Chapter 2 Agency Proposed Action and Alternatives

In this Chapter:

- **Agency Proposed Action**
- **Three Action Alternatives**
- **No Action Alternative**
- **Alternatives Eliminated from Consideration**
- **Comparison of Alternatives and Summary of Impacts**

BPA and LVPL have been studying ways to reinforce the transmission system that serves the Jackson and Afton, Wyoming areas. BPA and LVPL completed long-term (15-30 year) studies and developed alternatives that would reinforce the transmission system. Each alternative has different components and ability to solve the problem. This chapter describes the alternatives, summarizes how the environmental consequences differ among alternatives, and compares the alternatives against decision factors. BPA and the USFS are considering the Agency Proposed Action, and four alternatives including the No Action Alternative.

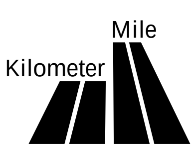
For Your Information

NEPA *requires that proposed major federal actions which may have significant impacts on the environment be examined in an environmental impact statement. NEPA helps public officials make decisions that consider environmental consequences.*

Regulations implementing the National Environmental Policy Act (***NEPA***) require federal agencies to analyze the consequences of taking no action, in this case, continuing to operate the transmission system under present conditions.

This chapter also describes other alternatives, such as burying the transmission line, that have been suggested but eliminated from detailed consideration for technical and/or economic reasons. (See Section 2.6, **Alternatives Considered and Eliminated from Detailed Consideration**.)

BPA uses metric measurements to comply with Public Law 100-418. See metric conversion chart on the inside of the back cover.



2.1 Agency Proposed Action

In the Agency Proposed Action, BPA and LVPL would construct a new 115-kV line from BPA's Swan Valley Substation near Swan Valley in Bonneville County, Idaho about 58 km (36 miles) east to BPA's Teton Substation near Jackson in Teton County, Wyoming. (See Map 1.) The Agency Proposed Action has the following components and would cost about $14,500,000 (1997 dollars). The cost, including all potential future planning actions, is estimated to be $19,400,000 (1997 dollars) over 30 years.

Please refer to Sections 1.4, ***Finding Solutions*** *and 1.7.1,* ***Long-Range Planning*** *for discussions of long-term planning and future planning actions.*

2.1.1 Transmission Line

2.1.1.1 Structures

For Your Information

*A **single-circuit** line has one electrical circuit on one structure.*

***Structure numbers** refer to a specific structure in a given mile (from west to east) of the existing Swan Valley - Teton No. 1, 115-kV transmission line. For example, a road near structure 6/2 is near the second structure in mile six of the existing line east of Swan Valley Substation.*

*A **double-circuit** line has two separate electrical circuits on the same structure.*

A new 115-kV line would be built next to the existing Swan Valley-Teton No. 1, 115-kV transmission line. Most of the new line would be supported by a mix of ***single-circuit*** wood pole H-frame structures or steel single pole structures. (See Table 2-1 and Figure 2-1.)

BPA proposes to use 2-4 double-circuit single pole structures across from the Pine Basin Lodge in the Pine Creek area. This is described in Section 2.1.2. At Teton Pass (***structure numbers*** 26/2 to 29/3), BPA proposes to use the existing structure footings and replace the body and tops of the existing structures with new ***double-circuit*** steel lattice structures for structures 28/3, 28/4, 29/1, and 29/2. Structures 27/5 to 28/2, 28/5, and 29/3 will need to be totally rebuilt. Coming off Phillips Ridge into Teton Substation (structure numbers 35/1 to 36/2), BPA would remove the existing single-circuit structures and replace them with double-circuit single steel pole structures. A few single circuit steel and wood poles would be used close to the substation. Both the lattice steel and single pole double-circuit structures are shown in Figure 2-2, with their general location on Map 2, **Sample Structure Locations**.

Table 2-1 identifies structure types along the new ROW. These structures types are proposed at this time with the best available design information known at this time. Structure types may change as more design information is known.

Table 2-1. Structure Types Proposed along the New ROW

Between Structures	Structure Type		Between Structures	Structure Type
Swan Valley Substation to 4/3	single-circuit wood H-frame		26/2 - 29/3	double-circuit steel lattice
4/4	single-circuit wood pole		29/4 - 34/7	single-circuit steel pole
4/5 - 6/2	single-circuit wood H-frame		35/1 - 36/2	double-circuit steel pole
6/3 - 6/7	double-circuit steel pole		36/3	single-circuit steel poles
6/8 - 7/2	single-circuit wood H-frame		36/4 - 36/5 in Teton Substation	single-circuit wood poles
7/3 - 26/1	single-circuit steel pole			

Figure 2-1. Existing and Proposed Single-Circuit Structures and Right-of-Way

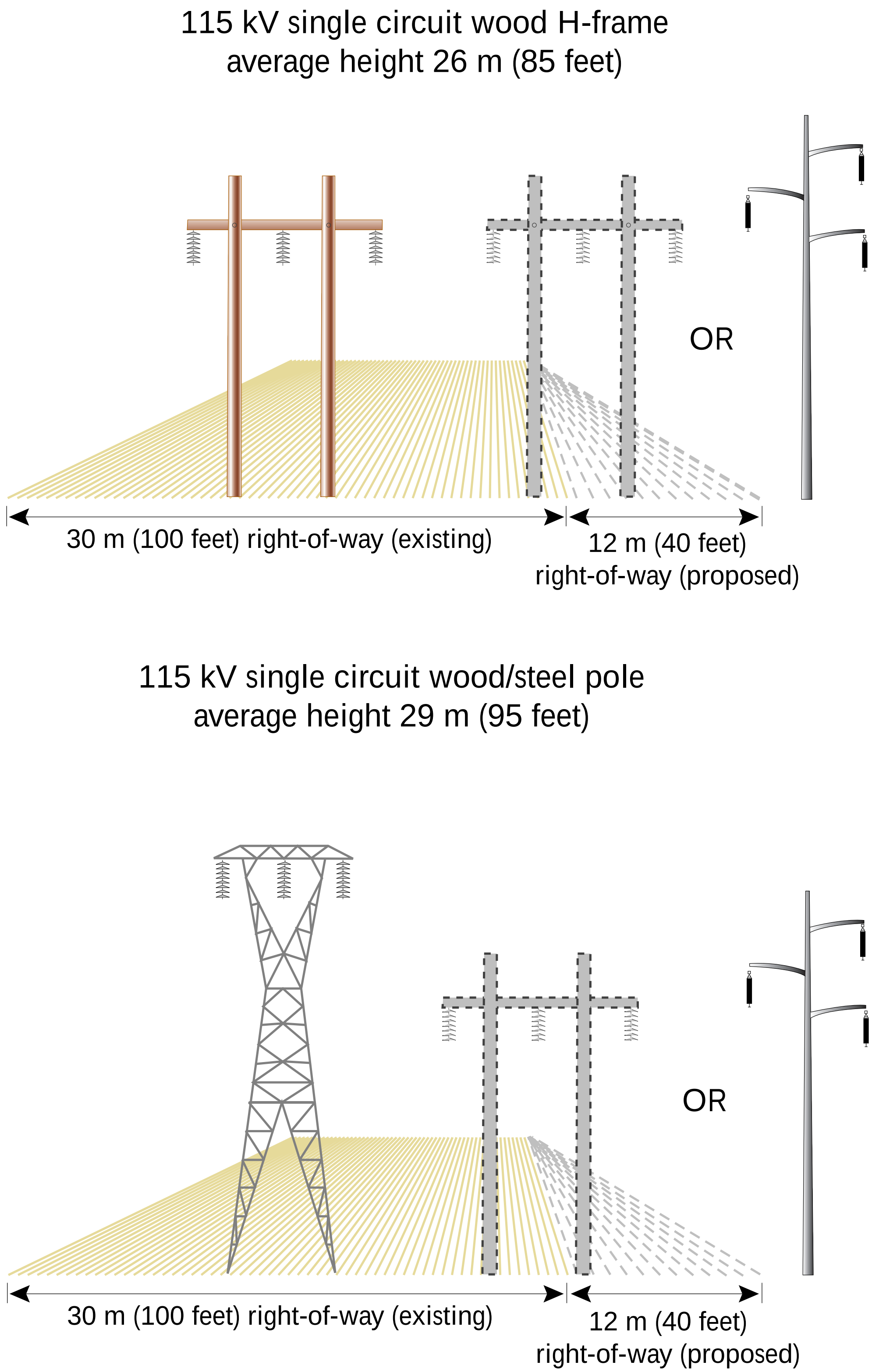
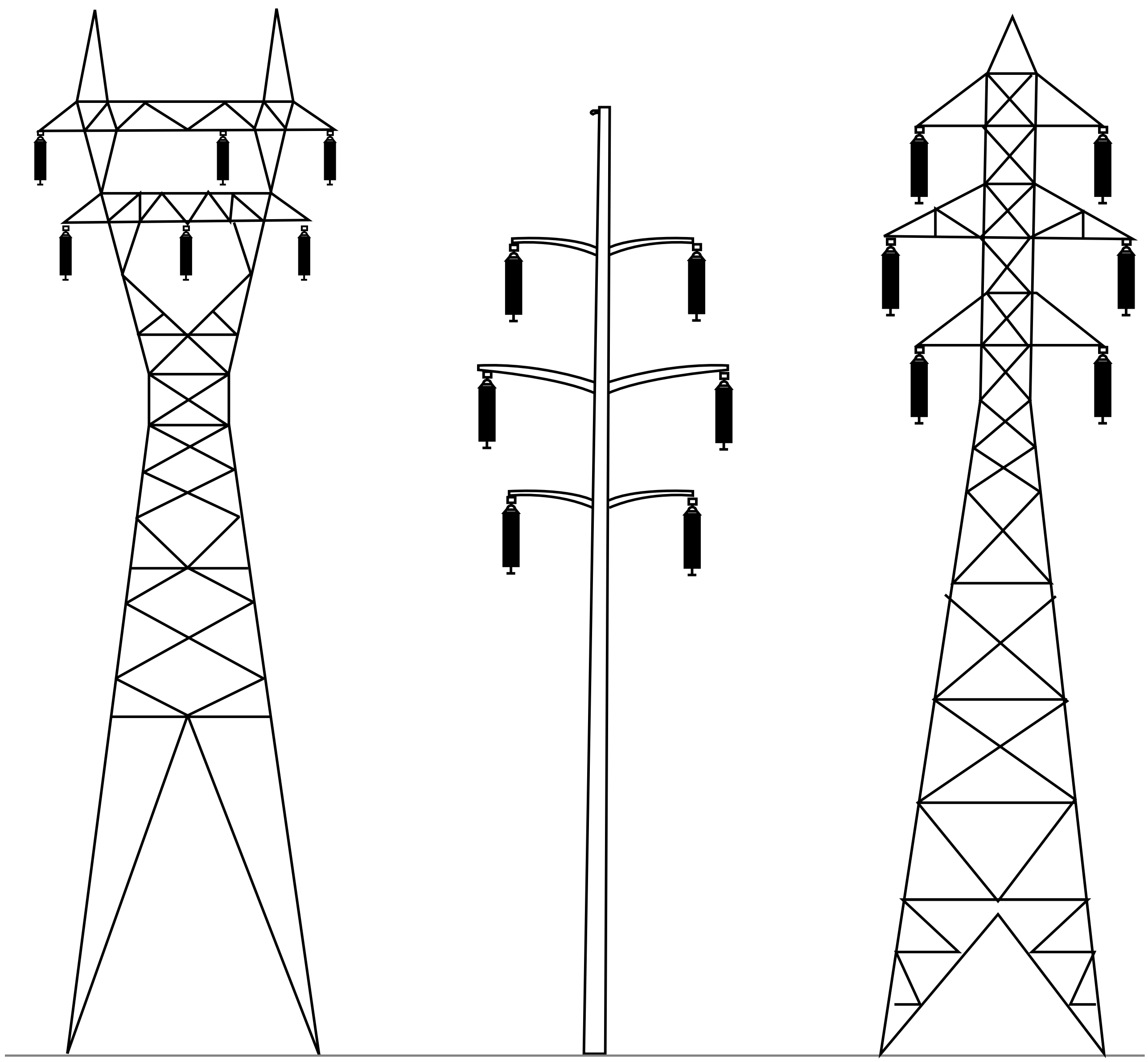


