

YOUR GUIDE TO THE HYDROGEN ECONOMY

H2Nation

Hydrogen / Solar / Wind Energy

Vol. 1 Issue 2 March/April 2004

Living High
Off The
Power Grid

Hydrogen
Hybrids

The Future Is Here

On a Wing and
a Fuel Cell
First Fuel Cell
Passenger Aircraft

The End
of Oil?

Renewable Energies
The Road to the
Hydrogen Economy

\$5.95 US \$7.95 Canada
ISSN 1545-7036



9 771545 703008

www.h2nation.com



THE HOUSE OF SPIRES

A house on top of the mountains. Life at 11,000 ft. has its challenges. We went to the home of Chuck and Theresa Burr to see this magnificent off-grid home. Page 36.



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The House of Spires

By Judd Boyer

The Paiute Indians called these mountains sacred. The miners found treasures of gold and vast riches. Today a new treasure sits at 11,000 feet above sea level.

Alex Markels of Newsweek Magazine said it best: “The beauty of doing a Telluride story is that you get to go there.” No truer words have ever been spoken.

One afternoon, sitting at my desk in the home office of H2Nation Magazine, I received a phone call from a gentleman asking a question we have heard many times before:

“Where can I buy a fuel cell system for my off-grid home?”

As we talked, a story began to unfold -- a story not only about a young couple building their off-grid dream home, but a story rich in history and adventure—a story of a home that sits at the top of the world. We had to go there. We had to visit the home of Chuck and Theresa Burr.

Larry, the science editor, and I left our office in Sparks, Nevada, early on a warm fall day this last September and drove eastward across the desert on I-80. Along this route, we encountered numerous geothermal power plants and all too many coal plants. By sundown, we arrived in Salt Lake City, only halfway to our destination. With an early start next morning, we reached the town of Telluride by midday. Right from the start, you could tell that this was a town of history; the storefronts looked as if they were right out of an old western movie. This was a town that held many stories, both sweet and sad.

After a quick tour of the town, we headed for the Burr home. With our GPS in hand, we set out for our final destination. After turning off the main road, we followed a dirt road that lead past the remains of what was once a mining camp. We read the instructions again, laughing at “If you come to two lakes, you’ve gone too far.”

When we pulled into the driveway of a beautiful home high in the Colorado mountains (with a view that is beyond words), we checked our GPS -- and sure enough, it read 11,074 ft. The only time I had ever been at 11,000 feet in my life was in an aircraft -- with oxygen!

The site on which the home was built was a working gold mine in the early days of Colorado. It had served as a test bed for the new AC electric transmission systems being developed at the time by Nicola Tesla and the Westinghouse Company for use in the mining operations. Today, the house sits at the base of a rugged, snow-covered peak and is built right into the bedrock with no sign whatever of the ancient gold mine that once operated there.

We were graciously welcomed by our host and hostess and made to feel at home in this house with splendid and breathtaking views of snow covered mountains. The craftsmanship of this home was apparent.



(Left) The road to the Burr Home. (top) The colors of the house blend into the surrounding area. (Above) The surrounding view is remarkable from any point on the property.

The exterior colors blended easily into the surrounding area, making this new home look as if it had always been there.

Chuck Burr took us around his property and as we walked he explained the history of the land and the mine, and how it was the first mining operation to use AC power.

We enjoyed a delicious evening meal, and talked about incorporating an electrolyzer and fuel cell as a backup for power to the house. We were surprised to learn that a team from Plug Power was to be there in the morning to discuss that very issue. After a delightful conversation, we retired for the night. We had never seen sky as black and vast, or stars as bright as we saw from the great bedroom windows that night. Made us feel we were part of the heavens we were viewing.



The powerhouse. The heart of the Burr residence energy station. Shown are the 16 BP 150 watt solar electric panels.

Bright and early next morning, we began the job we went there to do: that is, to investigate every aspect of this magnificent structure and find out how its inhabitants live and enjoy the home and its surroundings. Chuck explained that before the building began, he and Theresa, along with the aid of Leif Juell (Alternative Power Enterprises) mapped out what they felt would be needed in the way of power, not only to amply supply the finished home, but for use in the construction of the home. They decided that sixteen BP 150 photovoltaics, and two Xantrex 4024 inverters with an Outback Power distribution system, was the path to take. With the basic system in place, construction could begin. The home was completed in July of 2003.



The generous use of windows with a southern exposure help to warm the home in the winter.

Every aspect of this home was designed to maximize energy efficiencies. A generous but balanced window layout on the southern exposure allows passive heating anytime the sun is shining. The heat collected during the day in the second floor concrete slab slowly reradiates throughout the home in the evening, keeping it very comfortable. A fan installed in the high ceilings directs warm air down under the slab to keep temperatures regulated. Use of SIP or Structural Integrated Panels for most of the exterior walls as well as the roof insures a more than adequate insulation barrier to severe temperatures. The SIP panel is a lamination of polystyrene or Styrofoam between two layers of plywood or oriented strand board. The home is built directly on bedrock so a generous use of steel beams and concrete for most of the main structure disallowed the use of conventional batt type insulation. The SIP panels allowed nearly perfect sealing and high R value insulation without creating thermal bridges.

