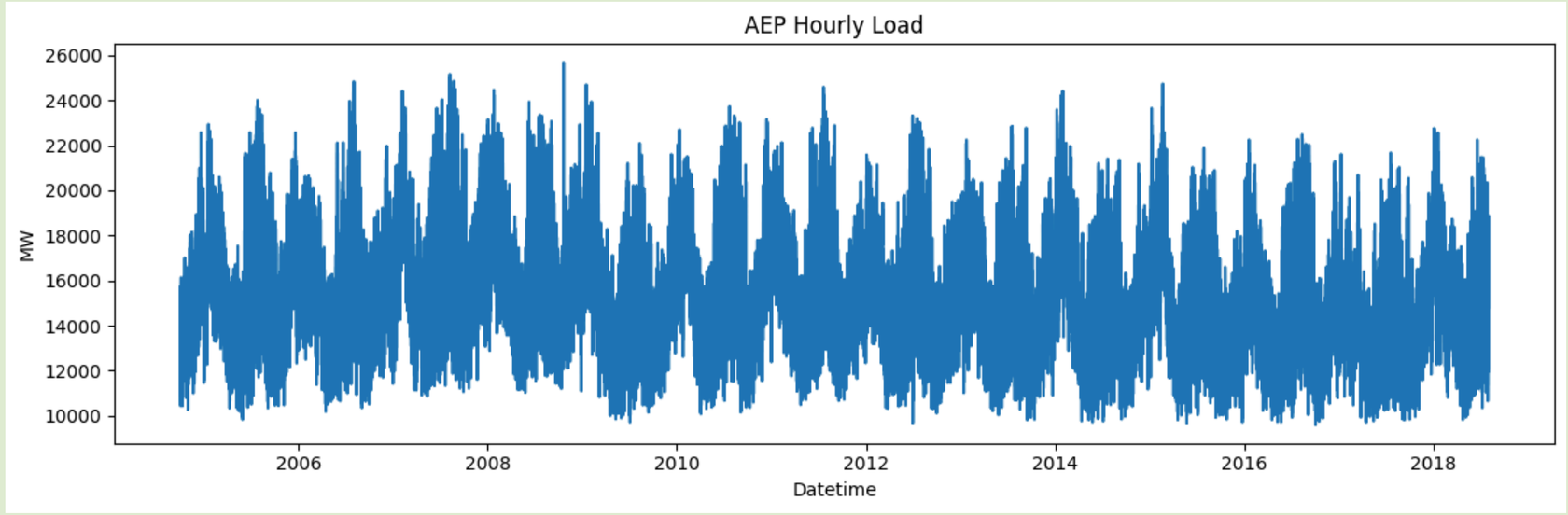
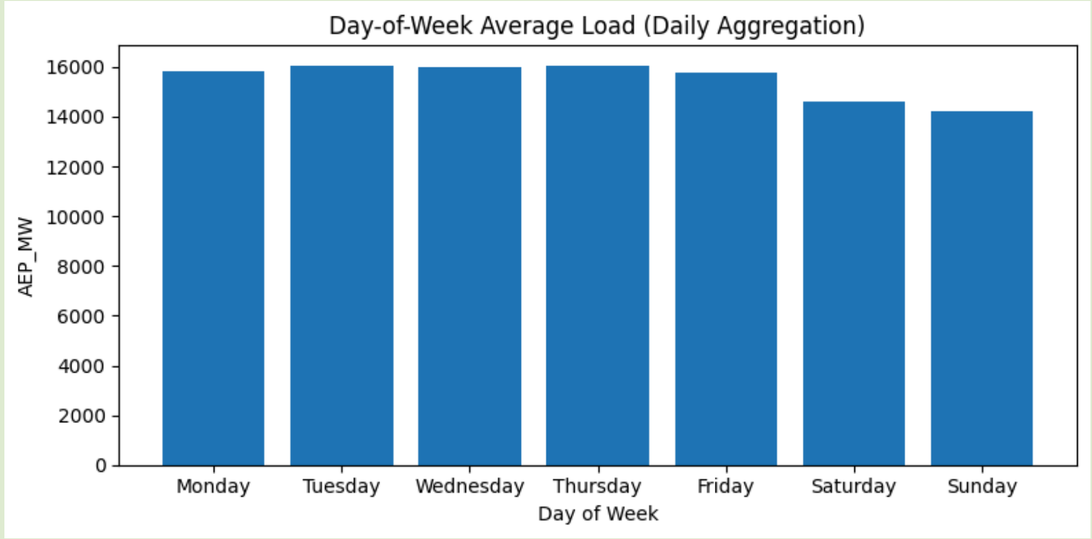
Managing Energy Consumption For Winter and Summer in 2019

