Chapter 6 - Fiscal Management & Public Infrastructure

Leesburg, Hamilton, and Round Hill have extended utilities into the surrounding Joint Land Management Areas (JLMA). The Comprehensive Plan does not recommend extending municipal systems into adjacent rural areas except when necessary to resolve public health issues in existing communities.

Loudoun Water's Capital Improvement Plan (CIP) is a 10-year roadmap for creating, maintaining, and funding present and future infrastructure needs.[1] The Loudoun Water CIP is approved by the Loudoun Water Board of Directors. Capital water and wastewater improvements are complex and interrelated and often require a great deal of planning over many years to define their extent, location, and cost. The underlying strategy of the CIP is to plan for facilities necessary for the safe and efficient delivery of water, wastewater, and reclaimed water services in accordance with policies, goals, and objectives adopted by Loudoun Water. A critical element of a balanced Capital Improvement Plan is to preserve and enhance existing facilities as well as provide new assets to respond to growth of the community and changing service needs as outlined in the Comprehensive Plan and other Board policies.

Waste Management

The Loudoun County Department of General Services, Waste Management Division operates the Solid Waste Management Facility ("landfill") and provides recycling opportunities for residents and businesses. Landfill operations are fee-supported. The County also offers recycling drop-off centers, household hazardous waste collection events, collection of seven materials for recycling or diversion at the landfill, and educational programs. The County anticipates continuing operations at the Evergreen Mills Road landfill site and relying on continued recycling and commercial facilities to redirect a significant amount of waste material. International demand for recycled material is, however, a key factor in the success of recycling programs. Continued review and updating the County's Solid Waste Management Plan will provide the more detailed management and planning necessary to meet State requirements to anticipate future needs.

Energy ~~and Communication~~

Electrical demand ~~in the County has grown dramatically in recent years with the development of data centers in eastern Loudoun. Demand is expected to continue to grow with new data center construction, the operation of the Silver Line Metrorail, and other land development. Changes in data center technology have resulted in electrical demand increasing from 100 watts up to 300 watts per square foot. Demand for data center development within the County is anticipated to be strong for the foreseeable future.~~ in the region has steadily increased with the growth of business and residential development and the continued expansion of the data center industry. Data centers are among the highest consumers of electricity within Loudoun County. Electric providers in recent years have completed upgrades to existing high voltage

[1] The Loudoun Water Capital Improvement Plan can be accessed at www.loudounwater.org.

transmission corridors and have received and/or are seeking state approvals for other routes in the County to deliver bulk electricity to the region and to concentrations of data centers where existing and future load growth are forecasted. The County and electrical providers anticipate that additional construction and/or upgrades to the existing high voltage transmission network will be required in portions of the County to meet current and forecasted electric demand associated with future development to ensure that federal mandated reliability standards for the electric grid are maintained within certain limits if one or more components of the transmission network were to fail.

High voltage electrical transmission lines are crucial to the delivery of large volumes of bulk electricity from generating facilities over long distances to local utility substations where the high voltage electricity is reduced to a lower voltage before being conveyed through a network of distribution lines to the end-users within the community. In Virginia, the placement of high voltage transmission lines is regulated by the state and are defined as any electrical line with capacity equal to or greater than 138 kilovolts (kV). High voltage transmission lines are generally constructed overhead on galvanized metal lattice, H-frame or monopole towers that range in height from 125-feet to 180-feet and require a cleared right-of-way (ROW) that is typically the approximate height of the towers. High voltage transmission lines may also be placed underground in some instances, though construction costs are higher, and engineering, operation, and repair of the lines are more complex. As such, underground lines represent only a small percentage of the number of high voltage transmission lines within Virginia.

