

NOTE: This is a draft of a brochure that is being developed to provide basic information about high-voltage transmission lines to the U.S. general public. If you have suggestions for additional topics that should be addressed, or advice on corrections or other changes that it might be good to make, please share those with Granger Morgan at gm5d@andrew.cmu.edu.

High Voltage Power Lines in the United States

This brochure is organized in five parts.

Part 1 reviews a number of basic ideas about high voltage power lines

Part 2 describes different kinds of common high voltage power lines

Part 3 explains who builds, owns, operates and regulates high voltage power lines

Part 4 discusses risks, costs and benefits of different kinds of high voltage power lines

Part 5 explains who wrote this brochure and how it was paid for.

In each part of the brochure you will find a basic introduction to the main ideas for that topic. Then, if you would like to learn more details about any of the topics, you can find them at the back of the brochure.

PART 1: Basic Ideas About High Voltage Power Lines

What is a high voltage power line?

Any power line that operates at a voltage of more than about 50,000 volts is usually considered to be a “high voltage” power line.

Many lines that travel a long distance operate at voltages between about 345,000 and 500,000 volts. These lines are called “extra high voltage” or EHV lines.

A few lines operate at even higher voltages like 765,000 volts. Those lines are called “ultra-high voltage” or UHV lines.

In other parts of the world, such as China, some lines operate at voltages of just over a million volts.

High voltage power lines are sometimes also called “transmission lines” because they carry, or “transmit,” power from one place to another.

Why do we have high voltage power lines?

When electric power was first developed in the late 1800s, generators (power plants) were close to where houses, businesses and factories were located so it wasn’t necessary to move the electricity very far.

As the use of electric power became more popular, it was no longer practical to have power plants close to everyone who wanted to use it, so it became necessary to move the power for longer and longer distances. High voltage lines were helpful to use resources that were far away from the cities, such as hydro power plants.

It is much more efficient to move power over longer distances on lines that operate at a high voltage. You can learn why this is true in the Part 1 details section at the end of the brochure.

Does the U.S. really need more high voltage power lines?

There are several reasons why there is a need for more high voltage power lines (or at least a need for more high voltage “*transmission capacity*”). The reasons are different in different parts of the country. Here are some of the reasons:

- To make the power system more reliable and resilient. For example, if there is not enough local generation because of a local problem like a big storm, or very hot or cold weather, a transmission line can move power into the area that has the problem from other places that have generation available.
- To move power from remote locations where there is generation to places where more power is needed. For example, much of the best wind generation in the U.S. is in the Midwest and much of the best solar power is in the Southwest.
- To move power to meet the needs of new electrical consumers. These could be things like converting industry from using natural gas to electricity, charging lots of electric vehicles, or supplying electricity to big new data centers.

In answering the previous question, why did you talk about needing “more high voltage transmission capacity” rather than just needing “more high voltage transmission lines”?

Building new lines is not always the best way to move more power. As explained in Part 2, by making various changes to an existing high voltage line it is sometimes possible to move two or three times as much power through that line. That way the amount of power that can be moved through the system is increased without building a line.

As more people put solar power on their roof, won’t that make the need for new high voltage power lines go away?

Solar power on the roof, and other forms of “distributed generation,” can reduce the need for some new high-voltage powerlines, but that will not eliminate the need. For example, while distributed generation can be very helpful, it is also expensive. Large wind and solar plants can make electricity at much lower cost. A robust system is important to have power that everyone can afford. It is also important to increase the reliability for the overall power system.

PART 2: Different kinds of high voltage power lines

In the US, most high voltage power lines carry AC or alternating current. However, in recent years, high voltage power lines that use DC, or direct current, have been becoming more practical. You can find an explanation of the difference between AC and DC in the details for Part 2 at the end of the brochure.

How does the size of a new transmission line get chosen?

How big a new transmission line needs to be depends on how much power it needs to carry in the part of the grid where it will be built. Most lines carry AC or alternating current. Over the years, power companies and manufacturers have largely standardized on six basic voltages for AC high voltage lines. These are 65,000 volts (or 65kV); 120,000 volts (or 120 kV); 230,000 volts (or 230 kV); 345,000 volts (or 345 kV); 500,000 volts (or 500 kV); and 765,000 volts (or 765 kV).

Lines that use the highest voltages like 500 kV or 765 kV are only used in some parts of the grid where they move large amounts of power over many tens to hundreds of miles.

As explained in the details at the back of the brochure, you can get a rough idea of the voltage at which a line operates by looking at the length of the insulators that support the wires (conductors). Higher voltage lines have longer insulators.

In some parts of the country there are high voltage lines that use DC or direct current. Most DC lines operate at voltages of between 320,000 volts (320 kV) and about 500,000 volts (500 kV).