INTRODUCTION DATA

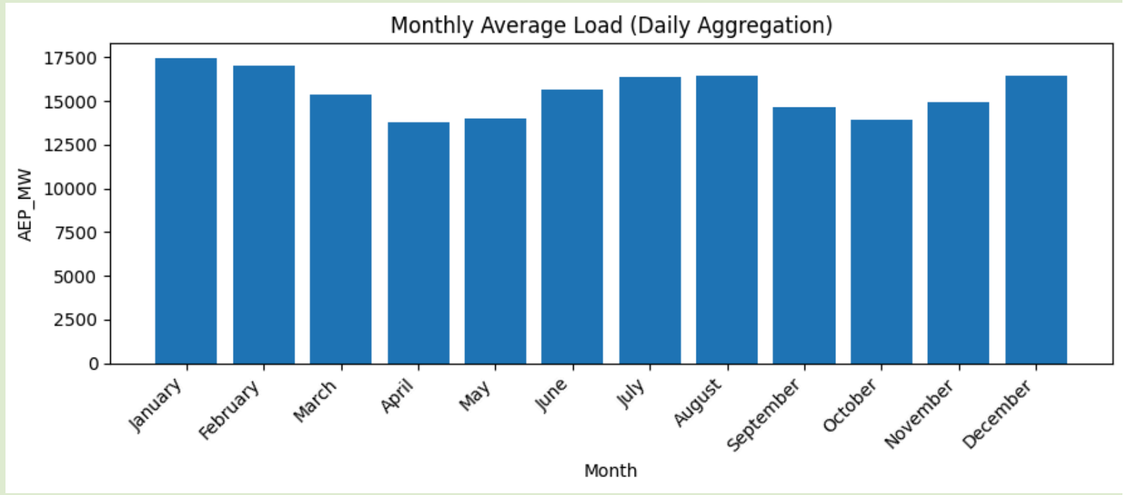


this data is based on 121273 row of “data American Electric Power Megawatt” From 2004 October until 2018 August.
this dataset is from https://www.kaggle.com/datasets/robikscube/hourly-energy-consumption

