# BPA Segmentation Review
# Industry Practices Scan

## Summary and Conclusion:

BPA staff undertook this industry scan to better understand what other transmission utilities across the nation are doing to functionalize transmission facilities for ratemaking purposes. This scan is not exhaustive, but does consider a vast majority of the nation's transmission utilities. It is primarily confined to FERC-jurisdictional utilities because the necessary information is more readily available and more easily obtained. The comparisons to jurisdictional utilities do not mean to imply that BPA must be measured by these standards; rather, it provides useable information to compare BPA's segmentation practices with the broader industry.

The scan was undertaken to answer several questions:

1. How comparable to BPA are other transmission utilities' facilities in size and voltage?
2. What, if any, voltage threshold do other utilities use to separate transmission from distribution facilities?
3. Do the utilities differentiate transmission rates by voltage or other criteria?

The scan was undertaken by first examining FERC Form 1 information to identify utilities with transmission facilities. Using 2012 Form 1s, 181 utilities were included in this identification. In order to narrow the pool, 102 utilities, those with more than 500 line miles of transmission, were selected for further consideration. The 500 mile threshold was chosen as a balance between providing a representative pool of sufficient size and the inclusion of utilities with so little transmission that comparisons become weak. Form 1 data was collected on transmission and distribution composition for each of the 102 utilities. In addition, the transmission tariffs for these utilities were then examined to determine their rate design.

The results of the scan produce several informative indicators:

1. BPA ranks fourth in terms of transmission line miles. This list includes operating utilities, not holding companies. There are five holding companies whose combined operating companies have more line miles of transmission than BPA. Furthermore, WAPA and TVA, who are not included in the 102 utilities, also have more transmission line miles than BPA. BPA would rank sixth if these two utilities were included.
2. Almost three-fourths of BPA's transmission lines are above 200kV. This ranks BPA fifth highest by percentage of transmission that is over 200kV. Only one utility, Oncor in Texas, has more 500kV line miles than BPA.
3. There is no standard voltage level used to separate transmission from distribution. A few utilities put all facilities below 115kV into distribution, while a few others put all facilities above 13kV into transmission; most utilities are between these two bookends and the thresholds are distributed across this voltage spectrum. Some utilities appear to use some sort of a "bright-line" threshold, but most appear to have a "fuzzy-line" threshold, meaning that a predominant amount of facilities, but not all, at a certain voltage are transmission and almost everything below this line is

distribution. In a small number of interviews BPA conducted with other transmission utilities, BPA heard that they often use a voltage level as a guideline, but will then identify additional facilities as distribution if they are radial in nature. This is consistent with the many "fuzzy-line" entries seen in the Form 1s. It appears that 35kV is the median threshold used, with about half of the utilities using a higher threshold and about half of the utilities using a 35kV or lower threshold.

4. There are some utilities that differentiate their transmission facilities and rates by voltage level. Most of those that have voltage-differentiated transmission rates are members of an ISO that requires this separation to distinguish between ISO-wide facilities and local facilities. There is no clear normal threshold used to distinguish between higher voltage facilities and lower voltage facilities; the thresholds range from 35kv to 200kV.
5. A review of transmission tariffs shows that there are a number of other utilities that charge separately for intertie or special-use facilities.

The following discussion presents the more in-depth analysis of the industry scan.

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## Part 1: Background

### What Is Segmentation?

Segmentation is a part of BPA's cost allocation process in determining transmission rates. The Segmentation Study associates specific transmission facilities (lines, substations, general plant, communications, other equipment) into defined groups, called segments. The Study identifies and aggregates costs into seven segments: 1) Generation Integration; 2) Integrated Network; 3) Southern Intertie; 4) Eastern Intertie; 5) Utility Delivery; 6) Direct Service Industry (DSI) Delivery; and 7) Ancillary Services. Once each facility is associated with one or more segments, the total investment and historical O&M for each segment is calculated. The total investment and O&M for each segment becomes an allocation factor to distribute the rate period transmission revenue requirement across the segments, with investment for depreciation and debt service costs and historical O&M used for rate period O&M costs. The costs assigned to each segment are then used to set the various rates for the use of each segment.

### History of BPA Segmentation

BPA's first transmission rate filing occurred in 1976, shortly after the Federal Columbia River Transmission System Act, 16 U.S.C. § 838 *et seq.*, was enacted. BPA filed the rates with the Federal Power Commission, which was later reorganized as the Federal Energy Regulatory Commission (Commission) in 1977. The Commission was having problems substantiating the rational basis for BPA's transmission rates. In December 1980, the Commission ordered the rates remanded without prejudice.[1] The Commission requested that BPA demonstrate: 1) a rational basis for the determination of the annual cost of the transmission system; 2) a rational basis for the determination that the annual costs of the transmission system had been equitably allocated between Federal and non-Federal system users; and 3) a justification and ratemaking rationale to support the use of airline mileage billing determinants in the FPT-1 rates, as contrasted to circuit mile cost supported type rates. In addition, an explanation, including calculations, of how the revenue figures were derived in support of the proposed rate schedules was requested.[2]

Prior to the remand order, the Commission had alerted BPA to some of the problems it was having with the transmission rates. This allowed BPA to develop more supporting information

[1] 13 FERC ¶ 61,185.

[2] BPA responded to the Commission's request in November 1981, supported in part by the 1979 COSA segmentation, and approval of the 1976 transmission rates was granted in August 1982. 20 FERC ¶ 61,142.

in its 1979 power rate case with respect to the transmission costs included in bundled power rates. BPA developed its first segmentation methodology in that case to demonstrate that power rates were appropriately recovering its share of transmission costs. Transmission rates used segmentation results for the first time in the 1981 rate case.

Between 1979 and 1996 there was one segment not included in current rates, the Fringe segment. The Fringe segment was comprised of higher voltage facilities that were deemed to be used only by Federal power using a contract path determination. Fringe, Delivery, and Generation Integration costs were recovered through bundled power rates, as was Federal power's 12CP share of Network costs.