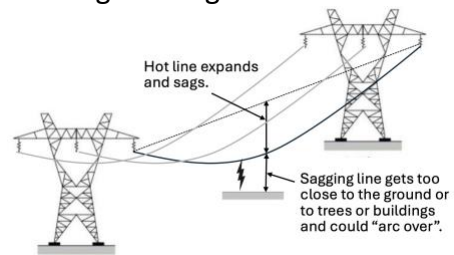
How can more power be moved through an existing high voltage line?

In some cases, it's possible to increase the voltage of an existing line. To do that, it may be necessary to replace the strings of insulators that support the wires with longer strings. However, higher voltage lines also need wider rights-of-way (the clear spaces under and on both sides of the line).

If increasing the width of the right-of-way is not possible, another strategy that can be used involves replacing the wires in the line so that it can carry a higher current. The ordinary wires (conductors) in most high voltage power lines are made of a steel central core surrounded by aluminum wires. As the amount of current flowing through a line is increased, the line heats up. As metal gets hotter it expands. When that happens the length of the wires in the power line increases, and the line begins to sag. If it sags too much it can get close to the ground or to buildings or trees. Because the voltage on the line is very high, when that happens it can "arc over." Lines sag more in the summer when it is hot and there is no wind to cool the line.

There are newer conductors in which the steel core is replaced by material such as carbon fiber, which does not expand very much when it is heated. By replacing the ordinary conductors with these newer conductors ("reconducting the line"), often twice as much power can be moved through the line. While it is tricky and must be done with care, in some cases it is even possible to replace the conductors without turning off the line.¹ You can see examples of the two kind of conductors in the details at the back of the brochure.

When a large current flows through a line, the line can heat up and begin to sag.



By replacing the regular wires with new ones that don't expand and sag, much more power can be moved through the line.

Why are some newer high voltage lines using direct current (DC)?

Until very recently DC was only used in high voltage powerlines to move very large amounts of power over long distances. For example, since 1970 the US has had a high voltage DC line, called the Pacific Intertie, that moves large amounts of power roughly 850 miles back-and-forth

¹ Chojkiewicz, E., Paliwal, U., Abhyankar, N., Baker, C., O'Connell, R., Callaway, D., & Phadke, A. (2024). Accelerating transmission capacity expansion by using advanced conductors in existing right-of-way. *Proceedings of the National Academy of Sciences*, 121(40), e2411207121.

between the Pacific Northwest and Southern California. In those days, only very long lines that used DC were cheaper than lines that used AC.

Because of the development of newer types of solid-state electronics, it is becoming increasingly affordable to build shorter lines that use DC. Lines like that can be used to move power a few hundred miles within the grid.

The US power grid is divided into three separate electrically independent sections: the eastern interconnect; the western interconnect; and much of the state of Texas. For technical reasons, it is not possible to build AC lines that connect between these regions, but such connections can be made using DC lines.

Can high voltage lines be buried underground, or under lakes and rivers?

Because of the alternating electric and magnetic fields they make, it is not possible to bury cables that carry high voltage AC power for distances of more than just a few miles. In contrast, because the electric and magnetic fields they make are constant, cables that carry high voltage DC power can be buried for hundreds of miles. Cables like that are now being widely used in Europe and other parts of the world. They are often the best way to move power to the shore from offshore wind farms.

In the US, underwater DC cables have been used to connect Long Island with New York and Connecticut. They have also been used to move power across San Francisco Bay. A high-voltage cable is now being installed to move power from Quebec to New York City. Portions of that cable are buried under Lake Champlain and under the Hudson River.

The systems that convert back and forth between AC and DC power are still expensive. This high cost of “converter stations” limits where it is practical to build high voltage DC lines.

PART 3: Who builds, owns, operates and regulates high voltage power lines?

Up until the middle of the 1990s, most power companies in the United States, owned their own generation, transmission lines and the distribution lines that carried power out to individual customers. Companies that own all three of these parts of the power systems are called “vertically integrated.”

Because economists argued that electricity would be cheaper if there was competition between generators, some parts of the country began to break up their power companies. In those parts of the country separate companies now own generators, transmission lines, and the local lines that carry power to customers. However, that process did not occur everywhere in the country, and there are still some parts of the country in places like the southeast where power companies continue to be vertically integrated.

Most of the companies that own and operate transmission lines are “investor owned” and are regulated by state Public Utility Commissions, which oversee the prices they can charge. In addition to being regulated by the states, the planning and operation of high voltage transmission lines that go between states is also regulated at the federal level by the Federal Energy Regulatory Commission (FERC)

In recent years, a handful of independent companies called “transmission developers” have also begun to build private transmission lines.

In most of the rest of the world, a single national organization, plans, builds, and operates all the high voltage lines under supervision by a single nationwide regulator.

