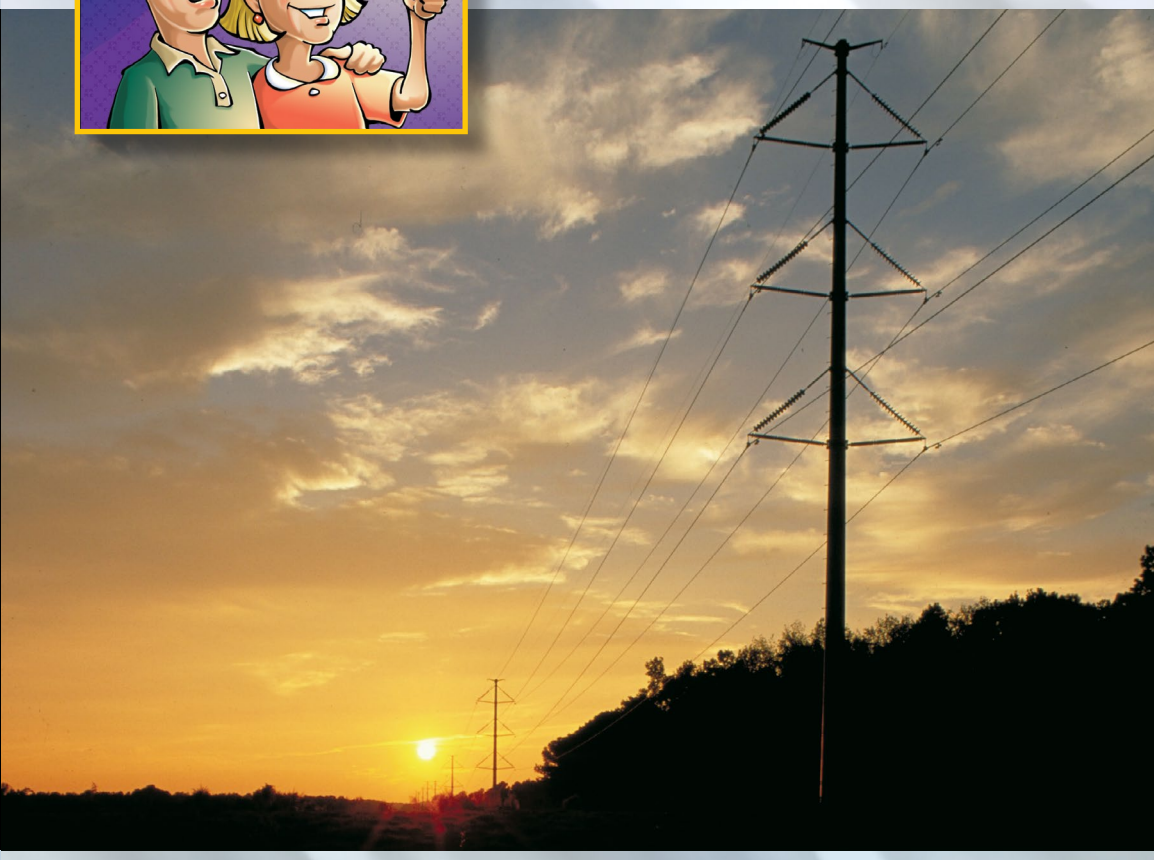
Your Right to Light

Community Leader's Guide to Electric Transmission



GeorgiaTransmission

THE POWER LINE BOOK

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GeorgiaTransmission

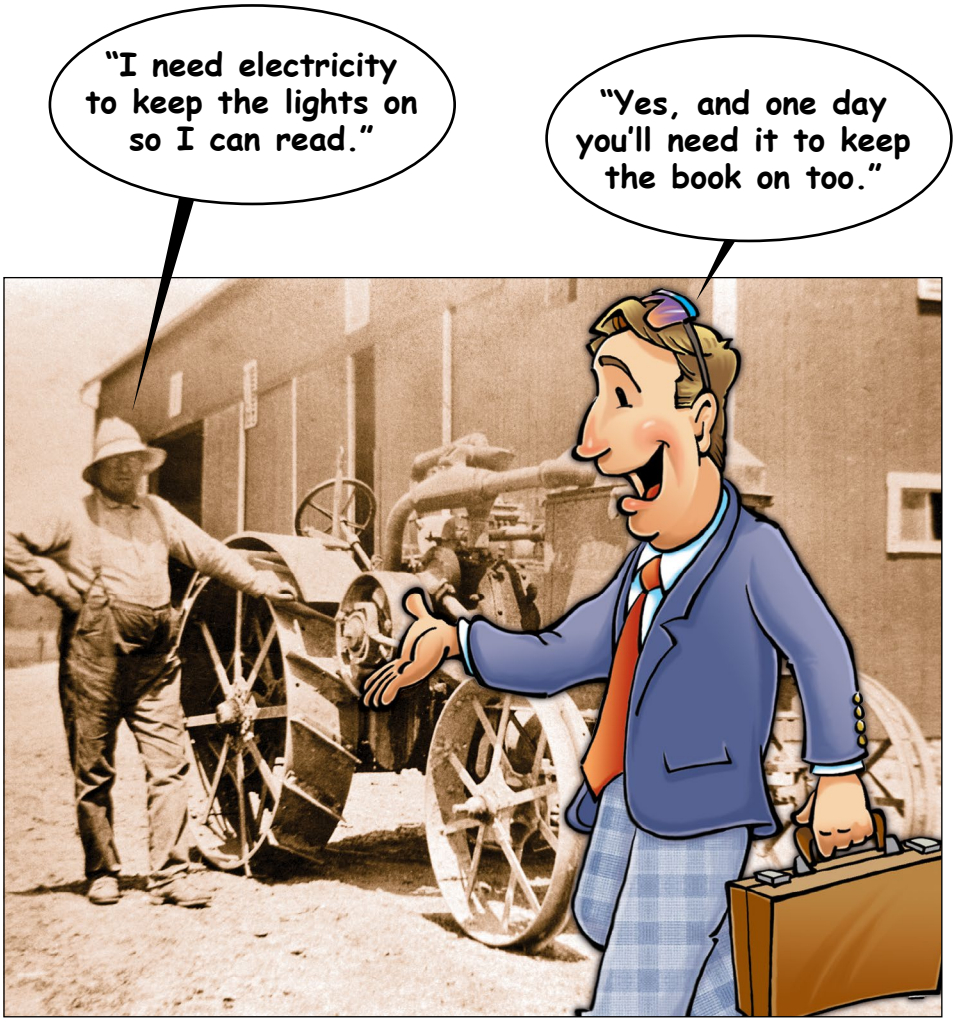
I'm a new power pole. I'm your refuge in winter and relief in summer. I'm a pole that helps wash your clothes, cook your food and surf the web. I keep your teachers, farmers and doctors in business. I'm your light. I make lives and livelihoods possible.