Figure 2-2. Proposed Double-Circuit Structures



115-kV steel lattice
average height 30 m (100 feet)

115-kV steel pole
average height 27 m (90 feet)

115-kV steel lattice
average height 30 m (100 feet)

2.1.1.2 Conductors

The wires or lines that carry the electrical current in a transmission line are called conductors. A single-circuit 115-kV line has three conductors; a double-circuit 115-kV line has six conductors. Each conductor would be about 0.24 cm (0.93 in.) in diameter.

For Your Information

A right-of-way is an easement over the land of another owner. The exact amount of right-of-way cleared varies at any point and mostly depends on slope, tree height and growth rate, and line height. This variation in clearing requirements gives the ROW a scalloped or feathered appearance. BPA anticipates that about 25 hectares (62 acres) of clearing could occur for the transmission line and about 6 hectares (15 acres) of clearing for access roads for the Agency Proposed Action. Because clearing would be done in the national forests, location and amounts of clearing would be coordinated with the Forest Service.

2.1.2 Additional Right-of-Way

Additional ROW would be needed for the new structures and line. The amount of additional ROW width needed would range from 0-30 m (0-90 feet), with the average additional width at about 12 m (40 feet). New ROW is proposed for the north side of the existing ROW except for the following areas:

- Through the Swan Valley area and into the mouth of Pine Creek (Swan Valley Substation to structure 6/1), the new ROW would be east and south of the existing line.
- Through the Pine Creek area to the Idaho State Route 33 crossing (between structures 7/3 and 21/1), the new line would be south of the existing ROW.
- In areas where double-circuit structures would be used, no additional ROW would be needed.

BPA also considered several routing options in the Pine Creek area. Several of those options require additional ROW.

2.1.2.1 Pine Creek Routing Option A

From structures 6/1 to 7/2, BPA would place the new transmission line north of the existing line, up the hill about 244 m (800 feet) or more. (See Figure 2-3).

2.1.2.2 Pine Creek Routing Option B

BPA would place the new transmission line next to and north of the existing line from structures 6/1 to 7/2. (See Figure 2-3).

2.1.2.3 Pine Creek Routing Option C

BPA would cross State Route 31 at structure 6/1, route the line on the south side of Pine Creek up the hill behind Pine Basin Lodge, and tie into the existing ROW at structure 7/2 on the south side of the existing ROW. (See Figure 2-3.)

2.1.2.4 Pine Creek Routing Option D (Preferred)

BPA would remove up to seven existing structures from structures 6/2 to 6/8 and replace them with two to four double-circuit structures on the existing ROW. (See Figure 2-4).

2.1.2.5 Pine Creek Routing Option E

At structure 5/8, BPA would route the line to the east and cross the highway and Pine Creek (see Figure 2-4). The line would remain south of the highway and Pine Creek. Before the line reached Pine Basin Lodge, it would turn and cross the highway and Pine Creek again. The line would then return to the existing ROW at structure 6/8.

2.1.3 Clearing Required

For safe and uninterrupted operation of a transmission line, vegetation within a ROW is not allowed to grow above a certain height. Restrictions vary depending on the size of the transmission line, type of vegetation on and off the ROW, and terrain.

BPA would develop a clearing plan. The plan would identify the area on either side of the structures where existing vegetation must be removed. It also specifies the correct vegetation heights along and at varying distances from the line. Considerations that influence the amount of clearing along the line are: line voltage; vegetation species, height and growth rates; ground slope; conductor elevation above ground; and clearance distance required between the conductors and other objects.

For Your Information

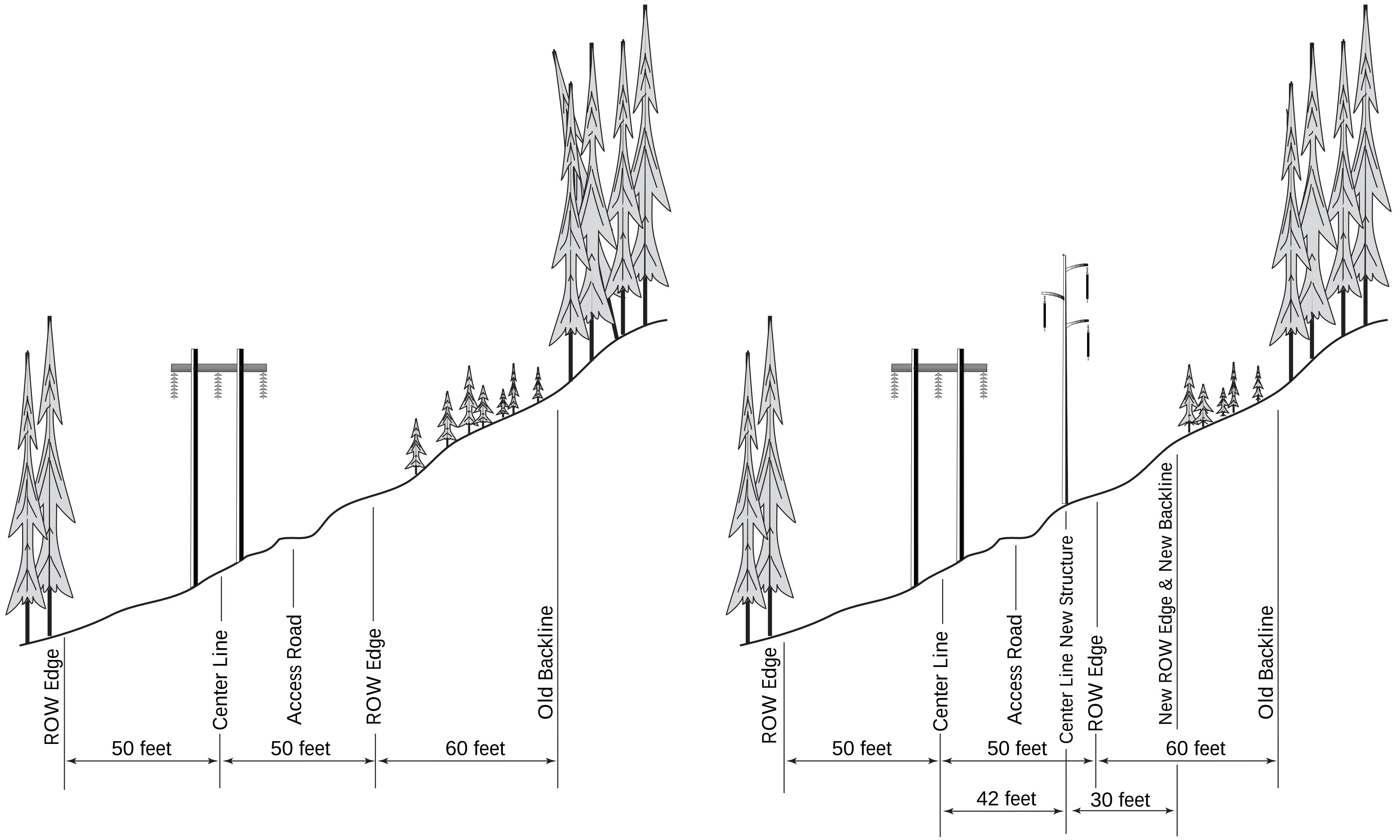
*A **backline** is a line painted on trees that identifies trees that could fall or bend into a transmission line, or that a transmission line could swing into. All trees inside the backline, including safe trees, are usually cut.*

Burning is not BPA's preferred method of disposing of this material. Disposal methods would be coordinated with the Forest Service on all National Forest lands.

When the original transmission line was built in 1968, contractors cleared a 100-foot ROW and in addition, cleared trees beyond the ROW out to a ***backline***. Figure 2-5 shows this for existing structure 8/8. Since the old backline was cleared, trees have grown back but these trees are smaller than the trees beyond the original backline. The new line would be placed close to or within the existing ROW edge. In most cases, clearing for the new ROW would be to the new ROW edge, which in most cases would be within the old backline. Any leaning or diseased trees beyond the new ROW edge would be cleared (see Figure 2-5). In addition, to account for heavy ice loads on the conductors (wires), the new wires may hang lower than the existing wires and cause trees to be removed in the existing ROW in valleys between structures.

