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Divide To Conquer Net-Zero

Getting To Net-Zero Carbon Emissions Is A Difficult Challenge For Any Building. First, You Have To Decide If You're Going To Tackle Both Electrical And Thermal Energy Loads, Which Really Is A Lot To Take On At Once. Having Faced This Decision, I Recommend The Divide-And-Conquer Approach: Choose Net-Zero Electrical Or Thermal, And After Achieving One, Tackle The Other.

By Edward Brzezowski, PE, Noveda Technologies, Branchburg, N.J.

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Getting to net-zero carbon emissions is a difficult challenge for any building. First, you have to decide if you're going to tackle both electrical and thermal energy loads, which really is a lot to take on at once. Having faced this decision, I recommend the divide-and-conquer approach: Choose net-zero electrical or thermal, and after achieving one, tackle the other.

That's the path **Ferreira Group** took for what has become known as the 31 Tannery Project in Branchburg, N.J.

In May 2006, Ferreira Group moved into its new office building and shop. In July 2007, it became the first documented net-zero electric commercial building in the United States. The 42,000-sq-ft building is the corporate headquarters for more than 200 people and provides shop space for a busy design/build firm. It also serves local and international communities as a living lab and showcase for energy efficiency and renewable energy systems and equipment.

In addition to perfect Energy Star 100 ratings for two years, July 2008 also marked the building's second anniversary of documented net-zero electric operation. What that means is that 31 Tannery produces at least as much electrical energy that it uses in a year, when accounted for at the site. It is generating a surplus of electrical energy, enough to operate for more than one month. Right now, Ferreira Group sells this excess electricity and its solar renewable energy credits back to the power utility, earning \$1.11/sq ft/year (after paying all of its annual electric and natural gas costs). Ferreira is now working on a fleet of plug-in hybrid vehicles that will charge from the building, helping the company take energy efficiency to next level.

The renewable electrical source of energy is a 223-kW photovoltaic system that feeds into inverters for conventional 3-phase 277/480 VAC electrical distribution. There's also a solar-heated domestic hot water system.

There are three key technologies for achieving net-zero buildings: energy conserving products, renewable energy sources, and monitoring and visualization. Getting thermal, electrical, and moisture loads down is of huge importance, and so is running equipment efficiently (or not at all when not needed). But what about monitoring and visualization?

In a net-zero building, loads and power systems have to be closely monitored backward and forward in time. Problems cannot be allowed to persist, nor can we wait for utility bills to arrive 30 to 45 days after use. Therefore, 31 Tannery has dedicated monitoring and visualization systems that produce instantaneous status reports on the building, systems, and equipment, as well as easy-to-read trends. A Web-based BAS, pervasive voice/data/video system, and kiosk displays provide real-time, ongoing commissioning for optimal operations.

To complete the transformation to total net-zero, 31 Tannery needs to eliminate its need of natural gas for space heating. Ferreira Group and Noveda Technologies are currently investigating options and potential partners to accomplish this. Solar thermal might work; but perhaps a deep bore, direct-use geothermal system is a better option. In either case, the efficiency of the building and the availability of the hydronic radiant loops make us well prepared for going totally net-zero in the future.

Having completed the net-zero electricity leg of a two-part journey, our goal for net-zero carbon emissions is within reach.

Author Information

Brzezowski is the founder and executive vice president of engineering of Noveda Technologies. While working for The Ferreira Group, he engineered the 31 Tannery building and developed its approach for visualization-based monitoring.

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