For this, I'm ignored. I'm mostly overlooked until there's a power outage or a new power line is planned. Then, I'm too ugly for your neighborhood.

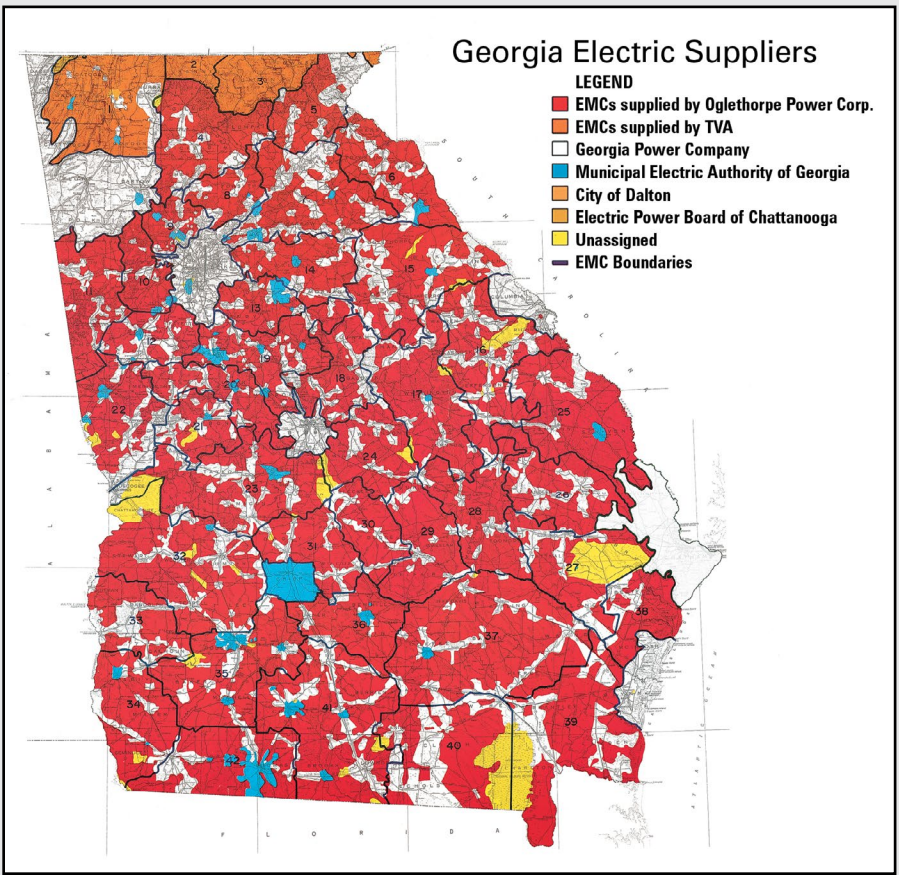
It would be nice if you would set a kind eye on the silent steel sentinels that shoulder the state's energy. But just know this – our state is growing. While new neighbors require new poles for new lines, these lines also mean reduced outages for you.

Our state's residents are connected through a huge web of power lines. As demand grows, the web is strengthened to avoid shortages. Thus, new poles like me mean fewer blinking clocks and quicker restoration after storms for you. New poles help make Georgia's electric system more reliable than systems you'll find in most states.

No, new power poles are not a problem. Without us, outages would increase. If neglected long enough, power line shortages could cause forced outages, emergency conservation and political storms over real problems. Most of Georgia is in good shape because thousands like me are on the job. We quietly solve problems you don't see. So when you see a steel pole on a roadside, just know that I am one reason electric light is more dependable than daylight.
Simply put, we protect your right to light.



In the land where "gold in dem der hills" was said to keep others from leaving for the California Gold Rush, neighbors banded together and built their own electric systems. Forty-one not-for-profit electric membership cooperatives (EMCs) were organized in Georgia — the first in 1936, the last in 1948. Today these 41 EMCs provide electricity to nearly half the state's population.



Georgia electric suppliers

- EMCs serve nearly half the state's residents.
- Georgia Power is the state's largest utility and has the most customers.
- Georgia's 41 electric membership cooperatives (EMCs) are the second largest utility group, serving just under half the state's population. Co-ops are collectively owned and governed by the people they serve. EMCs' service territories cover 73 percent of the state.
- Other power players in the state are MEAG Power, Dalton Utilities and the Tennessee Valley Authority.
- EMCs own three not-for-profit companies located in Tucker, Ga., in the Atlanta metro area. These not-for-profit companies are Georgia Transmission Corp. (electric transmission), Oglethorpe Power Corp. (power generation) and Georgia System Operations Corp. (energy control/system operation services).

