



Bluebonnet's 11,000 miles of power lines mostly span the sky, but in new neighborhoods, they are increasingly out of sight

THE ELECTRIC UNDERGROUND

WHAT LIES BENEATH

By Ed Crowell

Going underground is going forward all over the Bluebonnet Electric Cooperative service area. Subterranean power is popular because it is more reliable and less intrusive on the landscape. It is more expensive than traditional overhead power lines strung between tall poles in yards and along roadways, but the price has fallen in the past decade.

It's not just neighborhoods that are sinking their power below ground. New schools and large commercial projects favor buried lines to carry their large electrical loads.

About 500 miles of Bluebonnet's 11,000 miles of lines disappear into the earth. Last year about 43 miles of underground lines were added to the co-op's system and the previous year about 25 miles were added.

Just east of Austin in Manor, the subdivisions of Presidential Glen, Presidential Meadows and Stonewater have underground power lines along streets that are completed or under construction. It's the same with Easton Park homes along McKinney Falls Parkway in southeastern Travis County and Pecan Park homes in Bastrop.

An even bigger development where power lines will be buried is the community of Whisper Valley to be built near Manor off the Texas 130 toll road. Whisper Valley model homes are expected to be open early this month. It's a massive development billed as a "green" community. The development plans to have 7,500 homes — all served by buried electrical lines — when finished in several years.

"Most every week we are either trenching for (underground distribution) cable lines or pulling lines through to make connections," said Shawn Ely, electric distribution design supervisor at Bluebonnet.

The primary advantage of underground lines is "less electrical exposure to rain, wind, ice and lightning, which increases reliability," Ely said. The insulated cables and watertight connections are necessary to withstand moisture, but floods could cause power outages if the buried equipment is submerged in water for too long.

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PRIMARY RISER

To build underground lines, crews dig 4-foot deep trenches. Gray PVC pipes (conduits) are laid inside and covered. 'Mule tape' (a pull string) is blown through the piping, then tied to the cable. Crews pull the heavy line through the conduit, using a lubricant to smooth the process.

PRIMARY RISER: Also called a 'riser pole,' this is where overhead lines go underground, protected by PVC conduits. Bluebonnet typically uses one power-carrying cable per conduit. A 'terminator' at the top of the pole is where an overhead line is spliced to the line heading underground. A silicon seal helps protect the splice from dust, moisture or lightning damage.

PULLBOX: The length of any stretch of line is limited, because friction between cable and conduit can damage the line, especially when there are twists and turns and elevation changes. A 4-foot-by-4-foot green, fiberglass sectionalizer cabinet, called a 'pullbox,' is where power lines end and begin. They are joined electrically so power flows smoothly or can easily be turned off when needed. All of this makes it easier to find faults and reduce the size and duration of outages.



PULLBOX

Sarah Beal photos



DISTRIBUTION CABLES

These thick cables, left, carry power using a conductive aluminum center. It is protected and strengthened by layers of other materials, including water-blocking substances and sunlight-resistant polyethylene.

Joe Stafford photo

TRANSFORMER: Transformers are mounted on a fiberglass pad and housed in green steel boxes. Inside, voltage is decreased to 240 volts or 120 volts, the level of power used by homes and businesses. Each transformer box can serve up to six secondary junction boxes.

SECONDARY JUNCTION BOX: Also known as an 'underground junction box' or UJB for short, this is the connection point where cables extend directly to no more than two homes.

TEMP TO PERM METER: During construction of a development or house, a 'temp to perm' — short for temporary to permanent — meter is used to provide power for construction. After construction, a permanent meter is installed at each house.



TRANSFORMER



SECONDARY JUNCTION BOX



TEMP TO PERM METER

'One nice thing about buried lines is that the power doesn't usually go out during storms.'

— George Steman,
RESIDENT OF SHADOW GLEN IN MANOR

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One common threat to buried lines is accidental damage caused by homeowners or contractors who dig nearby and inadvertently hit electric lines, which typically are nestled 4 feet below ground. Buried lines "are not visible and therefore are more susceptible to (such) dig-ins," Ely said.

The expense of materials, equipment and labor for underground lines has dropped in recent years. A decade ago, buried projects could cost up to 10 times more than overhead lines. Now, on average, buried electric lines in subdivisions cost anywhere from three to eight times more than a comparable system of overhead lines and poles, Ely said.

Bluebonnet workers generally begin installing underground power lines when a development's builder installs water lines and storm-water and sewage drainage pipes. The electrical line work is done before streets are paved so Bluebonnet's lines can cross under the roads where needed.

