

Proposal for

Plymouth Area Electric Grid Upgrade

Xcel Energy has been working with the community to develop a solution to address electric deficiencies in the Plymouth area for more than six years. After Xcel Energy withdrew its Hollydale 115 kilovolt (kV) transmission line proposal in 2013, the company began working to develop new alternatives to ensure the community has reliable electric service. While the population in the city of Plymouth has quadrupled over the last 40 years, the four primary electric substations, as well as the majority of distribution and transmission lines serving the Plymouth area are between 25 and 60 years old.

Three different electric solutions were developed with careful consideration of public input along with a focus on minimizing impacts to the community. Xcel Energy presented these three alternatives (A, B, and C) at two public meetings in May, 2016. The three power grid alternatives would improve reliability by reducing outages caused by overloaded equipment, and by decreasing the amount of time necessary to recover from an outage. Following these public meetings, Xcel Energy carefully reviewed all input, revised alternatives where possible, and compared the three alternatives using both public input and a data-based comparison.

Modified Alternative C selected

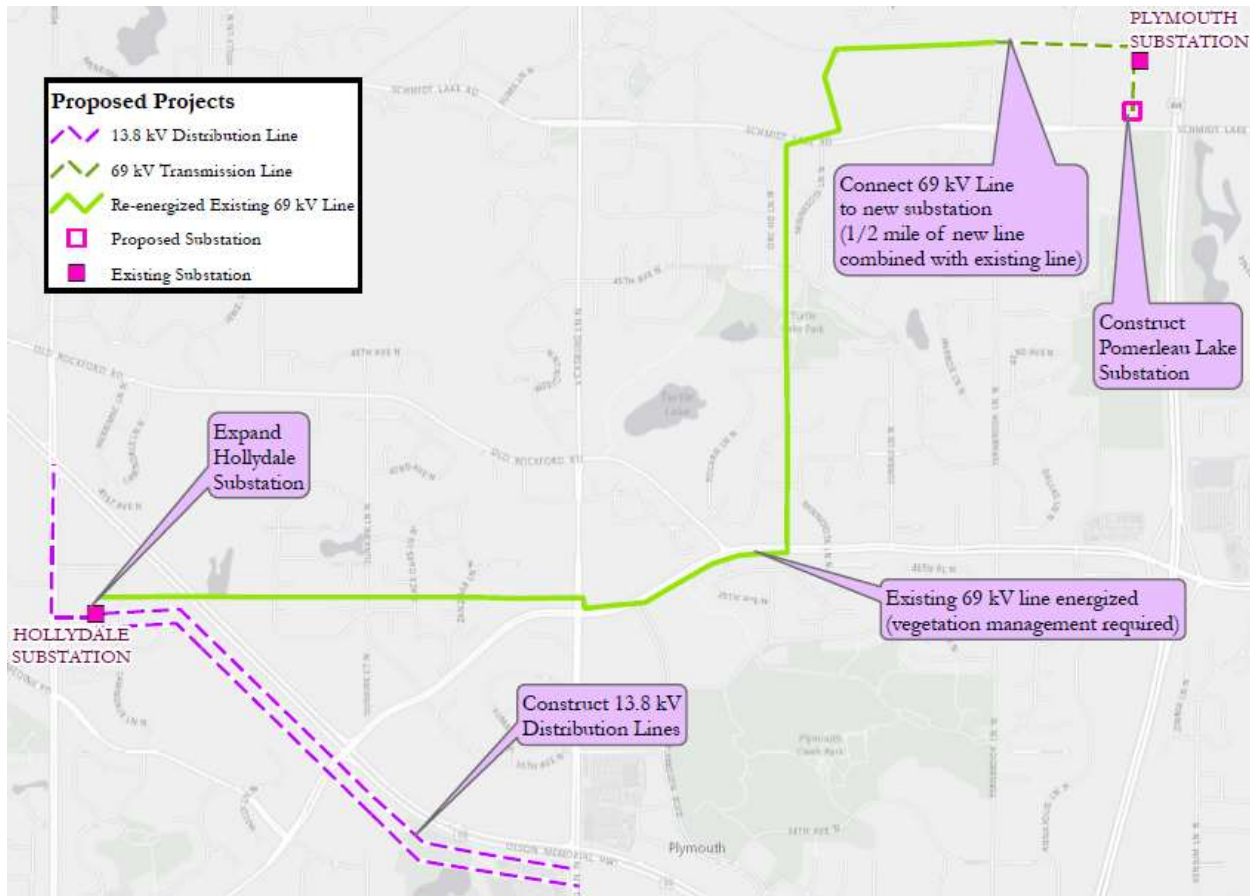
Xcel Energy is planning to construct a modified version of Alternative C (view map below). This alternative relies on existing infrastructure, requiring less construction of new facilities and minimizing human and environmental impacts. In addition, Alternative C provides the best electrical performance of the three alternatives and is the best long-term solution for the area's electrical needs.

