Net-Zero for

Wendell Falls offers homeowners a chance to soak up some sun.

BY BARBARA HORWITZ-BENNETT

DEMONSTRATING THAT NEAR-NET-ZERO HOMES CAN BE AFFORDABLE for more North Carolinians, a new development just east of Raleigh combines solar panels, a home battery and sustainably built homes that are 23 percent more energy efficient than the average local home.

Block party. Wendell Falls' highly energy-efficient design, and the option for rooftop solar and a home battery, are making near net-zero feasible for more North Carolinians.

COURTESY OF WENDELL FALLS

the Masses

At Wendell Falls (**www.wendellfalls.com**), a 3,348-home master-planned community, low-E windows, advanced framing, high-efficiency lighting and appliances, WaterSense-certified faucets and toilets, tankless water heaters and third-party blower door, duct and exhaust flow testing combine to deliver an average low Residential Energy Services Network Home Energy Rating System (HERS) score of 63. However, what really sets this 1,267-acre project apart is the opportunity to incorporate rooftop solar panels and a Tesla home battery, delivering greater grid independence at an affordable price point.

By allowing homeowners to package the added costs of a higher building efficiency design and solar power directly into the home's mortgage, total monthly operating costs—i.e., the mortgage and utility bills—are actually lower for a higher-priced home with these features than a similar code-built home, reports Graham Alexander, senior residential energy specialist at Southern Energy Management in Raleigh.

So if homeowners qualify for a 30 percent tax credit and utility rebate for the solar panels, they're looking at an eight- to 10-year payback for a 10 percent return on investment. But perhaps even more convincing is the fact the solar array will put owners into a cash-positive position from the get-go. By rolling the solar into the mortgage, monthly payments increase by $50 to $60. However, homeowners simultaneously save $70 to $80 on their monthly electric bill.

Furthermore, the cost of solar energy in North Carolina has gone down—now averaging $10,000 to $15,000 after incentives—so it's no longer considered a high-end amenity.

COURTESY OF GARMAN HOMES

Super sustainable. Homes in the Wendell Falls development are Energy Star and National Green Building Standard Bronze level certified, and meet ecoSelect standards.

"If you're in a financial position to buy or finance a car, now you're also in a financial position to be able to buy a solar array," says Jamie Hager, green building specialist at Southern Energy Management.

Generally speaking, builders are hesitant to put solar on a spec house, but with this new mortgage option, Alexander and Hager are optimistic this will enable more homeowners to opt for solar on new construction projects.

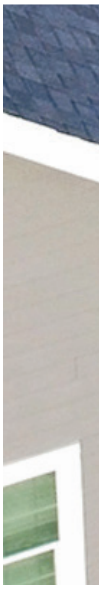
For the Wendell Falls project, the builder, Homes by Dickerson, selected black mono-crystalline modules with a 25-year warranty for the solar panels. While more expensive than poly-crystalline and thin-film PV panel technologies, mono-crystalline is a more efficient module, converting the highest amount of solar energy into electricity, and offering a proven track record of reliability and longevity.

But the big selling point for mono-crystalline was aesthetics. Black on black blends in much better to the dark shingled roofs typically found in North Carolina. In addition to avoiding the industrial look of solar farms, these solar modules are more power dense, so more energy harvesting can be packed into a smaller space, Alexander explains.

TIGHT AND EFFICIENT

Of course, a high-efficiency solar array and advanced home battery are only one half of the near-net-zero question. The homes themselves had to be efficiently designed, starting with the building enclosure and proceeding to the electrical, mechanical and plumbing systems.

For starters, Southern Energy Management directed the builder to take advantage of advanced framing techniques, including two-stud corners—which offer the same structural integrity as traditional solid corners—and ladder blocking where the exterior and interior



walls meet up. Combined with 2-by-6 framing, insulated headers and reduced framing at windows and doors, these strategies allow for more insulation in these spaces, resulting in an above-code wall system.

Another key strategy was third-party insulation inspections and testing to verify that the home is performing as designed, according to Jonathan Bailey, project superintendent for Homes by Dickerson in Raleigh.

"These tests are performed on items hidden behind the walls and in crawlspaces and attics that are not easily accessible," Bailey says. "Not only do these tests ensure that the homes we are building meet Energy Star standards, they also act as a form of quality assurance for our customers."