HOURLY AVERAGE DAY POWER USAGE

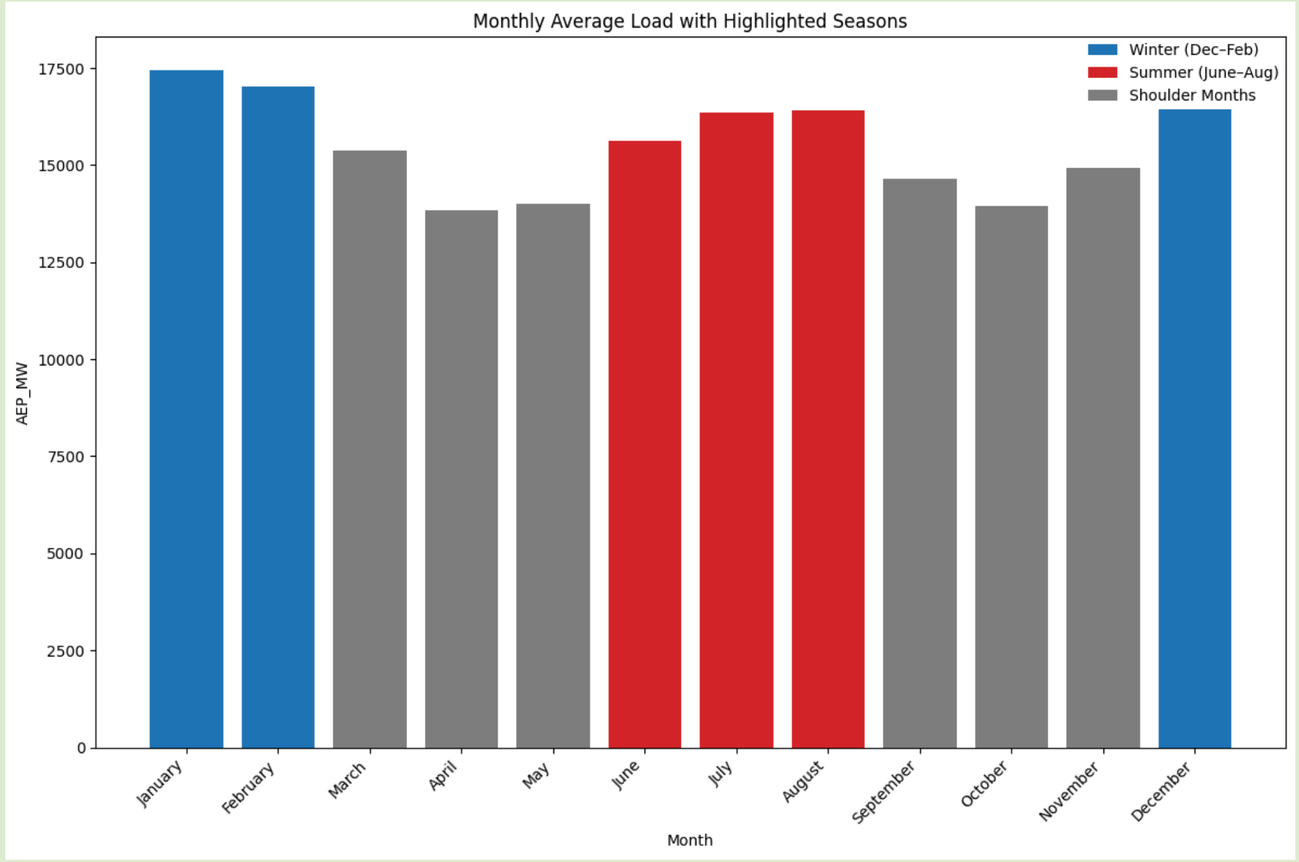


There is no clear distribution in here

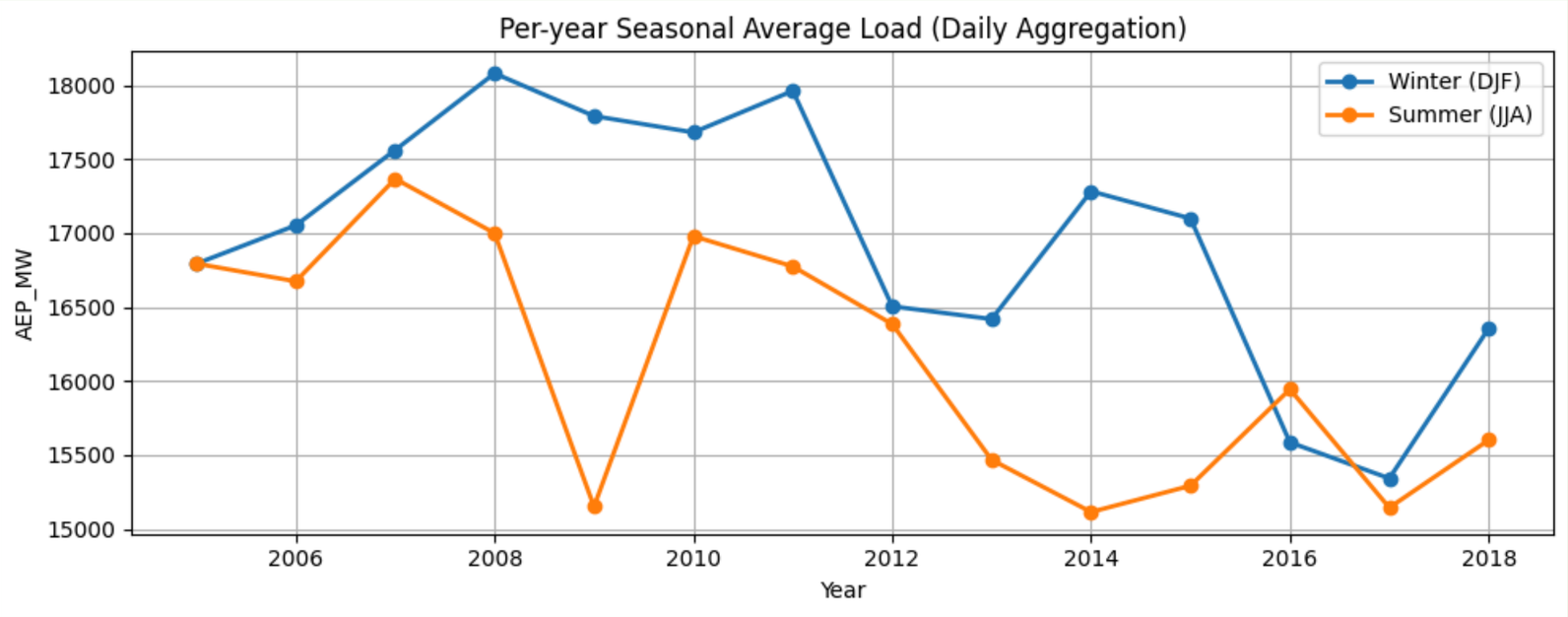


There is a pattern can be seen in this data

SEASONAL POWER CONSUMPTION



YEARLY CONSUMPTION ON WINTER SUMMER

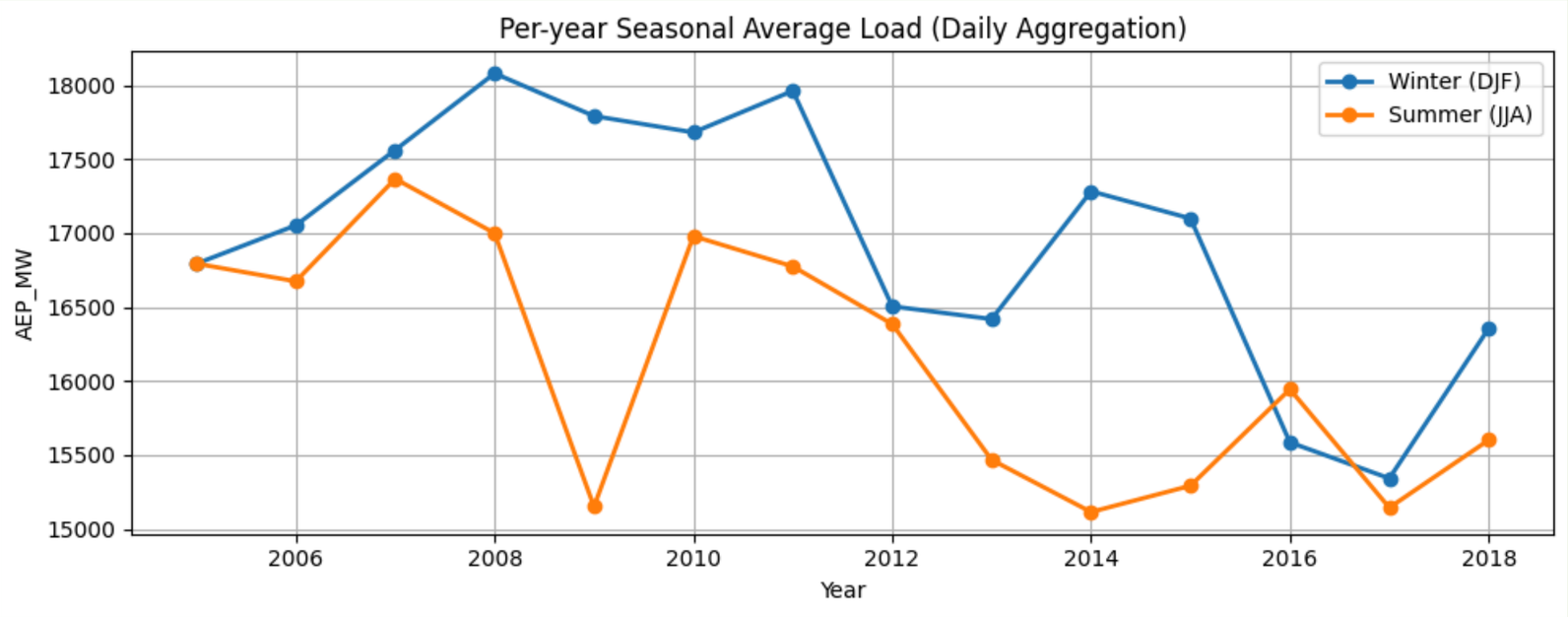


Even with a clear pattern, we need to be careful in a event like 2009 and 2016.
2009:

1. U.S. electricity demand fell ~4.2% in 2009, the largest annual drop in at least 60 years, driven by the recession's hit to factories and business activity. [1]
2. EIA notes a ~10% year-over-year fall in industrial power use during 2009—this sector is highly sensitive to downturns. [2]
3. June–July 2009 were cooler than normal in the Northeast/Midwest. NOAA's June and July U.S. climate summaries document below-normal temperatures there. Cooler conditions suppress cooling load. [3]

[1] https://www.ferc.gov/sites/default/files/2020-05/som-rpt-2009.pdf?
[2] https://www.eia.gov/todayinenergy/detail.php?id=142918
[3] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/200906?

YEARLY CONSUMPTION ON WINTER SUMMER



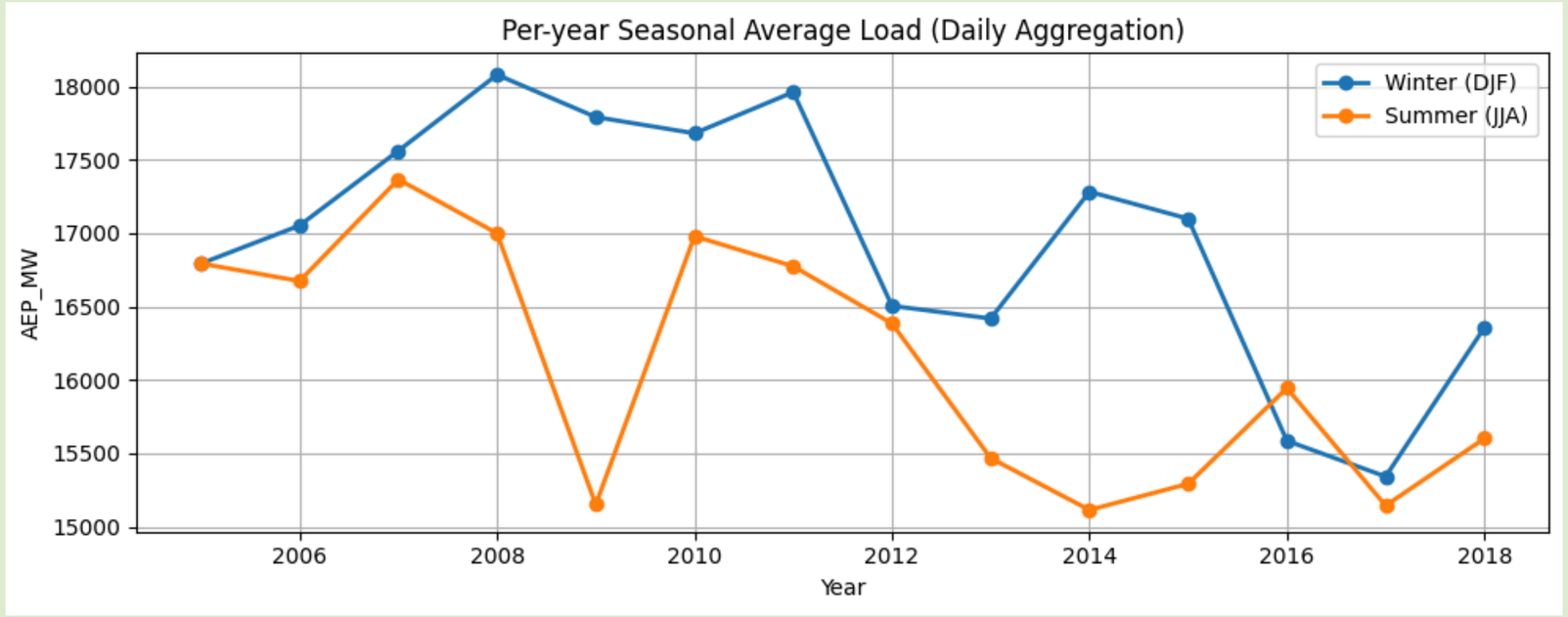
Even with a clear pattern, we need to be careful in a event like 2009 and 2016.
2016:

1. Summer 2016 heat: U.S. cooling degree days (CDDs) were the highest on record, and June–Aug CDDs were 12% above 2015 and 24% above normal → heavier air-conditioning load. [4]
2. Winter 2015–16 warmth: The U.S. had its warmest winter on record, strongly influenced by El Niño → suppressed heating demand. Regional offices covering northern Ohio (AEP territory) also documented an abnormally warm winter. [5]

[4] https://www.ferc.gov/sites/default/files/2020-05/som-rpt-2009.pdf?

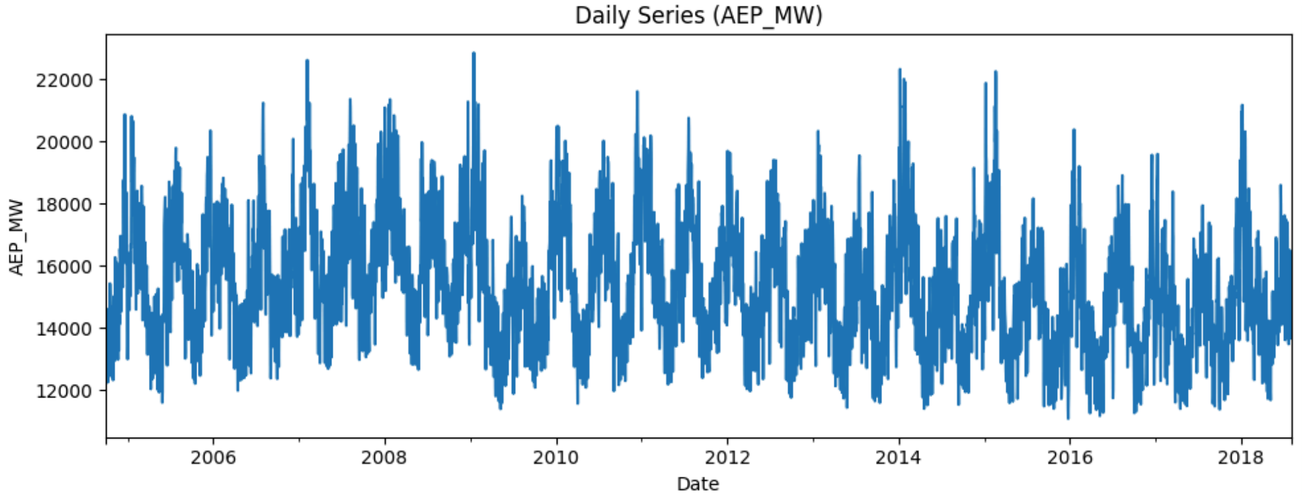
[5] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/201613

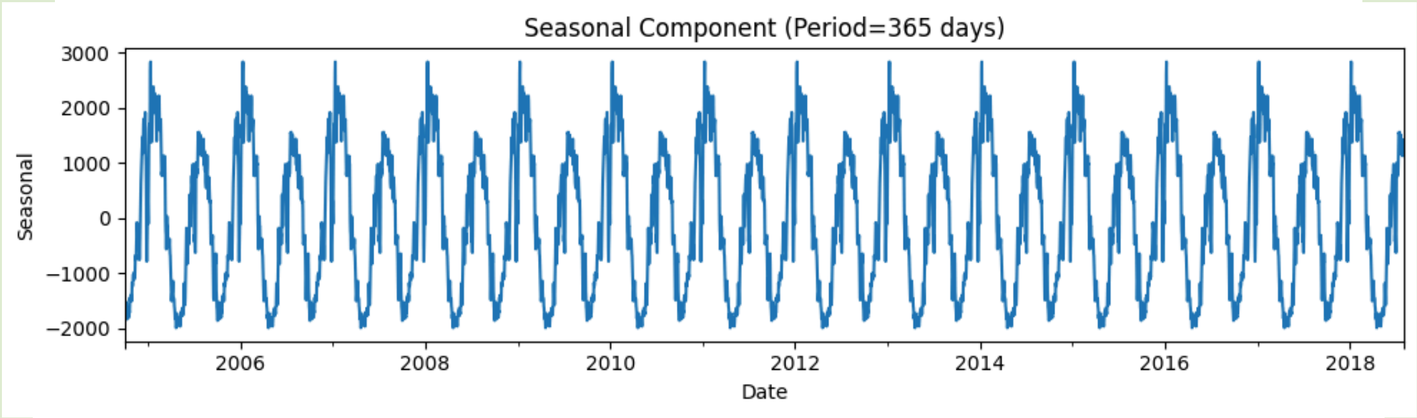
YEARLY CONSUMPTION ON WINTER SUMMER

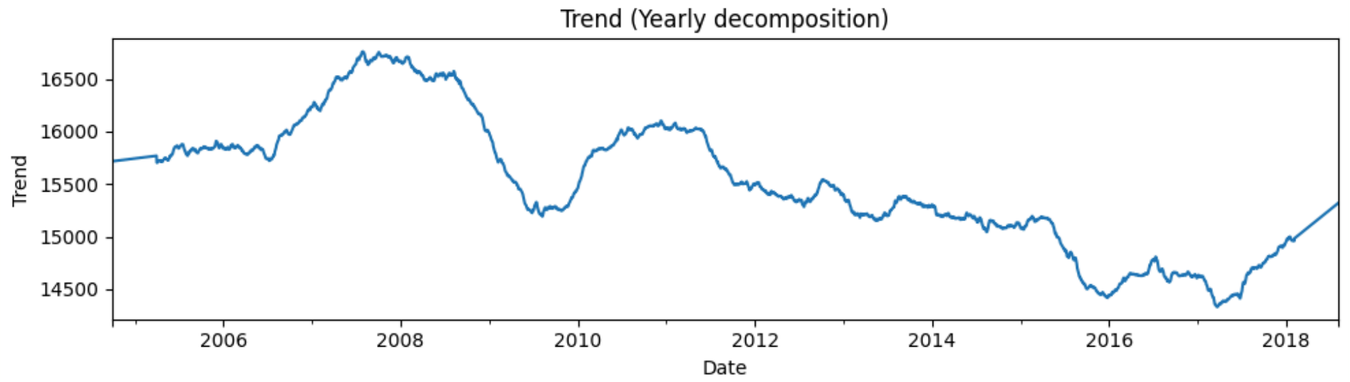


1. 2008–09 recession → industrial load collapsed. [1]
2. Cool early/mid-summer 2009 in the Midwest/Northeast [2][3]
3. Summer 2016 heat were the highest on record heavy air conditioning [4]
4. Winter 2015–16 warmth its warmest winter on record [5]

