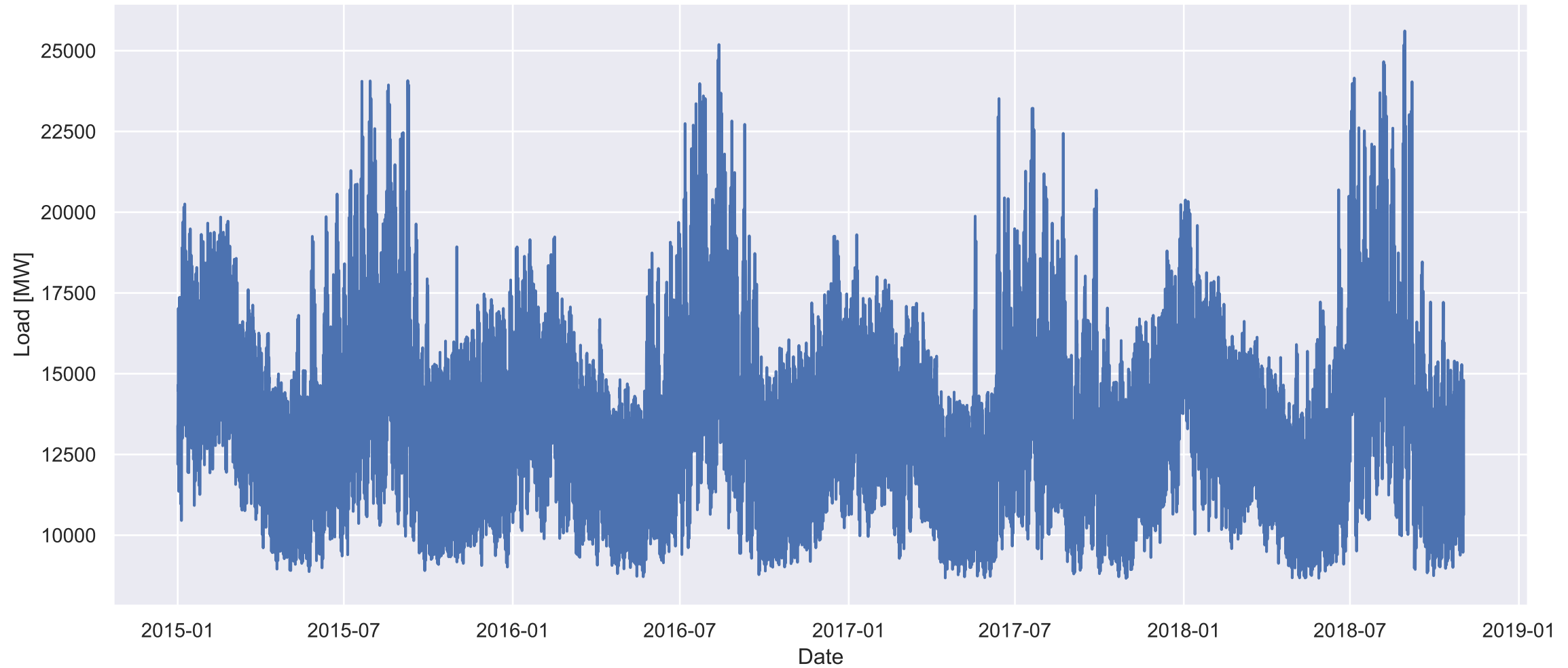
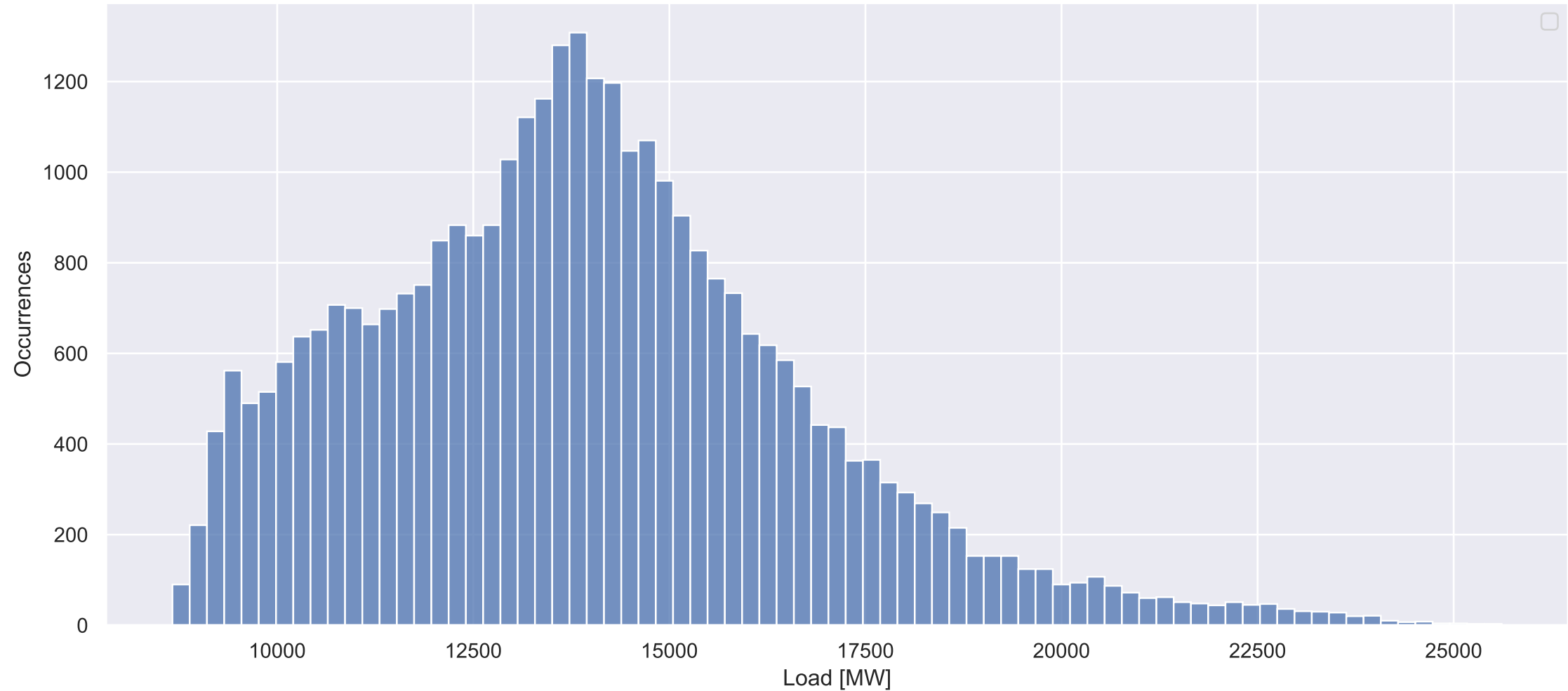


