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Authors

Seel, Joachim

Millstein, Dev

Kemp, Julie Mulvaney

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Empirical Indicators of Transmission Value in the Southeast United States

Joachim Seel, Dev Millstein, Julie Mulvaney Kemp

August 2025



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Empirical Indicators of Transmission Value in the Southeast United States

Prepared for the
Grid Deployment Office
U.S. Department of Energy

Principal Authors
Joachim Seel
Dev Millstein
Julie Mulvaney Kemp

Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 90R4000
Berkeley CA 94720-8136

August 2025

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Inventory of empirical data sources to assess transmission value across the Southeast

In areas that participate in wholesale electricity markets, concurrent differences in locational marginal prices (LMPs) are a key indicator of the value of additional transmission (see <https://doi.org/10.21203/rs.3.rs-3957695/v1>). This includes most of the contiguous United States, where balancing areas are part of either an Independent System Operator (ISO), Regional Transmission Organization (RTO), or energy imbalance market footprint. However, the Southeast lacks an organized wholesale electricity market, necessitating an investigation of other indicators of transmission value in this region.

One possibility is the Federal Energy Regulatory Commission's (FERC) system lambda data. This economic metric represents the minimized marginal production costs of thermal generators, including fuel and other variable operation and maintenance expenses. Each balancing authority (BA) is required to file its hourly system lambda data with FERC along with additional methodological details in Part II, Schedule 6b. However, the level of detail provided in these filings varies and can sometimes be vague. Lambda data for each calendar year are typically filed by June of the following year, giving coverage through the end of 2023 in the early spring of 2025. Unlike market LMPs which exist at a fine spatial resolution (e.g., a single generator's connection point to the grid) and at an aggregated level (e.g., zonal price), BA's report a single system lambda for their entire balancing area. The next section of this report conducts a deep dive into this data source.

Bilateral energy transaction prices offer an alternative empirical data source but present several challenges. These prices incorporate factors beyond pure electricity costs—such as transmission charges, contract terms (firm versus interruptible), and the parties' market perspectives (risk preferences, opportunity costs, and future expectations). Consequently, the negotiated bilateral price reflects a compromise between buyer and seller rather than the concurrent regional price differentials traditionally used to assess transmission value. Bilateral trade data appear in FERC's Electric Quarterly Reports (EQR) and in proprietary indices like Platts' Southeastern on- and off-peak price reports. However, Platts' data are behind a paywall and were not accessible for this analysis.

A third potential empirical data source is the Southeast Energy Exchange Market (SEEM, <https://southeastenergymarket.com/>), which launched in November 2022. SEEM is a platform that facilitates bilateral trading utilizing available unreserved transmission. Currently, *“SEEM members represent nearly 23 entities in parts of 12 states with more than 180,000 MWs [...] across two time zones. These companies serve the energy needs of more than 36 million retail customers (nearly 60 million people).”* SEEM and the SEEM Auditor, Potomac Economics, publish aggregate information on clearing prices on a daily, monthly, and annual basis. For example, the “Public Daily Informational Report” includes the average price for each hour of the day. However, clearing prices and bid-offer spreads are only reported for SEEM as a whole, and thus do not shed light on the value of transmission between different areas in the Southeast.

Transmission value assessment based on system lambda data reported to FERC

The Southeast lacks an organized wholesale electricity market comparable to those managed by other ISOs/RTOs in the United States, as well as energy imbalance markets such as the EIM and WEIM in the western interconnect. Although ISOs report interface node data to external balancing authorities (BAs), the prices at these nodes primarily reflect the ISO’s perspective on electricity imports and exports rather than that of the BAs. Therefore, assessing the value of electricity trades—whether between BAs and ISOs or among BAs—requires a separate electricity price estimator for Southeastern BAs.

In the absence of more precise price data, we use FERC’s system lambda data as a price proxy. System lambda data have been criticized for several reasons. Critics point out that these data often show minimal price variation or contain zeros, do not fully account for marginal transmission losses and congestion costs, and fail to incorporate scarcity rents during peak load hours (see <https://www.nber.org/papers/w24756>). As a result, relying solely on lambda data may underestimate the true economic value of electricity imports and exports, representing only a lower bound of the actual transmission value. Moreover, differences in system lambda values might reflect varying accounting practices rather than true regional differences in electricity prices. With these concerns in mind, we systematically review system lambda data from each southeastern BA, eliminate data sources that appear unreliable, and analyze the remaining data to gain insight into transmission value while remaining cognizant of the potential limitations.

System lambda data are available for most major southeastern BAs, as detailed in the appendix. Given the abovementioned concerns, we investigated these prices and found that Dominion Energy South Carolina (SCEG) only provides hourly data that consists entirely of zeros. Florida Power and Light (FPL) supplies system lambda data with little variation and of significantly lower magnitude compared to those of nearby BAs such as Tampa Electric and Duke Florida. Finally, the data quality from Santee Cooper/South Carolina Public Service Authority (SC) appears questionable for at least some years, notably 2012, 2013, and 2022. In contrast, the remaining BAs exhibit sufficient hourly, diurnal, monthly, and annual price variation to support a transmission valuation analysis.

Transmission Value

Transmission value is defined as the average hourly absolute price difference between two regions and will mainly be presented as an annual average in \$2024/MWh (using a GDP deflator).

$$T_{avg} = \frac{1}{N} \sum_{t=1}^N |p_{1,t} - p_{2,t}|$$

Intra-regional transmission value

This section examines transmission value in two Southeast regions using only FERC system-lambda data. First, we consider SERTP (the Carolinas, Georgia, and Tennessee), then FRCC (Florida).

SERTP. Within SERTP, the annual average transmission value between balancing authorities has historically ranged from \$2 to \$25 /MWh. However, early lambda filings for South Carolina in 2012–2013 appear anomalously high, producing implied values up to \$139 /MWh between SC and TVA. In 2022, SC’s reported marginal cost increase lagged its neighbors’, yielding an apparent transmission value near \$50 /MWh. Even outside these outliers, SC often shows above-average values. In the high-price environment of 2022, SERTP transmission values rose to \$13–\$28 /MWh (Figure 1).

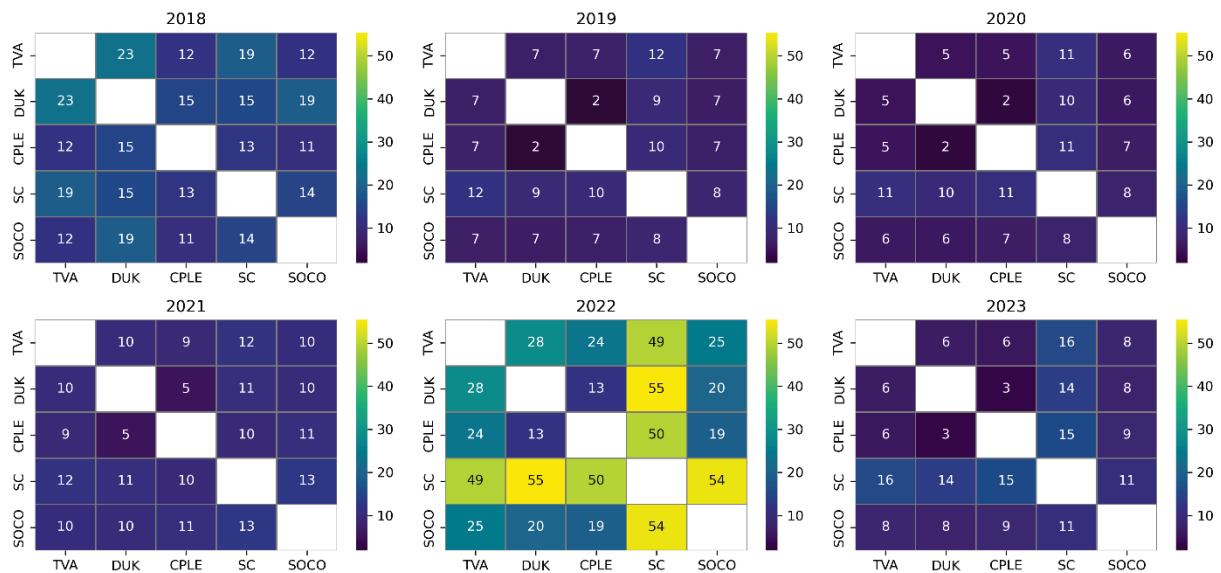


Figure 1. Transmission Value Matrices for SERTP 2018-2023

FRCC. In Florida, we compare annual average trade values among Duke Energy Florida (FPC), Tampa Electric (TEC), the Florida Municipal Power Pool (FMPP), and Florida Power & Light (FPL). These values range from \$4 to \$19 /MWh (Figure 2). Note that 2022 values involving FPL should be treated cautiously, since the BA reported unusually low marginal cost data to FERC.

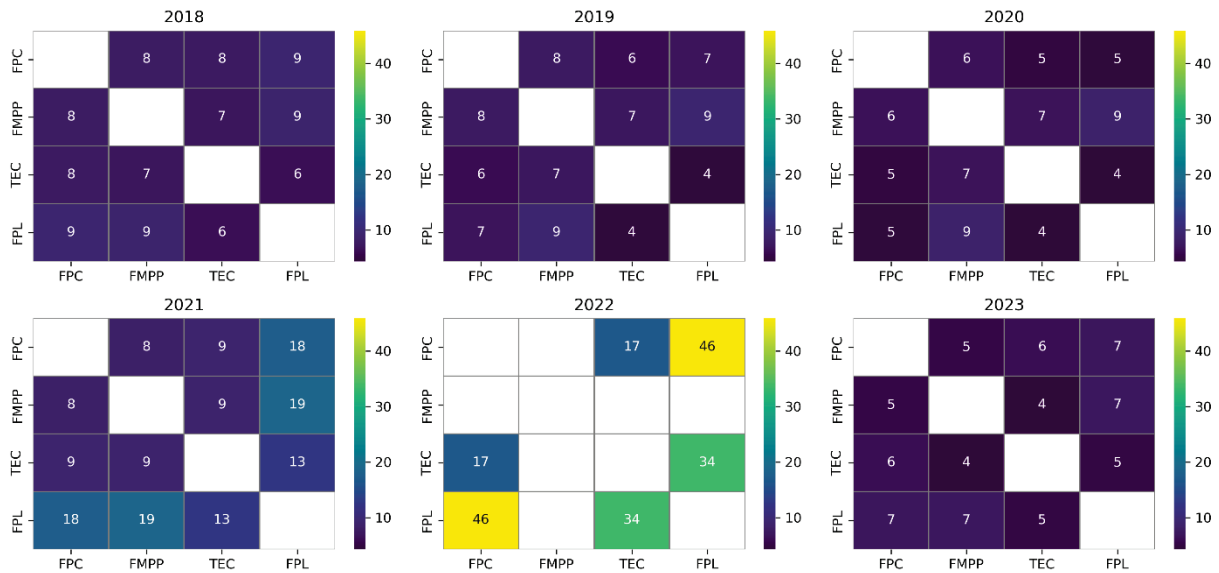


Figure 2. Transmission Value Matrices for FRCC 2018-2023

Inter-regional transmission value

Transmission value across three broader regions is examined: within the Southeast between Southern Company (SOCO) in SERTP and FPC in FRCC; between MISO and SOCO; and between PJM and Duke Energy Carolinas (DUK). The analysis employs the relevant interface nodes within MISO and PJM for links to SOCO and DUK.

Figure 3 presents average annual transmission values for these three inter-regional corridors, ranging from \$5 to \$28 /MWh, with transmission between PJM and DUK consistently exhibiting the highest values. As shown later in more detail most of the transmission value is driven by larger regional polar vortex events that lead to significant price spikes (as in early January 2018, February 2021 parallel to winter storm Uri, or December 2022).

