Seasonal Electric Demand in the Southeastern United States

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Although the Southeast is widely perceived to be a summer peaking region, many of its utilities experience winter peak events. Residential and small commercial resistance heating loads, including backup heating installed in heat pump units, often drive these winter peak events. Understanding where winter peak events may occur, and identifying energy efficiency, demand response, and distributed energy resource solutions may help address these issues.

Utilities often describe their planning process around being winter, summer or dual peaking / transitional, but there is no single regulatory filing in which such a declaration is made. Based on evidence discussed below, Southeastern utilities are classified in Table 1. Notably, public utility systems are overrepresented in the winter peaking and dual peaking / transitional groups.

Table 1: Seasonal Electric Demand Tendencies of Southeastern Utility Systems

Winter Peaking Utility Systems

- Seminole Electric Cooperative
- PowerSouth Energy Cooperative
- Santee Cooper
- JEA
- Lakeland Electric

Dual Peaking / Transitional Utility Systems

- Duke Energy Florida
- Duke Energy Progress[1]
- Tennessee Valley Authority (TVA)
- Alabama Power[2]
- Tampa Electric (TECO)[2]

Summer Utility Systems

- Gainesville Regional Utilities (GRU)
- Municipal Electric Authority of Georgia (MEAG)
- Oglethorpe Power
- Georgia Power
- Tallahassee
- Orlando Utilities Commission (OUC)
- Florida Power & Light (FPL)
- South Carolina Electric & Gas (owned by SCANA)
- Florida Municipal Power Agency
- Gulf Power
- Duke Energy Carolinas[1]
- Mississippi Power

[1] Duke Energy Carolinas and Progress have recently filed Integrated Resource Plans that designate their systems as winter peaking. Their most recently approved plans designate their systems as summer peaking.

[2] Alabama Power and TECO both forecast winter peaking trends, but there is limited indication of winter peak events in the historical record. This classification is subject to further review.

Background and Method of Analysis

Southern Alliance for Clean Energy (SACE) collected data from the Federal Energy Regulatory Commission (FERC) Form 714 for the utility planning authorities listed above. Data availability is incomplete, particularly prior to 2006. These data are stored and managed in the SACE Energy Information System (SENFO). In some cases, data gaps or alternative reporting resulted in SACE consulting alternative data sources (such as utilities' Ten Year Site Plan filings in Florida) or making best guess estimates to fill in gaps caused by missing data.

Utilities were then classified based on two FERC Form 714 datasets: planning authority seasonal peak forecast and actual hourly system load. For the planning authority seasonal peak data from years 1998-2015, we used the prior year's forecast. For example, the 2012 forecast peak is obtained from the

forecast filed in 2011. By using a year-ahead forecast, we approximated a weather normalized peak – an estimate of the peak that does not take into account year-to-year variations in weather.

In addition to studying historical data, the conclusions reached in this study also consider future forecast data filed or years 2016-2025. We used forecast data filed with FERC in 2015 and 2016. While not illustrated in any figures, these data informed our findings with respect to Alabama Power, TECO, Duke Energy Carolinas, and Duke Energy Progress, as discussed in the notes to Table 1.

For the actual hourly system load, "system" refers to the planning authority, which often includes multiple utilities. The utility systems listed above are believed to include 100% coverage of utility electric demand in Alabama, South Carolina, Georgia and Florida, as well as partial coverage of Kentucky, Tennessee (>99%), Mississippi, North Carolina and Virginia (<1%). Actual winter and summer peaks for the 1998-2015 planning years (June-May) were obtained from the annual hourly system load data.

Findings

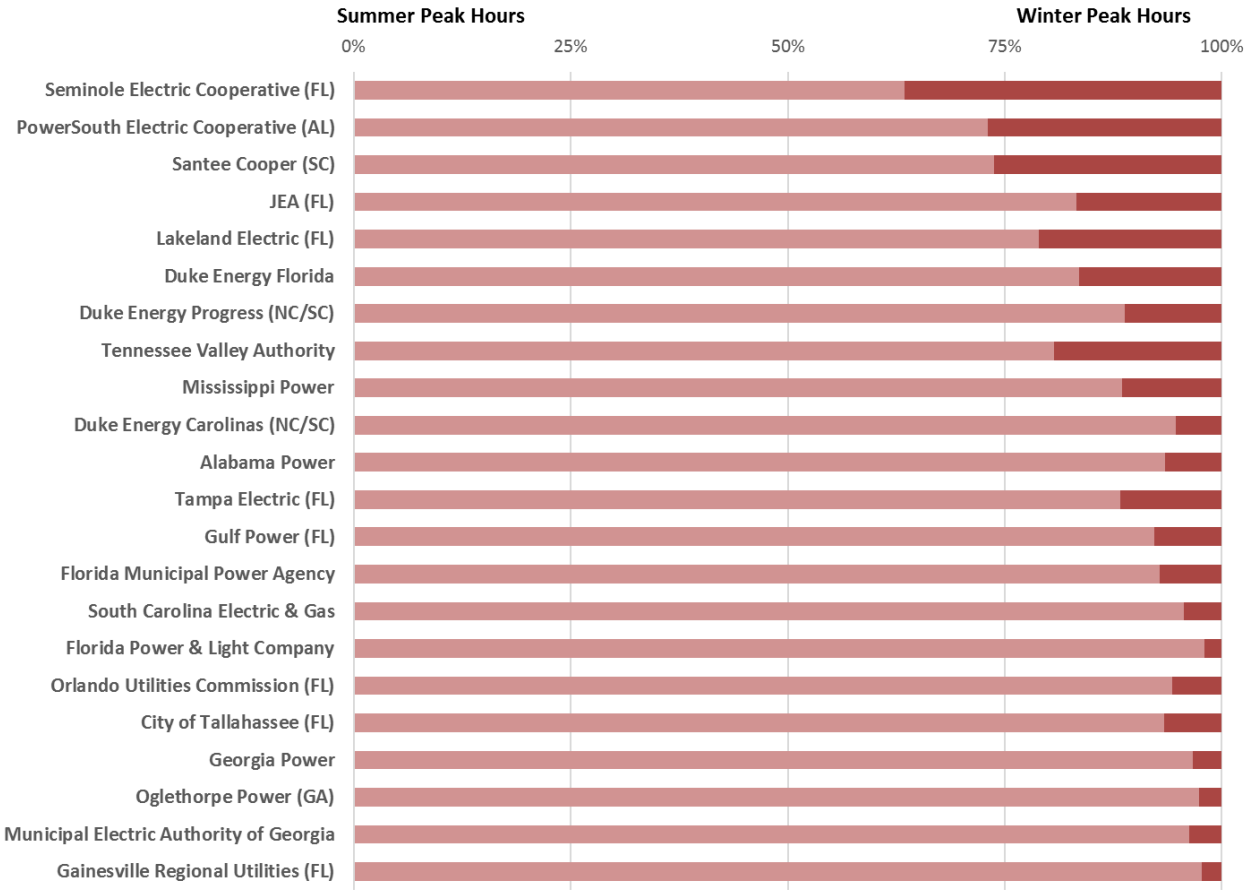
While an objective criterion for determining which utilities are winter, dual or summer peaking is seemingly elusive, one method for visualizing the distribution of utilities is to look at the percentage of past years in which the utility planning authority reported a winter or summer peak. Figure 1 below orders the utility planning authorities according to this metric. The classification suggested above also takes into consideration utility forecast data and regulatory filings.

Figure 1: Seasonal Peaks Reported by Southeastern Utility Systems, 1998-2015

Source: SACE analysis of utility data filed on FERC Form 714 for 1998-2015. For some utilities, data coverage is incomplete.

Another way to consider the balance between winter and summer peaking on utility systems is by comparing the number of peak hours by season. In Figure 2, the relative share of seasonal peak hours is graphed, considering the top 1% of total system load hours ranked by system load factor. Southeastern systems range from a high of 37% of peak hours in the winter at Seminole Electric Cooperative to a low of 2% at Gainesville Regional Utilities. This shows that even for winter peaking systems like Seminole, high loads occur more frequently in the summer.

Figure 2: Peak Hours, by Season, Reported by Southeastern Utility Systems, 1998-2015

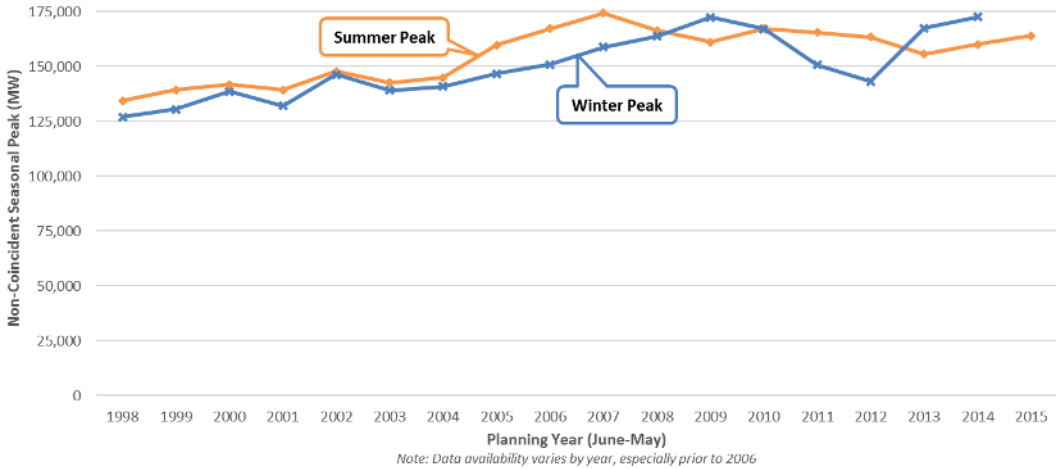


Source: SACE analysis of utility data filed on FERC Form 714 for 1998-2015. For some utilities, data coverage is incomplete.

Even though some Southeastern utilities are winter peaking, summer load continues to set the annual peak in the Southeast, as illustrated in Figure 3. Over the past 18 years, only a few regional annual peaks were set in the winter months. Furthermore, the highest winter peak events tend to be less frequent compared to summer peaks. For example, the top 25 summer and winter peaks for JEA (Jacksonville, Florida's municipal utility system) are shown in Figures 4 and 5. The tight cluster of summer peak events indicates a relatively large number of high peak events in the summer season, compared to the wider spread of winter peak events, which show fewer days with high system peaks. This pattern is characteristic of all Southeastern utility systems reviewed in detail for this study.

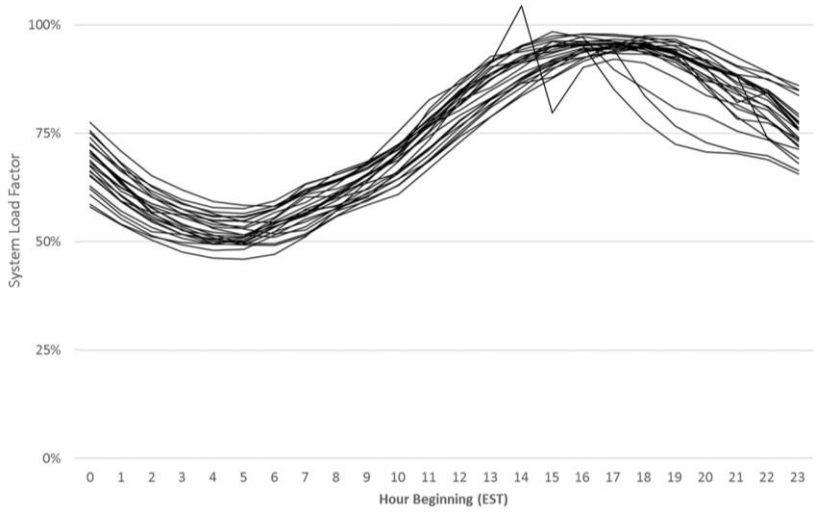
In addition to considering these historical data, SACE's classification of Southeastern utilities into the three groups in Table 1 also considered utility system forecast data. The forecast data are similar to historical data, with the exception of four utilities discussed in the notes to Table 1. While the Southeast remains a summer peaking region, winter peaks are a significant factor in utility planning.

Figure 3: Total Seasonal Peaks Reported by Southeastern Utility Systems, 1998-2015



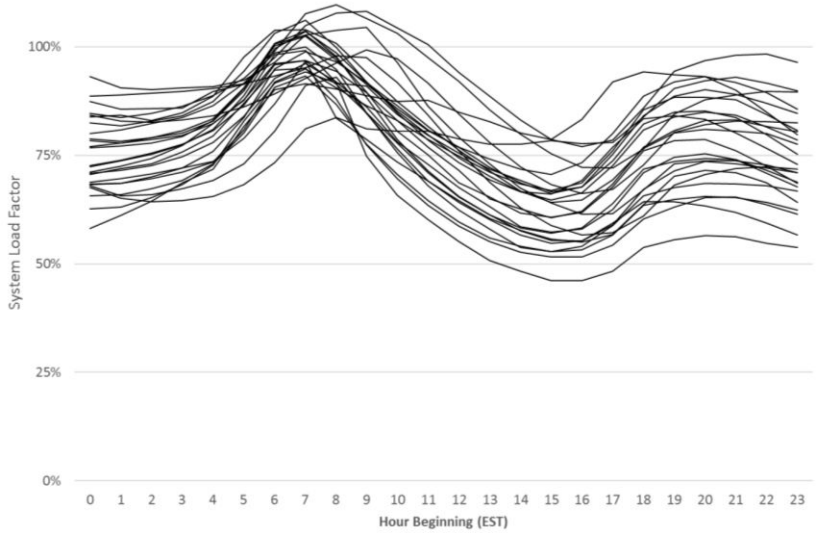
Source: SACE analysis of utility data filed on FERC Form 714 for 1998-2015.

Figure 4: Top 25 Summer Peak Events on JEA Utility System, 1998-2015



Source: SACE analysis of JEA data filed on FERC Form 714 for 1998-2015. Irregular data from original filing.

Figure 5: Top 25 Winter Peak Events on JEA Utility System, 1998-2015



Source: SACE analysis of JEA data filed on FERC Form 714 for 1998-2015.