In 1987, a group of building experts from 15 countries, under the aegis of the Paris-based International Energy Agency, toured 45 commercial buildings worldwide to investigate what kinds of building systems reduced energy consumption most effectively, which failed to do so, and why.

Among the participants were two German engineers, Matthias Schuler and Thomas Auer, who, according to Schuler, came away from the project with two overriding ideas. The first was that the most energy-efficient buildings they studied had been
designed from the start with the target of reducing energy consumption—holistically, not as an afterthought.

The second grand idea was that the “conversation” between architects and engineers was halting, at best. “Engineers think in numbers, architects think in pictures,” Schuler recalls. “There was a need for a moderator”—an entity that would iterate ideas back and forth between members of the Building Team to enable them to integrate the physical elements of any building project to produce the optimal solution.

From that exercise was born, in 1992, Transsolar Climate Engineering. Based in Stuttgart, Munich, and New York, the 46-employee energy design consultancy has served as moderator and climate engineer for such pacesetting projects as the Hochtief Prisma office building (Frankfurt-am-Main), the Mineral Bath in Bad Elster, the Federal Office Building (Berlin), Deutsche Post Tower (Bonn), the Lavin-Bernick Center for Student Life (Tulane University), the New Bangkok International Airport, and the Klarchek Information Commons at Loyola University Chicago (see “Naturally Cool Enclosure,” June 2008, [www.BDCnetwork.com/article/ca6570756.html](http://www.BDCnetwork.com/article/ca6570756.html)).

**Manitoba Hydro: Putting integrated design to the test**

Transsolar's mediation skills were put to the test in the design of a new corporate headquarters for Manitoba Hydro. In 2000, the Canadian province's electric utility set out to build what it hoped would be the most energy-efficient office building in the world, one that would use 60% less energy than that set by Canada’s model national energy code. In addition, the company set high standards for workplace functionality, urban regeneration, signature architecture, and cost-effectiveness.

Manitoba Hydro's management assembled its Building Team—Canadian firms Kuwabara Payne McKenna Blumberg (KPMB), architect; Smith Carter Architecture & Engineers, AOR; Earth Tech Canada, M/E engineers; Yolles/Crosier Kilgour, structural engineers; and construction manager PCL, plus Transsolar as climate/energy engineer—and required them to operate under a brand new “integrated design process” (IDP) formulated by Natural Resources Canada.

Manitoba Hydro’s board had one final demand: Its new HQ had to be the tallest building in Winnipeg. That mandate could lead to only one solution—a tall, skinny building. In the numerous charrettes that were held to comply with the IDP contract, however, it became clear to the team and client that, based on Transsolar's modeling, Winnipeg's damnably contradictory climate—with minus-35ºF temperatures in the winter and (remarkably) more sunny days than any other big city in Canada—would make it impossible for such a pencil-thin structure to meet the 60% energy-conservation goal.

From the IDP process emerged a radically different building—an 18-story tower sitting on a four-story, A-shaped base, totaling 372 feet in height. (CanWest Place, at 420...
feet, and two other Winnipeg buildings are taller.) The diagonal facades of the A are clad in double skins with operable interior windows to control air circulation and indoor temperature. A solar chimney at the vertex of the A uses stack pressure to exhaust hot air in summer. A ground-source heat pump system feeds water to a radiant heating and cooling system in the exposed concrete ceiling slab.

The full south façade of the 18-story tower is glazed to take advantage of Winnipeg’s sunshine. Double skins on the east and west temper the outside air, and a solar chimney at the north end enhances air exhaust.

The bottom of the A, along the south side, is glazed over the full height of the tower to take advantage of the sun in winter; operable louvers in the inner façade can be closed in summer to reduce indirect solar heat gains. The tower floors are divided into three six-floor layers, each with a south-facing atrium that serves as a voluminous winter garden to condition the air going into the offices on each floor.
“The building is like an organism,” says Auer. “The radiant system fits with the geothermal system, the façade fits with the ventilation, and the shape of the building fits with the solar access. The systems and the building operations become integral to the physical structure and mechanical systems of the building.”

The first 300 employees moved in last December. Even though it was minus-30°F outside, the inside temperature was comfortable. Another 1,500 staff will move in next month, when the $258 million building is expected to be completed.
Where Passive Climate Systems Work Best

Passive solar design and natural ventilation concepts work better in more northerly climates like Winnipeg or Chicago than in places like New Mexico or New Orleans, says Transsolar's Matthias Schuler. Cold temperatures and relatively low sun angle make buildings in northern cities good candidates for the kind of hybrid ventilation treatment used at Manitoba Hydro. Building projects in other climates need approaches specific to their locales.

Transsolar's Thomas Auer says he's seeing a more open attitude toward innovative building approaches among North American clients. On the one hand, “North America was always budget-driven,” he says. “In Germany, there is a different attitude. Buildings here contribute more to the social fabric of the city.”

At the same time, European regulations, such as those requiring worker proximity to windows, can handcuff designers. “In Germany, workstations are lined up against the wall, and this leads to a double-loaded building,” he says. “The Hydro building has 40 feet of column-free space to furnish an open plan. Nobody would do this in Germany.”