Power lines, like light bulbs, come in different sizes

Whether you need to light a foosball table or a football stadium, the electricity you receive travels over miles of power lines of different sizes. Transmission lines transmit power from power plants to the EMCs and other utilities. Utilities then deliver electricity to customers over their own networks of smaller distribution power lines. Accomplished at nearly the speed of light, it takes more time to sneeze than it does for power to travel from a plant in Augusta to a dentist's drill in Americus. Well, we don't think anybody sneezes at 186,000 miles per second.

Georgia's most common power lines

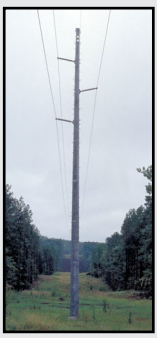
Power lines are defined by their voltage. If a power line were a garden hose, the volume flowing through it would be current and the pressure in the line would be voltage. A kilovolt, 1000 volts, is abbreviated kV.

The power trip from plant to customer is actually a continuous relay between power lines of decreasing voltages. It begins with the heavy weights (500 kV in Georgia) and ends with 120- and 240-volt lines that run to homes.

Transmission lines carry power from plants to local utilities. In Georgia, power travels down a series of different size transmission lines: 500 kV, 230 kV, 115 kV and some 69 kV and 46 kV. Transmission lines are often thought of as the large cross-country variety, but lines of 230 kV and lower voltages are common along roadsides too.

500kV

230 kV



115 kV

69 kV

46 kV

TRANSMISSION

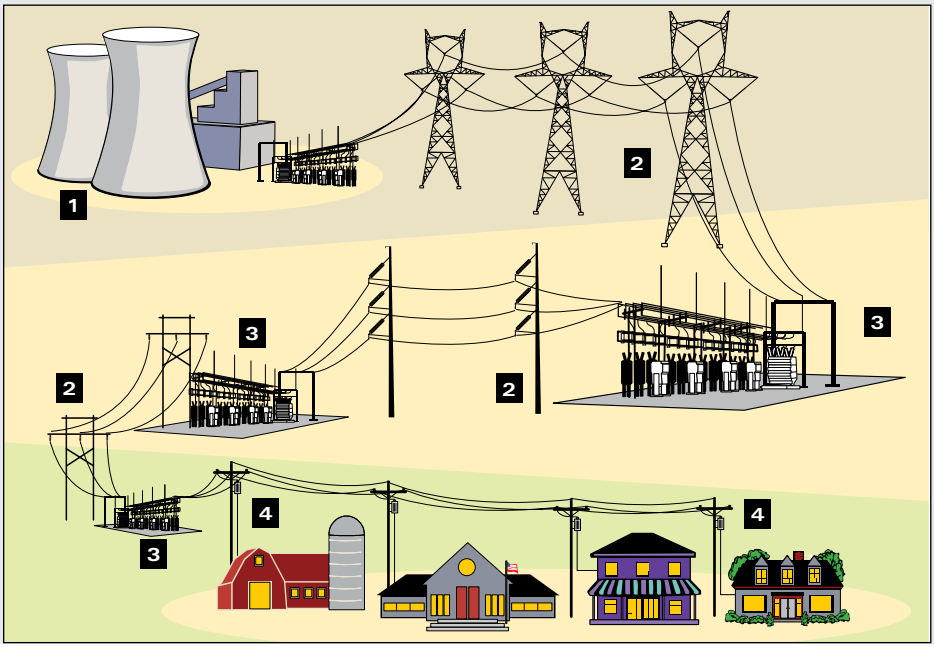
Distribution lines, typically 25,000 and 12,000 volts, are networks of local power lines that EMCs and other utilities use to deliver electricity to homes, businesses, schools and so on. In some cases, industrial customers take service directly from a transmission line. While distribution lines are often thought of as the ones on wooden poles along neighborhood streets, they are also built on metal and concrete poles. Unlike their transmission counterparts, these lines are commonly built underground. The most common distribution lines in Georgia are 25 kV and 12 kV.

25 kV or 12 kV

DISTRIBUTION

Power without power lines

Without power lines, we'd have to generate power where it's used. That could mean a gas-powered generator or a huge battery in your backyard. You get the idea. As population and personal energy use grow significantly in your area, there are three ways to maintain reliable electricity: get everyone to permanently conserve, get additional power generation locally or use transmission lines to bring in power from far away.



1. Generation:

Power comes from baseline plants and a host of intermittently used gas, diesel, coal, hydro and renewable units in and out of the state. EMCs, through Oglethorpe Power Corporation, are partial owners of some of the state's largest power plants.

2. Transmission:

Power is relayed along transmission lines of decreasing voltages (500 kV, 230 kV, 115 kV, 69 kV and 46 kV), using all available power lines along the grid in relation to the resistance on each line. At different points along the chain, power is taken by an EMC's industrial customer or it is transferred to local distribution lines.