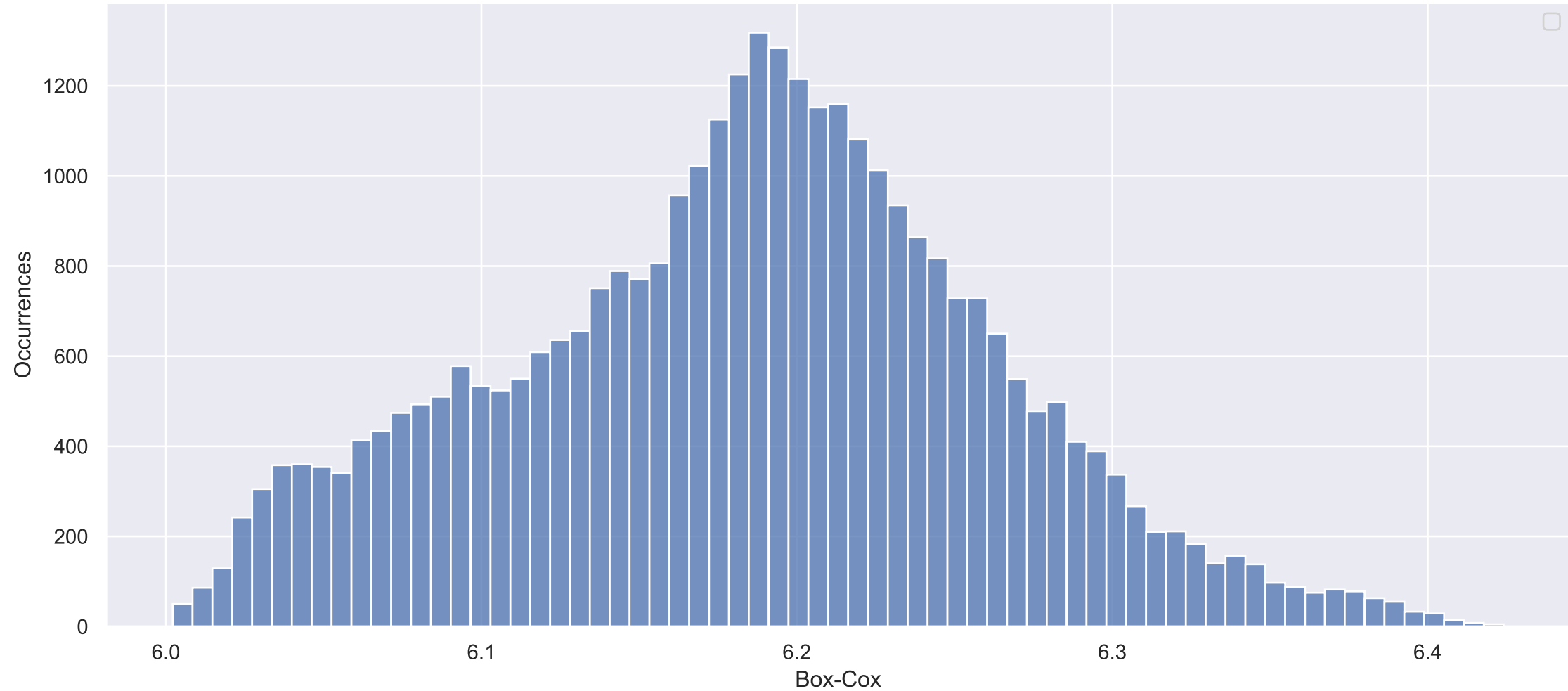
ISONewEngland dataset demand curve



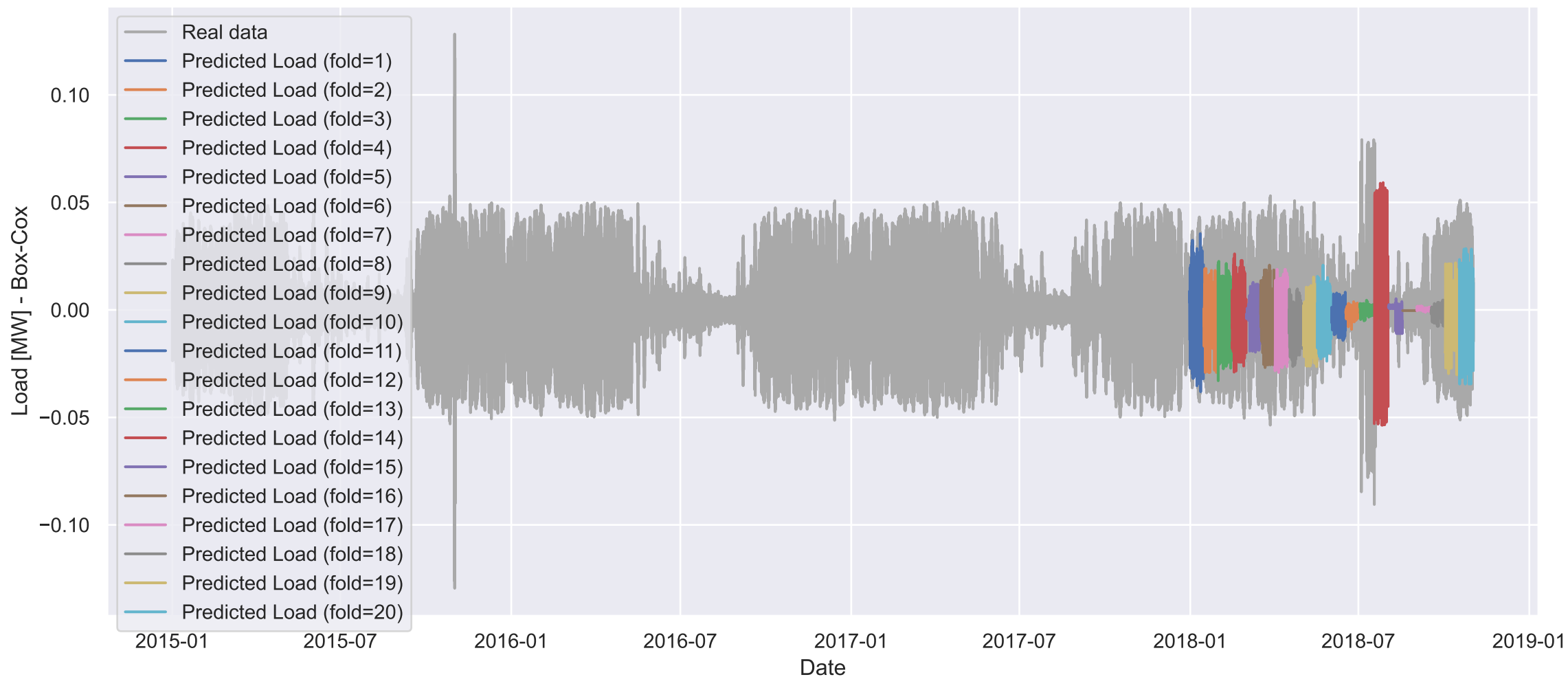
ISONewEngland Demand Histogram



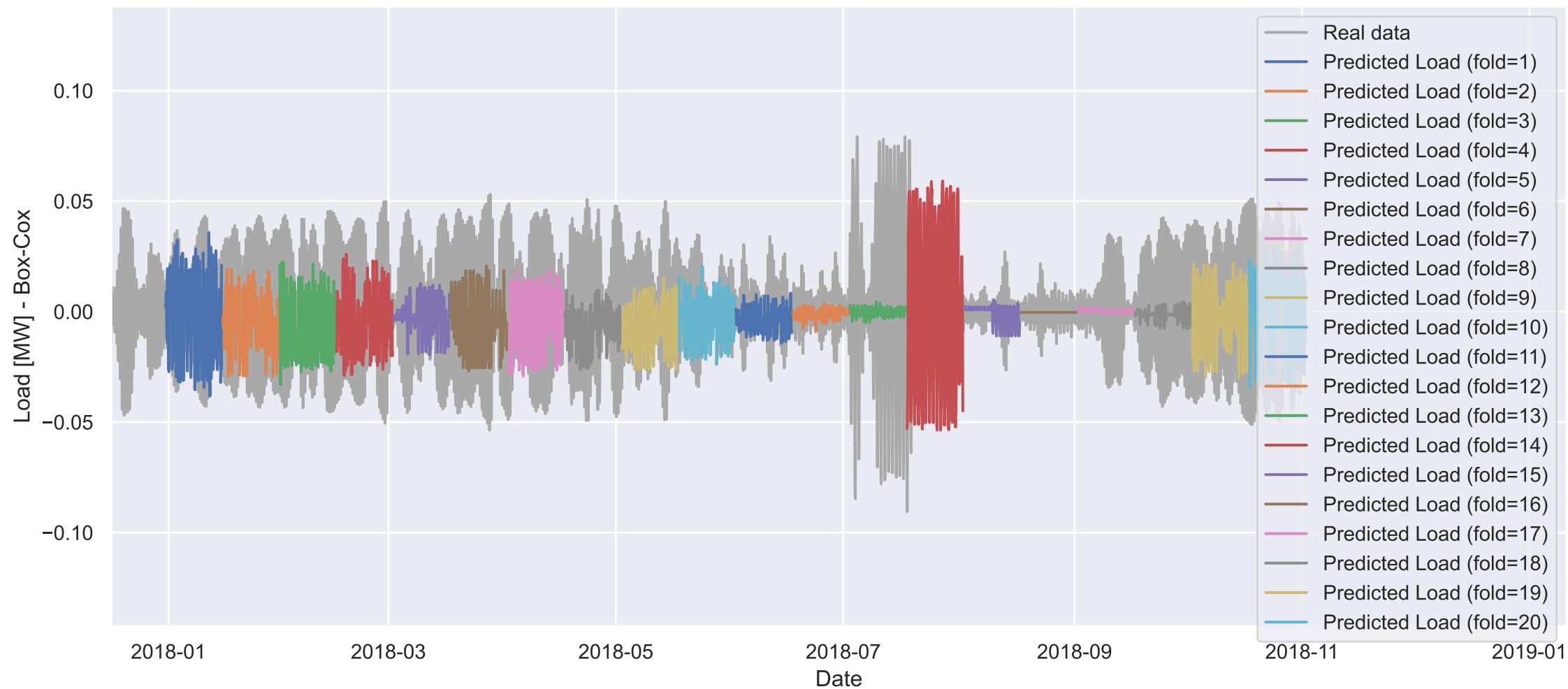
ISONewEngland Demand Histogram



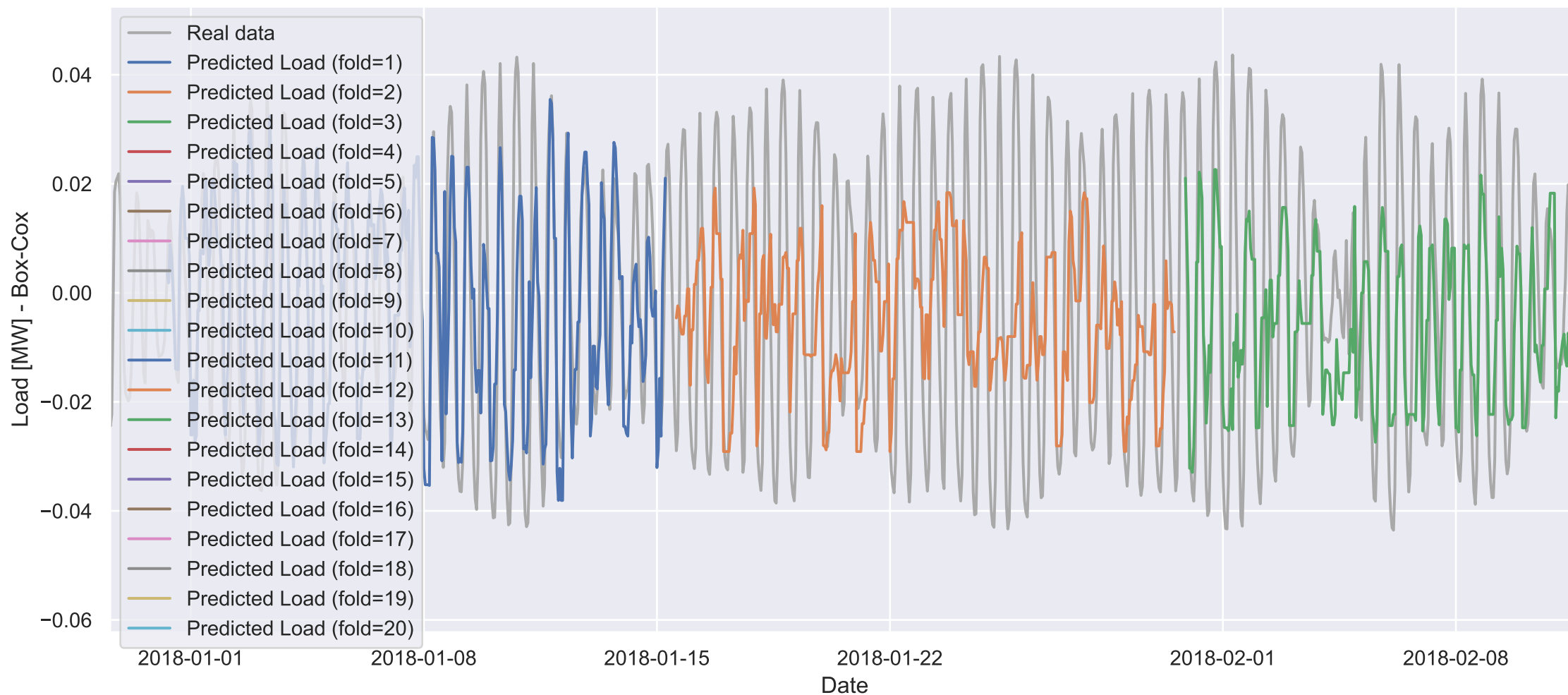
Electricity Prediction [MW] - with Box-Cox Transformation - mode_0



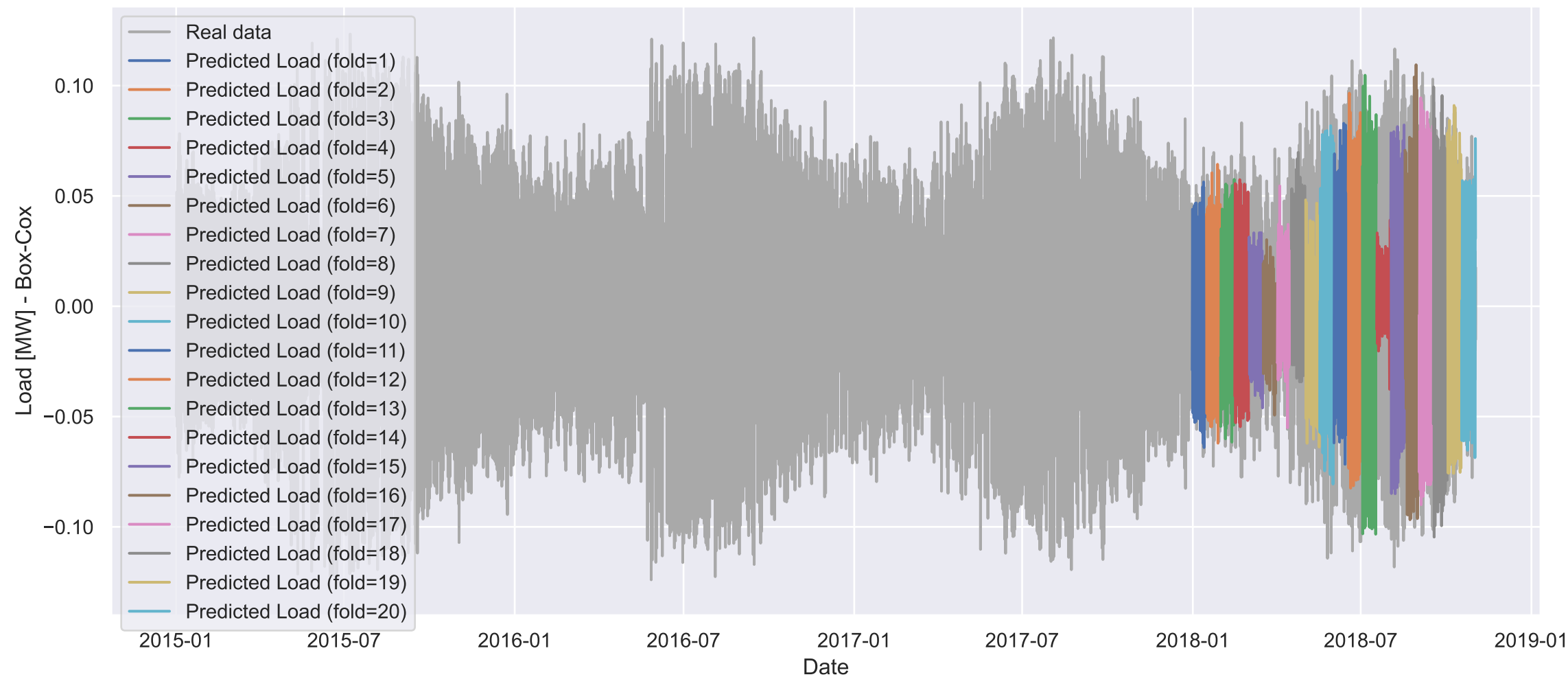
Electricity Prediction [MW] - with Box-Cox Transformation - mode_0



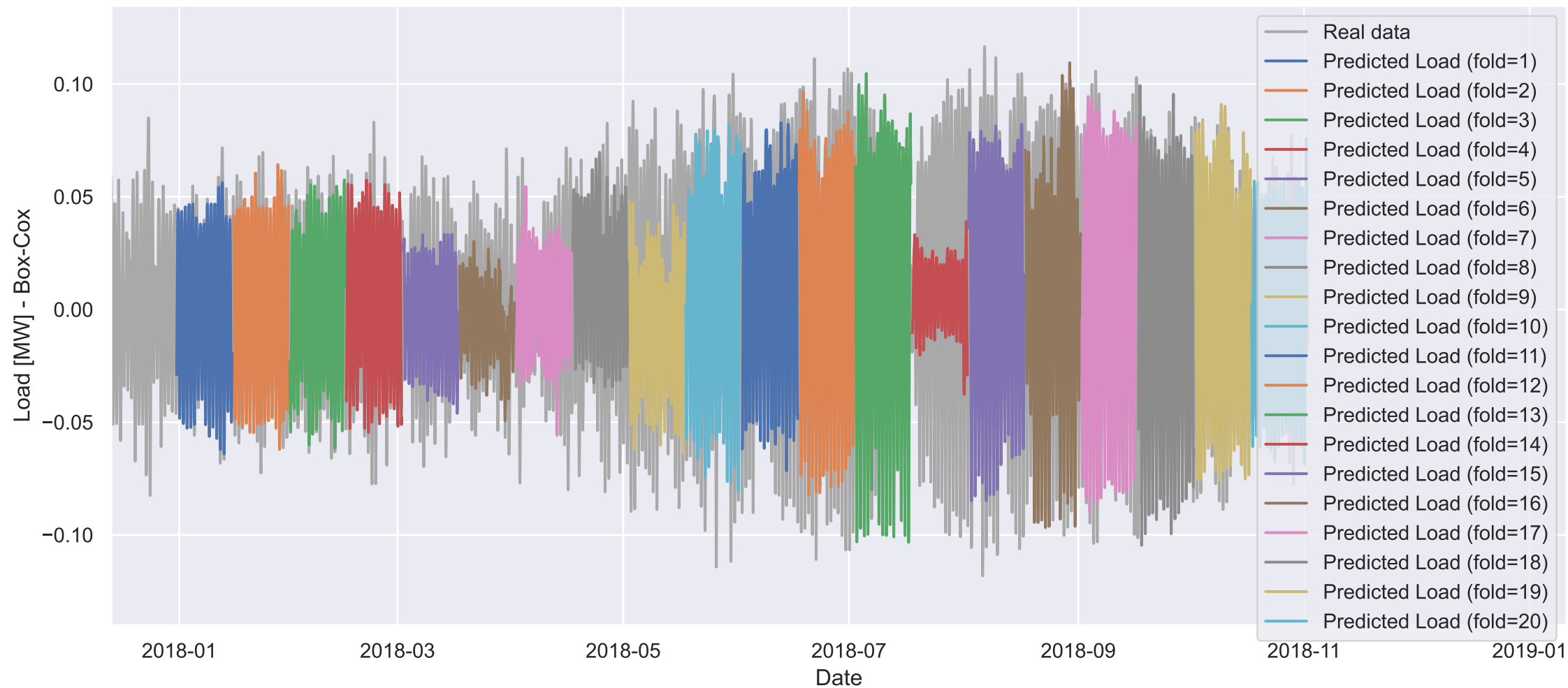
Electricity Prediction [MW] - with Box-Cox Transformation - mode_0



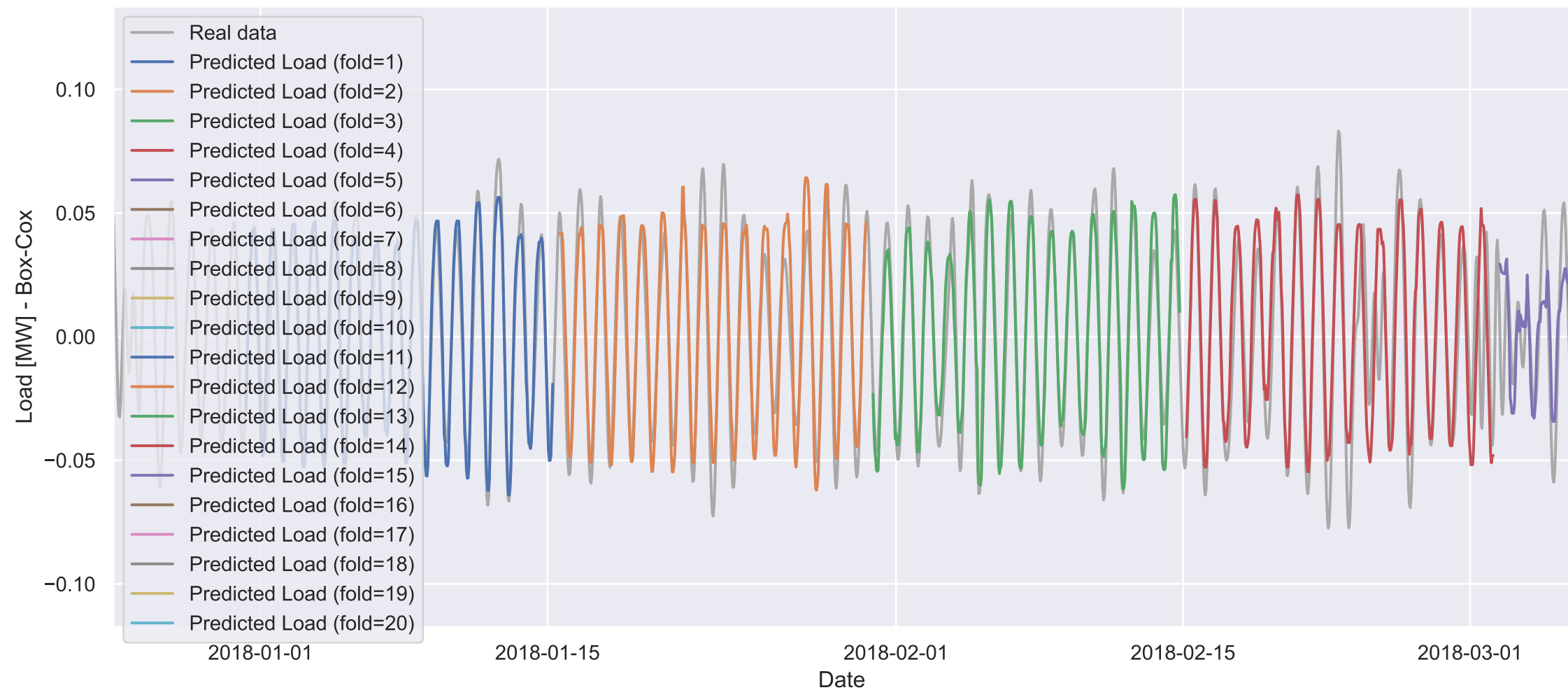
Electricity Prediction [MW] - with Box-Cox Transformation - mode_1