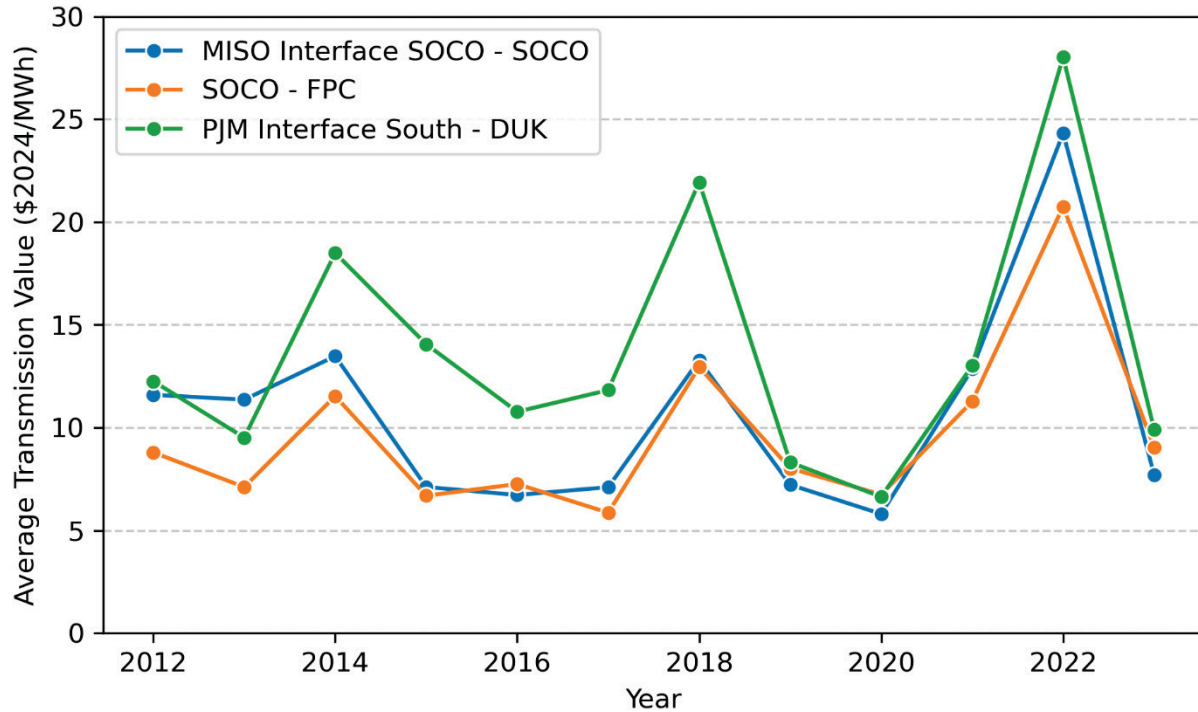


Figure 3. Annual Average Inter-regional Transmission Values 2012-2023

Southern Company – Duke Energy Florida

Long-term average transmission value between SOCO and FPC between 2012 and 2023 is \$9.7/MWh, but we observe significant variations, not just year to year, but also within a year. Transmission value is often highly clustered within a few hours. Figure 4 shows that in 2018 50% of the annual transmission value accrued in just 3% of all hours, whereas in other years it was spread across 13% to 24% of all hours.

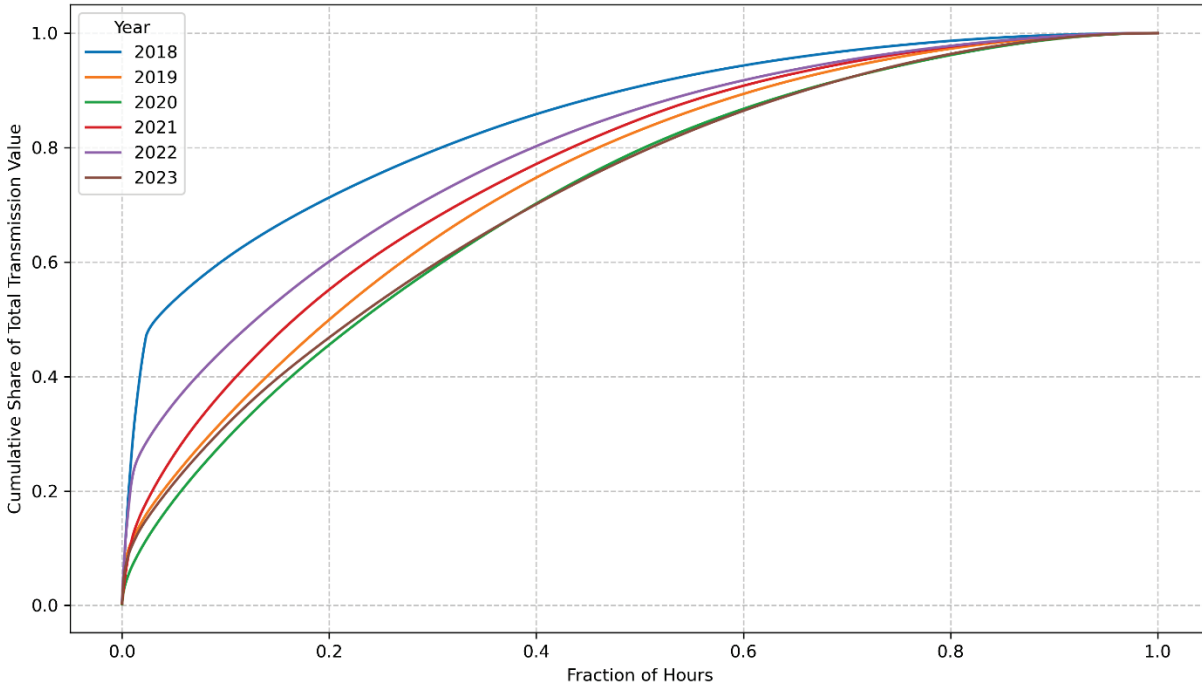


Figure 4. Cumulative Transmission Value Curve, SOCO-FPC, 2018-2023

Detailed heatmaps for all hours of the year are shown in the appendix. While rich in information (showing hourly price differences to spike up to \$1717/MWh in 2022), they are less suitable for a quick comparison between years or regions. Figure 5 instead uses polar-clock heatmaps to summarize average hourly transmission value by month. Each chart divides the circle into 24 angular segments (one per hour in local, Eastern time) and shows 12 concentric rings for months (January at the center, December at the outer edge). Color intensity encodes the mean price difference (\$/MWh) for each hour-month cell.

Several patterns emerge. Large, discrete weather events—such as the January 2018 polar vortex or December 2022 cold snap—drive the highest transmission values, with elevated price spreads persisting across most hours. Recurring seasonal patterns also appear, notably afternoon price differentials in the summer and morning differences in the fall.

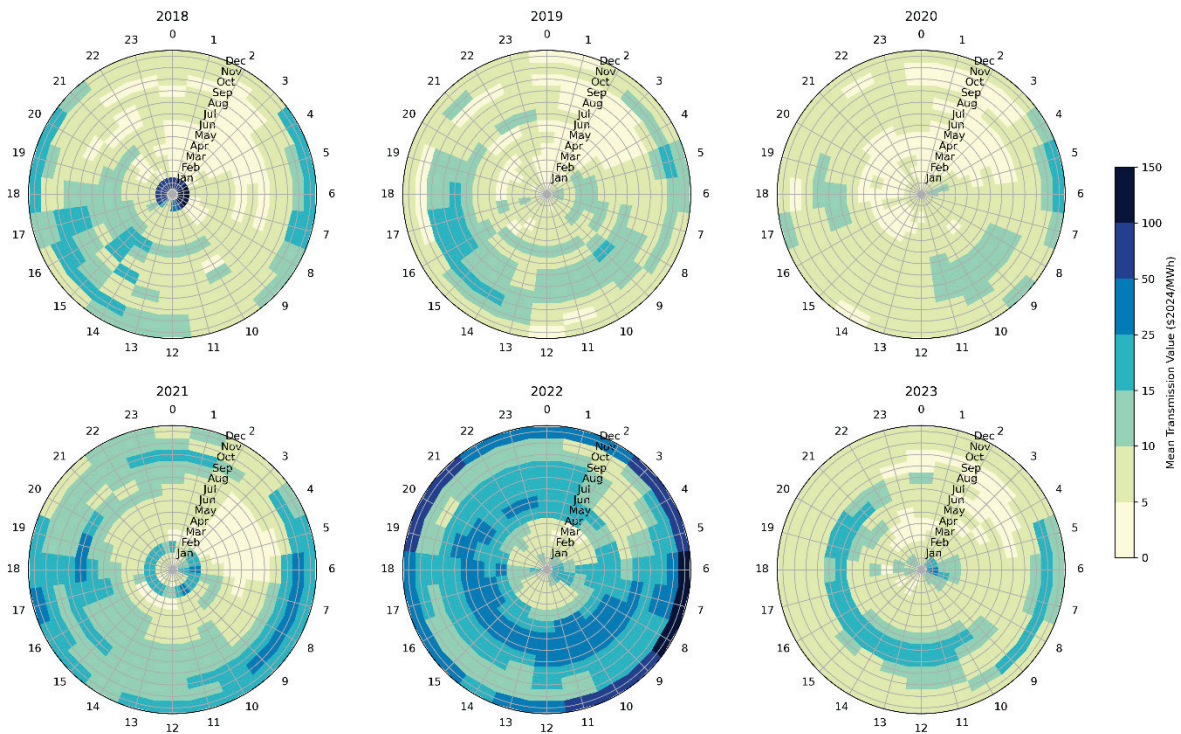


Figure 5. Polar Clock Heatmap of Transmission Value, SOCO-FPC, 2018-2023

MISO – Southern Company

Long-term average transmission value between MISO and SOCO between 2012 and 2023 is \$10.7/MWh. Figure 6 shows that, just like in SOCO-FPC, 50% of the annual transmission value accrued in just 3% of all hours in 2018, whereas in other years it was spread across 11% to 18% of all hours.

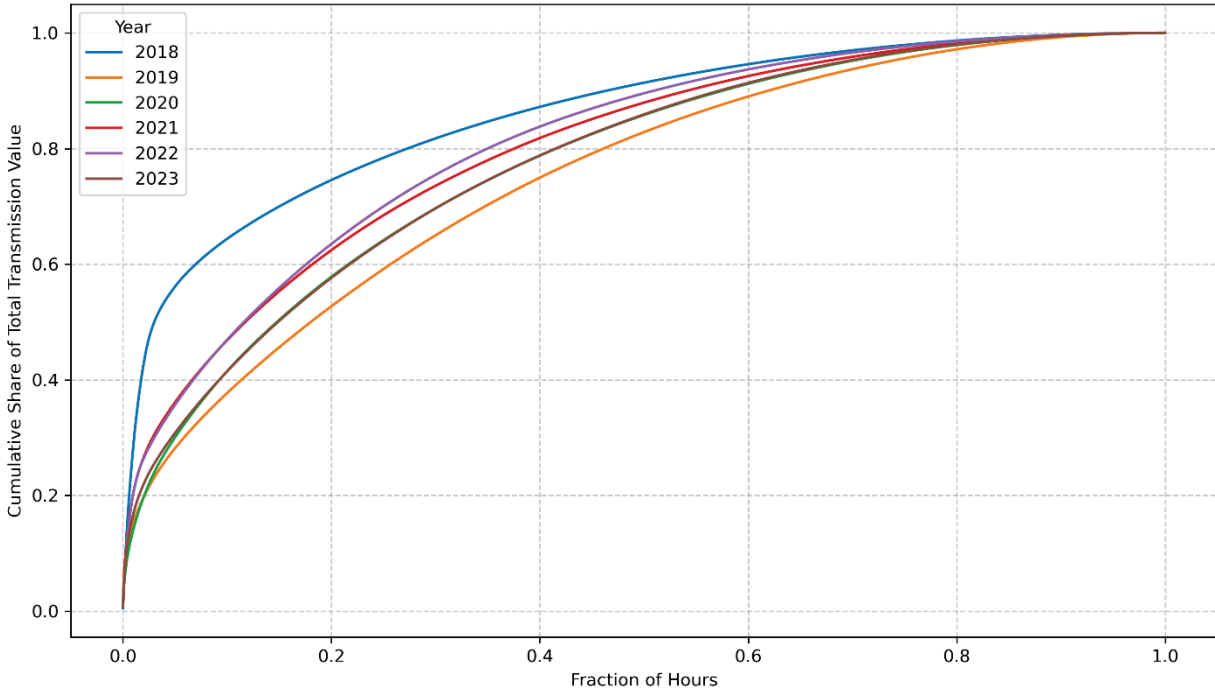


Figure 6. Cumulative Transmission Value Curve, MISO-SOCO, 2018-2023

Figure 7 again highlights the impact of polar vortex events on transmission values between MISO and SOCO (January 2018, February 2021, and December 2022). Nonetheless summer afternoons and late nights also consistently drive value, as do fall mornings.