Hager adds that the insulation inspection, blower door, duct and exhaust flow tests enable builders to pinpoint and address areas that impact energy use, comfort and indoor air quality encountered during construction that are not detailed in house plans. "Without these inspections and tests, homes can experience high energy bills, comfort issues and even mold problems and not have an idea where to start truly addressing their problems," Hager says.

By tightening the envelope and boosting insulation, the home is easier to heat and cool, with increased comfort and enhanced energy savings, she adds.

Ultimately, the tight, tested enclosures and insulation strategies result in homes that meet the High Efficiency Residential Option in the 2012 North Carolina Conservation Energy Code.

Dark synergy. Black on black mono-crystalline modules blend in well with the homes' dark shingled-roofs. They also work to convert a high level of solar energy into electricity.

COURTESY OF SOUTHERN ENERGY MANAGEMENT

Open air. The Wendell Falls homes incorporate a smart, whole-house fresh air ventilation system for enhanced indoor air quality and energy efficiency.

COURTESY OF GARMAN HOMES

PHOTOS COURTESY OF GARMAN HOMES

Easy viewing. Low-E, double-pane windows enhance daylighting and thermal performance in the Wendell Falls development.

CERTIFIED GREEN

As for the mechanical systems, the homes are outfitted with properly sized HVAC systems with high-performance filters and a whole-house fresh air ventilation system. Here, the homes have been designed to introduce fresh air through a dedicated "respiratory system," to allow the home to breathe without compromising its comfort and energy efficiency.

Furthermore, duct leakage has been tested to be less than 3 percent, compared to 30 percent or higher with some existing home duct systems. Naturally, this makes a large difference in air conditioning efficiencies.

Additional sustainable measures include low-VOC paints, Sustainable Forest Initiative-certified subfloor and sheathing, radiant barrier roof sheathing, high efficiency lighting and appliances, and regionally appropriate landscaping.

Wendell homes also meet Southern Energy Management's ecoSelect standards, which address energy, and indoor air and water quality through a straightforward checklist of strategies.

Furthermore, the houses are Energy Star certified and have achieved National Green Building Standard Bronze-level certification. This means that the residences offer high levels of energy efficiency and address water, indoor air quality, site design and materials for resource efficiency and sustainability.

"By making ecoSelect Certification a standard for all new homes, Wendell Falls is setting the bar high for building efficiency," Alexander says. "This allows for a solar array to have a much larger percentage of impact on a home's electric bill than a code-built home." **GB**

Room to spare. With a large 13.5 kWh storage capacity, the 44-by-29 inch Tesla *Powerwall 2* home battery system enables Wendell Falls homes to achieve near net-zero performance.

COURTESY OF SOUTHERN ENERGY MANAGEMENT

The Tesla *Powerwall*: What's it All About?

CAPITALIZING ON ADVANCED home battery technology with the Tesla *Powerwall 2*, Wendell Falls in Wendell, N.C., is giving homeowners the option to store their own solar power and not be so dependent on the grid.

"The Tesla *Powerwall,* combined with solar panels, provides that next step in green-home construction, offering our residents further grid autonomy and security against power outages," reports Hunter Matthews, Wendell Falls marketing manager.

"It is designed for the homeowner that wants these benefits but not the traditional ongoing maintenance of previous battery technologies," adds Graham Alexander, senior residential energy specialist for Southern Energy Management in Raleigh, N.C. "The 10-year warranty and the ease of use with this product via a phone app makes the solution feasible for every homeowner."

The Tesla *Powerwall 2* offers a large 13.5 kWh storage capacity, making it well suited for most large modern homes. The system delivers 7 kW of peak power and 5 kW of continuous energy, and runs 44 inches by 29 inches in length and width and 5.5 inches in depth.

"Building on experience from the durable Tesla electric vehicle batteries, it is a well-engineered system and has so far proven to be a very high-performing battery," writes renewable energy consultant Jason Svarc in a *Clean Energy News* review. "Also, it is the only battery to incorporate liquid cooling, which may mean it outlasts other batteries, especially in hotter climates."

This second generation of the *Powerwall* product also offers an integrated DC-AC inverter and a notable price drop. At the same time, supply is currently not keeping up with demand, leading to a six-month wait for the product. **GB**