In 1996, BPA's power and transmission costs were unbundled; each power customer paid separate power and transmission rates. In the 1996 rate case, BPA proposed to roll the Fringe into the Network and roll in a portion of Delivery facilities into the Network. The proposal was hotly debated; in particular, IOUs disputed the roll in of the Fringe, and various parties disputed using 34.5kV as the threshold for the Network. Ultimately, the case settled with all parties deferring on the segmentation issues to get other elements of the settlement. The major segmentation-related elements of the settlement were that power rates would pay for transfer agreement costs, the Network would consist of non-Intertie facilities that were 34.5kV and higher (no Fringe), the Northern Intertie would be rolled into the Network, BPA would endeavor to sell Delivery facilities (defined as facilities below 34.5kV) to the local utilities to allow them to avoid the Delivery rate, the NT rate would have a Load Shaping charge to account for peak usage, and the then-current Customer Service Policy for the allocation of costs of new transmission facilities would be replaced with a policy that conformed with open access principles.

Since 1996, all BPA transmission rate cases were settled, until the BP-14 case. The settled rate cases did not change segmentation. In the BP-14 rate case, staff proposed to continue the same segmentation methodology used since the 1996 settlement. Although the facility and associated cost analysis was updated, the definitions and criteria of the segments were not. These definitions and criteria became a major issue in the BP-14 rate case with various parties disputing or defending the proposed segmentation. The primary issue was the definition of the Integrated Network segment. The issue of rolling the Fringe into the Integrated Network was renewed. The use of the 34.5kV threshold was questioned; a 116kV threshold was proposed, as was assigning lower voltage costs to the utilities using facilities below that threshold. Others defended the current segmentation methodology as conforming to statutory provisions for widespread use and BPA's application of uniform rates.

**What Is the Purpose of This Scan?**

In the BP-14 rate case, a number of parties weighed in on a variety of segmentation issues and concerns and made recommendations for alternative segmentation methodologies. The Administrator, while supporting the staff proposal using the 34.5kV threshold, was concerned about the reliance on a segmentation arising out of a settlement. Considering the amount of time since there had been a thorough review of segmentation policy, he decided to establish a public process to review BPA's segmentation policy and implementation. In addition, the

Administrator deferred the decision on rolling the Montana Intertie into the Network segment pending the results of the segmentation review.

This scan is part of the preparation for the segmentation review process. It is designed to give participants an overview of current industry practices regarding methodologies that are analogous to BPA's segmentation practice.

**Part 2: Information Gathered for the Industry Scan**

The scan commenced by gathering FERC Form 1s for all utilities with the exception of non-transmission single purpose entities, such as generation owners like Southern Electric Generating Company and Yankee Atomic Electric Company. The Form 1 information for 181 utilities was used to identify utilities with a significant amount of transmission facilities, resulting in the selection of the 102 utilities that would be examined further. These 102 utilities are those with more than 500 line miles of transmission, as specified in the Form 1 filings. The transmission tariffs for the 102 utilities were then collected to allow a review of the rate design for each utility. Other information about utilities, such as transmission rate summaries, was added to the Form 1s and tariffs.

BPA staff also contacted several utilities for further discussion regarding their practices. BPA staff met with staff The Southern Companies, Duke Energy, Southern California Edison, and Pacific Gas & Electric to probe deeper into their segmentation or functionalization practices.

**Part 3: Developing the Focus of the Scan and the Target Pool of Utilities**

Based on the issues discussed in the BP-14 rate case, staff developed three basic questions to be answered by this industry scan:

1. How comparable to BPA are the other utilities' transmission facilities in size and voltage?
2. What, if any, voltage threshold do other utilities use to separate transmission from distribution?
3. Do the utilities differentiate transmission rates by voltage or other criteria?

The first question was used to determine the scope of the scan. BPA has over 15,000 line miles of transmission. Adding BPA to the 181 utilities, BPA would rank fourth in terms of transmission line miles. The inclusion of TVA and the other two PMAs to the list would move BPA to sixth of 185 utilities. It was concluded that including utilities with small or no transmission would not add much value to the exercise, and the 100 utilities would comprise a representative pool of utilities. The 100th utility had 626 line miles, and moving the line to 500 miles would pick up two others, including Consolidated Edison, one of the largest utilities in the nation. Thus, a cutoff at 500 miles was used for this scan. Of the utilities excluded, 20 have between 100 and 500 miles of transmission lines, 23 have between 1 and 100 miles, and 35 have no transmission lines, including 6 RTO/ISO companies and 10 that have sold or spun off all of their transmission facilities into independent transmission companies. Finally, two separately reporting utilities, AEP Texas North and AEP Texas West, were merged into one utility for the purposes of this scan because they operate together under one tariff and are very similar in composition.

The 181 utilities first considered and the 102 utilities selected are listed in Table 1. Map 1 shows a pictorial view of the 102 utilities and includes six holding companies that own some of the 102 utilities, as well as BPA, TVA, WAPA, and SWAPA. The icons representing each utility is a pie chart where the slices of the pie depict the voltage composition of each utility and the diameter of the pie is scaled to the line miles of transmission owned by the utility.