~~Electrical and communication services are provided under the purview of state and federal agencies. This limits the County's ability to mitigate certain impacts. For example, the County regulates the location of electrical substations but not the high voltage distribution lines to and from the substations. Similarly, the County may review the location of cell towers and monopoles for impacts on surrounding properties, but cannot prescribe locations and, therefore, cannot require broadband or communication service in underserved areas. The County does, however, work with the providers to encourage improved service and locations.~~ As of 2025, approximately 37 miles of 500 kV transmission lines and 125 miles of 230 kV transmission lines have been constructed overhead, and two miles of 230 kV transmission lines have been constructed underground in the County. The backbone of the County's transmission system is the 500 kV lines that run north to south through the middle of the County. The primary 230 kV transmission lines serving portions of eastern and western Loudoun are located proximate to portions of the Washington and Old Dominion Trail, the Broad Run, Route 7, Route 50, and through "Data Center Alley" adjoining Waxpool Road and Loudoun County Parkway (see Electrical Infrastructure Map). Rather than a centralized, regional substation to serve the County's growing electrical demands, smaller substations have been constructed to serve geographic areas ~~for~~ and individual high energy users ~~providers~~. As demand for increased ~~electrical~~ electricity ~~power~~ continues, greater consideration should be given to the location and appearance of transmission lines, substations and distribution ~~power~~ lines to provide ~~and~~ adequate siting and screening of these facilities to reduce the visual impact ~~up~~on the community.

Electrical ~~and communication~~ services are provided under the purview of state and federal agencies~~.~~, ~~This limit~~ limiting the County's ability to mitigate impacts. For example, the County regulates the location of electrical substations but not the high voltage transmissions line to and from the substations. In Virginia, the State Corporation Commission (SCC) regulates the

location and construction of high voltage transmission lines through the issuance of a Certificate of Public Convenience of Necessity.[2] When reviewing and approving applications for high voltage transmission corridors, the SCC considers several criteria which include the need for the transmission line and the impact on the reliability of electric service, impacts on the environment, including scenic assets and, historic and cultural resources, impact on economic development, and conformance with local comprehensive plans.[3]

As such, the policies include an Electrical Infrastructure Map that identifies all existing and approved high voltage transmission corridors as a feature of the *Loudoun County 2019 Comprehensive Plan.* The policies establish the County's preference to colocate and/or expand existing and approved transmission corridors where practicable before considering the construction of new transmission corridors to minimize community and environmental impacts. The County also supports the deployment of new technologies, such as smart grids, advanced conductors, and others to optimize the ability of the existing high voltage electric transmission network to efficiently serve the County and limit the need for new transmission corridors. The County's electrical infrastructure will continue to evolve with the integration of renewable electric sources, electric storage facilities, and electric generation facilities that balance the supply of electricity during peak demand, as well as other technologies to improve the performance, efficiency and reliability of the electrical network.

The expansion and development of the County's electrical infrastructure to address future load growth and ensure the reliability of the network requires deliberate planning and collaboration between both the County and electrical providers. The electrical policies provide guidance on the location, siting, design, and aesthetics of high voltage transmission corridors and electrical infrastructure that align with County and community objectives to minimize adverse effects on environmental, historic, and natural resources as well as existing and proposed land uses. The electrical policies serve as a guide for electrical providers, County staff, elected officials, and other governmental decision-makers when planning and considering where and how high voltage transmission corridors and improvements to the electrical network should be constructed and managed within the County.

~~Energy and~~ Communication

Broadband internet service is an increasingly important asset to business in Loudoun as e-commerce grows throughout the nation. The lack of broadband service in western Loudoun is cited as a major constraint on the rural economy. It also puts western households and students in particular at a disadvantage. County efforts to extend broadband service have included regulatory changes to support new technologies. With limited control over market factors and federal regulation, the County will encourage landowners to install ~~put in place the~~ conduits and other infrastructure to help minimize the cost of extending the service, and will explore other incentives to encourage network expansion. ~~Similary,~~The ~~the~~ County may review the location of cell towers and monopoles for impacts on surrounding properties, but cannot prescribe locations and, therefore, cannot require broadband or communication service in

[2] SCC Virginia Transmission – Line Projects
[3] Code of Virginia- 56-46.1.A & B.

underserved areas. The County does, however, work with providers to encourage improved service and locations.

