



PROJECT SUMMARY D8 SUBMISSION

UNIVERSITY OF WYOMING (UWYO)
U.S. DEPARTMENT OF ENERGY
SOLAR DECATHLON BUILD CHALLENGE 2023

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I. Updated Summary

The goal of the Wind River project is market transformation to show Wyoming homeowners that a **Zero-energy house** can be **attractive** and **market-ready**, and to show Wyoming homebuilders that they can build a Zero-energy house with off-the-shelf equipment and familiar construction methods. We hope to inspire future clients, contractors, engineers, and tradespeople to imitate these methods and normalize this type of construction in the industry.

This is truly a real-world project. The University of Wyoming students have partnered with a private homebuilder, Timshel Construction (Cory and Morgan Toye), who is financing the project as a **'spec home'**, to be sold on the open market after the competition. Therefore, the students' design needed to meet the rigors of a real-world project in terms of economy, constructability, and consumer appeal.



Figure 1. Rendering of the Wind River House

The need for energy-efficient homes in Wyoming is clear. Among all states, Wyoming ranks #2 in terms of residential energy use per capita, according to the U.S. Energy Information Administration. Moreover, the concept of energy-independence fits in with Wyoming’s culture as a pioneer state.

II. Design Philosophy

As a ‘spec home’, to be sold on the open market after the competition, Wind River is designed to meet the needs and expectations of Wyoming homebuyers. We aim to demonstrate that a Zero-energy house can be attractive and market-ready. Zero-energy houses do not need to look like a science experiment.

We call the style of the home “Minimal Mountain Modern,” with forms and materials that complement the natural landscape. The form has two major roof slopes, to accommodate both Passive and Active solar. This location and climate are ideal for passive solar heating. One roof is sloped south to accommodate PV panels. One is sloped north to create a larger amount of south-facing glass at the loft level, for passive solar heating.

The site is quite spectacular (see section III). The design is site-specific, not only for solar orientation but also to address the scenic views of the landscape—red canyons to the south, and the Wind River Mountain range including Gannett Peak to the northwest. The open loft space above the kitchen is a kind of ‘overlook’, especially advantageous for these views.

Since the start of the project, we’ve placed the highest priority on constructability, to show Wyoming homebuilders this type of house is replicable and feasible. Therefore, the structural design uses typical methods: a slab-on-grade foundation, wood framing, and conventional trusses. Students coordinated with a professional engineer (a UW Architectural Engineering alumnus) to prepare the structural documents. The mechanical systems include an air-source heat pump to produce hot (or cold) water and feed a radiant floor throughout the house. For builders, this is not ‘typical’ but it can be accomplished with off-the-shelf equipment and ordinary plumbing skills. Likewise, we designed a fresh air monitoring system with heat recovery ventilation. All engineering and construction documents comply with local and regional codes.

Currently there are no homebuilders in our state creating energy-efficient or solar spec homes, so Wind River has a significant opportunity to educate the public.

We plan to market the house with comfort, quality, and design, while also selling people on the idea that you can have a better home, with minimal utility bills, for the same monthly payment as a typical home. Energy efficiency and production can translate into more space for the same monthly price.

III. Construction Site Details

A unique characteristic of this project is that the students are located in Laramie, Wyoming, but the site is located about 220 miles away. This has presented some challenges for the student team: long-distance collaboration with the builder; periods of absence from campus and classes.

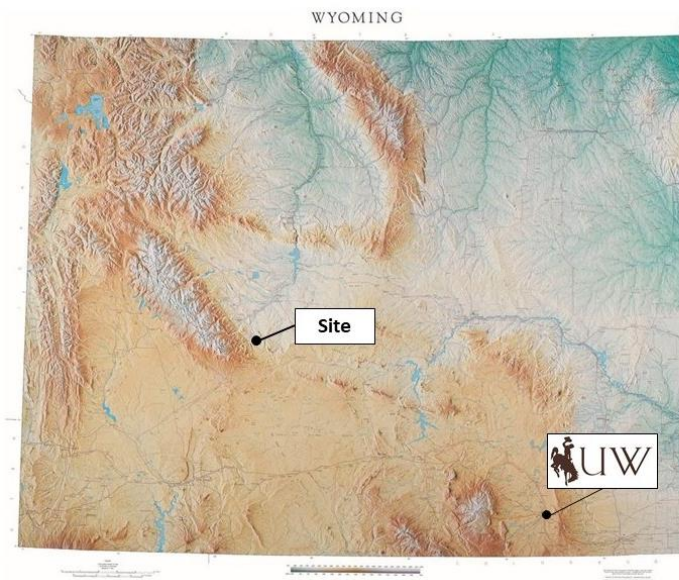


Figure 2. Map of Wyoming showing students’ location compared to site.

The five-acre site is in a rural location about ten miles southwest of Lander, Wyoming. Lander (pop. 7,500) is a hub for outdoor recreation, and the home to the National Outdoor Leadership School (NOLS). The South Pass historic site, an important stop on the Overland Trail, is nearby.

The Wind River home is named for the Wind River Mountain range, which is visible to the west and northwest. Gannett Peak (13,802 feet) is the highest peak in Wyoming. There are sweeping views to the north, northwest, and southeast which helped shape the design and orientation of the house. The landscape consists of rocky soil, sagebrush-covered hills, and red sandstone canyons.



Figure 3. Overview of site

The project is built on previously undeveloped land. We respectfully acknowledge that this land was the ancestral territory of the Shoshoni and Northern Arapaho People.

IV. Construction Partners

Timshel Construction (Cory and Morgan Toye) is financing and building the project. They have taken a significant risk in committing to building a student design and in committing to fulfilling the requirements of the Decathlon. Cory is a UW alumnus and proud of his connection to the University.

Additionally, their goal in this project is not to make a significant profit, but to establish a new benchmark for the homebuilding industry in Wyoming. Timshel has some prior experience building Zero-energy and energy-efficient homes, consulting with UW faculty (Figure 4).

V. Public Exhibit and Community Strategies

Our public event will take place from **April 14th-16th**. During that time, members of the community and surrounding areas will be invited to join us at the house for a tour. Figure 5 also shows the public tour route.



Figure 4. The UWYO Solar Decathlon team in the wind River home.

During the tour, students will provide information about the design philosophy and interesting components of the building. Students will also be available to answer questions that anyone visiting the house may have.

The focus will be to show the people of the community how net-zero homes can be very practical and comfortable, while still being efficient in saving energy and money. We hope to bring attention to this building style in the entire industry by spreading the word to contractors, engineers, tradespeople, and others that can attend.

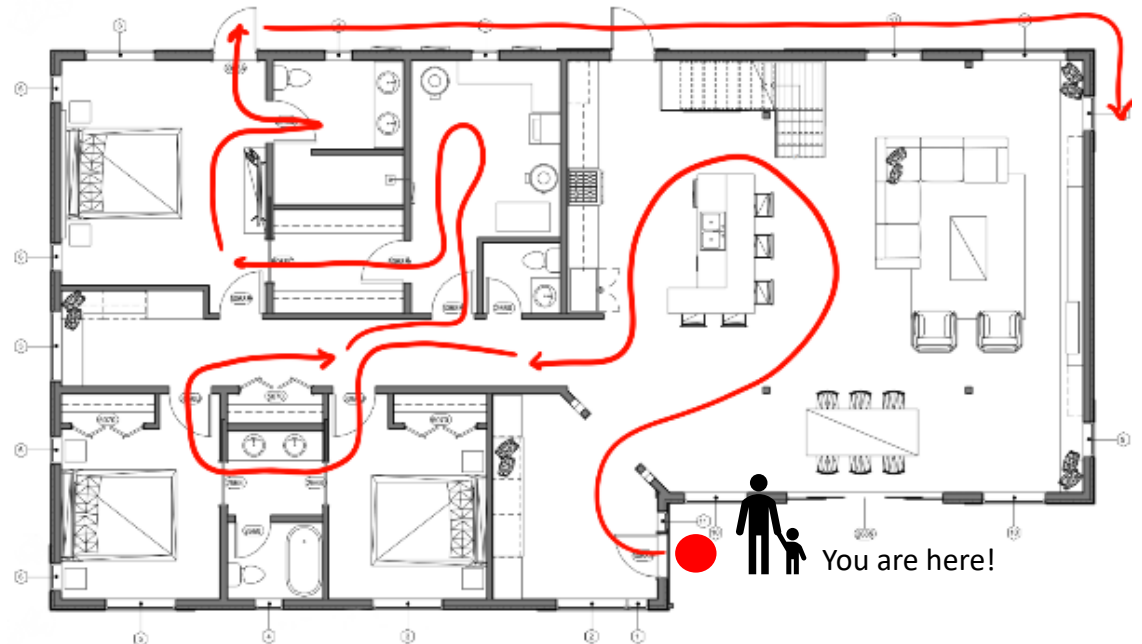


Figure 5. Ground floor plan with public tour route.

VI. Future Plans for the House

Following the competition, the house will be sold on the open market and will be privately-owned, perhaps losing its identity as a demonstration home. We are hopeful that the owners will be proud of its identity as a Zero-energy home and will continue to promote these concepts to the Wyoming community

Figure 6. Wind River Progress



VII. Final Details

The home will be open on the following dates:

April 14th from 12 p.m. to 5 p.m.

April 15th from 9 a.m to 5 p.m.

April 16th from 10 a.m to 5 p.m.

The Open House will include:

Educational materials will be available for viewers as they experience the home. These will include a detailed handout explaining the features of the home and the innovative technologies used, as well as a television screen near the entrance used to introduce the home to all visitors. Details of situation of construction, February 2023, can be found in Figure 6 and Figure 7 also displays the handout that visitors will receive during our public event.



Figure 7: The handout open house attendees will receive.

VIII. Online and Public Exhibition Success

Our student team has developed and maintained a social media presence throughout the stages of the competition. This includes a website, Facebook page, and Instagram account that have been actively sharing information with the community about the construction process, timeline, and educational information about the technologies used in the home.

Website | Instagram | Facebook



Figure 8. Student-Designed Flyer to Promote Upcoming Open House