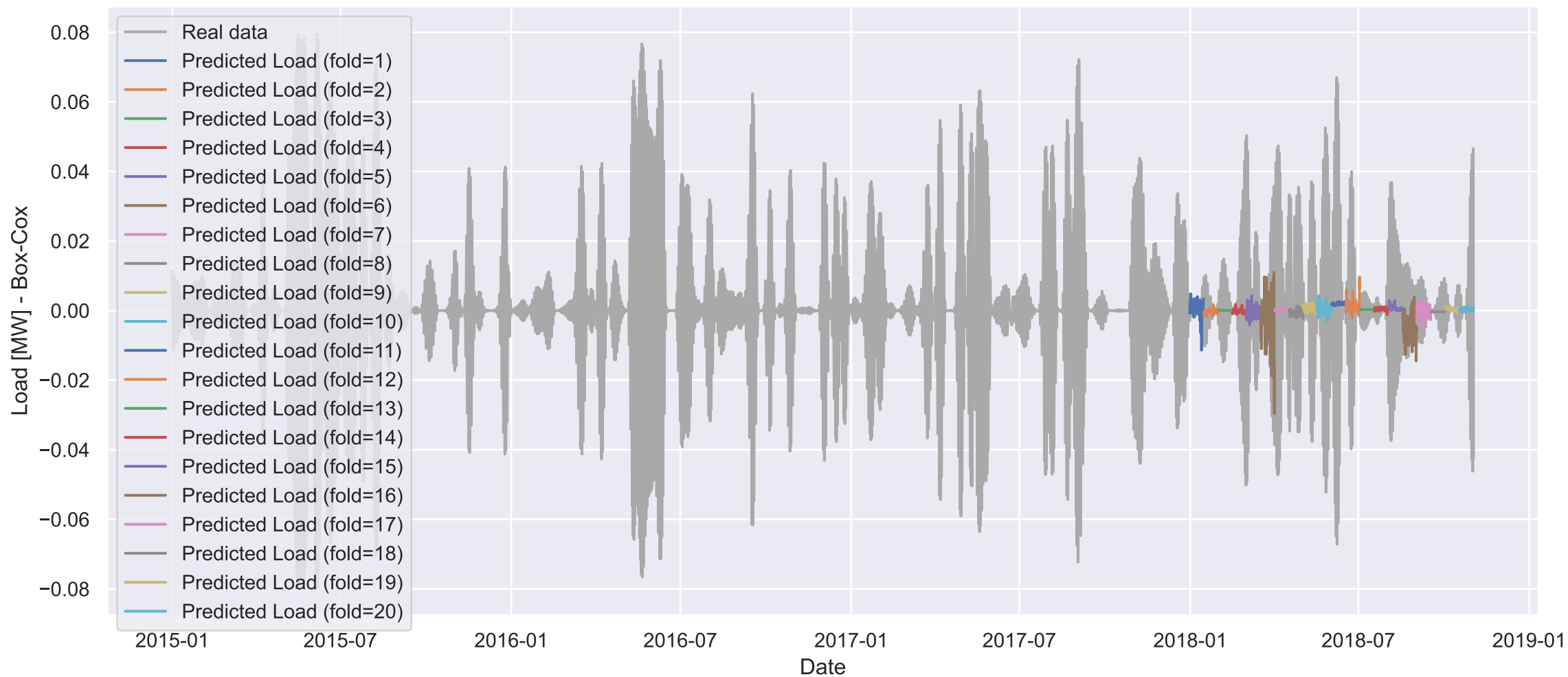
Electricity Prediction [MW] - with Box-Cox Transformation - mode_1



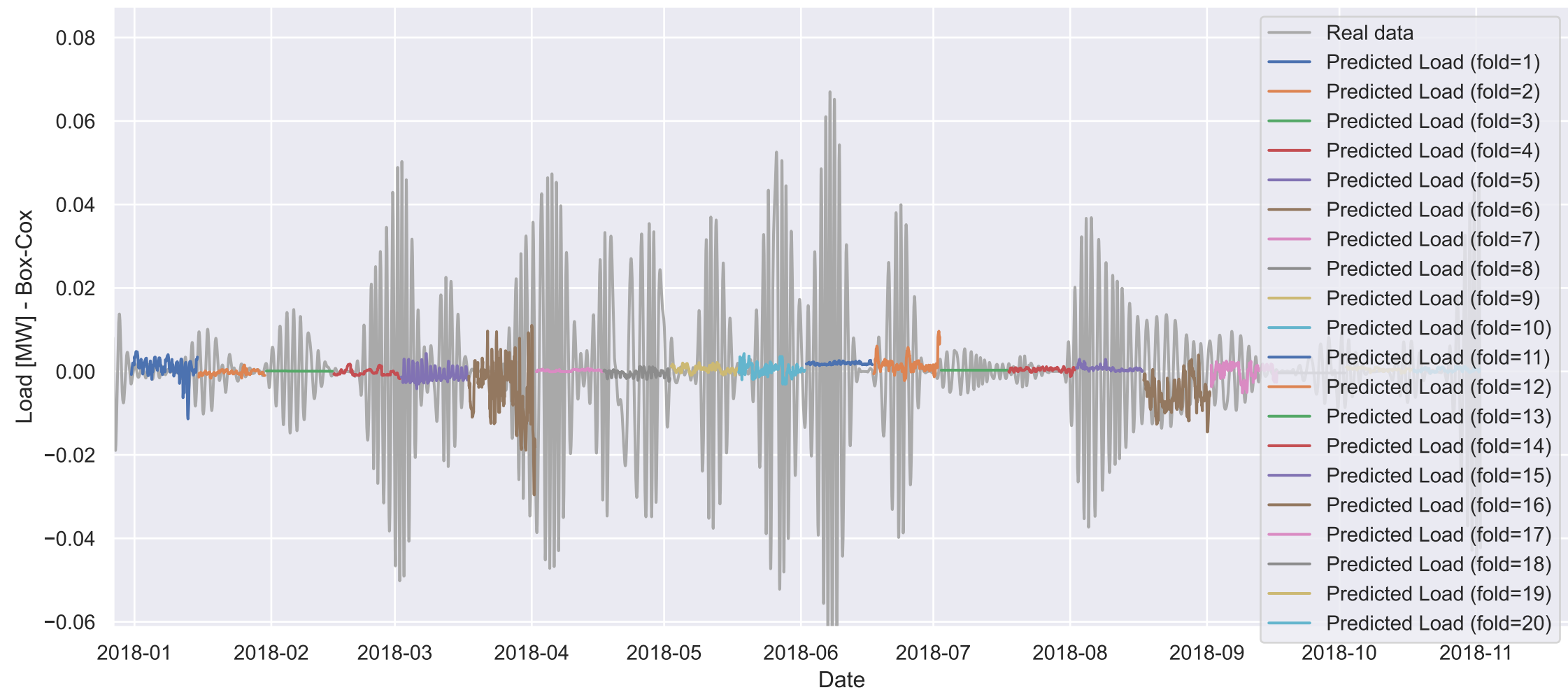
Electricity Prediction [MW] - with Box-Cox Transformation - mode_1



Electricity Prediction [MW] - with Box-Cox Transformation - mode_2



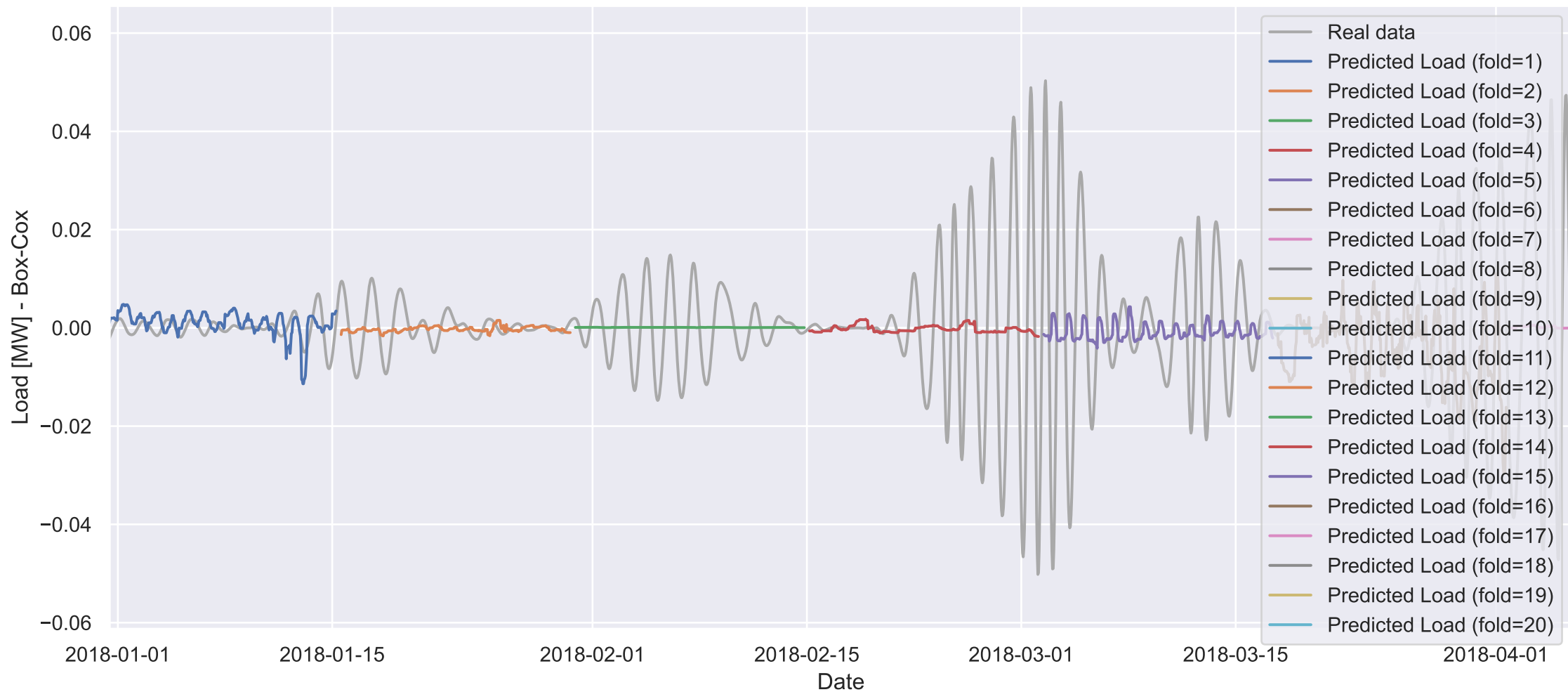
Electricity Prediction [MW] - with Box-Cox Transformation - mode_2



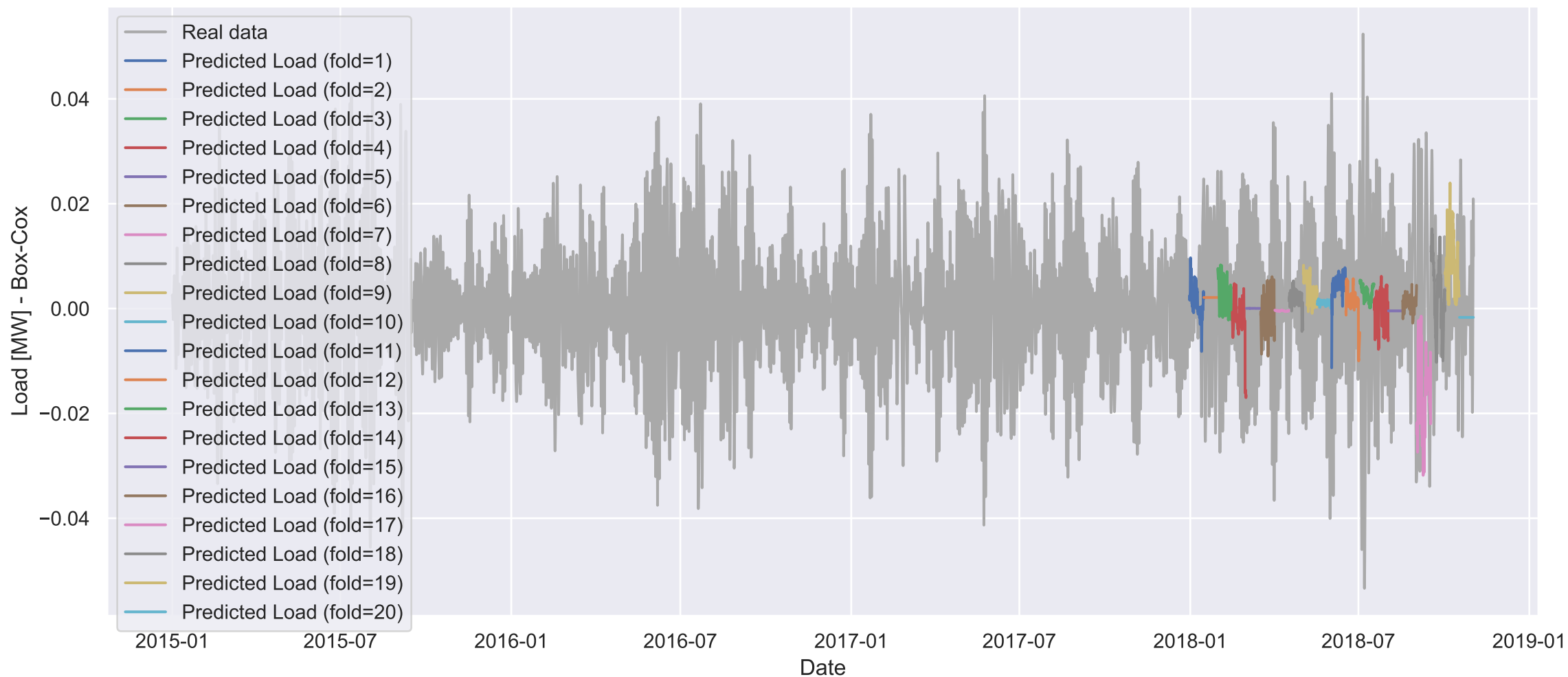
The figure displays a time series plot comparing 'Real data' (grey line) with 20 'Predicted Load' series (colored lines). The plot is divided into four vertical sections by dashed lines. The first section shows low-amplitude oscillations. The second section shows moderate oscillations. The third section shows high-amplitude, high-frequency oscillations. The fourth section shows moderate oscillations. The predicted load series are mostly flat or follow the general trend of the real data.

