**Electricity Transmission Report**

**Participants**

**Transmission Chair**
Mike Lidinsky – POWER Engineers, Inc.

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
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<tbody>
<tr>
<td>Dave Angell</td>
<td>Idaho Power Company</td>
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<tr>
<td>Jared Ellsworth</td>
<td>Idaho Power Company (Alternate)</td>
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<tr>
<td>Jake Gentle</td>
<td>Idaho National Laboratory</td>
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<tr>
<td>Lori Adams</td>
<td>Rocky Mountain Power</td>
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<tr>
<td>Rod Fisher</td>
<td>Rocky Mountain Power (Alternate)</td>
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<tr>
<td>Ron Beazer</td>
<td>POWER Engineers, Inc.</td>
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<tr>
<td>Scott Waples</td>
<td>Avista Utilities</td>
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<tr>
<td>Helen Rosentrater</td>
<td>Avista Utilities (Alternate)</td>
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<tr>
<td>John Williams</td>
<td>BPA</td>
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<tr>
<td>Tom Baldwin</td>
<td>Idaho National Laboratory</td>
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<tr>
<td>Shawn Dolan</td>
<td>Kootenai Electric Cooperative</td>
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<tr>
<td>Rick Knori</td>
<td>Lower Valley Energy</td>
</tr>
<tr>
<td>Robert Neilson</td>
<td>Energy Technologist</td>
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Executive Summary

Idaho’s Transmission Operators: Serving a Growing and Changing Electrical Load

Transmission is the movement or transfer of electric energy over an interconnected group of lines and associated equipment between points of supply and points at which it is transformed for delivery to consumers or is delivered to other electric systems. Transmission ends when the energy is transformed to distribution for the consumer. Growing population and increasing grid security have led to additional lines which creates broader grid stability. In addition to high-voltage lines, Idaho uses some lower voltage transmission (subtransmission) to enhance reliability of distribution areas.

Idaho’s electrical power demand is steadily growing as its population and economic activity expands. Serving a growing load in Idaho means acquiring and distributing more electricity either from sources in Idaho or sources outside of Idaho. In either case, steady transmission capacity growth is also required. For example, Idaho Power projects demand growth in its service territory at 36% in the next 20 years. Idaho Power also notes that transmission capacity into and across southern Idaho is fully subscribed. The need for transmission capacity growth in Idaho’s immediate future is clear.

Idaho’s hydroelectric generation assets have long been regarded as the crown jewels of the state’s power generation infrastructure. Idaho has recently seen the addition of significant new generation resources that take advantage of highly capable gas turbine generation technology and fortuitous low natural prices to increase the availability and reliability of in-state generation resources. Like many other states, Idaho is seeing the development of new renewable energy resources from wind, solar, and geothermal facilities. The Idaho transmission and distribution networks will need to develop and expand to accommodate these in-state contributors to Idaho’s electric energy budget.

Idaho’s high-voltage backbone also participates in energy exchanges among neighboring states and the regional grid. Energy transfers and exchanges are critical components in maintaining the reliability and cost-effectiveness of Idaho’s energy supply as well as those of neighboring states. This role is likely to be even more important in the future as the regional grid adapts to the incorporation of new generation assets with novel or unfamiliar profiles of availability such as solar and wind resources. In the context of a regional grid, wind, and solar generation can supply energy to windless places, and areas not suitable for solar generation. The ability to wheel electrical power will be crucial to the adoption of renewable resources such as wind and solar as reliable and dispatchable contributors to Idaho’s energy supply.

1 www.eia.gov/tools/glossary/index.cfm?id=electricity
Strategic Transmission Assets in Idaho: Avista, Idaho Power, Rocky Mountain Power, and the Bonneville Power Administration

The brawny work of getting electrical power to the general vicinity where it is needed is done by the Idaho web of high-voltage transmission lines: typically, those circuits with voltages of 161,000 V (161 kV) and above. The majority of Idaho’s strategic transmission lines are 230 kV, with some 345 kV lines towering above the Gem State, and even some 500 kV lines looming up. These high-voltage facilities are high-capital undertakings because of their technical demands for equipment, topography, and clearances, as well as the cosmetic aspects of their interaction with the population (human and animal) and the landscape. The ownership, operation, and maintenance of the Idaho backbone falls primarily to three investor owned utility companies – Avista Utilities, Idaho Power, and Rocky Mountain Power, and with the federal power marketing agency Bonneville Power Administration (BPA).

- Avista (formerly Washington Water Power) is based in Spokane, Washington. Avista’s Idaho assets include 230 kV lines supplying the local transmission and distribution networks in northern Idaho. Avista’s big 230 kV lines, in cooperation with BPA, connect BPA regional network facilities in Montana and Washington State.
- Idaho Power is the principal backbone supplier to the southern half of Idaho, in conjunction with BPA.
- Rocky Mountain Power (formerly named Utah Power), is one of three business units aggregating up to PacifiCorp based in Portland, Oregon. Rocky Mountain Power is a key strategic supplier of electrical power to loads in Eastern and Southeast Idaho.

Figure 1. Line Types

2 www.idahopower.com/AboutUs/PlanningForFuture/ProjectNews/HemingwayTransmission/default.cfm
BPA also supplies electrical power to Idaho load areas through transmission that it owns and through interconnections with Avista, Rocky Mountain Power, and Idaho Power.

Major Strategic Developments in Idaho’s Future

Idaho’s key transmission providers have ongoing plans, (noted later in this document) for comparatively routine improvements to the transmission lines they own and use: typically new lines and improvements to existing lines in the 230 kV and 161 kV transmission classes. These improvement projects are generally improvements to lines feeding local or regional load areas within the state.

In addition to this radial supply activity, Idaho transmission providers are also in the midst of major strategic development for several electrical superhighway projects: lines operated at Extremely High Voltage (EHV) – 500 kV heavyweights. These lines are tall, high-clearance transmission lines that lend themselves to efficiently linking widespread load areas and provide paths for shifting and balancing generation and consumption power flows across multi-state areas.

- The Boardman-to-Hemingway (B2H) 500 kV Line: Idaho Power, Rocky Mountain Power and BPA are cooperating in the development of a 500 kV line linking a proposed new substation in Boardman, Oregon, with the Hemingway Substation near Melba, Idaho. The B2H project will provide capacity for exchanging energy between the Pacific Northwest and the Intermountain West. This line is now in the permitting process.

- The Gateway West 500 kV Project: Gateway West is a joint undertaking by Rocky Mountain Power and Idaho Power to develop a 500 kV line 850 miles long, linking the Melba substation with the Windstar substation near Glenrock, Wyoming. This project will allow its owners to serve growing load in Idaho, accommodate new renewable generation capacity, and strengthen transmission reliability in the area it will serve.

Whipsawed: The Great Concentrated ROW vs. Reliability Dilemma

In planning to increase the capacity and reliability of Idaho’s high-voltage electrical transmission infrastructure, the electricity backbone providers listed above are encountering a notable conflict in regulatory imperatives. One regulatory imperative deriving from agencies such as the Forest Service and Bureau of Land Management (BLM) stress the importance of minimizing and confining the transmission line routing corridors to limit the impacts of line development on other uses, but power line service reliability is regulated by the agencies, particularly (in Idaho’s case) by the North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Committee (WECC). Clearance between co-located lines is
a crucial factor in reliability for individual lines, adjacent lines and for the system as a whole. If NERC and WECC regulations affecting clearance distances are relaxed, the risk of cascade failures in Idaho may need to be recalculated, since this regulatory conflict could tend toward packing of critical lines into more confined rights of way (ROW).

## A Guide to Who’s in Charge of Idaho’s Transmission Network

Owners and operators of Idaho’s arterial high-voltage electricity transmission networks are closely regulated by a number of specialized entities who influence a number of factors related to the development of major transmission including the rates charged for service over such lines and the line ratings. Principal agencies include the Federal Energy Regulatory Commission (FERC), the North American Electric Reliability Corporation (NERC), and the Western Electricity Coordinating Committee (WECC).

- **FERC** regulates the transmission and wholesale sales of electricity in interstate commerce, reviews the siting applications for electric transmission projects under limited circumstances, and protects the reliability of the high voltage interstate transmission system through mandatory reliability standards.
- **NERC** works to ensure the reliability of the bulk power system in North America through development and enforcement of reliability standards and annual assessment of seasonal and long-term reliability.
- **WECC** supports entities throughout the Western Interconnection as they carry out their reliability missions.

## The Role of the Idaho Public Utilities Commission in Regulating the Idaho High-Voltage Electricity Backbone

Under Idaho’s state law, the Idaho Public Utilities Commission (Commission) supervises and regulates Idaho’s investor-owned utilities to ensure that customers receive adequate service at just and reasonable rates. It does not regulate municipal or cooperative utilities or the Bonneville Power Administration. The Idaho Legislature has granted the Commission quasi-legislative and quasi-judicial authority in Titles 61 and 62 of Idaho Code. In its quasi-legislative capacity, the Commission sets retail rates and makes rules governing utility operations. When a utility requests a rate increase for its retail customers, the Commission staff examines the utility’s revenues, expenses, and investments to determine the amount needed for the utility to reasonably recover its costs and earn a fair return on its investments. As a result, the ability for utilities to recover costs associated with transmission investment is critical to the utility’s ability to continue to invest in the transmission infrastructure needed to safely and reliably serve its customers.
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1 — Introduction

Transmission Systems – Making Distance Irrelevant

Electrical transmission systems are sophisticated technological infrastructures with the principal mission of collecting huge amounts of energy from power generation sites, often far away from the point of ultimate use, and delivering it reliably and safely to ratepayers with as little loss of energy and value as possible.