3. Substations:

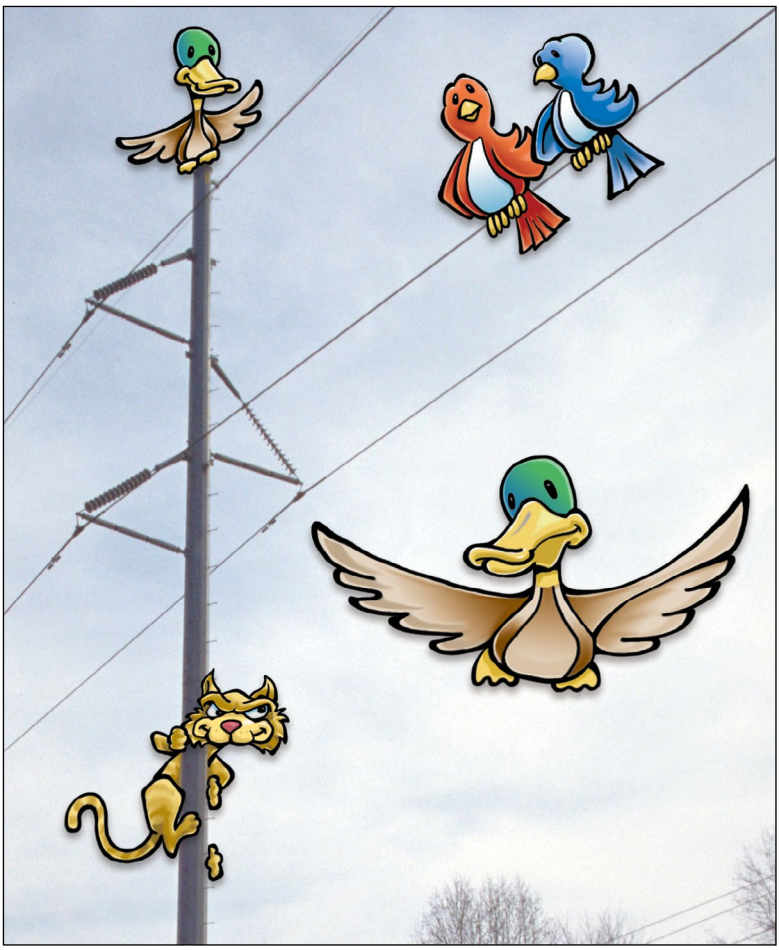
At each point where power line voltage changes, this transfer is accomplished by substations. Substations have large transformers that "step up" or "step down" the voltage. Voltage is similar to the pressure in the line that the current travels along.

4. Distribution:

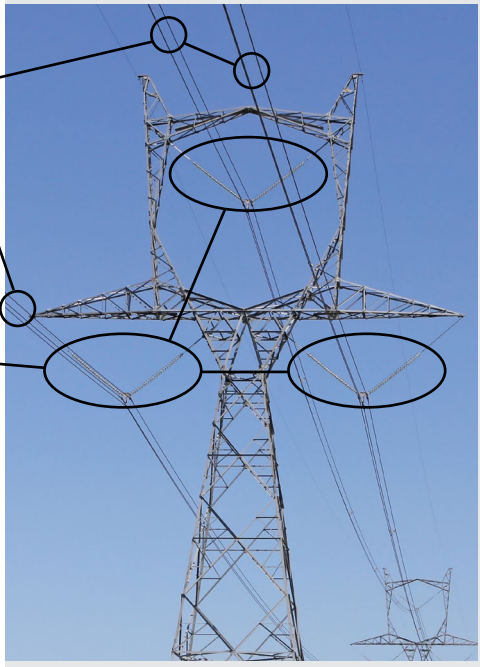
EMCs and other utilities use separate networks of local distribution power lines to serve individual customers.

What's on those poles?

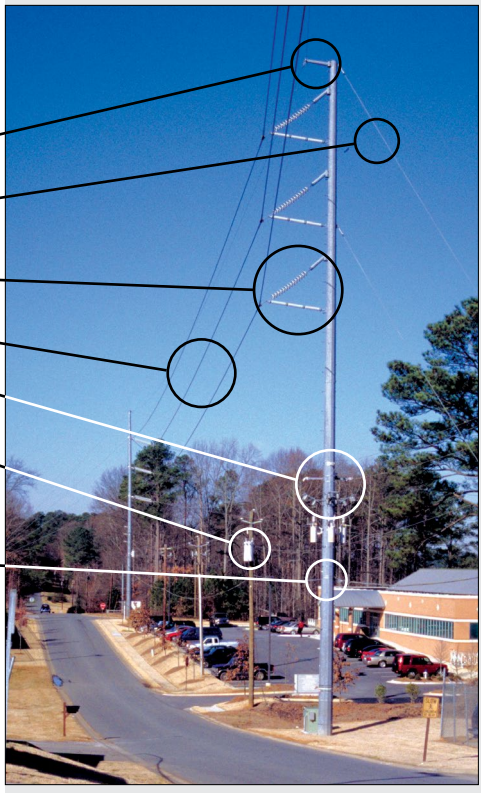
Besides squirrels, birds, sneakers, cats and ducks? Power line equipment includes the lines themselves, also called cables or conductors, switches that serve as circuit breakers, insulators that block electricity from energizing the pole itself and transformers that convert electricity from one voltage to another. We're not done yet: Lightening arrestors act as ground wires, guy wires support the structures and a host of electronics can be used to remotely monitor, meter and affect system operations. No, not yet: Cable, telephone and other utilities also can be located with lines, and…