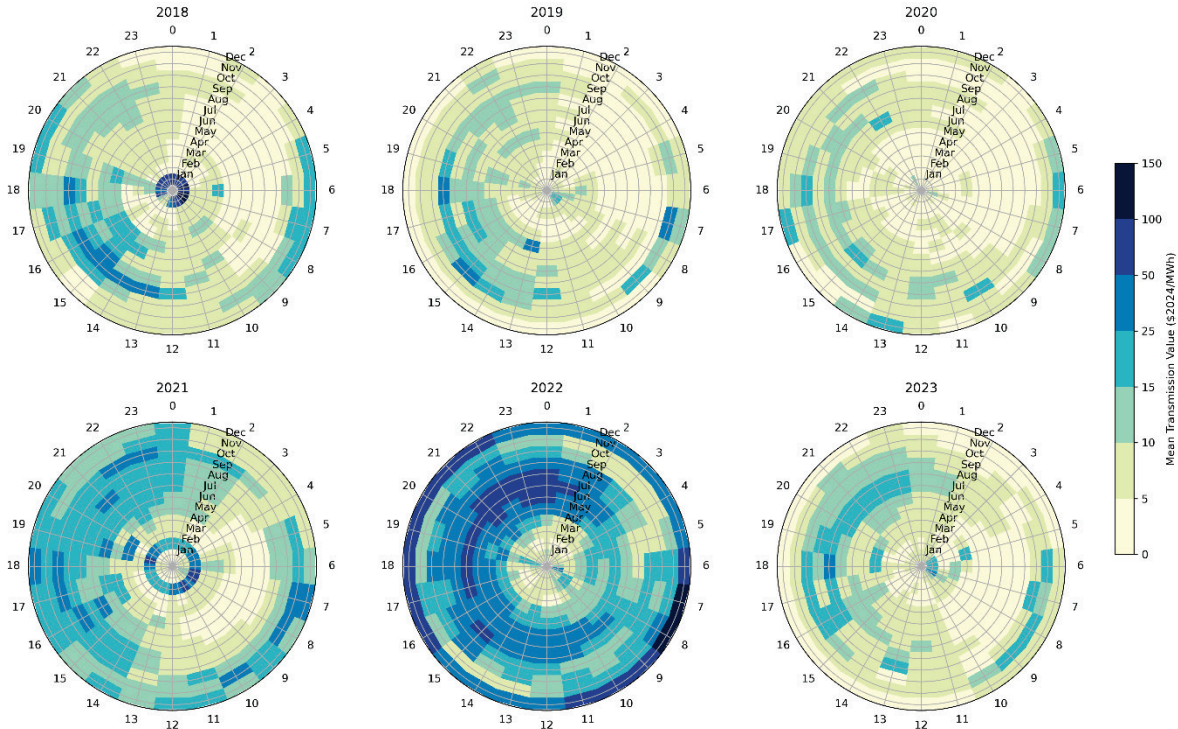


Figure 7. Polar Clock Heatmap of Transmission Value, MISO-SOCO, 2018-2023

PJM – Duke Energy Carolinas

Long-term average transmission value between PJM and DUK between 2012 and 2023 is the highest among the three regional corridors at \$13.7/MWh. The transmission value is spread across more hours in comparison to the other regions, with 50% of the annual cumulative value reached within 9% to 16% of all hours as shown in Figure 8.

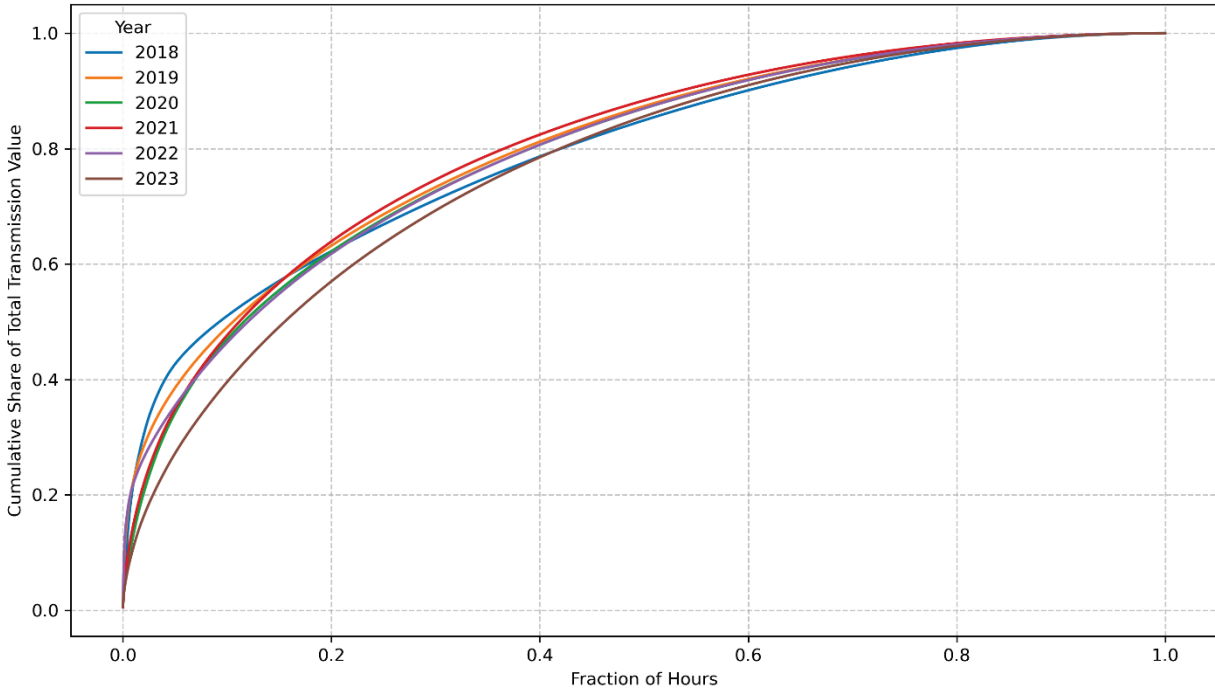


Figure 8. Cumulative Transmission Value Curve, PJM-DUK, 2018-2023

The impact of polar vortex events (January 2018 and December 2022, the February 2021 event played less of a role) on transmission values between PJM and Duke Energy Carolinas are shown in Figure 9. It also highlights that some years (for example, the second half of 2018) exhibit elevated price differentials across nearly all hours, whereas in others high transmission value is concentrated in specific periods, such as summer afternoons in 2019.

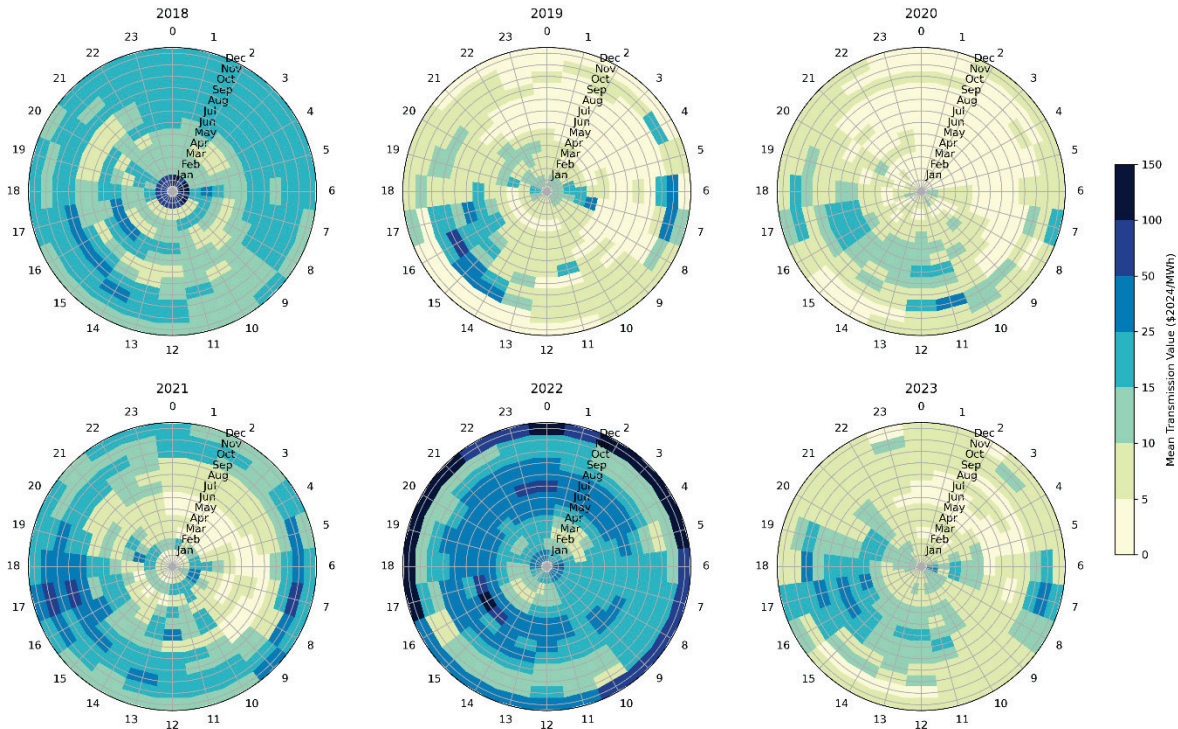


Figure 9. Polar Clock Heatmap of Transmission Value, PJM-DUK, 2018-2023

Conclusion

The Southeast’s lack of an organized wholesale market or formal imbalance market means that valuing transmission requires an alternative to ISO-reported nodal prices. Here, FERC’s system-lambda data—despite known limitations—is used as a proxy for hourly marginal costs.

Intra-regional findings:

Annual averages historically span \$2–\$25/MWh in SERTP and \$4–\$19/MWh in FRCC, (disregarding transmission value driven by anomalously low values in FPL in 2022 or apparent outlier years in SC). The ranges of transmission value reported here are large, spanning an order of magnitude in some cases. Much of this variation is driven by year-to-year changes, with 2022 being a year with particularly high intra-regional transmission value.

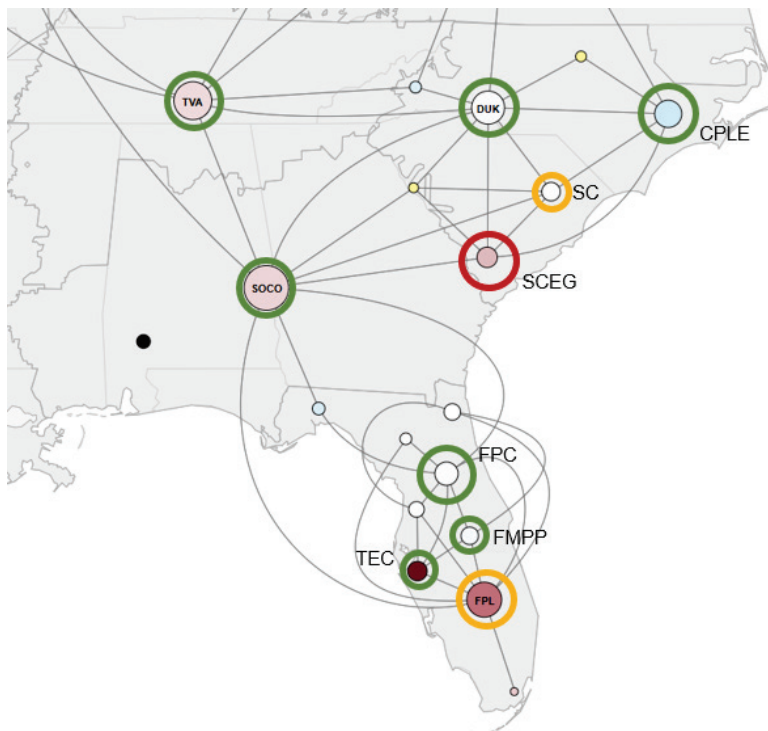
Inter-regional corridors:

Long-time average transmission values across broader regions range from \$10 to \$14/MWh, though much of the transmission value is concentrated in a small portion of hours. Across all regions, extreme weather—particularly polar vortex events in January 2018, February 2021, and December 2022—drives the largest price spreads. Seasonal patterns also emerge, with summer afternoons and fall mornings contributing consistently to transmission value.