Merchantable timber (including timber for poles, posts, and firewood) would be sold and non-merchantable timber would be left to be lopped and scattered or piled and burned. Contractors would be required to use brush blades instead of dirt blades on bulldozers for clearing. Other best management practices for timberland would also be used.

Figure 2-5. Clearing



Existing Wood H-Frame and Clearing at Structure 8/8

Existing Wood H-Frame, New Steel Pole, and New Clearing at Structure 8/8

At the structure sites, all trees, brush, stumps, and snags would be felled and removed, including root systems. The site may be graded to provide a relatively level work surface.

About 25 hectares (62 acres) would be cleared. This is based on clearing an average of 16 m (40 ft) of additional ROW.

An additional 6 hectares (15 acres) would be cleared for roads that are needed off the ROW and for roads in poor condition that BPA would upgrade. Roads are discussed in the next section.

2.1.4 Access Roads

BPA normally acquires rights and develops and maintains permanent overground access for travel by wheeled vehicles to each structure. ***Access roads*** are designed for use by cranes, excavators, supply trucks, boom trucks, and line trucks for construction (including tree removal) and maintenance of the transmission line. Truck size and carrying weight help determine road specifications. BPA prefers road grades of 6 percent or less for highly erodible soils (silts), and 10 percent or less for erosion resistant soils (earth and broken rock). For short distances, maximum acceptable road gradients are 15 percent for trunk or main roads, and 18 percent for spur roads (roads that go to each structure if the structure is not located on a trunk road). Grades in excess of 18 percent would be approved by the Forest Service on lands managed by the Forest Service.

Best Management Practices (BMP's) are used in the construction and upgrading of access roads. These are described in Section 4.5.2.2. New or existing trunk access roads from the main highways to the ROW are rocked for construction and maintenance activities. After construction, water bars are installed on trunk access roads along the ROW. Trunk and spur access roads are also prepared for reseeding and reseeded.

For Your Information

*BPA improves **access roads** by grading, improving drainage, and adding gravel to the road surface. After construction, roads are maintained for emergency access and maintenance. In some areas where access roads would not be built, helicopter construction would be used to erect structures and put up the conductor. After construction and during an emergency on a structure that has no access road to it, maintenance would need to evaluate their need for access and build a road if necessary. Maintenance would coordinate this need with the Forest Service.*

***Best management practices** are a practice or combination of practices that are the most effective and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.*

Exact location and design of new roads are typically done during or after final design of the transmission line. Because some new access roads would be in national forests, their location and design is closely coordinated with the Forest Service.

2.1.4.1 Trunk and Spur Roads

Most of the new line could be built using existing access roads that cover over 80 percent of the line. This existing road system consists of trunk roads, which are the main roads travelled by construction and maintenance vehicles, and spur roads, which are short road segments branching off the trunk roads. Spur roads access existing structures. Trunk roads are located on and off the ROW. Existing trunk roads and structures accessible by these roads are listed in Table 2-2.

About 4.5 km (2.8 miles) of new, permanent off-ROW and about 2.7 km (1.7 miles) of new, permanent on-ROW trunk roads would be needed for construction and maintenance for the new and existing lines. Those portions of existing ROW that do not have

Table 2-2. Existing Trunk Roads

For Your Information

This table lists existing BPA access roads. Some roads are also USFS roads and are identified as such in the table.

Structures	Accessed by:		Structures	Accessed by:
1/1-1/3	Road 1-1,1-2		18/3-18/4	Road 18-1
1/4-3/7	Bonneville County Rd.		18/5-21/2	Road 18-2,18-3, 18-4,19-1,21-1 (new gate),21-3
4/1-4/4	Bonneville County Rd.		21/3-23/4	Road 21-2,22-1, 22-2,22-3,22-4
4/5-4/7	Road 4-1		23/5-24/3	No access roads here
4/8-5/6	Road 5-1		24/4-24/5	Road 24-1 (new gate),24-2,24-3
5/7-6/1	Road 5-2 (new gate),5-3,5-4		24/6-26/7	Road 26-1,26-2,26-3 (new gate),26/4
6/2-6/9	No access roads here		26/8-27/6	Road 27-1,27-2
6/10-6/12	Road 6-2		27/7	Access from Hwy. 22
7/1-8/1	Road 7-1,7-2		28/1	Access from Hwy. 22
8/2-8/6	Road 8-1, 8-2 (USFS 250)		28/2-28/5	Road 28-1
8/7-8/10	No access roads here		29/1-29/3	No access roads here
8/6-9/4	Road 9-1,9-2,9-3		29/4-30/4	Road 29-1,29-2, 29-3,30-2
9/5-10/2	No access roads here		30/5-33/8	Road 31-1 (new gate),31-2, 32-1,32-2,32-3
10/3-11/6	Road 10-1, 10-2,10-3,11-1, 11-2,11-3 (new gate) (USFS 252),11-4		34/1-35/1	Road 34-1,34-2,34-3, 35-1-R
12/1-14/6	Road 12-1, 12-2,12-3,12-4, 12-5,13-1,13-2, 13-3,13-4,13-5, 13-6 (new gate),13-7 (new gate) (USFS 253),14-1, 14-2,14-3,14-4, 14-5		35/2-35/5	Access from Fish Creek Road
15/1-18/2	Road 15-1, 15-2,15-3,15-4, 16-1,16-2,17-1 (new gate)		35/6-36/5	Access from Moose Wilson Road

access are from structures 6/2 to 6/9, 8/7 to 8/10, 9/5 to 10/2, 23/5 to 24/3, 24/6 to 26/7, and 29/1 to 29/3. Tables 2-3 and 2-4 identify where new off-ROW and on-ROW trunk roads would be built to access some of these areas. Other areas would not have any roads because of very steep terrain. A full field survey of the existing and required new access roads would be done prior to construction and may result in changes to the summary shown in Tables 2-3 and 2-4.

Easements for new trunk roads outside the existing ROW would be 15 m (50 feet) wide. New or existing trunk roads would be graded to provide a 4.2 m (14 foot) travel surface, with an additional 1.2-1.8 m (4-6 feet) to accommodate curves. About 3 m (10 feet) on both sides of the road would be disturbed for ditches, etc.

For Your Information

In some cases, spur roads may not be built to individual structure sites if the structure can be constructed from the trunk road or by helicopter. In the future, however, BPA may need to build a spur road to the structure for maintenance if there is no other way to access it.

Spur roads would be built from the on-ROW trunk roads to access new structures and would be on existing or new ROW. The amount of new, permanent spur roads is about 7.3 km (4.5 miles), assuming the average length is about 30 m (100 ft.). The number of spur roads by line mile is shown in Table 2-4.

Some roads would not be used after the transmission line is built. This is the case for roads developed in agricultural areas. After construction, the area used for roads located in crop fields would be restored as much as possible and farmers could plant their crops. All other roads would remain to provide access for line maintenance. All new and existing access roads proposed at this time are shown in Appendix C, **Photomaps**.

2.1.4.2 Stream Crossings

New and existing access roads would cross both perennial and intermittent streams. For construction, BPA would use or improve existing bridges, build new or replace unusable bridges, and use temporary bridges. Table 2-5 shows this information by line mile and area. New permanent or temporary roads would add four additional intermittent stream (as shown on USGS maps) crossings. At these and existing crossings, BPA would use culverts that are properly sized, designed, and armored so they do not significantly affect flow or stream gradient, and minimize long-term sediment delivery.

2.1.4.3 Gates

Access roads that cross private land and land managed by the Forest Service are typically gated and locked by BPA. Thirteen gates presently limit access to the existing ROW. Gates are constructed of heavy pipe and painted yellow on Forest Service.

For Your Information

A full field survey of the existing and required new access would be done prior to construction and could result in some changes to the summary shown in Tables 2-3 and 2-4.

Table 2-3. Changes to Off-ROW Trunk Road System

Mile	Near Structure:	Action
4	4/2	Build 600 ft. of temporary road in agricultural field and retain permanent rights
5	5/8	Build 1600 ft. of new road if Pine Creek Routing Option E is chosen
6	6/2 6/4 6/5	Build 1600 ft. of new road Build 250 ft. of new road Build 250 ft. of new road
7	7/1 7/1 7/2	Buy 2900 ft. of good existing road Release 700 ft. of Road 7-1 Build 400 ft. of new road
8	8/1 8/6	Buy 1200 ft. of fair existing road Build 1000 ft. of new road
9	9/3 9/4 9/8	Buy 900 ft. of poor existing road Buy 1200 ft. of fair existing road Build 500 ft. of new road
10	10/7	Release1395 ft. of Road 10-3
21	21/2	Build 400 ft. of new road
22	22/10	Buy 600 ft. of poor existing road (new gate)
23	23/5 23/10	Build 1000 ft. of new road Build 1400 ft. of new road
24	24/3	Build 1200 ft. of new road
26	26/2 26/1 26/1	Buy 1000 ft. of poor existing road Release 150 ft. of Road 26-2 Release 310 ft. of Road 26-1
27	27/7	Buy 1400 ft. of poor existing road
28	28/1 28/4 28/4	Build 3000 ft. of new road Build 1200 ft. of new road Buy 600 ft. of fair existing road
30	30/1 30/4 30/3	Release 800 ft. of Road 30-1 Build 600 ft. of new road (new gate) Buy 800 ft. of poor existing road
31	31/8	Buy 900 ft. of good existing road
35	35/1	Buy unknown length of access to Road 35-1-R