Following the public meetings, Xcel Energy modified Alternative C by moving the location of the proposed Pomerleau Lake Substation to a parcel of city-owned land north of Schmidt Lake Road and just west of I-494. In addition to constructing the new Pomerleau Lake Substation, Alternative C includes re-energizing the existing 3.4 mile 69 kV line between the new Pomerleau Lake Substation and Hollydale Substation, constructing a half-mile of 69 kV line parallel to an existing transmission line from the existing 69 kV line to the new Pomerleau Lake Substation, and building three 13.8 kV distribution lines (total of 3.3 miles) from the Hollydale Substation. The Hollydale substation will be upgraded on land own by Xcel Energy. Alternative C requires no installation of additional pad-mounted transformers in Plymouth.

Great River Energy (GRE) owns the existing 69 kV line and easements in Plymouth and Medina. Xcel Energy is negotiating to purchase the line from GRE. In taking ownership of the 69 kV line and easements, Xcel Energy has agreed to restrict the operating voltage of the existing Hollydale to Pomerleau Lake line route to 69 kV.

The remainder of this document provides a summary of project purpose and need, a comparison of the three alternatives and a description of the selected alternative. A glossary with some of the commonly used-terms is included at the end of this document.

Alternative C Modified Route

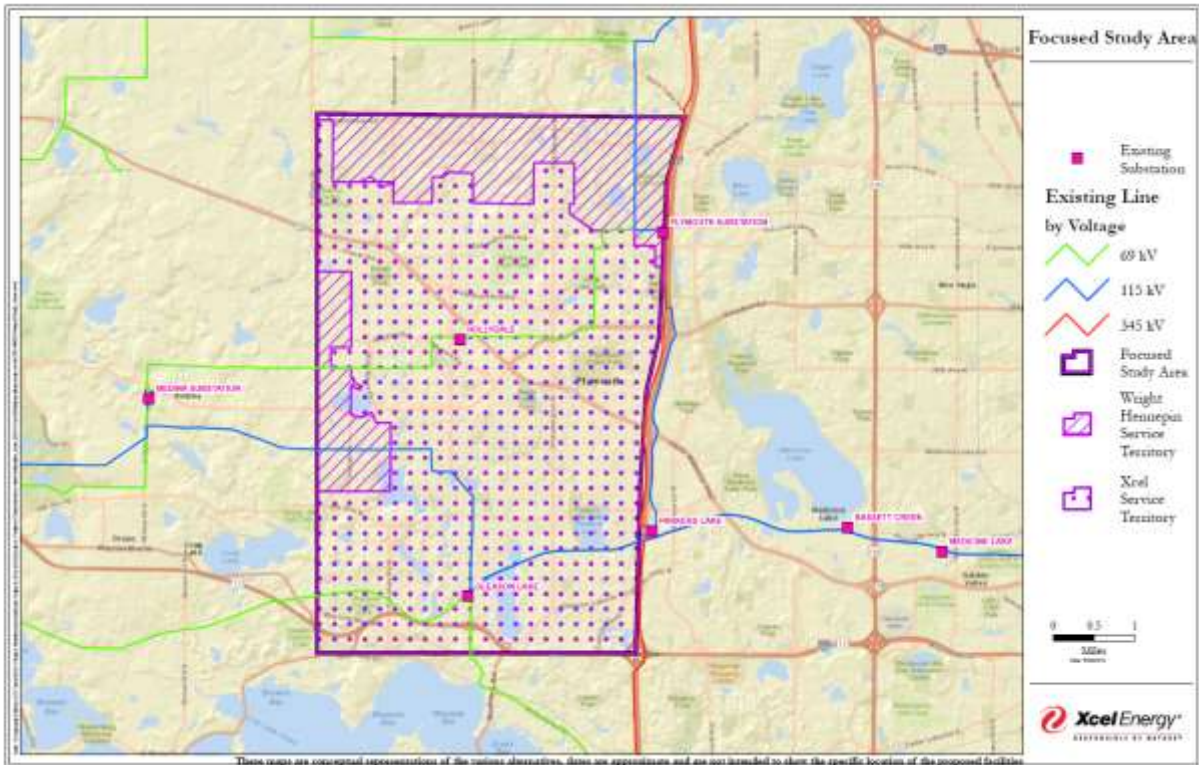


Project Need – Distribution System

The electric distribution delivery system in the shaded Focused Study Area below (Figure A) must be upgraded to maintain reliable electric service in the Plymouth-area.

Demand for electricity in this area currently exceeds the capability of the existing distribution lines during peak use times. For the distribution system to operate reliably, each distribution line has a limit that should not be exceeded. The distribution system is designed to serve normal load and have the capacity to pick up load from adjacent lines if those lines experience an outage. In recent years, electric load in the Focused Study Area has exceeded these limits on some distribution lines from 100 to 400 hours a year. Additionally, the load has exceeded the capability of one of the existing substation distribution transformers in the area. If the system is not reinforced, the risk of more frequent and longer outages will increase as the load in the area continues to grow. Even if there were no more load growth, the system still needs to be reinforced.