Instead of using pole-setting trucks and aerial bucket trucks, Bluebonnet and contractor crews dig trenches for underground lines with backhoes and trenching machines. They also use directional boring rigs and cable-pulling machines.

All linemen for Bluebonnet are trained in varying degrees of expertise with underground lines along with the regular education they receive to operate and maintain overhead power lines. The training on buried lines includes how to locate the spot where an underground line fault has occurred and how to fix the interrupted electric service.

To visitors of completed housing developments where underground lines are in place, the clean and uncluttered look of the streets is particularly obvious driving in from highways filled with utility poles, guy-wires and multiple strands of overhead line. That is the case at Shadow Glen in Manor off busy U.S. 290.

The skyline difference is definitely noticeable, said resident George Steman, who was walking his dog on a sidewalk near the subdivision's large recreation center and pool.

"Oh yeah," he answered when asked if he was aware of the underground lines when he bought a house in the subdivision in 2013. "It was the same way in San Angelo where I was living before. I think it is an obvious advantage," he said.

"The only tradeoff is the green boxes," he said of the Bluebonnet transformers that are tucked into 4-by-4-foot locked steel boxes near the street. Each distribution box serves four to six houses.

The skinny foot-high green box in front of each house is the junction box that connects



Shawn Ely

the incoming power to the line running to the house.

All the boxes, which are locked for safety, are necessary for electrical service and repair.

Steman pointed to a cupola on top of Shadow Glen's tall water slide structure beside the pool. "They had to rebuild that after it was hit by lightning," he said. "One nice thing about buried lines is that the power doesn't usually go out during storms."

Lake Somerville State Park officials would agree. The Burlison County park, which is served by Bluebonnet, was closed because of flooding over Memorial Day weekend in 2015, when the lake rose 17 feet above its full level. Weeks of heavy rains put many of the park's campsites — including those with electrical outlets — under water.

A Bluebonnet crew conducted an inspection before re-energizing the park's underground cables to the campsites. Then the cables and other equipment were checked to make sure they were functioning and safe, Ely said. ■

Stay safe around those green boxes

Those green metal boxes may look interesting, especially to kids, but they are potentially dangerous if tampered with. Inside them is high-voltage equipment. Here are some safety tips:

- Do not obstruct the tops or sides of the large transformer boxes or the smaller junction boxes. Trees, shrubs, fencing, decks or decorations such as planters should be kept at least 5 feet from the sides and back of the boxes and 10 feet from the front. Nothing should be placed on top of the boxes and they should not be painted.
- Children should not play or sit on the boxes.
- If a box is opened, damaged or defaced, please contact a Bluebonnet member service representative at 800-842-7708 immediately.
- The boxes are locked and can only be opened by Bluebonnet employees or authorized contractors to make repairs or restore power.



Sarah Beal photos

Matthew Ledford, above, works on a transformer powering underground lines in the Pecan Park subdivision in Bastrop. Below, a Bluebonnet crew works to install power at a transformer in the Bastrop subdivision. From left, they are Ledford, Danny Bolding and Tim Joswiak.

Linemen working on buried lines learn how to locate the spot where a line fault has occurred and restore power.



Whisper Valley is planned as an environmentally friendly development where all homes will include Google Fiber, geothermal heating and cooling and Nest smart technology.

Bluebonnet providing underground power to Whisper Valley subdivision in Manor

After developers for Taurus Investment Holdings of Texas bought 2,062 acres of wooded, rolling hills and lowlands 3 miles south of Manor in 2006, there was barely a whisper of activity at the site for several years. The recession had put brakes on plans for building 7,500 energy-saving homes.

Today, Whisper Valley is beginning to hum. A few model homes are expected to be open in early May. Streets are in place for 237 lots to be sold in an initial 90-acre section of the development.

Bluebonnet Electric Cooperative will construct the underground power lines for the entire project.

Douglas Gilliland, president of Taurus of Texas, said buried power lines are a staple of new developments in the state and elsewhere. "I think homeowners expect underground and see overhead electric as less desirable," he said.

The homes are planned to have underground geothermal heat pumps and air conditioning, rooftop solar panels, Nest smart home technology and access to underground 1 gigabit Google Fiber internet.

To serve Whisper Valley, Bluebonnet converted about a mile of overhead line with limited electrical load capacity along FM 973 to a circuit with much greater overall capacity and multiple voltages for different types of load needs.

A new electrical substation in the area may be needed when Whisper Valley is filled with thousands of homes, said Shawn Ely, Bluebonnet's electric distribution design supervisor.

— Ed Crowell