Table 2-4. Changes to On-ROW Trunk Road System and New Spur Roads

Mile	Between Structures:	Trunk Road Action	Number of New Spurs
1	1/3-2/1	Build 4600 ft. of temporary road in agricultural field	6 temporary
2	2/1-3/1	Build 4700 ft. of temporary road in agricultural field	7 temporary
3	3/1-3/7	Build 4700 ft. of temporary road in agricultural field	7 temporary
4	4/1-5/1	Build 5000 ft. of temporary road in agricultural field	9 temporary
5	5/1-5/6 5/7 5/8-5/9 5/10-6/1	Rebuild 2300 ft. permanent road (new gate b/t 5/1-2) Nothing needed here Rebuild 700 ft. of permanent road Build 800 ft. of new permanent road	6 permanent 1 permanent 2 permanent 2 permanent
6	6/1 6/4 6/5 6/8-6/12	Nothing needed here Nothing needed here Nothing needed here Rebuild 1600 ft. of permanent road	1 permanent 1 permanent 1 permanent 5 permanent
7	7/1-7/2 7/3-8/1	Nothing needed here Rebuild 4600 ft. of permanent road	2 permanent 8 permanent
8	8/1 8/2-8/5 8/6-8/8 8/8-9/1	Nothing needed here Rebuild 1800 ft. of permanent road Build 1000 ft. of new permanent road Rebuild 1900 ft. of permanent road and build 500 ft. of new permanent road	1 permanent 4 permanent 3 permanent 2 permanent
9	9/1 9/2 9/3 9/4-9/8	Nothing needed here Nothing needed here Nothing needed here Build 3100 ft. of new permanent road	1 permanent 1 permanent 1 permanent 5 permanent
10	10/1-10/3 10/3-11/1	Build 1300 ft. of new permanent road Rebuild 3600 ft. of permanent road	3 permanent 6 permanent
11	11/1-11/6	Rebuild 4100 ft. of permanent road	6 permanent
12	12/1-13/1	Rebuild 400 ft. of permanent road	7 permanent
13	13/1-14/1	Rebuild 400 ft. of permanent road	6 permanent
14	14/1-14/2 14/3-14/5 14/6	Rebuild 200 ft. of permanent road Rebuild 1000 ft. of permanent road Nothing needed here	2 permanent 3 permanent 1 permanent
15	15/1-15/2 15/3-15/7	Rebuild 400 ft. of permanent road Rebuild 2500 ft. of permanent road	2 permanent 5 permanent
16	16/1-17/1	Rebuild 5100 ft. of permanent road	7 permanent
17	17/1-18/1	Rebuild 5700 ft. of permanent road	7 permanent
18	18/1-18/2 18/3-18/4 18/5-18/7 18/8-19/1	Rebuild 400 ft. of permanent road Rebuild 700 ft. of permanent road Nothing needed here Rebuild 1000 ft. of permanent road	2 permanent 2 permanent 3 permanent 1 permanent

Table 2-4. continued

Mile	Between Structures:	Trunk Road Action	Number of New Spurs
19	19/1-20/1	Rebuild 6100 ft. of permanent road	1 permanent
20	20/1-20/10	Rebuild 4700 ft. of permanent road	10 permanent
21	21/1-21/2 21/3-22/1	Build 500 ft. of new permanent road Rebuild 4400 ft. of permanent road	4 permanent 8 permanent
22	22/1-23/1	Rebuild 4400 ft. of permanent road	10 permanent
23	23/1-23/4 23/5-23/10	Rebuild 1800 ft. of permanent road Build 1200 ft. of new permanent road	4 permanent 6 permanent
24	24/1-24/3 24/4-24/5	Build 700 ft. of new permanent road Nothing needed here	3 permanent 2 permanent
Note: No access roads proposed from 24/6-26/1			
26	26/2 26/3-26/7 26/8-27/1	Nothing needed here No access roads proposed Rebuild 600 ft. of permanent road	1 permanent none needed 1 permanent
27	27/1-27/2	Rebuild 2000 ft. of permanent road (new gate between 27/7 and 28/1)	7 permanent
28	28/1-28/5	Nothing needed here	5 permanent
29	29/3-30/1	Rebuild 3500 ft. of permanent road	6 permanent
30	30/1-30/3 30/4 30/5-31/1	Rebuild 1100 ft. of permanent road Nothing needed here Rebuild 3500 ft. of permanent road	3 permanent 1 permanent 7 permanent
31	31/1-32/1	Rebuild 5900 ft. of permanent road	10 permanent
32	32/1-33/1	Rebuild 5500 ft. of permanent road	10 permanent
33	33/1-33/8	Rebuild 5500 ft. of permanent road	8 permanent
34	34/1-35/1	Rebuild 3200 ft. of permanent road	5 permanent
35	35/2-35/5 35/6-36/1	Build 2200 ft. of temporary road Build 2100 ft. of temporary road	4 temporary 4 temporary
36	36/1-36/4	Build 1200 ft. of temporary road	3 temporary

Table 2-5. Stream Crossings

Mile	Intermittent Stream Crossing	Perennial Stream Crossing	Type of Crossing
6		Pine Creek	existing bridge
6	Flume Canyon Creek (Options C and E)		existing road
7	Canal Canyon Creek		existing road
8		Pine Creek	replace existing bridge
8	unnamed		new road
9		Pine Creek	existing ford for maintenance only
9		Poison Creek	existing culverts
10	unnamed		existing culvert
11		Pine Creek	existing bridge
11		Tie Creek	new bridge or culvert
14		Coalmine Creek	existing double culverts
15		Little Pine Creek	new bridge
15		Murphy Creek	existing road
16	Allen Canyon		existing road

Table 2-5. continued

Mile	Intermittent Stream Crossing	Perennial Stream Crossing	Type of Crossing
18		Pole Creek	existing culvert
19	Nordeli Canyon		existing road
21		Trail Creek	existing bridge
22	unnamed		existing road
24	Hungry Creek		existing road
24	tributary to Hungry Creek		new road
27	3 unnamed		improve culverts
28	unnamed		new road
30		north fork of Trail Creek	existing road
34		Phillips Canyon Creek	improve bridge
35		Phillips Canyon Creek	temporary bridge or culvert
35		Lake Creek	temporary bridge or culvert
35		Fish Creek	temporary bridge or culvert

land. All parties that have a right to use the road would have access to it. At this time, BPA estimates installing about 13 new gates. Gate locations are identified in Tables 2-2, 2-3, 2-4 and in Appendix C.

2.1.5 Staging Areas

During construction of the transmission line, areas would be needed off the main highways, near the existing ROW, where equipment such as steel, spools of conductor, and other construction materials would be stored until the material is needed for construction.

BPA has identified five areas that could be used as staging areas. All of these areas are located off Highways 31, 33, and 22 between Swan Valley and Jackson and are shown on Map 1; four sites are shown on photomaps in Appendix C. Two are located on Forest Service land near structure 21/2 and Mike Harris Campground on the north and south side of Highway 33. The third site is located on Forest Service land in a pullout area at the top of Pine Creek Pass. The fourth site is located on Forest Service land in a pullout area on the south side of Highway 22 and south of structures 25/5 and 25/6. The fifth site is in a pullout area east of Teton Pass summit on the south side of Highway 22 where the Old Pass road meets the highway.

For Your Information

The Bureau of Reclamation manages the land that the Swan Valley Substation occupies and has granted BPA a right-of-way for the operation of the Swan Valley Substation.

2.1.6 Line Termination and Equipment

The new line would terminate at Swan Valley and Teton substations. Terminating a line requires special types of equipment. New equipment would be placed on BPA property within the substation yard at Teton Substation. The fenced yard at Swan Valley Substation would be expanded east into an existing parking lot.

The following equipment would be installed at Swan Valley and Teton substations. The equipment is shown in Figure 2-6.

Power Circuit Breakers — A breaker is a switching device that can interrupt a circuit in a power system during ***overload*** or fault conditions. Faults are caused by lightning, trees falling into the line and other unusual events. Several kinds of breakers have been used in substations. The breakers planned for this project, called gas breakers, are insulated by special non-conducting gas (sulfur hexafluoride). Small amounts of hydraulic fluids are used to open and close the electrical contacts within gas insulated breakers. The hydraulic fluid is the only toxic or hazardous material that would be used. One breaker would be installed at each substation.

Substation Dead Ends — Dead ends are structures within the confines of the substation where incoming and outgoing transmission lines end. Dead ends are typically the tallest structures in a substation. Both substations will require a new substation dead end. At Teton Substation, the existing deadends are 16.5 m (54 feet) high.

Transmission Line Dead End — The last transmission line structure on both the incoming and outgoing sides of the substation are called dead end structures. These structures are built with extra strength to reduce conductor tension on substation dead ends and provide added reliability to the substation. The single wood pole structure inside the Teton Substation is 20 m (65.5 feet) high. Both substations would require a new transmission line dead end. At Teton Substation, the dead end would be a single wood pole structure.

For Your Information

Ground wire *is wire that is strung from the top of one structure to the next; it shields the line against lightning strikes.*

Ground wire — One or two overhead ***ground wires***, depending on structure type, would be placed along the entire line. The wire would be placed about 3 m (10 feet) above the transmission line to protect the line and substations from lightning strikes. The thickness would vary from 0.95-1.6 cm (0.375-0.625 in.) depending on elevation and known ice conditions.

Substation Fence — This chain-link fence with barbed wire on top provides security and safety. Space to maneuver construction and maintenance vehicles is provided between the fence and electrical equipment.

Substation Rock Surfacing — An 8-cm (3-inch) layer of rock selected for its insulating properties is placed on the ground within the substation to protect operation and maintenance personnel from electrical danger during substation electrical failures.

Disconnect Switches — Switches are devices used to mechanically disconnect or isolate equipment. Switches are normally placed on both sides of circuit breakers. Three new switches would be installed at each substation.

Bus Tubing, Bus Pedestals — Power moves within a substation and between breakers and other equipment on rigid aluminum pipes called bus tubing. Bus tubing is elevated by supports called bus pedestals.

2.1.7 Communication Equipment

BPA has an existing communications network in place that delivers signals from control centers to operate substation equipment in remote locations. This network also provides voice communication for substation operators and maintenance

For Your Information

In 1994, BPA prepared an Environmental Assessment on the fiber optics program, entitled, BPA's Operational Telecommunications Fiber Optics Project.

personnel. BPA uses a combination of fiber optics, microwave, and radio communication at Swan Valley Substation. For Teton Substation, BPA uses the transmission line as a carrier for communication signals.

BPA is proposing to install fiber optic cable on the new line for communication. Fiber optics transmit messages using light pulses. Glass fibers, which are almost as thin as human hair, carry the light pulses. Glass fibers are wrapped in polyurethane sheaths and are grouped in cables. The cables would be installed on the new transmission structures and new telecommunication equipment would be placed in the substation control house. Because ground wire would be installed along the entire line, the fiber optic cable could be contained within the ground wire, otherwise, the new cable could be installed on the structures underneath the conductors and would be about 1.6 cm (0.625 in.) thick.

2.1.8 Maintenance

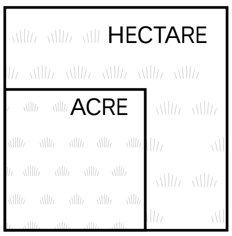
BPA would perform routine, periodic maintenance and emergency repairs on structures, substations, and accessory equipment. These activities typically include replacing poles, crossarms, and insulators. Within substations, BPA may need to replace equipment periodically. If BPA develops new access to structures, this access would remain throughout the life of the line so BPA can perform routine and emergency maintenance on the line. BPA would also need to maintain existing roads. Maintenance activities on existing roads include road grading, and clearing and repairing ditches and culverts. A new ROW Management Plan would be developed within a year of project completion. Using the knowledge and experience of maintaining the existing line and roads since 1968, BPA would include in the plan specific maintenance activities for the new line and roads. The plan would be developed in cooperation with the Forest Service.

Another large part of maintenance activities is vegetation control. During the transmission line design phase, clearing specialists develop a clearing plan for the project. Specialists consider the kind of line, the height and growth habits of the vegetation, slope, allowable conductor height, and wind and snow patterns, to determine which vegetation must be removed. (See Section 2.1.3, **Clearing Required**.)

After construction, maintenance crews assume responsibility for the line. This includes controlling ***noxious weeds***, and managing for tall growing vegetation in and adjacent to the ROW. The ROW Management Plan would identify methods used to manage vegetation. At that time BPA would work with the Forest Service to identify the manual, mechanical, biological, and chemical methods needed to manage vegetation. Those methods chosen would be evaluated under the Vegetation Management EIS presently being updated by BPA in cooperation with the Forest Service. If required, additional site-specific NEPA environmental work (categorical exclusion or environmental assessment) would be completed at that time and would tier off of the Vegetation Management EIS.

2.2 Single-Circuit Line Alternative

Reminder



Hectare: about two and one-half acres

Please refer to Sections 1.4, ***Finding Solutions*** *and 1.7.1,* ***Long-Range Planning*** *for discussions of long-term planning and future planning actions.*

The Single-Circuit Line Alternative has all the components of the Agency Proposed Action except the entire line would be supported by the single-circuit wood pole H-frame structures shown in Figure 2-1. There would be no double-circuit structures. The entire line would be located on the north side of the existing ROW and would require about 23 m (75 feet) of additional ROW width. About 73 hectares (181 acres) of forestland would be cleared. This alternative does not include the Pine Creek Routing Options.

This alternative would cost about the same as the Agency Proposed Action ($14,200,000 [1997 dollars]). There would be some cost savings from not using double-circuit structures but that may balance out with having to get additional ROW easements for the single-circuit structures and doing additional clearing. The cost including all potential future planning actions is estimated to be about $19,100,000 (1997 dollars) over 30 years.

2.3 Short Line Alternative

For Your Information

Tap *- The point at which a transmission line is connected to a substation or other electrical device to provide service to a local load.*

The Short Line Alternative has all the components of the Single-Circuit Line Alternative from Targhee ***Tap*** to Teton Substation. BPA and LVPL would construct the new line from Targhee Tap near Victor in Teton County, Idaho 29 km (18 miles) east to Teton Substation (see Map 1). Like the Single-Circuit Line Alternative, all new structures would be single-circuit (shown in Figure 2-1) and the new ROW would be located on the north side of the existing ROW.

BPA would also construct a new switching station on or close to the existing ROW near Targhee Tap. Targhee Tap would then be removed. Two potential station sites are shown on Map 1.

Preferred Site on the ROW — This site would be located between structures 18/3 and 18/4 just west of Targhee Tap in timberland. The new switching station would require about 0.4 hectare (1 acre), which includes the existing ROW, and would be similar to Teton Substation, but with one additional ***bay***. (See Figure 2-6.)

A ***bay*** *is an area set aside in a substation for special equipment.*

Reminder

*Please refer to Sections 1.4, **Finding Solutions** and 1.7.1**,** **Long-Range Planning** for discussions of long-term planning and future planning actions.*

Site off the ROW — This site would be located between structures 18/3 and 18/4, north of Targhee Tap in agricultural land. The new switching station would also cover about 0.4 hectares (1 acre) but BPA would acquire about 1-2 hectares (3-5 acres) of land for the agricultural site. A parking area, substation entrance road, electrical service, and a small control house would also be needed. These are described below.

This alternative would cost about $11,100,000 (1997 dollars). The cost including all potential future planning actions is estimated to be about $19,300,000 (1997 dollars) over 30 years.

Substation Entrance Road — Substation entrance roads are high-quality roads for construction, operation and maintenance crews and their equipment to access the site. Some of the electrical equipment installed at the substation is very heavy and construction and maintenance trucks have wide turning radii. An 18-m (60-foot) road right-of-way would be acquired. A 6-m (20-foot) wide rock road surface with 1.5-m (5-foot) wide shoulders would be needed for the road.

Electrical Service — Electrical needs at the switching station would be supplied by BPA or the local utility. The existing distribution system serving the area would need minor equipment adjustments that depend on the site selected for the new switching station.

Control House — Equipment that is used to perform certain functions at a substation can be housed inside a small building called a control house. Equipment might include fans, and communication and computer equipment.

For Your Information

*A **var** is a unit of measurement of reactive power in a circuit.*

***Thyristors** are semiconductor switches.*

2.4 Static Var Compensation Alternative

BPA would install a Static ***Var*** Compensator (***SVC***) at Teton or Jackson substations. (See Map 1.) An SVC is a group of electrical equipment placed at a substation to help control voltage on a transmission system. Equipment includes a transformer, capacitors, reactors, ***thyristor*** valves, a cooling system, and computer controls. Some components are housed together in a small building at the substation and others remain outside in the substation yard.

Teton Substation is the preferred location for the SVC because it is BPA-owned, easier to access and maintain, has existing communication facilities, and can house the SVC without BPA buying additional property. Jackson Substation is owned by LVPL and would need to be expanded about 0.2 hectare (0.5 acre) to house the new facility.

This alternative would cost about $6,200,000 (1997 dollars). The cost including all future planning actions is estimated to be about $20,100,000 (1997 dollars) over 30 years.

A portion of the west fence line at Teton Substation would be moved on existing BPA property for the following new equipment, which would require about 46 m x 46 m (150 feet x 150 feet) of added space. (See Figure 2-7.) If chosen, Jackson Substation would require the same equipment.

Transformer — A transformer is a device for transferring electrical energy from one circuit to another. A new 30-70 megavolt amphere (***MVA***) 115-kV transformer would be installed.

Shunt Capacitors — Shunt capacitors are generally located in substations and used to increase the voltage at the end of a line. Three new 25 MVar capacitor groups would be installed at the north end of Teton Substation, west of the existing two capacitor groups.

Reactors — Reactors are devices used to control voltage. Three reactors would be installed at the southwest end of Teton Substation.

Thyristor valves — Thyristors are semiconductor switches. Three valves would be installed between the transformer and the reactors.

Control House — An additional small control house would be installed to house the computer controls and cooling system.

2.5 No Action Alternative

The No Action Alternative is traditionally defined as the no build alternative. This No Action Alternative assumes that no new transmission line is built, and no other equipment is added to the transmission system. The existing transmission line and substations would be operated and maintained as they are now.

2.6 Alternatives Considered and Eliminated from Detailed Consideration

BPA and LVPL studied a variety of alternatives to meet the need. After study, the following alternatives were eliminated from further consideration because they either could not meet the need for the project or they were considered unreasonable.

2.6.1 Conservation

Conservation was suggested as an alternative during the scoping process. Conservation programs are typically used to solve problems and modify electricity use patterns in limited geographic areas at specific times of the day and year.

For Your Information

An ***average megawatt*** *is the unit of energy output over a year, equivalent to the energy produced by the continuous operation of one megawatt of capacity over a period of time.*

LVPL has participated in conservation programs, many sponsored by BPA, since 1983. Programs have accomplished electrical savings of 3.305 ***average megawatts (aMW)*** (see Table 2-6). BPA no longer provides conservation funding to LVPL, but LVPL is working with the Town of Jackson Building Department to develop building codes that include conservation measures such as increased insulation in buildings.

Table 2-6. Conservation Programs in the LVPL Service Area

Program	aMW Savings
Weatherwise (residential retrofit)	0.2356
Super Good Cents	0.3456
Water Heaters	0.0379
Shower Heads	0.1593
Aerators	0.2284
Energy Smart Design (new and existing commercial)	0.1256
Energy Saving Plan (industrial)	1.083
Solar Water Heaters	0.0077
Waterwise (Irrigation)	0.0067
Street and Area Lighting	1.075
Total	3.305

Though conservation programs do reduce the need for power in the area, the magnitude of energy savings that can be accomplished is too small (less than one year of load growth) to defer the need for system reinforcement. Also, load projections include conservation savings. Still load growth has far outpaced the energy savings and the total load cannot be kept below the present system limit of 125 MW.

Because conservation programs cannot meet the need, they were eliminated from further consideration.

2.6.2 Transmission System Plans

BPA's and LVPL's initial study identified transmission plans that could potentially meet the need. Another transmission plan was suggested during scoping. These plans contain many actions over the 30-year planning period at and between different substations in northeastern Idaho and western Wyoming; the major actions are described in Section 2.6.2.2, **System Plans**.

After engineers studied the plans, the plans were eliminated from further consideration because of their high cost.

2.6.2.1 Cost Considerations

BPA is mandated by the Northwest Power Act to recover its costs sufficiently to repay the U.S. Treasury after first meeting its other costs. The electric energy industry is changing rapidly, with increased competition that has lowered the price of power and transmission services from BPA's competitors. As the electric industry changes, BPA must be able to recover its costs and compete with other suppliers in the western United States. BPA must balance its responsibilities to its ratepayers, customers and the environment and set its rates at the lowest possible level consistent with sound business principles. BPA looks for alternatives that would help keep its rates low. Alternatives that may meet the need, but that have costs sufficiently greater than other alternatives were eliminated from consideration to respond to BPA's need to remain competitive in the long term.

LVPL, in order to stay competitive with other public utilities, also needs to make sound financial decisions. Like BPA, they will consider alternatives that meet the need for the project but will eliminate those with relatively higher costs.

