ISEN Report

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Project Summary

The Tiny House Movement is a response to the growing desire of smaller and simpler living spaces for those who feel concerned about the environment and the negative impact of excessive resource consumption.

A leading advocate of this movement, Jay Schafer, founder of the Tumbleweed Tiny House Company, provides pre-made homes and building plans for small houses ranging from 65 to 837 total square feet. Building upon Jay’s ideas, our team set out to design and construct a tiny house sized less than 130 square feet that will function as a completely independent system.

It generates its own inputs and outputs without the need to connect to any outside sources. After six months of researching and consulting with various experts, six months of fundraising, and a year of construction, our team has produced a house that provides its user all the necessary resources to live year round.

Benefits of ISEN Funding

ISEN funding provided access to the main components of the water collection and solar energy system, allowing students to design and implement the most important layer of the tiny house project. This complexity separates Northwestern’s tiny house from other less sophisticated models. An off-grid electrical and water system also allowed us to broaden student involvement because it demanded electrical, mechanical, and environmental engineering. With the funding, our students were given the rare opportunity to implement theory into practice.

More importantly, the funding provided students the opportunity to learn about the role of off-grid technologies in sustainable design. Off-grid technologies offer no pure efficiency advantage in comparison to large scale generation. Instead, their value is seen in the larger scheme of design. Decentralizing power generation has the following key advantages:

- No additional embodied energy or risk in mass infrastructure
- Faster adaptation and evolution of technologies
- Reduced risk of city wide blackouts
- Democratization of the energy solution

The strength of our project was its ability to expand the design to solve a wide range of sustainability questions.

Each component purchased with ISEN funding tells a story. The water pillow and filters show how simple rainwater can be collected and turned into potable drinking water. The sizing of the pillow gives visitors an idea of the capacity required to allow for daily water year round in a Chicagoland climate.
Similarly, the batteries and battery enclosures show the major difference between an off-grid versus on-grid design. As important as the water pillow is for rainwater storage, the batteries give capacity for electricity. This distinction is a key design component that helps visitors understand how to create a robust self-sustaining home.

The Outback Power Inverter and DC refrigerator gave a layer of energy efficiency often missed by individuals implementing green technologies. It also symbolized a key design component easily translatable to current homes generating their own energy. Eliminating the ten percent energy loss conversion from DC power to AC power wherever we could is a crucial efficiency measure used throughout our design. However, allowing for AC power shows that a comfortable mix can be had through careful design.

Finally, the hot water tank, which was a special tank required for the solar hot water system, showed the meshing of energy and water systems. The most efficient means of translating solar energy, solar hot water gave our students and visitors greater awareness of the range of energy system.

Many students become engaged with our philosophy and project because of its practical use and the extensive list of technologies they can learn about. This is also true for the visitors hoping to either incorporate our design elements into their homes, build their own tiny house, or simply learn about the available technologies.

**Outcomes: Northwestern Exhibit**

On March 5th to 10th, the Northwestern Tiny House team showcased their design on the Northwestern Campus in front of the Ford Motor Building. As a testament to its inclusive design philosophy, the team estimated between six hundred to eight hundred visitors throughout this week. Visitors came from the Evanston community to as far away as Los Angeles just for the opportunity to feel the space and talk to the designers. Their backgrounds ranged from interested students to couples hoping to build their own tiny house.

The exhibition proved the house’s technical capabilities, including its transportability. It is also proved its philosophy, specifically its promotion of off-grid technologies, resonates with the public. Its message is amplified by physically having the technologies at exhibition and working. This is the best method for show the practical value of off-grid tiny houses.