The U.S. situation, in which a variety of different companies own different parts of the high voltage transmission system and are supervised by different regulators, makes the process of planning and expanding of the U.S. high voltage transmission system quite complicated.

PART 4: Risks, Costs and Benefits of Different Kinds of High Voltage Power Lines

How much land do different kinds of high voltage lines use?

Both overhead AC and DC high voltage power lines need a cleared strip of land for their right of way (ROW). The width of the right of way varies by the type of line, who is operating the line, and which state it is in. Some operators will allow low bushes in the right of way, others want only grass in the right of way so it is easy for trucks to get in to do service. All operators want to keep trees trimmed back close to the edge of the ROW so that there won't be any "arc over" as lines and trees sway in the wind. The table below shows approximate values for the width of the right of way (ROW) for standard voltage levels of high voltage AC power lines:

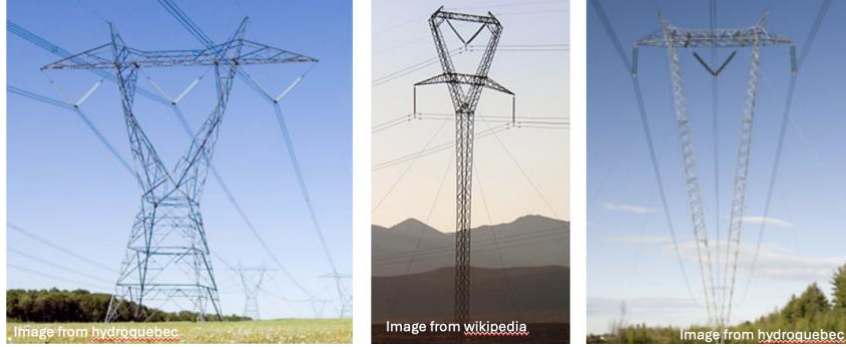
Voltage of the AC line	Typical width of the ROW
69,000 volts or 69 kV	Between 50 and 100 feet
115,000 or 115 kV	Between 70 and 150 feet
230,000 volts or 230 kV	Between 125 and 150 feet
345,000 volts or 345 kV	Between 150 and 200 feet
500,000 volts or 500kV	Between 175 and 250 feet
765,000 volts or 765 kV	Between 200 and 250 feet

Most overhead high voltage DC lines operate at a voltage of between 320,000 and 525,000 volts (320 kV to 525 kV). The width of the ROW for these lines is about the same or a little narrower than for AC lines.

The ROW for buried high voltage DC cables is typically only a few 10s of feet. While trees can not be planted on top of them, other low vegetation can be allowed.

Are there ways to reduce the visual profile of overhead high voltage power lines?

There are a number of ways in which high voltage power lines can be made to appear less massive. Towers can be made thinner and be given a different profile. Rather than use self-supporting towers like the one in the image below on left, they can be held in place by the conductors themselves and by guy wires. Two examples of towers of that kind that are shown in the images below on the right.



There can also be tradeoffs between reducing a line's profile and making it sturdy enough to withstand wind and the buildup of tons of ice during ice storms. With thin profile guyed towers there is a risk of a cascading "domino collapse". To limit how many towers could collapse in a major storm, stronger "corner towers" (also called "tension" or "anchor" towers) are used every so often along the line.

There is nothing theoretical about the risk of tower collapse during a major storm. The image on the right shows towers that came down in a cascading failure due to heavy ice buildup in Quebec in a big ice storm along the U.S. Canadian border in January of 1998.



Do transmission lines cause wildfires?

Under normal circumstances, transmission lines do not cause wildfires. However, when conditions are very hot and dry, and the current in a line is high, the line may sag and arc over to dry vegetation and start a fire. Any fire, however it gets started, can cause serious damage to transmission lines.