If LVPL wanted to borrow the full amount to pay for an alternative that costs $10,000,000, the utility would use common electric industry debt ratios as a guide for weighing the financial impact. Table 2-7 lists these ratios as percentages for LVPL, compares them to an average figure for other utility cooperatives, and then shows the change when $10,000,000 of debt is added.

The first ratio, *Total Debt to Total Asset,* measures how much of the utilities total assets have been financed using borrowed money (both in the short and long term). The higher the percentage, the more other people's money is being used to generate profits. At the end of 1995, LVPL had financed 58 percent of its total assets with borrowed money. Choosing an alternative that costs about

$10,000,000 would raise this percentage to 64 percent. The average 1994 percentage for utility cooperatives is 5 percent. The 1994 data is the most up-to-date data available but the averages do not change much from year to year with so many utilities included in the average.

Table 2-7. LVPL and Utility Cooperatives Average Debt Ratios

Ratio Type	Co-op Average	LVPL	with additional $10,000,000 debt
Total Debt to Total Asset	5%	58%	64%
Long-Term Debt to Total Asset	49%	48%	55%
Long-Term Debt to Total Capitalization	47%	60%	67%
Total Debt to Total Capitalization	50%	73%	77%
Times Interest Earned	1.97	1.98	not applicable

The second ratio, *Long-Term Debt to Total Asset*, is similar to the first ratio but only looks at long-term debt used to finance assets. This ratio is looked at much more closely since long-term debt commits a utility over the long term to pay interest and eventually to repay the borrowed amount. A greater percentage shows less financial flexibility and a greater possibility the utility may default on a loan. At the end of 1995, LVPL had financed 48 percent of its total assets with long-term financing. Adding $10,000,000 of debt would raise this percentage to 55 percent. The average 1994 percentage for utility cooperatives is 49 percent.

The third ratio, *Long-Term Debt to Total Capitalization*, indicates the extent to which the utility has used long-term debt in its permanent financing. If this percentage is high, the utility has less financial flexibility to meet its needs because it is locked into the interest payment on the debt. At the end of 1995, LVPL had obtained 60 percent of its permanent financing from debt sources. Adding $10,000,000 debt increases this percentage to 67 percent. The average 1994 utility cooperative percentage is 47 percent.

For Your Information

BPA recognizes that there are an infinite number of possibilities of locating a transmission line from the Swan Valley Substation to Teton Substation. When locating new transmission lines, BPA tries either to replace existing lines, or to use or parallel an existing ROW. Following this ROW practice can greatly reduce costs and environmental impacts. For example, adding a transmission line next to an existing one can cause less visual impact than a new, totally separate line, and the need for new access roads can be kept to a minimum by using existing access roads. This is especially important in this area where much of the land is publicly owned and managed for national parks, forests, and wilderness areas.

The fourth ratio, *Total Debt to Total Capitalization*, is another measure of debt leverage. LVPL's ratio is 73 percent, while the average utility cooperative ratio is 50 percent. LVPL's ratio would increase to about 77 percent if LVPL finances another $10,000,000.

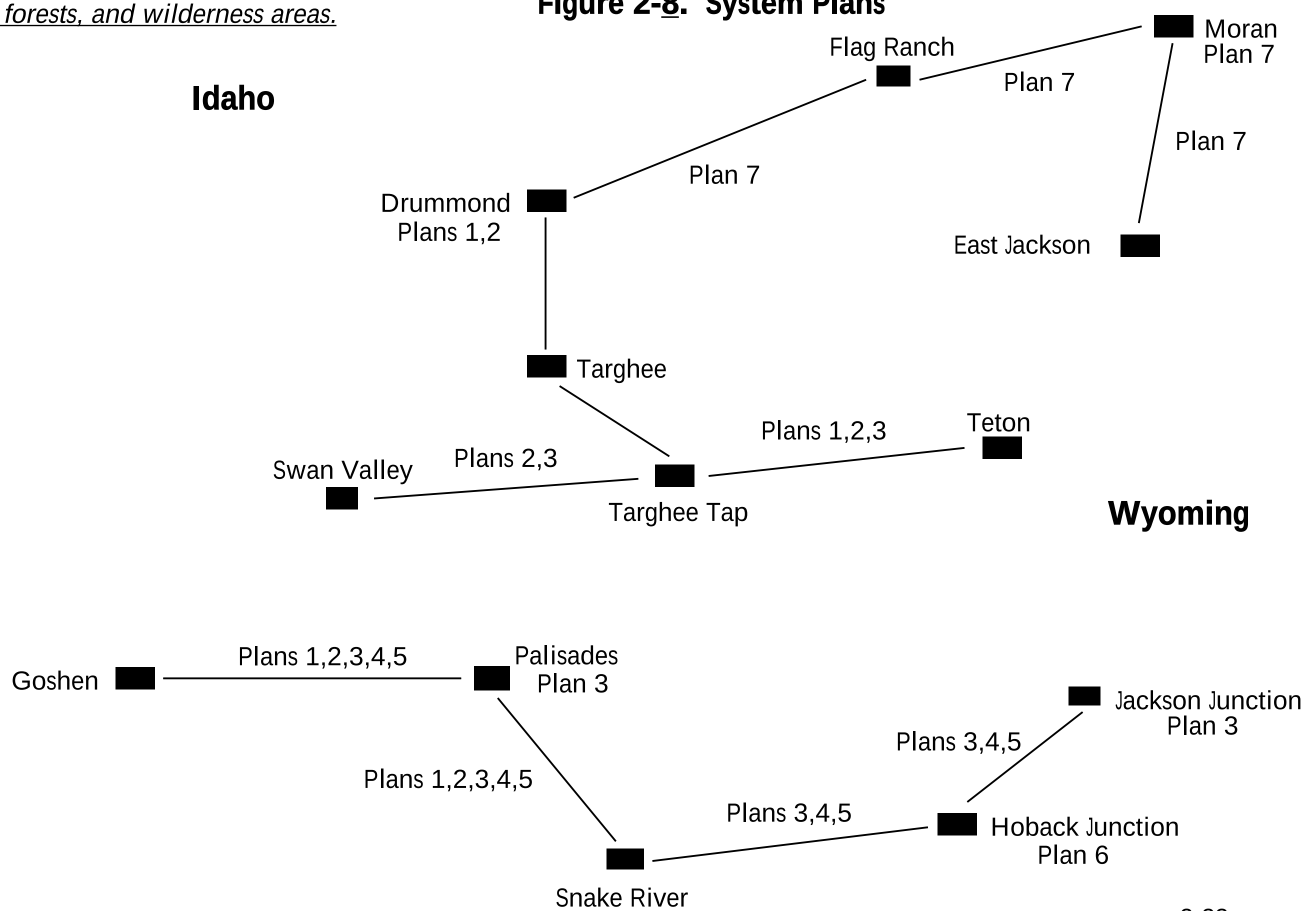
The final ratio, *Times Interest Earned*, indicates a utility's ability to meet their interest payments out of their annual operating earnings. LVPL's ratio is 1.98. The average cooperatives' ratio is 1.97. Financiers frequently require utilities to maintain this ratio at 1.5 or greater.

More expensive alternatives (e.g., undergrounding transmission lines) increase these percentages further and decrease LVPL's ability for future borrowing. LVPL wants to make fiscal decisions that allows it to remain flexible and competitive in today's market.

2.6.2.2 System Plans

This section describes the major actions of transmission system plans that were studied by BPA and LVPL (Plans 1-6), but eliminated from further consideration because of either the high costs and/or transmission system reliability. These plans are shown schematically in Figure 2-8. Plan 7 was suggested during scoping.

Figure 2-8. System Plans



For Your Information

*Cost estimates for these plans include all planning actions for each plan (not just the major actions identified here) and are in **1994 dollars** while the agency proposed action and alternatives described earlier are given in 1997 dollars. Analysts studied the plans in this section in 1994 and assumptions about inflation, cost of equipment, interest rates, etc. are in 1994 dollars. The agency proposed action and alternatives were developed in late 1995 and 1996 and are in 1997 dollars. Because the plans in this section were eliminated, it was not cost-effective to update the cost estimates to 1997 dollars.*

Plan 1 — This plan would rebuild the Targhee Tap-Teton transmission line to double circuit. This plan would cost about $13,700,000 (***1994 dollars***).

Plan 2 — Plan 2 would rebuild the Swan Valley-Teton transmission line to double circuit. This plan would cost about $16,200,000 (1994 dollars).

Plan 3 — Plan 3 would operate the southern corridor (through the Snake River Canyon), Palisades-Jackson Junction, at 161-kV. A new 161/115-kV transformer would be installed at Jackson Junction and Palisades. This plan would cost about $21,500,000 (1994 dollars).

Plan 4 — Plan 4 would rebuild the Palisades-Snake River-Jackson Junction 115-kV line (also the Snake River Canyon) to double circuit. This plan would cost about $17,700,000 (1994 dollars).

Plan 5 — Plan 5 would build a new parallel second single-circuit line along the southern corridor (Snake River-Jackson Junction) and double circuit Palisades-Snake River. This plan would cost about $15,600,000 (1994 dollars).

Plan 6 - Plan 6 would install series compensation (series capacitors) along the southern corridor at Hoback Junction. The amount of series compensation required to serve the full load during a line outage would cause overvoltages in both normal and outage conditions. The series capacitors could be distributed over several locations, which is technically feasible, but expensive. This plan was eliminated because it is technically complex making it too expensive.

Plan 7 — Plan 7 was suggested during the scoping period. In this plan, about 56 km (35 miles) of 115-kV line would be built from Drummond to Flag Ranch; about 48 km (30 miles) of 115-kV would be built from Flag Ranch to Moran Substation; and about 53 m (33 miles) of 69-kV line from Moran Substation to Kelly Substation to East Jackson would be rebuilt to 115-kV because the present spacing, insulation, conductor and structures are not capable of energization at 115-kV. Moran and Kelly substations would be converted from 69-kV to 115-kV. These stations are in Grand Teton National Park. About 32 km (20 miles) would be in the Grand Teton National Park and a large part of the line from Kelly to East Jackson would be in the National Elk Refuge. Part of the proposed line would be near the southern border of Yellowstone National Park.