Legend:

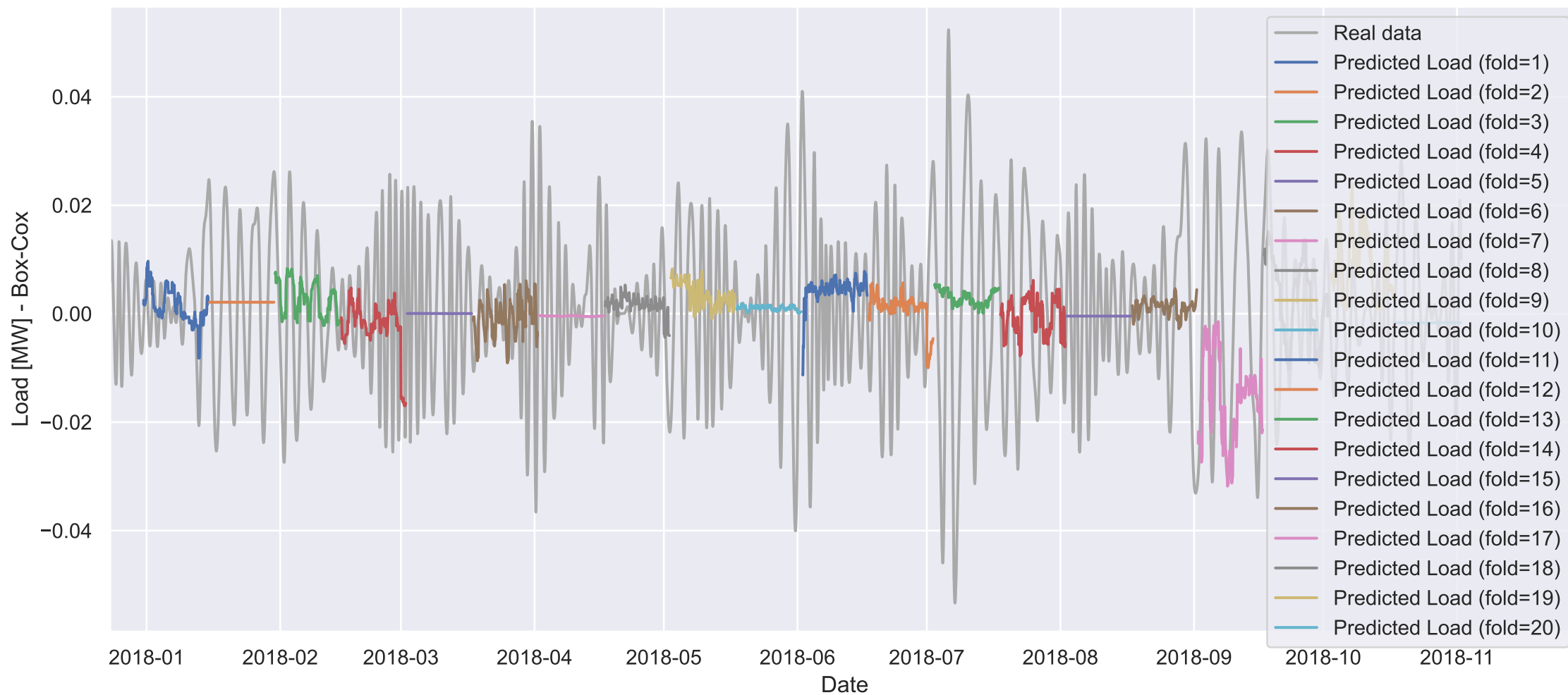
- Real data
- Predicted Load (fold=1)
- Predicted Load (fold=2)
- Predicted Load (fold=3)
- Predicted Load (fold=4)
- Predicted Load (fold=5)
- Predicted Load (fold=6)
- Predicted Load (fold=7)
- Predicted Load (fold=8)
- Predicted Load (fold=9)
- Predicted Load (fold=10)
- Predicted Load (fold=11)
- Predicted Load (fold=12)
- Predicted Load (fold=13)
- Predicted Load (fold=14)
- Predicted Load (fold=15)
- Predicted Load (fold=16)
- Predicted Load (fold=17)
- Predicted Load (fold=18)
- Predicted Load (fold=19)
- Predicted Load (fold=20)



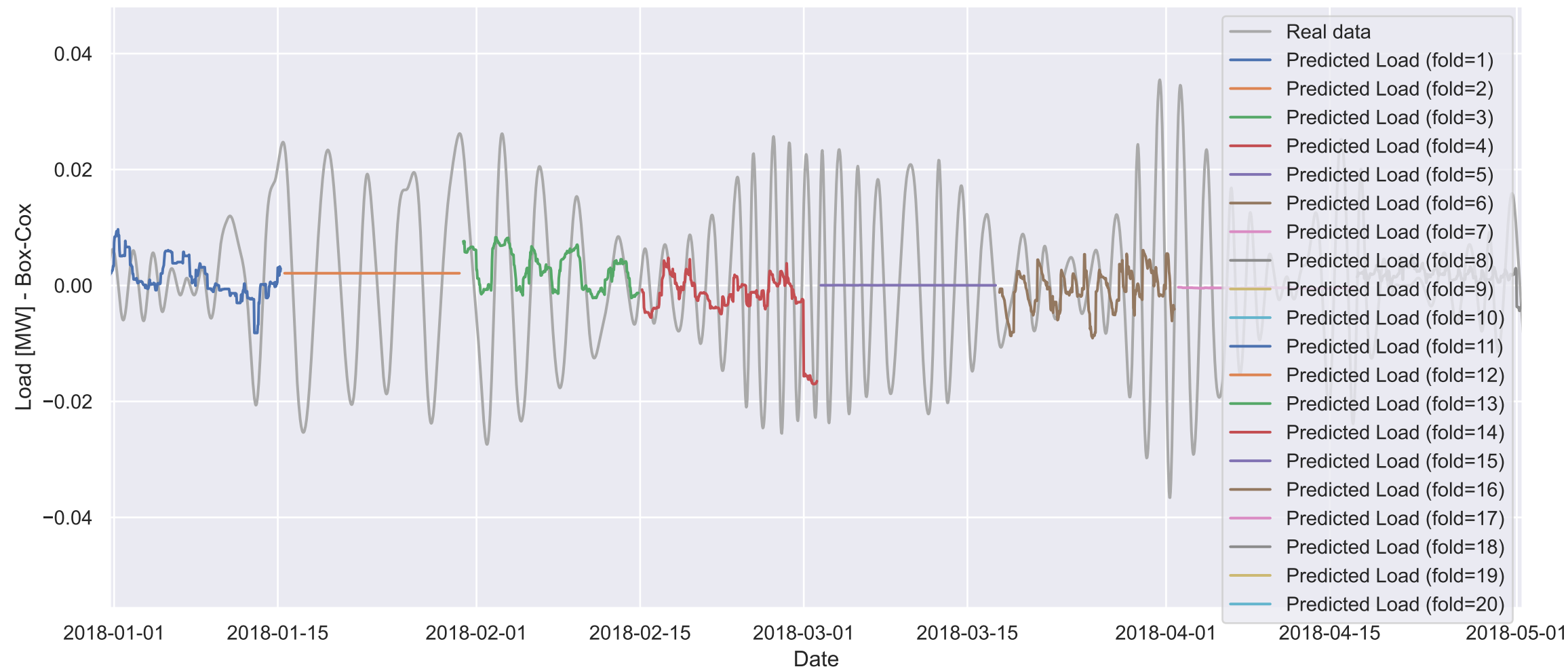
Electricity Prediction [MW] - with Box-Cox Transformation - mode_3



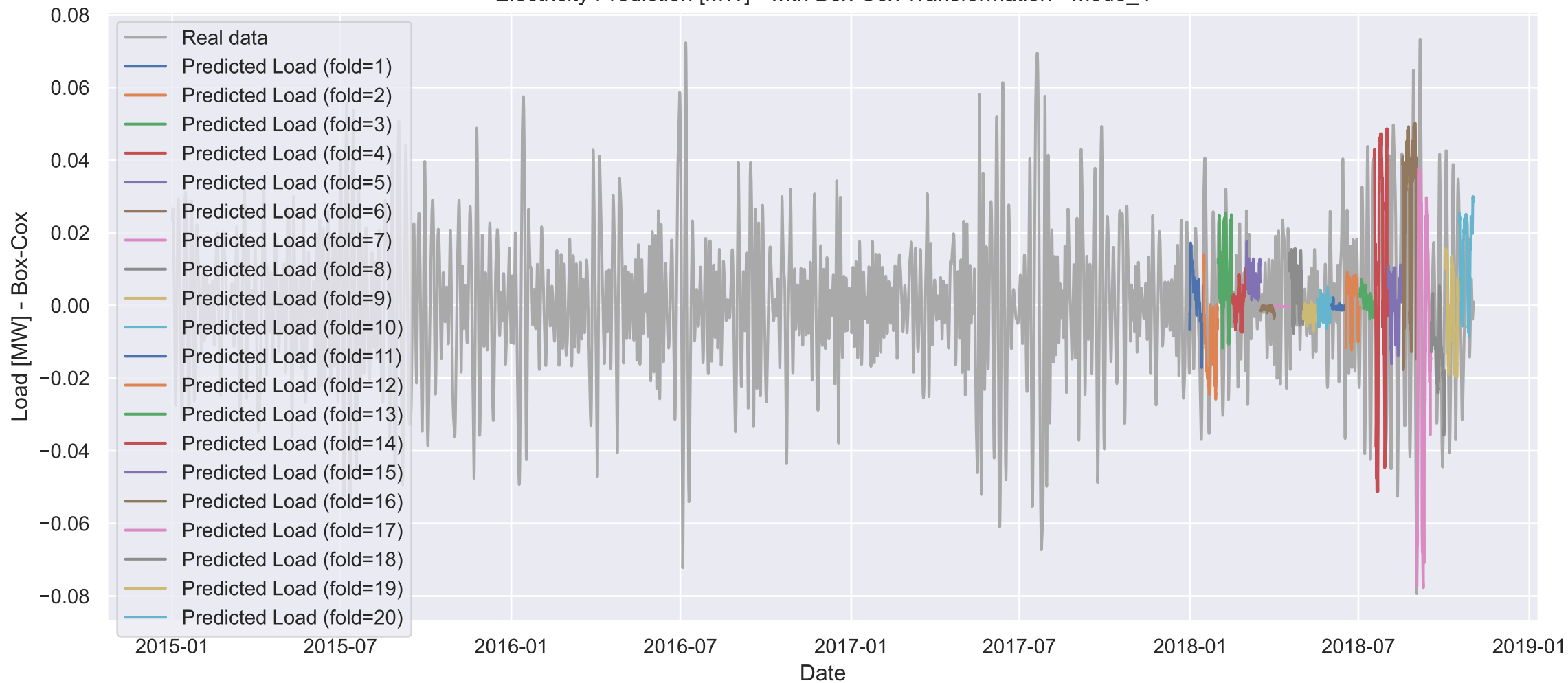
Electricity Prediction [MW] - with Box-Cox Transformation - mode_3



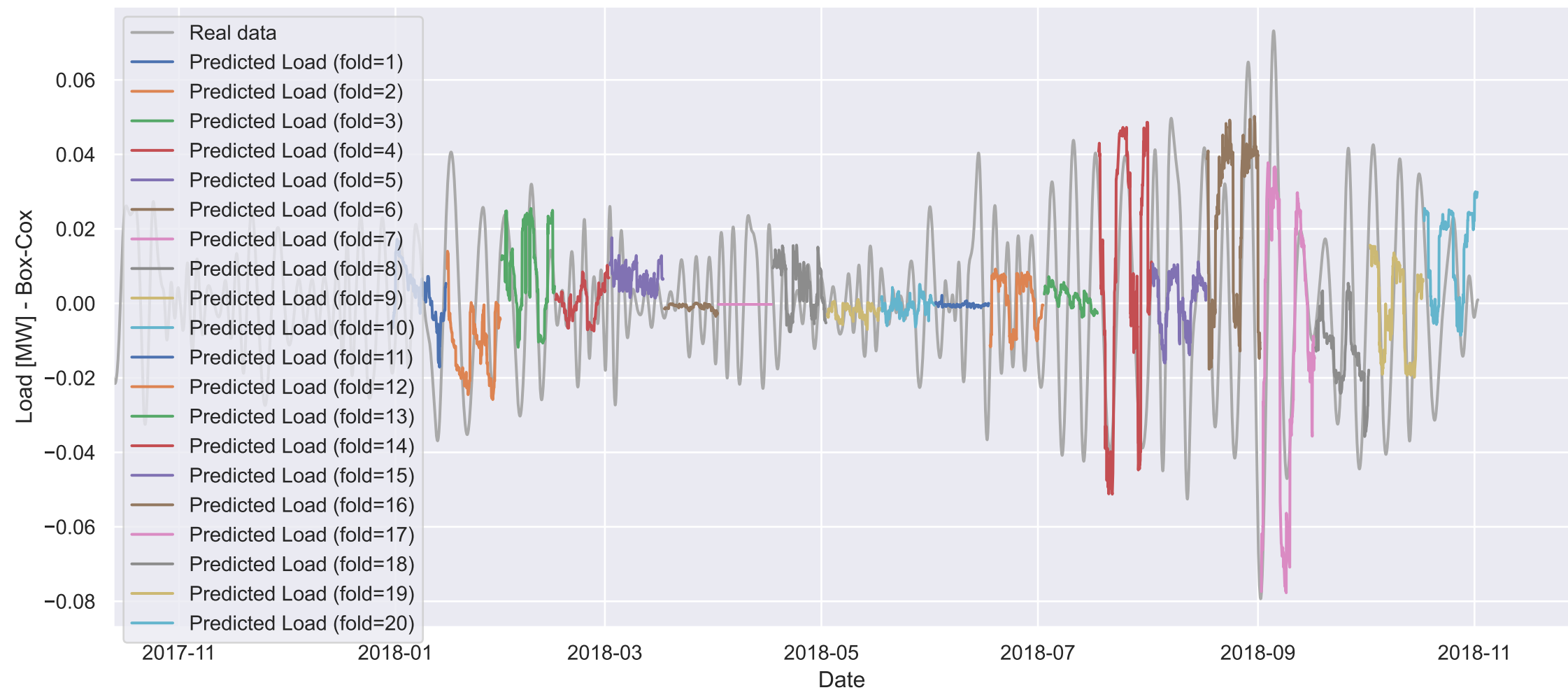
Electricity Prediction [MW] - with Box-Cox Transformation - mode_3



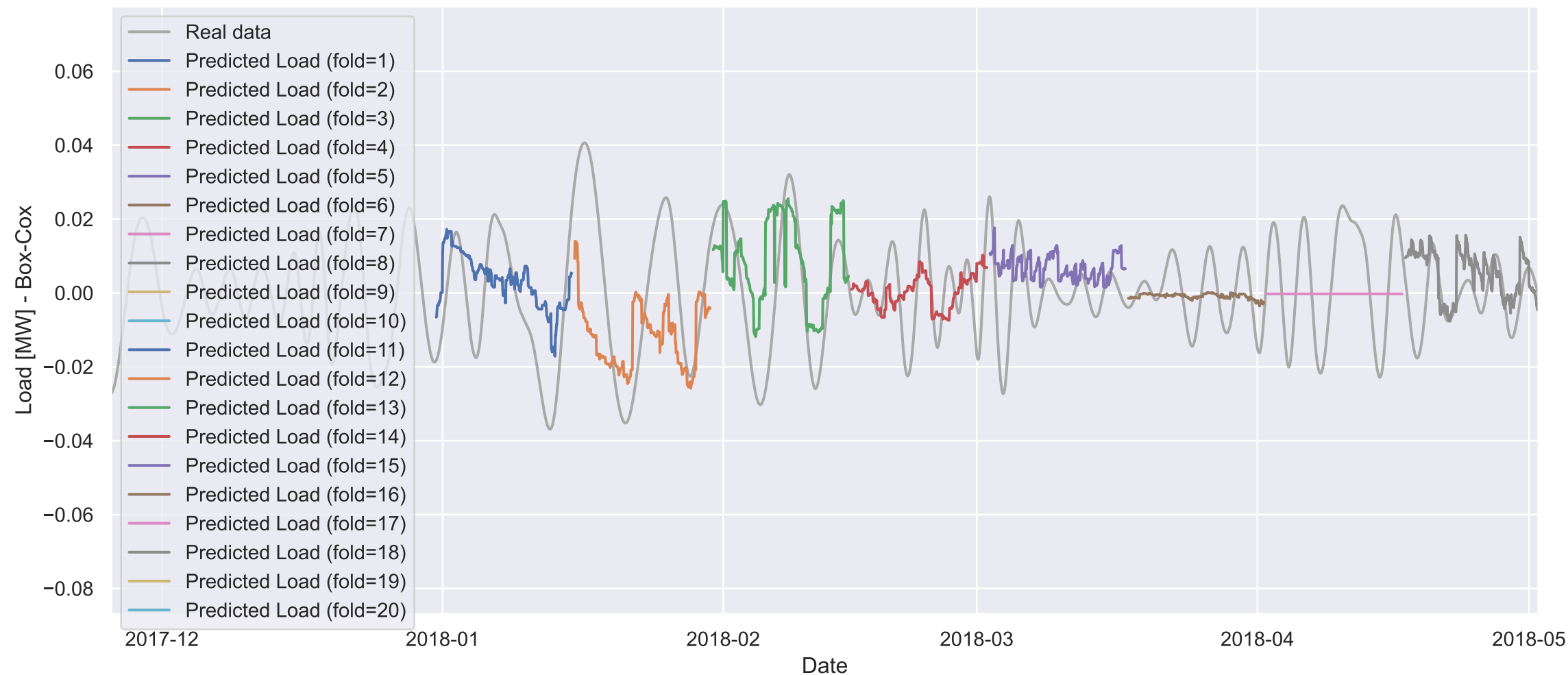
Electricity Prediction [MW] - with Box-Cox Transformation - mode_4