Several of the utilities considered in the scan are owned by one of several holding companies that operate under a single transmission tariff. The larger holding companies and their operating companies are:

AEP:
- AEP Appalachian Trans
- AEP Indiana Michigan Trans
- AEP Kentucky Trans
- AEP Ohio Trans
- AEP Oklahoma Trans
- AEP Southwestern Trans
- AEP Texas Central
- AEP Texas North
- AEP West Virginia Trans
- Appalachian
- Indiana-Michigan
- Kentucky Power
- Ohio Power
- Oklahoma Public
- Southwestern Electric

Xcel:
- Colorado
- Northern States Minnesota
- Northern States Wisconsin
- Southwestern Public

Duke:
- Carolina
- Duke Carolinas
- Duke Indiana
- Duke Kentucky
- Duke Ohio
- Florida Power

Southern:
- Alabama
- Georgia
- Gulf
- Mississippi

FirstEnergy:
- Allegheny
- American Transmission Systems
- Cleveland
- Jersey Central
- Metropolitan
- Monongahela
- Ohio Edison
- Penn Elec
- Penn Power
- Potomac Edison
- Toledo
- West Penn

Entergy:
- Entergy Arkansas
- Entergy Gulf
- Entergy Louisiana
- Entergy Mississippi
- Entergy New Orleans
- Entergy Texas

Some utilities have either divested all or most of their transmission into independent transmission companies. The independent transmission companies are included in the scan as are to two of the divesting utilities (Ohio Edison and Duquesne) that retained sufficient facilities to meet the 500 line mile cutoff. The ITCs and the divesting utilities are:

| Independent Transmission Company | Divesting Utility |
|---|---|
| **American Transmission Company** | Madison |
| | Upper Peninsula |
| | Wisconsin Electric |
| | Wisconsin Power |
| | Wisconsin Public |
| **American Transmission Systems** | Duquesne |
| | Ohio Edison |
| | Penn Power |
| | Toledo |
| **ITC*Transmission* (International)** | DTE (Detroit Edison) |
| **ITC Midwest** | Interstate |
| **Michigan Electric** | Consumers |
| **Vermont Transco** | Central Vermont |
| | Green Mountain |
| | Vermont Electric |
| | Vermont Transmission |

**Part 5: Separating Transmission and Distribution**

The next question regards the separation of facilities between transmission and distribution. Each utility performs this separation so that the jurisdiction over the facilities can be appropriately determined—federal jurisdiction of transmission facilities and state jurisdiction of distribution facilities—and the costs associated with each function can be appropriately accounted for in ratemaking.

A review of the Form 1 submittals, which list substations as either transmission, distribution, or both, provides the following indication about how facilities are separated into transmission or distribution by the various jurisdictional utilities based on voltage level[3] reported by the utilities. The separation cannot always be precisely articulated in voltage terms. For this study, if 1 or 2 facilities at one particular voltage out of 50 to 100 at the same voltage were designated in a different function, the predominant function was used. If 5 to 10 facilities out of 50 to 100, or 2

[3] A note about voltage terminology: This report refers to various voltages of transmission facilities. There is a great diversity of transmission voltages, too many to separately include and maintain a readable and understandable discussion. Thus, voltage levels are grouped into several voltage classes for ease of use. Facilities with voltages below 10kV are generally ignored in the analysis conducted for this scan. In almost all cases, transmission facilities with voltages below 10kV are generation step-up facilities. So far, no issue has been raised regarding BPA's rate treatment for generation step-up facilities. The following voltage classes represent a range of voltage levels:

| Class | Range |
|---|---|
| 13kV | 10-19.99kV |
| 25kV | 20-29.99kV |
| 35kV | 30-39.99kV |
| 46kV | 40-54.99kV |
| 69kV | 55-99.99kV |
| 115kV | 100-126.99kV |

| Class | Range |
|---|---|
| 138kV | 127-149.00kV |
| 161kV | 150-199kV |
| 230kV | 200-299.99kV |
| 345kV | 300-399.99kV |
| 500kV | 400kV and higher |
| | |

or 3 facilities out of 5 to 10, were in designated in a different function, that voltage level was considered to be split between functions, and labeled as likely to be a particular function.

| Count of Utilities | 115kV | 69kV | 46kV | 35kV | 25kV |
|---|---|---|---|---|---|
| **Transmission** | 96 | 82 | 45 | 30 | 13 |
| **Likely Transmission** | 1 | 3 | 6 | 7 | 4 |
| **Either** | 1 | 3 | 5 | 11 | 3 |
| **Likely Distribution** | 0 | 3 | 2 | 8 | 9 |
| **Distribution** | 0 | 3 | 10 | 29 | 52 |
| **Indeterminate** | 4 | 8 | 34 | 17 | 21 |
| **Total Population** | 102 | 102 | 102 | 102 | 102 |
| **Tx Probability** | 99% | 92% | 79% | 50% | 23% |

The 35kV column of the table shows that 30 of 102 utilities include all of their 35kV facilities in transmission, 7 include most of their 35kV facilities in transmission, 11 include about half of their 35kV facilities in transmission, 8 include most of their 35kV facilities in distribution, 29 include most of their 35kV facilities in distribution, and 17 cannot be determined (these utilities have no facilities at voltages between those designated transmission and those designated distribution, e.g., 46kV is transmission and 25kV is distribution and there are no 35kV facilities). The probability that any specific 35kV facility would be designated as transmission is about 50 percent ([30+7+½ of 11] ÷ [102 –17] = 50%). The use of this threshold is reinforced by a statement by the Commission in its legal analysis of Order 888: "while there is no uniform breakout point between transmission and distribution, it appears that utilities account for facilities operated at greater than 30kV as transmission and that distribution facilities are usually less than 40kV." Order No. 888, Appendix G, FERC STATS. & REGS. ¶ 31,036 at 31,981 n.100.

Map 2 shows a pictorial view of the 102 utilities where the icons representing each utility depict whether the voltage threshold between transmission and distribution is distinct or not. If there is a clear separation between transmission voltage and distribution voltage, the icon has separated halves ( ) and the lowest voltage designated as transmission and the highest voltage designated as distribution is listed. If one voltage level is sometimes transmission and other times distribution, the icon has joined halves ( ) and the voltage level is listed for both functions. If various voltage levels are not clearly transmission or distribution, the icon has alternating quadrants ( ) and the various voltage levels are listed around the icon.