[1] https://www.ferc.gov/sites/default/files/2020-05/som-rpt-2009.pdf?
[2] https://www.eia.gov/todayinenergy/detail.php?id=14291&
[3] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/200906?
[4] https://www.ferc.gov/sites/default/files/2020-05/som-rpt-2009.pdf?
[5] https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/201613

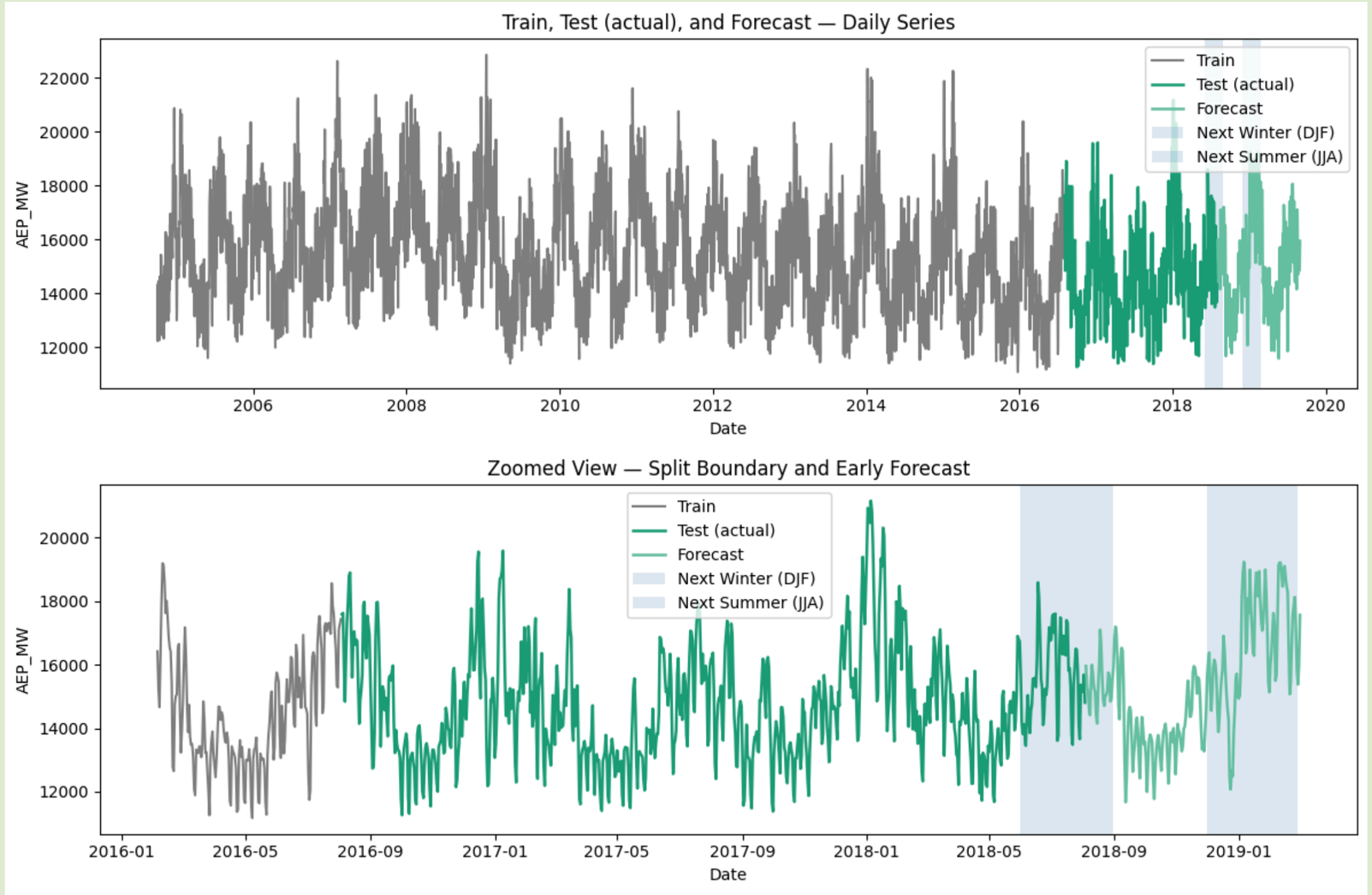