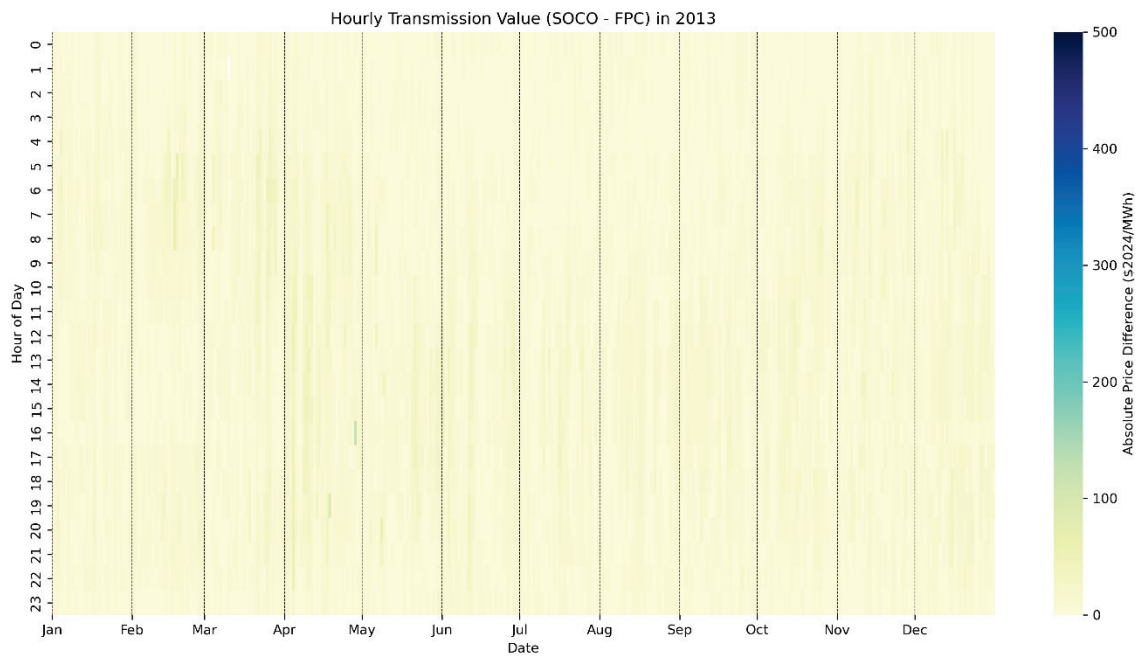
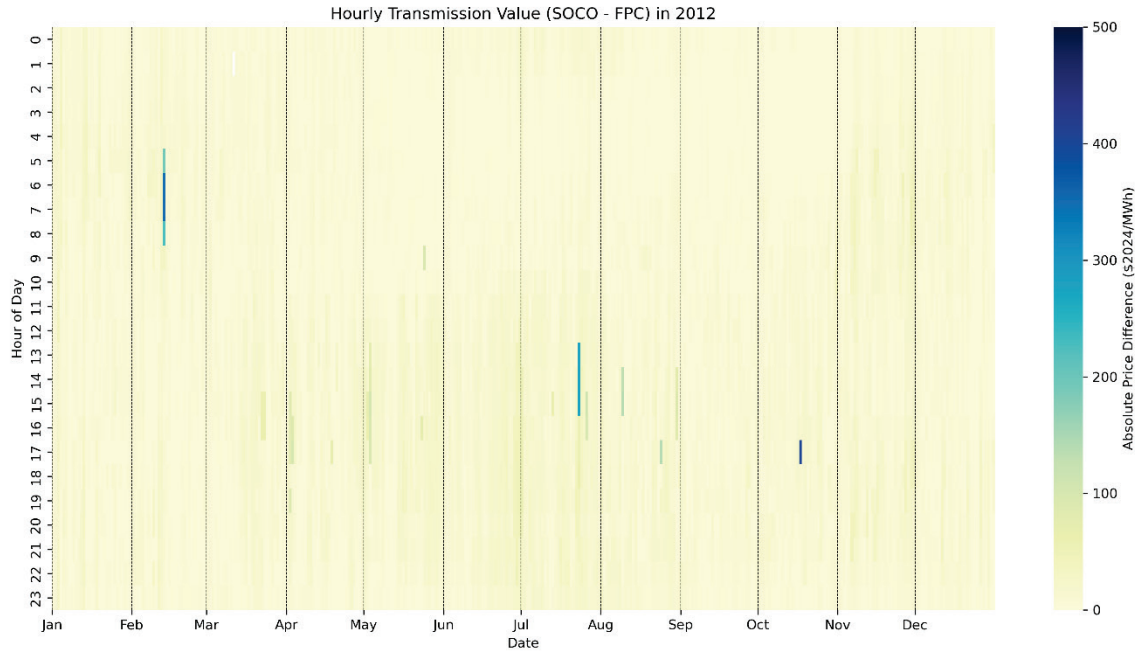
Appendix

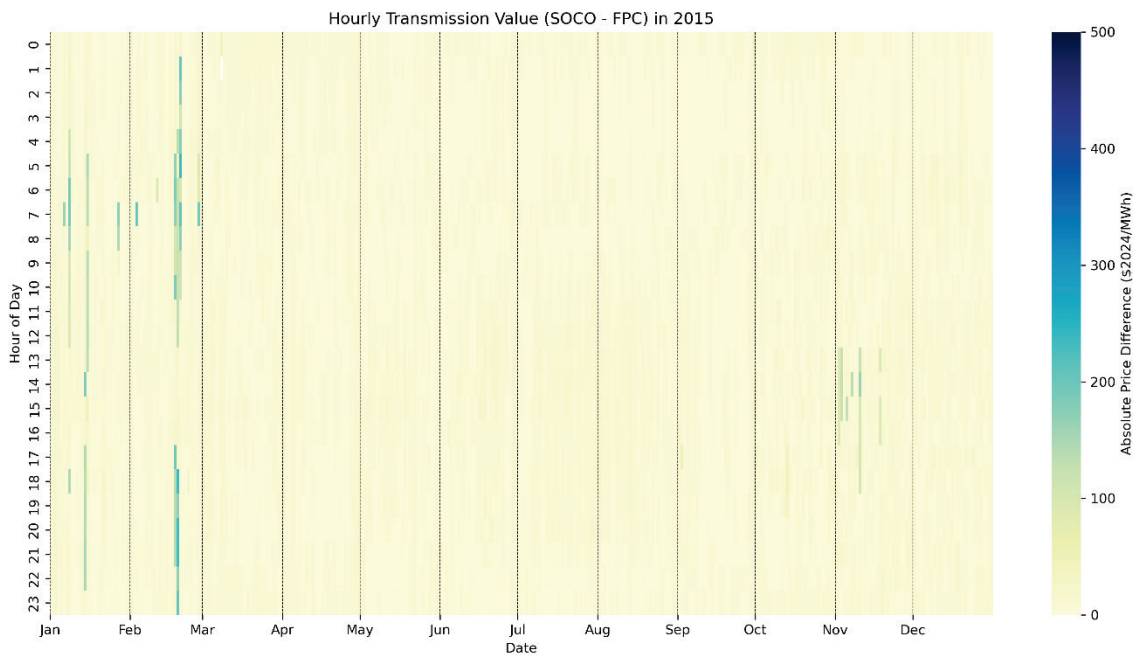
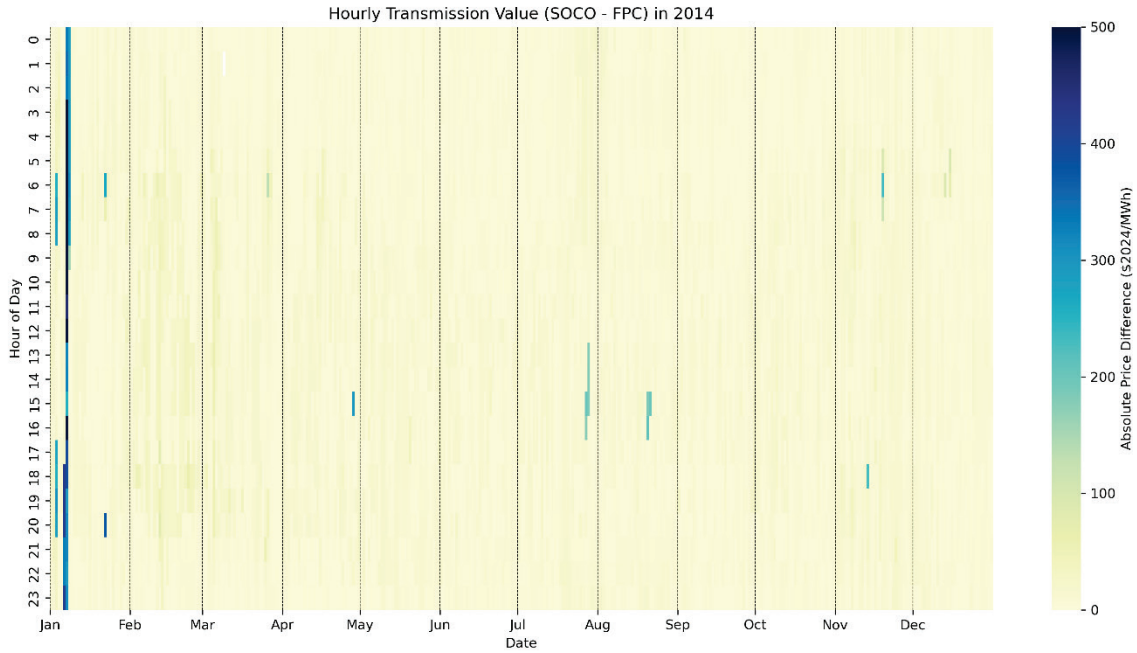
Price Data Inventory