High capacity power generation facilities are localized, while people and their power-using enterprises are comparatively spread out, especially in Idaho. Transmission networks everywhere have evolved in a kind of hub-and-spoke pattern, to cost-effectively move electrical power from isolated generation sites to a widespread network of end uses. The use of high-voltage transmission facilities is the key to accomplishing this with a minimum of value degradation due to resistance losses. So a principal technical aim of utility transmission is to make distance irrelevant.

An arterial transmission network is also a sophisticated market device, which can coordinate and support the delivery, by different and even competitive suppliers, of electrical power to users. And an arterial transmission network, as a large high-capital installation, inevitably attracts and funds a high level of technical and commercial attention to its planning, use and maintenance. This level of attention is crucial for an infrastructure network that needs to be secure, reliable, economical, and rapidly adaptable to changing demands and economic circumstances.

Introduction to Transmission System Components

Electric power is produced at generating stations and transmitted to consumers through a complex network of individual components, including transmission lines, transformers, and switching devices.

It is common practice to classify the transmission network into the following subsystems:

- Transmission system
- Subtransmission system
- Distribution system

The transmission system connects all major generation stations and main load centers in the system. It forms the backbone of the integrated power system and operates at the highest voltage levels (typically 230 kV and above). The generation voltages are usually in the range of 11,000 V to 35,000 V (11 kV to 35 kV). At the generation plant substation, the electrical current is stepped up, via large transformers, to the transmission voltage level, and power is transmitted to transmission substations where the voltages are stepped down to the subtransmission level.
(typically, 69 kV to 138 kV). The generation and transmission subsystems are often referred to as the bulk power system.

The subtransmission system transmits electricity in smaller quantities from the transmission substations to the distribution substations. Large industrial customers are commonly supplied directly from the subtransmission system.

The distribution system represents the final stage in the transfer of electricity to the individual customers. The primary distribution voltage is typically between 4.0 kV and 34.5 kV. Small industrial customers are supplied by primary feeders at this voltage level. The secondary distribution feeders supply residential and commercial customers at 120/240 V.

The sketch below shows the relationship between electrical power from two generation sites, in this case, a coal-fired power station and a wind farm, with the overhead and underground lines and substation facilities between the power plants and the end users.
2 – Electricity Transmission in Idaho – Current Status

Figure 3. WECC Transmission Map (used with permission)
WECC’s transmission map above provides at least two eloquent statements about human life in Idaho. One statement is that almost no one lives in the mid-section; the other statement is that the top of Idaho and the bottom of Idaho don’t appear to be securely joined together.

WECC’s map also dramatically shows, using graphic colors, the routing and spacing of the major electrical transmission arterials that pass through, in and out of Idaho. The colored lines represent the heavyweight division in utility transmission, lines that carry voltages of 230 kV and upward to include the 500 kV lines. Lower-voltage regional and local transmission routes, up to 138 kV, are shown in black. The electricity network shown conveys a useful overall picture of economic life in Idaho, showing patterns of residential and industrial power use, the locations of Idaho-based generation (most of it hydroelectric, but with a growing complement of gas-fired generation), and connections to the electrical grid serving the other states surrounding Idaho.

**Transmission Providers in Idaho and the DNA of American Electrification**

The structure of today’s Idaho transmission network reveals an engaging story about the network’s origins and evolution. If we look into the current members of Idaho’s transmission family, we can see artifacts of the beginnings of early 20th century electrification in the form of today’s municipal utilities, electric cooperatives and irrigation districts, which still participate in the transmission network, mostly at the local end.

The rise of the large investor-owned regulated monopoly utilities is clearly marked on the map, with Idaho Power, Rocky Mountain Power and Avista (formerly Washington Water Power) today being owners and custodians of high-voltage service to Idaho consumers.

The New Deal federal power authority phenomenon is vividly marked on the Idaho map. The vast Bonneville Power Administration delineates its high-voltage and high-capacity territory along Idaho’s western border.

**Species of Transmission Entities – A Natural History**

There are a number of types of organizations that participate in the U.S. electrical transmission industry. Below is a brief discussion of various transmission types that participate in the Idaho transmission network.

- **Investor-owned electric utilities (IOUs)** – These are the well-known big utility companies: usually multi-state operations with regulatory compacts/obligations to serve ratepayers, regulated by state public utility commissions and federal government authorities such as FERC. The big IOUs in Idaho are Idaho Power, Rocky Mountain Power and Avista.
- **Federal Power Administrations** – The TVA was famously the flagship federal power administration in the U.S. Southeast. Closer to home are BPA and WAPA. BPA, the
northwest’s regional power administration, is a principal transmission contributor to the Idaho system and a key overseer of regional power flows affecting Idaho’s energy exchanges with the grids of other states within BPA’s regional portfolio.

- **Consumer-owned utilities** – A number of cities and rural areas in Idaho participate in the transmission systems as participant buyers and sometimes suppliers of electricity from local generation. A number of Idaho cities host generation as part of their interaction with the Idaho transmission network. Idaho’s numerous REAs and co-ops often handle large local loads for mining, agriculture and industrial activity, sometimes generating locally and universally using power from the Idaho grid.

- **Merchant transmission entities** – In some areas of the U.S., transmission service is provided by a dedicated transmission company whose whole business is transmission service sold or contracted to upstream generators and downstream distributors. Merchant transmission or independent transmission services are not operating in Idaho, and some merchant transmission projects are in various stages of early planning. One merchant transmission project with Idaho interconnections has been permitted – The Southwest Interconnection Project running from Shoshone, Idaho to Las Vegas. This project, owned by LS Power and NV Energy, is awaiting the development of demand to begin active development of the line.

## The Management of Transmission Service in Idaho: Who’s In Charge?

That’s right: who’s in charge? The Idaho transmission network is a complicated entity: partly private, partly public, in-state and interstate, and an economic and human survival asset of critical significance to the general welfare of people in Idaho.

The management of a statewide electric transmission network is formidably complicated, involving the utility companies, state public utility commissions, federal regulators, utility reliability and coordinating councils, security concerns, and market conditions.

At the technical level, transmission management deals most directly with the interaction of capacity, geography, and population density. The transmission lines into and across the state of Idaho are divided geographically into paths. The capacity of each path is determined by either the electrical utility or through an industry peer-reviewed study process. In most cases, the electrical capacity of a transmission path is limited for reliability purposes, so that if a single element on the transmission system is unexpectedly lost, power can still be transferred, and electrical customers will not be affected.

The capacity associated with a transmission path can be used for multiple purposes. The majority of the transmission in the state of Idaho is used to serve Idaho customers, and therefore Idaho customers pay for the majority of the cost (capital investment and operating expense) through their utility bills. Since Idaho customers pay this majority cost for the
transmission lines in Idaho, they have access to the transmission capacity first and the capacity is set aside for Idaho customer use.

As electrical demand varies throughout the year, there are large periods of time where the capacity on the Idaho transmission system exceeds what Idaho customers’ need.

This excess transmission capacity can be sold to other electric entities. However, the BPA holds a long-term firm Network transmission agreement to serve its customers located with the Idaho Power transmission system. Under the terms of this agreement, service to BPA customers has the same priority as Idaho Power’s retail customers. BPA has been purchasing some form of firm transmission service from Idaho Power since the 1960s. It is only when Idaho customers and BPA are not utilizing the transmission that it will be sold. In the case the capacity is sold, Idaho customers and BPA receive credit for the use of these lines by others, thus, income from electrical wheeling directly offsets the cost of transmission that Idaho customers pay.

Under state law, the Idaho Public Utilities Commission supervises and regulates Idaho’s investor-owned utilities to ensure that customers receive adequate service at just and reasonable rates. It does not regulate municipal or cooperative utilities or Bonneville Power Administration. The Idaho Legislature has granted the Commission quasi-legislative and quasi-judicial authority in Titles 61 and 62 of Idaho Code. In its quasi-legislative capacity, the Commission sets rates and makes rules governing utility operations. When a utility requests a rate increase, the Commission staff examines the utility’s revenues, expenses, and investments to determine the amount needed for the utility to reasonably recover its costs and earn a fair return on its investments. As a result, unless transmission and other utility investments are deemed reasonable and appropriate, it may not be able to recover costs and earn a return on these investments.

**A Quick Guide to Idaho’s High-Voltage Transmission**

**Entities/Owners**

<table>
<thead>
<tr>
<th>Avista</th>
<th>Connected Load in Idaho: 0.7 GW</th>
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<td>An investor-owned utility based in Washington, Avista owns and operates transmission serving its client loads in Washington, Montana and Idaho. Avista transmission within Idaho is found in the northern half of the state, and notably includes two 230 kV lines passing through Idaho and connecting Avista assets in Washington and Montana. The Avista 230 kV transmission lines are the backbone of Avista’s Transmission System and consist of two “rings” centered near the Spokane/Coeur D’Alene area and the Lewiston/Clarkston area. The two rings are interconnected north to south at the Benewah Station in Idaho. The Avista generation resources bringing energy to the Idaho area include western Montana hydroelectric generation, natural gas fired combustion turbines and combined cycle combustion turbines in</td>
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northern Idaho, the 500/230 kV Substation at Hot Springs Station in western Montana, the 500/230 kV Substation at Hatwai in Lewiston, Idaho, and local generation resources on the Spokane River.