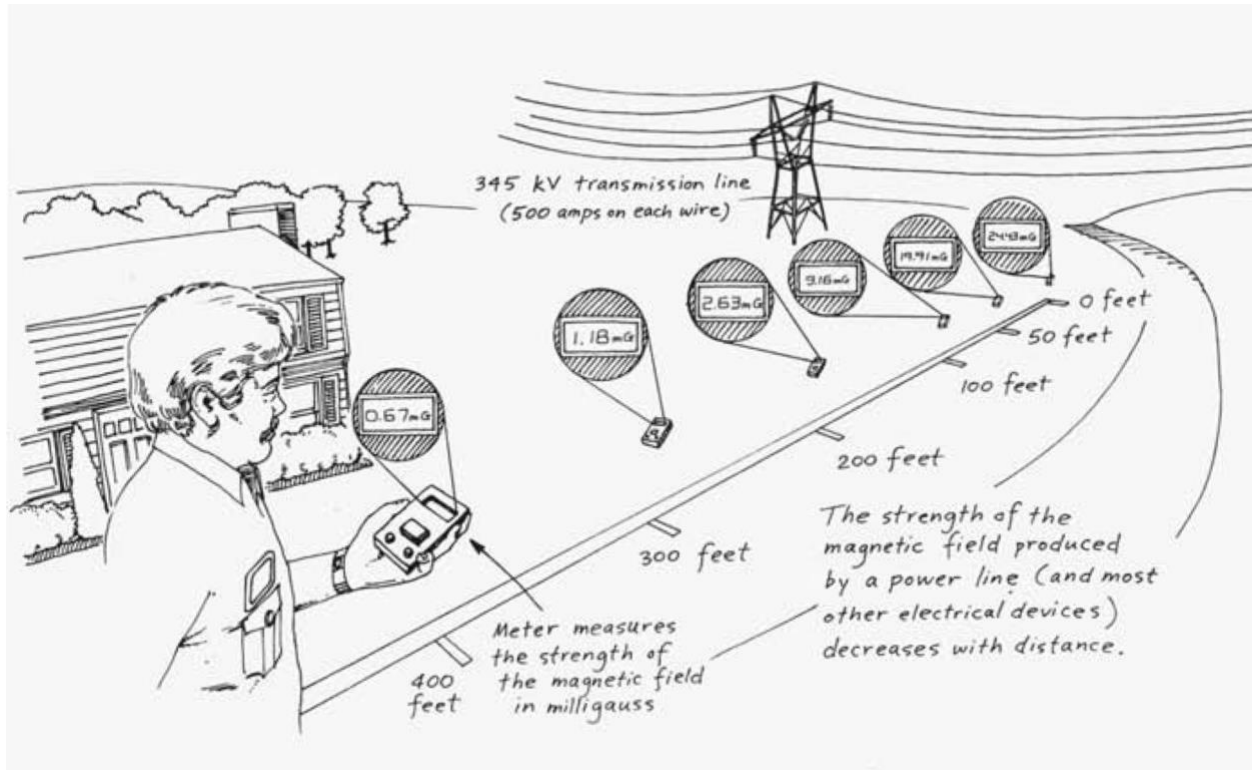
There is a delicate balance here. During periods of extreme fire risk, we want electricity to stay on so that emergency communication and services will continue to operate. At the same time, if there is a very high risk that a line might start a fire it should be turned off (deenergized). Deciding exactly when that should happen is a challenging problem. Communities and operators of transmission lines need to have open and respectful conversations about establishing a policy that is appropriate for each location.

Converting transmission lines to underground cables is one strategy to address this issue. For high voltage AC transmission lines that can only be done for short distances but may be the best strategy in certain very high-risk regions. Converting an entire high voltage AC line to buried underground high voltage DC cable is a very expensive proposition, which probably only makes sense in a few very special circumstances.

What about the electric and magnetic fields from transmission lines?

There are both AC electric and magnetic fields around high voltage power lines. The strength of these fields right under a high voltage transmission line can be very high. While some countries allow transmission lines to pass right over buildings, that is not allowed in the US.

As you move away from a transmission line, the strength of the fields falls off *very* rapidly (in terms of an equation as $1/\text{distance}^2$). Studies done at Carnegie Mellon in the late 1980s² found most people do not know this and think that any transmission line they can see is exposing them to strong fields. *This is not true.* Once you are several hundred feet away from a transmission line, the fields are weaker than those that you encounter around your house, in the stores you visit and in your place of work.



Of course, that doesn't answer the more basic question "does exposure to power frequency electric or magnetic fields, cause health risks?" After decades of research with animals and long-term epidemiological studies of people the answer is we are still not sure. There is evidence that exposure to fields can cause biological changes. There is not clear evidence that those changes can give rise to significant health impacts.

What *is* clear is that the any health risk that may come from long-term exposure to the electric and magnetic fields from powerlines is much smaller that the health and safety risks we all face in our daily lives.

² Morgan, M. G., Florig, H. K., Nair, I., Cortés, C., Marsh, K., & Pavlosky, K. (1990). Lay understanding of low-frequency electric and magnetic fields. *Bioelectromagnetics*, 11(4), 313-335.

Do nearby transmission lines affect property values?

Perhaps in some cases. However, the evidence is contradictory. Much of what people have written on this topic involves opinions rather than actually looking at property sales values. The several studies that have actually analyzed sales prices found little or no impact. You can learn more about what these studies say in the detail section at the back of this brochure

The honest answer to this question is “it depends.” In many cases, nearby high voltage transmission lines have no impact on property values, but sometimes, for at least a while, there can be a negative impact.

PART 5: Who Wrote this Brochure and How Was it Paid For?