In staff's discussion with Southern Company, it was mentioned that Southern considers all investment in substations with transmission equipment to be transmission investment regardless of the voltage of that specific investment. Thus, for example, if it is determined that a station with a 230/13kV transformer that connects to the distribution system contains other equipment that is clearly transmission, the entire station is considered transmission and all of its costs are included in network rates. This treatment appears to be used by other utilities as well. The review of Form 1 data indicates as many as 55 utilities have a significant number of substations with 13kV low side transformers in the transmission function. The 55 utilities and the number of substations by function are shown in Table 4.

**Part 6: Transmission Rate Design**

The final question regards the transmission facilities each utility charges includes in its transmission rates. 66 utilities include all network transmission facilities into rolled-in their network rates (Point-to-Point and Network Integration). 35 utilities differentiate their network transmission rates into bulk system rates and sub-transmission rates based on a voltage basis. Table 2 lists the 35 utilities with a brief description of the rate design.

The 35 utilities with voltage differentiated rates are distinguished by 13 that are operating companies of two holding companies that use voltage-differentiated rates, 19 that are members of three ISO/RTOs that require voltage differentiated rates, and three stand-alone utilities. Thus, the 35 utilities can be combined into eight entities that have determined to use voltage differentiated rates. One utility with rolled-in network rates (South Carolina) specifies different loss factors for 115kV+ and below 115kV.

Six utilities have facility-differentiated transmission rates, usually for interties connecting to other areas. Table 3 lists these six utilities.

**Part 7: Treatment of Radial Lines**

The treatment of radial transmission lines is not always evident in the material collected for this industry scan; thus, a comprehensive discussion cannot be presented. However, in meetings with other utilities, the treatment of radial lines was discussed.

Duke Energy is in the process of revising its treatment of radial lines. In the past, Duke would roll in the cost of its radial lines into its network transmission rates and would give network credits to a customer that constructed a radial line between Duke's network and the customer's load. Duke's new policy would directly assign its radial lines and would not give credits to customers for radial lines. Duke Carolinas implemented this treatment several years ago; Duke Progress is implementing this policy in January 2014. In both cases, the policy was not retroactive—Duke did not remove its radials from its network rates and continued applying credits for customer facilities built prior to the new treatment.

The Southern Company directly assigns radial lines that are serving only wholesale or only retail functions to the user of such lines. Radial lines with mixed usage (both retail and wholesale customers) are included in the network. Southern's wheeling customers challenged their old Direct Assignment policy as not providing customers comparable treatment. Southern settled the dispute and changed its policy. Pursuant to the settlement, radial lines constructed between 2003-2010 were removed from the Network segment.

Southern California Edison and Pacific Gas & Electric generally assign radial wholesale lines to the customer served from the radial. The Commission changed the practice Edison uses to assign breakers in 2004; Edison did not retroactively apply this change in practice, but applies the new practice whenever new equipment is added to an older station.

Members of the Southwest Power Pool are required to remove single-customer radial lines from the costs submitted for inclusion in SPP bulk system transmission rates.

**Table 1: List of Utilities Surveyed; Designation of Utilities Included in Industry Scan**

| Operating Utility | Holding Company | ISO/RTO (included utilities only) | Line Miles | Included (noted by mileage rank) |
|---|---|---|---|---|
| AEP Appalachian Trans | AEP | | 0 | |
| AEP Indiana Michigan Trans | AEP | | 17 | |
| AEP Kentucky Trans | AEP | | 0 | |
| AEP Ohio Trans | AEP | | 145 | |
| AEP Oklahoma Trans | AEP | | 91 | |
| AEP Southwestern Trans | AEP | | 0 | |
| **AEP Texas Central** | AEP | | 4,250 | 31 |
| **AEP Texas North** | AEP | | 4,147 | with #31 |
| AEP West Virginia Trans | AEP | | 0 | |
| **Alabama** | Southern | | 10,544 | 7 |
| Alaska | | | 61 | |
| Alcoa | | | 147 | |
| Allegheny | FirstEnergy | | 87 | |
| **Allete (Minnesota Power)** | Allete | MISO | 2,623 | 49 |
| Ameren Illinois | Ameren | | 0 | |
| Ameren Transmission | Ameren | | 29 | |
| **American Transmission Co** | Integrys | MISO | 10,921 | 6 |
| **American Transmission Systems** | FirstEnergy | PJM | 6,740 | 13 |
| **Appalachian** | AEP | PJM | 5,595 | 21 |
| **Arizona** | Pinnacle | | 5,913 | 18 |
| **Atlantic City** | Pepco | PJM | 1,402 | 77 |
| Attala | Cleco | | 0 | |
| **Avista** | | | 2,198 | 56 |
| **Baltimore** | Exelon | PJM | 923 | 90 |
| **Bangor** | Emera | ISO-NE | 868 | 91 |
| **Black Hills** | Black Hills | | 626 | 92 |
| **Black Hills Colorado** | Black Hills | | 231 | with #92 |
| Buckeye | | | 0 | |
| CAISO | | | 0 | |
| **Carolina** | Duke | | 6,198 | 17 |
| **CenterPoint** | | | 3,739 | 37 |
| **Central Hudson** | | NYISO | 629 | 100 |
| **Central Maine** | Iberdrola | ISO-NE | 2,654 | 47 |
| **Central Vermont** | Gaz Metro | ISO-NE | 693 | 97 |
| Cheyenne | Black Hills | | 26 | |
| **Chugach** | | | 536 | 101 |
| **Cleco** | Cleco | | 1,322 | 81 |
| **Cleveland** | FirstEnergy | PJM | 2,114 | 59 |
| **Colorado** | Xcel | | 5,701 | 19 |