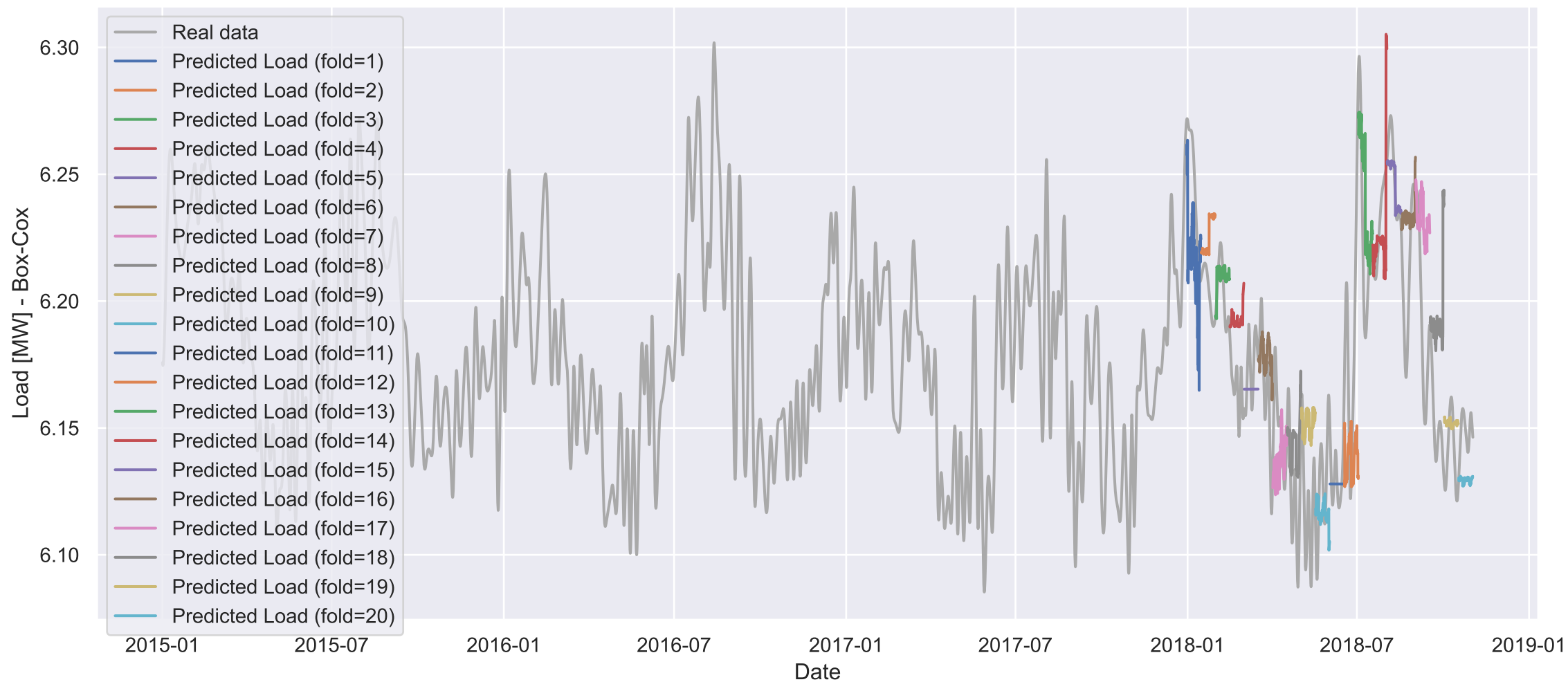
Electricity Prediction [MW] - with Box-Cox Transformation - mode_4



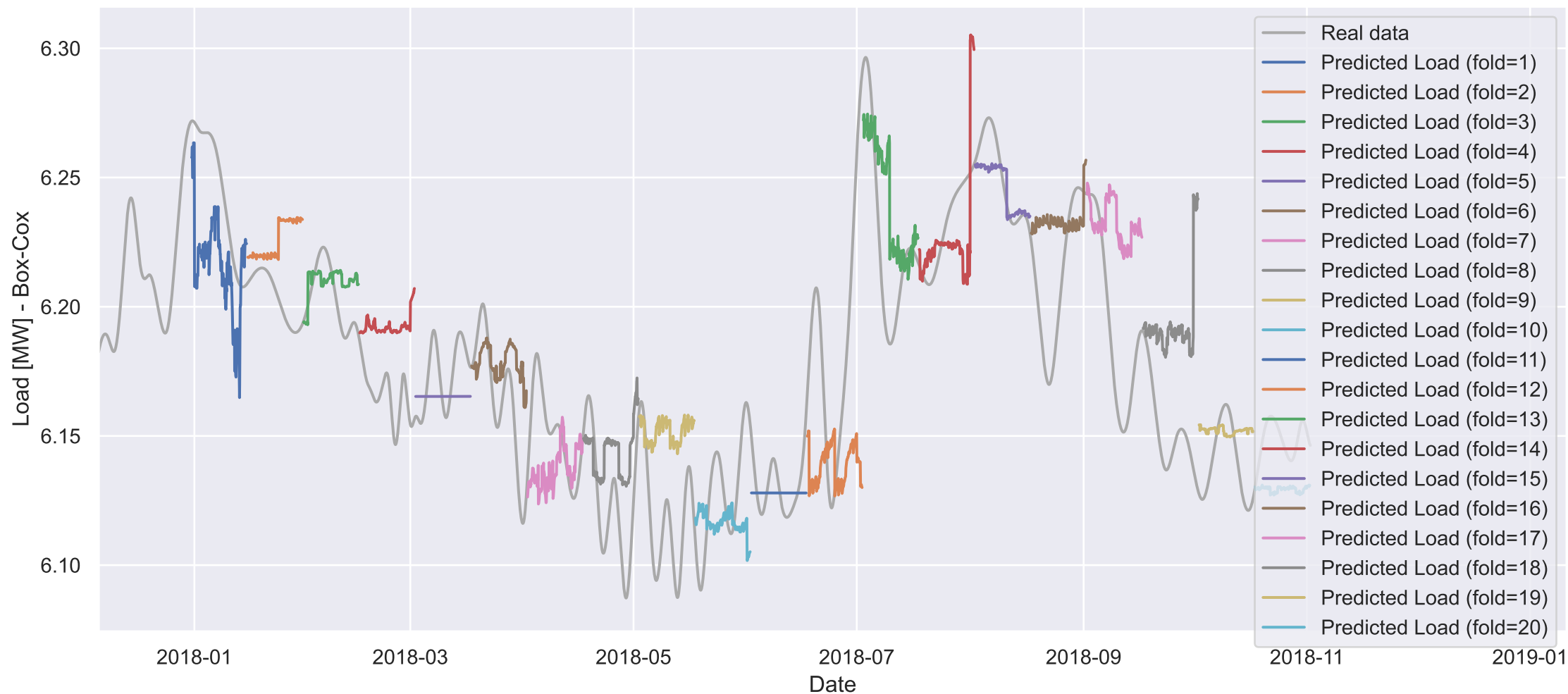
Electricity Prediction [MW] - with Box-Cox Transformation - mode_4



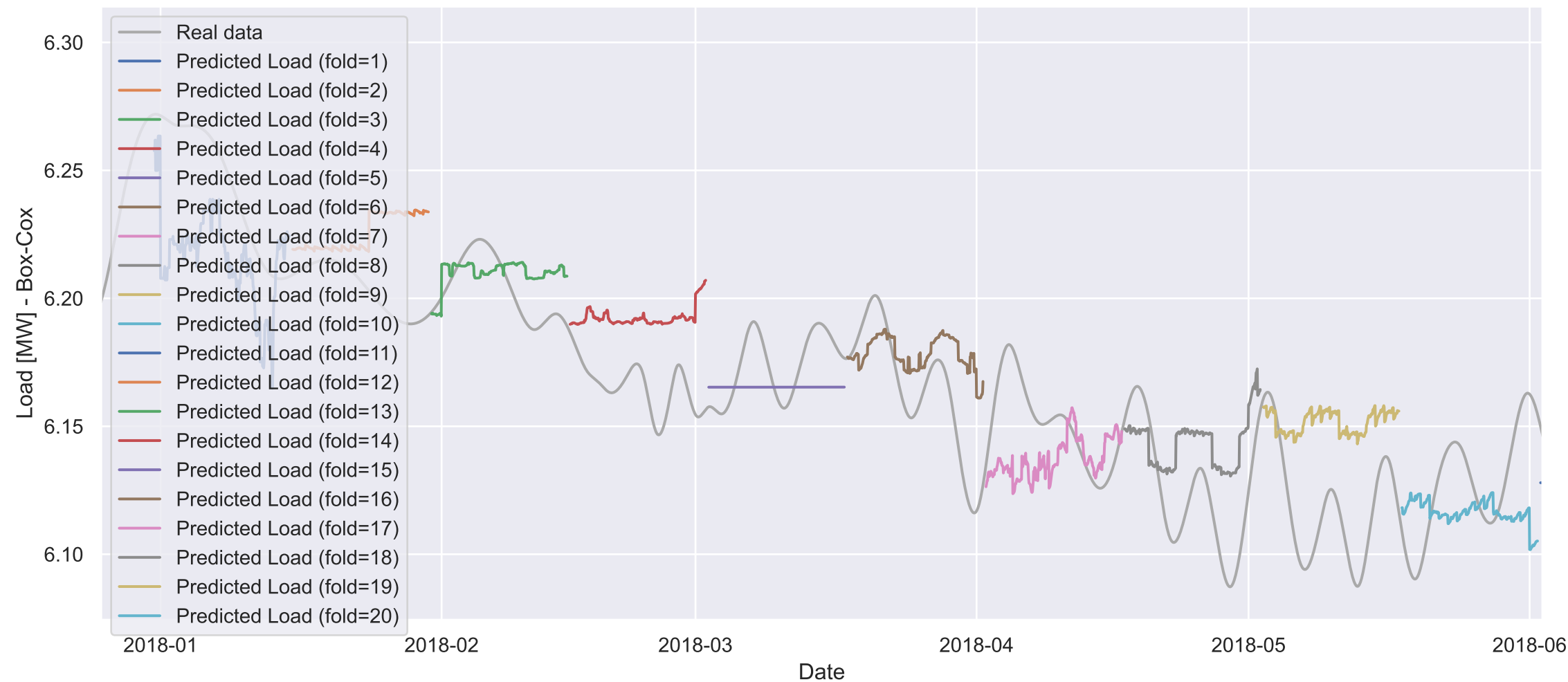
Electricity Prediction [MW] - with Box-Cox Transformation - mode_5



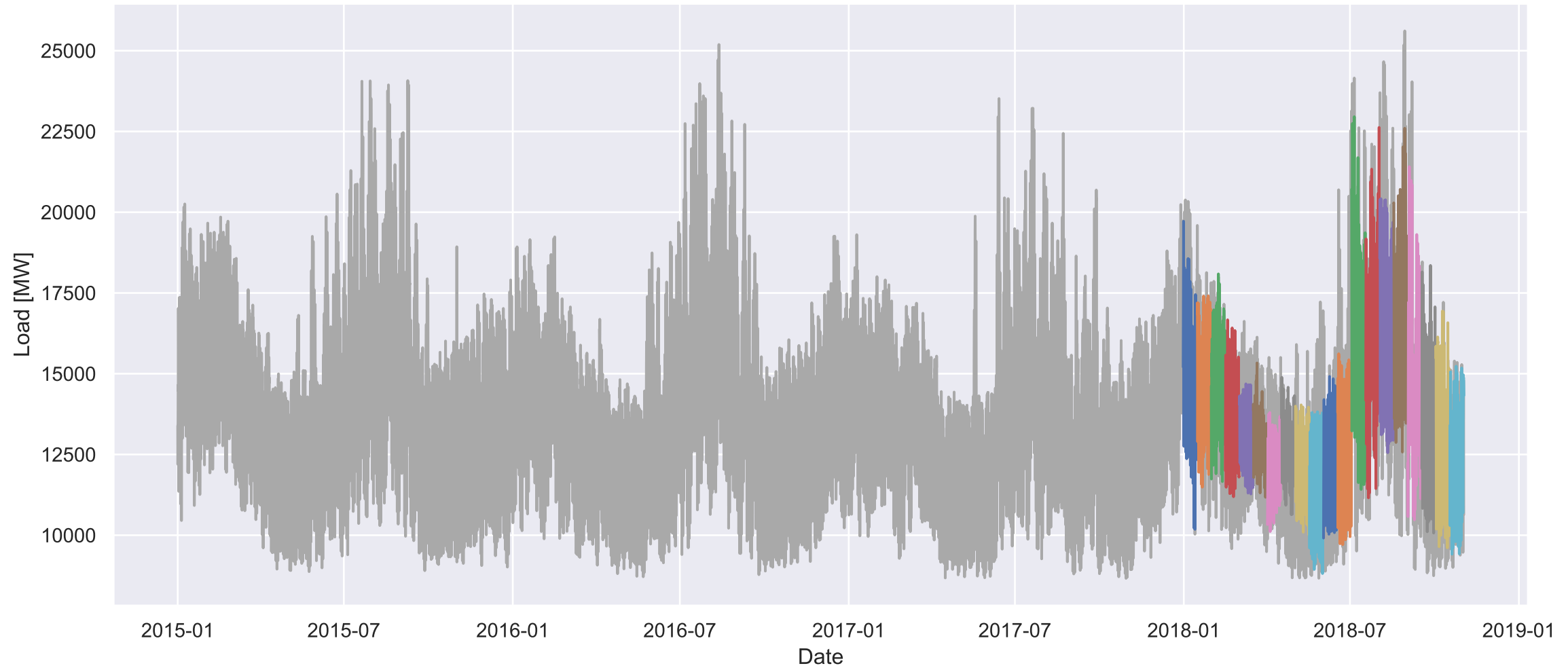
Electricity Prediction [MW] - with Box-Cox Transformation - mode_5