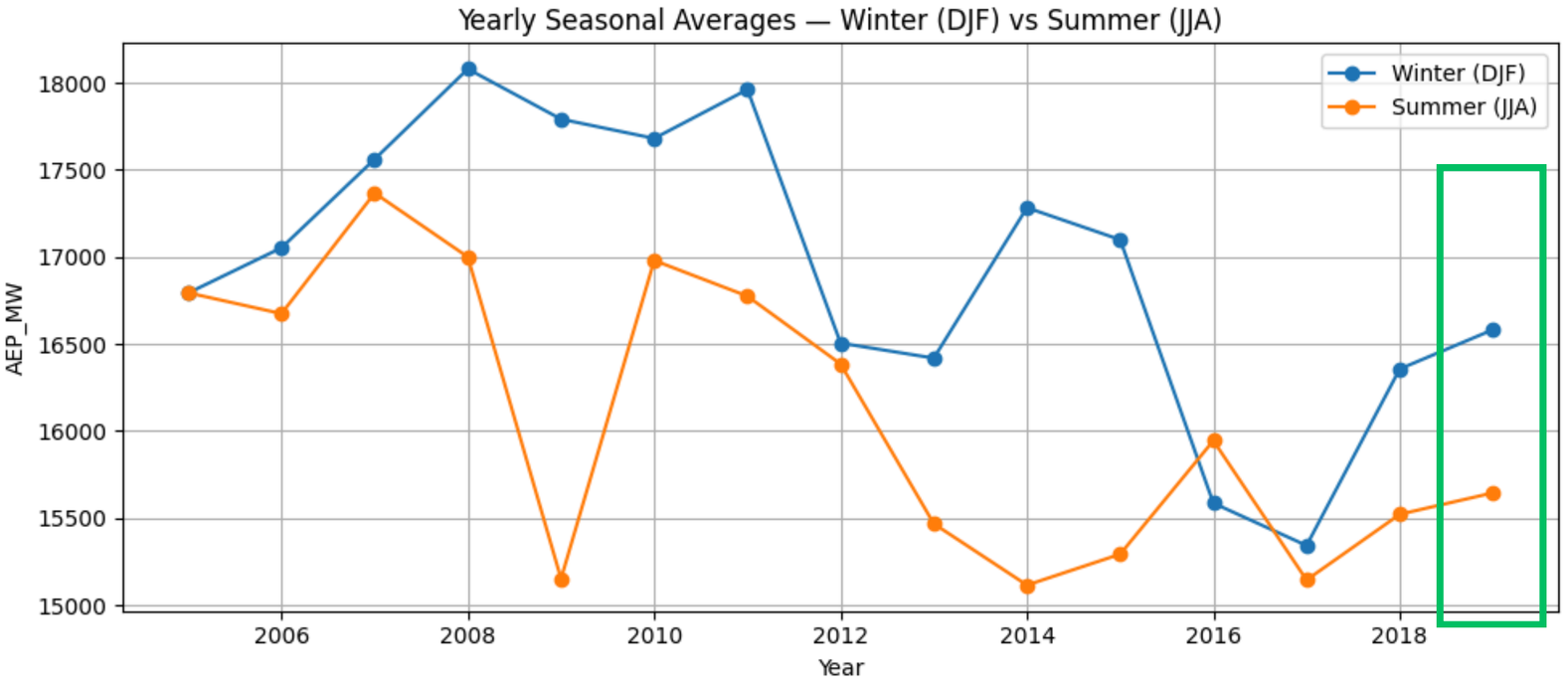
*DATA IS BEING APPROACH IN AVERAGE OF HOURLY IN DAY

PREDICTION FOR ONE YEAR AHEAD SUMMER AND WINTER



*Forecast happen based on trend and past data (ignoring disasters and unexpected events)

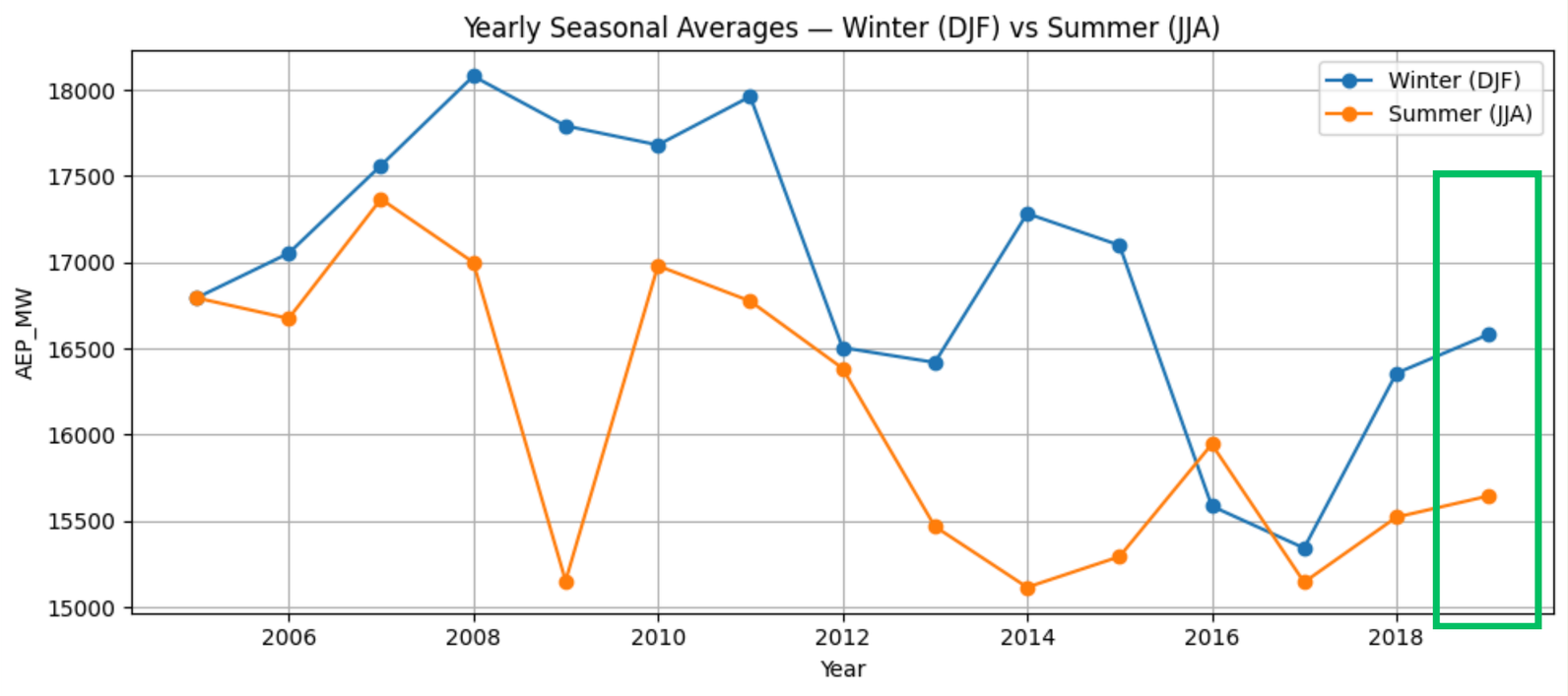
PREDICTION FOR ONE YEAR AHEAD SUMMER AND WINTER



What to do to handle this power consumption (for winter)?