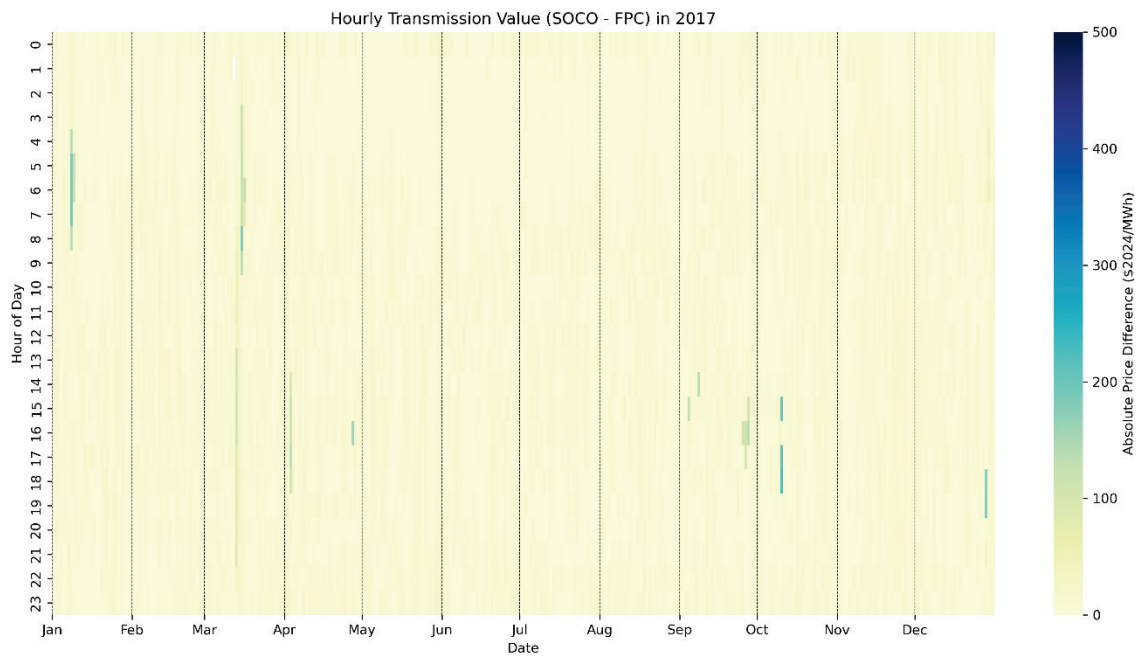
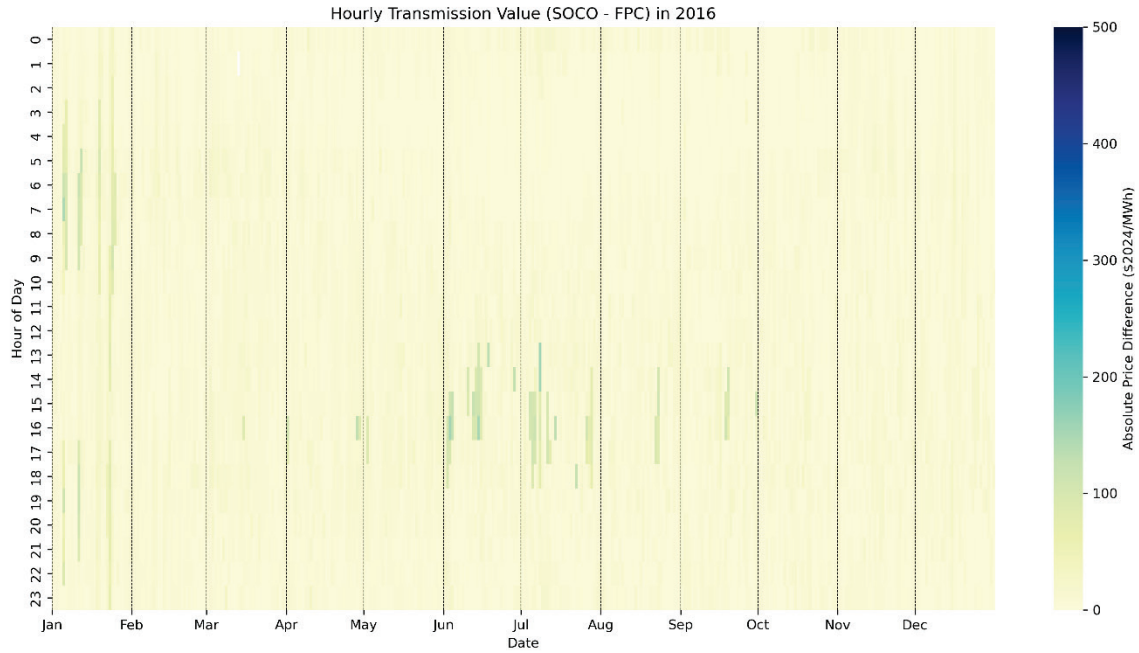
BA	Name	Region	ISO Interface Node	FERC Lambda
TVA	Tennessee Valley Authority	Tennessee	MISO Interface TVA	2012-2023
DUK	Duke Energy Carolinas	CAR	PJM Interface South / MISO Interface DUK	2012-2023
CPLE	Duke Energy Progress East	CAR	PJM Interface South / MISO Interface CPLE	2012-2023
SC	South Carolina Public Service Authority / Santee Cooper	CAR	MISO Interface SC (2012-2016)	2012-2023
SCEG	Dominion Energy South Carolina	CAR	MISO Interface SCEG	No report
SOCO	Southern Company	SE	MISO Interface SOCO	2012-2023
FPC	Duke Energy Florida	FLA	MISO Interface FPC (2012-2016)	2012-2023
FMPP	Florida Municipal Power Pool	FLA	MISO Interface FMPP (2012-2016)	2012-2021, 2023
TEC	Tampa Electric Co	FLA	MISO Interface TEC (2012-2016)	2012-2023
FPL	Florida Power and Light	FLA	MISO Interface FPL (2012-2016)	2012-2023

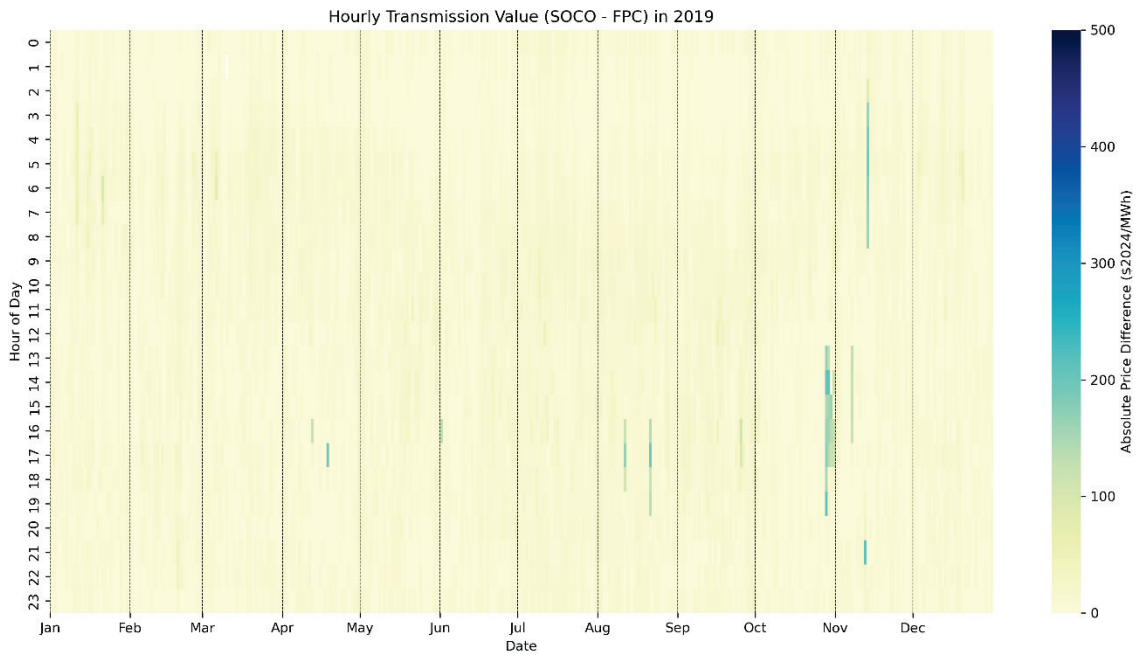
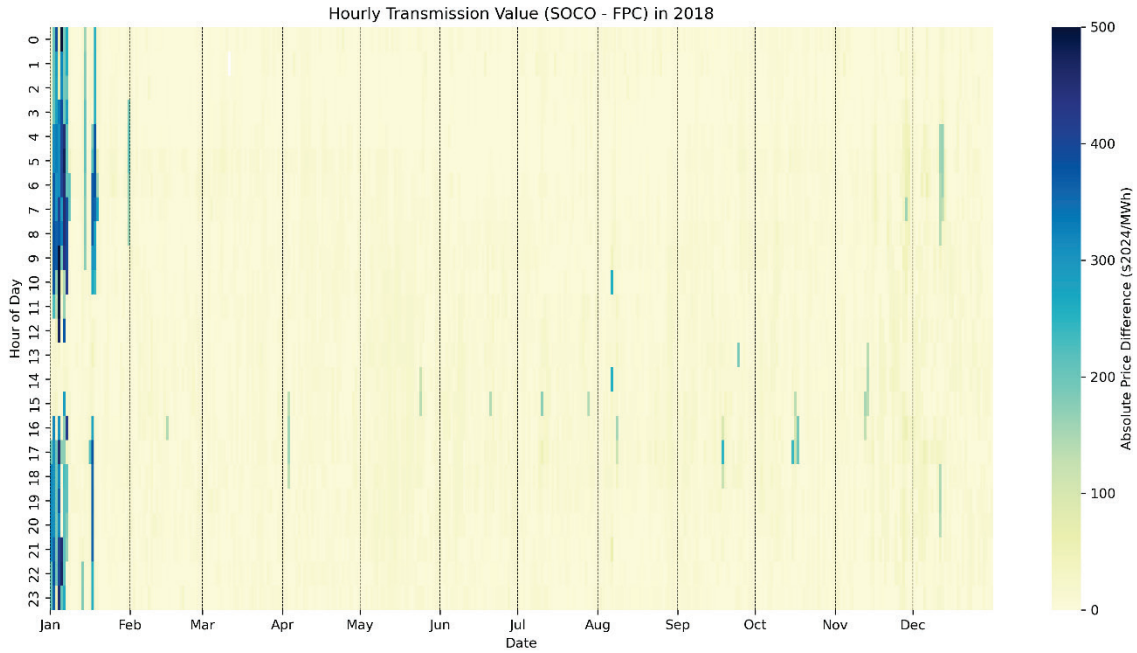