Fiscal Management

Loudoun County uses an integrated approach to land use and fiscal planning. This approach uses economic and demographic forecasting models, as well as service and facility standards, to help determine current and future capital facilities needs in the County. The Board established Loudoun County's Fiscal Impact Committee (Committee) in 1992. This advisory committee reviews assumptions about future growth and capital facility needs. The Committee provides recommendations to the Board on four key documents that the County uses to coordinate land use and financial planning: 1) long-range forecasts and demographic, economic, and financial information included in the Fiscal Impact Committee Guidelines; 2) Capital Facility Standards

Electrical

Fiscal Policy 6: Support expanded electrical capacity and reliability, balancing economic growth with the goal of minimizing negative impacts on the community, cultural and historic resources, and the environment.

Strategy

6.1: Colocate and utilize existing and approved corridors for transmission line expansion where practicable to minimize community, visual, and environmental impacts.

Actions

A. Encourage the safe grouping ~~and~~, burying ~~of utility lines and facilities~~ and colocation of new transmission lines and electric infrastructure within existing and approved transmission corridors as depicted on the Electric Infrastructure Map to minimize community and environmental impacts.

B. Utilize and upgrade existing transmission infrastructure to support the reliability of the electric grid, whenever possible, to reduce the need for new transmission infrastructure.

C. Support rebuilding, voltage conversions and upgrades, and modernization of existing electric infrastructure and transmission corridors to better utilize resources and minimize impacts on existing and future development.

D. Encourage underground electric transmission lines within existing overhead transmission line easements where expanding the width of an existing transmission corridor to colocate transmission lines is unfeasible.

E. Construct new electrical transmission and distribution lines within and along existing utility, Metro rail, and road ROW to minimize impacts on existing and future development.

F. Design and site proposed electrical infrastructure to preserve areas necessary for future ROW acquisition and ancillary easements for construction of utility and road improvements.

Strategy

6.2 Minimize the impacts of transmission corridors and electrical infrastructure through appropriate location, siting and design techniques to ensure compatibility with the surrounding built and natural environment.

Actions – Transmission Lines

A. Existing transmission corridors should be expanded only, when necessary, with no greater than the minimum width required to accommodate the proposed transmission lines and electrical infrastructure to minimize impacts.

B. Locate new transmission corridors and electrical facilities in areas planned for commercial or industrial uses. Mixed-use and residential areas should be avoided and only be considered when other, non-residential areas are not available.

C. Encourage the use of location, siting, and design techniques that minimize the visual impact of overhead high voltage transmission corridors and electrical infrastructure using setbacks, existing forest and vegetative screens, landscape berms, and landscape buffers.

D. Utilize design techniques and route alternatives for new overhead transmission corridors to avoid and/or minimize visual impacts to Urban Centers, Mixed-Use Developments, Residential Neighborhoods, Towns, Rural Historic Villages, Rural Landscapes, and County Historic and Cultural Conservation Districts.

E. Support the undergrounding of high voltage electric transmission lines where practicable to minimize visual impacts to Urban Centers, Mixed-Use Developments, Residential Neighborhoods, Towns, Rural Historic Villages, Rural Landscapes, and County Historic and Cultural Conservation Districts.

Actions – Substations

A. Work with electrical providers to identify potential ~~high voltage distribution lines and~~ substation locations that minimize impacts on key travel corridors, sensitive cultural and historic resources, and existing residential communities ~~or to place high voltage distribution lines underground when approaching such areas; and where possible, use existing transmission corridors and substation sites to expand capacity~~.

B. Encourage the use of design techniques that will minimize the visual impact of electrical substations adjacent to major travel corridors or residential communities including the use of stealth design techniques.

Strategy

6.3: Prioritize the placement of transmission lines underground when proximate to Urban Centers, Mixed-use Development, Residential Neighborhoods, Towns, Rural Historic Villages, Rural Landscapes and County Historic and Cultural Conservation Districts to preserve the character of residential communities, sensitive rural landscapes, cultural and historic resources, and significant cultural landscapes

Actions

A. Construct underground transmission lines in short, strategic segments where visual, environmental, or safety concerns warrant the investment to mitigate impacts.

B. Construct underground transmission lines, whenever possible, along existing or planned utility, Metro rail, and road ROW to minimize impacts on existing and future development.

C. Encourage the consolidation of underground transmission and distribution lines in joint conduit systems or other means that will limit size and create an organized, and methodical arrangement of easements for new projects.

D. Mitigate the visual impact of transition stations utilized to place overhead transmission lines within an underground configuration by providing appropriate siting, screening and buffering of the facilities from adjacent uses.

E. Encourage the undergrounding of existing overhead transmission and distribution lines as technological improvements advance to improve the aesthetics of the built and natural environment.

Strategy

6.4: Accommodate additional local electrical demand through optimization, and efficient use of existing transmission lines and electrical infrastructure, and the development of ~~encourage~~ local electrical generation in appropriate locations ~~throughout the County~~.

Actions

A. Promote reconductoring and voltage conversion to increase capacity within existing transmission corridors before considering the construction of new transmission corridors.

B. Support the deployment of new technologies, such as smart grids and Grid-Enhancing Technologies (GET) designed to improve grid capacity, reliability, and efficiency and limit the need for new transmission corridors.

C. Establish zoning regulations and design standards that permit alternative electrical generation such as wind and solar generation by and for individual users.

D. Enhance renewable energy integration into the electrical grid by creating and implementing a comprehensive strategy, promoting energy efficiency, supporting renewable energy projects, and engaging businesses and the community through education and outreach.

E. Encourage local electrical generation and energy storage in appropriate locations to provide additional electrical capacity and enhance the reliability of the network.

F. Support expanded electrical capacity through generation facilities that ~~use clean burning and~~ produce low emissions of pollutants, utilize environmentally sound fuel sources, and incorporate energy efficient designs.

G. Support integrating electric generation and energy storage systems (behind the meter) within existing and new developments to reduce the need for additional electrical infrastructure.

H. Continue to monitor and minimize energy use in County facilities and create a program that would encourage benchmarking energy use ~~in~~for private-sector buildings.

I. Encourage the exploration and adoption of emerging technologies and innovative solutions that enhance the efficiency, reliability, and sustainability of electrical grid and infrastructure within the County to include supporting pilot projects, research initiatives, and collaborations with technology developers to integrate cutting-edge advancements into the local electric grid.

Strategy

6.5: Support the development of interconnected trails and the preservation and enhancement of natural resources and wildlife habitat within transmission corridors.

Actions

A. Collaborate with electric providers to create and plan for multi-use trails within existing and proposed transmission corridors and easements where appropriate to provide public access to open space, encourage healthy lifestyles, and link destinations throughout the County.

B. Encourage environmentally friendly transmission corridor management through Integrated Vegetation Management to allow native plant species and habitat to flourish within transmission corridors.

C. In areas where wide clearing of vegetation is not essential for line safety, advocate for narrower ROW footprints or strategic tree retention to maintain buffers and reduce habitat fragmentation.

D. Develop a "Utility Corridors Greenway Strategy" to align utilities, recreation, and conservation goals and integrate transmission corridors into the County's Linear Parks and Trails System.

E. Initiate partnerships with electrical providers to formalize access agreements for trail development and land management and establish agreements for vegetation management plans in perpetuity that support pollinators, native grasses, and low-shrub habitat.