500-kV transmission line



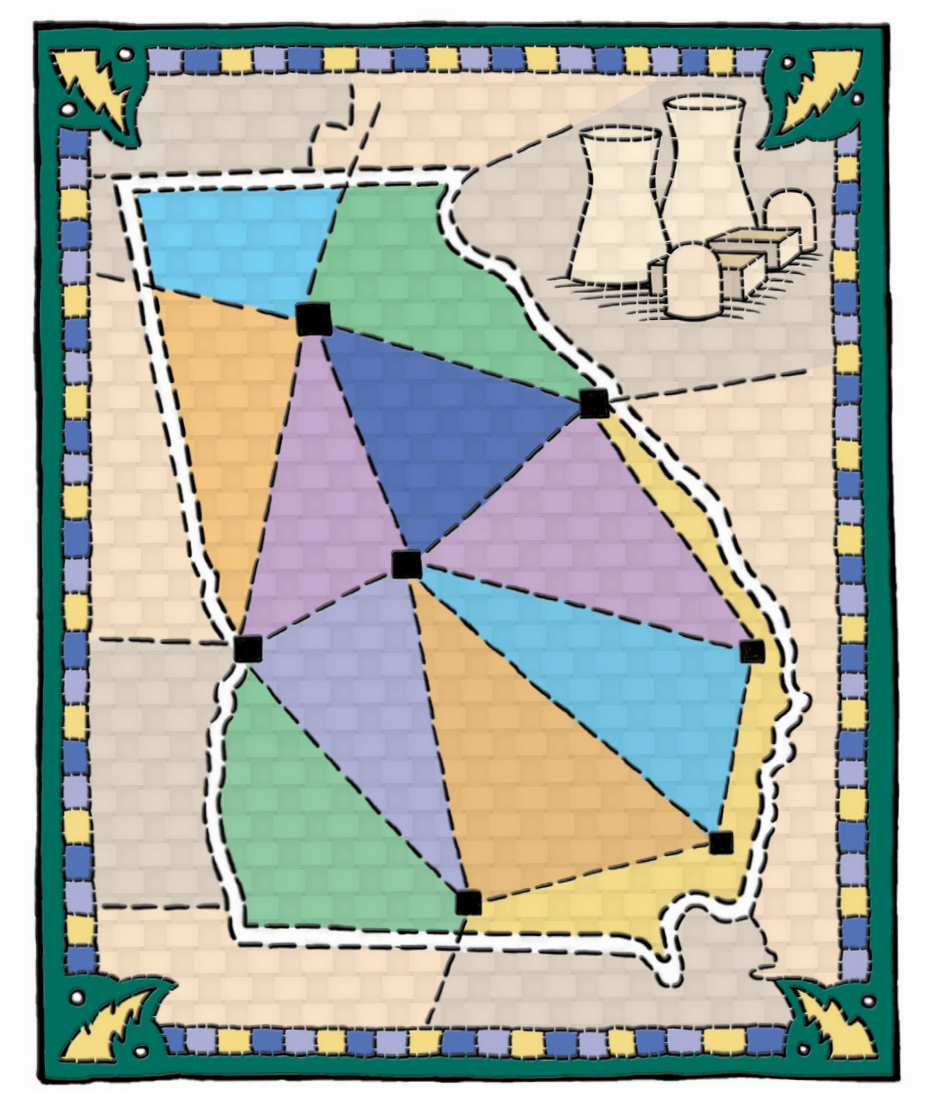
230-kV transmission line and distribution line



Miles of lines in Georgia:
Transmission: More than 17,500 miles
Distribution: More than 180,000 miles

The power grid: stitching communities together

With poles like needles and cables like threads, electric transmission lines stitch Birmingham to Athens to Savannah to Willacoochee. Power delivery is made up of generation, transmission and distribution. Transmission connects power plants and other power generators to the EMCs and other electric utilities that distribute power to individual customers.



Electric transmission in Georgia

- There are about 17,500 miles of transmission lines in the state.
- Georgia Transmission, solely focused on electric transmission for EMCs, and Georgia Power, a publicly owned electric utility, are the state's largest "electric transmission providers."
- Transmission providers plan, build and maintain transmission lines, substations and other facilities.
- Through a rare and progressive arrangement in the electric utility business, more than 16,500 miles of the state's electric transmission assets are jointly planned and operated by Georgia Transmission, Georgia Power, MEAG Power and Dalton Utilities. Under a set of Integrated Transmission System (ITS) agreements, these organizations work together to set guidelines, reduce duplication of facilities and increase efficiency. The facilities are jointly planned and operated, and they are individually owned, built and maintained.

Carrying a bigger load without a flicker

Power on demand. That's why new power lines are needed. A strong electric grid maintains overall reliability, minimizes outages and lessens the risk for system-wide outages. Aging infrastructure must be replaced to sustain increased usage during times of peak demand for electricity. A robust, reliable electric grid is essential to attracting industry and jobs to the state. As Georgia's population and economy grows, the electric transmission grid must be strong and reliable.

How does growth affect reliability?

- Seasonal, daily and hourly fluctuations in energy are anticipated, and power generation is scheduled or ordered accordingly.
- With adequate warning, additional generation can be brought online. But power line facilities that carry this power are finite. As such, sustained growth in population or energy demand must be offset by new power lines or the entire system's reliability and efficiency will suffer.
- Transmission line planning seeks to ensure there is adequate power line capacity to accommodate seasonal peak demand (highest use during summer and winter) and, when possible, for the system to operate even if one element, such as a substation or transmission line, is temporarily lost.

What happens if lines aren't built?