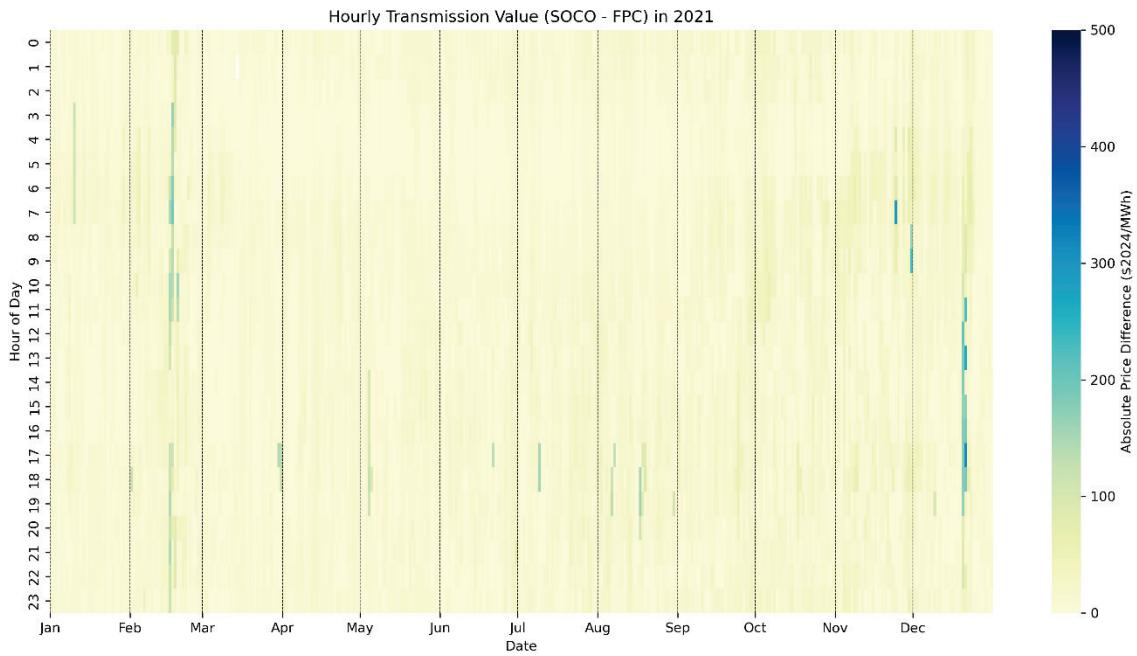
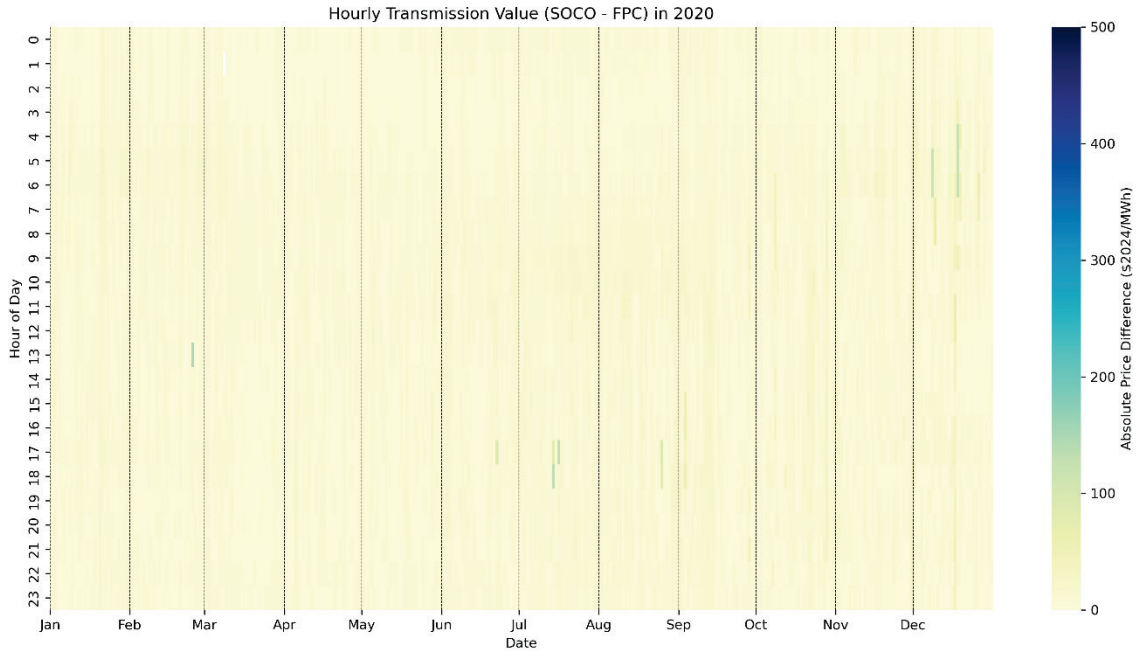
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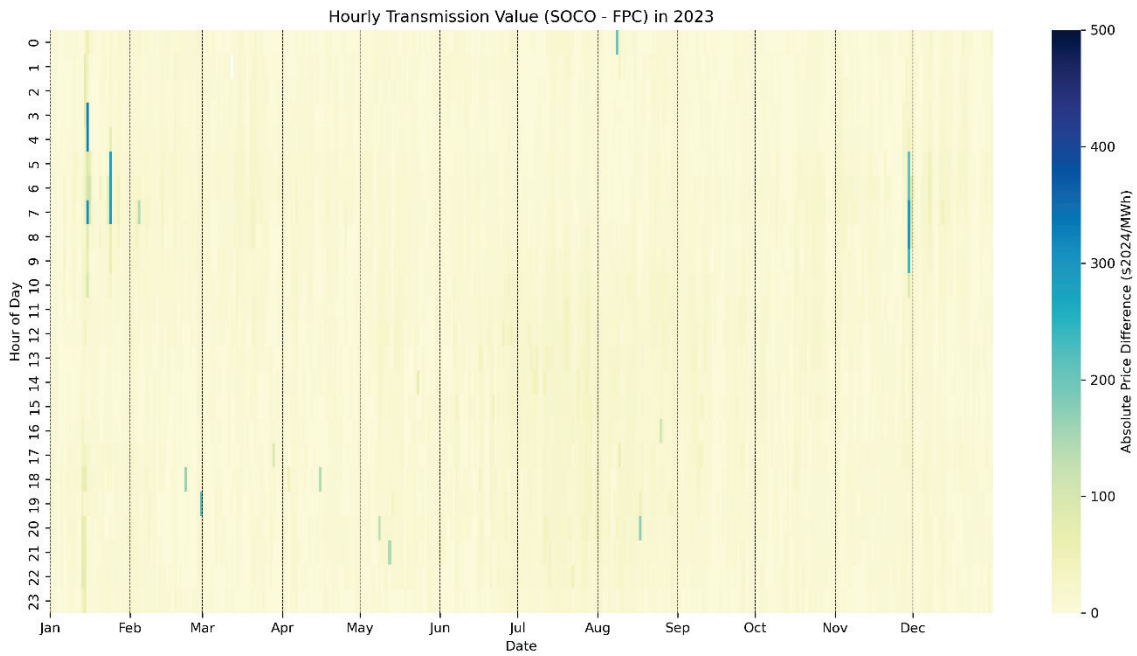
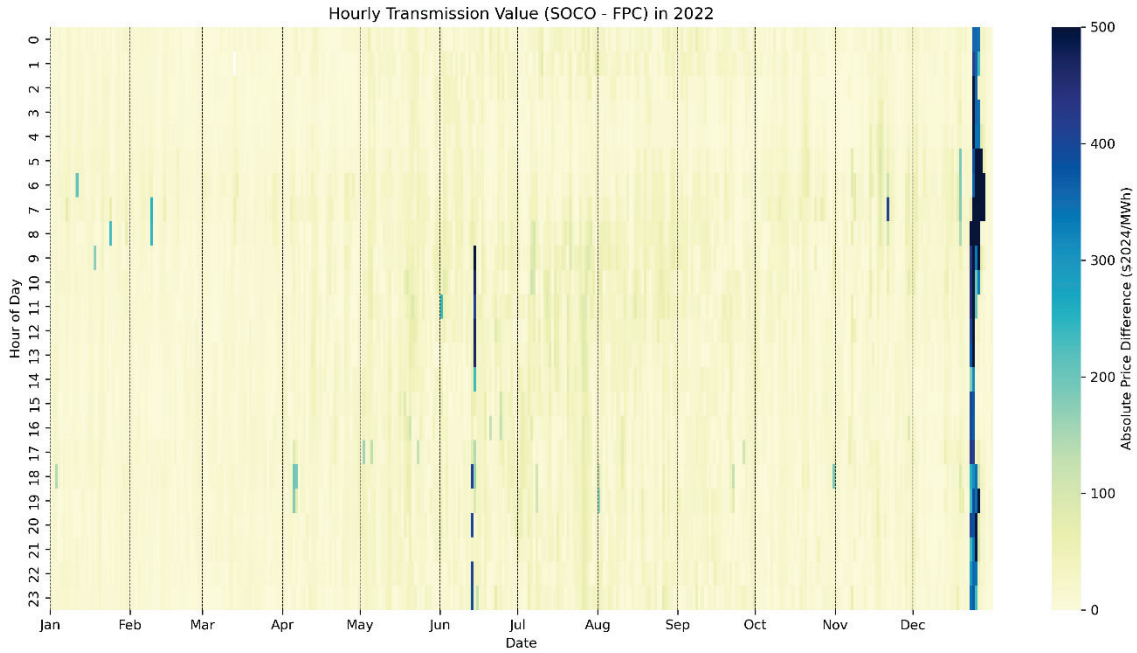




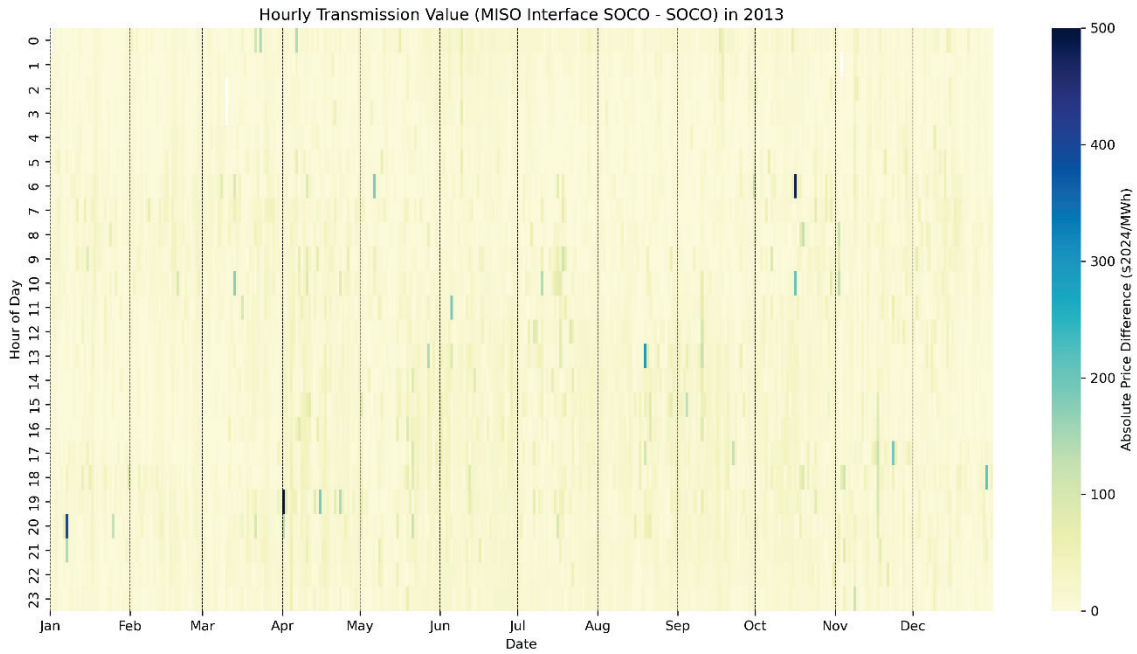
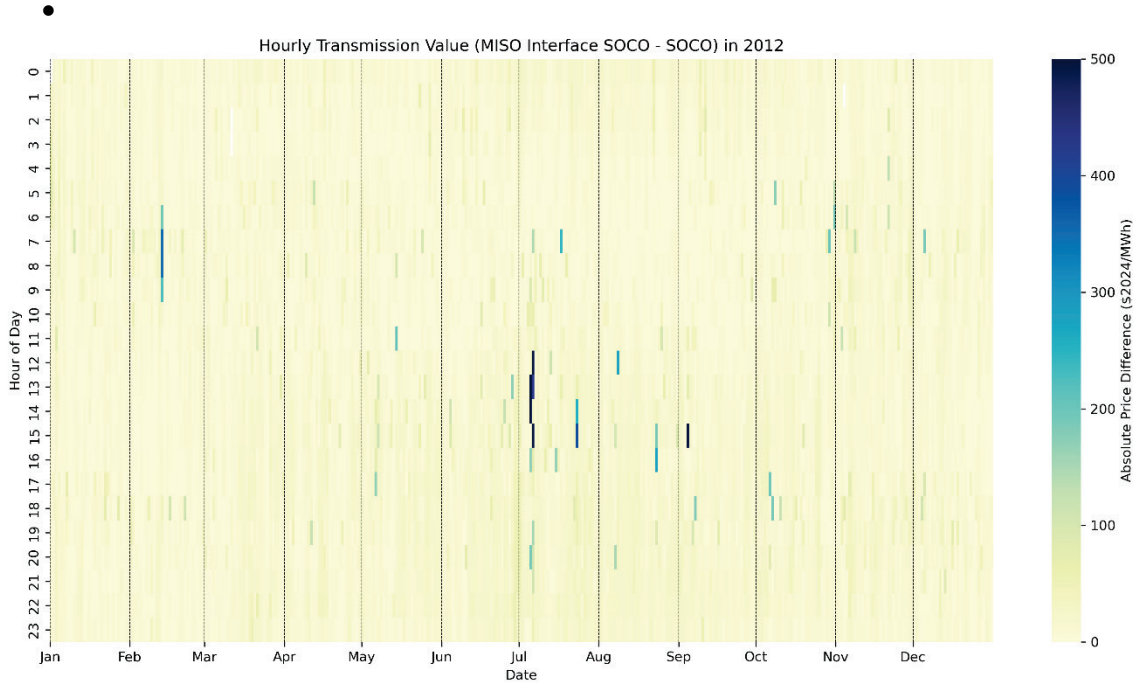