F. Encourage and support integrated habitat restoration within transmission corridors.

G. Support wildlife connectivity studies to identify priority habitat areas and movement corridors when managing and planning for natural areas and passive uses within existing transmission corridors.

Strategy

6.6: Support and facilitate ongoing education and collaboration with the community regarding future planning of high voltage transmission corridors fostering open communication, building trust, and providing accessible resources.

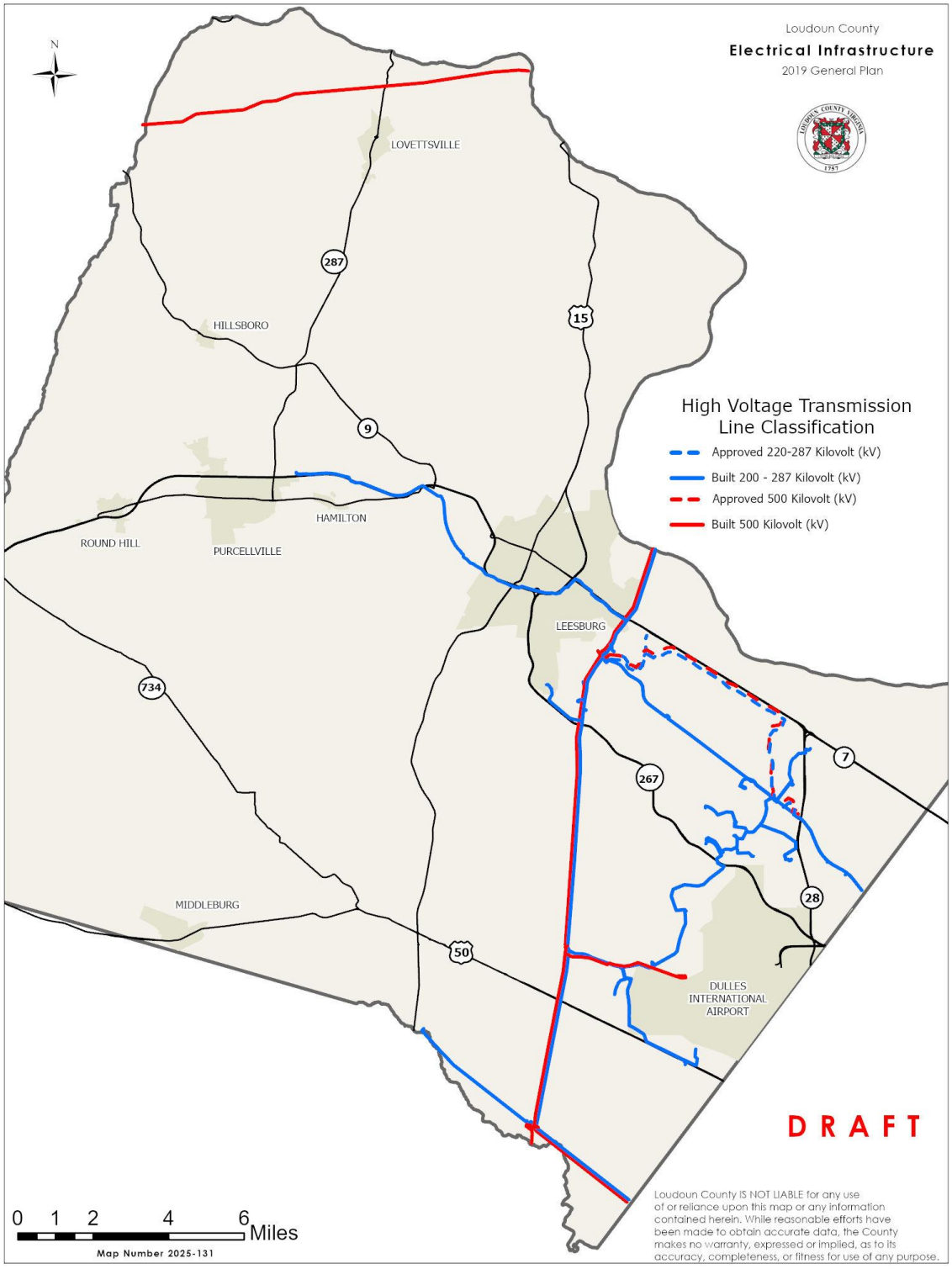
Actions

A. Support early community engagement with electric providers, property owners, stakeholders, and local government on transmission corridor projects when considering improvements and expansions of existing high voltage transmission corridors or the establishment of new transmission corridors.