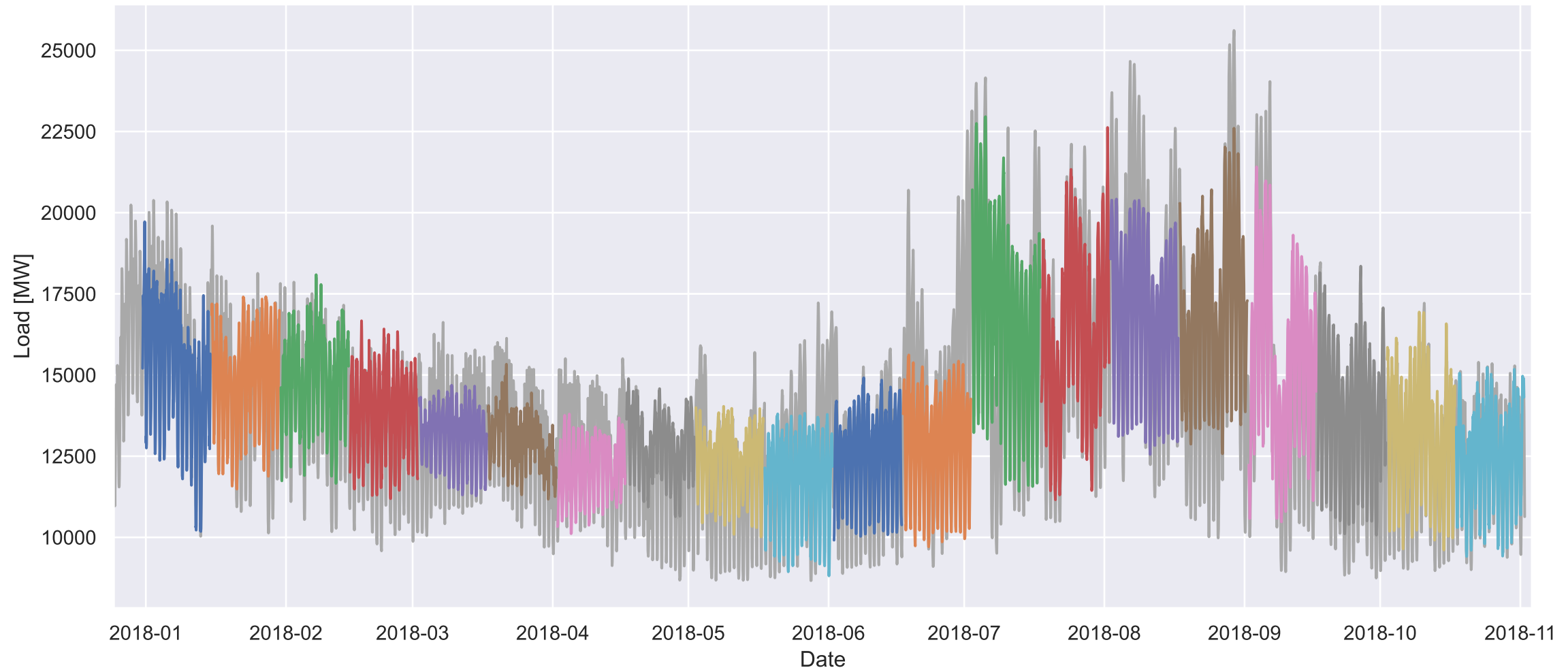
Electricity Prediction [MW] - with Box-Cox Transformation - mode_5



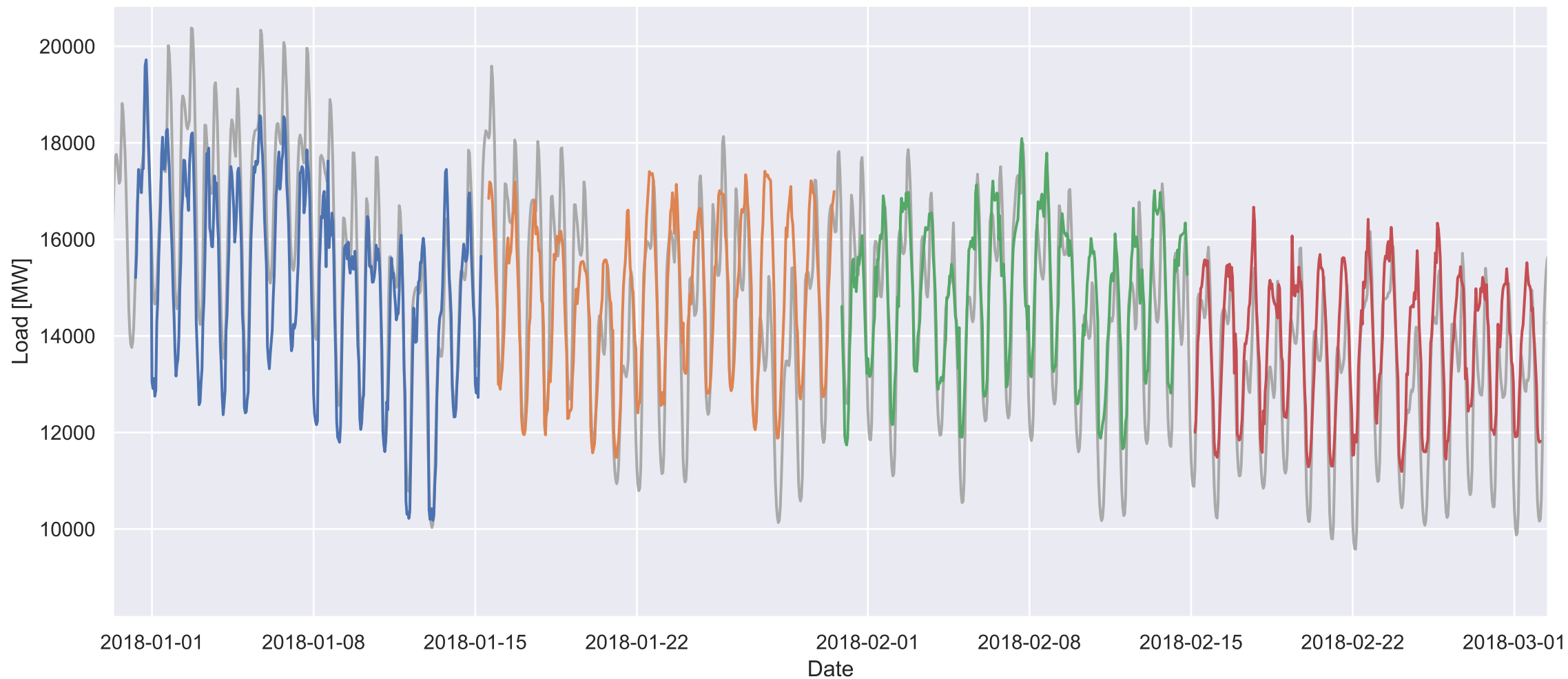
ISONewEngland dataset Load Forecasting - Cross-Validation of 20-fold



ISONewEngland dataset Load Forecasting - Cross-Validation of 20-fold



ISONewEngland dataset Load Forecasting - Cross-Validation of 20-fold




```

Dataset: ISONewEngland
Years: ['2015', '2016', '2017', '2018']
CrossValidation: True
KFOLD: 20
OFFSET: 26280
FORECASTDAYS: 15
NMODES: 5
MODE: ceemdan
MODEL: ceemdan
BOXCOX: True
ALGORITHM: ensemble
Time Series Regression - Load forecasting using ensemble algorithms Dataset
import has been started
Data cleaning function has been started

Feature engineering has been started
Adding date components (year, month, day, holidays and weekdays) to input
data Adding bridge days (Mondays / Fridays) to the Holiday column
Plot Histogram
No handles with labels found to put in legend.
Box-Cox transformation
Plot Histogram after Box-Cox Transformation
No handles with labels found to put in legend.
Complete Ensemble Empirical Mode Decomposition with Adaptive Noise (CEEMDAN)
has been started Max iterations reached for IMF. Continuing with another IMF.

896.513 seconds - Complete Ensemble Empirical Mode Decomposition with
Adaptive Noise (CEEMDAN) has finished. Load Forecasting algorithm has been
started
CrossValidation has been started
Predict 20-folds each by 15.0 days
Prediction on decomposed part: mode_0
Offset has been set by 1095.0 days

-----
Score per fold - mode_0 -----
----- > Fold 1 - r2_score_train: 0.81631
> Fold 1 - r2_score_test: 0.54524
> Fold 1 - rmse: 0.01440
> Fold 1 - mae: 0.01079
> Fold 1 - mape: 335.63248
> Fold 1 - smape: 139.31558 -----
----- > Fold 2 - r2_score_train: 0.71335
> Fold 2 - r2_score_test: 0.13060
> Fold 2 - rmse: 0.02407
> Fold 2 - mae: 0.02039
> Fold 2 - mape: 152.56155
> Fold 2 - smape: 144.39236 -----
----- > Fold 3 - r2_score_train: 0.71319
> Fold 3 - r2_score_test: 0.39173
> Fold 3 - rmse: 0.02008
> Fold 3 - mae: 0.01625
> Fold 3 - mape: 163.19599 > Fold 3 - smape: 139.25621 -----
----- > Fold 4 - r2_score_train:

```

```

0.69078
> Fold 4 - r2_score_test: 0.14372
> Fold 4 - rmse: 0.02342
> Fold 4 - mae: 0.01923
> Fold 4 - mape: 364.68360
> Fold 4 - smape: 142.21258 -----
----- > Fold 5 - r2_score_train: 0.57382
> Fold 5 - r2_score_test: 0.21116
> Fold 5 - rmse: 0.01975
> Fold 5 - mae: 0.01616
> Fold 5 - mape: 188.05081
> Fold 5 - smape: 152.56249 -----
----- > Fold 6 - r2_score_train: 0.71496
> Fold 6 - r2_score_test: 0.31415
> Fold 6 - rmse: 0.02366
> Fold 6 - mae: 0.01980
> Fold 6 - mape: 163.05610
> Fold 6 - smape: 142.71107 -----
----- > Fold 7 - r2_score_train: 0.68592
> Fold 7 - r2_score_test: 0.05139
> Fold 7 - rmse: 0.02319
> Fold 7 - mae: 0.01889
> Fold 7 - mape: 419.62236 > Fold 7 - smape: 142.40931 -----
----- > Fold 8 - r2_score_train:
0.56940
> Fold 8 - r2_score_test: 0.13292
> Fold 8 - rmse: 0.02270
> Fold 8 - mae: 0.01836
> Fold 8 - mape: 417.86589
> Fold 8 - smape: 146.21040 -----
----- > Fold 9 - r2_score_train: 0.61830
> Fold 9 - r2_score_test: 0.23394
> Fold 9 - rmse: 0.01717
> Fold 9 - mae: 0.01352
> Fold 9 - mape: 217.98504
> Fold 9 - smape: 137.64428 -----
----- > Fold 10 - r2_score_train: 0.69019
> Fold 10 - r2_score_test: 0.08525
> Fold 10 - rmse: 0.01270
> Fold 10 - mae: 0.01029
> Fold 10 - mape: 561.21543
> Fold 10 - smape: 136.11169 -----
----- > Fold 11 - r2_score_train: 0.54105
> Fold 11 - r2_score_test: -0.00292
> Fold 11 - rmse: 0.01129
> Fold 11 - mae: 0.00875
> Fold 11 - mape: 421.29982
> Fold 11 - smape: 141.02477 -----
----- > Fold 12 - r2_score_train: 0.52857
> Fold 12 - r2_score_test: 0.05901
> Fold 12 - rmse: 0.00788
> Fold 12 - mae: 0.00638
> Fold 12 - mape: 162.17918
> Fold 12 - smape: 152.85399 -----

```

```

----- > Fold 13 - r2_score_train: 0.31914
> Fold 13 - r2_score_test: -0.00305
> Fold 13 - rmse: 0.04493
> Fold 13 - mae: 0.03793
> Fold 13 - mape: 102.65733
> Fold 13 - smape: 185.17809 -----
----- > Fold 14 - r2_score_train: 0.89642
> Fold 14 - r2_score_test: -2.99646
> Fold 14 - rmse: 0.03517
> Fold 14 - mae: 0.03076
> Fold 14 - mape: 4216.40387
> Fold 14 - smape: 166.58202 -----
----- > Fold 15 - r2_score_train: 0.26301
> Fold 15 - r2_score_test: -0.36337
> Fold 15 - rmse: 0.00757
> Fold 15 - mae: 0.00545 > Fold 15 - mape: 579.27487
> Fold 15 - smape: 148.24335 -----
----- > Fold 16 - r2_score_train: 0.00118
> Fold 16 - r2_score_test: -0.00358
> Fold 16 - rmse: 0.00558
> Fold 16 - mae: 0.00422
> Fold 16 - mape: 130.50731
> Fold 16 - smape: 176.54301 -----
----- > Fold 17 - r2_score_train: 0.30557
> Fold 17 - r2_score_test: -0.00008
> Fold 17 - rmse: 0.01395
> Fold 17 - mae: 0.01003
> Fold 17 - mape: 115.45567
> Fold 17 - smape: 178.79113 -----
----- > Fold 18 - r2_score_train: 0.27769
> Fold 18 - r2_score_test: 0.08273
> Fold 18 - rmse: 0.02173
> Fold 18 - mae: 0.01888
> Fold 18 - mape: 113.54137
> Fold 18 - smape: 172.15566 -----
----- > Fold 19 - r2_score_train: 0.77300
> Fold 19 - r2_score_test: 0.30274
> Fold 19 - rmse: 0.02202 > Fold 19 - mae: 0.01837
> Fold 19 - mape: 215.44040
> Fold 19 - smape: 147.57455 -----
----- > Fold 20 - r2_score_train: 0.72638
> Fold 20 - r2_score_test: 0.18282
> Fold 20 - rmse: 0.02616
> Fold 20 - mae: 0.02111
> Fold 20 - mape: 177.07188
> Fold 20 - smape: 142.04538 -----
----- Average scores for all folds:
> r2_score_train: 0.57091 (+ 0.22118)
> r2_score_test: -0.02510 (+ 0.70525)
> rmse: 0.01987 (+ 0.00914)
> mae: 0.01628 (+ 0.00804)
> mape: 460.88505 (+ 873.82361)
> smape: 151.69090 (+ 14.89875) -----
----- Load Forecasting algorithm has been started

```

```
CrossValidation has been started
Predict 20-folds each by 15.0 days
Prediction on decomposed part: mode_1
Offset has been set by 1095.0 days -----
-----
Score per fold - mode_1 -----
----- > Fold 1 - r2_score_train: 0.88184
> Fold 1 - r2_score_test: 0.93253
> Fold 1 - rmse: 0.00891
> Fold 1 - mae: 0.00684
> Fold 1 - mape: 343.99318
> Fold 1 - smape: 133.67144 -----
----- > Fold 2 - r2_score_train: 0.99014
> Fold 2 - r2_score_test: 0.87843
> Fold 2 - rmse: 0.01275
> Fold 2 - mae: 0.01047
> Fold 2 - mape: 429.09754
> Fold 2 - smape: 135.42052 -----
----- > Fold 3 - r2_score_train: 0.98717
> Fold 3 - r2_score_test: 0.91556
> Fold 3 - rmse: 0.01060
> Fold 3 - mae: 0.00858
> Fold 3 - mape: 455.12433
> Fold 3 - smape: 135.27074 -----
----- > Fold 4 - r2_score_train: 0.98349
> Fold 4 - r2_score_test: 0.71335 > Fold 4 - rmse: 0.02013
> Fold 4 - mae: 0.01491
> Fold 4 - mape: 436.14767
> Fold 4 - smape: 136.46932 -----
----- > Fold 5 - r2_score_train: 0.92245
> Fold 5 - r2_score_test: 0.68350
> Fold 5 - rmse: 0.01938
> Fold 5 - mae: 0.01586
> Fold 5 - mape: 253.46925
> Fold 5 - smape: 140.60533 -----
----- > Fold 6 - r2_score_train: 0.85693
> Fold 6 - r2_score_test: 0.45215
> Fold 6 - rmse: 0.02249
> Fold 6 - mae: 0.01655
> Fold 6 - mape: 480.93307
> Fold 6 - smape: 143.18780 -----
----- > Fold 7 - r2_score_train: 0.94521
> Fold 7 - r2_score_test: 0.45764
> Fold 7 - rmse: 0.02538
> Fold 7 - mae: 0.01990
> Fold 7 - mape: 240.64343
> Fold 7 - smape: 140.18310 -----
----- > Fold 8 - r2_score_train: 0.87000
> Fold 8 - r2_score_test: 0.49902 > Fold 8 - rmse: 0.02824
> Fold 8 - mae: 0.02291
> Fold 8 - mape: 230.79040
> Fold 8 - smape: 134.91478 -----
----- > Fold 9 - r2_score_train: 0.87168
```

```
> Fold 9 - r2_score_test: 0.67711
> Fold 9 - rmse: 0.02925
> Fold 9 - mae: 0.02510
> Fold 9 - mape: 468.48981
> Fold 9 - smape: 142.64194 -----
----- > Fold 10 - r2_score_train: 0.97670
> Fold 10 - r2_score_test: 0.79079
> Fold 10 - rmse: 0.02530
> Fold 10 - mae: 0.02019
> Fold 10 - mape: 424.80900
> Fold 10 - smape: 134.84379 -----
----- > Fold 11 - r2_score_train: 0.94578
> Fold 11 - r2_score_test: 0.73818
> Fold 11 - rmse: 0.02662
> Fold 11 - mae: 0.01981
> Fold 11 - mape: 285.37624
> Fold 11 - smape: 130.94028 -----
----- > Fold 12 - r2_score_train: 0.96248 > Fold 12 -
r2_score_test: 0.87638
> Fold 12 - rmse: 0.02303
> Fold 12 - mae: 0.01927
> Fold 12 - mape: 259.95935
> Fold 12 - smape: 130.34236 -----
----- > Fold 13 - r2_score_train: 0.98635
> Fold 13 - r2_score_test: -0.59417
> Fold 13 - rmse: 0.04372
> Fold 13 - mae: 0.03749
> Fold 13 - mape: 1571.77041
> Fold 13 - smape: 148.33986 -----
----- > Fold 14 - r2_score_train: 0.92695
> Fold 14 - r2_score_test: 0.37696
> Fold 14 - rmse: 0.04649
> Fold 14 - mae: 0.04053
> Fold 14 - mape: 124.02523
> Fold 14 - smape: 153.36904 -----
----- > Fold 15 - r2_score_train: 0.98838
> Fold 15 - r2_score_test: 0.86179
> Fold 15 - rmse: 0.02359
> Fold 15 - mae: 0.01927
> Fold 15 - mape: 557.90854
> Fold 15 - smape: 133.03663 -----
----- > Fold 16 - r2_score_train: 0.98486
> Fold 16 - r2_score_test: 0.86850
> Fold 16 - rmse: 0.02259
> Fold 16 - mae: 0.01863
> Fold 16 - mape: 200.41607
> Fold 16 - smape: 131.49075 -----
----- > Fold 17 - r2_score_train: 0.99594
> Fold 17 - r2_score_test: 0.92322
> Fold 17 - rmse: 0.01685
> Fold 17 - mae: 0.01231
> Fold 17 - mape: 388.87599
> Fold 17 - smape: 129.74688 -----
----- > Fold 18 - r2_score_train: 0.98960
```

```

> Fold 18 - r2_score_test: 0.90433
> Fold 18 - rmse: 0.01651
> Fold 18 - mae: 0.01329
> Fold 18 - mape: 670.58159
> Fold 18 - smape: 133.91378 -----
----- > Fold 19 - r2_score_train: 0.99050
> Fold 19 - r2_score_test: 0.96327
> Fold 19 - rmse: 0.00988
> Fold 19 - mae: 0.00786
> Fold 19 - mape: 426.89338
> Fold 19 - smape: 134.57886 -----
----- > Fold 20 - r2_score_train: 0.99398
> Fold 20 - r2_score_test: 0.72900
> Fold 20 - rmse: 0.01944
> Fold 20 - mae: 0.01272
> Fold 20 - mape: 351.60757
> Fold 20 - smape: 136.91714 -----
----- Average scores for all folds:
> r2_score_train: 0.95252 (+ 0.04653)
> r2_score_test: 0.68238 (+ 0.34088)
> rmse: 0.02256 (+ 0.00952)
> mae: 0.01812 (+ 0.00851)
> mape: 430.04560 (+ 291.61260)
> smape: 136.99422 (+ 5.96128) -----
----- Load Forecasting algorithm has been started
CrossValidation has been started
Predict 20-folds each by 15.0 days
Prediction on decomposed part: mode_2
Offset has been set by 1095.0 days -----
-----

Score per fold - mode_2 -----
----- > Fold 1 - r2_score_train: 0.15761
> Fold 1 - r2_score_test: -0.99308
> Fold 1 - rmse: 0.00311
> Fold 1 - mae: 0.00247
> Fold 1 - mape: 1440.93884
> Fold 1 - smape: 151.77376 -----
----- > Fold 2 - r2_score_train: -0.35928
> Fold 2 - r2_score_test: -0.02880
> Fold 2 - rmse: 0.00391
> Fold 2 - mae: 0.00267
> Fold 2 - mape: 191.91829
> Fold 2 - smape: 159.02337 -----
----- > Fold 3 - r2_score_train: -0.01575
> Fold 3 - r2_score_test: 0.00046
> Fold 3 - rmse: 0.00692
> Fold 3 - mae: 0.00551
> Fold 3 - mape: 103.16971
> Fold 3 - smape: 191.69736 -----
----- > Fold 4 - r2_score_train: 0.26862
> Fold 4 - r2_score_test: 0.01347
> Fold 4 - rmse: 0.01731
> Fold 4 - mae: 0.01145

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```
> Fold 4 - mape: 1995.49698
> Fold 4 - smape: 176.42459 -----
----- > Fold 5 - r2_score_train: -0.26305
> Fold 5 - r2_score_test: -0.07075
> Fold 5 - rmse: 0.01674
> Fold 5 - mae: 0.01216
> Fold 5 - mape: 151.58114
> Fold 5 - smape: 163.94727 -----
----- > Fold 6 - r2_score_train: -1.09801
> Fold 6 - r2_score_test: -0.74608
> Fold 6 - rmse: 0.01637
> Fold 6 - mae: 0.01065
> Fold 6 - mape: 164634.05970
> Fold 6 - smape: 174.03558 -----
----- > Fold 7 - r2_score_train: 0.02642
> Fold 7 - r2_score_test: 0.00463
> Fold 7 - rmse: 0.02191
> Fold 7 - mae: 0.01694
> Fold 7 - mape: 174.93951
> Fold 7 - smape: 192.54080 -----
----- > Fold 8 - r2_score_train: 0.11809
> Fold 8 - r2_score_test: 0.01593
> Fold 8 - rmse: 0.01936
> Fold 8 - mae: 0.01661
> Fold 8 - mape: 106.38794
> Fold 8 - smape: 185.40285 -----
----- > Fold 9 - r2_score_train: -0.14939
> Fold 9 - r2_score_test: -0.00383
> Fold 9 - rmse: 0.01460
> Fold 9 - mae: 0.00988
> Fold 9 - mape: 265.97817
> Fold 9 - smape: 169.25208 -----
----- > Fold 10 - r2_score_train: -0.29528
> Fold 10 - r2_score_test: -0.01313
> Fold 10 - rmse: 0.02334
> Fold 10 - mae: 0.01752
> Fold 10 - mape: 1862.92421
> Fold 10 - smape: 180.26063 -----
----- > Fold 11 - r2_score_train: 0.05275
> Fold 11 - r2_score_test: -0.00268
> Fold 11 - rmse: 0.02728
> Fold 11 - mae: 0.01950
> Fold 11 - mape: 2532.43781
> Fold 11 - smape: 174.02830 -----
----- > Fold 12 - r2_score_train: 0.36789
> Fold 12 - r2_score_test: -0.01641
> Fold 12 - rmse: 0.01606
> Fold 12 - mae: 0.01141
> Fold 12 - mape: 1505.79598
> Fold 12 - smape: 169.44379 -----
----- > Fold 13 - r2_score_train: 0.00000
> Fold 13 - r2_score_test: -0.00897
> Fold 13 - rmse: 0.00284
> Fold 13 - mae: 0.00239
```

```

> Fold 13 - mape: 130.76297
> Fold 13 - smape: 170.48723 -----
----- > Fold 14 - r2_score_train: 0.38513
> Fold 14 - r2_score_test: 0.05543
> Fold 14 - rmse: 0.00336
> Fold 14 - mae: 0.00194
> Fold 14 - mape: 812.82177
> Fold 14 - smape: 156.93954 -----
----- > Fold 15 - r2_score_train: 0.23993
> Fold 15 - r2_score_test: 0.00304
> Fold 15 - rmse: 0.01836
> Fold 15 - mae: 0.01572
> Fold 15 - mape: 110.03300
> Fold 15 - smape: 185.90765 -----
----- > Fold 16 - r2_score_train: 0.44609
> Fold 16 - r2_score_test: -0.86797
> Fold 16 - rmse: 0.01052
> Fold 16 - mae: 0.00840
> Fold 16 - mape: 261.40799 > Fold 16 - smape: 138.74232 -----
----- > Fold 17 -
r2_score_train: 0.48909
> Fold 17 - r2_score_test: -0.16488
> Fold 17 - rmse: 0.00514
> Fold 17 - mae: 0.00404
> Fold 17 - mape: 683.99091
> Fold 17 - smape: 151.96737 -----
----- > Fold 18 - r2_score_train: 0.00000
> Fold 18 - r2_score_test: -0.01441
> Fold 18 - rmse: 0.00365
> Fold 18 - mae: 0.00255
> Fold 18 - mape: 262.50747
> Fold 18 - smape: 161.74472 -----
----- > Fold 19 - r2_score_train: -0.29228
> Fold 19 - r2_score_test: -0.05864
> Fold 19 - rmse: 0.00322
> Fold 19 - mae: 0.00229
> Fold 19 - mape: 683.25003
> Fold 19 - smape: 160.89624 -----
----- > Fold 20 - r2_score_train: 0.17940
> Fold 20 - r2_score_test: 0.00526
> Fold 20 - rmse: 0.01565
> Fold 20 - mae: 0.00944 > Fold 20 - mape: 282.28882
> Fold 20 - smape: 174.78066 -----
----- Average scores for all folds:
> r2_score_train: 0.01290 (+ 0.35509)
> r2_score_test: -0.14457 (+ 0.30976)
> rmse: 0.01248 (+ 0.00769)
> mae: 0.00918 (+ 0.00580)
> mape: 8909.63456 (+ 35733.02109)
> smape: 169.46481 (+ 13.74701) -----
----- Load Forecasting algorithm has been started
CrossValidation has been started
Predict 20-folds each by 15.0 days
Prediction on decomposed part: mode_3

```


Offset has been set by 1095.0 days -----

Score per fold - mode_3 -----

----- > Fold 1 - r2_score_train: 0.15709

> Fold 1 - r2_score_test: -0.05949

> Fold 1 - rmse: 0.00818

> Fold 1 - mae: 0.00653

> Fold 1 - mape: 330.66031

> Fold 1 - smape: 151.60652 -----

----- > Fold 2 - r2_score_train: 0.00000

> Fold 2 - r2_score_test: -0.00052

> Fold 2 - rmse: 0.01575

> Fold 2 - mae: 0.01408

> Fold 2 - mape: 124.08191

> Fold 2 - smape: 165.19548 -----

----- > Fold 3 - r2_score_train: 0.32519

> Fold 3 - r2_score_test: 0.18665

> Fold 3 - rmse: 0.01206

> Fold 3 - mae: 0.00993

> Fold 3 - mape: 164.07317

> Fold 3 - smape: 157.93133 -----

----- > Fold 4 - r2_score_train: 0.80238

> Fold 4 - r2_score_test: -0.09491

> Fold 4 - rmse: 0.01317

> Fold 4 - mae: 0.01022

> Fold 4 - mape: 175.27850

> Fold 4 - smape: 159.82626 -----

----- > Fold 5 - r2_score_train: -0.00224

> Fold 5 - r2_score_test: -0.00296

> Fold 5 - rmse: 0.01404

> Fold 5 - mae: 0.01245

> Fold 5 - mape: 100.01894

> Fold 5 - smape: 198.70104 -----

----- > Fold 6 - r2_score_train: 0.47875

> Fold 6 - r2_score_test: -0.16390

> Fold 6 - rmse: 0.01341

> Fold 6 - mae: 0.00938

> Fold 6 - mape: 1116.32308

> Fold 6 - smape: 152.58738 -----

----- > Fold 7 - r2_score_train: 0.01162

> Fold 7 - r2_score_test: -0.00583

> Fold 7 - rmse: 0.01360

> Fold 7 - mae: 0.01063

> Fold 7 - mape: 119.35209

> Fold 7 - smape: 182.75825 -----

----- > Fold 8 - r2_score_train: -0.31043

> Fold 8 - r2_score_test: 0.01750

> Fold 8 - rmse: 0.00739

> Fold 8 - mae: 0.00578

> Fold 8 - mape: 4102.55310

> Fold 8 - smape: 153.59638 -----

----- > Fold 9 - r2_score_train: -0.81731

> Fold 9 - r2_score_test: -0.03602

```

> Fold 9 - rmse: 0.01417
> Fold 9 - mae: 0.01231
> Fold 9 - mape: 141.46892
> Fold 9 - smape: 154.75921 -----
----- > Fold 10 - r2_score_train: -0.08308
> Fold 10 - r2_score_test: -0.01464
> Fold 10 - rmse: 0.01627
> Fold 10 - mae: 0.01173
> Fold 10 - mape: 158.61760
> Fold 10 - smape: 169.31496 -----
----- > Fold 11 - r2_score_train: -0.87339
> Fold 11 - r2_score_test: -0.18131
> Fold 11 - rmse: 0.01510
> Fold 11 - mae: 0.01139
> Fold 11 - mape: 178.45077
> Fold 11 - smape: 138.10846 -----
----- > Fold 12 - r2_score_train: -0.58512
> Fold 12 - r2_score_test: -0.10697
> Fold 12 - rmse: 0.01479
> Fold 12 - mae: 0.01241
> Fold 12 - mape: 152.86896
> Fold 12 - smape: 164.21045 -----
----- > Fold 13 - r2_score_train: 0.20193
> Fold 13 - r2_score_test: 0.01102
> Fold 13 - rmse: 0.02626
> Fold 13 - mae: 0.02213
> Fold 13 - mape: 119.23744 > Fold 13 - smape: 168.69056 -----
----- > Fold 14 -
r2_score_train: 0.39307
> Fold 14 - r2_score_test: 0.14127
> Fold 14 - rmse: 0.01434
> Fold 14 - mae: 0.01269
> Fold 14 - mape: 130.77871
> Fold 14 - smape: 162.55860 -----
----- > Fold 15 - r2_score_train: 0.00000
> Fold 15 - r2_score_test: -0.00139
> Fold 15 - rmse: 0.01194
> Fold 15 - mae: 0.00993
> Fold 15 - mape: 110.89107
> Fold 15 - smape: 185.00910 -----
----- > Fold 16 - r2_score_train: 0.28330
> Fold 16 - r2_score_test: -0.04757
> Fold 16 - rmse: 0.01535
> Fold 16 - mae: 0.01199
> Fold 16 - mape: 118.20283
> Fold 16 - smape: 165.70385 -----
----- > Fold 17 - r2_score_train: 0.87062
> Fold 17 - r2_score_test: -0.24125
> Fold 17 - rmse: 0.02372
> Fold 17 - mae: 0.01912 > Fold 17 - mape: 268.34352
> Fold 17 - smape: 131.08579 -----
----- > Fold 18 - r2_score_train: 0.64177
> Fold 18 - r2_score_test: 0.03344
> Fold 18 - rmse: 0.01248

