Can an old brick barn, converted into office space, really be among America’s most energy efficient buildings? It’s starting to look that way.

When NBI needed a new office to accommodate their staff expansion, the property they ended up renting was an historic brick barn, built in 1865, that had been converted to offices in the mid 1970’s. Before NBI moved in, the property had been vacant for a couple of years, although well-maintained generally. Among its energy efficient features were brick walls with no insulation, single-glazed windows, T-12 and CFL lighting, almost all electrical switching at the circuit breakers, and exterior lighting on a nearly random schedule.

Beyond the normal (environmentally friendly) carpeting and (low-VOC) interior paint job the space required, NBI also negotiated replacement of the two 30+ year old split system air-conditioning system (with electric resistance heat) with variable speed high efficiency heat pumps. NBI paid for the high efficiency HVAC upgrade beyond code, but lighting related improvements would have to wait for the next budget cycle.

Because of the long vacancy between tenants, NBI had little information about the building’s prior performance. However, in the coldest and hottest months of the year, electricity costs were around $220 to $260 per month, which translates into over 4,000 kWhs per month. In our first month (December, when the building was not occupied every day) energy use was 2800 kWh, so 4,000 does not seem inappropriate for a cold month. The new mechanical system, with zoning so that the upstairs conference room floats when not being used, dropped January’s use to 1600 kWh – a huge decrease in heating energy from the advanced heat pump – and more comfort and less noise from the variable air flow elements. We did find that the electric backup (the so-called emergency heat) was coming on during morning warm-up, so we had the HVAC installer put in a cut out so that electric resistance could only come on if the temperature was below 36 degrees.

In hot weather, we open up the building for natural ventilation to cool the space and the bricks; air conditioning is usually not needed until late afternoon, and then only on days exceeding 80 degrees.

Our lighting is brutally bad from an efficiency perspective, but the upstairs conference room has plenty of daylight; on most days the lights simply aren’t needed. On a typical day, only half the downstairs lights are in use. My office, about 100 square feet, has 384 watts of connected load, and I need to turn on not just my lights, but several other areas of the barn lighting when I work in the space – I have a nice view, but not enough daylighting. The proposed redesign for my work space will use 56 watts, which, combined with occupancy sensors, should cut my lighting energy by 90%. It may also enable us to save some additional cooling energy, as my south-facing location is usually first to overheat due to the equivalent of a small space heater on full time.
The computer are mostly portables, the water cooler is unplugged, the coffee pot stores hot coffee in a thermos and the random outside lamps are burning out – we have gone from 13 to 4 functional outside lights over the last few months – untouched by human hands. Employees can also work from home, but the office is reasonably full most days.

So, we have now been in the office with the new mechanical system for more than six months of bills post-HVAC upgrade, from freezing weather to over 100 degrees. The bills divided by the square footage work out to 26,000 BTUs/Sq ft. annualized. Even when we correct for Energy Star variables (and get the full year’s data), we will still be looking at an excellent score.

It’s not the typical energy efficient building; it’s much more about staff empowerment and paying attention. We are a small shop in a small space, but that space is comfortable, functional and well used. Naturally ventilating and cooling down our brick mass almost take mechanical cooling out of the equation. It’s a simple lesson from an old building.

Maybe we’ll thrown on some PVs and be the first net-zero energy historic barn/office in the country. But first, we’d better reduce that energy usage some more.