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<th>BPA</th>
<th>Connected Load in Idaho: N/A</th>
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<td></td>
<td>BPA is not a commercial wholesaler or retailer of electrical capacity; rather, it represents the federal government’s Pacific Northwest ownership and coordination of regional and interstate capacity transfers among utilities to increase reliability throughout the region and provide a broad base for balancing supply with changes in regional load. BPA’s Pacific Northwest asset inventory includes a number of 500 kV and 1,000 kV high-capacity lines that link up with IOUs throughout the region. BPA’s high-voltage electric grid links virtually all utilities in the Northwest. Utilities that generate their own power often rely on BPA’s system rather than building their own transmission lines, which reduces the number of power lines that span the landscape. BPA owns and operates the Federal Columbia River Transmission System (FCRTS), which consists of all federally owned transmission lines and facilities in the Pacific Northwest. BPA operates and maintains about three-fourths of the high-voltage transmission in its service territory. BPA’s service territory includes Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah and Wyoming. BPA’s supply prominence in Idaho is focused on the northern part of Idaho through its connections with Avista’s 230 kV Coeur d’Alene and Clarkston rings. In southeastern Idaho, BPA provides service to 14 consumer owned utilities via connection with PacifiCorp, the parent company of Rocky Mountain Power and with Idaho Power.</td>
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<tr>
<th>Idaho Power</th>
<th>Connected Load in Idaho: ~3.7 GW</th>
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<td></td>
<td>Idaho’s home-state IOU utility, based in Boise, provides electrical power to a wide swath of loads across the southern half of the state, particularly the Snake River and Boise River basins. Idaho Power territory notably includes the state’s biggest population concentrations in the Boise area, and also extends its transmission service northward in Idaho and westward into eastern Oregon. Idaho Power owns and operates an extensive network of lines along its transmission corridor, including 345 kV lines, 230 kV lines, 161 kV lines, and 138 kV lines. Idaho Power’s generation resource includes its great capital fleet of hydroelectric dams on the Snake River and lower Salmon River. Idaho Power also has an interest in coal-fired generation out of state, including the Jim Bridger plant in Wyoming and North Valmy plant in Nevada.</td>
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| PacifiCorp (Rocky Mountain Power) | PacifiCorp is one of the West’s leading utilities, serving approximately 1.8 million customers in six western states. PacifiCorp was formed in 1984, when its electric utility, natural resource development and telecommunications businesses grew into full-fledged enterprises. In 1989, it merged with Utah Power & Light. Today PacifiCorp is part of Berkshire Hathaway Energy and the business unit under PacifiCorp that delivers power to customers in Utah, Idaho, and Wyoming is called Rocky Mountain Power (RMP). Rocky Mountain Power owns and operates a system of over 1,800 miles of electric transmission facilities in Idaho. This includes approximately 154 miles of 500 kV transmission lines, 414 miles of 345 kV transmission lines, and 210 miles of 230 kV transmission lines.

RMP’s generation fleet includes hydroelectric sites in Idaho totaling more than 84.35 MW of capacity. RMP also purchases electrical power from a number of qualifying Idaho sources, typically wind and hydro resources. RMP’s parent company, PacifiCorp, is a co-owner of the Jim Bridger coal-fired plant in Wyoming with Idaho Power. The RMP system is notable for serving a number of large mining loads in central and eastern Idaho, particularly Caribou County. |
| Electric Cooperative, Mutual, and Municipal Utilities in Idaho | There are 28 rural electric cooperatives, mutuals, and municipalities providing electric service in Idaho.

These utilities serve more than 130,000 customers in Idaho, accounting for 16% of Idaho’s load. Most of these utilities collaborate under the Idaho Consumer Owned Utilities Association on issues of administrative, governmental, and regulatory significance.

**Fall River Rural Electric Co-Op** is an electric cooperative, owned by those it serves and governed by a nine-member Board of Directors. The Cooperative serves nearly 16,000 member connections throughout rural areas in southeast Idaho, western Wyoming, and southwest Montana. Fall River Electric Co-Op has a line from Romset to West Yellowstone which is 5.64 miles and was constructed at 115 KV and 1 mile constructed at 69 KV, all operated at 46 KV.

**Idaho Falls Power** is a municipal electric utility serving the corporate city limits of Idaho Falls, Idaho. The City has operated the utility continuously since its establishment in 1900. Idaho Falls Power has approximately 18 miles of 161 kV |
# Near Term and Future Needs for Electricity Transmission in Idaho

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<th><strong>Avista</strong></th>
<th><strong>Coeur d’ Alene Area</strong></th>
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<td>Avista’s Coeur d’ Alene area represents roughly 22% of Avista area load. Planned spending is distributed primarily to mitigate plant condition issues followed by reliability needs, with example projects including rebuilds of the Coeur d’Alene – Pine Creek and Cabinet – Bronx – Sand Creek 115 kV transmission lines and the Noxon Rapids 230 kV Station Rebuild project.</td>
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<th><strong>Lewiston and Clarkston Area</strong></th>
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<td>Avista’s Lewiston – Clarkson area represents roughly 16% of Avista area load. Projects in this area are primarily directed at reliability issues, with notable projects including a 230 kV Voltage Control project and an upgrade to the Clearwater Station.</td>
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<th><strong>BPA</strong></th>
<th><strong>Montana to Washington Transmission System Upgrade Project</strong></th>
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<td>The purpose is to increase available transmission capacity from BPA’s Garrison Substation in Western Montana to power markets west of the Cascades that serve the entire Northwest.</td>
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<th><strong>Southeast Idaho Load Service</strong></th>
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<td>BPA has been evaluating alternative ways to meet its power supply and transmission service obligations to its preference customers located in southeast Idaho following PacifiCorp’s notice of termination of the legacy agreement (dating back to the 1960s) in 2011. BPA’s SE customers served by the PacifiCorp exchange agreement is approximately 250 aMW and 450 MW winter peaking. One possible solution is participation with Idaho Power and PacifiCorp in the 500-kilovolt Boardman to Hemingway Transmission Project (B2H). Currently, BPA is funding its proportional share of the B2H permitting cost.</td>
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<th><strong>Hooper Springs Transmission Project</strong></th>
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<td>BPA is proposing to build a new 115 kV transmission line and a new 138/115-kV substation called Hooper Springs Substation in Caribou County, Idaho. The new transmission line and substation are needed to improve voltage stability on the transmission grid and to meet future load growth.</td>
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<td>Idaho Power projects demand growth in its service territory to be 36% in the next 20 years, up to 4,500 MW of connected load in Idaho. Currently,</td>
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**Power**

Transmission into and across southern Idaho is fully subscribed. Idaho Power also needs to serve new generation resources, probably from gas-fired generation inside and outside the state. Idaho Power also needs to make infrastructure improvements related to regional and national interconnections.

**Gateway West and Boardman-to-Hemingway Projects**

Idaho Power, PacifiCorp, and BPA all have transmission requirements that are scheduled to be met by a combination of the Gateway West and Boardman to Hemingway transmission projects.

**Reliability Maintenance/Improvement Projects**

Transmission is also needed to maintain/improve reliability in the Idaho Power transmission network. Two projects are under development to address service reliability for the Wood River valley.

The King – Wood River 138 kV transmission line from Hagerman to Hailey will be rebuilt with an increased conductor size for continued service of the entire Wood River during the outage of the Midpoint (between Shoshone and Jerome) – Wood River line.

The Wood River to Ketchum line provides for continued service during outage of the existing radial transmission line between Hailey and Ketchum.

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**RMP**

The largest service area in Idaho for Rocky Mountain Power is the Goshen Area in eastern Idaho. Rocky Mountain Power has projects planned in this area in order to maintain and improve reliability. A full list of projects Rocky Mountain Power has planned can be found in Section 5 of this document. The transmission projects are planned in order to improve reliability.

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**Suggestions and Concerns Received from Other Idaho Utility Entities**

A number of Idaho utility companies, particularly local and retail utility suppliers, have provided comments to this report. All comments received to date have emphasized the need for additional capacity and reliability on lines connecting them to backbone suppliers, and on the EHV lines operated by backbone suppliers themselves. The 500 kV Gateway West Project receives fervent support by utility commentators, as well as a strengthening of BPA’s high-capacity supplier role to the Southwest Idaho region. Key transmission supplies to Northern Idaho have prompted concerns by area utilities about the security and reliability of existing transmission performance in radial lines connecting with the Washington-to-Montana assets operated by Avista and BPA.
4 – OPPORTUNITIES AND OBSTACLES FOR DEVELOPING NEW ELECTRICITY TRANSMISSION RESOURCES

The Market

<table>
<thead>
<tr>
<th>Market Opportunities</th>
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<tbody>
<tr>
<td>Continuing population and GDP growth in Idaho will increase demand.</td>
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<tr>
<td>Moderate natural gas pricing supports development of new gas-fired generation capacity.</td>
</tr>
<tr>
<td>Moderate electrical power rates encourage commercial and industrial development.</td>
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<tr>
<td>Development (if any) of large wind and solar generation resources may stimulate new high-capacity line routing in Idaho.</td>
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<table>
<thead>
<tr>
<th>Market Obstacles</th>
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<tbody>
<tr>
<td>Financial and investor uncertainty impede commitment of capital.</td>
</tr>
<tr>
<td>Investment in transmission can seem to be a mundane type of investment, compared to more high-yield or high-earnings investment.</td>
</tr>
<tr>
<td>Uncertain outcomes in energy system project development means risk, and risk means higher cost.</td>
</tr>
<tr>
<td>Building transmission today is very difficult as utilities try to find the most economical route which usually is the most challenging due to access road locations and potential impacts to residents, businesses, wetlands, wildlife, timber harvest, and other resources. The preferred route could be the most expensive alternative (not the easiest) to construct, but may provide a way forward that would limit project impacts and disruptions across a broad array of communities and neighborhoods, manages costs to property owners, and achieves the goal of preserving transmission system reliability and/or commercial usage. However, the wholesale customer and/or ratepayer cost may increase to accommodate the new route.</td>
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Environmental and Permitting

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<tr>
<th>Environmental and Permitting Opportunities</th>
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<tr>
<td>Are some federal agencies and departments getting faster with reviews, leasing, etc.? The answer is no. Opportunities to improve and accelerate federal processes for reviews, leasing, and other associated work may exist; it is the general consensus that the federal process is cumbersome.</td>
</tr>
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</table>
The WGA, BLM, and WECC are attempting to streamline and improve the process by facilitating permitting of transmission projects, such as tempering clearance requirements, etc.