This brochure was written by Granger Morgan who works in the Engineering College at Carnegie Mellon University. You can learn more about him on the web at:

<https://epp.engineering.cmu.edu/directory/bios/morgan-m-granger.html>

Money to pay for making the brochure came from the [Alfred P. Sloan Foundation](#) and from academic funds at Carnegie Mellon University.

Additional Details for Each Part

More Details on Part 1 on Basic Ideas About High Voltage Power Lines

Why is it more efficient to use high voltage to move electric power?

As the name suggests, electrical resistance is the property of a conductor to resist the flow of an electrical current. All wires have some resistance (R). That is true for wires in your home toaster but it's also true for wires in powerlines.

When a current (I) flows through any wire it heats it up. The amount of that heating increases with the square of the current multiplied by the resistance of the wire.

As an equation, that looks like this:

$$\begin{aligned} \text{Energy that gets used up in heating the wire} &= I \times I \times R \\ &\text{or } I^2 \times R \end{aligned}$$

The amount of power that can be moved over a power line is the voltage (V) multiplied by the current (I). As an equation, that looks like:

$$\text{Amount of power the line moves} = V \times I$$

Because the energy that goes into heating the power line ($I^2 \times R$) goes up quickly as the current increases, to move a certain amount of power through a line, and minimize how much energy is wasted in heating up that line, it is best to keep the current low and make the voltage high.

In Part 2 we'll see another consequence of heating up a line when the current through the line is high.

More Details on Part 2 on different kinds of high voltage power lines

Why are there so many wires (“conductors”) in a high voltage AC power line?

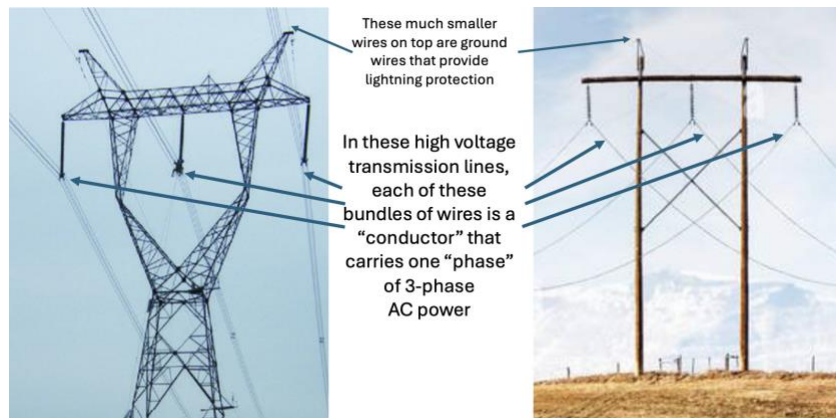
In an AC power line, the current reverses direction back and forth 60 times every second. It turns out to be more efficient (uses less steel and aluminum) if instead of using just one wire or conductor in a high voltage AC power line, three conductors are used.

Compared with the first conductor (or first “phase”) the current reversing back and forth in the second conductor (or second “phase”) is delayed by $1/3$ of a cycle (0.00556 sec). Similarly, the current reversing back and forth in the third conductor (the third “phase”) is delayed by $2/3$ of a cycle (0.01111 sec). This is called three phase power.

It is not only more efficient to use three phase power for transmission lines, it is also more efficient to use three phase power to run things like very large motors.

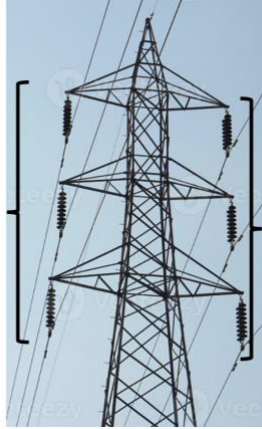
Why did you switch from talking about “wires” to talking about “conductors”?

When a powerline is operating at a very high voltage the air right around the wires can begin to break down. This causes something called corona and is responsible for the buzzing sound that you can sometimes hear when you’re underneath a high voltage power line. It is possible to reduce or eliminate corona by using conductors that have a large diameter. The same thing can be achieved by bundling several wires together as a single conductor. For this reason, as the pictures below show, almost all three phase high voltage power lines use bundles of wires to serve as the conductor for each of the three phases.



Each set of three phase conductors like those in the images above is called a circuit. Sometimes a transmission line carries more than one circuit. For example, the line in the image below is carrying two circuits.

