



# energizeEASTSIDE

## underground transmission lines fact sheet

### Introduction

Underground transmission lines can seem like an attractive alternative to overhead lines, but there are significant environmental and financial reasons why few electric utilities routinely put transmission lines underground.

Undergrounding transmission lines can cost five to ten times what overhead lines cost, and such lines can be unavailable for service for long periods during restorations, leaving the entire electrical system vulnerable.

### Transmission vs. distribution lines

There's a big difference between distribution lines that power your home and transmission lines that connect to substations, which in turn serve tens of thousands of customers and businesses. Transmission lines bring large amounts of power to a city or region but cost much more to build and maintain. Your

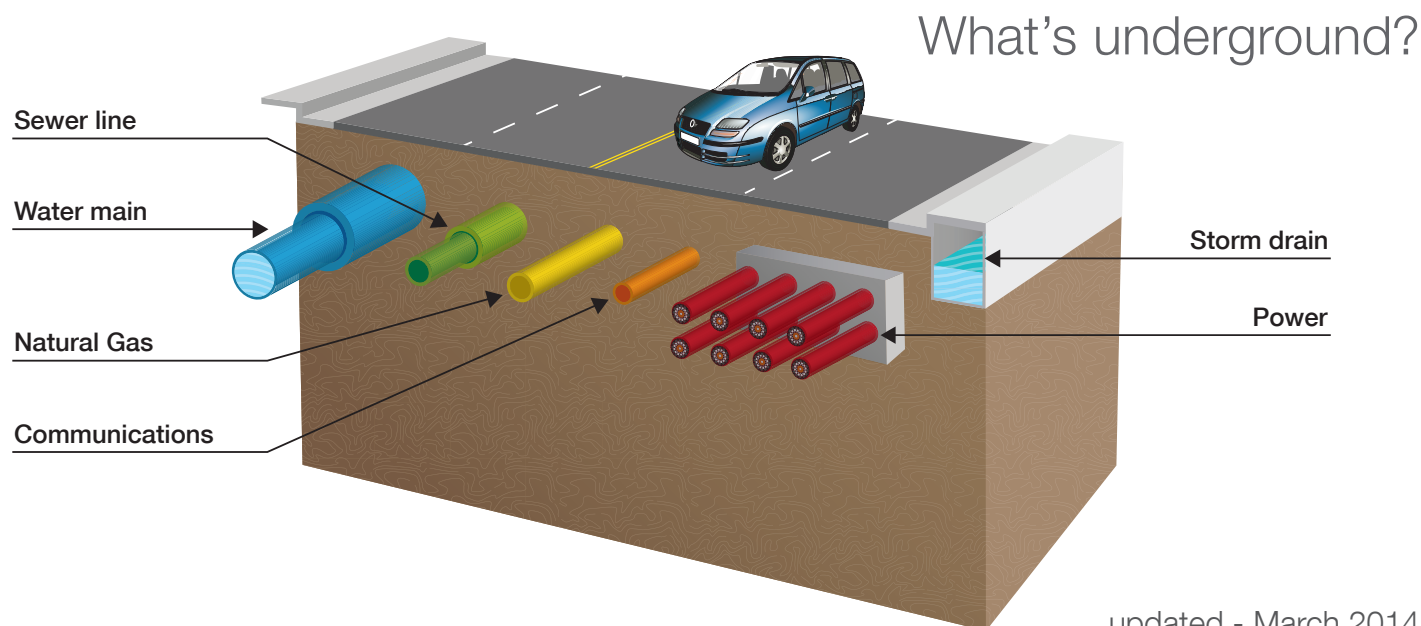
home may already be fed by an underground distribution line, while very few of the thousands of miles of transmission lines that PSE owns are underground.

### Advantages of undergrounding: reliability and visibility

Underground transmission systems are very reliable. Because lines are underground, they are less susceptible to storm-related outages. Visual impacts of underground transmission lines are reduced because fewer poles are required.

### Disadvantages to undergrounding: footprint, costs, maintenance and environmental impacts

Because they need additional cooling and insulation, underground transmission lines are typically installed in concrete duct banks, which can extend 5 or more feet below the surface.



These require an easement 30 feet to 50 feet wide, which, unlike with overhead lines, must be completely free of trees. With overhead lines, trees that are compatible with the lines can remain.

Beneath our streets is a complex infrastructure that includes gas, sewer, water and communications lines. Adding the large footprint of underground transmission lines may mean rerouting some of these existing utilities, which increases project costs. Similarly, if future construction requires underground transmission lines to be moved, the expense is many times that of moving overhead lines.

Outside of urban streets, installing lines in bare earth can pose problems too. Unstable or steep slopes, bedrock, wetlands and sites with hazardous materials aren't suitable for undergrounding.

### Costs

Placing transmission lines underground costs more. Puget Sound Energy hired the engineering firm Power Engineers to study the costs of undergrounding power lines on the Eastside. They found that undergrounding transmission lines in our area would cost between \$20 million and \$28 million per mile, depending on the local terrain and equipment used. In contrast, the estimated cost per mile of installing overhead power lines in the same area would be between \$3 million and \$4 million. These construction figures, which encompass labor, materials and equipment, don't take into account other costs such as acquiring access, easements and property, and permitting.

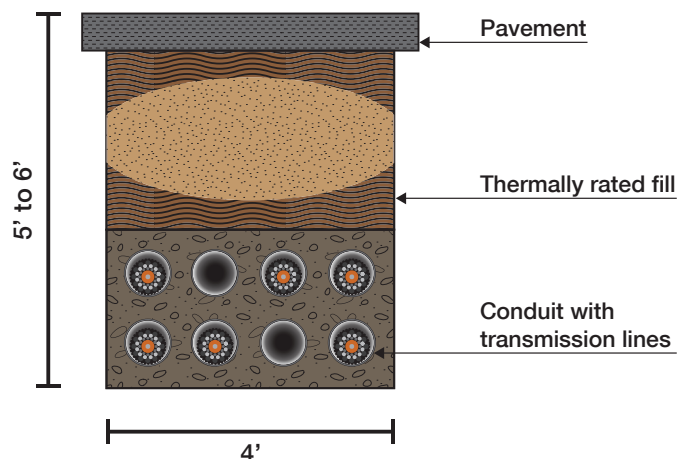
The standard upgrades associated with Energize Eastside will be shared by all PSE ratepayers, as with all capital projects in our regional power system. We estimate the project will cost between \$150 million and \$300 million if the lines remain overhead, as they are currently configured. However, if a local government requires undergrounding to benefit a specific neighborhood, regulations require that those additional costs be paid locally, typically by local taxpayers.

### Repairs and maintenance

Accidents can happen, and as with any infrastructure system, underground transmission lines are subject to repair. Locating faults in underground systems is considerably more difficult, and repairs can take days to months to complete. Overhead lines can typically be repaired in a matter of hours or days.

### Environmental impacts

Installing underground electric transmission lines is not without environmental impacts. In addition to concrete trenches and treeless rights of ways, large concrete access vaults must be installed every quarter to half mile to allow for regular maintenance and inspection. Construction prep can include extensive clearing and grading and dust and noise from construction lasts three to six times as long as installing an overhead line.



Typical underground line concrete duct bank.



Construction of concrete duct bank for underground lines.