- Set the base winter reserve margin slightly below your historical max (e.g., ~11–12% of your typical winter average), but keep a cold-snap buffer (+3%) ready to activate if a multi-day cold spell appears.
- Finish major maintenance before Dec 1 so full capacity is available.
- Stage demand response for morning/evening peaks (07–10, 17–20), deploying only when temperatures drop materially.

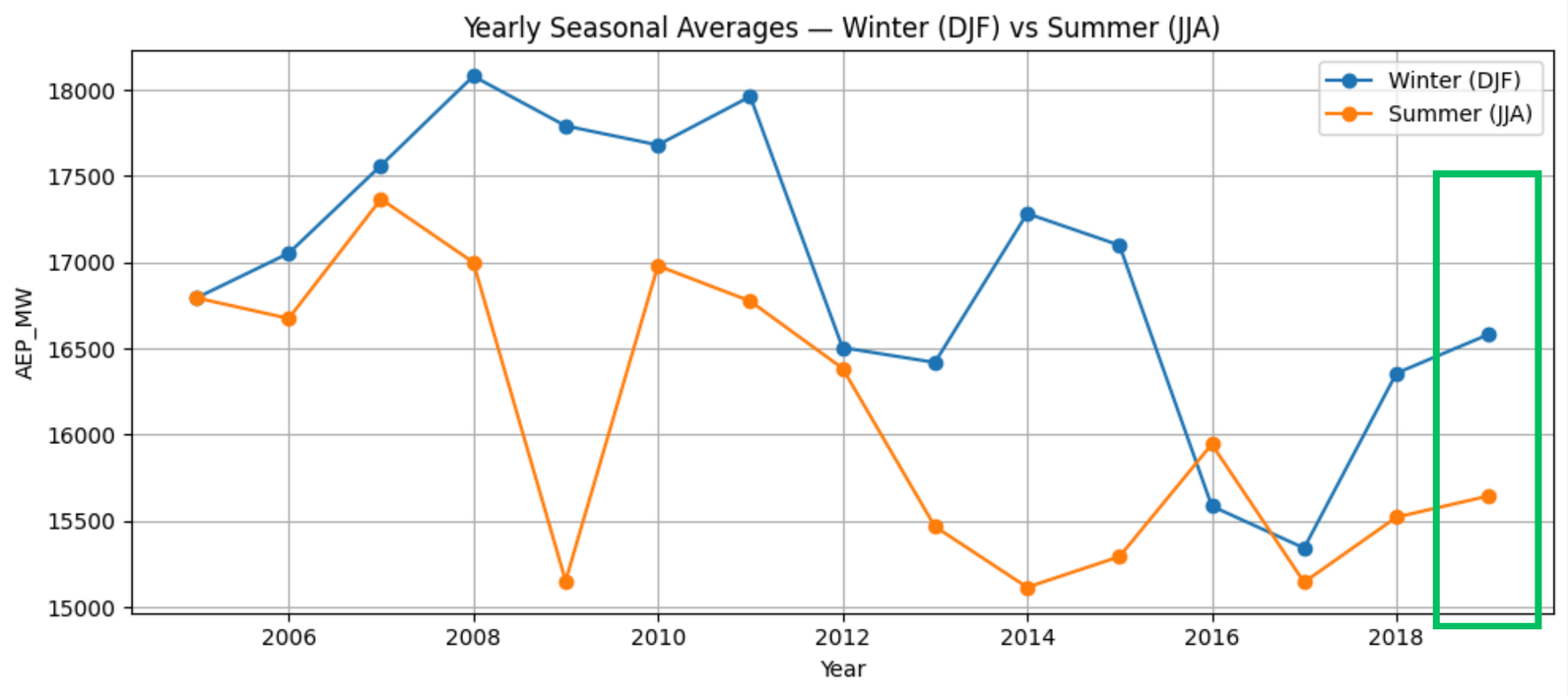
PREDICTION FOR ONE YEAR AHEAD SUMMER AND WINTER



What to do to handle this power consumption (for summer)?

- Set the summer reserve margin around ~10%, and add a heat-wave buffer of +2–3%.
- Tighten demand respons for 14:00–19:00, with pre-cooling playbooks for C&I customers.
- Ensure peakers/storage are fully ready by May, and defer noncritical maintenance on summer-critical assets.
- Use week-ahead heat forecasts to trigger extra buffer and DR calls.

PREDICTION FOR ONE YEAR AHEAD SUMMER AND WINTER



What happen if the margin doesn't able to fill it?
If the demand forecasts for summer or winter 2019 fail (i.e. demand turns out higher than predicted), **we'll need to rely on backup generation via LNG-fired natural gas and coal plants to cover the shortfall.**

This action supported by the report of:

1. NOAA's Oct 2018 outlook favored warmer-than-average conditions across much of the U.S. (i.e., fewer heating degree days → softer winter load risk). [6]
2. PJM's Summer 2019 assessment expected peak loads slightly higher than Summer 2018 (broader RTO that includes AEP's footprint). NERC's 2019 Summer Reliability Assessment similarly reviewed higher summer peak conditions. [7]

[6]https://www.noaa.gov/media-release/winter-outlook-favors-warmer-temperatures-for-much-of-us?
[7] https://www.puc.pa.gov/electric/pdf/reliability/summer_reliability_2019-pjm.pdf?