

# Transmission Line Cost Analysis

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*Joint Commission on Technology and Science*

*Emerging Technology Issues*

*Advisory Committee*

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# 230kV Overhead & Underground Lines

## Five-mile Long Examples

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### 230kV Pipe Type Underground Line

Three cables per phase (approximate capacity of 1035 MVA)

Spare cable for redundancy purposes

### 230kV XLPE Underground Line

Two cables per phase (approximate capacity of 1035 MVA)

Spare cable for redundancy purposes

### 230kV Overhead Line

Twin-bundled conductor (approximate capacity of 1047 MVA )

No spare facilities required



# Initial Cost Analysis

## 230kV Overhead & Underground Lines

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<i>5 mile line</i>	<b>UG - Pipe Type</b>	<b>UG - XLPE</b>	<b>Overhead</b>
<b>Materials</b>	\$16,927,000	\$14,714,000	\$955,000
<b>Labor</b>	\$20,518,000	\$15,086,000	\$1,147,000
<b>Misc.</b>	\$2,550,000	\$1,838,000	\$756,000
<b>R/W</b>	\$582,000	\$485,000	\$2,424,000
<b>Total</b>	<b>\$40,577,000</b>	<b>\$32,123,000</b>	<b>\$5,282,000</b>

*Factors that may increase the cost of an underground system over and above the estimates shown include rock excavation, installation in pavement, requirements for boring street crossings, R/W acquisitions costs, reactive compensation and line configuration.*



# Maintenance Costs Included for Life Cycle Analysis

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## Overhead Lines

### Routine Programs

- Vegetation Management
- Line Patrols
- Storm Repairs

### Non-routine Expenses

- Wood Pole Replacements
- Crossarm Replacements
- Insulator Replacements
- Switch Replacements
- Arrester Installations
- Corten Steel Rehabilitation

## Underground Lines

### Routine Programs

- Pumping Plant Inspections
- Line Patrols
- Vegetation Management

### Non-routine Expenses

- XLPE Cable option includes cable, splices & terminations replacement after year 40

# Life Cycle Cost Analysis 230kV Overhead & Underground Lines

(70 years)

<i>5 mile line</i>	Pipe Type Cable	XLPE Cable	Overhead
<b>Materials</b>	\$16,927,000	\$14,714,000	\$955,000
<b>Labor</b>	\$20,518,000	\$15,086,000	\$1,147,000
<b>Misc.</b>	\$2,550,000	\$1,838,000	\$756,000
<b>R/W</b>	\$582,000	\$485,000	\$2,424,000
<b>Maintenance</b>	\$250,000	\$1,970,000	\$138,000
<b>Total</b>	<b>\$40,827,000</b>	<b>\$34,093,000</b>	<b>\$5,420,000</b>

*Maintenance cost shown is the net present value of future expenses over the 70 year life of the facilities. XLPE Cable option includes 100% cable replacement after year 40.*



# Cost Analysis Summary

## 230kV Overhead & Underground Lines

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### *Cost Comparison to Overhead Lines*

<b>UG System</b>	<b>Initial Costs</b>	<b>Life Cycle Costs</b>
230kV Pipe-Type	7.7	7.5
230kV XLPE	6.1	6.3

*Note: As previously indicated, the Company's concerns regarding underground construction include reliability and operability concerns in addition to cost impacts.*