In [1]:
```
from matplotlib import pyplot as plt
from matplotlib.dates import MonthLocator, num2date
from matplotlib.ticker import FuncFormatter
from prophet import Prophet
from prophet.diagnostics import cross_validation, performance_metrics
from prophet.plot import add_changepoints_to_plot

import pandas as pd
import numpy as np
import datetime as dt
from collections import defaultdict
import time
import datetime as dt
from pytz import timezone
tz = timezone('EST')
from tqdm import tqdm

from sklearn.metrics import mean_absolute_error, mean_absolute_percentage_error,

import seaborn as sns
%config InlineBackend.figure_format = 'retina'
%matplotlib inline
from matplotlib import pyplot as plt
from matplotlib import style
sns.set()
```

In [2]:
```
nemassbost2011 = pd.ExcelFile(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_hou
nemassbost2011 = pd.read_excel(nemassbost2011, 'NEMASSBOST')
nemassbost2012 = pd.ExcelFile(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_hou
nemassbost2012 = pd.read_excel(nemassbost2012, 'NEMASSBOST')
nemassbost2013 = pd.ExcelFile(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_hou
nemassbost2013 = pd.read_excel(nemassbost2013, 'NEMASSBOST')
nemassbost2014 = pd.ExcelFile(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_hou
nemassbost2014 = pd.read_excel(nemassbost2014, 'NEMASSBOST')
nemassbost2015 = pd.ExcelFile(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_hou
nemassbost2015 = pd.read_excel(nemassbost2015, 'NEMASSBOST')
nemassbost2016 = pd.ExcelFile(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_hou
nemassbost2016 = pd.read_excel(nemassbost2016, 'NEMA')
```

In [3]:
```
nemassbost2017 = pd.read_excel(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_ho
nemassbost2018 = pd.read_excel(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_ho
nemassbost2019 = pd.read_excel(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_ho
nemassbost2020 = pd.read_excel(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_ho
nemassbost2021 = pd.read_excel(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_ho
nemassbost2022 = pd.read_excel(r"C:\Users\Rohan\Desktop\Big Data\Load Data\smd_ho
```

In [4]:

```
nemassbost2022
```

Out[4]:

	Date	Hr_End	DA_Demand	RT_Demand	DA_LMP	DA_EC	DA_CC	DA_MLC	RT_LMP	RT_
0	2022-01-01	1	2293.0	2171.821	33.01	32.35	0.23	0.43	26.26	25.
1	2022-01-01	2	2213.3	2093.030	33.03	32.31	0.28	0.44	26.21	25.
2	2022-01-01	3	2113.4	2025.558	31.25	30.85	0.00	0.40	27.85	27.
3	2022-01-01	4	2094.7	1983.638	30.06	29.69	0.00	0.37	25.47	25.
4	2022-01-01	5	2098.1	1980.257	31.26	30.86	0.00	0.40	29.66	29.
...	...	...	...	...	...	...	...	...	...	
739	2022-01-31	20	3397.3	3431.972	227.75	226.40	0.00	1.35	297.63	295.
740	2022-01-31	21	3277.7	3332.719	203.77	202.82	0.00	0.95	265.60	264.
741	2022-01-31	22	3108.5	3181.992	184.25	183.42	0.00	0.83	253.17	251.
742	2022-01-31	23	2929.9	2993.214	180.74	179.93	0.00	0.81	191.40	190.
743	2022-01-31	24	2740.9	2830.547	191.49	190.54	0.00	0.95	190.27	189.

744 rows × 14 columns

In [5]:

```
val2011 = nemassbost2011['DEMAND']
val2012 = nemassbost2012['DEMAND']
val2013 = nemassbost2013['DEMAND']
val2014 = nemassbost2014['DEMAND']
val2015 = nemassbost2015['DEMAND']
val2016 = nemassbost2016['RT_Demand']
val2017 = nemassbost2017['RT_Demand']
val2018 = nemassbost2018['RT_Demand']
val2019 = nemassbost2019['RT_Demand']
val2020 = nemassbost2020['RT_Demand']
val2021 = nemassbost2021['RT_Demand']
val2022 = nemassbost2022['RT_Demand']
```

In [6]:

```
values = [val2011, val2012, val2013, val2014, val2015, val2016, val2017, val2018,
values_df = pd.concat(values, axis=0, ignore_index=False)
values_df = values_df.reset_index()
period = len(values_df)
```

In [7]:
```
rng = pd.date_range('2011-01-01', periods=period, freq='1H')
date_df = pd.DataFrame({ 'ds': rng})
date_df = date_df.reset_index()
```

In [8]:
```
frames = [date_df, values_df]
nemassbost_load = pd.concat(frames, axis=1, ignore_index=False)
nemassbost_load = nemassbost_load.rename(columns={nemassbost_load.columns[1]: 'ds
frames2 = [nemassbost_load['ds'], nemassbost_load['y']]
nemassbost_load = pd.concat(frames2, axis=1, ignore_index=False)
nemassbost_load
```