When locating new transmission lines, BPA tries either to replace existing lines, or to use or parallel an existing transmission right-of-way. Following this right-of-way practice can greatly reduce costs and environmental impacts. For example, adding a transmission line next to an existing one can cause less visual impact than a new, totally separate line, and the need for new access roads can be kept to a minimum by using existing access roads.

This alternative may not work technically or would be less effective to meet the need compared to some other plans. It also requires more transmission line and would be more expensive than other plans. Potential environmental impacts to national parks could be high. This plan was eliminated from further consideration for these reasons.

2.6.3 Routing the Transmission Line Outside the Palisades Wilderness Study Area

A small portion of the existing transmission line is within the boundaries of the Palisades Wilderness Study Area (***WSA***) on the Bridger-Teton National Forest. The transmission line was built before the passage of the Wyoming Wilderness Act of 1984, which created the wilderness study area. When the line was built, BPA and the Forest Service jointly decided on the existing route to meet long-range plans for forest and recreational development and aesthetics, and to avoid difficult terrain such as avalanche areas (Williams, August 30, 1966).

BPA considered rerouting the proposed transmission line outside the WSA in this area. The WSA continues south of the existing line on the Bridger-Teton National Forest, so building to the south would not avoid the WSA. BPA considered routing the line north of the WSA, but this area has extremely steep terrain and is susceptible to avalanches. Access to build the line would be difficult. A new section of line to the north would also be more visible from other areas because it would create a new ROW. Because the terrain is difficult to build on, costs would also be more than building next to the existing line.

It is possible that any wilderness designation could exclude the existing line by express exemption or adjustment of the boundary of the WSA. It is also possible that a rebuild of the existing line to double circuit on the existing ROW could be no more obtrusive on wilderness characteristics than the existing line, and would thus not impair its wilderness character and potential for inclusion in the National Wilderness Preservation System.

BPA considered the increased costs of this alternative and its potential for greater environmental impact and eliminated it from further consideration.

2.6.4 Double-Circuit Structures 29/3-32/6

The proposed single-circuit, single pole steel structures require less ground disturbance and fewer access road improvements. Using these structures would require about 6 m (20 feet) of new ROW, and the small trees in this new ROW would be cleared. This additional clearing may be visible from a distance.

At the request of the Bridger-Teton National Forest, BPA considered using double-circuit structures instead of single-circuit structures from structures 29/3 to 32/6. This is a highly scenic area in the viewshed east from Teton Pass. Double-circuit structures are taller than single-circuit structures, disturb more ground at each site, and require that roads be upgraded to accommodate large construction equipment. No trees would be cleared. Using double-circuit structures in this area would increase the cost of construction by $1,150,000.

BPA eliminated using double-circuit structures in this area from further consideration because of the increased costs.

2.6.5 Burying the Transmission Line

During the scoping process, many people suggested burying the proposed transmission line. Putting 58 km (36 miles) of transmission line underground is technically feasible. Burying and operating the transmission line underground was primarily eliminated from further consideration because of high costs.

The costs of burying a line are high and depend on terrain and soil conditions. General costs for undergrounding a line in flat terrain with deep soils and cobbles are about $775,000/km ($1,240,000/mile) (1998 dollars).

While these general costs are for undergrounding in a flat area, the terrain crossed by most of the proposed line is rugged, especially near Teton Pass, with many steep and rocky areas. General costs to bury the line across this kind of mountainous terrain would be about $1,075,000/km ($1,720,000/mile) (1998 dollars). In comparison, the cost for building the overhead single-circuit 115-kV transmission line is about $252,000/km ($403,000/mile) (1997 dollars).

Building and maintaining a line underground has environmental impacts similar to a buried pipeline. For example, to create a trench to bury the cable, vegetation, soil and rocks would be removed along the length of the line. In areas where there is bedrock at the surface, such as Teton Pass, rock would likely need to be blasted. To cross streams such as Fish Creek, a tunnel would be excavated underneath the creek for the cable, disturbing streambanks and potentially affecting groundwater and surface water quality. Construction equipment and activities would create noise, disturbing local residents near Teton Substation and Targhee Tap, and wildlife along the length of the line. Until vegetation is reestablished, disturbed areas along the line would be visible as would any new transition stations. New access roads would be needed for construction and maintenance of the buried line.

2.6.6 Substation Locations for the SVC

BPA and LVPL considered Hoback Junction, Rafter J, East Jackson, Wilson, and Crystal substations as potential locations for the SVC. Because BPA does not own any of these substations, BPA does not have communication into these substations, making remote operation impossible. Maintenance also would be difficult. Because of location (in some cases next to steep slopes, rivers, backyards or roads), expansion of the existing substation yards would be difficult. In addition, Hoback Junction is located far from the main load center.

2.6.7 Local Generation

Building local ***generation*** was suggested during the scoping process. The Northwest Power Act prevents BPA from building or owning generation facilities. In the future, LVPL plans to operate as a combined electric and gas utility, making it possible for LVPL to build or own a gas generation facility. Included in LVPL's future natural gas plan is construction of a natural gas transportation pipeline into its service area, and a natural gas combustion turbine generating plant. Initial gas distribution is to be from a liquefied natural gas (LNG) pilot program in its service area. LVPL is just starting this program and results are uncertain. If this program is successful, a natural gas pipeline and combustion turbine plant may become reasonably foreseeable.

As part of its planning process, LVPL looked at different locations for siting a natural gas combustion turbine. In 1992, an area between Alpine and Afton, Wyoming was studied but LVPL and BPA found that new generation in this area would only defer any transmission investment for 1-2 years. Conversely, siting a plant in or near the load center of Jackson, east of the Teton Range, would effectively eliminate the need to move more than 125 MW of power over the existing lines.

With the present load forecast, a 60 MW generation source in or near the Jackson area would delay the need for a new transmission facility about 10 years (about 2010). A 100 MW source of generation would delay the need to 2021. The cost of new generation (e.g., combustion turbine) would be many times the cost of the Agency Proposed Action, about $10,000,000-10,500,000/10 MW unit.

Environmental impacts would depend on fuel source (e.g., nuclear, coal, natural gas) and the site of the generation plant. If located away from Jackson, new transmission lines and facilities would be needed to integrate the power into the local transmission system.

This alternative was dropped from further consideration because of high costs and the potential environmental impacts and challenges of locating generation facilities in the Jackson area.

2.7 Comparison of Alternatives and Summary of Impacts

This section compares all the alternatives described in this chapter using the project purposes from Chapter 1 and the predicted environmental impacts from Chapter 4. Tables 2-8 and 2-9 summarize the environmental impacts and compare the alternatives.

2.7.1 Environmental Impacts

2.7.1.1 Land Use

The Agency Proposed Action proposes double-circuit structures in some sensitive locations, which decreases the need for land disturbance and new ROW. Single-circuit steel poles proposed in some locations also require less land taken from production. Agricultural land and timberland would be taken out of production. Low to moderate impacts would occur. Rangeland, and residential and commercial land would not be impacted.

The Single-Circuit Line Alternative would take slightly more land out of production than the Agency Proposed Action because only single-circuit structures would be used.

The Short Line Alternative would impact less land than the Agency Proposed Action and the Single-Circuit Line Alternative. A new switching station would be built. If the new switching station is built on agricultural land, it would permanently remove some land from production. If the new switching station is built at the preferred location under the existing ROW just west of Targhee Tap, no land would be taken out of agricultural production but additional clearing of timberland would be needed.

Table 2-9. Alternatives Compared to Project Purposes

Project Purposes or Objectives	Agency Proposed Action	Single-Circuit Line Alternative	Short Line Alternative	SVC Alternative	No Action (No Construction)
Minimize negative impacts to the environment	Double-circuit structures help lessen impacts to some environmental resources.	Has the most environmental impacts of all alternatives.	No or low to high impacts on the environment but only on the Targhee Tap to Teton portion (the eastern part of Targhee and the Bridger-Teton National Forests).	Lower environmental impacts than line alternatives but impacts are more concentrated in a commercial and/or residential environment.	No disturbance to natural resources. Could have negative socioeconomic (including public health and safety) impacts depending on frequency, extent, and length of outages in winter.
Minimize costs while meeting BPA and LVPL's long-term transmission system planning objectives for the area	About a $300,000 difference in both the up-front costs ($14,500,000) and the 30-year costs ($19,400,000) of this alternative and the Single-Circuit Line Alternative. This alternative is slightly more expensive.	About a $300,000 difference in both the up-front costs ($14,200,000) and the 30-year costs ($19,100,000) of this alternative and the Agency Proposed Alternative. This alternative is slightly less expensive.	Least expensive of the line alternatives to build in 2000 ($11,100,000). About the same costs as other line alternatives and less expensive than the SVC to meet long-term planning objectives ($19,300,000).	Least expensive of the construction alternatives to build in 2000 ($6,200,000) but most expensive if long-term planning objectives are to be met ($20,100,000).	Least expensive of all the alternatives in 2000 but does not meet long-term planning objectives. Could be the most expensive alternative if blackouts occur.
Maintain BPA and LVPL transmission system reliability	Because of the double-circuit structures, this alternative is the second most reliable alternative after the Single-Circuit Line.	A new line on separate structures makes this the most reliable alternative.	Not as reliable as the Single-Circuit Alternative or Agency Proposed Action. Building a new line back to Swan Valley is needed by 2020 to maintain system reliability.	Emergency maintenance during winter could compromise system reliability. A new line would be needed in 2007 to maintain system reliability.	Does not maintain system reliability.

The SVC Alternative is located in residential and commercial areas that surround the substations under consideration. No changes in land use are expected so no impacts would occur.

The No Action Alternative has no immediate impacts to land use. All transmission facilities are located in land use zones that allow for their operation and maintenance.

2.7.1.2 Visual Resources

The Agency Proposed Action responds to public concerns about and emphasizes decreasing impacts to visual resources. It proposes using double-circuit structures in sensitive areas to decrease visual impacts. The addition of double-circuit structures near Pine Basin Lodge, through Teton Pass, and just below Phillips Ridge to Teton Substation makes the Agency Proposed Action more responsive to these concerns than other alternatives. Impacts to visual resources would generally be low or moderate, but high impacts would occur to visual resources at Teton Pass and from Fish Creek Road to Teton Substation.

The Single-Circuit Line Alternative uses single-circuit structures in the areas identified as sensitive and emphasizes reliability over concern for visual resources.

