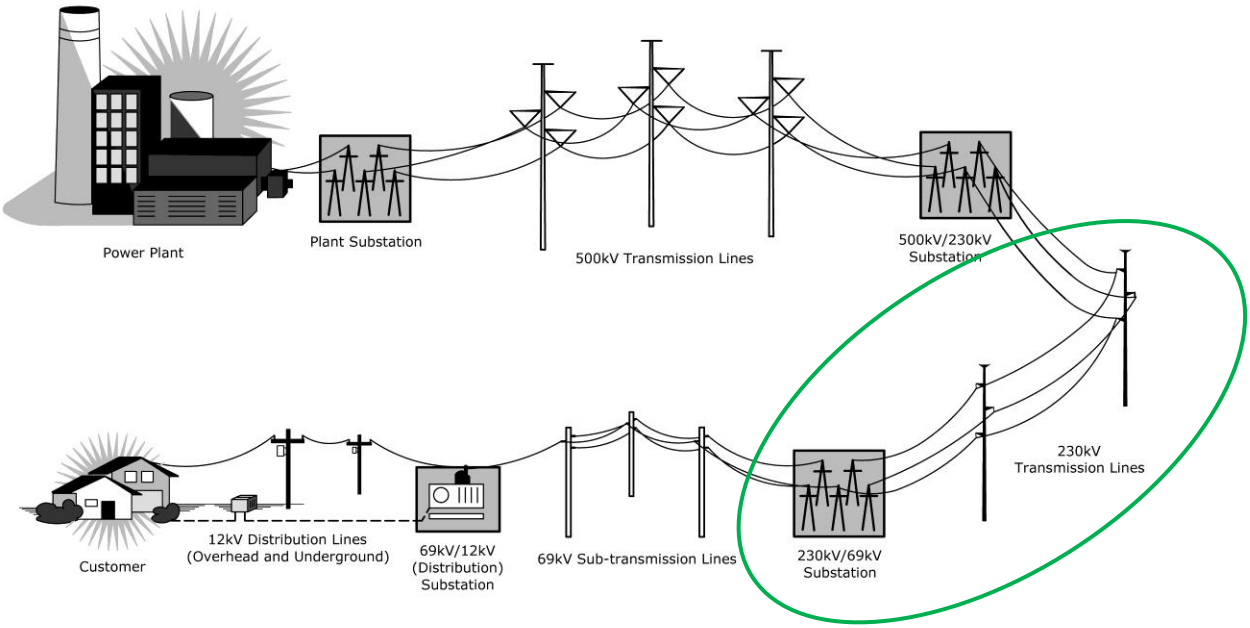
Three Rivers 230kV Power Line Siting

We are developing a plan to build new electrical infrastructure to provide safe and reliable electric service to a new data center customer and support overall growth in the west valley. The information below is in anticipation of questions typically asked during line siting projects such as this.

How does electricity get to my house from where it's made?

In today's world, electricity is manufactured in many ways, from large-scale remote power plants all the way to local small-scale renewable energy sources. However, the bulk of electricity, no matter where it is generated, travels over long distances through a system of transmission and distribution lines that carry the electricity to where it is needed, and substations that convert the voltage to an amount usable by a specific customer. This diagram gives an approximation of the path that electricity takes between where it is manufactured and a typical customer.

This Project primarily consists of the 230kV transmission segment – circled in green on the diagram below.



What will this project serve?

The Three Rivers Project is intended to serve a new data center customer in Goodyear and will also enable us to support the overall growth in the area.

The new Three Rivers Substation will be located on the customer's site near the southwest corner of Van Buren Street and Bullard Avenue. A new line will connect the existing power line along the Agua Fria River to the Three Rivers Substation, approximately 3-7 miles to the west (depending on routing). Then a second line will be routed from the substation back to the existing power line.

Why is this power line project necessary?

Although we have the necessary infrastructure to meet current energy needs in this area, the amount of power needed to serve the data center customer at full build-out requires new 230kV infrastructure and will also provide the energy needs for future growth in the surrounding area.

How does this project benefit me?

This project will bring direct and indirect benefits to individuals and the community as a whole. Providing safe and reliable electric service for Compass Datacenters will enable economic growth, bringing high-end jobs and revenue to the area. This project will improve the power infrastructure in the west valley, which benefits economic development for surrounding cities in the long term, including:

- The ability to better meet the growing energy needs, and increase the reliability to residents
- Help create new businesses and job opportunities
- Help sustain a larger tax base to better support the communities

When will these lines and substations be built?

