

somebody in West Virginia sitting on a coal mine that it doesn't make sense to burn coal for power? But it doesn't make sense to ship coal to central Virginia or to somewhere where they could do hydro." And right here in central Virginia at the old Rapidan Milling Company, they're making hydro, and it is free, clean, and devilishly ingenious. "To me it's very fascinating, just mechanically," says Kevin eagerly as he jumps around the water house describing how this contraption works. He points to the swirling water. "What you have down there is a wheel on its side, and on the edges of the wheel are these little cups called runners; and then the runners are covered by little doors called wicket gates, and essentially, it drains out like a bathtub through a hole under all this water called a draft tube; and as the water drains out, it spins the turbine which spins the shaft," rattles Kevin.

"Everything in water power depends on head," he continues, "the difference in the water up there," he points to the mill pond upstream "and the water that comes out down there;" he points to the tail race that goes underneath the highway bridge and returns the water to the river unchanged. "It's nothing to do with the flow, it's all about the differential of the fall."

Kevin's had to learn a lot about water power and electrical generation when "this particular building came across my radar by happenstance." That was three years ago, but the real start date goes back to 2000 when his father, a successful Palm Beach realtor, contractor and developer realized, "There ought to be a way to develop responsibly. Energy and resources should be husbanded." Never mind that notion was completely opposite to the bigger-is-better mindset of those days, when "essentially you build a flat roofed concrete box and air condition it to make it habitable."

Robert O'Brien invited his son Kevin to join the firm. They moved FPC to Charlottesville, and changed the paradigm. And then they came across this great big, well, monstrosity of a building on the Rapidan River with two electrical generating turbines dating back to the 1930s in it. Still he remembers telling himself, "This community and this site have a lot of potential."

They set to work. With the financial help of loyal investors and Virginia National Bank in Orange, and the expertise of engineer Kevin Edwards, they pulled the two turbines, refurbished them, and installed modern computerized monitoring, remote control, and safety equipment. Back in the 60s, when it came time to clean the intake racks of trash and leaves, "It had to be manually raked when it got clogged," says Kevin. In fact, "The last guy who was making power here, he just shut down in September and October when all the leaves were coming down the river; he just couldn't keep up." But now, mechanical rakes automatically comb the intake racks, dumping leaves into a sluice that returns them back to the river from whence they came. "This is a big efficiency improvement," says Kevin.

This "efficiency improvement" bogged down however when it ran up against corporate foot dragging and stonewalling. Kevin cites the measure; it's called Schedule 19. It basically says that power companies, such as Dominion, that have been awarded a de facto monopoly on power distribution, in return, must buy it wholesale at going rates from whomever generates it, no matter how small. And so the O'Briens sell their river-generated electricity to Dominion for five cents per kilowatt hour. "My understand-



Photos courtesy Kevin O'Brien and Rapidan Renewable Energy and FPC
Before and after: an original 1930s-era turbine before being shipped to the Leffel factory in North Carolina, and the same turbine after refurbishment.



ing is they just basically take our power and immediately sell it for three times as much. No skin off their apple," he shrugs.

Still, Kevin is reluctant to diss Dominion because, like it or not, they are his new business partner. Plus, this whole process is as new to them as it is to him. "We have a bunch to learn about the hydropower business," he admits. But still, "This could have happened 11 months ago. There's been a lot of hurry up and wait, and that's been part of the learning curve as well." At one point, 30th District Delegate Ed Scott had to step in to make things happen, which they finally did, about a month ago. After weeks of running tests and turning the system on and off and recalibrating and testing again, they officially started continuously generating power this past July 4.

What a coincidence: Independence Day! How appropriate, because those two little turbines down there in the basement are this massive building's ticket to financial freedom. Five cents a kilowatt at 100 kilowatts per hour, 24-7 translates into, well, do the math: a pretty nice, not huge, but steady income that gives Kevin and this "pretty ugly building," some breathing room.

"Right now, it's a way to get the building useful again," says Kevin, "and, we hope, a way to make the whole site

useful again in terms of contributing to the community and once again being a vibrant part of the community. We're looking at this as sort of a Phase I. It's generating some income, paying its own debt service, paying the interest on the loans that built it, and hopefully allowing us the time to explore how to otherwise develop the site."

There's a structural advantage here as well. Look closely at the building. It is essentially post and beam construction. All those ugly cinderblock walls could be removed and the building would not collapse. You could replace those walls with glass, or wrought iron railings, creating balconies with stud walls, windows and doors set back, or a combination of all of these options. When you look at it that way, the possibilities are endless.

But, the last thing they want to do is tear this place down. That act in itself is hugely wasteful. "Simply reusing and not abandoning all this mass of energy and resources that are embedded in this structure is an environmental plus. I just think the whole idea of reuse and recycle...There's a lot of exciting possibilities," says Kevin.

He ticks them off one by one: The floor, housing the generators, the one above the water house, could be a lobby, office and museum displaying refurbished flour mill equipment and machinery. The generators themselves need to be enclosed; they're noisy; they hum and whine. But, the floors above, which happen to be above the floodplain, could have multiple uses: a destination restaurant, an art gallery and/or studio(s), offices for nonprofit organizations, even an ultra hip 3,000-square-foot loft living space on the top floor.

An external hallway on the south side, level with the roadway, could also hold solar hot water panels, which could be used for building heating and cooling. An atrium-like elevator like you see in hotels could make these top floors accessible from that exterior hallway.

The 10 silos which were "made for immense internal pressure pushing out," could have windows and doors and floors put in without weakening them. They could be offices, residences; Kevin has even considered converting the silo exteriors into a climbing wall with a rectilinear green lawn roof on top.

If they had borrowed millions of dollars and did this all at once, it would never work. "We would certainly be regretting that now," says Kevin, referring to the economic slow down. "The phased approach, as opposed to the highly leveraged all-at-once approach, is conducive to doing something that's environmentally responsible." Besides he adds, on big projects when you encounter "logistical, procedural or regulatory hurdles, you're always too impatient to work out the kinks because you've got these big loan payments...Going slowly, in the long run, is going to be better for the vision of the place as something that contributes to the community."

He leans forward in his chair. "It's eyes wide open," he says sensibly. "It's not like it's a charity or anything, but it's more of a whimsical labor of love type project that we think will bear fruit; but certainly no get-rich-quick scheme. It's really about slowly investing time and energy and imagination into this little community and hopefully in the long run having that bear out into something that everyone could be proud and pleased and happy about." And all the while, those two little steady-eddy turbines down there hum and whirl and generate power... and income.

Small really is beautiful.



Photo by Phil Audibert

Kevin O'Brien has spent the past three years refurbishing and modernizing two existing hydropower turbines at the Rapidan mill. They now supply about 100 kilowatts per hour to the Dominion grid.



Photo by Phil Audibert

The Rapidan Mill today. Note that concrete post and beam construction means that the cinderblock walls are not load-bearing. They can be removed and replaced with glass or balconies or stud walls, windows and doors.



Photo by Phil Audibert

The heart of the operation. The water-powered rotating shaft comes out of the floor, through the square gear box and turns the keg-like generator on top. Electrical boxes behind Kevin O'Brien are crammed with high tech safety and remote control computer systems.

Small is beautiful

Down in the water house on what you might call the "ground" floor of the old Rapidan Mill, two relatively small turbines rotate as water drains through what's called a draft tube. They steadily turn two black shafts, each maybe four inches in diameter. The rotating shafts rise up from the water and disappear into the ceiling. In the room above they turn two generators, basically electric motors in reverse, each about the size of a keg of beer.

From the generators, electrical conduit the thickness of a man's arm, leads to a cut-off lever, a control panel, and finally to an outdoor transformer, about the size of three office filing cabinets. From the transformer, the conduit leads up a utility pole and connects to Dominion Virginia Power's grid.

If everything's running right, this Lilliputian generating station will manufacture maybe 105 kilowatts per hour, enough to power 60 to 100 households, which is about what we have in the surrounding village of Rapidan. To Dominion, this is a minor annoyance, a mere drop in the bucket.

To the rest of us it is a triumph. It is the same triumph felt by the mariner when the wind fills his sails, or the glider pilot when he soars up on a thermal, or even the bicyclist, when he crests the hill, and rockets down the other side. It is also the triumph of the rugged individual against the faceless masses, the small businessman vs. the giant corporation. It is the little engine that could.

Kevin O'Brien is one of these triumphant people, but he doesn't brag about it. Yes, he is a dreamer, but he is also "eyes wide open." He has grandiose ideas, but he wants to take them one step at a time, never losing focus on what's best for this community. Most importantly, he thinks in terms of "small is beautiful."

"The massive economies of scale have just proven to be a kind of an unviable idea," reasons this former schoolteacher turned environmentally responsible entrepreneur. "We'll spend countless resources in this notion that something's too big to fail, whereas it's almost just too big NOT to fail."

Take power companies, for example. "We're locked into a system, if we don't change it, of massive power plants that have maximum negative environmental impact, and maximum inefficiency. In some cases line losses alone are 20 percent just pumping it so many miles away. Whereas if we had so many little regional plants..." he points to his two tiny turbines, and lets the sentence finish itself. "Of course it would cost Dominion a lot more, it would hurt their business model, but for the rest of us, it would make more sense. It would be more efficient in terms of the grid. You could tailor the fuel source exactly to that community, whether it be water or wind."

He figuratively slaps himself and exclaims, "Hey! Who am I to tell

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Photo courtesy of Alan Shotwell
 This photo was taken at the turn of the last century. This structure most likely replaced a mill that was burned by the Yankees in 1864.

Photo courtesy of Alan Shotwell
 The concrete dam that you see today at Rapidan was built in 1936, just in front of the old log dam visible in this photo.

Review file photo
 The date was June 15, 1950. Although abundant water was nearby, Orange Volunteer Fire Department pumpers couldn't supply enough pressure to reach the top floors of the Rapidan Milling Company. The silos were saved, but the mill burned to the ground.

Photo by Alan Shotwell
 Anchored on bedrock, the Rapidan Mill has survived numerous floods, including the June 25-28 1995 deluge, when the river crested here at 30.4 feet. Pictured at left are Adele Shotwell, Allison Hurlock and Sara Shotwell.

A brief history of the Rapidan Mill

"There's never been a time there has not been a mill," says fifth-generation Rapidan resident Alan Shotwell.

Shotwell, who is the author of a history of this unique village called Rapidan Communities, tempers this statement with a couple of clarifications: There probably wasn't a mill here prior to 1772. A few mills may have been washed away, and, certainly, one was burned by the Yankees; another burned by accident. But, he adds, they were always rebuilt and shortly back in business. In fact, there was a mill at this same site in Rapidan before there was even a community.

To understand why a mill and why in Rapidan and why on the Orange County side of the river, one must go back to the formation of the Southwestern Mountains. The river parallels this escarpment of ancient rock from Liberty Mills to Mine Run. "This rock is the one thing that endures," says Shotwell. It protects the river banks from erosion; it paves a solid bottom for wagons to ford at shallow places; and, most importantly, this rock provides a secure anchor for mill pond dam structures.

The first mill at Waugh's Ford, as it was known

then, was probably built in 1772 by Lawrence Taliaferro (pronounced Toliver, please). In those days, most mills had "overshot wheels," where a large paddle wheel on the side of the mill house used the power of horizontally flowing water to turn grindstones. Colonial farmers, who had settled and planted the fertile Davidson soil in this area, flocked to this and many other mills constructed along the Rapidan and other streams to grind their grain into flour. And because this was also an important ford and a household water source, it was only natural that a community should establish itself here.

When the Orange and Alexandria Railroad arrived in 1854, Waugh's Ford became Rapidan. Proof that the mill was built on solid ground can be evidenced by Mary Jane (Boggs) Holladay's April 20, 1861 diary entry. "The oldest inhabitants do not remember such a freshet (flood) as we have had," she writes, adding that other mills and dams "both above and below us were carried off." Her husband, Henry Holladay, "succeeded in moving from the lower floor of the mill, everything except some ground plaster. While they were all busy about it, the water rose so high as to render it dangerous for them to try to attempt leaving the mill."