When temperatures stay severe for long periods of time and are then accompanied by cloudy weather, a unique supplemental heating system is employed. Plastic tubing was embedded into the floor slabs during construction. A propane-fired boiler heats water that is then circulated



The office is equipped with the latest high tech gear, including high speed internet.



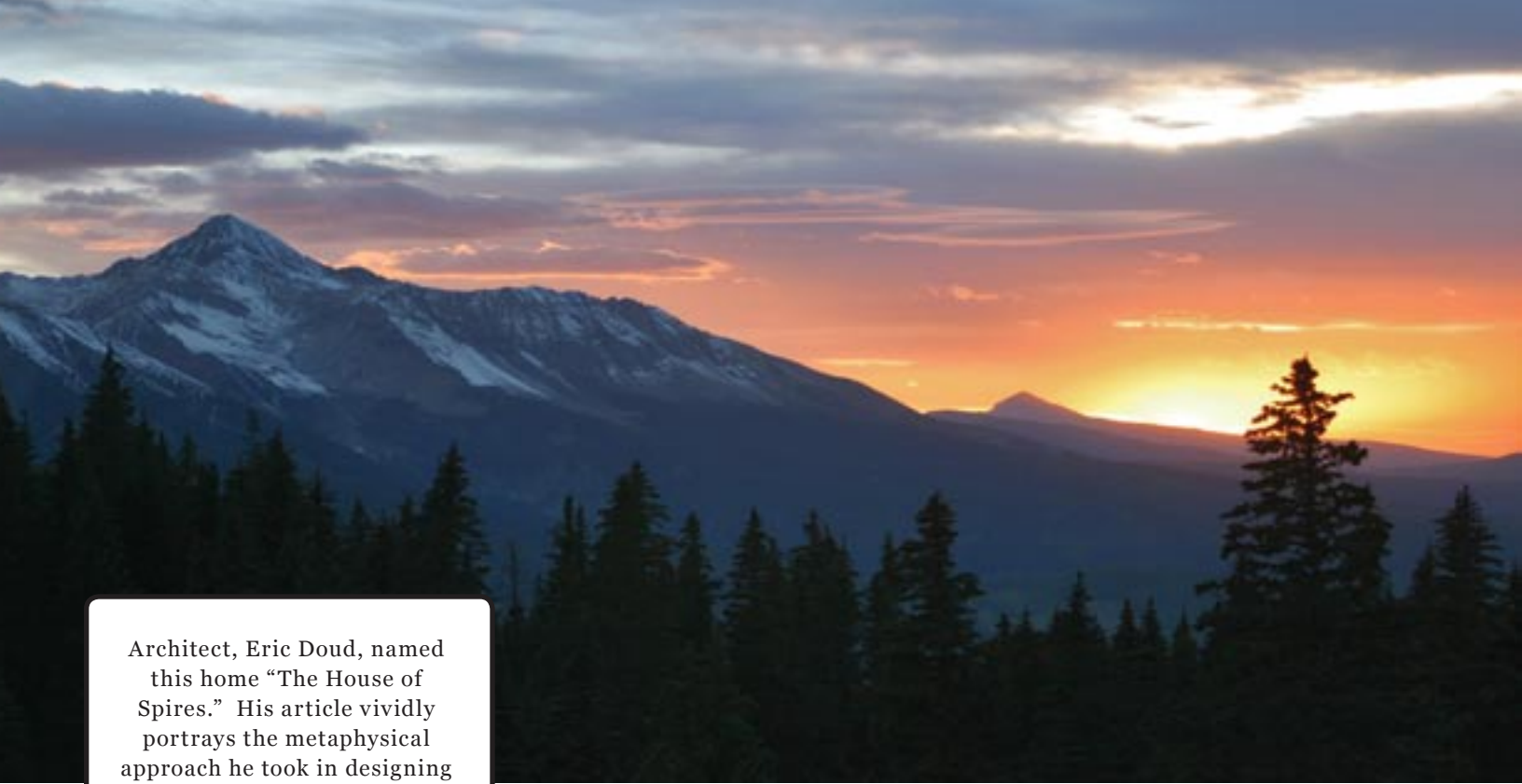
The kitchen is warm and airy. Built-in storage and an oversized commercial refrigerator/freezer keeps them well stocked for long winter days and nights.

through tubing embedded in the floors. Four one thousand gallon propane tanks are buried in solid bedrock in front of the house. Although this propane is used mainly for heating hot water and for cooking, it is unlikely that a large quantity of propane will be used each season for general heating purposes, because the heavy insulation of the house and passive solar heating should be adequate for all warming needs.

Another addition made as the home was being built consisted of a set of insulated tubes from the powerhouse to the boiler located in the basement. The powerhouse roof has adequate space for additional thermal solar collectors to be added in the future.