Figure A – Focused Study Area for Distribution Needs

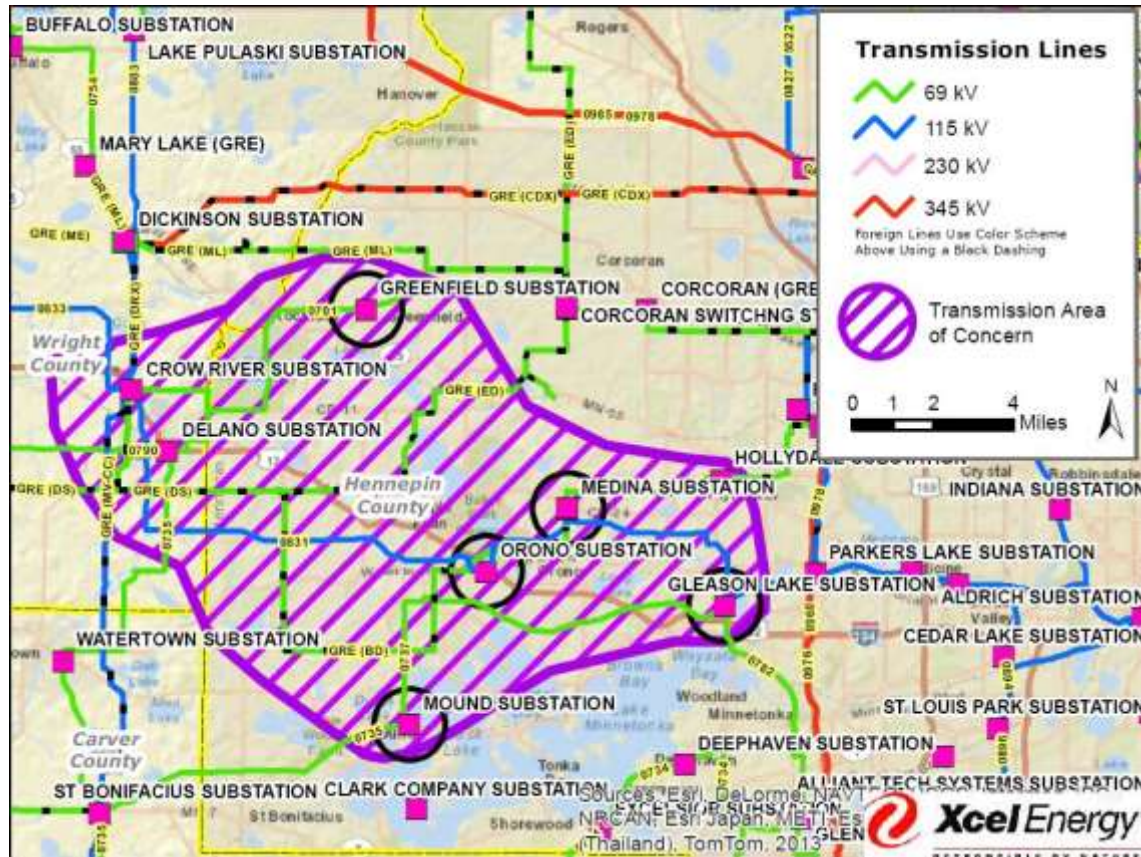


Project Need – Transmission System

The transmission need in the Plymouth-area is driven by increasing demand on the distribution system and deficiencies on the transmission system when certain elements of the system are out of service to serve the load in the Transmission Area of Concern (Figure B). The Transmission Area of Concern encompasses the Focused Study area and includes the cities of Plymouth, Medina, Minnetonka, Greenfield, Rockford, Mound, Maple Plain, and Delano. As the load on the distribution system in the Transmission Area of Concern grows, the transmission need to serve that load also increases.

Xcel Energy is planning to rebuild an existing three-mile transmission line between the Parker's Lake Substation and the Gleason Lake substation. Reconstruction of this line combined with the new proposed facilities will solve the near term transmission needs in the area.

Figure B



Three Alternatives Presented

After Xcel Energy withdrew its Hollydale transmission proposal in 2013, the company began working to develop new alternatives to solve the system deficiency. Guiding principles of the new planning effort included using smaller scale distribution facilities to minimize impacts, avoiding/minimizing new transmission facilities in the area, and encouraging conservation measures.

Xcel Energy examined elements from all previously studied alternatives and public comments received during the Public Utilities Commission process. This review focused the team on utilizing/rebuilding existing infrastructure and where possible, limiting any new lines to distribution voltage levels. Xcel Energy developed three alternatives that will solve the Plymouth-area electric system deficiency for the next 20 to 30 years. The infrastructure improvements proposed by Xcel Energy in these three alternatives are designed to address both the distribution and transmission needs. The three proposed Plymouth-area power grid alternatives that Xcel Energy presented at the May 2016 open house would improve reliability by reducing the frequency of power outages caused by overloaded equipment, and by decreasing the amount of time necessary to recover from an outage.

