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Local father, son engineers plan energy-smart home

By Don Dodson

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URBANA – The home Ty and Deb Newell are building in Urbana will have enough solar power to heat and cool the place – plus run the car.

Ty Newell, a retired University of Illinois professor of mechanical engineering, has always been interested in solar energy and other green technologies. So he decided to put them to work in creating the Newells' retirement home.

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The home, dubbed the "Equinox" house, is under construction on Haydon Drive on the north side of the Beringer Commons subdivision. Beringer Commons is on the east side of Urbana, at the northwest corner of U.S. 150 and High Cross Road.

Work started on the house Sept. 22 – about the time of the fall equinox – and Newell hopes it will be finished by the spring equinox on March 20.

The house, which emphasizes sustainable living, builds on calculations made by Newell and his son, Ben, the president of Newell Instruments in Urbana.

The two mechanical engineers did simulations and modeling of what the expected energy use would be.

Ty, left, and Ben Newell teamed up to plan the 'Equinox' house being built on the north side of Beringer Commons in Urbana. In the background is the solar array that will power the energy-efficient retirement home of Ty and Deb Newell. By Vanda Bidwell

"This home should use about one-fifth the energy of a well-built conventional home," Ty Newell said.

The 2,100-square-foot living area, adjacent to a roughly 600-square-foot garage, will be heated and cooled by an 8.2-kilowatt solar power collector in the backyard. That will produce enough energy to heat and cool the house and power an electric car for at least 6,000 miles a year, he said.

The house will be tied to the electric grid, supplying energy to the grid in summer and taking energy from it in winter.

Ty Newell said the house will use more energy in winter than the solar array generates, but in summer the system will produce more energy than the house needs. As a result of utility "net metering" policies – which give homeowners credit for electricity they generate – it should result in a "zero electric bill" for the Newells.

The solar collectors should "pay for themselves in 20 years," he said.

The Equinox house is a single-story home with four bedrooms and 2 1/2 bathrooms. It's designed to appeal to retiring baby boomers – many of whom, Ty Newell believes, are both environmentally conscious and cost-conscious.

The house is super-insulated, with 18-inch-thick insulated concrete forms around the foundation and 12-inch-thick wall panels. It's also super-sealed, minimizing the number of pipe and vent openings to reduce energy leaks. Many of the ducts have small diameters.

The unusual construction involves upfront costs that should help reduce operating costs in years to

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come. But Newell figures the cost of construction is $100 to $125 per square foot – on par with other homes in the Beringer Commons area.

He estimates the overall cost of the home at $270,000 to $280,000, plus $35,000 for the solar installation. But a tax credit will cut about 30 percent of the solar installation's cost.

The house will have a water-collection system and cistern that will supply about 80 percent of the Newells' water needs. The family has gotten permission from the Illinois Department of Public Health to use the collected water for showers, toilets and laundry. But they'll have to rely on the water company for potable water.

Only one other single-family residence in Illinois has gotten similar permission, Ty Newell said.

The Equinox house will rely on a special conditioning system developed by Newell Instruments that will ventilate, heat and cool the house, as well as dehumidify it and heat the water.

The Newells think there may be commercial potential in the so-called CERV (Conditioning Energy Recovery Ventilator) system, but haven't decided yet whether to exploit it.

The house won't have wall-to-wall carpeting or drapes, Ty Newell said. Instead, it will have throw rugs and window shades. The motivation is to minimize exposure to allergens and chemicals. Plus, it's easier to clean the house "when things aren't tacked down," he said.

Another unusual feature of the house: a sundial calendar planned for the cedar-sided east and west exterior walls. The sundial will allow people to determine not only the time of day, but also the time of year.

The idea of the Equinox house stems from the Newells discussing sustainable energy concepts with Urbana businessman Ivan Richardson and his sons, Brian and Brad.

Richardson has his own solar collection system, as do several others on the east side of Urbana, Ty Newell said. Most of those systems range from 3 to 6 kilowatts, but Newell believes the Equinox house's 8.2-kilowatt system will be the largest residential solar collector in the area.

The house employs some, but not all, of the "Passive House" concepts championed by the local "e-co lab" organization, Newell said. Those homes are super-insulated, but not necessarily super-sealed, he said. Another difference, he said, is that the Equinox house's underlying concrete slab isn't super-insulated.

The "Passive House" concept originated in Europe. Newell said he adapted the design for the Midwest, which gets more heat and humidity than much of Europe does.

Although Newell is serving as general contractor for his own project, Brian Richardson works as the construction contractor. Jean Ascoli provided architectural design services, and Jim French provided structural design expertise.

Ty Newell said he thinks the Equinox house concept could prove attractive to retiring baby boomers, partly because of the need to downsize and partly because they can tap 401(k) and 403(b) accounts to help cover the upfront costs.

"What people want to know is, 'Is it affordable?'" he said.

Already, his sister in Colorado has expressed interest in such a house, and others are intrigued by what's taking shape in the Urbana subdivision.

When the solar panel framing was erected in the backyard last fall, some neighbors or passers-by guessed it was a set of bleachers or maybe framework for a greenhouse, Ty and Ben Newell said.

Deb Newell, who continues to work as a librarian at Thomas Paine School in Urbana, said she's excited about the house.

"I think it's a wonderful idea, and I'm very proud of my husband and son," she said.

When finished with the project, the Newells hope to turn their attention to retrofitting their existing 1920s-era house at 704 W. Michigan Ave., U, to a more sustainable structure. The "deep retrofit" would include super-insulating and super-sealing that house.

Ty Newell said he retired from the UI in 2007, partly to concentrate on the Equinox house and partly to work with Ben.

"I loved every minute at the university," Ty Newell said. "As Ben started to grow the business, it went beyond what a single engineer could handle. ... I thoroughly enjoy working with him."

Newell Instruments, founded in 1997, is based in a lab on High Cross Road a short distance north of the Equinox house.

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The company, which has a staff of four, specializes in refrigeration and air-conditioning technologies. It does consulting work for military contractors, appliance manufacturers and the copper and aluminum industries, among others.

Ben Newell said the company hasn't had to advertise its services. Clients generally find Newell Instruments as a result of exposure to the Newells' research work, having read their papers or talked with them at conferences.

Ben Newell said he and his colleagues aren't afraid of adapting different types of technologies to a particular job.

While some traditionalists may say, "You can't do that," Newell said, "We don't care. We try things they think don't exist."

Features of the 'Equinox' house

— 8.2-kilowatt solar-collection system in backyard that fully powers the home and produces enough energy to run an electric car for 6,000 to 9,000 miles a year.

— Super-insulated and super-sealed walls and roof that prevent energy leaks.

— Specially designed system that uses heat-pump technology for fresh-air ventilation, heating, cooling, dehumidifying and water-heating.

— Rainwater-collection system and cistern that provide 80 percent of annual water needs.

— "Clean surfaces" inside (no wall-to-wall carpeting or drapes) to minimize presence of allergens and chemicals.

— Passive solar design with clerestory windows that provide daylight without the glare.

— No appliances requiring natural gas.

— Long-lasting LED (laser-emitting diode) lighting used throughout the house.

Source: Newell Instruments. For more details, see http://newellinstruments.com/equinox.html.

On the Web

Area residents can keep tabs on construction of the Equinox house via the Web by going to www.newellinstruments.com and clicking on the "Equinox construction blog" link.