

# COMPARISON OF OVERHEAD AND UNDERGROUND POWER LINES



Central Maine Power  
New York State Electric & Gas  
Rochester Gas and Electric  
United Illuminating



## How does AVANGRID determine where power lines will go?

The electric transmission system forms the backbone of bulk power grids in the United States, delivering energy from where it is generated to where it is used locally. To meet the growing demand for power, new transmission lines are being planned, and existing lines are being upgraded in order to improve grid reliability.

As the fossil fuel generators are being replaced by renewable generation, which is usually far away off shore or on shore, transmission lines have to be built to bring power from such places to the power consumers usually in the cities.

While more than 98% of transmission routes worldwide are built overhead by utility companies, there are situations where placing lines underground may be considered. In addition, undergrounding is also used in distribution for new developments or projects and funded by developers.



# Why not install all power lines underground to reduce impacts from inclement weather?

AVANGRID companies build both overhead and underground lines. We complete a feasibility analysis any time we design a new system or a replacement system. We have used underground systems where there are no aboveground alternatives, where they are approved or required by state utility regulator, or directly paid for by customers in new developments as part of a new distribution project. Many considerations impact the choice to install overhead lines or underground lines.

Overhead lines and underground lines are markedly different technologies and any comparison proves to be difficult and complex. Comparisons should be made only with individual projects with case specific requirements in terms of voltage, capacity, length, geography and topography, etc.

## KEY BENEFITS OF OVERHEAD LINES

- **Cost of installation** – Overhead lines can be built for as little as 25% of the cost of underground lines.
- **Ease of maintenance** – It is easier to access overhead lines and utility poles for repairs, maintenance or upgrade.
- **Ease of modification** – Overhead systems can be more easily reconfigured or re-routed to better serve customers or meet demand.
- **Other benefits:**
  - Reduction in cost of electricity due to the lower cost of construction and maintenance
  - Increased capacity to transmit electricity over longer distances
  - Reduced complexity of design, installation, operation, maintenance and repair
  - Easier to install in all types of topographies
  - Facilitation of interconnection between power grids for increased reliability and electricity exchanges

## KEY DISADVANTAGES OF OVERHEAD LINES

- Impact to landscape and overall aesthetics
- More susceptible to damage caused by trees and inclement weather
- Require vigorous vegetation management

## KEY BENEFITS OF UNDERGROUND LINES

- Less susceptible to tree damage and inclement weather since most of the line is buried underground
- Fewer environmental and aesthetic impacts to the landscape
- Other benefits:
  - Increased reliability of electricity service due to the reduced number of line faults
  - Reduced electrical hazards to humans and wildlife
  - Reduced environmental impacts such as the needs for vegetation clearance
  - Lower life-cycle line maintenance costs

## KEY DISADVANTAGES OF UNDERGROUND LINES

- Higher initial costs of materials, construction and installation
- Longer duration to repair which can be five to 10 times the cost of overhead lines
- Complicated construction that requires trenching along entire line route and disruption to traffic and businesses during construction and maintenance activities



## What is the difference in the construction costs between overhead and underground power lines?

Because investments in infrastructure are ultimately embedded into customer rates, cost is an important consideration in choosing between overhead and underground lines. We consider the rate impacts on all our customers.

Overhead lines require less capital investment than underground lines, and a comparison based on cost alone would nearly always favor the selection of overhead lines. Exceptions include densely populated urban areas and metropolitan areas, or where lines need to cross wide bodies of water, or where there are other considerations such as regulations and permitting requirements that make overhead lines impractical.

### HOW IS THE DECISION MADE TO INSTALL AN OVERHEAD OR UNDERGROUND LINE?

State public utility commissions, regulators, municipalities and utilities must consider several factors when evaluating proposed transmission lines:

- The need for the new line and its impact on the reliability of electric service
- Potential aesthetic, environmental and public safety impacts
- Socio-economic impacts on development and community
- Local comprehensive land-use plans
- The estimated cost of constructing the line which is given a prominent role in transmission line proceedings under current statutes

Individual state utility regulatory commissions and federal commissions objectively evaluate these factors and goals of individual projects. Through expert and professional analysis, regulators must then seek to determine the appropriate service solution.

Although the concept of running transmission lines underground is often popular with the public, regulators must weigh the perceived benefits against the technical challenges underground lines can present – not to mention the significantly higher costs that may eventually be incurred by utility customers.

Decisions usually follow “least cost” implications for utilities and transmission system operators. However, this has not always been the case.

*To preserve aesthetics while supporting high demand, cities like Bridgeport, Conn. weigh the cost of underground power lines.*





## How the Electrical Transmission and Distribution System Works

### THERE ARE FOUR MAIN COMPONENTS OF THE ELECTRIC SYSTEM



**Generating Stations:** Generation is the production of electricity at power plants or clean-energy facilities.



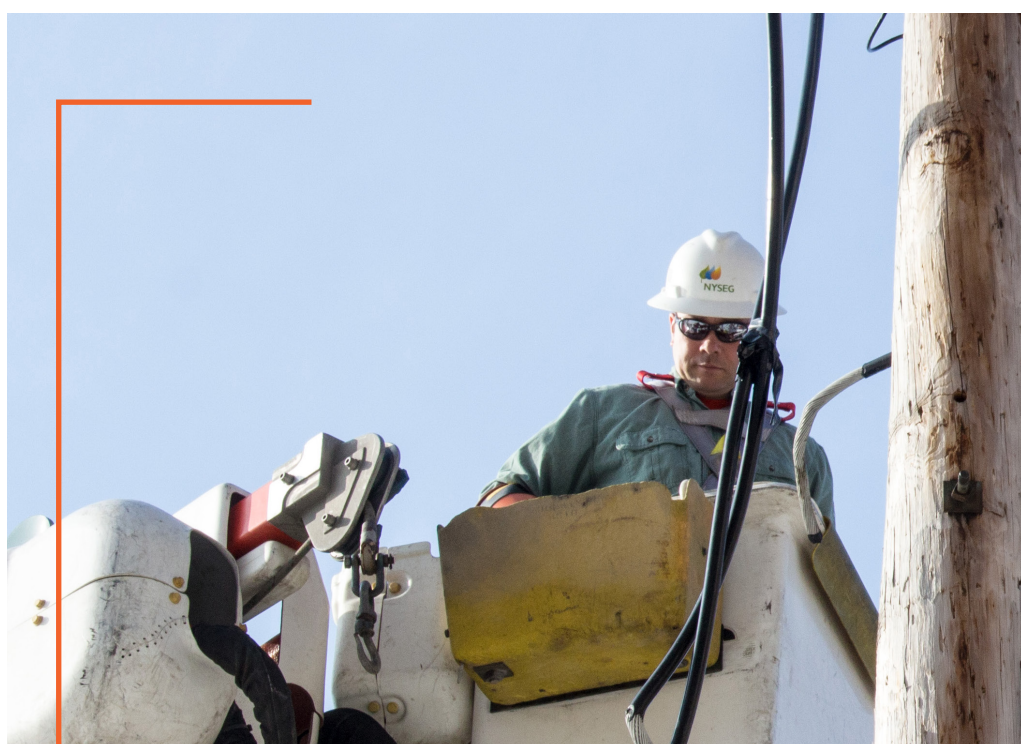
**Transmission:** Transmission is the system that carries electricity from the generators across long distances to the load centers where it's used. ISO-New England operates the Transmission system in the six New England States and NYISO in New York. Distribution is the network of roadside lines and poles and equipment that bring electricity to individual customers. UI is primarily a distribution company.



**Distribution Substation:** A distribution substation steps down high voltage electricity from the transmission system to lower voltage electricity to feed into distribution lines.



**Distribution to Customer:** Distribution is the network of roadside poles and equipment that bring electricity to individual customers.



**CENTRAL MAINE  
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Part of the AVANGRID Family



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