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<thead>
<tr>
<th>Environmental and Permitting Obstacles</th>
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<tr>
<td>On occasion, utilities experience delays in permitting that are detrimental to the purpose and need of the project.</td>
</tr>
<tr>
<td>There’s a fair amount of NIMBY (Not In My Back Yard) sentiment. Many recent incomers to Idaho figure they’re fleeing from things like growth and transmission line installation. See, in Glossary, “NOPE” and “BANANA.” Managing public involvement is formidably expensive and time consuming.</td>
</tr>
<tr>
<td>Climate change regulations can complicate and slow down utility planning processes.</td>
</tr>
<tr>
<td>No matter where you pick to build something, somebody likes that spot just the way it is. You will hear from them.</td>
</tr>
</tbody>
</table>

**National Environmental Act (NEPA) Process**
- Federal government/agencies suffer from an inability to timely permit transmission projects
- The permitting process is focused on environmental impacts – this has a tendency to force projects onto private property
- There are very limited available corridors left for transmission lines in southern Idaho due to Greater Sage-Grouse and other environmental constraints, coupled with private property interests
- If steppe sage habitat continues to decline (primarily due to fires) more species could become endangered, and more constraints could be placed on BLM-managed and other lands which would further limit the ability to route transmission projects
- Schedule overruns negatively impact purpose and need for the project

**The Technology of Transmission**

<table>
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<tr>
<th>Technical Opportunities</th>
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<tbody>
<tr>
<td>Transmission design and construction technology continues to get better.</td>
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<tr>
<td>Sophisticated transmission and distribution gear can improve utility management of line security, capacity and reliability.</td>
</tr>
<tr>
<td>Smart Grid technological developments can be expected to provide a higher</td>
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and more active communications and control technology at the subtransmission and distribution level. Smart Grid is a general nickname for many related and interactive controls capabilities, usually housed within distribution substations, for monitoring and throttling local power delivery for optimum reliability and energy utilization, as well as monitoring and troubleshooting system performance at the local level.

GIS-based routing tools assist greatly in the routing/siting of transmission lines. Information can come from a variety of resources and can be updated throughout the process.

Transmission infrastructure developers can benefit from identification of constraints (Areas of Critical Environmental Concern, sage grouse habitat) and opportunities (existing infrastructure such as roads, pipelines, and transmission lines if reliability requirements allow) for input into the routing tool. There are several tools available for use. Most utilize a “weighting” of constraints approach, from exclusionary (total avoidance) to areas of opportunities and determine the best transmission route for the project. This is a great tool for public input to include their routing constraints as well as environmental. This route is then field verified to determine if it is constructible and if any resources along the route have been either misidentified or unidentified.

The Western Governors Association has sponsored a website that collects cultural and other information to assist project proponents in preliminary siting/routing activities.

Upgrading existing transmission lines with new technology/low-sag conductors could increase line capacity without requiring a total rebuild of existing lines, or siting and permitting a new line.

During the past five years, BPA and Idaho Falls Power participated in the largest Smart Grid Demonstration Project in the United States. Projects include (but not limited to): Home energy systems, distributed generation, batteries, smart appliances, voltage optimization tools, as well as exploring ways to integrate solar and wind resources by increasing or decreasing load, in real time, based on the needs of the system. BPA, in addition to its involvement in Smart Grid, began offering 15-minute scheduling on its transmission system. The option of buying, selling and transmitting energy in the shorter time frame provides more market flexibility to respond to unexpected changes in power generation and demand, making more effective use of available transmission lines to deliver energy. By offering 15-minute scheduling, BPA meets requirements to help remove barriers to integrating variable energy resources included in Federal Energy Regulatory Commission Order 764. BPA currently has more than 4,500 megawatts of
wind energy connected to its transmission system and expects that number to increase as state and national policies and other factors drive additional development of renewable resources.

<table>
<thead>
<tr>
<th>Technical Obstacles</th>
<th>Electromagnetic Fields (EMF) continues to be a concern for many citizens and consumers, and poses some unknown for utility engineers as well. It has been questioned whether long-term public exposure to electric and magnetic fields produced through the generation, transmission and use of electric power might adversely affect our health. Over the last 25 years, numerous research studies and scientific reviews have been conducted to address this question. In 1999, the National Institute of Environmental Health Sciences (NIEHS) reported to the U.S. Congress that the overall scientific evidence for human health risk from EMF exposure was determined to be “weak” and that aggressive regulatory action was not warranted. However, the agency also concluded that EMF exposure could not yet be recognized as entirely safe because of weak scientific evidence that exposure may pose a small risk related to childhood leukemia. As such, NIEHS recommended a more passive approach with emphasis on additional scientific research and continued public/regulatory education. The last 10 years of additional EMF research and investigations have not yet prompted any significant change to this position. The best transmission line routes are taken. Additional routes are more difficult to develop and permit. Extra High Voltage (EHV) underground is cost prohibitive.</th>
</tr>
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| Competing Uses and Public Interactions | Interaction Opportunities | Use of non-specular conductor greatly reduces the visual impacts of the wire. Different structure types can also be used to minimize visual or other impacts, including: lattice structures, “H-frame” structures, and mono-pole structures. Finishes other than galvanizing can be used to reduce visual impacts of the structures, such as dulled galvanizing, weathering steel, and painted steel. Some options may be cost-prohibitive or maintenance-intensive for certain types of structures. |
Utilizing the terrain during structure spotting is also a typical way to decrease the visual impacts of transmission lines.

| Interaction Obstacles | Historically, transmission line developers and operators have regularly dealt with induced voltage concerns, both for people and animals (dairies). This is usually termed “stray voltage” instead of “induced voltage.” This typically occurs on parallel, metal objects such as wire fences and irrigation pipes. Proper engineering and installation can minimize induced voltage effects. Requirements to mitigate these effects are in the National Electrical Safety Code (NESC).
Routing is sometimes complicated by flight patterns for aerial farming applications vs. routing of transmission lines/siting of transmission towers.
Farming/equipment accidents around structures, or the apparent risk of them, can sometimes complicate routing.
Transmission Radio Frequency interference with GIS-based farming operations is sometimes a concern for routing in agricultural areas. |

| Reliability Opportunities | New transmission projects have the opportunity to increase reliability. Adequate separation between lines for reliability purposes is needed, which means more real estate. This only works if new right of ways are available, use of existing right of ways may limit this opportunity. |

| Reliability Obstacles | Permitting agencies using WECC transmission circuit adjacency as a siting criterion (the language from TPL-001-WECC-CRT-2.1 Regional Criterion) beyond its intended use for establishing consistent system performance.
Locating transmission lines in a corridor-style build-out is often preferred. However WECC separation “criteria” may preclude the project’s ability to do so.
Changes in WECC separation criteria brings uncertainty to the project siting. |

| Private Property Rights | These are limited due to the impacts that exist in perpetuity from transmission access through private property which limits opportunities for |
## Opportunities
- future land uses.

<table>
<thead>
<tr>
<th>Property Rights Obstacles</th>
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<tbody>
<tr>
<td>Concerns about private property interests not having a voice in the NEPA process are frequently encountered in the permitting process.</td>
</tr>
<tr>
<td>Transmission line developers deal with concerns about transmission line interference (including tower spotting) with GIS-based farming practices depending upon which system is utilized by the farmer.</td>
</tr>
<tr>
<td>Location of transmission lines on private property can raise questions and fears about impacts to property values.</td>
</tr>
<tr>
<td>Property owners may not want to grant an easement in perpetuity, preferring to structure it more like a wind farm arrangement where they receive annual compensation. This can add cost or market risk to the project ledger.</td>
</tr>
<tr>
<td>Landowners may fear that once a transmission line is permitted, it will lead to other transmission lines paralleling the one permitted.</td>
</tr>
</tbody>
</table>

### 5 – Description of Current, Near-Term and Future Planned Electricity Transmission Projects

| Joint Utility | **Boardman to Hemingway:** PacifiCorp, Bonneville Power Administration (BPA), and Idaho Power jointly propose to design, construct, operate, and maintain a new 500 kV single-circuit electric transmission line from a proposed substation near Boardman, Oregon to the Hemingway Substation near Melba, Idaho, known as the Boardman to Hemingway Transmission Line Project or B2H Project. Idaho Power is leading the permitting process for the Project. The B2H Project would provide additional capacity for exchanging energy between the Pacific Northwest and the Intermountain West, depending on which region is experiencing the highest demand. The Project would also serve load, improve reliability, interconnect resources, and take advantage of seasonal and near-term load and generation diversity between regions. Status: Federal permitting in the Draft Environmental Impact Statement Process. |
| **Gateway West:** This project is jointly proposed by Rocky Mountain Power and Idaho Power to build and operate approximately 1,000 miles of new high-voltage transmission lines between the Windstar substation... |
near Glenrock, Wyoming and the Hemingway substation near Melba, Idaho. The project would include approximately 150 miles of 230 kV lines in Wyoming and approximately 850 miles of 500 kV lines in Wyoming and Idaho. Rocky Mountain Power and Idaho Power are building this new transmission line to provide electricity to meet increasing customer needs. It will deliver power from existing and future electric resources including renewable resources such as wind energy. In addition, the line will provide strength and reliability to the region’s transmission system. The project is scheduled for line segments to be completed in phases between 2020 and 2024. Status – Federal permitting in the Final Environmental Impact Statement process released for most of the project. Two segments in southwestern Idaho are requiring a supplemental EIS.