Out[8]:

	ds	y
0	2011-01-01 00:00:00	2474.000
1	2011-01-01 01:00:00	2367.000
2	2011-01-01 02:00:00	2282.000
3	2011-01-01 03:00:00	2231.000
4	2011-01-01 04:00:00	2212.000
...	...	...
97171	2022-01-31 19:00:00	3431.972
97172	2022-01-31 20:00:00	3332.719
97173	2022-01-31 21:00:00	3181.992
97174	2022-01-31 22:00:00	2993.214
97175	2022-01-31 23:00:00	2830.547

97176 rows × 2 columns

In [9]:
```
model = Prophet(
        changepoint_prior_scale=0.5,
        seasonality_mode='multiplicative',
        interval_width=0.95,
    )
model.add_country_holidays(country_name='US')
```

Out[9]:
```
<prophet.forecaster.Prophet at 0x21c414296d0>
```

In [10]:
```
model.fit(nemassbost_load)
```

Out[10]:
```
<prophet.forecaster.Prophet at 0x21c414296d0>
```

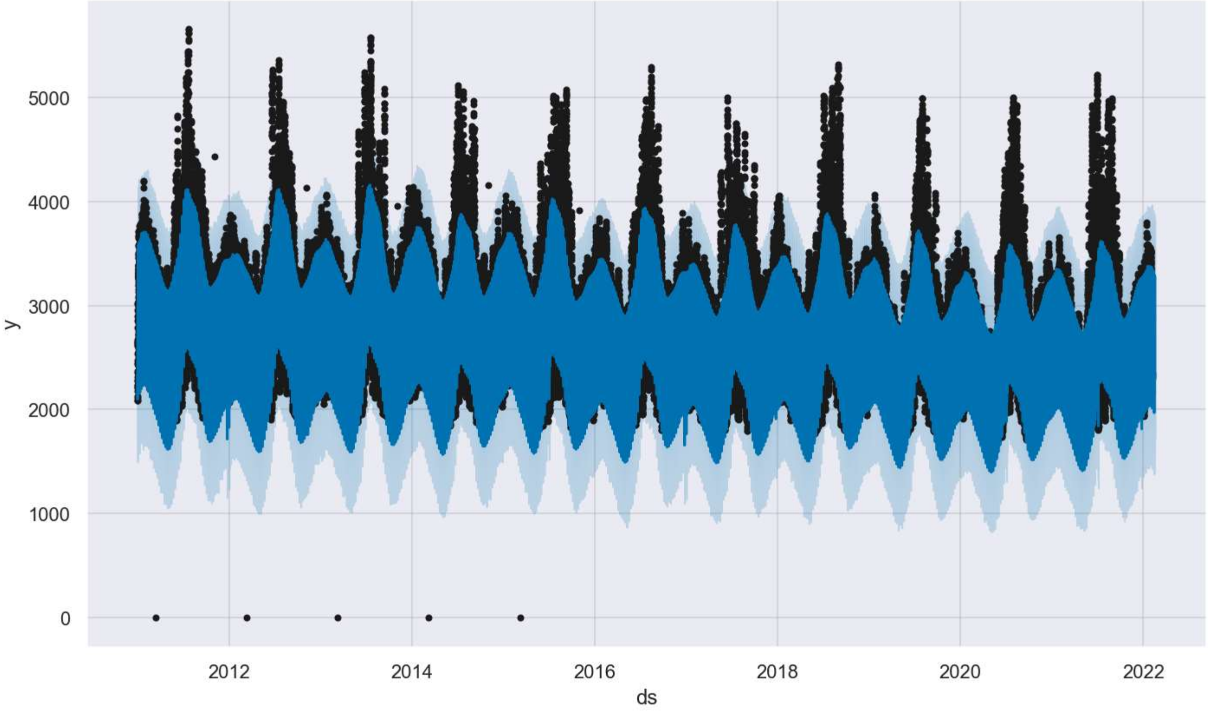
In [11]:
```
future_pd = model.make_future_dataframe(
        periods=365,
        freq='1H',
        include_history=True
    )

# make predictions
forecast_pd = model.predict(future_pd)
```