| Operating Utility | Holding Company | ISO/RTO (included utilities only) | Line Miles | Included (noted by mileage rank) |
|---|---|---|---|---|
| **Commonwealth Edison** | Exelon | PJM | 4,879 | 27 |
| **Commonwealth Indiana** | | | 6 | |
| **Connecticut** | Northeast | ISO-NE | 1,761 | 67 |
| **Consolidated Edison** | ConEd | NYISO | 505 | 102 |
| Consolidated Water | | | 61 | |
| Consumers | CMS | | 0 | |
| **Dayton** | AES | PJM | 2,417 | 53 |
| **Delmarva** | Pepco | PJM | 1,835 | 64 |
| Deseret | | | 274 | |
| DTE (Detroit) | | | 0 | |
| **Duke Carolinas** | Duke | | 8,351 | 9 |
| **Duke Indiana** | Duke | MISO | 5,280 | 23 |
| Duke Kentucky | Duke | | 105 | |
| **Duke Ohio** | Duke | PJM | 1,937 | 62 |
| **Duquesne** | | PJM | 677 | 98 |
| **El Paso** | | | 1,784 | 66 |
| Electric Energy | | | 55 | |
| **Empire** | | SPP | 1,354 | 79 |
| **Entergy Arkansas** | Entergy | MISO | 4,825 | 28 |
| **Entergy Gulf** | Entergy | MISO | 2,361 | 55 |
| **Entergy Louisiana** | Entergy | MISO | 2,777 | 45 |
| **Entergy Mississippi** | Entergy | MISO | 2,869 | 43 |
| Entergy New Orleans | Entergy | | 142 | |
| **Entergy Texas** | Entergy | MISO | 2,466 | 52 |
| Fitchburg | Unitil | | 38 | |
| **Florida Light** | NextEra | | 6,725 | 14 |
| **Florida Power** | Duke | | 5,115 | 24 |
| **Georgia** | Southern | | 12,809 | 4 |
| Golden Spread | | | 299 | |
| Golden State | | | 0 | |
| Granite State | National Grid | | 0 | |
| **Green Mountain** | Gaz Metro | ISO-NE | 1,009 | 88 |
| **Gulf** | Southern | | 1,616 | 72 |
| **Idaho** | | | 4,790 | 29 |
| Indiana-Kentucky | | | 45 | |
| **Indiana-Michigan** | AEP | PJM | 4,046 | 35 |
| **Indianapolis** | AES | MISO | 839 | 93 |
| **International** | ITC | MISO | 2,818 | 44 |
| Interstate | Alliant | | 0 | |
| ISO New England | | | 0 | |
| **ITC Midwest** | ITC | MISO | 6,526 | 15 |

| Operating Utility | Holding Company | ISO/RTO (included utilities only) | Line Miles | Included (noted by mileage rank) |
|---|---|---|---|---|
| **Jersey Central** | FirstEnergy | PJM | 2,159 | 58 |
| **Kansas City Missouri** | | SPP | 1,650 | 70 |
| **Kansas City Power** | Great Plains | SPP | 1,807 | 65 |
| **Kansas Gas** | Westar | SPP | 2,514 | 51 |
| **Kentucky Power** | AEP | PJM | 1,282 | 84 |
| **Kentucky Utilities** | PPL | | 4,079 | 34 |
| Kingsport | | | 72 | |
| Lockhart | | | 90 | |
| Louisville | PPL | | 0 | |
| Madison | MGE | | 0 | |
| Maine Electric | | | 185 | |
| Maine Public | Emera | | 381 | |
| MassElec | National Grid | | 144 | |
| **Metropolitan** | FirstEnergy | PJM | 1,422 | 76 |
| **Michigan** | ITC | MISO | 5,600 | 20 |
| **MidAmerican** | MidAmerican | MISO | 3,875 | 36 |
| Midwest Electric | | | 0 | |
| **Midwest Energy** | | SPP | 1,670 | 69 |
| MISO | | MISO | 0 | |
| **Mississippi** | Southern | | 2,178 | 57 |
| **Monongahela** | FirstEnergy | PJM | 1,600 | 73 |
| **Montana-Dakota** | MDU | MISO | 3,105 | 42 |
| Mt Carmel | | | 19 | |
| Narragansett | National Grid | | 320 | |
| National Grid | National Grid | | 0 | |
| **Nevada** | NV Energy | | 1,725 | 68 |
| New England H-T | | | 121 | |
| New England Power | National Grid | | 0 | |
| New England Trans | | | 6 | |
| **New Hampshire** | Northeast | ISO-NE | 1,013 | 87 |
| **New Mexico** | PNM | | 3,189 | 41 |
| **New York** | Iberdrola | NYISO | 4,426 | 30 |
| **Niagara Mohawk** | National Grid | NYISO | 10,380 | 8 |
| North Central | | | 0 | |
| Northern Indiana | NiSource | | 0 | |
| **Northern States Minnesota** | Xcel | MISO | 4,956 | 26 |
| **Northern States Wisconsin** | Xcel | MISO | 2,375 | 54 |
| **NorthWestern** | Northwestern | MISO in SD | 8,135 | 10 |
| Northwestern Wisconsin | | | 147 | |
| **NSTAR** | NSTAR | ISO-NE | 951 | 89 |
| NYISO | | NYISO | 0 | |