<table>
<thead>
<tr>
<th>Avista</th>
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<tr>
<td><strong>Coeur d’Alene Area</strong></td>
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<tr>
<td><strong>Noxon Rapids 230 kV Station Rebuild:</strong> The station is in need of a rebuild due to the present age and condition of the equipment. The station is the interconnection point of the Noxon Rapids Hydro Electric Dam and a significant asset in the reliable operation of the Western Montana Hydro (defined as the combination of Noxon Rapids, Cabinet Gorge, Hungry Horse, and Libby generation) Complex. An unplanned outage caused by equipment failure or other means causes curtailment of the local generation facilities.</td>
</tr>
<tr>
<td><strong>Cabinet Gorge Switching Station:</strong> A new 230 kV switching station located along the transmission line right of way south of Cabinet Gorge has been proposed. Completion of the project may reduce generation capacity restrictions during certain outage conditions.</td>
</tr>
<tr>
<td><strong>Pine Creek 230/115 kV Transformer Replacement:</strong> The Substation Engineering Group has identified the need to existing devices with a single 125 MVA autotransformer. The new transformer will be specified to match Avista’s present standard configuration.</td>
</tr>
<tr>
<td><strong>Noxon – Pine Creek #2 230 kV Transmission Line:</strong> The existing Noxon – Pine Creek 230 kV Transmission Line is constructed as a double circuit transmission line 60% of the total length from Noxon Station. The completion of the double circuit across the remaining 40% of the line would provide two 230 kV transmission lines from Noxon to Pine Creek to improve transfer capability from the Clark Fork complex. Other alternatives are under consideration.</td>
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| Avista – Lewiston / Clarkston Area |
Hatwai – Lolo #2 230 kV Transmission Line: A second 230 kV transmission line from Hatwai to Lolo and bypassing the Lolo Station to create a Hatwai – Oxbow 230 kV Transmission Line has been proposed. Presently, the outage of the Hatwai – Lolo 230 kV Transmission Line followed by a second 230 kV transmission line outage in the Lewiston/Clarkston area requires the back tripping of the Lolo – Oxbow 230 kV Transmission Line. Construction of the proposed transmission line is desired to eliminate the need for the back tripping scheme.

230 kV Voltage Control: There is an ongoing issue with high voltage on the 230 kV transmission system in the Lewiston/Clarkston area. The high voltage problem is persistent most months of the year (the exception is heavy summer loading) and the high voltage peaks during the overnight hours. The high voltage condition is a result of the expansion of Avista’s 230 kV transmission network. Although there are many benefits to a large networked transmission system, one negative outcome is that long, lightly loaded transmission lines produce large amounts of line charging current (leading reactive MVAR), increasing system voltage. Presently, there is no practical way to correct the high voltage issue with the existing 230 kV transmission system beyond taking lines out of service. A plan has been developed to install two 50 MVAR switchable reactors at one of the 230 kV stations in the area.

Idaho Power

Rebuild Goshen-Big Grassy 161 kV Line: Rebuild existing 70+ year old 161 kV line.

Hemingway-Bowmont 230 kV line: Add the 230 kV line circuit on existing structures from Hemingway to Bowmont to integrate B2H into Treasure Valley.

Hubbard-Bowmont 230 kV Line: This project uprates the existing 138 kV line from Bowmont-Hubbard to 230 kV, to integrate B2H project into Treasure Valley.

Gateway West Bridger to Populus 500 kV Line: Build a new 500 kV transmission line from Jim Bridger station in Wyoming to Populus station in southeastern Idaho.

PacifiCorp (Rocky Mountain Power)

Goshen to Rigby Radial Tap Line Reconductoring: Replace 7 miles of conductor to increase line capacity from 21 MVA to 66 MVA and support voltage in the area.

Goshen to Jefferson Street 161 kV Rebuild: Rebuild the line to mitigate clearance issues and improve reliability.

Summer Lake-Midpoint Loop Reconstruction: Reconstruction of
loop line to facilitate maintenance work without outages and facilitate interconnection with 500 kV Gateway west line.

**Kinport to Goshen 230 kV Line:** Install a new 230 kV line to increase load service capability in the Goshen area by 300 MW, and to reduce loading on the Idaho Power Don to Blackfoot 138 kV line.

| Bonneville Power Administration | Montana to Washington: Upgrade to existing transmission system in Montana, Idaho and Washington to increase available transmission capacity from PBA’s Garrison Substation to power markets west of the Cascades. This is still in the decision making process. |
| Fall River Rural Electric Co-Op | Huntsman Springs to Tetonia: Construction of a 7.3 mile 69 KV (operated at 46 KV) line; construction slated for the summer of 2015. |
| Idaho Falls Power | **161 kV line:** Idaho Falls Power is in the process of planning to build another 18 miles of 161 kV. |

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**6 – 2012 Idaho Energy Plan Electrical Transmission Recommended Policies and Actions**

In 2007, the Idaho Legislature’s Interim Committee on Energy, Environment and Technology (Committee) submitted for consideration to the Idaho Governor and Legislature the first integrated energy plan (2007 Idaho Energy Plan), with an accompanying Minority Report. This plan was adopted by the Legislature and Governor. As part of the 2007 Plan, the Committee recommended (and HCR 013 [First Regular Session 2007] required) that the Legislature revisit the Idaho Energy Plan every five years in an effort to assure the facts and recommendations contained in the Plan continue to reflect the best interests of Idaho businesses and citizens. This 2012 update to the 2007 Plan is intended to accomplish this goal.

The 2012 Idaho Energy Plan is centered on five objectives of Idaho’s energy future: (1) Ensure a secure, reliable and stable energy system for the citizens and businesses of Idaho; (2)
Maintain Idaho’s low-cost energy supply and ensure access to affordable energy for all Idahoans; (3) Protect Idaho’s public health, safety, and natural environment and conserve Idaho’s natural resources; (4) Promote sustainable economic growth, job creation, and rural economic development; and (5) Provide the means for Idaho’s energy Policies and Actions to adapt to changing circumstances.

The 2012 Idaho Energy Plan offered policy guidance and recommended actions to help achieve these objectives. The following are the policy guidance and recommendations that relate to electricity transmission, using the policy and actions numbering system found in the Energy Plan:

**Electricity Resources**

**Policies**

2 – Align legislative policies, regulatory policies, and state agency activity to consistently reinforce and support state objectives regarding energy efficiency, energy production, and delivery.

**Actions**

E-4 – Idaho’s electric utilities should continue evaluating transmission as a resource option in resource planning and should continue participating in the development of local, sub-regional and regional, national, and international transmission plans to construct transmission facilities that are needed to provide reliable, low-cost energy service to their customers.

**Electricity Transmission**

**Policies**

5 – It is Idaho policy to encourage a stable, robust, reliable transmission system in order to provide low-cost energy to Idaho consumers and facilitate renewable generation.

**Actions**

E-16 – Idaho should continue participating in regional efforts aimed at increasing the capability of the western transmission grid and bringing to Idaho the benefits of cost-effective remote resources.
Summary of Transmission Line Permitting Steps and Requirements (Idaho Power)

Federal Process

- Idaho State agencies, counties, local agencies, and municipalities can become Cooperating Agencies (or Coordinating Agencies) in the federal NEPA process to be included as a voice in the federal process
- NEPA Permitting Process (BLM-led)
  - Application (SF299)
  - Notice of Intent (NOI) published in the Federal Register
  - Scoping period (to allow for public input on proposed routes and to develop alternate routes for analysis)
  - BLM works with cooperators and consultants to develop a Draft Environmental Impact Statement
  - Notice of Availability (NOA) published in the Federal Register for a Draft EIS
  - Public comment period for the Draft EIS
  - BLM works with cooperators and consultants to develop a Final EIS
  - NOA published in the Federal Register for a Final EIS
  - Public comment period for the Final EIS
  - BLM issues a Record of Decision
  - BLM issues a Notice to Proceed to the applicant
- BLM’s internal organizational structure does not allow for efficient siting of transmission line projects that cross multiple field office and/or state boundaries
- Even if a project is a priority for the federal administration, that does little to positively affect the local agency staff to make the project a priority for them

Idaho State Permitting Process

- There is no statewide citing process in Idaho. Idaho counties are responsible for permitting transmission lines within each county border pursuant to the Local Land Use Planning Act
- Each county has its own requirements for public notification, obtaining a Conditional Use Permit or Special Use Permit or no requirements for transmission projects
- By law, the Idaho Public Utilities Commission has back-stop siting authority for transmission, however, this law has never been tested

Miscellaneous

- Project purpose and need statements provide understanding to the federal, state and local governments for why the project is necessary and are critical to the transmission system
- Proponents should not count on the agency public outreach/public input process, but should develop a robust one of their own to run prior to or concurrent with the agency’s public outreach/public input process
Glossary

**Accelerated depreciation**: Any method of depreciation used for accounting or income tax purposes that allow greater deductions in the earlier years of the life of an asset, as opposed to straight-line depreciation that spreads the cost evenly over the life of an asset. Accelerated depreciation encourages capital projects, the benefits of which are passed on to utility customers in the form of updated and expanded generation, transmission and distribution infrastructure.

**Advanced Metering Infrastructure (AMI)**: AMI is the term coined to represent the networking technology of fixed network meter systems that go beyond automated meter reading (AMR) into remote utility management. The meters in an AMI system are often referred to as smart meters, since they often can use collected data based on programmed logic. Originally AMR devices just collected meter readings electronically and matched them with accounts. As technology has advanced, additional data could then be captured, stored and transmitted to the main computer and often the metering devices could be controlled remotely. Many AMR devices can also capture interval data and log meter events. The logged data can be used to collect or control time of use or rate of use data that can be used for energy or water usage profiling, time of use billing, demand forecasting, demand response, energy conservation enforcement, remote shutoff, etc.

**Aggregator**: Related to Direct Access. A company that consolidates a number of individual users and/or suppliers into a group in order to sell power in bulk.

**Alternating current (AC)**: Current for which the flow of electrons periodically reverses direction (as opposed to direct current where the flow of electrons is in one direction.

