***The Governor’s STEM Competition***

***Bishop Shanahan High School***

***State Competition Project Plan***

**“Brilliantly Bright Solar LED Street Signs”**

Stephen Anderson, Angela Herb, Matthew Horger, Andrew Johnson, Conor Waldt

**Proposal**:

By designing and implementing a folding mechanism for road signs with a LED lighting system powered by solar energy, we hope to create a safer standard for roadways while maintaining energy efficiency.

**Real World Problem**:

The nation’s roadways are the scene of countless accidents, injuries, and deaths each year. In an effort to contribute to safety on the road, we propose the fabric action of visibly-enhanced stop signs, wired with an LED lighting system. Further, in an attempt to conserve energy, we endeavor to make these stop signs solar-powered. These stop signs will increase visibility and, as a result, will hopefully lessen the probability of accidents. Also, these folding high-visibility signs will have a special application during inclement weather, as they will aid drivers in seeing and preparing for stops and as a result will make the roads safer.

**Background Research Information (B.R.I):**

* 2009 Version of the *Manual on Uniform Traffic Control Devices (MUTCD)*
  + Section 2A.06 - “Light Emitting Diode (LED) units may be used individually within the legend or symbol of a sign and in the border of a sign, except for changeable message signs, to improve the conspicuity, increase the legibility of sign legends and borders, or provide a changeable message.”
  + Section 2A.08 - If used, the LEDs shall have a maximum diameter of 1/4 inch and shall be the following colors based on the type of sign:

1. White or red, if used with STOP or YIELD signs.

* A study on safety effects of LEDs embedded in STOP signs, conducted by the Texas Transportation Institute in 2004, found:
* A 28.9 percent reduction in the number of vehicles not fully stopping.
* A 52.9 percent reduction in the number of vehicles moving through the intersection without significantly slowing.
* A similar study, conducted by the Virginia Transportation Research Council in 2007, found:
* A statistically significant decrease in vehicle approach speeds ranging from 1.9 to 3.4 miles per hour (mph) with an average of 2.7 mph (7% decrease) indicated that LED STOP signs positively affected driver behavior.

**Risks and Safety Information**: (Risk Assessment Form Previously Submitted)

**Identification of a Community Need:**

1. The safety of drivers and passengers as well as promoting the safe flow of traffic during nighttime.
2. Convenience of unfamiliar drivers who may not notice the stop sign while driving on unfamiliar roads.
3. Increased safety for those drivers who have to be dispatched during harsh winter weather.
4. Increased ease of work for those municipality workers who must open these stop signs at intersections.

**Budget Documentation ($750): (see attached Budget Sheet)**

**Costs of Future Improvement:**

**Future Application:**

Pennsylvania, and in particular the Philadelphia area, is unfortunately prone to severe weather. During heavy storms, most notably snowstorms, the visibility of signs is dramatically reduced. Drivers may have to drive in harsh winter conditions and the probability of accidents increases. Also, the risk is posed for drivers who have to be dispatched to lift the stop signs in the event that the power goes out. With the future development for this project, the risk for crashes of these drivers would drastically be reduced.

**STEM Professions** **Required for Actual Product:**

Electrical Engineers to design and create the solar power connection to the LED lights

(Electromechanical Engineers to design the rotating solar panel)

Statisticians to predict the effectiveness of our signs, and compare to the standard sign

Traffic Engineers to analyze the traffic patterns and usefulness of the stop sign at intersections

AutoCAD Specialists to draw final design of the signs

**Business/Corporate Connections:**

Downingtown Engineering Consultants

315 East Lancaster Avenue, Downingtown, PA 19335, United States

The Burns Group - Engineering and Construction

222 Valley Creek Blvd., Suite 140, Exton, PA 19341, United States

Communications Test Design, Inc

1373 Enterprise Drive., West Chester, PA 19380

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| Works Cited  Ed. Arnold, Jr., and K. E. Lantz, Jr., "Evaluation of Best Practices in Traffic Operations and Safety: Phase 1: Flashing LED Stop Signs and Optical Speed Bars."  Gates, T.J., Carlson, P.J., and Hawkins, H.G., Jr., "Field Evaluations of Warning and Regulatory Signs with Enhanced Conspicuity Properties."  "How Light Affects Our Brain's Performance: Photic Memory for Executive Brain Responses." ScienceDaily. University of Liege, 10 Mar. 2014. Web. 14 Jan. 2015.  *Manual on Uniform Traffic Control Devices*. Washington, D.C.: U.S. Dept. of Transportation, Federal Highway Administration, 2009. Print.  Rice, Ed. "Embedded LEDs in Signs." FHWA. N.p., May 2009. Web.  Snyder, Edgar. PennDOT Releases 2012 Pennsylvania Crash Facts & Statistics. Edgar Snyder & Associates., 01 July 2013. Web. |
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