These three conductors carry the three "phases" that together make up one "circuit"

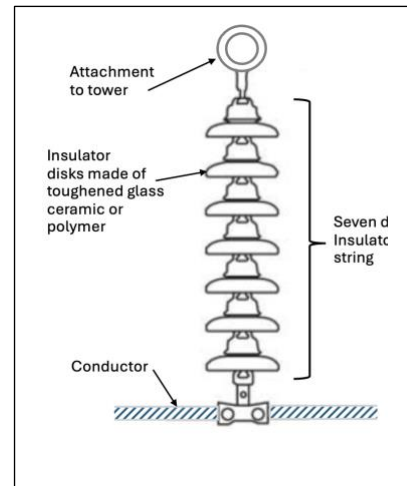


These three conductors carry the three "phases" that together make up a second "circuit"

Why are long funny looking insulators used to support the conductors in high voltage power lines?

Because the voltage is high, the insulators have to be long to keep the wire away from the tower, so the line doesn't arc over to the tower (or the ground or other nearby objects). The insulators are made up of separate disks that are strung together. If a single long insulator was used instead, contamination from rain could leave behind a long conducting path along which an arc could form.

An easy way to get a rough idea of the voltage of a line is to see how long the string of insulators is. The length of an insulator string can vary depending upon local conditions like dust and air pollution. The picture shows an insulator string with seven disks of the sort that a line operating at 230,000 volts might have. The table below lists the average insulator length and the number of insulator discs for standard operating voltages.

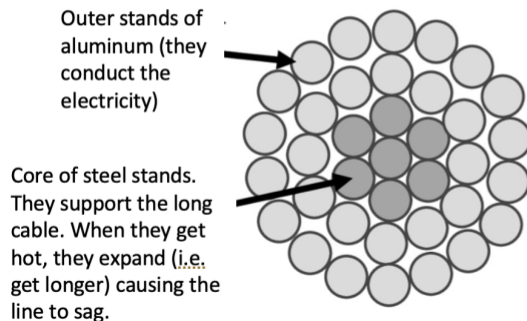


Voltage	Approximate length of insulator string	Approximate number of disks in an insulator string
69,000 volts or 69 kV	2 to 3 feet	4 to 6 disks
115,000 or 115 kV	3.5 to 4.5 feet	7 to 9 disks
230,000 volts or 230 kV	6 to 8 feet	11 to 17 disks
345,000 volts or 345 kV	8 to 11 feet	16 to 21 disks
500,000 volts or 500 kV	11 to 14 feet	24 to 27 disks
765,000 volts or 765 kV	14 to 18 feet	30 to 35 disks

How are “low sag” conductors different from regular conductors?

As the diagrams below show, the core of an ordinary conductor is made up of steel wires, which can expand (get longer) when they get hot. Low sag conductors have a core made of material that does not expand very much when it gets hot.

Cross-section of a conventional conductor



Cross-section of a low-sag conductor

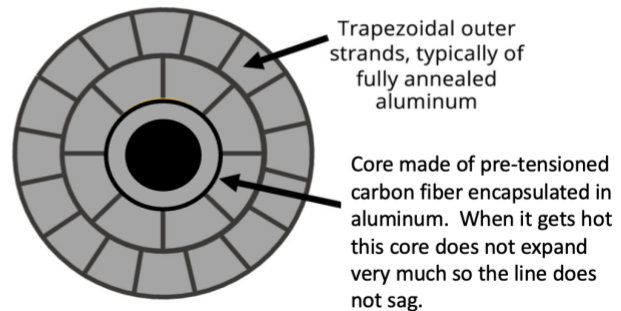


Image modified from Chojkiewicz et al, (2025), PNAS.

What is the difference between AC and DC?

The power that flows from a battery in your flashlight or car battery is DC power. That means the current always flows in the same direction. However, the power we use here in the US from the electricity system is called “60 Hz AC.” That means the direction that the current is flowing reverses back and forth 60 times in every second. Hz stands for “Hertz” and is a technical term for cycles per second.

In some other parts of the world such as Europe, the electricity system uses “50 Hz AC.”

Why do most power lines use AC?

The reason our power systems uses AC is that with AC it’s much easier to use devices called “transformers” to change voltage up and down. Transformers are used all through AC power systems. Generators typically produce electricity at around 13,000 volts. Then a transformer is used to increase the voltage and send the power out on a high voltage powerline. At a location where power is needed, another transformer is used to lower the voltage back down to send the electricity along on a “distribution line” to customers like factories, businesses, and people’s houses. At a house, another transformer is used to bring the voltage down to the level of 120 or 240 volts that is used in a home.

Until recently, it was very hard and expensive to change DC voltage up or down. However, by using solid state devices called “power electronics,” it has become much easier in recent years to move DC voltages up and down.

Many modern appliances like computers, mobile phones, and stereo systems convert AC power to DC to use in their internal electronics.

Why can't long AC cables be buried?

The rapidly changing electric and magnetic fields that are produced by an AC power cable interact with the electric charges in near-by objects. These interactions cause losses that limit how much power can be moved through longer cables. In contrast, the DC fields produced by a DC power cable do not change and they do not limit how much power can be moved through the line.