| Operating Utility | Holding Company | ISO/RTO (included utilities only) | Line Miles | Included (noted by mileage rank) |
|---|---|---|---|---|
| **Ohio Edison** | FirstEnergy | PJM | 707 | 96 |
| **Ohio Power** | AEP | PJM | 7,772 | 11 |
| Ohio Valley | | | 427 | |
| **Oklahoma Gas** | OGE | SPP | 5,046 | 25 |
| **Oklahoma Public** | AEP | SPP | 3,537 | 39 |
| **Old Dominion** | | | 95 | |
| **Oncor** | Energy Future | ERCOT | 15,473 | 3 |
| Orange | ConEd | | 302 | |
| **Otter Tail** | | MISO | 5,390 | 22 |
| **Pacific Gas** | PG&E | CAISO | 18,618 | 1 |
| **PacifiCorp** | MidAmerican | | 16,784 | 2 |
| **PECO** | Exelon | PJM | 1,381 | 78 |
| **Penn Elec** | FirstEnergy | PJM | 2,701 | 46 |
| Penn Power | FirstEnergy | PJM | 48 | |
| Pike County | | | 48 | |
| Pioneer | | | 0 | |
| PJM | | | 0 | |
| **Portland** | | | 1,129 | 85 |
| **Potomac Edison** | FirstEnergy | PJM | 1,284 | 83 |
| **Potomac Electric** | Pepco | PJM | 784 | 94 |
| **PPL** | PPL | PJM | 4,123 | 32 |
| **PSEG** | | PJM | 1,461 | 75 |
| **Puget Sound** | | | 2,618 | 50 |
| **Rochester** | Iberdrola | NYISO | 1,287 | 82 |
| Rockland | ConEd | | 91 | |
| Safe Harbor | | | 1 | |
| **San Diego** | Sempra | CAISO | 1,935 | 63 |
| Sharyland | | | 15 | |
| **Sierra Pacific** | NV Energy | | 2,050 | 61 |
| **South Carolina** | SCANA | | 3,463 | 40 |
| **Southern California** | | CAISO | 12,302 | 5 |
| **Southern Indiana** | Vectren | MISO | 1,017 | 86 |
| **Southwestern Electric** | AEP | SPP | 4,086 | 33 |
| **Southwestern Public** | Xcel | | 6,904 | 12 |
| Southwest Power Pool | | | 0 | |
| Superior | Allete | | 89 | |
| System | | | 0 | |
| **Tampa** | TECO | | 1,333 | 80 |
| Toledo | FirstEnergy | | 223 | |
| **Tuscon** | Unisource | | 2,074 | 60 |
| UGI | | | 0 | |

| Operating Utility | Holding Company | ISO/RTO (included utilities only) | Line Miles | Included (noted by mileage rank) |
|---|---|---|---|---|
| **Union** | Ameren | MISO | 2,627 | 48 |
| United Illuminating | UIL | | 105 | |
| Unitil | Unitil | | 0 | |
| UNS | Unisource | | 330 | |
| Upper Peninsula | Integrys | | 0 | |
| Vermont Electric | | | 0 | |
| **Vermont Transco** | | ISO-NE | 713 | 95 |
| Vermont Transmission | | | 52 | |
| **Virginia** | Dominion | PJM | 6,406 | 16 |
| Wabash Valley | | | 203 | |
| **West Penn** | FirstEnergy | PJM | 1,620 | 71 |
| **Westar** | Westar | SPP | 3,659 | 38 |
| **Western Mass** | Northeast | ISO-NE | 636 | 99 |
| Wheeling | | | 216 | |
| Wisconsin Electric | We Energies | | 0 | |
| Wisconsin Power | Alliant | | 0 | |
| Wisconsin Public | Integrys | | 0 | |
| Wisconsin River | | | 0 | |
| **Wolverine** | | MISO | 1,553 | 74 |
| | | | | |
| Select Holding Companies | Southern | | 27,147 | |
| | FirstEnergy | | 9,870 | |
| | Entergy | | 15,440 | |
| | Duke | | 26,986 | |
| | AEP | | 34,966 | |
| | Xcel | | 19,937 | |
| | | | | |
| Tennessee Valley Auth | | | 16,080 | |
| WAPA | | | 17,060 | |
| SWPA | | | 1,380 | |
| BPA | | | 15,173 | |

**Table 2: Network Transmission Rate Designs—Voltage Differentiation**

| Operating Utility | Network Transmission Rate Design |
|---|---|
| **66 utilities** | No voltage differentiated Network rates |
| **Southern Company utilities:** | |
| Alabama | Southern-wide Bulk System (69kV+) plus Sub-transmission (44/46kV) |
| Georgia | Southern-wide Bulk System (69kV+) plus Sub-transmission (44/46kV) |
| Gulf | Southern-wide Bulk System (69kV+) plus Sub-transmission (44/46kV) |
| Mississippi | Southern-wide Bulk System (69kV+) plus Sub-transmission (44/46kV) |
| **FirstEnergy utilities:** | |
| American Transmission Systems | Bulk System (138kV+) plus Sub-transmission (69kV-) |
| Atlantic City | Bulk System (69kV+) plus case-by-case below |
| Cleveland | Bulk System (138kV+) plus Sub-transmission (69kV-) |
| Jersey Central | Bulk System (34kV+) plus case-by-case below |
| Monongahela | Bulk System (138kV+) plus Sub-transmission (69kV-) |
| Penn Elec | Bulk System (46kV+) plus case-by-case below |
| Potomac Edison | Bulk System (138kV+) plus Sub-transmission (69kV-) |
| Potomac Electric | Bulk System (115kV+) plus case-by-case below |
| West Penn | Bulk System (138kV+) plus Sub-transmission (69kV-) |
| **ISO New England utilities:** | |
| Bangor | ISO BHE network rate for 69kV+ plus a BHE retail service rate for lower voltage |
| Central Maine | ISO CMP network rate for 69kV+ plus a CMP retail service rate for lower voltage |
| Green Mountain | ISO GMP network rate for 69kV+ plus a GMP retail service rate for lower voltage |
| NSTAR | ISO NSTAR network rate for 69kV+ |
| Western Mass | ISO NSTAR network rate for 69kV+ |
| Connecticut | ISO NU network rate for 69kV+ plus a NU retail service rate for lower voltage |
| New Hampshire | ISO NU network rate for 69kV+ plus a NU retail service rate for lower voltage |
| Vermont Transco | ISO VT network rate for 69kV+ |
| **Southwest Power Pool RTO utilities:** | |
| Empire | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |
| Kansas City Missouri | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |
| Kansas City Power | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |

| Operating Utility | Network Transmission Rate Design |
|---|---|
| Kansas Gas | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |
| Midwest Energy | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |
| Oklahoma Public | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |
| Southwestern Electric | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |
| Westar | SPP Bulk System (60kV+) plus utility-specific basis for lower voltage and one-customer radials |
| **California ISO utilities:** | |
| Pacific Gas | Regional Access Charge (200kV+) plus Local Access Charge (<200kV) |
| San Diego | Regional Access Charge (200kV+) |
| Southern California | Regional Access Charge (200kV+) plus Local Access Charge (<200kV) |
| **Virginia** | Bulk System (69kV+) plus case-by-case below |
| **Tucson** | EHV (345kV+) plus Non-EHV (69-138kV), with separate loss factors |
| **Chugach** | Transmission rate applies to 115kV+ (Chugach settled its rate case by including its 34.5kV sub-transmission facilities in retail rates) |

**Table 3: Network Transmission Rate Designs—Facility Differentiation**

| Operating Utility | Facility Transmission Rate Design |
|---|---|
| **Allete** | separate rate for HVDC facilities |
| **Avista** | separate rate for Colstrip facilities |
| **Black Hills** | separate rate for DC intertie facilities |
| **El Paso** | separate rate for Palo Verde-Westwing facilities |
| **Oncor** | separate rate for intertie facilities |
| **Puget Sound** | separate rate for Colstrip and Southern Intertie facilities |

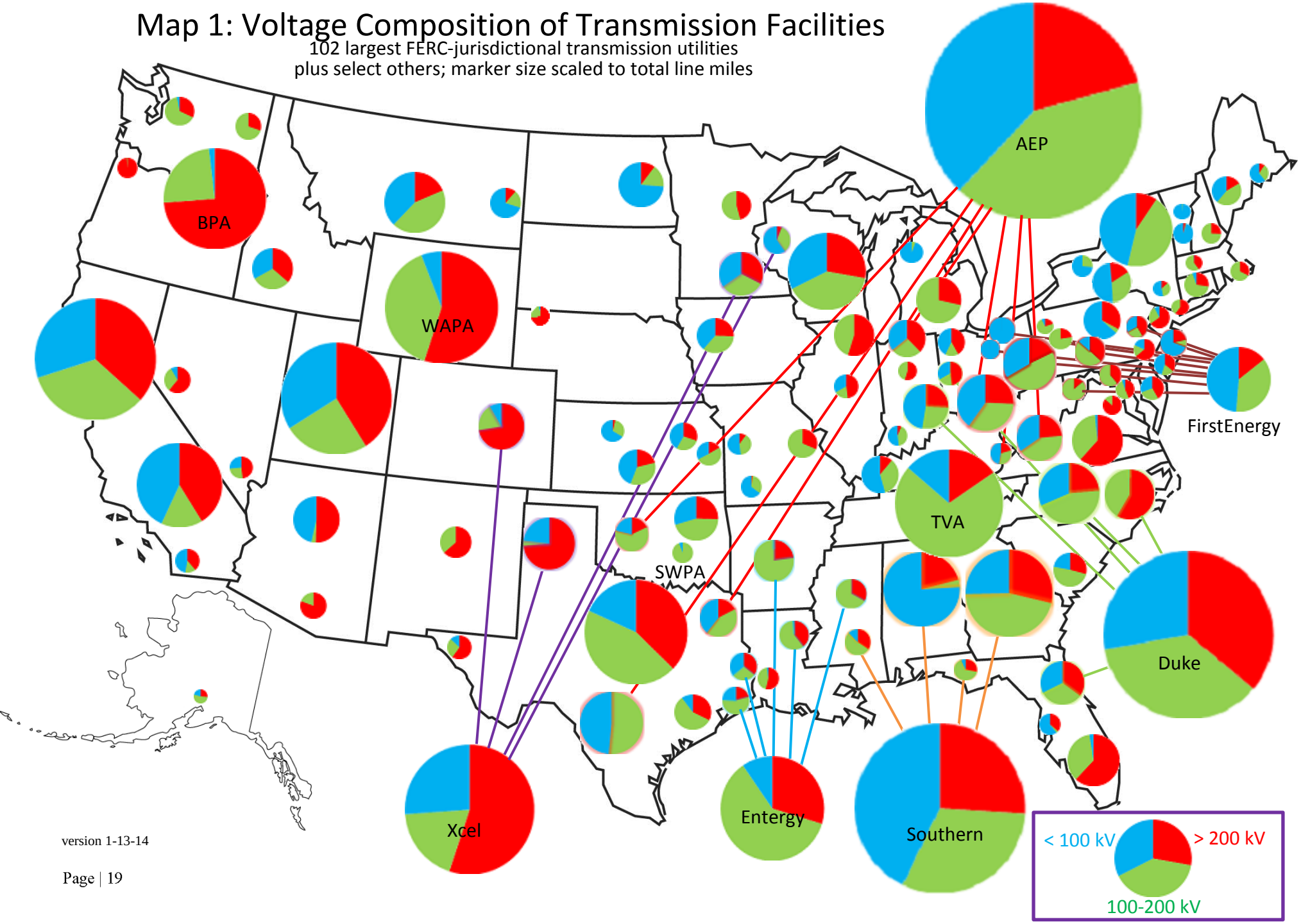
**Table 4: Count of 13kV Transmission (TX) and Distribution (DX) Stations**