**Auction**: In the context of a cap and trade system, a process of bidding for greenhouse gas emission allowances.

**Automated meter reading (AMR)**: Technology of automatically collecting data from energy or water metering devices and transferring that data to a central database for billing and/or analysis. This form of utility data collection eliminates the need for each meter to be visually read by a technician, thereby reducing personnel costs.

**Avoided cost**: The cost to produce or otherwise procure electric power that an electric utility does not incur because it purchases this increment of power from a qualifying facility (QF). It may include a capacity payment and/or an energy payment component.

**Backup power**: Power provided by terms of the contract to a customer when the normal source is unavailable.

**Balancing**: That portion of generation capacity that must be set aside specifically to fill in any gaps between power demand and supply on a moment-to-moment basis to make sure the system stays in balance.
**BANANA**: Stands for “Build Absolutely Nothing Anywhere Near Anything,” a usually weary characterization of local sentiment opposing siting of a project or development, typically on grounds of resistance to perceived environmental or scenic impacts. See “NIMBY” and “NOPE.”

**Baseload**: The minimum amount of electric power or natural gas delivered or required over a given period of time at a steady rate. The minimum continuous load or demand in a power system over a given period of time.

**Baseload plant**: A plant that is normally operated to take all or part of the minimum continuous load of a system and that consequently produces electricity at an essentially constant rate. These plants are operated to maximize system mechanical and thermal efficiency and minimize system operating costs. Traditionally, coal, nuclear plants and some high efficiency natural gas plants have been considered baseload plants. Baseload plants are also required to firm intermittent energy resources such as wind or solar.

**Base rate**: A charge normally set through rate proceedings by appropriate regulatory agencies and fixed until reviewed at future proceedings. It is calculated through multiplication of the rate from the appropriate electric rate schedule by the level of consumption.

**Bonneville Power Administration (BPA)**: A power marketing and electric transmission agency of the U.S. government with headquarters in Portland, Oregon.

**Brokers**: Agents who match wholesale power buyers to sellers for a fee. They are subject to Federal Energy Regulatory Commission jurisdiction.

**Brownout**: A reduction in the voltage at which customers are supplied due to a power shortage, system or mechanical failure, or overuse by customers. Loads may not actually be disconnected, but brownouts can still be very harmful to electronic equipment, especially if prolonged. Brownouts may be noticeable to the consumer (such as flickering or dimming of lights) but are not always apparent.

**BTUs**: British thermal unit is a traditional unit of energy equal to about 1,055 joules. Production of 1 kWh of electricity generated in a thermal power plant requires about 10,000 BTUs. 1 gallon gasoline ≈ 125,000 BTUs.

**Capacity (electric)**: The maximum power that can be produced by a generating resource at specified times under specified conditions.

**Capacity factor**: A capacity factor is the ratio of the average power output from an electric power plant compared with its maximum output. Capacity factors vary greatly depending on the type of fuel that is used and the design of the plant. Baseload power plants are operated continuously at high output and have high capacity factors (reaching 100 percent). Geothermal, nuclear, coal plants, large hydroelectric and bioenergy plants that burn solid material are usually operated as baseload plants. Many renewable energy sources such as solar, wind and small hydroelectric power have lower capacity factors because their fuel (wind, sunlight or water) is not continuously available.
**Capacity, peaking:** The capacity of facilities or equipment normally used to supply incremental gas or electricity under extreme demand conditions. Peaking capacity is generally available for a limited number of days at a maximum rate.

**Class of service:** A group of customers with similar characteristics (e.g., residential, commercial, industrial, etc.) that are identified for the purpose of setting a rate for service.

**Commercial:** A sector of customers or service defined as non-manufacturing business establishments, including hotels, motels, restaurants, wholesale businesses, retail stores and health, social and educational institutions. A utility may classify the commercial sector as all consumers whose demand or annual use exceeds some specified limit. The limit may be set by the utility based on the rate schedule of the utility.

**Commission:** State public utility commission(s); the Federal Energy Regulatory Commission.

**Conservation:** Demand-side management (DSM) strategy for reducing generation capacity requirements by implementing programs to encourage customers to reduce their energy consumption. Program examples include incentives/savings for the installation of energy efficient appliances, lighting and electrical machinery, and weatherization materials.

**Control area:** A geographical area in which a utility is responsible for balancing generation and load. A control area approximates the service area of a utility.

**Cooperative electric utility (Co-op):** Private, not-for-profit electric utility legally established to be owned by and operated for the benefit of those using its service. It will generate, transmit and/or distribute supplies of electric energy to cooperative members. Such ventures are generally exempt from federal income tax laws. Many were initially financed by the Rural Electrification Administration, U.S. Department of Agriculture.

**Cost-based rate:** A rate based upon a projected cost of service and throughput level, contrasted with a market-based rate determined directly by supply and demand.

**Cost of capital:** The weighted average of the cost of various sources of capital, generally consisting of outstanding securities such as mortgage debt, preferred stock and common stock.

**Cost of service:** The total cost to provide service, including return on invested capital, operation and maintenance costs, capital costs, administrative costs, taxes and depreciation expense. Traditional utility cost of service may be expressed as: \( \text{operating costs} + \text{taxes} + (\text{rate of return} \times [\text{cost of plant} - \text{depreciation}]) \) More frequently called revenue requirement.

**Cross-subsidization:** The practice of charging rates higher than the actual cost of service to one class of customers in order to charge lower rates to another class of customers.

**Curtailment:** A temporary, mandatory power reduction under emergency conditions taken after all possible conservation and load management measures and prompted by problems of meeting peak energy demand.
**Customer costs:** Costs directly related to serving a customer, regardless of sales volume, such as meter reading, billing, and fixed charges for the minimum investment required to serve a customer.

**Demand:** The amount of power consumers require at a particular time. Demand is synonymous with load. It is also the amount of power that flows over a transmission line at a particular time. System demand is measured in megawatts.

**Demand-side management (DSM):** The term for all activities or programs undertaken by an electric system to influence the amount and timing of electricity use. Included in DSM are the planning, implementation and monitoring of utility activities that are designed to influence customer use of electricity in ways that will produce desired changes in a utility's load shape such as, among other things, direct load control, interruptible load, and conservation.

**Depreciation:** The loss of value of assets, such as buildings and transmission lines, to age and wear. Among the factors considered in determining depreciation are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the technology, changes in demand, requirements of public authorities, and salvage value. Depreciation is charged to utility customers as an annual expense.

**Deregulation:** The reduction or elimination of government power in a particular industry usually enacted to create more competition within the industry. Since the mid-1990s, many states across the nation have embarked on some form of deregulation of the electric industry, allowing the sale of electricity at market prices with the theory that competition will keep prices low, compared to a regulated market in which customer rates are directly tied to costs. (*See also restructuring.*)

**Direct Access:** The ability of a retail customer to purchase commodity electricity directly from the wholesale market rather than through a local distribution utility. (*See also Industrial bypass.*)

**Direct current (DC):** Current for which the flow of electrons is in one direction (as opposed to alternating current where the flow of electrons periodically reverses direction).

**Dispatch:** The monitoring and regulation of an electrical or natural gas system to provide coordinated operation; the sequence in which generating resources are called upon to generate power to serve fluctuating load; the physical inclusion of a generator's output onto the transmission grid by an authorized scheduling utility.

**Distribution (electrical):** The system of lines, transformers and switches that connect the high-voltage bulk transmission network and low-voltage customer load. The transport of electricity to ultimate use points such as homes and businesses. The portion of an electric system that is dedicated to delivering electric energy to an end user at relatively low voltages.

**Distributed generation:** Electric power produced other than at a central station generating unit, such as that using fuel cell technology or on-site small-scale generating equipment.
**Electric utility:** A corporation, person, agency, authority or other legal entity that owns and/or operates facilities for the generation, transmission, distribution or sale of electric energy primarily for use by the public. Facilities that qualify as co-generators or small power producers under the Public Utility Regulatory Policies Act (PURPA) are not considered electric utilities.

**Electricity generation:** The process of producing electric energy by transforming other forms of energy such as steam, heat or falling water. Also, the amount of electric energy produced, expressed in kilowatt-hours or megawatt-hours.

**Electricity transmission congestion:** Transmission congestion results when transmission lines reach their maximum capacity so no additional power transactions can take place, regardless of power needs. Attempting to operate a transmission system beyond its rated capacity is likely to result in line faults and electrical fires, so this can never occur. Congestion can be alleviated by adjusting the system to increase its capacity, add new transmission infrastructure, or decrease end-user demand for electricity.

**Electromagnetic Field (EMF):** A field (such as around a high voltage power line, wireless devices, and household appliances) that is made up of associated electric and magnetic components, which results from the motion of an electric charge and possesses a definite electromagnetic energy. Electromagnetic fields diminish rapidly with distance from the source (by the inverse square of the distance).

**Exempt Wholesale Generator (EWG):** A class of generators defined by the Energy Policy Act of 1992 that includes the owners and/or operators of facilities used to generate electricity exclusively for wholesale or that are leased to utilities.

**Extra High Voltage (EHV):** A voltage above 500kV

**Federal Energy Regulatory Commission (FERC):** A quasi-independent regulatory agency within the U.S. Department of Energy having jurisdiction over interstate electricity sales, wholesale electric rates, hydroelectric licensing, natural gas transmission and related services, pricing, oil pipeline rates and gas pipeline certification.

**Filed rate doctrine:** The doctrine established under the Natural Gas Act that requires rates to be on file with the commission and that prevents increased rates from being imposed retroactively; also known as “retroactive ratemaking.” This also applies to electric utilities.

**Firm power:** Electric power that is guaranteed by the supplier to be available during specified times except when uncontrollable forces produce outages.

