

COMING UP

In next week's issue, read about different law practice specialties found at a number of Denver firms.

Zero value means big returns

NREL's energy efficient building hopes to hit net-zero consumption by 2014

BY CATHY PROCTOR

DENVER BUSINESS JOURNAL

They have workable windows at Golden's National Renewable Energy Laboratory — a 360,000-square-foot, \$91.4 million office building known as the Research Support Facility (RSF). It enables employees to enjoy the fresh air., a rarity for modern office buildings.

The stairs are inviting and easy to locate, also rare. They're behind the glass doors just off the main hallway through the center of the building. The stairs are wide and carpeted, with windows to the outside courtyards.

These elements are part of the overall design of the RSF office building, which houses 1,300 federal employees, said Shanti Pless, an energy efficiency research engineer at NREL.

Since the building was completed in 2011, dozens of architects, engineers, designers, contractors and owners have toured it, eager to learn about the next leap in energy efficiency for commercial office buildings, Pless said.

NREL calls the RSF building the "greenest in the world," and it's designed to be net zero in annual energy consumption — meaning it'll produce as much energy, via the 2.6 megawatts' worth of solar power panels, as it consumes.

At the end of April 2014, NREL will know whether the RSF building will hit the net-zero goal, on the one-year anniversary of when the last bank of solar-power panels started operations, Pless said.

He's confident the building will hit that goal, given the building's energy performance so far.

But Pless warns that the net-zero goal is a never-ending one.

"Net zero is a continuing, ongoing target," Pless said during an interview and tour of the building. "It's an operational target. You have to design [the building] to it, and once it's built, the building needs to perform to that target."

Two of the building's three narrow, east-west, parallel wings were completed in 2010. A third expansion wing was finished in 2011.

The building complex — which also includes a parking lot, data center and cafeteria — was designed to be energy efficient, Pless said.

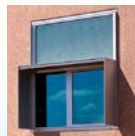
Marching orders given

During the bidding process, the teams of architects, engineers and contractors were given three goals:

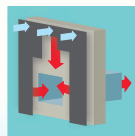
- Energy use. They were told the build-

Efficiency by design

Renewable energy and efficiency features are at the heart of of the National Renewable Energy Laboratory's Research Support Facility



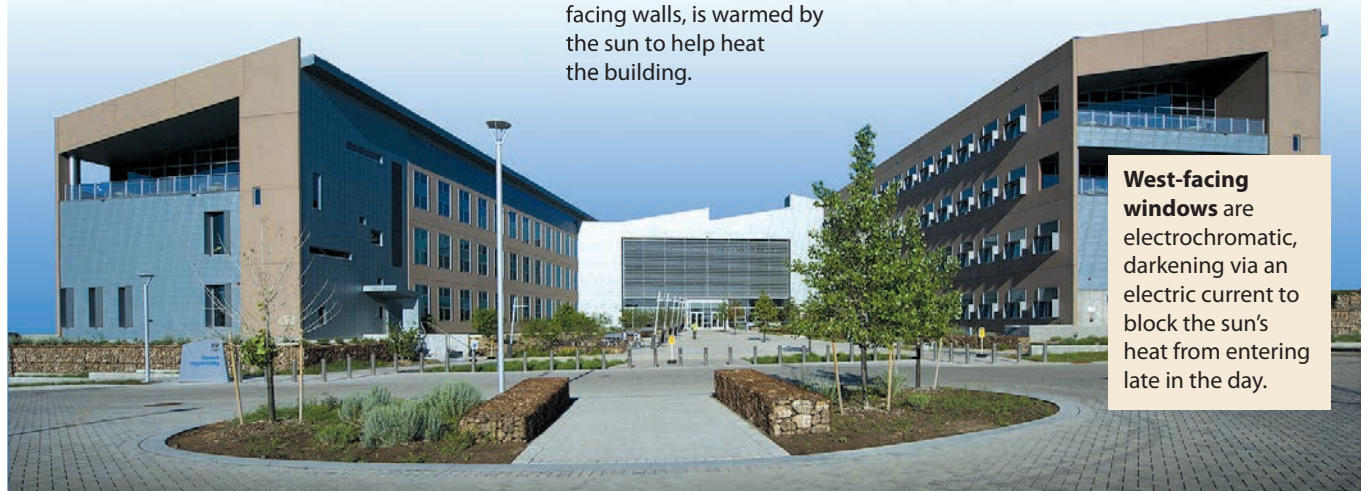
South-facing windows
Light shelf reflects light and shades unlowered windows



Transpired solar collector.
Cool air flowing under a sheet of black perforated metal, attached 8 inches from the building's south-facing walls, is warmed by the sun to help heat the building.



Louvered sunshades on the windows block the sun's rays. Instead, the shades catch the light, reflecting it to the ceiling to help light the workspace.



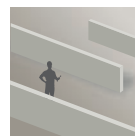
West-facing windows are electrochromatic, darkening via an electric current to block the sun's heat from entering late in the day.



Recycled building materials include beetle-kill pine used in the lobby and runway materials from Stapleton Airport used in the foundation and slabs.



Landscaping consists of Gabion walls (wire cages filled with rocks) and low-water native plants.



A labyrinth of concrete structures in the crawl space stores thermal energy and provides passive heating through the under-floor ventilation system.

Source and photos: National Renewable Energy Laboratory

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ing could use about 35,000 British thermal units (Btus) per square foot, or about one-third the energy consumption of a typical Denver office building.

- It had to have space for 1,300 employees and a data center.

- And they could spend \$254 per square foot, not including the cost of the solar-power panels. That's about 25 percent less than the average \$335-per-square-foot cost to build typical commercial buildings designed to achieve LEED ratings. (LEED is short for Leadership in Energy & Environmental Design.)

Pless said placing an energy-use goal into the design-build contract was deliberate.

"We recognized that every single design decision has an energy impact in addition to a cost impact, and by considering energy early enough in the process, you can incorporate the most efficient options in

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Shanti Pless, an energy efficiency research engineer at NREL, checks out the lighting in the hallway. "Net zero is a continuing, ongoing target," he says.

IN THIS SECTION

DEEP CUTS

Prescient offers new way to construct buildings and save energy. **A15**



Q&A

Green council exec Angie Fyfe on future of LEED ratings. **A16**



MAKING THEIR MARK

Jeter Thomas says oil and gas industry tech savvy. **A17**