Alternatives Proposed in May, 2016

Alternative A - 34.5 kV from Pomerleau Lake Substation ([View Map](#))

- Construct Pomerleau Lake Substation south of Schmidt Lake Road, just west of I-494
- Build 4.3 miles of 34.5 kV distribution line to the existing Hollydale Substation on County Road 101 south of Highway 55
- Construct a 3.5 mile 34.5 kV distribution line along Fernbrook Lane and Highway 55
- Install approximately 12 pad-mounted transformers in various locations.

Alternative B - 34.5 kV from Parkers Lake Substation ([View Map](#))

- Expand the existing Parkers Lake substation near I-494 and County Road 6
- Construct 5 miles of 34.5 kV distribution line from Parker's Lake Substation to the existing Hollydale Substation on County Road 101 south of Highway 55
- Build a 4.7 mile 34.5 kV distribution line along Fernbrook Lane and Rockford Road
- Install approximately 12 pad-mounted transformers in various locations.

Alternative C - Re-energize existing 69kV line ([View Map](#))

- Construct Pomerleau Lake Substation south of Schmidt Lake Road, just west of I-494 (Note: the updated Alternative C chosen moves the Pomerleau Lake Substation north of Schmidt Lake Road)
- Re-energize the existing 3.4 mile 69 kV line between the new Pomerleau Lake Substation and the existing Hollydale Substation
- Connect existing 69 kV line to new Pomerleau Lake substation and vegetation management along the existing 69 kV line
- Build two new 1.5 mile and one 0.3 mile 13.8 kV distribution lines from the Hollydale Substation
- Upgrade the Hollydale Substation on land owned by Xcel Energy
- Requires no pad-mounted transformers

*The existing 69 kV transmission line west of the Hollydale Substation remains unchanged on all three of these alternatives.

Pomerleau Substation Site

Alternatives A and C include the construction of Pomerleau Lake Substation near Schmidt Lake Road and I-494. In Alternative A and C, Xcel Energy initially proposed to build the Pomerleau Lake Substation on land that could be used for a future city park adjacent to I-494.

