

Transmission lines

A comparison: overhead vs. underground

Fact sheet

PSE.com

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Puget Sound Energy's 2,600-mile network of transmission lines safely transports high-voltage electricity generated by hydropower, natural gas, coal, wind and solar sources to substations in local communities throughout PSE's nine-county electric service area. PSE's transmission system primarily consists of overhead high-voltage lines supported on wood or steel poles.

When deciding whether or not to place electric lines underground, utilities must weigh the costs and benefits to customers. *Underground* lines typically improve aesthetics, have lower vegetation-management costs, and reduce the frequency of outages. On the other hand, *overhead* lines are less expensive to construct and repair, quicker to repair when an outage occurs, and less disruptive to the environment. For these reasons, utilities traditionally favor overhead transmission lines, except where such lines are impractical like instances that require underwater cable to supply electricity from the mainland to islands.

Following is a comparison of overhead and underground transmission lines in the areas of aesthetics, environmental impacts and costs:

Aesthetics

Overhead

- Poles, wires and support anchors are visible
- Some vegetation can remain under or beside the lines

Underground

- No poles, wires or support anchors visible
- Steel termination poles are visible (see photo to the right)
- Vegetation must be completely removed on and around the route

Outage Impacts

Overhead

- Outages are more frequent during normal and severe weather
- Repairs can typically be made within a day

Underground

- Outages are less frequent
- Repairs can take up to six weeks

Construction Impacts

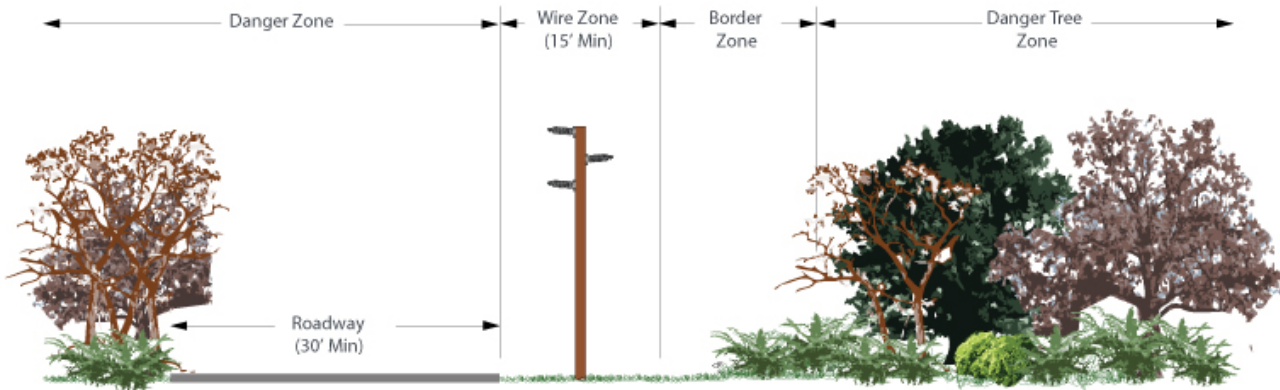
Overhead

- Temporary traffic impacts if work is in or along street rights-of-way
- Construction entails setting poles and stringing wire
- Construction equipment used includes line trucks, bucket trucks and tree-removal equipment
- Environmental impacts include removing trees and removing 120 cubic yards of dirt per mile

Underground

- Temporary traffic impacts if work is in or along street rights-of-way
- Substantial trenching is required: roughly 5 ft. (wide) x 6 ft. (deep) trench is required for the line; a 20 ft. (wide) x 10 ft. (deep) trench is required every 1,800 feet for the utility vaults
- Construction equipment used includes line trucks, bucket trucks, backhoes and tree-removal equipment
- Environmental impacts include removing trees and removing roughly 6,200 cubic yards of dirt per mile





Typical cross section of overhead 115 kilovolt transmission lines

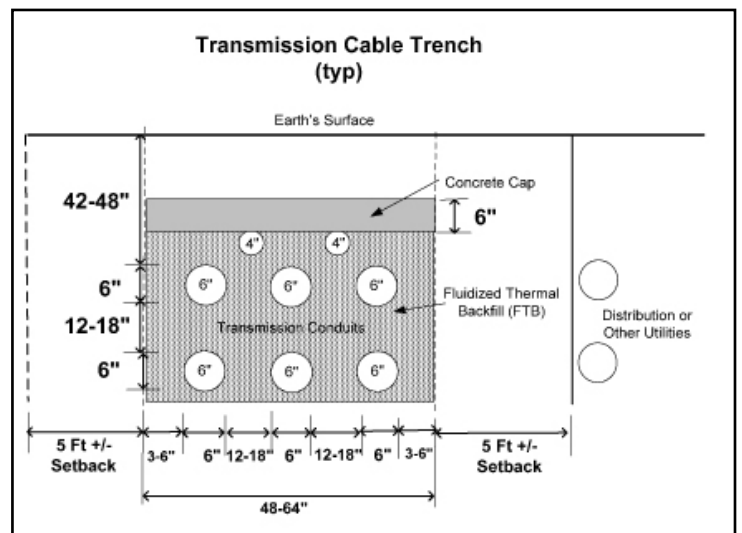
Costs

Overhead

- \$500,000 to \$1 million per mile to construct
- Costs more for annual maintenance, including vegetation management
- Costs less to repair, upgrade and relocate
- Costs from car-pole accidents and transmission line losses are higher
- Costs are covered by all customers; no additional area costs to local customers are necessary

Underground

- \$4 million to \$10 million per mile to construct
- Costs less for annual maintenance
- Vegetation management costs are negligible; however, affected vegetation creates a “wider” utility corridor due to potential impact from surrounding trees’ root systems
- Costs more to repair, upgrade and relocate
- Costs from car-pole accidents and transmission line losses are lower
- Costs are not covered by all customers; local customers who benefit must pay the cost difference of undergrounding via local-area rate surcharge



Typical cross section of underground 115 kilovolt transmission lines

Underground and overhead transmission lines Estimated cost comparison		
	Construction	O & M ¹
Underground	\$4 million-\$10 million per mile	\$300 per mile per year
Overhead	\$500,000-\$1 million per mile	\$1,100-\$1,900 per mile per year

¹ O & M costs include vegetation management, and exclude storms and locating temporary services.