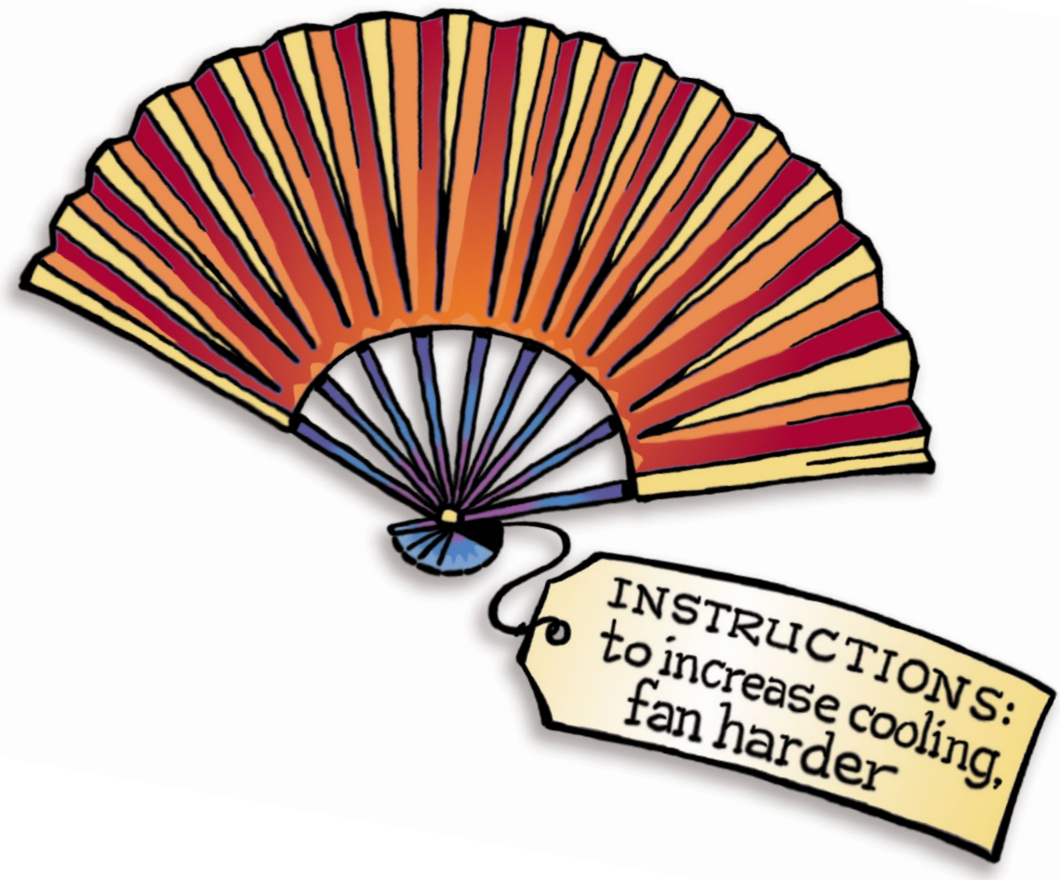
- Communities have different levels of reliability. Keeping the power on for each customer is a result of the adequacy of the infrastructure in place and a range of maintenance and operations activities.
- If sustained growth is not met with new lines and substations, then customers would start to see more outages. At first, this could mean how many times you come home to blinking clocks, the number of hours without heat and lights during an ice storm and the time it takes to restore power after a storm.
- If neglected long enough, a shortage of transmission facilities would mean peak demand could not be met, triggering emergency steps to avoid cascading system failures that create widespread blackouts. These steps can include using large mobile generators to supplement local power, taking select customers offline, reducing the voltage being delivered to customers (brownouts) and shutting down substations in select areas (blackouts).

Storms and other interruptions

- Compared to distribution lines, transmission lines suffer relatively few storm-related outages. According to the Edison Electric Institute, roughly 85 percent of all outages occur on distribution systems.
- Tree limbs and other debris contacting lines account for most transmission line outages. Most transmission line repairs are made with automated systems. When crews are needed to locate and remove obstructions, restoration generally takes a few hours. Repairs take longer when damage occurs in remote areas or damage is widespread.

Air conditioning without electric transmission

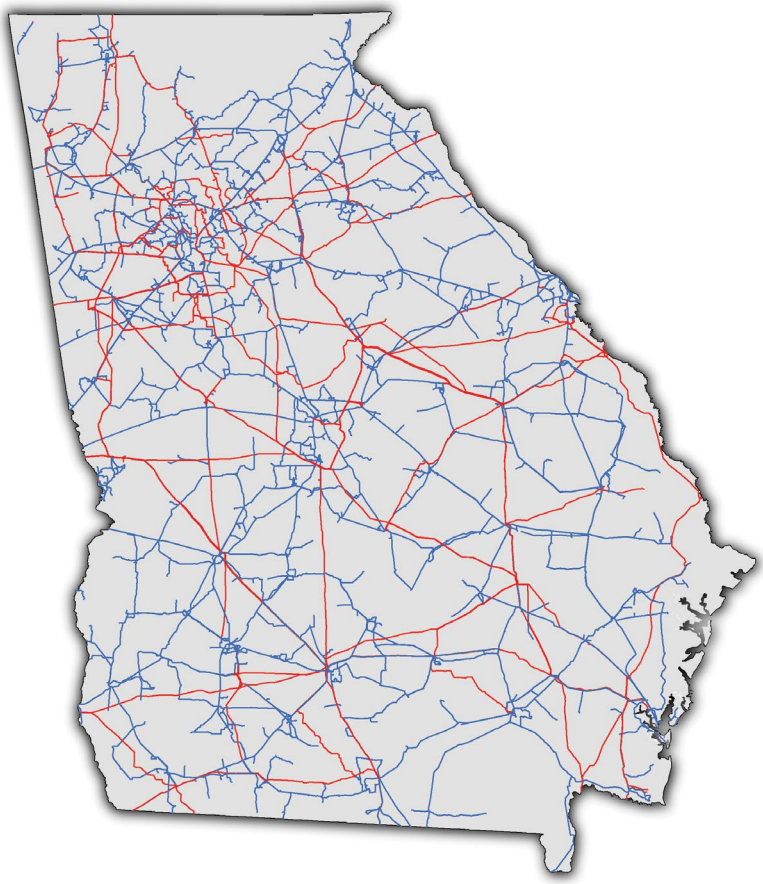
Georgians benefit from electric service that is more reliable and less expensive than the national average. This means less air conditioning by hand fan. But the state also is one of the nation's fastest growing. To keep up with electric demand, Georgia's utilities invest an average of $300 million annually in new transmission lines and system upgrades to ensure that fans and flashlights remain in the drawer.