A number of the comments received from landowners and other stakeholders expressed concern about the proposed location for this substation. Xcel Energy worked with the City of Plymouth and local residents to identify an alternative substation site. In July 2016, the city identified a new city-owned parcel on Schmidt Lake Road that is adjacent to the existing Plymouth Substation as an alternative site for this substation. This substation site is located further from residences than the original substation site. A map of the new Pomerleau Lake Substation location is provided below.



The Pomerleau Lake Substation is an essential component of both Alternatives A and C as the distribution lines installed as part of these alternatives need to have a power source. The Pomerleau Lake Substation on Schmidt Lake Road is a good location for current and future system upgrades as it is located near the Focused Study Area and adjacent to an existing 115 kV transmission line. The Focused Study Area is the area where demand for energy has exceeded the capabilities of the existing distribution facilities.

Alternative B does not require construction of the Pomerleau Lake Substation, it would utilize new feeders sourced from the Parkers Lake Substation further south. The major drawbacks of Alternative B is a lack of flexibility to handle future growth, difficulty in expanding the Parkers Lake Substation, less reliability due to the long feeders from Parkers Lake, and the significant length of new lines. Given the proximity of the Pomerleau Lake Substation to the Focused Study Area, Xcel Energy believes that a new

substation near Schmidt Lake Road and I-494 provides the best long term solution to meet the area's power needs.

Public Involvement

On May 25, 2016 Xcel Energy held two open houses to present the three alternatives and collect public feedback. Ads were placed in area newspapers and a mailing was sent to over 7,700 landowners and other stakeholders notifying them of the open houses. Approximately 80 people attended the open houses. Additionally the project team has briefed local and state officials and neighborhood groups. The company has received more than 200 responses, the majority of which were on comment forms with the rest being e-mail, phone calls, or letters. Copies of all responses are posted on the project [web page](#). Xcel Energy also responded to numerous questions from residents and stakeholders about the alternatives and the need for these upgrades. These questions and responses are also listed on the project webpage.

Xcel Energy appreciates the time and effort of residents, local and state officials, and other stakeholders who participated in the evaluation and refinement of the three alternatives by attending the public open houses and providing feedback. This feedback was helpful in enabling the company to assess and refine these alternatives.

Evaluation of alternatives

All three alternatives were designed to meet the near and long-term distribution and transmission system needs. Below is a summary comparing the impacts and performance of the three alternatives.

Comparison of Potential Impacts

All three alternatives require construction of new distribution lines. Alternative B requires the most miles of new distribution lines. A comparison of the mileage of new distribution lines for each alternative is provided below:

- Alternative A: Eight miles of new distribution lines in near term and nine miles in long-term (2040)
- Alternative B: 10 miles of new distribution lines in near term and 11 miles in long-term (2040)
- Alternative C: Four miles of new distribution lines in near term no new facilities anticipated in the long term (2040)

While the identified routes of for the new distribution lines are preliminary, a rough count of first row houses along each route is:

- Alternative A: 145 homes along new distribution line routes
- Alternative B: 98 homes along new distribution line routes

- Alternative C: 26 homes along new line routes and 85 homes along the existing 69 kV line that would be re-energized as part of this alternative

In addition, Alternatives A and B require 12 pad-mounted transformers (approximately 9x11x10 feet) and 12 switching cabinets (5x6x7 feet) to be installed in various locations in the Western Plymouth. Alternative C does not require any new pad-mounted transformers.

Alternative A and C both require a new Pomerleau Lake Substation while Alternative B requires expansion of the Parkers Lake Substation.

System Performance

Both Alternative A and B rely on longer distribution lines as compared to Alternative C. The use of long distribution lines is problematic as they consist of more equipment that can fail and also have more exposure to external factors that can increase the chance of outages.

Both Alternative A and B do not perform as well as Alternative C because both of these alternatives install additional capacity to serve electrical demand farther from the Focused Study Area.

Moreover, while in the short-term all three alternatives meet the needs of the area at relatively the same costs, both Alternative A and B will require additional facilities east of I-494 in the 2040 timeframe to serve additional electrical demand. Alternative C is also best able to accommodate future needs in the area. Unlike Alternatives A and B, Alternative C does not exhaust the capacity of existing substations. In addition, the construction of the new Pomerleau Lake substation in Alternative C allows for additional distribution capacity to be added to that substation as needed to serve growing electrical needs.

Alternative C has a lower cost than the other alternatives in the near-term and significantly lower costs in the long-term because it utilizes mostly existing facilities.