More Details on Part 3 on who builds, owns, operates and regulates high voltage power lines?

Unlike many other countries around the world, where a single organization plans, builds and operates the power system, in the United States many different organizations are involved in doing these things.

Many high-voltage power lines are owned and operated by investor-owned utilities. Much of the planning for these lines is done at a local or state level. Their regulation is the responsibility of state regulatory utility commissions (PUCs or sometimes PSC or DPU). In other cases, especially for longer lines, and lines that cross between states, the federal government also plays a role through an organization called the Federal Energy Regulatory Commission or FERC.

To make matters even more complicated there are also private companies called “independent transmission developers” that build lines to move power to places where it is needed.

You can find details on the very complicated nature of all the different participants involved in planning, building, operating, and regulating the electricity system in a report from the US National Academies titled *The Future of Electric Power in the United States*. This report can be downloaded for free at:

<https://www.nationalacademies.org/projects/DEPS-BEES-17-02>

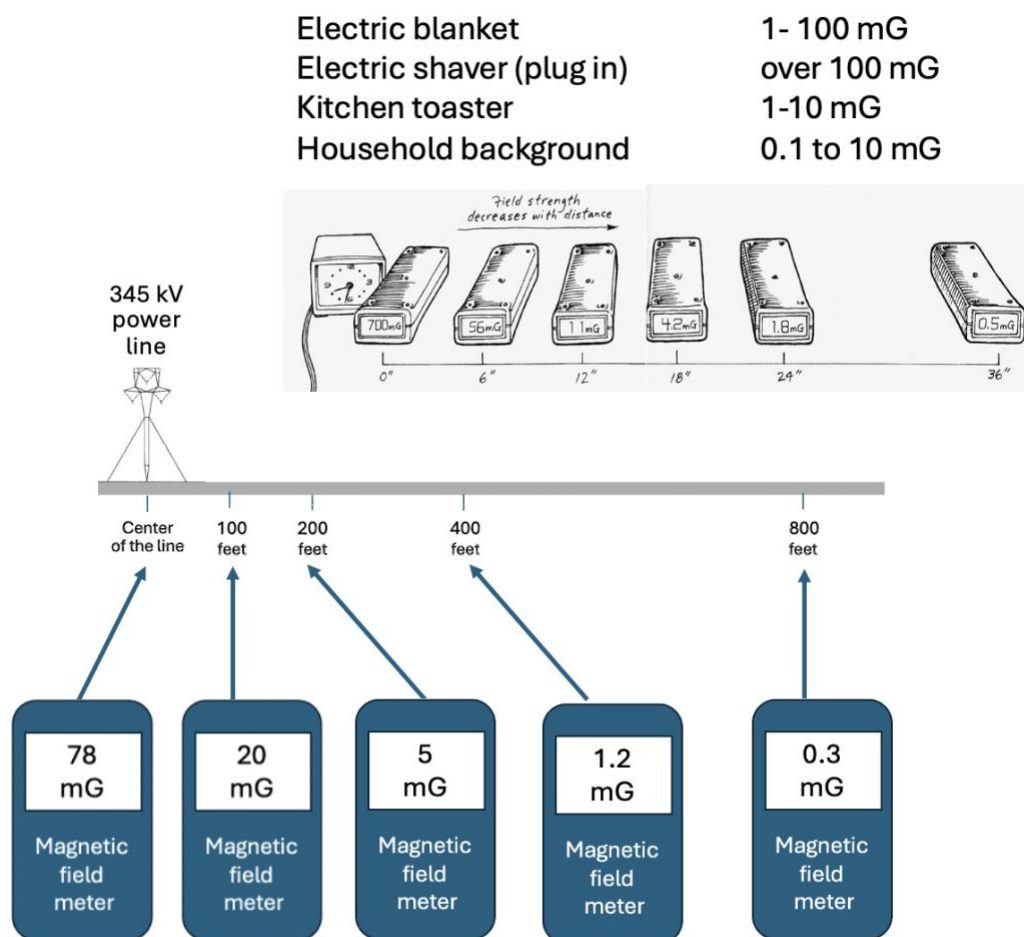
More Details on Part 4 on risks, costs and benefits of different kinds of high voltage power lines

In terms of exposure, is there a key difference between electric fields and magnetic fields?

Yes, electric fields cannot pass through things like buildings or many other barriers. Magnetic fields can pass through buildings and many other barriers.

What other things besides high-voltage power lines produce power frequency electric and magnetic fields?

There are power frequency AC electric and magnetic produced by many things in our homes, shops and offices. The strength of those fields is often *much* higher than the strength of fields from nearby high-voltage power lines. The diagram below shows a few examples. In these pictures the strength of the magnetic field is shown in units of milligauss.