Transmission lines are either load-serving lines or bulk lines

BLUE
Local growth in EMCs territory is met with "load-serving" transmission lines (mostly 115 kV and 46 kV, and some 230 kV lines).

RED
A series of large transmission lines, mostly 500 kV and 230 kV, form a grid of arteries for efficiently getting bulk power to major load centers.



Understanding the grid

- A "grid" is a collection of large transmission lines that moves bulk power over long distances. Large transmission lines were once built to connect utilities to generating stations and neighboring utilities. Now they also transport power over several utilities' territories.

- Grids operate like huge webs, connecting each community and region of the state. All power sources work in tandem to put power on the grid, and all customers collectively take it off. As such, no matter where bulk lines are built in the state, they contribute to the reliability of your electricity.

- To keep pace with growth and prevent congestion on the grid, Georgia Transmission and Georgia Power are currently building several hundred miles of bulk lines.

- The term "grid" also is used to refer to three regional transmission grids, also called interconnections, which encompass all transmission facilities in North America. Grids are so interconnected that a strong enough change in power in Alabama, for instance, can be detected as far away as Maine, and every state in between.

Beware of gopher tortoise

For some state residents - gopher tortoises – power lines aren't a not-in-my-backyard issue. Power lines are their backyards. For people, though, power lines are overlooked in the background of life until a new line is proposed or the power goes out. Since we respect that most people don't want power poles in their backyards, we work with communities to build lines in the most suitable locations. Routing lines is not a matter of picking two points and drawing a line. Rather, many months of examining community, environmental and engineering conditions are followed by public meetings before final routes are selected. Special clearing methods, screening with trees and different types of construction materials are used to reduce visual impacts. And environmental managers pride themselves in the work they do to maintain rights of way to benefit people, plants and animals. This includes work with the Department of Natural Resources on protecting the habitat of gopher tortoises.

Most power line construction in Georgia is completed without public controversy because projects are built with the cooperation of elected officials, community leaders, landowners and residents in communities across the state. Although a few controversial projects get more than their share of attention, here are some important facts community leaders should know:

- By their nature, electric cooperatives are governed by local ratepayers, also referred to as members and owners. These not-for-profit organizations are collectively owned by the ratepayers, and their boards of directors are comprised of, and are responsible to, local member-owners.
- Public meetings on new transmission lines, a state legal requirement since 2004, have successfully improved dialogue between residents and utility managers.

Citizens gather to share information on a proposed transmission line.

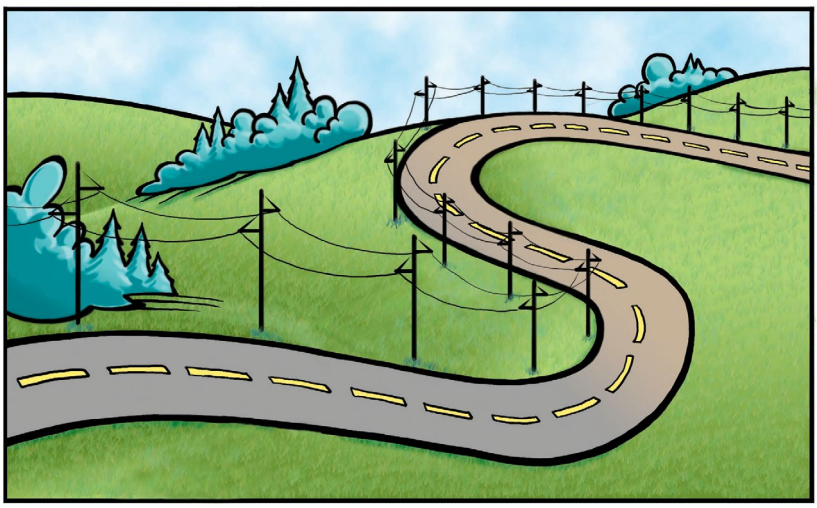
- Nearly all land parcels and easements are acquired through mutual agreement with sellers. Historically, less than 3 percent of Georgia Transmission's land acquisitions have been obtained in court through eminent domain. This level of agreement on any issue is rare.
- Eminent domain is used as a last resort to prevent one person or one group from stopping a community from getting electricity, water, roads, etc.
- Georgia Transmission conducts National Environmental Policy Act (NEPA) analyses and complies with dozens of other federal and state environmental laws. We also adhere to requirements of the:

  Department of Transportation,
  Occupational Safety and Health Administration,
  Rural Utilities Service (RUS),
  Federal Energy Regulatory Commission, and
  North American Electric Reliability Council.