The Short Line Alternative includes a new switching station that would be located to minimize visual impacts.

The SVC Alternative would create high impacts to residents surrounding Teton Substation. Visual impacts would be low around Jackson Substation because the substation is in a mixed use (residential and commercial) area.

The No Action Alternative has no visual impacts beyond what is occurring from operation and maintenance of the existing transmission line.

2.7.1.3 Recreation Resources

The Agency Proposed Action makes the same trade-offs in recreation areas as for visual resources. Double-circuit structures have fewer impacts to recreation. Impacts would be low to moderate. Construction could interfere with recreation temporarily, and some roads open to the public would be gated and closed after construction.

The Single-Circuit Line Alternative uses single-circuit structures in the areas identified as sensitive and emphasizes reliability over concern for recreation resources.

The Short Line Alternative includes a new switching station, but no impacts are expected at the switching station.

No impacts are expected to recreation from the SVC Alternative.

The No Action Alternative has no recreation impacts beyond what is occurring now from operation and maintenance of the existing line.

2.7.1.4 Wilderness, Wilderness Study Areas, Recommended Wilderness and Roadless Areas

The existing utility corridor and associated access roads had lost all wilderness character when wilderness, wilderness study areas, recommended wilderness and roadless areas were designated. The Agency Proposed Action would rebuild the existing line to double-circuit on existing ROW in the Palisades Wilderness Study Area and would not change its potential for future designation as wilderness. The Agency Proposed Action would not affect the future designation of the roadless area it would cross as wilderness. The Single-Circuit Line Alternative and the Short Line Alternative would require more ROW and clearing for the single-circuit line and roads. Expanding the ROW could compromise the character of the Palisades WSA and affect its future designation as wilderness. The SVC Alternative and the No Action Alternative would not affect these areas.

2.7.1.5 Public Health and Safety

The Agency Proposed Action uses some double-circuit structures, which would decrease the transmission line magnetic field levels near Teton Substation relative to the No Action Alternative. Substation magnetic field levels are not expected to increase to residences near Teton Substation.

For the Single-Circuit Line Alternative, transmission line magnetic fields would decrease on the south side and increase on the north side of the ROW relative to the No Action Alternative.

Both the Single-Circuit Line and Short Line Alternative (structures would look the same as what is there now) would result in somewhat lower field levels on the south side of the ROW compared to the No Action Alternative. Since the new line would be located north of the existing line, field levels would be higher than the No Action Alternative on the north side of the ROW.

Since no new transmission line is included in the SVC Alternative, no change to the magnetic field level is expected when compared to the No Action Alternative.

None of the transmission line alternatives are expected to increase the magnetic field environment at the residences near Teton Substation.

If the SVC Alternative is selected, the specialized SVC equipment would result in an additional, and somewhat unique, magnetic field source within Teton or Jackson substations. Increases to nearby residences are possible, and the amount of any potential increase at either site would depend on the design, location and operating modes of the SVC equipment. Like the transmission line alternatives, the SVC is proposed to be located on the far side of the substation away from residences (see Figure 2-7.) Magnetic field increases to nearby residences are possible and the amount of any increase would depend on the design, location and operating modes of the SVC equipment. Noise would increase depending on background noise and equipment operation, but would stay within local standards.

2.7.1.6 Water Quality, Soils and Geology

The Agency Proposed Action uses some double-circuit structures in sensitive areas. Building these structures would disturb less soil and cause fewer impacts to water quality and soils. Some original footings may also be used which would disturb less soil. Impacts to water quality and soils range from no impact to high impacts and the degree is dependent on the type of soil affected and the success of erosion control measures.

Slightly more land would be disturbed where single-circuit structures are used instead of double-circuit structures for the Single-Circuit Line Alternative and the Short Line Alternative.

The SVC Alternative would disturb the area of the substation only.

No impacts are expected from the No Action Alternative except those already occurring from operation and maintenance of the existing line.

2.7.1.7 Floodplains and Wetlands

The transmission line alternatives would have similar impacts to floodplains and wetlands. Wetlands would experience no to high impacts from construction but these could be minimized with prudent placement of erosion control measures. The SVC Alternative would have no impacts to floodplains and wetlands. No impacts are expected to floodplains and wetlands from the No Action Alternative except those already occurring from operation and maintenance of the existing line.

2.7.1.8 Vegetation

The Agency Proposed Action would disturb about half of the vegetation compared with the Single-Circuit Line. Impacts to vegetation would be low to high depending on the amounts cleared and the ability of an area to revegetate. Using double-circuit structures would decrease the area and vegetation disturbed. The Short Line Alternative is half the length of these alternatives and would disturb less vegetation.

The SVC Alternative would only disturb any existing vegetation at existing substation sites.

The No Action Alternative would create no impacts to vegetation except those already occurring from operation and maintenance of the existing line.

2.7.1.9 Wildlife

Impacts to wildlife from the Agency Proposed Action range from none to moderate. Less vegetation would be disturbed because this alternative would use double-circuit structures in some locations. The potential to impact threatened and endangered species is also less because in some locations the existing structure bases and footings would be used. Less shrub area would be converted, which could impact some species negatively. Bird collisions could be increased if ***mitigation*** measures are not used.

For Your Information

Mitigation *lessens the impacts predicted for each resource. Mitigation may include reducing or minimizing the impact, avoiding it completely, or rectifying or compensating for the impact.*

The Single-Circuit Line Alternative would disturb more vegetation and wildlife using the vegetation.

The Short Line Alternative would have fewer impacts to wildlife because it is half as long.

The SVC and No Action Alternatives would create no impacts to wildlife except those already occurring from operation and maintenance of the existing line.

2.7.1.10 Fisheries

The Agency Proposed Action would follow best management practices, would disturb less soil and vegetation because it would use double-circuit structures in some locations, and would have fewer impacts to water quality and to local fisheries. Impacts to fish range from low to moderate and depend on impacts to stream turbidity.

The Single-Circuit Line Alternative would disturb more soil because single-circuit structures would be used for the entire line.

The Short Line Alternative would have similar impacts as the Single-Circuit Line Alternative east of Targhee Tap.

The SVC and No Action Alternatives would have no impacts to fisheries except those already occurring from operation and maintenance of the existing line.

2.7.1.11 Cultural Resources

Two historic resources were found that are eligible to the National Register of Historic Places (***NRHP***). BPA has made a determination of no adverse effect as portions of these sites could be affected by construction but the effect would not be harmful. BPA has coordinated this determination with the State Historic Preservation Office (***SHPO***) and the Advisory Council on Historic Preservation. Mitigation in the form of recordation is proposed. These sites are located in areas affected by the Agency Proposed Action, Single-Circuit Line Alternative and Short-Line Alternative. The sites would not be affected by the SVC and No Action Alternatives.

Tribes were consulted and no traditional cultural property was identified in or near the ROW.

2.7.1.12 Socioeconomics

Construction would create a positive impact on employment for the local economy for all the action alternatives. No impacts are expected for the No Action Alternative.

2.7.1.13 Air Quality

Impacts from vehicle emissions and construction dust are expected to be low for all action alternatives. No impacts are expected for the No Action Alternative except those already occurring from operation and maintenance of the existing line.

2.7.2 Reliability

The Agency Proposed Action is less reliable than the Single-Circuit Line Alternative because double-circuit structures would be used and separate lines on separate structures are safer in avalanche and slump prone areas. Steep terrain and extreme weather conditions in the project area combine to increase avalanche hazard and the certainty that both lines would go out of service if a double-circuit structure goes down. However, this alternative meets BPA's standards of providing power to LVPL with a high probability that power would be available when LVPL needs it.

The Single-Circuit Line Alternative is the most reliable of all the alternatives. It meets BPA's standards of providing power to LVPL with a higher probability that the power would be available when LVPL needs it. Separate lines on separate structures are safer in avalanche and slump prone areas.

The Short Line Alternative is not as reliable as the Agency Proposed Action or the Single-Circuit Line Alternative. Some reliability is compromised if the existing Swan Valley to Teton line goes down because power would need to flow north to Drummond and back down to Jackson. It is more reliable than the SVC Alternative.

The SVC Alternative would be a short-term solution to the problem. This alternative may not be as reliable as the transmission line alternatives. Because the SVC Alternative consists of electrical equipment, there are more switching mechanisms and moving parts. This may require more emergency maintenance compared to a line that has more routine, scheduled maintenance. As a result, the line is more likely to be available when it is needed.

The No Action Alternative is the least reliable alternative and would lead to voltage collapse if a critical line is lost on the system. Collapse of the system could continue over a long period (hours or even days) if outages occur in winter when deep snows make access to the existing transmission system difficult.

For Your Information

Line loss *is the power lost during the transfer of power from one place to another. More power moved over a smaller number of lines increases line loss.*

2.7.3 Costs

The Agency Proposed Action has fewer transmission ***line losses*** than most alternatives. This helps make the line more economical to build over the long term. There is an estimated $300,000 difference in both up-front and long-term costs between the Agency Proposed Action and the Single-Circuit Alternative. Higher material and labor costs associated with double-circuit structures would make the up-front costs higher. The margin of error present in the calculations to do the 30-year costs essentially makes the long-term costs about the same. Also, over a 30-year period this alternative would cost about the same to build as the Short Line and would be slightly cheaper to build than the SVC Alternative.

The Single-Circuit Line Alternative also has fewer transmission line losses than most alternatives. This helps make the line more economical to build over the long term. Like the Agency Proposed Action, this alternative would be initially more expensive to build but over a 30-year period, it would cost about the same to build as the Short Line and would be slightly cheaper to build than the SVC Alternative.

The Short Line Alternative is a short-term fix to the problem. Though up-front construction costs are less than the Agency Proposed Action or the Single-Circuit Line Alternative, over the 30-year planning period it costs about the same to build the Short Line Alternative because by 2020, the line would need to be extended from Targhee Tap to Swan Valley Substation. Over 30 years, costs are less than the SVC Alternative.

The SVC Alternative has more line losses than the other alternatives. It has significantly lower up-front costs than other alternatives but over the 30-year planning period it becomes the most expensive alternative because of the need to build a transmission line from Swan Valley to Teton Substation in 2007.

Depending on the frequency, duration, and extent of blackout conditions in the area, the No Action Alternative could be the most costly in the long run.