**Force majeure:** A common law concept borrowed from the French civil law meaning superior or irresistible force that excuses a failure to perform. It has been defined by the U.S. Supreme Court as a cause that is “beyond the control and without the fault or negligence” of the party excused. Force majeure events also must not have been reasonably foreseeable (e.g., a blizzard in Houston in January may be a force majeure event, but a January blizzard in Montana may not qualify).
**Forecasting:** The process of estimating or calculating electricity load or resource production requirements at some point in the future.

**Franchise:** A special privilege conferred by a government on an individual or corporation to occupy and use the public rights of way and streets for benefit to the public at large. Public utilities typically have exclusive franchises for utility service granted by state or local governments.

**Generator nameplate capacity (installed):** The maximum rated output of a generator or other electric power production equipment under specific conditions designated by the manufacturer. Installed generator nameplate capacity is commonly expressed in megawatts (MW) and is usually indicated on a nameplate physically attached to the generator.

**Gigawatt:** A gigawatt (GW) is equal to one billion \(10^9\) watts.

**Gigawatt-hour:** A gigawatt-hour (GWh) is a unit of electrical energy that equals one thousand megawatts of power used for one hour. One gigawatt-hour is equal to 1,000 megawatt-hours.

**Green power:** Term usually used to mean power produced from a renewable resource such as wind, solar, geothermal, biomass or small hydropower.

**Grid:** The layout of the electrical transmission system or a synchronized transmission network.

**High-voltage lines:** Wires composed of conductive materials that are used for the bulk transfer of electrical energy from generating power plants to substations located near to population (load) centers. Transmission lines, when interconnected with each other, become high voltage transmission networks. In the U.S., these are typically referred to as "power grids" or sometimes simply as "the grid". Electricity is transmitted at high voltages (110 kV or above) to reduce the energy lost in long distance transmission. Power is usually transmitted through overhead power lines. Underground power transmission has a significantly higher cost.

**Incremental energy cost:** Cost incurred by producing or purchasing next available unit of energy (gas, electricity, oil, coal, etc.).

**Independent power producers:** A non-utility power generating entity, defined by the 1978 Public Utility Regulatory Policies Act, that typically sells the power it generates to electric utilities at wholesale prices. *(See also Exempt Wholesale Generator.)*

**Industrial bypass:** A situation in which large industrial customers buy power directly from a non-utility generator, bypassing the local utility system. Deregulation of generation and transmission in some states has opened up the opportunity for large electricity users to purchase services from a supplier other than the local retail utility. *(See also Direct Access.)*

**Industrial customer:** The industrial customer is generally defined as manufacturing, construction, mining, agriculture, fishing, and forestry establishments. The utility may classify industrial service using the Standard Industrial Classification codes or based on demand or annual usage exceeding some specified limit. The limit may be set by the utility based on the rate schedule of the utility.
**Integrated Resource Plan (IRP):** A plan that utilities produce periodically for regulators and customers to share their vision of how to meet the growing need for energy. These plans contain a preferred portfolio of resource types and an action plan for acquiring specific resources to meet the needs of customers including conservation measures. Specific resources will be acquired as individual projects or purchases and, when appropriate, through a formal request for proposals (RFP) process.

**Interconnection:** A link between power systems enabling them to draw on one another’s reserves in times of need to take advantage of energy cost differentials resulting from such facts as load diversity, seasonal conditions, time-zone differences and shared investments in larger generating units.

**Intermediate Plants:** In between peakers and baseload plants is a class of plants called *intermediate* or *mid-merit plants*. These plants are run more often than peaking plants but not as often as base load plants. They are generally based on a combined-cycle combustion turbine design.

**Investor-owned utility (IOU):** A utility that is a privately owned, often publicly traded corporation whose operations are regulated by federal and state entities.

**Joint use facilities:** Facilities that are used in common by two or more entities. For example, a utility pole or structure may contain wires and equipment for electrical power service and wires and equipment for telephone/cable TV service.

**Kilowatt (kW):** A unit of electrical power or capacity equal to one thousand watts.

**Kilowatt-hour (kWh):** A unit of electrical energy that is equivalent to one kilowatt of power used for one hour. One kilowatt-hour is equal to 1,000 watt-hours. An average household will use between 800 and 1,300 kWhs per month, depending upon geographical area.

**Load:** The amount of electric power delivered or required at any specific point or points on a system. The requirement originates at the energy-consuming equipment of the consumers. The load of an electric utility system is affected by many factors and changes on a daily, seasonal and annual basis, typically following a general pattern. Electric system load is usually measured in megawatts (MW). It is synonymous with demand.

**Load management:** The management of load patterns in order to better utilize the facilities of the system. Generally, load management attempts to shift load from peak use periods to other periods of the day or year.

**Load shedding:** Usually an agreement arranged ahead of time to reduce electric system demand by dropping certain loads to keep others. For example, in exchange for cheaper power, an industrial customer may sign a contract agreeing to have its power interrupted, if needed, during peak demand periods.
**Local distribution company (LDC):** A company that obtains the major portion of its revenues from the operations of a retail distribution system for the delivery of electricity or gas for ultimate consumption.

**Market-based price:** The price of power on the open market.

**Marketers:** Organizations or individuals who take title to power in anticipation of selling it at a higher price to a buyer. Marketers are subject to FERC regulation.

**Megawatt (MW):** A unit of electrical power equal to 1 million watts or 1,000 kilowatts. Plant power output is typically measured in megawatts. *(See also capacity (electric)).*

**Megawatt-hour (MWh):** One million watt-hours of electric energy. A unit of electrical energy that equals one megawatt of power used for one hour.

**Metering:** Use of devices that measure and register the amount and/or direction of energy quantities relative to time.

**Multi-state Process (MSP):** A regulatory forum for exploring issues pertaining to the PacifiCorp Inter-Jurisdictional Cost Allocation Protocol (Revised Protocol). The objectives of the Revised Protocol include:

- Allocating PacifiCorp's costs among its jurisdictional states in an equitable manner
- Ensuring PacifiCorp plans and operates its generation and transmission system on a six state integrated basis in a matter that achieves a least-cost/risk-balanced resource portfolio for its customers
- Allowing each state to independently establish its ratemaking policies
- Providing PacifiCorp the opportunity to recover 100 percent of its prudently incurred costs

**Municipal utility:** A utility owned and operated by a municipality or group of municipalities.

**National Association of Regulatory Utility Commissioners (NARUC):** A professional trade association, headquartered in Washington, D.C., composed of members of state and federal regulatory bodies that have regulatory authority over utilities.

**Network:** An interconnected system of electrical transmission lines, transformers, switches and other equipment connected together in such a way as to provide reliable transmission of electrical power from multiple generators to multiple load centers.

**NIMBY:** Stands for “Not In My Back Yard,” a characterization of local sentiment opposing siting of a project or development, typically on grounds of resistance to perceived environmental or scenic impacts. See “BANANA” and “NOPE.”

**NOPE:** Stands for “Not On Planet Earth,” usually an extremely exhausting characterization of local sentiment opposing siting of a project or development, typically on grounds of resistance to perceived environmental or scenic impacts. See “NIMBY” and “BANANA.”
Normalization: The accounting method used to ensure that the sum total of taxes payable for an asset under an accelerated method of depreciation is congruent to what would be the sum total of taxes payable for that same asset under a straight-line method of depreciation. Normalization was instituted by Congress in 1969 to prevent the tax benefits of deferred payables from being directly passed on to customers instead of the proper governing authorities.

North American Electric Reliability Corporation (NERC): An organization subject to oversight by the Federal Energy Regulatory Commission and governmental authorities in Canada whose mission is to ensure the reliability of the bulk power system in North America. To achieve that, NERC develops and enforces reliability standards; assesses power adequacy annually via 10 year and seasonal forecasts; monitors the bulk power system; evaluates users, owners and operators for preparedness; and educates, trains and certifies electric industry personnel.

Obligation to serve: In exchange for the regulated monopoly status of a utility for a designated service territory with the opportunity to earn an adequate rate of return, comes the obligation to provide electrical service to all customers who seek that service at fair and reasonable prices. This has been part of what the utility commits to under the “regulatory compact” and also includes the requirement to provide a substantial operating reserve capacity in the electrical system. (See also regulatory compact.)

Off peak: The period during a day, week, month or year when the load being delivered by a natural gas or electric system is not at or near the maximum volume delivered by that system for a similar period of time (night vs. day, Sunday vs. Tuesday).

On peak: The period during a day, week, month or year when the load is at or near the maximum volume.

Open access: The term applied to the evolving access to the transmission system for all generators and wholesale customers. Also, the use of a utility's transmission and distribution facilities on a common-carrier basis at cost-based rates.

Outage: Periods, both planned and unexpected, during which power system facilities (generating unit, transmission line or other facilities) cease to provide generation, transmission or the distribution of power.

Peak demand: The maximum load during a specified period of time.

Peak load plant or peaker unit: A plant usually housing low-efficiency, quick response steam units, gas turbines, diesels or pumped-storage hydroelectric equipment normally used during the maximum load periods. Peakers are characterized by quick start times and generally high operating costs, but low capital costs.

Point of delivery: The physical point of connection between the transmission provider and a utility. Power is metered here to determine the cost of the transmission service.
**Point of regulation:** Refers to which entities are responsible for complying with regulations. Within the context of a cap and trade greenhouse gas emissions system, the point of regulation may occur upstream at the source of fuels or other greenhouse gas-containing substances; downstream with the distributors of fuel or electricity; or through a hybrid approach.

**Point to point:** Transmission service from one discrete point to another discrete point.

**Power Marketing Administrations (PMAs):** The federal government owns four power marketing agencies: the Western Area Power Administration, the Bonneville Power Administration, the Southeastern Power Administration, and the Southwestern Power Administration, all within the U.S. Department of Energy (DOE).

**Power plant:** A plant that converts mechanical energy into electric energy. The power is produced from raw material such as gas, coal, nuclear or other fuel technologies.

