. panels can be installed across residential buildings, with space for wiring and water drainage
- Can be combined with general renovations to ensure electrical and structural safety
- Install cost of $1.75 million, generating 138 MWh per year assuming 4 hours of full exposure
- 1.3 % of the school's total usage

Wind[3,4]

- 15 turbines with 15 ft. blades and 10 KW rating on flat-topped (primarily academic) buildings.
- Install cost of $900k, producing 210 MWh per year, given an average wind of 10 mph, 1.9% of AU's usage
- One 120 ft. turbine on the hill, with a 1.5 MW rating
- Install cost of $2.5 million, generating 2.1 GWh per year, given average wind speed of 10 mph, 19.1% of AU's usage

Installation

Many incentives that provide rebates and tax cuts to organizations that install green power sources can be claimed, but not by a private education institute. However, an outside contractor can pay for and install power systems on the university's property, then claim these bonuses, and sell power back to us[5].



Application to Other Campuses

The goal of the renovations to the Alfred University campus is not only to reduce our carbon footprint, but to serve as an example to other college campuses. Many schools are now implementing renewable energy sources, but Alfred would act as a model of the benefits of introducing large scale green energy operations. However it will still fall on each school to determine their own needs and implementation

No campus is built the same as another, and obviously this affects the what, where, and how of installing green technology. As such, Alfred would need to be thought of as a reference to base each campus's improvements on, rather than a cookie-cutter template.

Image Credit: Wake Forest University

Acknowledgements and references

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Sources

1. Umans, S. D. (2013). Fitzgerald & Kingsley's Electric Machinery, 7th Edition
2. Macalaster College 2016-2017 Energy Report
3. US Department of Energy
4. International Renewable Energy Agency
5. Hanbury Architectural Firm, hewv.com

Alfred University
The Inamori School of Engineering

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