Phase One: Construction of 69kV facilities has already begun (no Arizona Corporation Commission authorization required).

Phase Two: Construction of 230kV facilities is estimated to begin in early 2021 but is subject to acquiring a Certificate of Environmental Compatibility issued by the Arizona Corporation Commission. The in-service date is planned for mid-2022.

How many miles of new power lines are needed?

Two separate 230kV power lines are needed for this project, spanning approximately 3-7 miles per line, depending on final routes.

Can this line be constructed on existing power poles?

Existing power lines are often considered opportunities to locate new power lines. Although the existing power poles in this area are not large enough to support the new 230kV power lines for this project, we would take the opportunity to consider rebuilding existing power lines with larger poles that would enable us to consolidate the new 230kV power lines with the existing power lines. For example, the existing 69kV line along Van Buren Road would be considered an opportunity to rebuild and replace with the new 230kV poles.

Why doesn't APS place all electric power lines underground?

Placing transmission and sub-transmission voltage power lines underground is significantly more expensive than placing power lines overhead. Actual cost differences depend on various elements, including terrain, project length, environmental concerns, labor, and material differences, etc. An overhead line that spans trenches, washes, or other difficult terrain, may not be compatible for running underground, and would require added time and expense for additional labor and material. Depending on the voltage and the location of the power line and considering the inability to be cooled by the ambient (surrounding) air as in an overhead configuration, underground power lines may require special technology to keep the wires cool. Underground 230kV lines require the cable conduits to be encased in a special concrete slurry, which allows for greater heat dissipation while adding a layer of protection from accidental excavation.

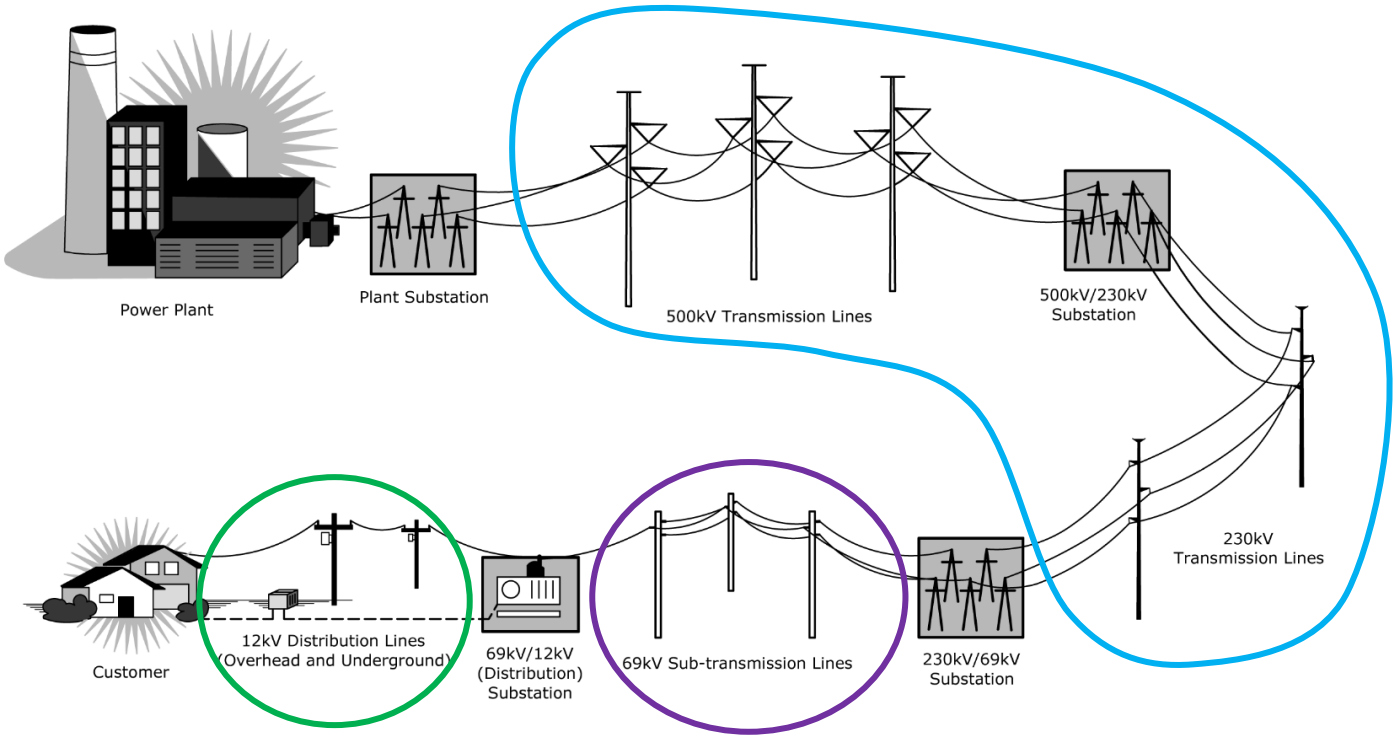
Buried power lines may also extend power outages, as it may take additional time to locate a specific power issue, access the fault and repair it. Additionally, underground systems can be prone to flooding in certain conditions.