The Burr home has all of the comforts you could ask for through use of renewable energy. Every energy need -- from the deep well pump, to the dishwasher, to a large commercial-sized refrigerator and all of the lighting -- is met by using only the sun and an occasional backup from a propane generator. Leif Juell, the contractor who installed the Burr energy system, commented he was pleased that the home included radiant in-floor heating. The relatively tiny amount of power consumed by this type of system when compared to a forced air heating system means lower power system costs and better wintertime performance with very little need for backup charging.





Architect, Eric Doud, named this home “The House of Spires.” His article vividly portrays the metaphysical approach he took in designing a beautiful structure with jewel-like appointments. He succeeded in blending the house with the surroundings so that the aesthetics and the ecology merged in a symphony of order and beauty.

**“HOUSE OF SPIRES”
THE BURR
RESIDENCE**

Eric Doud: Architect’s Statement

The Nature of Response

The effect of architecture is always beyond the purely visible. Response to architecture does not occur as an association in the mind alone; but, of necessity, space is experienced directly and becomes tactile knowledge held in the memory of the body.

A deeper comprehension occurs when the dominant sense of sight is mediated by the body’s

sensual understanding through this tactile experience. Architecture derives its fuller meaning from this understanding and it becomes powerful through the appropriate selection of form. Its visual response then (coupled with the choice of materials) evokes the deeper, sympathetic, sensual response.

Power of Place

The environmental setting of Gold King Basin poses a psychological dichotomy: the qualities of a fragile, high altitude environment with its subtlety of color and tenuous existence of high altitude flora; and the combined beauty of overpowering towers of rock and an eternal expanse of vista beyond.

In such a powerful location, the term “house site” cannot be used in the ordinary sense; for here, one is confronted with the power of place. Located at the very limit of the timberline, this site is extreme -- and the dwelling becomes the ultimate definition of shelter.

***Building
Structure & Materials***

Selection of a faceted geometry that reflected the prismatic and crystalline high altitude minerals for which the land was originally claimed was the approach taken in finding an appropriate architectural form. Exterior building materials were chosen from a limited palette that consisted of unfinished metal, massive abutments of site-quarried stone and heavy timber, all used in a direct and immediate way.

Interior spaces of the dwelling are held in dynamic balance between the battered stone walls grounding the north, and the transparency of glass in the south that provides an expansive view of the upper basin.

Reflective of the site’s fragile beauty coupled with its massive ruggedness, inside finishes are jewel box-like in detailing that consists of sheets of alder paneling set with ribbons of metal trim. Built-in furniture and cabinetry throughout combine



with freestanding furniture of quartersawn white oak, detailed with black walnut accents, built specifically for this house. Metal spire sculpture and the artistry of high altitude flowers depicted on stained glass panels add to the richness of materials and images.

Systems

State of the art building and mechanical systems provide for a largely energy independent structure. The building envelope is constructed of stressed skin panels separate from the structural frame, creating great thermal efficiency. Low E triple-glazed windows minimize heat loss and provide panoramic views with passive solar gain. Concrete floors thermally stabilize interior spaces by creating a heat sink for the passive gains. This functions as a thermal flywheel between the day and night cycles. Additionally, direct gain heat is captured with the use of a destratification fan that delivers solar-heated air from the top of the building envelope to the crawl space where it is absorbed, thus contributing to the thermal flywheel. Passive solar gains are also developed through Trombe Walls constructed in this case by painting southern-facing, concrete, foundation walls black and simply glazing their exterior surface. Electrical energy is supplied through photovoltaic power production. This is matched with energy efficient lighting and appliances. Any additional demand is supplied by a propane-fired, backup generator and house boiler.

Conclusion

The power of architecture is in its ability to evoke a primal response. It is the intent that through the articulation of built form, the selection of natural material and appropriate environmental systems, the result touches our deeper sensibilities and questions the origins of meaning. We, who come to such a powerful place, cannot equal anything so magnificent as that originally before us. We can only hope that our effort, in some small way, becomes a worthy offering to the surrounding grandeur. This is the House of Spires.☼



Total array rated power 2.4 kw consisting of 16 BP 150-S photovoltaic panels, nominal voltage of 24 vdc.
 Storage 12-4 volt Rolls Surrette 4ks25PS batteries 1347 amp hours each for total of 2694 amp hours.
 Two Trace (Xantrex) SW4024 inverters wired for 110/220 vac split phase, includes Outback AC and DC power distribution panels.
 Two Trace C40 charge controllers.
 One 20kw Onan propane fired generator for backup derated to 10kw due to altitude of 11,000 feet.
 4 in-ground Propane tanks holding 1000 gallons each.



12 Rolls Surrette 4ks25ps Series 5000 Batteries



Two Xantrex 4024, (Center) Outback DC (left) and AC (right)



Onan 20kw Propane generator



Buried in the bedrock are four one thousand gallon propane tanks



Contractor Leif Juell (Left) talks to Plug Power senior board member, John Elter (center), about a future fuel cell upgrade.