**Power Purchase Agreement (PPA):** Typical name for bilateral wholesale or retail power contract.

**Preference customers:** Publicly owned utilities and not-for-profit cooperatives, which, by law, have preference over investor-owned systems and industrial customers for the purchase of power from federal power marketers, such as the Bonneville Power Administration.

**Public Utilities Regulatory Policies Act (PURPA):** A federal law passed in 1978 as part of the National Energy Act. PURPA is meant to promote greater use of renewable energy and forced regulated electric utilities to buy power from other producers, if that cost was less than the utility's own "avoided cost" rate; the avoided cost rate represents the additional cost the utility would incur if it generated the required power itself or purchased the required power from another source. Implementation of PURPA was left to the individual states; in Idaho, the rules for PURPA implementation are set by the Idaho Public Utilities Commission.

**Qualifying facility (QF):** A designation created by PURPA for non-utility power producers that meet certain operating, efficiency and fuel-use standards set by FERC. To be recognized as a qualifying facility under PURPA, the facility must be a small power production facility whose primary energy source is renewable or a cogeneration facility that must produce electric energy and another form of useful thermal energy, such as steam or heat, in a way that is more efficient than the separate production of both forms of energy.

**Rate base:** The value of property upon which a utility is given the opportunity to earn a specified rate of return as established by regulatory authority. The rate base generally represents the value of property used by the utility in providing service and may be calculated by any one or a combination of the following accounting methods: fair value, prudent investment, reproduction cost or original cost. The rate base may include a working capital allowance covering such elements as cash, working capital, materials and supplies, prepayments, minimum bank balances and tax offsets. The rate base may be adjusted by deductions for...
accumulated provision for depreciation, contributions in aid of construction, accumulated deferred income taxes and accumulated deferred investment tax credits.

**Rate design:** The development of electricity prices for various customer classes to meet revenue requirements dictated by operating needs and costs within current regulatory and legislative policy goals.

**Rate of return:** The allowed rate of return is the percentage determined by the jurisdictional state or federal commission based on standards including the cost of capital in other sectors with comparable risk. The achieved rate of return is the actual result the utility obtained over any given period. Investor-owned utilities are not guaranteed, but given the opportunity, to earn a profit.

**Rate schedule:** The rates, charges and provisions under which service is supplied to a designated class of customers.

**REA:** Rural Electrification Administration; currently called *Rural Utility Service*.

**Regional transmission organization/group (RTO/RTG):** A proposal advanced by FERC to establish regional groups to expedite the coordination of wholesale wheeling. The group is voluntary in each region and may include transmission system owners, wholesale purchasers and independent power generators.

**Regulatory compact:** A traditional covenant between customers in a state and investor-owned utilities (IOUs). In exchange for the obligation to provide service to all customers in a defined service territory, an IOU is given a territorial monopoly on service and allowed to earn a limited return set by state regulators. The commission enforces the terms of the regulatory compact. *(See also Obligation to serve.)*

**Reliability:** The ability to meet demand without interruption. The degree of reliability may be measured by the frequency, duration and magnitude of adverse effects on consumer service.

**Renewable resource:** A power source that is continuously or cyclically renewed by nature, i.e. solar, wind, hydroelectric, geothermal, biomass or similar sources of energy.

**Request for Proposal (RFP):** Request for Proposal is a written solicitation that conveys to vendors a requirement for materials or services that the purchaser intends to buy. An RFP is a primary means of inviting a bid or proposal from prospective suppliers. The RFP process allows for the equitable and simultaneous comparison and analysis of competing businesses' product and service offerings.

**Reserve capacity:** Capacity in excess of that required to carry peak load, available to meet unanticipated demands for power or to generate power in the event of loss of generation.

**Residential consumer:** A consumer residing at a dwelling served by the company, and using services for domestic purposes. Does not include consumers residing in temporary accommodations, such as hotels, camps, lodges, and clubs.
**Restructuring:** The reconfiguration of the vertically integrated electric utility. Restructuring usually refers to separation of the various utility functions (such as power generation and transmission) into separate functions, typically to offer more competitive choices to customers. *(See also Deregulation.)*

**Retail:** Sales covering electrical energy supplied for end-use residential, commercial and industrial end-use purposes. Agriculture and street lighting are also included in this category. Power sold at retail is not resold by the purchaser to another customer.

**Retail competition:** A system under which more than one electricity provider competes to sell to retail customers and retail customers are allowed to buy from different providers. *(See also Direct Access.)*

**Retail wheeling:** The sale of electricity by a utility or other supplier to a customer in another utility's retail service territory. Refers to the use of the local utility's transmission and distribution lines to deliver the power from a wholesale supplier to a retail customer by a third party.

**Return on equity:** Compensation for the investment of capital. Regulated public utilities are allowed to charge rates that provide them an opportunity - but not a guarantee - to earn a reasonable return on their equity invested.

**Revenue requirement:** The amount of funds (revenue) a utility must take in to cover the sum of its estimated operation and maintenance expenses, debt service, taxes and allowed rate of return. Revenue requirement is often defined as: 

\[
\text{Revenue requirement} = \text{Operating expenses} + \text{depreciation expense} + \text{income taxes} + (\text{rate of return} \times \text{rate base}).
\]

**Rolling blackout:** Shutting off power to groups or blocks of customers in a controlled and preplanned manner to reduce system demand. Interruptions happen in intervals and between blocks of customers so all customers share in the efforts to reduce demand.

**Rural electric cooperative:** *See Cooperative electric utility.*

**RUS:** Rural Utility Service; formerly called *Rural Electrification Administration.*

**Sales for resale:** Energy supplied at wholesale to other utilities, cooperatives, municipalities and federal and state agencies for resale to ultimate consumers. May be subject to FERC regulation.

**Scheduled outage:** The shutdown of a generating unit, transmission line or other facility, for inspection or maintenance in accordance with an advance schedule.

**Scheduling:** Operating a power system to balance generation and loads; managing the accounting, billing and information reporting for such operations.

**Service area:** The territory in which a utility system is required or has the right to supply service to ultimate customers.
**Shaping or load shaping:** The scheduling and operation of generating resources to meet changing load levels. Load shaping on a hydroelectric system usually involves the adjustment of water releases from reservoirs so that generation and load are continuously in balance.

**Smart grid:** Smart grid is a concept. At the moment that concept is undeveloped. The basic concept of smart grid is to add monitoring, analysis, control, and communication capabilities to the national electrical delivery system to maximize the throughput of the system. In theory, the smart grid concept might allow utilities to move electricity around the system as efficiently and economically as possible. It might also allow the homeowner and business to use electricity as economically as possible. Consumers will have the choice and flexibility to manage electrical use while minimizing bills. Smart grid hopes to build on many of the technologies already used by electric utilities. It also adds communication and control capabilities with the idea of optimizing the operation of the entire electrical grid. To reduce this concept to a single sentence, one might describe smart grid as overlaying a communication network on top of the power grid.

**Specular reflection:** A mirror-like reflection of light.

**Spot market:** Commodity transactions in which the transaction commencement is near-term (e.g., within 10 days) and the contract duration is relatively short (e.g., 30 days).

**Spot purchases:** A short-term single shipment sale of a commodity, including electricity or gas, purchased for delivery generally on an interruptible or best efforts basis.

**Standards of conduct:** Requirements under FERC's marketing affiliate rule that prohibit discrimination in favor of the utility's own marketing affiliates and that require utilities to submit reports detailing compliance with the rules.

**Substation:** Equipment that switches changes or regulates electric voltage. An electric power station that serves as a control and transfer point on an electrical transmission system. Substations route and control electrical power flow, transformer voltage levels and serve as delivery points to industrial customers.

**Subtransmission system:** The subtransmission system transmits power in smaller quantities and at lower voltages (typically 69 kV to 138 kV) from transmission substations to distribution substations.

**Tariff:** A document filed by a regulated entity with either a federal or state commission; listing the rates the regulated entity will charge to provide service to its customers as well as the terms and conditions that it will follow in providing service.

**Test period:** In a rate case, a test period is used to determine the cost of service upon which the rates will be based. A test period consists of a base period of 12 consecutive months of actual operational experience, adjusted for changes in revenues and costs that are known and are measurable with reasonable accuracy at the time of the rate filing.
Transmission: The network of high-voltage lines, transformers, and switches used to move electrical power from generators to the distribution system (loads). This network is also utilized to interconnect different utility systems and independent power producers together into a synchronized network.

Transmission grid: An interconnected system of electric transmission lines and associated equipment for the transfer of electric energy in bulk between points of supply and points of demand.

Used and useful: The traditional test for whether a utility asset may be included in rate base.

Utility: A utility can be either a private or publicly owned company that provides a commodity or service that is considered vital to the general public, such as power, water, or gas for heating. Because utility services are considered necessities, utilities are allowed to operate as monopolies and prices and service conditions are regulated by the government or subject to review by citizens.

Volt: A unit of measurement of electromotive force or electrical potential. It is equivalent to the force required to produce a current of one ampere through a resistance of one ohm. Typical transmission level voltages are 115 kV, 230 kV and 500 kV.

Watt: A measure of real power production or usage equal to one joule per second.

Watt-hour (Wh): An electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electric circuit steadily for one hour.

Western Electricity Coordinating Council (WECC): A group of utilities banded together to promote reliability by coordinating the power supply and transmission in the West.

Wheeling: The use of the transmission facilities of one system to transmit power for another system. Wheeling can apply to either wholesale or retail service. (See also Retail wheeling.)

Wholesale power market: The purchase and sale of electricity from generators to resellers (who sell to retail customers or to wholesale customers) along with the ancillary services needed to maintain reliability and power quality at the transmission level.

Wholesale sales: Energy supplied to other electric utilities, cooperative, municipals, federal and state electric agencies and power marketers for resale to other wholesale customers or ultimate consumers.