B. Work with electrical providers to plan for future electric transmission and infrastructure needs in conjunction with demand forecasting associated with approved business, commercial and residential development.

C. Continue to improve coordination with electric providers in identifying future facilities and infrastructure needs to proactively plan improvements to the transmission network and distribution system which minimize community impacts.

D. Through ongoing education and collaboration, define advocacy positions for legislation to support expanded electrical transmission and generation infrastructure that responds to economic growth while balancing community needs.


Loudoun County
Electrical Infrastructure
2019 General Plan
N
LOVETTSVILLE
HILLSBORO
ROUND HILL
PURCELLVILLE
HAMILTON
LEESBURG
MIDDLEBURG
DULLES INTERNATIONAL AIRPORT
287
15
9
734
267
7
28
50
High Voltage Transmission Line Classification
Approved 220-287 Kilovolt (kV)
Built 200 - 287 Kilovolt (kV)
Approved 500 Kilovolt (kV)
Built 500 Kilovolt (kV)
DRAFT
0 1 2 4 6 Miles
Map Number 2025-131
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Glossary

B

***Behind the Meter**:* Refers to energy production and storage systems that directly supply homes and buildings with electricity. These systems are positioned behind the electric meter and are separate from the electric grid. Behind-the-meter systems include electric-generating and storage systems such as solar and battery storage that provide onsite energy and bypass the electric meter.

C

Cultural Landscapes: A geographic area, including both cultural and natural resources associated with a historic event, activity, or person, or exhibiting other cultural or aesthetic values.

E

***Electrical infrastructure**:* The networks and systems responsible for generating, transmitting, and distributing electricity to homes, businesses, and industries. It includes generation plants, substations, above ground and below ground transmission and distribution lines, and structures, and other related facilities.

***Energy Storage Facility**:* Energy storage equipment or technology that can absorb energy, storing such energy for a period of time, and redelivering energy after it has been stored.

H

***High Voltage Transmission Corridor**:* A tract of land owned, occupied, or leased by a transmission provider, or covered by an easement or right-of-way held by an electric provider, where an electric transmission line is constructed, operated, or maintained at a capacity equal to or greater than 138 kilovolts (kV).

I

***Infrastructure**:* A use classification that includes the basic installations and facilities on which new development depends. The public infrastructure includes public roads, public water and sewer, natural gas, telephone, and electric lines.

***Integrated Vegetation Management (IVM)**:* The practice of promoting desirable, stable, low-growing plant communities that will resist invasion by tall growing tree species using appropriate, environmentally sound, and cost-effective control methods.

Q-R

Reconductoring: Refers to the process of replacing the cable or wire on an electric circuit, typically a high-voltage transmission line, to afford a greater electric-current-carrying

capability. It involves installing new and larger capacity conductors on existing transmission poles.

S

***Smart Grid**:* A modernized electrical grid that integrates advanced digital technology, communication systems, and automation to improve the efficiency, reliability, and sustainability of electricity production, distribution, and consumption.

U

***Utility Line**:* A line suspended overhead on utility poles or buried underground that is used for the transmission and/or distribution, or conveyance, of public water, public sewer, natural gas, telephone, or electricity. Pursuant to Code of Virginia § 56-46.1., electrical transmission lines of 138 KV or more, approved by the State Corporation Commission, are deemed to have satisfied the requirements of the Zoning Ordinance.