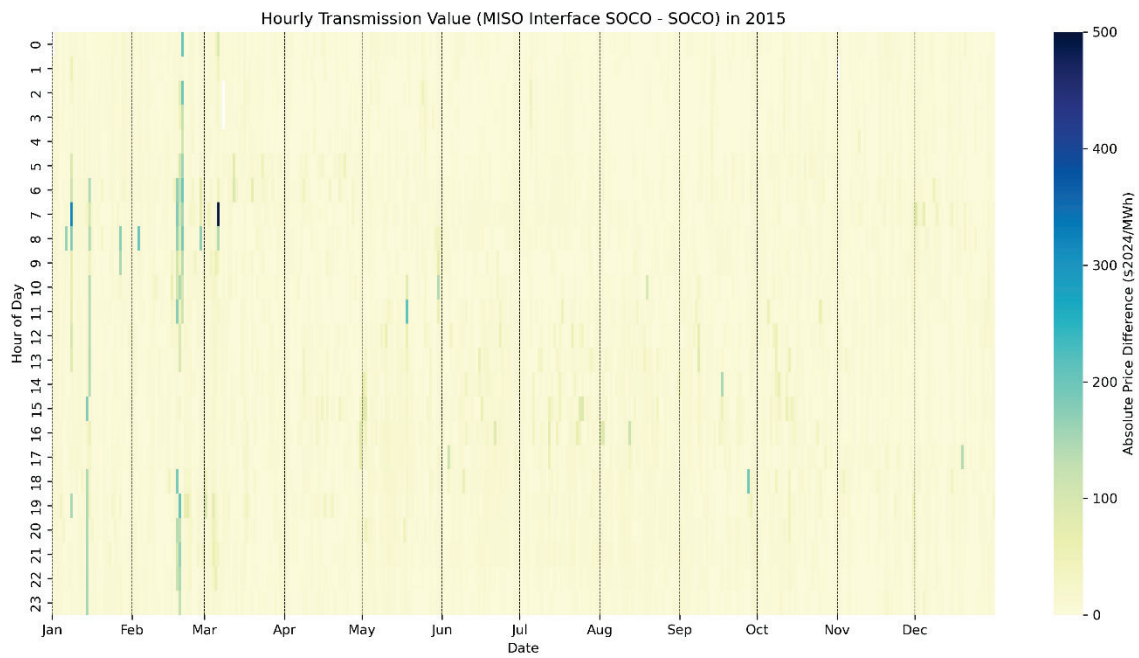
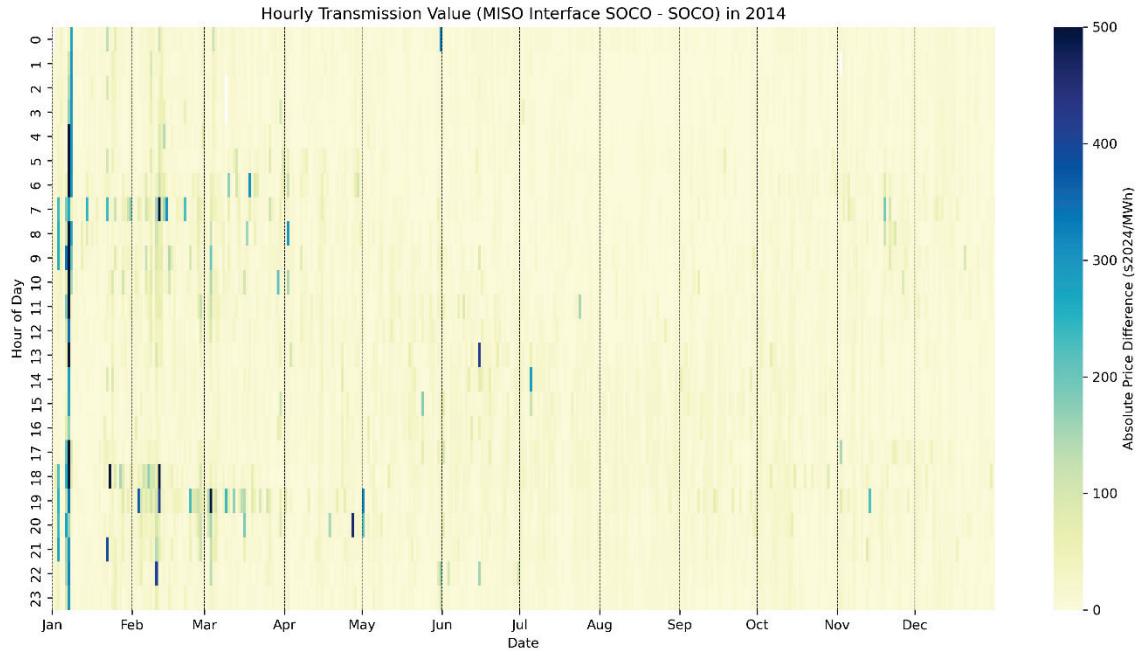


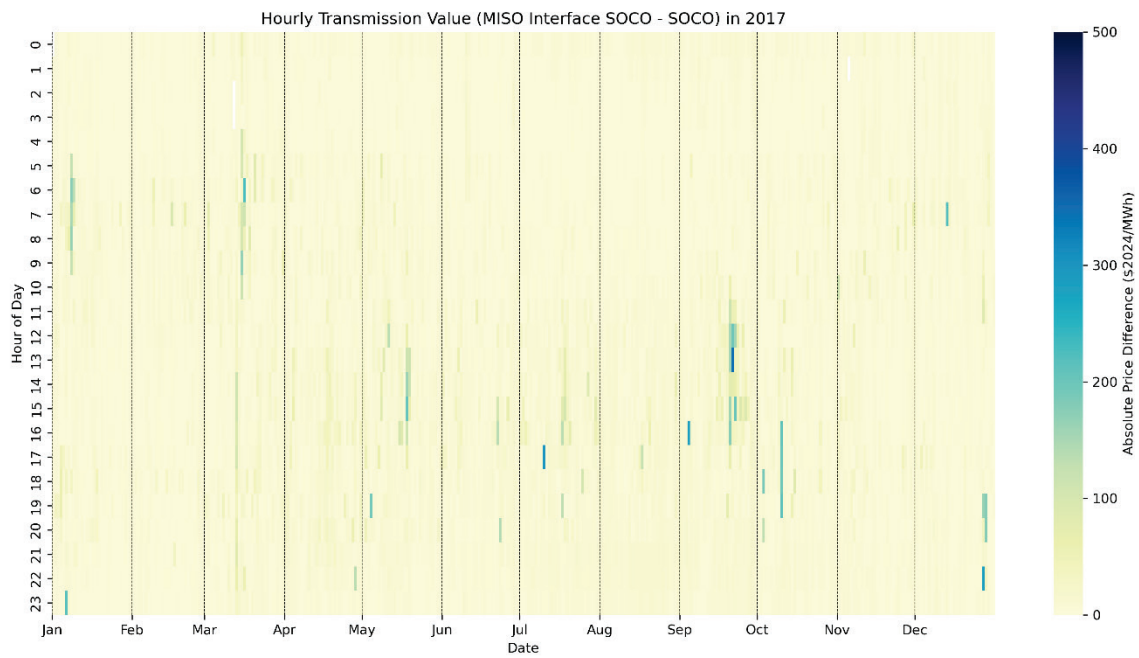
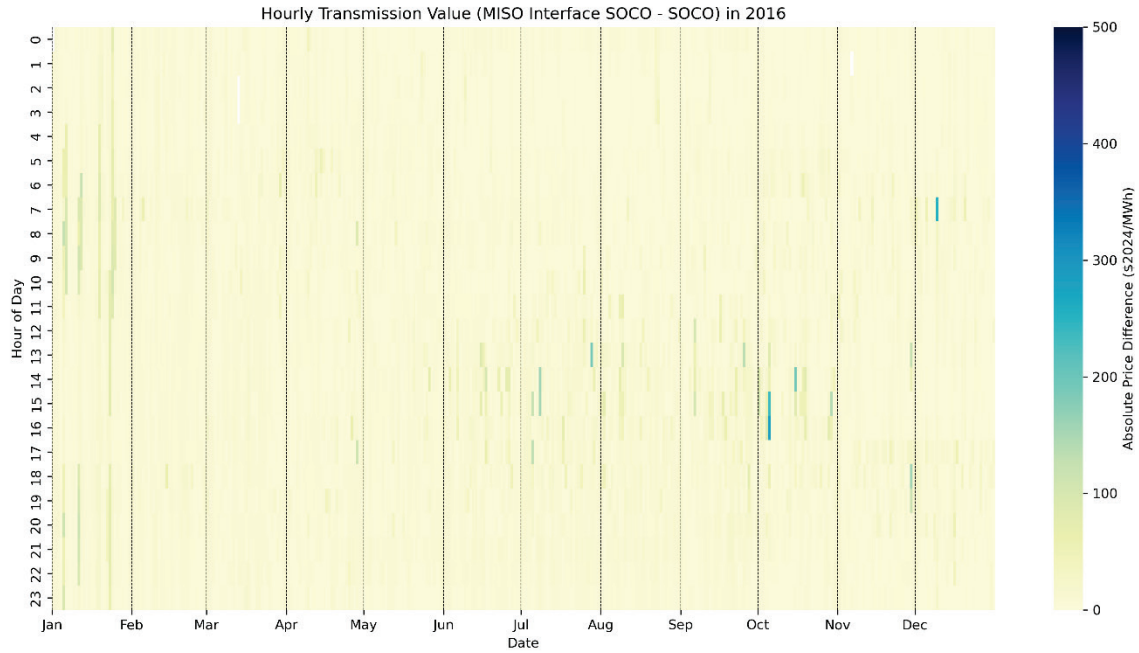


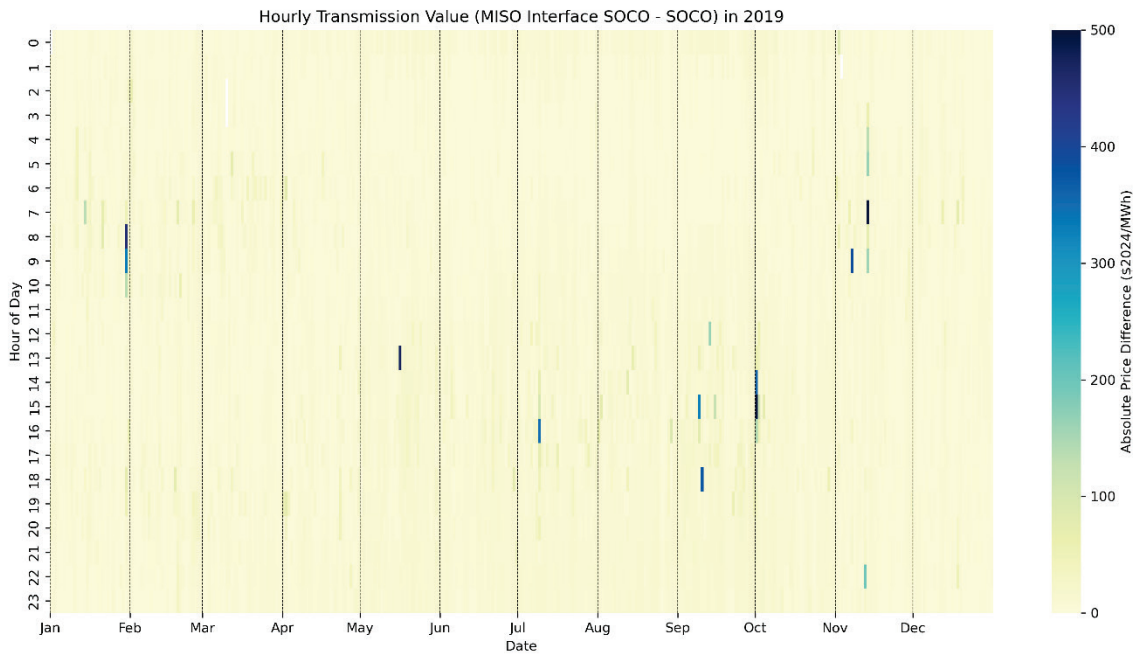
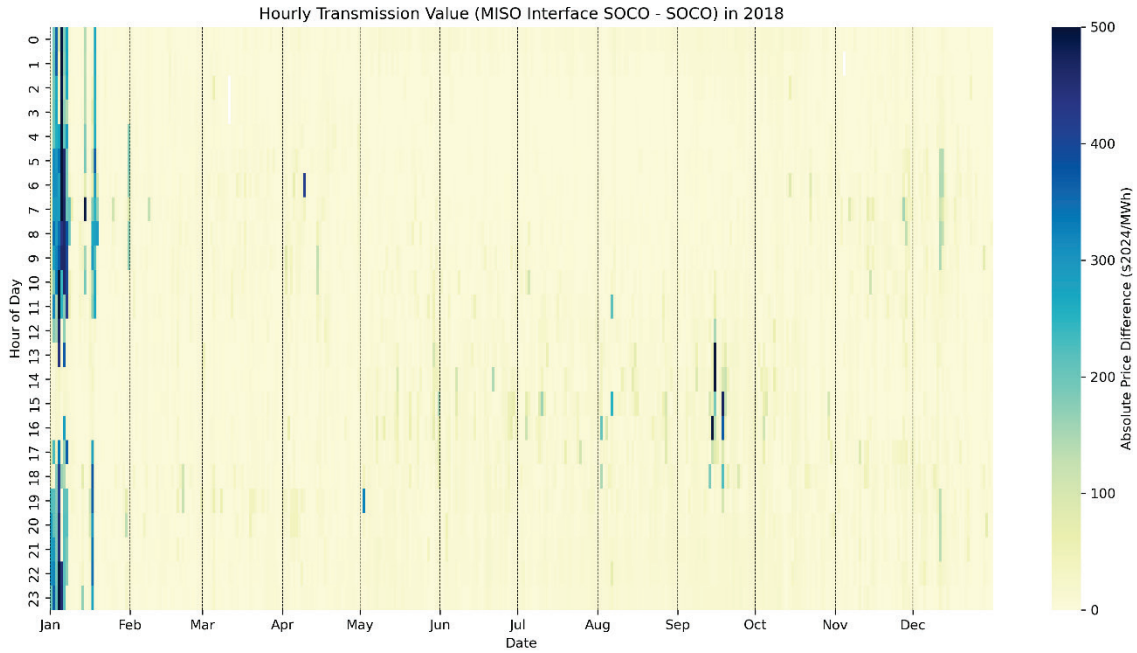