Selection of Alternative C

After a thorough analysis of the comments received, while examining the impacts to landowners and measuring the long-term benefits of each of the proposed alternatives, Xcel Energy has selected Alternative C. It relies on existing infrastructure and requires less construction of new facilities and has fewer associated human and environmental impacts. In addition, Alternative C is rated as providing the best electrical performance of the three alternatives and provides a best long-term solution.

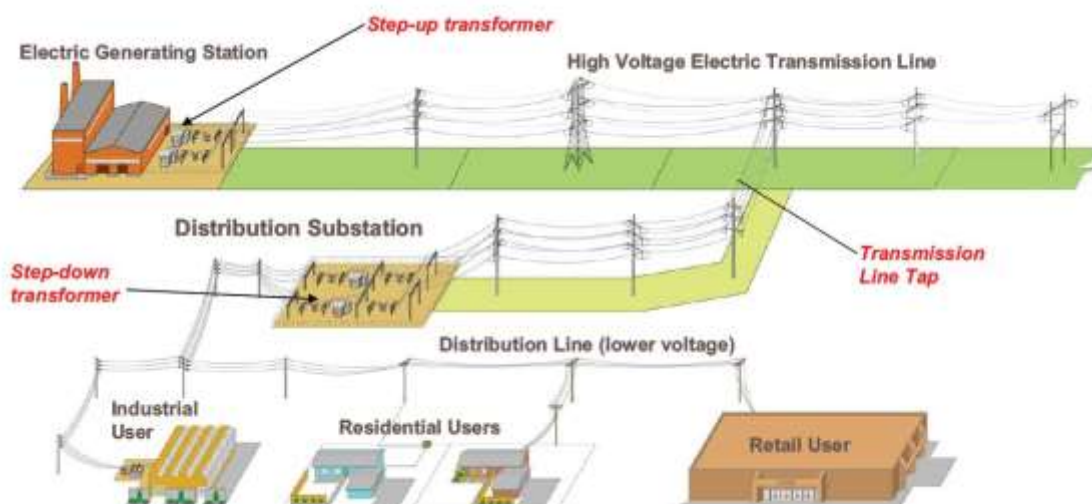
Alternative C requires the construction of Pomerleau Lake Substation and the re-energization of the existing 69 kV line between the Hollydale Substation and the new Pomerleau Lake Substation. Great River Energy (GRE) owns the existing 69 kV line and easements in Plymouth and Medina. Xcel Energy is negotiating to purchase the line from GRE. In taking ownership of the 69 kV line and easements, Xcel Energy has agreed to restrict the operating voltage of the existing Hollydale to Pomerleau Lake line route to 69 kV.

Approximate timeline (subject to change)

- December, 2016: File conditional use permit and negotiate land purchase with the city of Plymouth for Pomerleau Lake Substation
- June 2017: Start construction of Pomerleau Lake Substation
- Spring 2018: Start construction of a half-mile of new 69 kV line to connect existing Hollydale 69 kV line to Pomerleau Lake Substation
- December 2018: Estimated in-service date for Pomerleau Lake Substation and re-energization of 69 kV line between Hollydale and Pomerleau Lake (including a half-mile of new 69 kV line)
- 2019-2020: Construction of Hollydale Substation upgrades and associated distribution feeders.

How the electrical system works

Bringing energy to our homes and communities takes a lot more than just flipping a switch. The diagram below outlines the typical flow of energy. First, energy is generated through a variety of ways, and the power is increased to a higher voltage at a nearby substation. From there, energy is sent out over high voltage transmission lines, where it can be carried long distances. As it gets closer to where it is needed, power is transformed to lower voltages at distribution substations and sent out again to homes and businesses through smaller power lines called distribution lines or feeders.



Commonly-used terms

Distribution: An electric power distribution system is the final stage in the delivery of electric power; it carries electricity from the transmission system to individual consumers. Distribution lines are also referred to as 'feeders'.

Kilovolt (kV): Electrical potential equal to 1,000 volts.

Load: The amount of power demanded by consumers. It is synonymous with demand.

Peak demand: The maximum (usually hourly) demand of all customer demands plus losses. Usually expressed in megawatts (MW).

Transformer: Electrical device that changes the voltage in AC circuits.

Transmission: The process of transporting electric energy at high voltages from a supply source to utilities.