The journal goes on to describe her husband's futile and foolhardy attempt to lead everyone through the surrounding water to higher ground. "The men had to pass the night where they were," she continues. "All the millers and tenants and all our servants and several from other places were there, and from all I can understand they were as badly frightened as any set of people need be."

The mill withstood the "freshet" but could not withstand the destructive force of fire. Colonel Henry

Martin Lazelle's Chief of Staff reported that the 16th New York Volunteer Infantry captured and burnt to the ground, among other things, "the six-stone mill, said to contain 500 barrels of flour," on Sept. 16 1864.

But, the mill was rebuilt and continued on into the 20th century. It was sometime in the 1920s when it also started to generate electricity, supplying the vil-

lage of Rapidan with power. In 1936, they built the current concrete dam right in front of the old log dam. Also, in 1936, it is believed that the overshot wheel was replaced with the same turbines that drive today's generators! Now, instead of using horizontal flow, the mill and generating station relied on a more efficient vertical flow of water, akin to placing a propeller inside the drain of a giant bathtub.



Photo by Phil Audibert
 Kevin O'Brien hopes to be able to refurbish some of the old milling machinery and turn it into an educational exhibit in the lobby of the mini hydro power plant.

By June of 1950, Rapidan Milling Company had at least six concrete grain silos and was operating 24 hours a day. It was on the 15th of that month when an elevator jammed and the ensuing friction of belts and pulleys started a fire while everyone was on their lunch break. Mill manager, O.B. Jones and several workers made a valiant attempt to extinguish the blaze, when, "a charred and flaming plank fell from the top to the bottom, igniting each floor and the bottom in its descent."

The Orange Volunteer Fire Department responded to the blaze, but their pumpers couldn't generate enough pressure to reach the top of the four-story structure. So, they turned their hoses on the silos to keep them cool. The fire burned for days, fed by 15,000 bushels of grain. It was after that fire that the mill was rebuilt to the towering concrete pillar and frame structure that you see today.

Other than fire, a mill's next worst enemy is too much water. The Rapidan Mill survived deluges in 1861, 1937, 1942, and two 100-year floods in June (Agnes) and October of 1972, as well as unnamed storms on election eve in November of 1985 and on June 25-28 1995, where the water crested at 30.4 feet!

At its peak production, the mill churned out 525 hundredweight of flour daily. Alan Shotwell well remembers accompanying his grandfather, who was an agricultural statistician, to the mill to sample every 100th bag of flour for the USDA. Although it was "an OSHA nightmare," Shotwell says, "I never heard of anybody being injured over there. People who worked there had a rhythm."

Still in place on the upper floors of the structure are the remnants of old milling machines, including

a conveyor belt elevator where workers would hop on and off using handholds and foot platforms as they traveled between floors. "My understanding is it never stopped. You just timed it right," says Kevin O'Brien, of FPC Corporation, the building's current owner. "There are people in this community that rode on this thing," he marvels.

In 1966, the Rapidan Milling Company was sold, and as Alan Shotwell terms it, "the flame died." When it ceased production in 1968, it was only grinding animal feed. But it continued, for a while anyway, to on-again, off-again, contribute a small amount of electric power to what is now the Dominion grid.

Today it is still supplying power to that grid on refurbished turbines. But there's plenty of room for other compatible uses: residential, commercial, and recreational. Alan Shotwell says that, generally, the Rapidan community is supportive of Kevin O'Brien's plans, as long as things don't happen too fast. "Kevin has been very approachable and very understanding," says Shotwell. "I think his views and ours are parallel at this point in time."

Kevin O'Brien echoes these sentiments. "They've been very supportive," he says of the Rapidan community. "If this little bit of electricity can spur enough interest...to attract some combination of business or residence or even recreational use that's environmentally responsible and in keeping with the nice bucolic historic character of this little village, it will have done its job."

Many thanks to the research of Alan Shotwell and his historical work Rapidan Communities, from which many of the stories and facts cited in this article are gleaned.