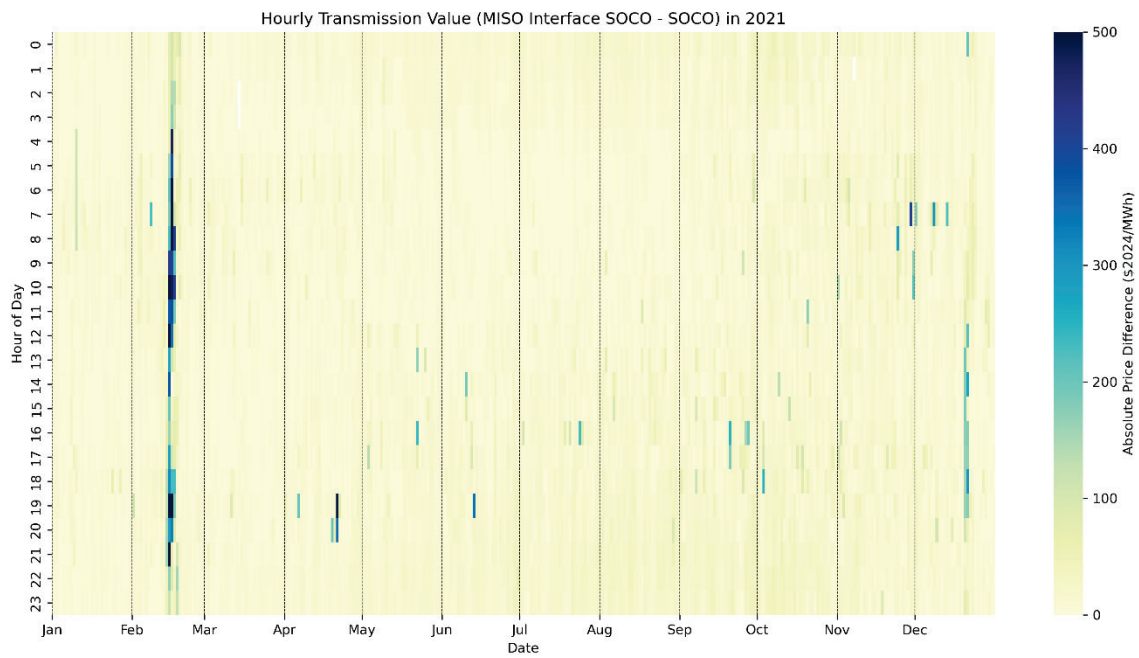
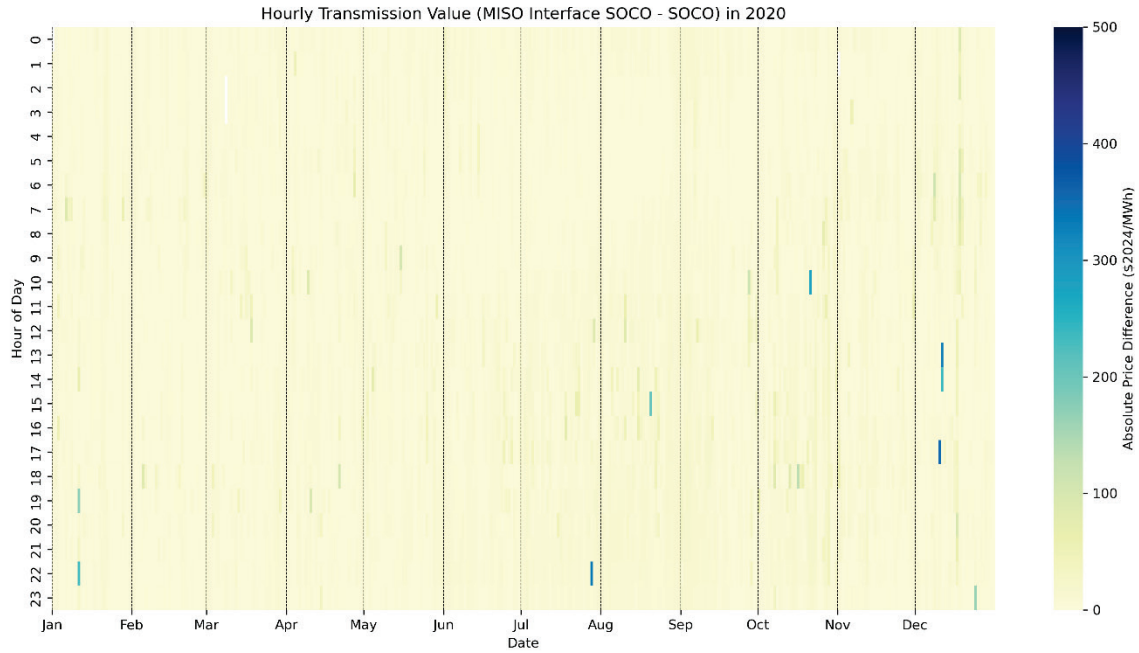
MISO-SOCO

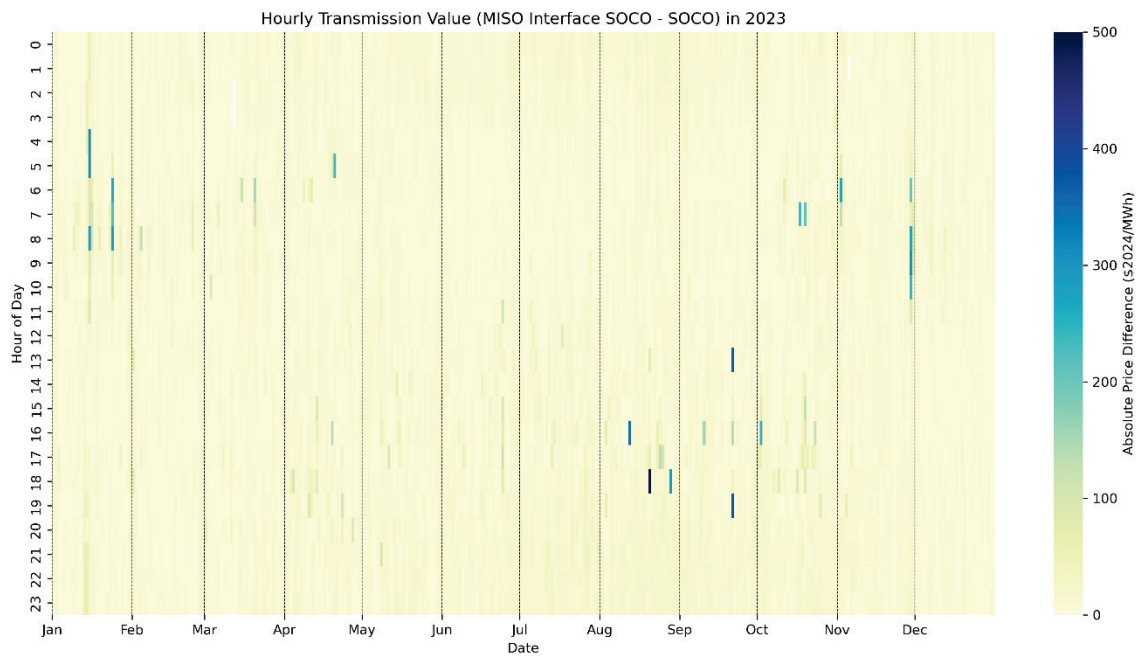
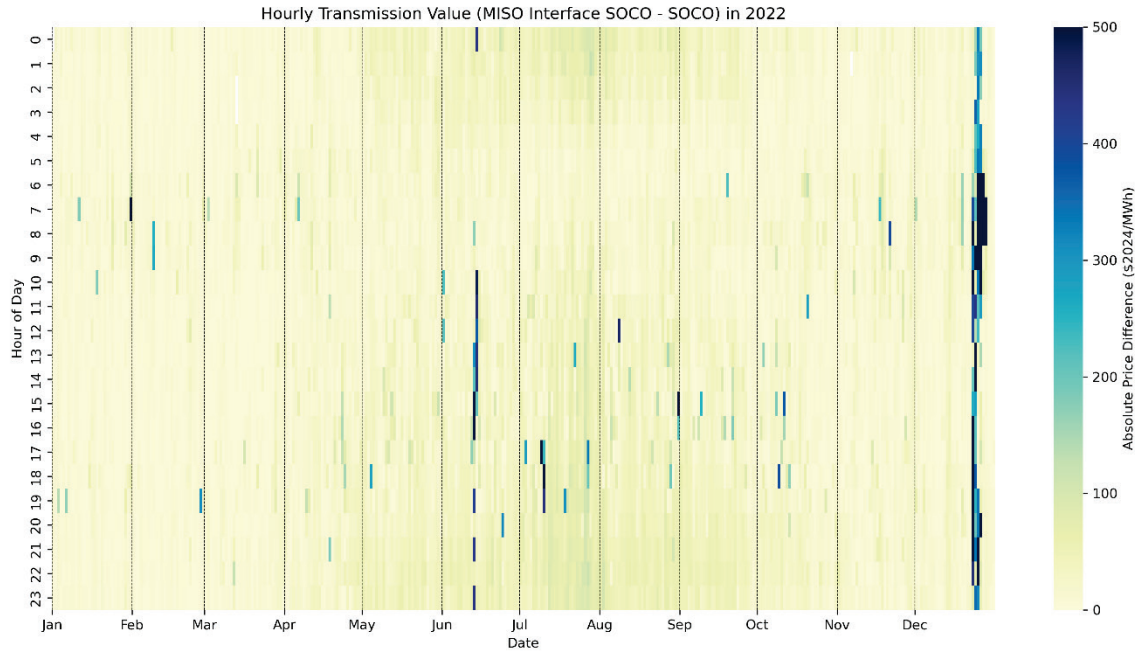












PJM-DUK