Examples of other fields (above) are from the CMU brochure "Fields from Electric Power"
 Example 345 kV power line (below) based on data from EPRI

Why do you use the phrase “power frequency, electric and magnetic fields”?

Not all electric and magnetic fields are alike. They can be static (i.e. never changing), or they can oscillate (on and off) at a wide variety of frequencies. In the United States electric power has a frequency of 60 cycles per second or 60 Hertz (Hz). Power in Europe, and many other parts of the world has a frequency of 50 Hz.

Light waves, radio waves, and other “electromagnetic” phenomenon have fields that oscillate at very different frequencies, as shown in the table below:

Class			Wave-length λ	Freq- uency f	Energy per photon E
Ionizing radiation	Y	Gamma rays	10 pm	30 EHz	124 keV
	HX	Hard X-rays	100 pm	3 EHz	12.4 keV
	SX	Soft X-rays	10 nm	30 PHz	124 eV
	EUV	Extreme ultraviolet	121 nm	3 PHz	10.2 eV
	NUV	Near ultraviolet	400 nm	750 THz	3.1 eV
		Visible spectrum	700 nm	480 THz	1.77 eV
Infrared	NIR	Near infrared	1 μ m	300 THz	1.24 eV
	MIR	Mid infrared	10 μ m	30 THz	124 meV
	FIR	Far infrared	100 μ m	3 THz	12.4 meV
Micro-waves ^[11]	EHF	Extremely high frequency	1 mm	300 GHz	1.24 meV
			1 cm	30 GHz	124 μ eV
	SHF	Super high frequency	1 dm	3 GHz	12.4 μ eV
	UHF	Ultra high frequency	1 m	300 MHz	1.24 μ eV
Radio waves ^[11]	VHF	Very high frequency	10 m	30 MHz	124 neV
	HF	High frequency	100 m	3 MHz	12.4 neV
	MF	Medium frequency	1 km	300 kHz	1.24 neV
	LF	Low frequency	10 km	30 kHz	124 peV
	VLF	Very low frequency	100 km	3 kHz	12.4 peV
	3	Band 3	1 Mm	300 Hz	1.24 peV
	2	Band 2	10 Mm	30 Hz	124 feV
1	Band 1	100 Mm	3 Hz	12.4 feV	

← frequency of dental X-ray

← frequency of fields in a micro-wave oven

← frequency of AM radio

← power frequency fields

Table is from Wikipedia

Notice that the entries at the top of this table are labeled “ionizing radiation.” These forms of radiation have enough energy to actually break chemical bonds. The energy in lower frequency, electric and magnetic (non-ionizing) fields is too small to break chemical bonds.

What could I look at if I want to learn more about what is known about possible health risks from exposure to power frequency fields?

Years ago, at Carnegie Mellon, we produced a very detailed brochure about this that you can download from:

https://www.cambridge.org/core/services/aop-cambridge-core/content/view/6153BD815B9C8273E87F70D10B8C3A2A/9780511814679apx2_p239-302_CBO.pdf/brochure_on_fields_from_electric_power.pdf

The US Environmental Protection Agency (EPA) provides a summary that you can view at:

<https://www.epa.gov/radtown/electric-and-magnetic-fields-power-lines>

What do reviews of published papers say about how high voltage transmission lines affect property values?

A review of all the published studies of the statistical evidence of the impact of nearby transmission lines was conducted by two academic researchers in Texas in 2010. Their review found “little or no effects on prices.”³ They also said that the effects that were found “tended to dissipate with time and distance.” They also said, “price analyses based on less formal paired sales and other techniques failed to find any effects.”

A review in 2012⁴ by a non-profit research organization that was commissioned by an industry trade group looked at a number of additional studies and concluded that “there is a large body of peer-reviewed evidence that suggests that property value impacts—measured in actual sales of properties affected by a transmission line easement to those that are not—often do not register, and when they do, they are relatively small.” However, these authors go on to explain that “there are case studies and appraisal reports that occasionally find very large impacts on sales price and or time on the market.”

A review of the literature published after 2010 that a group of academics published in 2017 concluded that that “...research finds adverse perceptions and general dislike of...[high-voltage overhead transmission lines] but reveals little or no diminution in [home and property] prices. Stated preferences by market participants in this case generally do not translate into noticeable price effects as revealed in market data.”

³ The paper is Jackson, T., & Pitts, J. (2010). The effects of electric transmission lines on property values: a literature review. *Journal of Real Estate Literature*, 18(2), 239-259.

⁴ Kroll, C. A., & Priestley, T. (1991). The Effects of Overhead Transmission Lines on Property Values: A Review and Analysis of the Literature, report prepared for the Siting and Environmental Planning Task Force. *Edison Electric Institute, Piedmont, CA*.