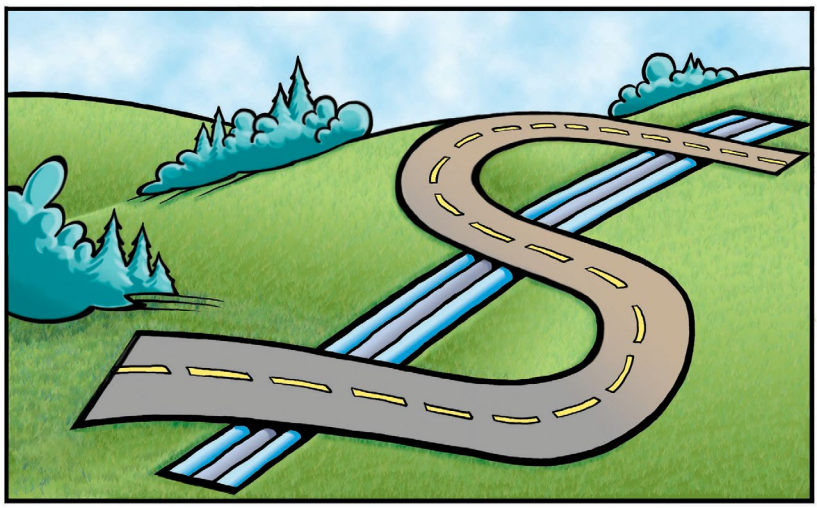
- The state Public Service Commission (PSC) approves long-term financing for the co-ops and reviews rate revisions, service rules and regulations.
- Georgia Transmission teamed with the Electric Power Research Institute (EPRI) and developed a national model for improving the way utilities site transmission lines. More than 200 people from neighboring utilities, agencies, civic groups and advocacy groups helped establish a model that is now being adopted by other utilities. For more information, see **www.gatrans.com/PlanningConstruction/EPRI-GTCSitingModel.**

Fear tactic or real concerns?

Opposition to power line construction often stems from one concern – the visual impact of new lines. Invariably, though, this issue brings about questions of electric and magnetic fields (EMF) safety and the building of transmission lines underground. Citizens and civic leaders should take time to learn about these important issues. Before you're asked, here are some basics and sources for more information.



Overhead power line route



Underground power line route

EMF

- Electric and Magnetic Fields (EMF), which are associated with transmission facilities, surround us every day. They are produced by lights, motors, televisions, power lines, coffee makers, hair dryers and all other devices that use electricity.
- Magnetic fields drop off quickly with distance, and the levels found 200 to 300 feet from most transmission lines are below the levels found in the average home.
- Numerous EMF studies have been conducted during the past 35 years to determine if exposure to EMF is harmful. While some studies have shown a statistical association between EMF exposure and increased cancer rates, no studies have established a cause-and-effect relationship between EMF and any harmful health effects.
- The National Institutes of Health (NIH) conducted a major study in 1999 on the subject and concluded that the evidence of health effects was "weak." The epidemiological study findings the NIH referred to were inconsistent and not supported by laboratory studies or any scientific explanation linking EMF and health problems.
- More information on health studies is available at the NIH's National Institute of Environmental Health Sciences at www.niehs.nih.gov/health/topics/agents/emf/index.cfm. We continue to monitor the latest research for further direction from the scientific community.

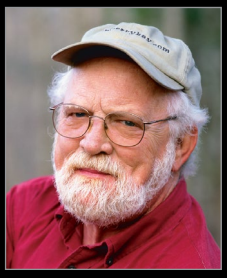
Underground seldom understood

- Unlike lower-voltage "distribution" power lines which deliver electricity to homes and businesses, high-voltage "transmission" lines are not frequently installed underground because of cost. Some relevant facts:
  - The need for insulated underground cables and a concrete trench with truck-size manholes along the length of an underground line increases building costs 5 to 10 times,
  - As for scope, some studies estimate the average cost at $10 million vs. $1 million per mile
  - Who benefits and who pays is an important issue, sometimes involving third-party cost sharing.
- While underground transmission lines are expected to have fewer weather-related outages, underground lines can still fail. And when outages occur, it takes an average of 8 to 10 days to repair an underground line, instead of hours to repair an overhead line.
- Transmission lines are not a major contributor to outages (85 percent are on distribution systems). Also, the lifespan of underground lines is estimated to be about half that of overhead lines.
- Georgia has less than 30 miles of underground transmission lines (115 kV and above) at nine locations. GTC is open to using more underground lines, and future uses are most likely to be on segments of a few miles or less in areas where overhead rights of way are restricted.
- With a few notable exceptions, our nation's utilities have found that building cross-country transmission lines underground is cost-prohibitive.

"My mother would not plug up an appliance without the use of a potholder because she was afraid it would burn her. I know it sounds silly today, but that was the attitude of people at that time."

"Electricity changed everything. Not a single thing in the history of mankind has changed the world as much as electricity. I really do appreciate what you do. It's a tough job. You should be very proud, because you represent purpose – not just a job."

— **Terry Kay**, speaking at a meeting of Georgia Transmission's employees.



Author, *The Year the Lights Came On*, a book about changes electricity brought to everyday life. He drew from memories like a day in 1947 when electricity arrived at his boyhood farm home in Hart County, Ga. Kay, whose brother, a lineman for the Rural Electrification Administration, died while hitchhiking between jobs, tells us stories like his mother writing postcards to Hart EMC to report outages at a time when it took four or five days to get repair service. Kay's signature novel, *To Dance With the White Dog*, was the first of his three books adapted into CBS Hallmark Hall of Fame movies. His other books include *After Eli*, *Dark Thirty*, *Shadow Song*, *The Runaway*, *The Kidnapping of Aaron Greene*, *Taking Lottie Home* and *The Valley of Light*.

"For us, the electricity was more than just light – we viewed it as a better chance to break out of the financial slump the area was in. Electricity meant the ability to run power tools, such as the buzz saw for logging. It also meant decent light to read by so we could study harder and improve our chances to attend college and get a better education. This one item ultimately led to all of the basics that helped to improve the quality of our lives."

— **Robert E. Dudley**, excerpt from a book by the native of Jefferson County, Ga.

Author, *Our Side of the Story*; a memoir by Robert Dudley (2002) Trafford Publishing, Victoria, B.C., Canada.

Protecting Georgia's Right to Light

Property rights booklet, links to kids' education web sites, annual report and much more at:
www.gatrans.com

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