In [12]:
```
forecast_pd[['ds', 'yhat', 'yhat_lower', 'yhat_upper']].tail()
```

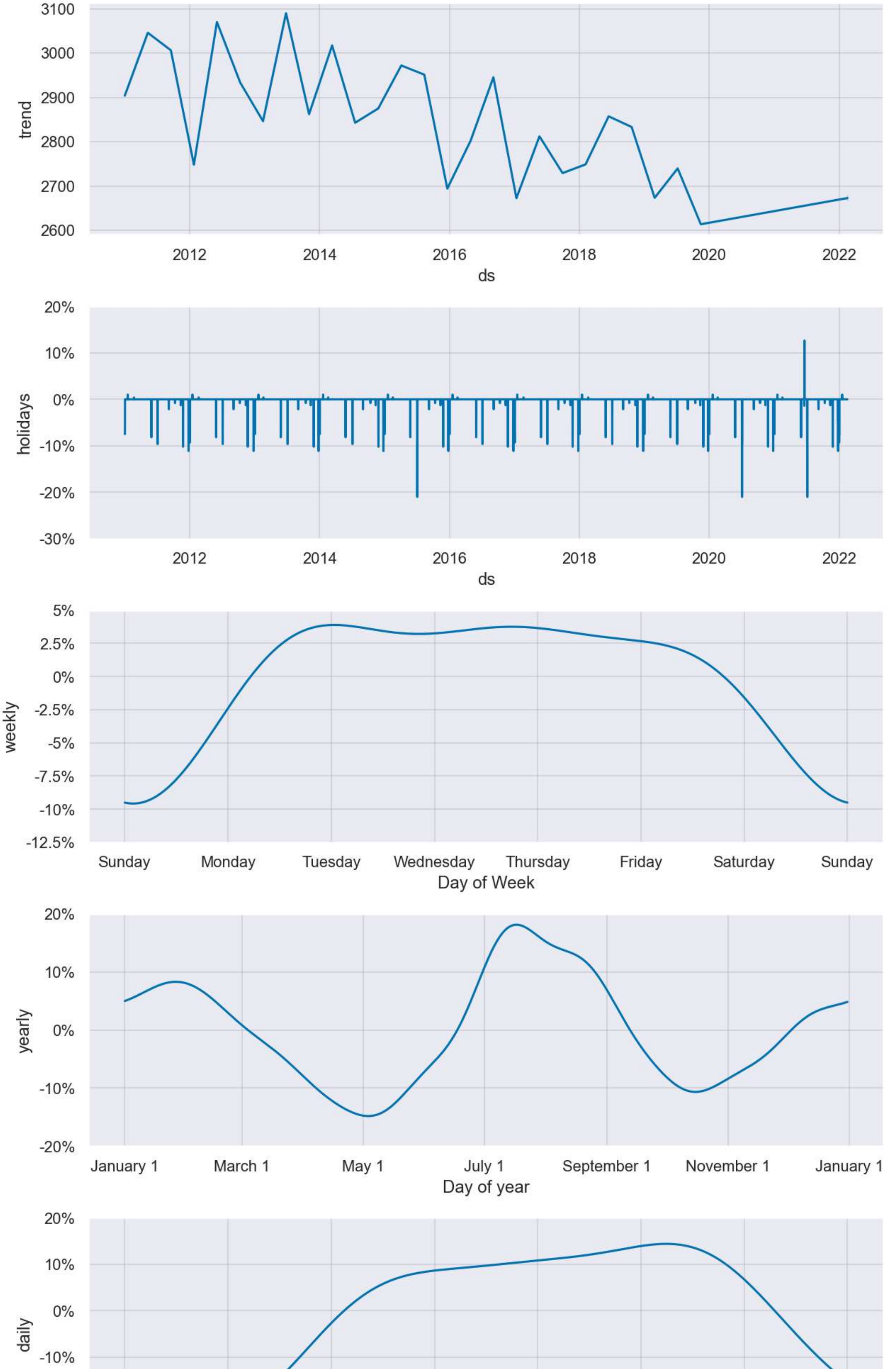
Out[12]:

	ds	yhat	yhat_lower	yhat_upper
97536	2022-02-16 00:00:00	2477.856424	1895.421955	3013.725683
97537	2022-02-16 01:00:00	2366.653877	1816.744042	2938.663993
97538	2022-02-16 02:00:00	2299.842996	1721.691274	2865.523223
97539	2022-02-16 03:00:00	2288.794608	1762.070472	2878.195247
97540	2022-02-16 04:00:00	2348.509610	1780.105049	2914.531632

In [13]:
```
fig1 = model.plot(forecast_pd)
```



```
In [14]: fig2 = model.plot_components(forecast_pd)
```



In [15]:
```
forecast_pd
```

Out[15]:

	ds	trend	yhat_lower	yhat_upper	trend_lower	trend_upper	Christmas Day	Chr Day
0	2011-01-01 00:00:00	2903.728324	1766.175559	2895.101747	2903.728324	2903.728324	0.0	
1	2011-01-01 01:00:00	2903.774015	1639.676683	2824.473215	2903.774015	2903.774015	0.0	
2	2011-01-01 02:00:00	2903.819705	1495.288850	2691.770081	2903.819705	2903.819705	0.0	
3	2011-01-01 03:00:00	2903.865395	1560.419953	2633.025587	2903.865395	2903.865395	0.0	
4	2011-01-01 04:00:00	2903.911086	1614.031167	2727.892329	2903.911086	2903.911086	0.0	
...	...	...	...	...	...	...	...	
97536	2022-02-16 00:00:00	2672.719377	1895.421955	3013.725683	2668.104546	2678.612327	0.0	
97537	2022-02-16 01:00:00	2672.722362	1816.744042	2938.663993	2668.039209	2678.651019	0.0	
97538	2022-02-16 02:00:00	2672.725348	1721.691274	2865.523223	2668.015270	2678.689711	0.0	
97539	2022-02-16 03:00:00	2672.728334	1762.070472	2878.195247	2668.013679	2678.728403	0.0	
97540	2022-02-16 04:00:00	2672.731320	1780.105049	2914.531632	2668.012088	2678.767094	0.0	

97541 rows × 73 columns

In [ ]: