

The Pennsylvania State University

Suburban Single Family Home

Project Summary

The 2019-2020 Penn State Solar Decathlon team is partnering with **Centre County Housing and Land Trust (CCHLT)** in order to design cost-effective, community oriented net-zero homes. CCHLT's mission is to "create diverse, vibrant communities through long-term affordable housing in Centre County, PA", specifically for the 80-120% median family income level bracket. In this way, CCHLT is both **revitalizing the community** in Centre County and reducing the financial strain on families in this income bracket, who have incomes that are both too low to

afford housing in this area, yet too high to qualify for any financial subsidies. In addition, **CCHLT does not necessarily know which plots of land they will obtain in the future, making it difficult to provide families with new homes.** Because of this, the Penn State team aims to create a **design strategy that accounts for any possible land that CCHLT may obtain in the future.** Each component in this design strategy will include one or more affordable, net zero-energy ready homes complete with a community space, **in order to fulfill CCHLT's mission as an organization.**

Design Strategies

In order to create a design strategy that accounts for any possible land that CCHLT may obtain, the Penn State team focused heavily on understanding the basis of sustainability as it morphs at different scales. Our strategy includes **three scales of design: the home, the neighborhood, and the community scale.** Our design strategy will include component pieces that allow CCHLT to fully customize their designs on any plot of land. If the obtained plot of land is sized for a single home, then CCHLT can use the component with a single home design. If the obtained plot of land can fit multiple homes, then CCHLT can use the components with combined home plots in order to best

fit the given site. In this way, CCHLT is able to easily obtain an affordable, net zero-energy ready home or neighborhood without extra strain to their company. In addition, each component in this design strategy will include a community aspect. On the scale of a home, the living and dining rooms act as the community core of the space. The neighborhood scale includes pollinator or vegetable gardens that work to support the surrounding houses. On the scale of a community, larger parks are designed to tie several neighborhoods together. In this way, our design strategy meets the needs of CCHLT's mission in terms of both affordability and community oriented design.

Project Data

Location: State College, Pennsylvania	Number of Bathrooms: 2 Full Baths
IECC Climate Zone: 5A	HERS Score without PV: 44
Floors: 1	HERS Score with PV: -2
Total Sq. Ft.: 1,536 ft ²	Construction and Labor Cost: \$122,000.00 without PV, without land \$180,000.00 with PV, without land
Lot Size: 6,889 ft ²	Estimated monthly energy cost w/out PV: \$58 per month (incl. service charge)
Occupancy: 4	Estimated monthly energy cost w/ PV: \$3 per month (incl. service charge)
Number of Bedrooms: 3	

Technical Data

Roof R-Value: R-49	Water Heating: 556 kWh/yr
Wall R-Value: R-32	Heating Load: 3,751 kWh/yr
Foundation R-Value: 10	Cooling Load: 234 kWh/yr
Window Performance: U - 0.24 SHGC - 0.26	Photovoltaic System Specifications: 21 Solar Panels 7.3 kW Array Sunpower: X21-350-BLK-BAC Includes Microinverters
Door Performance: U - 0.36	
HVAC Specification: Heatpump Water Heater Multi-Zone Ductless Mini-Split with Supplemental Backup Heating	