| Operating Utility | 13kV TX Stations | 13kV DX Stations |
|---|---|---|
| **AEP Texas** | 129 | 134 |
| **Alabama** | 230 | 662 |
| **Allete** | 4 | 15 |
| **American Transmission Co** | 71 | 290 |
| **Atlantic City** | 21 | 36 |
| **CenterPoint** | 21 | 152 |
| **Central Maine** | 33 | 137 |
| **Chugach** | 23 | 33 |
| **Cleco** | 25 | 179 |
| **Colorado** | 67 | 222 |
| **Connecticut** | 59 | 21 |
| **Duke Carolinas** | 60 | 146 |
| **Duke Indiana** | 96 | 401 |
| **Duke Ohio** | 11 | 122 |
| **Empire** | 16 | 73 |
| **Florida Light** | 70 | 334 |
| **Georgia** | 126 | 924 |
| **Idaho** | 60 | 118 |
| **Indiana-Michigan** | 81 | 140 |
| **ITC Midwest** | 18 | 205 |
| **Jersey Central** | 15 | 197 |
| **Kansas City Missouri** | 28 | 93 |
| **Kansas City Power** | 14 | 74 |
| **Kansas Gas** | 29 | 200 |
| **Kentucky Power** | 20 | 40 |
| **Kentucky Utilities** | 83 | 209 |
| **MDU** | 20 | 39 |
| **Metropolitan** | 15 | 123 |
| **Michigan** | 17 | 278 |
| **MidAmerican** | 175 | 183 |
| **Mississippi** | 16 | 39 |
| **Monongahela** | 15 | 94 |
| **New York** | 82 | 111 |
| **Niagara Mohawk** | 238 | 132 |
| **Northern States Minnesota** | 82 | 335 |
| **Northern States Wisconsin** | 37 | 111 |
| **NorthWestern** | 12 | 91 |
| **Ohio Power** | 188 | 263 |
| **Oklahoma Gas** | 52 | 201 |
| **Oklahoma Public** | 78 | 112 |

| Operating Utility | 13kV TX Stations | 13kV DX Stations |
|---|---|---|
| **Oncor** | 47 | 1050 |
| **Potomac Edison** | 11 | 99 |
| **PPL** | 42 | 320 |
| **PSEG** | 32 | 128 |
| **Sierra Pacific** | 38 | 72 |
| **South Carolina** | 22 | 52 |
| **Southern California** | 89 | 501 |
| **Southwestern Electric** | 67 | 171 |
| **Southwestern Public** | 114 | 187 |
| **Tucson** | 17 | 29 |
| **Vermont Transco** | 25 | 128 |
| **Virginia** | 64 | 262 |
| **West Penn** | 20 | 155 |
| **Westar** | 27 | 199 |
| **Western Mass** | 18 | 43 |

# Map 1: Voltage Composition of Transmission Facilities

102 largest FERC-jurisdictional transmission utilities
plus select others; marker size scaled to total line miles

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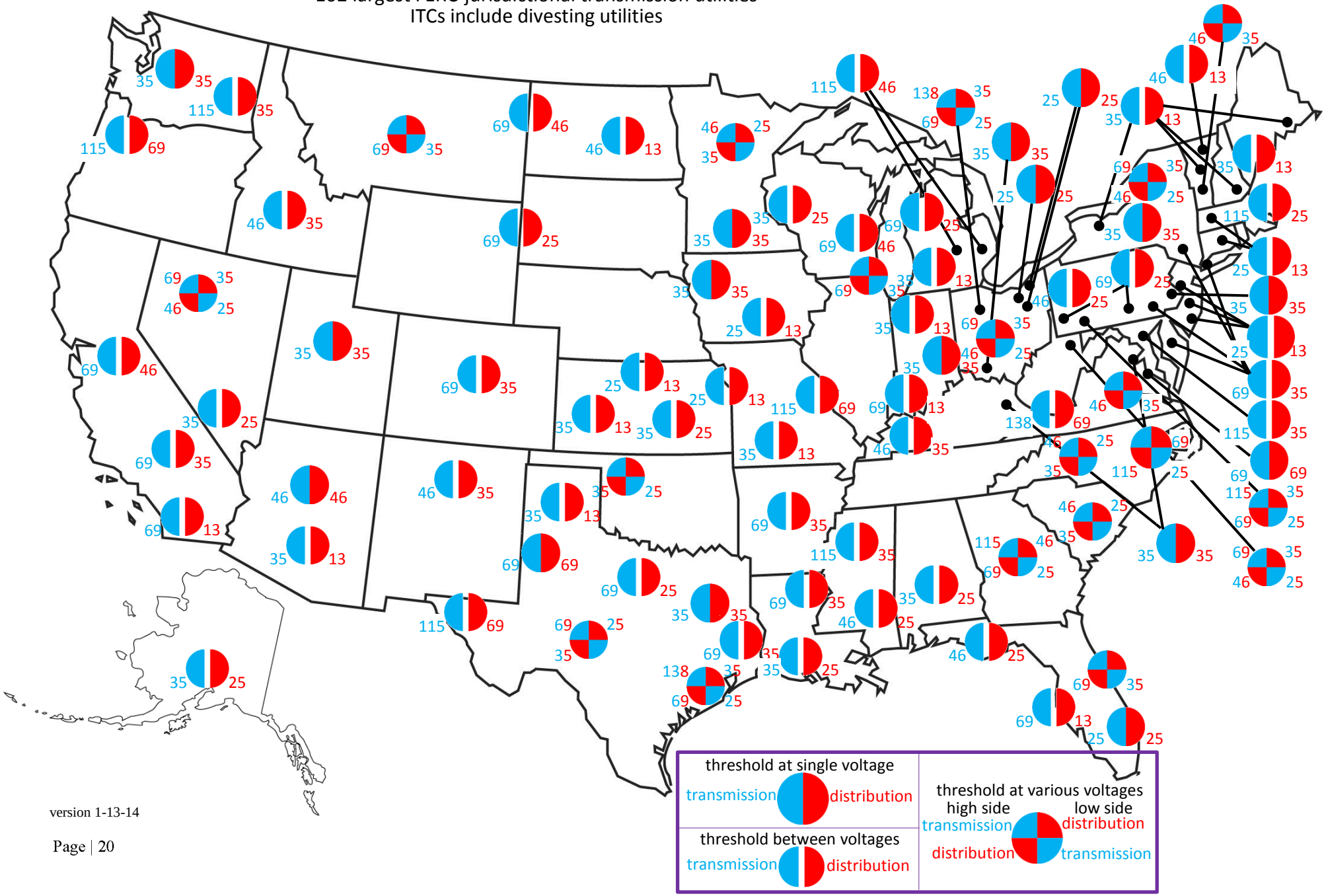
# Map 2: Transmission/Distribution Voltage Threshold

102 largest FERC-jurisdictional transmission utilities
ITCs include divesting utilities

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