Typically, lower voltage 12kV(distribution) lines are buried with new developments, as the additional cost to place the lines underground is passed onto homebuyers or business owners by the developer through impact fees. The bulk of the 12kV distribution lines found in the project study area are located underground.

The cost of building a 230kV power line overhead can vary depending on several factors. A typical power line, built on flat terrain costs approximately $1.8 million per mile, but can increase due to terrain, geology, or other factors. The cost to build a 230kV line underground can be 5-10 times (or more) the cost of building overhead.

While we will financially contribute the amount that would be necessary to install the lines overhead, the difference in cost between an overhead line and underground line would be borne by the community, developer, or any other organization requesting the underground option. Of interest to community members or others requesting an underground option is an existing state law, Arizona Revised Statute 48-620 (https://www.azleg.gov/ars/48/00620.htm), which may provide a mechanism to fund the additional costs through the formation of an underground improvement district. Use of ARS 48-620 or any other agreement would need to be in place and approved prior to beginning the engineering of the underground facility and procurement of materials and must meet our scheduled need for the line.

What is the difference between transmission lines and distribution lines?



Transmission lines deliver electricity over long distances from power plants to substations at a high voltage. These voltages range from 115-500kV. They bring electricity from the power source to the regional service area. Multiple transmission lines, including 230kV and 500kV, are currently located within the project study area.

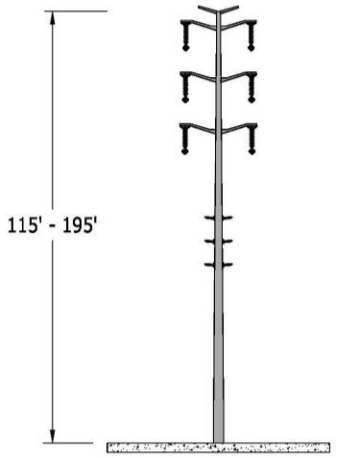
Sub-transmission lines carry voltages reduced from the major transmission line system, typically 69kV, to regional distribution substations.

Distribution lines bring electricity from substations to your home. These carry voltages of 12kV. The lines are smaller and cover shorter distances. The bulk of the 12kV distribution lines found in the of the project study area are located underground.

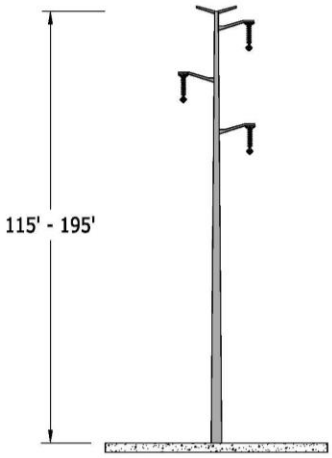
Arizona State Law requires utilities to obtain approval from the Arizona Corporation Commission prior to the construction of new electrical transmission facilities with voltages greater than 115kV, which applies to this 230kV project.

What do typical transmission structures look like?

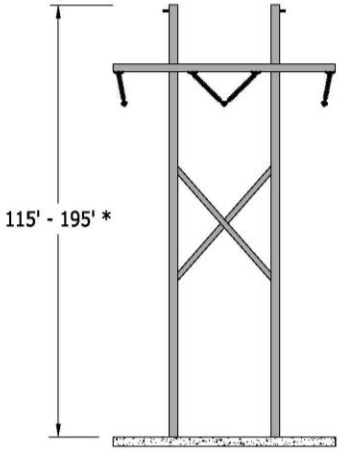
Transmission line structures vary in size and design based on a variety of factors such as the voltage capacity of the line, how many circuits will be carried by the structure, and other engineering considerations such as terrain. The structures proposed in this project will carry a 230kV line with a proposed typical height ranging between 115 – 130 feet +/-, but could increase up to 195’ (shown in the diagram below), depending on terrain and possible crossings of existing power lines, raised roads and other infrastructure. Although single monopole structures are typically used, H-frame structures (as pictured below) are often used for line crossings, and heights are generally shorter when crossing under existing lines.



Typical 230kV double circuit with 69kV double circuit underbuild monopole structure

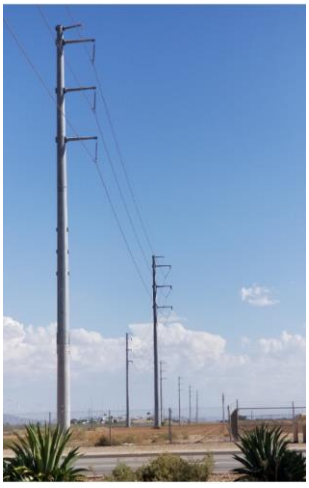


Typical 230kV single circuit monopole structure



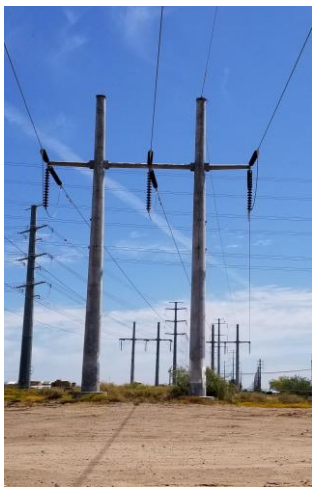
*Typical 230kV single circuit H-frame structure. *Height can be shorter when crossing under existing lines*

The photographs below are examples of typical 230kV structures.



230kV single-circuit monopole

230kV double-circuit monopole with double-circuit 69kV under build

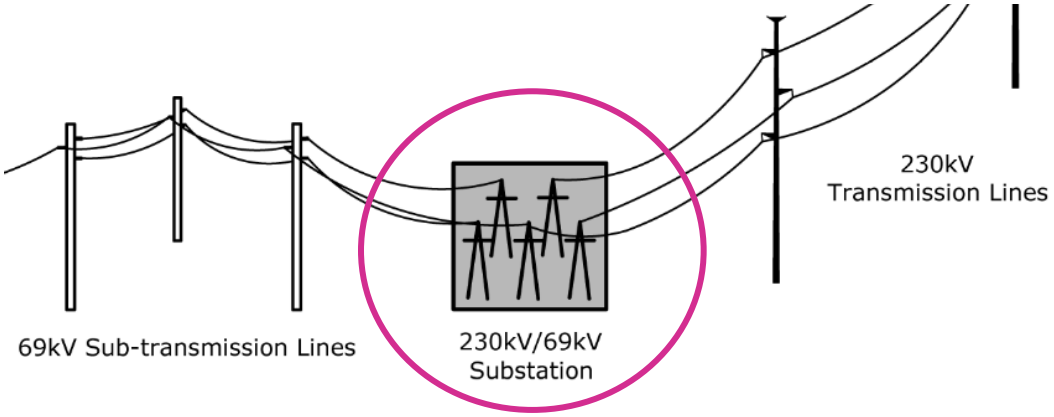


230kV single-circuit H-frame (crossing existing power lines)

What is a substation and why is it necessary?

Electric transmission lines connect to substations. Substations perform multiple purposes: stepping electricity levels up or down, transferring power from the transmission system to a distribution system, collecting power from generation facilities, or functioning as a switching station for rerouting electricity on the grid.

For this Project, the purpose of the proposed substation is to step electricity levels down from the regional 230kV transmission network to the sub-transmission level of 69kV to serve the data center customer.



How big is a substation, what does it look like?

A 230/69kV substation requires approximately 15-20 acres. We work with local communities to design substations that blend in with the surrounding area as much as possible. For this project, the Three Rivers Substation will be located within the Compass Datacenters site, with a 10- to 12-foot-high block wall surrounding the substation equipment. Below is an example of an existing 230/69kV substation.

230/69kV Substation – Aerial View

230/69kV Substation – Street View

Will these lines and substation create noise?

Transmission line noise can be described as humming or crackling. Audible noise from the power lines is created by:

- Corona discharge along the line
- Frequency and voltage level of the line

Corona is defined as the breakdown of air into charged electrical particles. The amount of corona for a transmission line is a function of several things including:

- Engineering design
- Voltage
- Phase spacing and geometry
- Weather conditions

Effects of corona can include:

- Audible noise
- Radio and TV interference

Suggested noise levels:

- Electric Power Research Institute (EPRI) studies show that customer complaints are registered at 52.5 decibels, A-weighted (dB(A))
- The Environmental Protection Agency (EPA) has concluded that day/night (Ldn) sound levels below 55.0 dB(A) will not cause interference or annoyance with outdoor activities.

Noise levels on a typical extra-high voltage transmission line are expected to be less than the suggested levels.

What about electric and magnetic fields?

60 Hertz (Hz) electric and magnetic fields (known as "EMF") are produced by all devices which use, carry, or produce electricity, including household appliances, office equipment, power lines, and wiring in buildings. These are actually two separate fields; the electric field is caused by the voltage on a conductor, while the magnetic field is caused by the current flowing in a conductor.

For power lines this means that the electric field is relatively constant (since the voltage of a power line does not fluctuate), while the magnetic field varies throughout time depending on the current flowing in the power line (this is a function of how much electricity our customers are using at any given time). The strength of both fields decreases as distance from the source increases. In addition, the electric field is easily shielded by solid objects such as buildings or trees, while the magnetic field is generally not shielded by these objects.

Due to these factors, and the fact that high voltage power lines are placed on poles high in the air, the field strengths at ground level near high voltage power lines, particularly the magnetic field strengths, are often similar to those encountered in close proximity to common household, school, and office electrical appliances.

There have been scientific studies on the potential health effects of EMF for more than 25 years. For a more thorough understanding of this research we recommend reviewing web sites of organizations such as the National Institute of Environmental Health Sciences and the World Health Organization (WHO). The WHO website, as of March 2017, states, "Extensive research has been conducted into possible health effects of exposure to many parts of the frequency spectrum. All reviews conducted so far have indicated that exposures below the limits recommended in the ICNIRP (1998) EMF guidelines, covering the full frequency range from 0-300 GHz, do not produce any known adverse health effect."

APS recognizes that research into potential health effects from exposure to EMF is ongoing and we try to respond appropriately. We follow this research closely and over the years we have helped to fund and have participated in some of this research. We also include EMF considerations into the design and siting of new power lines or structures. In addition, we can provide educational materials and field strength information on existing and proposed power lines as necessary. All our construction standards and practices meet or exceed the nationally accepted standards of the National Electrical Safety Code.

How will the final routes be determined?

The public process required to site this 230kV power lines includes hiring an outside environmental consultant to work with our team and help study various factors, including environmental impacts, public comments, agency and jurisdictional input, engineering and construction feasibility and cost, land use impacts, land acquisition, and regulatory approvals.

Of interest to this project is the nearby Phoenix/Goodyear Airport. Pole locations and heights within the Federal Aviation Administration airspace would be subject to their review and would need to meet their clearance standards.

By carefully evaluating these factors, we can develop various route alternatives that undergo further evaluations, including additional input from the public.

For this project, seven alternative route options have been identified as possible locations for the power lines. Each option connects the existing transmission line along the Agua Fria River to the project site, near Van Buren Road and Bullard Road. However, only two will be necessary for this project. Your input regarding these routes will help us determine the preferred route corridors that will be presented in a hearing process before the Arizona Power Plant and Line Siting Committee, and ultimately authorized by the Arizona Corporation Commission.

What is a Certificate of Environmental Compatibility (CEC)?

In Arizona, an energy provider must obtain a Certificate of Environmental Compatibility (CEC) from the Arizona Corporation Commission to construct a transmission line designed to operate at 115 kilovolts (kV) or more. Since this project involves new 230kV power lines, obtaining a CEC will be necessary.

At the conclusion of the environmental studies and the public process, we will present the project to the Arizona Power Plant and Line Siting Committee. The Committee will hear the evidence from APS, and any stakeholders wishing to participate in the siting process. This hearing is open to the public, and there will be time available for public comments. If the Committee approves the proposal, they will issue a CEC that is then submitted to the Arizona Corporation Commission for final approval.

How do I submit my input, and how does it help with the planning process?

Your input is a valuable part in the process to help us identify the appropriate locations for these power lines. The information you provide will help us minimize impacts to sensitive areas, while maximizing the use of existing route opportunities.
The following options can be utilized to submit your comments, questions and input:

- Virtual Open House (VOH) accessed online at threeriversopenhouse.com
- Comment Form (accessed on the project webpage at aps.com/threerivers)
- Open House Comment Forms
- Project information phone number: (833) 387-7518
- Project email: ThreeRiversSiting@aps.com