```

```

> Fold 18 - mae: 0.00997
> Fold 18 - mape: 855.02023
> Fold 18 - smape: 139.66280 -----
----- > Fold 19 - r2_score_train: 0.70259
> Fold 19 - r2_score_test: -1.34146
> Fold 19 - rmse: 0.01341
> Fold 19 - mae: 0.01142
> Fold 19 - mape: 4152.31799
> Fold 19 - smape: 155.72875 -----
----- > Fold 20 - r2_score_train: 0.00000
> Fold 20 - r2_score_test: -0.08579
> Fold 20 - rmse: 0.01270
> Fold 20 - mae: 0.00982
> Fold 20 - mape: 284.63419
> Fold 20 - smape: 162.04895 -----
----- Average scores for all folds:
> r2_score_train: 0.10984 (+ 0.47842)
> r2_score_test: -0.09971 (+ 0.30084) > rmse: 0.01441 (+ 0.00415)
> mae: 0.01169 (+ 0.00357)
> mape: 645.15867 (+ 1188.33821)
> smape: 160.95421 (+ 15.52183) -----
----- Load Forecasting algorithm has been started
CrossValidation has been started
Predict 20-folds each by 15.0 days
Prediction on decomposed part: mode_4
Offset has been set by 1095.0 days -----
-----

Score per fold - mode_4 -----
----- > Fold 1 - r2_score_train: 0.45925
> Fold 1 - r2_score_test: 0.14860
> Fold 1 - rmse: 0.01539
> Fold 1 - mae: 0.01335
> Fold 1 - mape: 242.76633
> Fold 1 - smape: 151.07363 -----
----- > Fold 2 - r2_score_train: 0.85873
> Fold 2 - r2_score_test: -0.10775
> Fold 2 - rmse: 0.02435
> Fold 2 - mae: 0.01992
> Fold 2 - mape: 228.04625
> Fold 2 - smape: 143.81646 -----
----- > Fold 3 - r2_score_train: 0.75244
> Fold 3 - r2_score_test: 0.27577
> Fold 3 - rmse: 0.01622
> Fold 3 - mae: 0.01301
> Fold 3 - mape: 302.77062
> Fold 3 - smape: 137.09506 -----
----- > Fold 4 - r2_score_train: 0.64770
> Fold 4 - r2_score_test: -0.05669
> Fold 4 - rmse: 0.01068
> Fold 4 - mae: 0.00837
> Fold 4 - mape: 209.97327
> Fold 4 - smape: 149.47310 -----
----- > Fold 5 - r2_score_train: 0.74208

```

```
> Fold 5 - r2_score_test: -0.55569
> Fold 5 - rmse: 0.01190
> Fold 5 - mae: 0.00945
> Fold 5 - mape: 469.37735
> Fold 5 - smape: 142.91767 -----
----- > Fold 6 - r2_score_train: 0.22599
> Fold 6 - r2_score_test: 0.10249
> Fold 6 - rmse: 0.00762
> Fold 6 - mae: 0.00633
> Fold 6 - mape: 158.41100
> Fold 6 - smape: 169.80010 -----
----- > Fold 7 - r2_score_train: 0.00000
> Fold 7 - r2_score_test: -0.08294
> Fold 7 - rmse: 0.01598
> Fold 7 - mae: 0.01464
> Fold 7 - mape: 99.91282
> Fold 7 - smape: 193.81424 -----
----- > Fold 8 - r2_score_train: 0.84217
> Fold 8 - r2_score_test: -1.13537
> Fold 8 - rmse: 0.01093
> Fold 8 - mae: 0.00811
> Fold 8 - mape: 516.93682
> Fold 8 - smape: 144.54509 -----
----- > Fold 9 - r2_score_train: 0.65825
> Fold 9 - r2_score_test: 0.22866
> Fold 9 - rmse: 0.00642
> Fold 9 - mae: 0.00516
> Fold 9 - mape: 152.83176
> Fold 9 - smape: 150.18934 -----
----- > Fold 10 - r2_score_train: 0.59750
> Fold 10 - r2_score_test: -0.07095
> Fold 10 - rmse: 0.01171
> Fold 10 - mae: 0.00846
> Fold 10 - mape: 306.87454
> Fold 10 - smape: 160.71004 -----
----- > Fold 11 - r2_score_train: -0.56102
> Fold 11 - r2_score_test: -0.02801
> Fold 11 - rmse: 0.01809
> Fold 11 - mae: 0.01373
> Fold 11 - mape: 104.53245
> Fold 11 - smape: 181.40866 -----
----- > Fold 12 - r2_score_train: 0.47453
> Fold 12 - r2_score_test: 0.09189
> Fold 12 - rmse: 0.01365
> Fold 12 - mae: 0.01187
> Fold 12 - mape: 200.21332
> Fold 12 - smape: 142.47938 -----
----- > Fold 13 - r2_score_train: -0.57421
> Fold 13 - r2_score_test: -0.03674
> Fold 13 - rmse: 0.02846
> Fold 13 - mae: 0.02505
> Fold 13 - mape: 117.94488
> Fold 13 - smape: 174.14554 -----
----- > Fold 14 - r2_score_train: 0.95343
```

```

> Fold 14 - r2_score_test: -0.29696
> Fold 14 - rmse: 0.03041
> Fold 14 - mae: 0.02058
> Fold 14 - mape: 432.79857 > Fold 14 - smape: 146.01116 -----
----- > Fold 15 -
r2_score_train: 0.82199
> Fold 15 - r2_score_test: 0.25076
> Fold 15 - rmse: 0.02725
> Fold 15 - mae: 0.02410
> Fold 15 - mape: 166.57170
> Fold 15 - smape: 161.18890 -----
----- > Fold 16 - r2_score_train: 0.90381
> Fold 16 - r2_score_test: -0.12705
> Fold 16 - rmse: 0.03750
> Fold 16 - mae: 0.03064
> Fold 16 - mape: 291.15063
> Fold 16 - smape: 141.31538 -----
----- > Fold 17 - r2_score_train: 0.99468
> Fold 17 - r2_score_test: 0.50457
> Fold 17 - rmse: 0.02528
> Fold 17 - mae: 0.01923
> Fold 17 - mape: 673.03705
> Fold 17 - smape: 142.55542 -----
----- > Fold 18 - r2_score_train: 0.70399
> Fold 18 - r2_score_test: 0.12699
> Fold 18 - rmse: 0.02199
> Fold 18 - mae: 0.01861 > Fold 18 - mape: 267.47931
> Fold 18 - smape: 140.35980 -----
----- > Fold 19 - r2_score_train: 0.90413
> Fold 19 - r2_score_test: 0.42811
> Fold 19 - rmse: 0.02123
> Fold 19 - mae: 0.01905
> Fold 19 - mape: 151.02298
> Fold 19 - smape: 146.47446 -----
----- > Fold 20 - r2_score_train: 0.75403
> Fold 20 - r2_score_test: -0.83009
> Fold 20 - rmse: 0.02016
> Fold 20 - mae: 0.01822
> Fold 20 - mape: 593.80704
> Fold 20 - smape: 149.07733 -----
----- Average scores for all folds:
> r2_score_train: 0.55797 (+ 0.44446)
> r2_score_test: -0.05852 (+ 0.38973)
> rmse: 0.01876 (+ 0.00805)
> mae: 0.01539 (+ 0.00668)
> mape: 284.32293 (+ 163.51534)
> smape: 153.42254 (+ 14.97089) -----
----- Load Forecasting algorithm has been started
CrossValidation has been started
Predict 20-folds each by 15.0 days
Prediction on decomposed part: mode_5
Offset has been set by 1095.0 days -----
-----

```

```
Score per fold - mode_5 -----
----- > Fold 1 - r2_score_train: 0.80675
> Fold 1 - r2_score_test: -1.07993
> Fold 1 - rmse: 0.03500
> Fold 1 - mae: 0.03167
> Fold 1 - mape: 0.55701
> Fold 1 - smape: 0.55906 -----
----- > Fold 2 - r2_score_train: 0.89603
> Fold 2 - r2_score_test: -7.06149
> Fold 2 - rmse: 0.02730
> Fold 2 - mae: 0.02190
> Fold 2 - mape: 0.35322
> Fold 2 - smape: 0.35242 -----
----- > Fold 3 - r2_score_train: 0.99786
> Fold 3 - r2_score_test: -0.18473
> Fold 3 - rmse: 0.01328
> Fold 3 - mae: 0.01143
> Fold 3 - mape: 0.19973
> Fold 3 - smape: 0.19957 -----
----- > Fold 4 - r2_score_train: 0.96598
> Fold 4 - r2_score_test: -9.22594
> Fold 4 - rmse: 0.02907
> Fold 4 - mae: 0.02705
> Fold 4 - mape: 0.43903
> Fold 4 - smape: 0.43794 -----
----- > Fold 5 - r2_score_train: 0.00676
> Fold 5 - r2_score_test: -0.44562
> Fold 5 - rmse: 0.01514
> Fold 5 - mae: 0.01302
> Fold 5 - mape: 0.21077
> Fold 5 - smape: 0.21102 -----
----- > Fold 6 - r2_score_train: 0.92343
> Fold 6 - r2_score_test: -0.02033
> Fold 6 - rmse: 0.02470
> Fold 6 - mae: 0.01918
> Fold 6 - mape: 0.35304
> Fold 6 - smape: 0.35219 -----
----- > Fold 7 - r2_score_train: 0.94513
> Fold 7 - r2_score_test: -1.24994
> Fold 7 - rmse: 0.02421
> Fold 7 - mae: 0.01932
> Fold 7 - mape: 0.29117
> Fold 7 - smape: 0.29174 -----
----- > Fold 8 - r2_score_train: 0.94326
> Fold 8 - r2_score_test: -0.31558
> Fold 8 - rmse: 0.02670
> Fold 8 - mae: 0.02392
> Fold 8 - mape: 0.42749
> Fold 8 - smape: 0.42642 -----
----- > Fold 9 - r2_score_train: 0.99338
> Fold 9 - r2_score_test: -2.33227
> Fold 9 - rmse: 0.03846
> Fold 9 - mae: 0.03429
> Fold 9 - mape: 0.57255
```

```
> Fold 9 - smape: 0.57050 -----
----- > Fold 10 - r2_score_train: -0.86521
> Fold 10 - r2_score_test: -0.63319
> Fold 10 - rmse: 0.02663
> Fold 10 - mae: 0.02194
> Fold 10 - mape: 0.32153
> Fold 10 - smape: 0.32207 -----
----- > Fold 11 - r2_score_train: 0.00113
> Fold 11 - r2_score_test: -0.03604
> Fold 11 - rmse: 0.00955
> Fold 11 - mae: 0.00782
> Fold 11 - mape: 0.12746
> Fold 11 - smape: 0.12752 -----
----- > Fold 12 - r2_score_train: 0.75900
> Fold 12 - r2_score_test: -1.11019
> Fold 12 - rmse: 0.06552
> Fold 12 - mae: 0.05251
> Fold 12 - mape: 0.81706
> Fold 12 - smape: 0.82246 -----
----- > Fold 13 - r2_score_train: 0.94253
> Fold 13 - r2_score_test: 0.18760
> Fold 13 - rmse: 0.03140
> Fold 13 - mae: 0.02390
> Fold 13 - mape: 0.58464
> Fold 13 - smape: 0.58361 -----
----- > Fold 14 - r2_score_train: 0.95906
> Fold 14 - r2_score_test: -0.89729
> Fold 14 - rmse: 0.02236
> Fold 14 - mae: 0.01733
> Fold 14 - mape: 0.33632
> Fold 14 - smape: 0.33620 -----
----- > Fold 15 - r2_score_train: 0.93720
> Fold 15 - r2_score_test: 0.62563
> Fold 15 - rmse: 0.00975
> Fold 15 - mae: 0.00745
> Fold 15 - mape: 0.25003
> Fold 15 - smape: 0.25021 -----
----- > Fold 16 - r2_score_train: 0.98299
> Fold 16 - r2_score_test: -0.60772
> Fold 16 - rmse: 0.03456
> Fold 16 - mae: 0.02803
> Fold 16 - mape: 0.46191
> Fold 16 - smape: 0.46042 -----
----- > Fold 17 - r2_score_train: 0.98213
> Fold 17 - r2_score_test: -1.19230
> Fold 17 - rmse: 0.04955
> Fold 17 - mae: 0.04183
> Fold 17 - mape: 0.70256
> Fold 17 - smape: 0.69916 -----
----- > Fold 18 - r2_score_train: 0.99712
> Fold 18 - r2_score_test: -7.90638
> Fold 18 - rmse: 0.04774
> Fold 18 - mae: 0.04104
> Fold 18 - mape: 0.67067
```

```

> Fold 18 - smape: 0.66783 -----
----- > Fold 19 - r2_score_train: -0.21479
> Fold 19 - r2_score_test: -0.78035
> Fold 19 - rmse: 0.01925
> Fold 19 - mae: 0.01644
> Fold 19 - mape: 0.26174
> Fold 19 - smape: 0.26131 -----
----- > Fold 20 - r2_score_train: 0.76631
> Fold 20 - r2_score_test: -8.18814
> Fold 20 - rmse: 0.02073
> Fold 20 - mae: 0.01941
> Fold 20 - mape: 0.31548
> Fold 20 - smape: 0.31604 -----
----- Average scores for all folds:
> r2_score_train: 0.68630 (+ 0.50767)
> r2_score_test: -2.12271 (+ 3.06748)
> rmse: 0.02855 (+ 0.01363)
> mae: 0.02397 (+ 0.01141)
> mape: 0.41267 (+ 0.18105)
> smape: 0.41239 (+ 0.18108) -----
----- Join all decomposed y predictions
Inverse Box-Cox transformation

Print and plot the results
OFFSET has been set by 1095.0 days -----
----- Score per fold - kfold_0 -----
----- > Fold 1 -
r2_score_train: 0.00000
> Fold 1 - r2_score_test: 0.70747 > Fold 1 - rmse: 1203.79281
> Fold 1 - mae: 989.09556
> Fold 1 - mape: 6.02467
> Fold 1 - smape: 6.26442 -----
----- > Fold 2 - r2_score_train: 0.00000
> Fold 2 - r2_score_test: 0.52988
> Fold 2 - rmse: 1382.55242
> Fold 2 - mae: 1081.52354
> Fold 2 - mape: 7.65810
> Fold 2 - smape: 7.42201 -----
----- > Fold 3 - r2_score_train: 0.00000
> Fold 3 - r2_score_test: 0.69580
> Fold 3 - rmse: 1013.71840
> Fold 3 - mae: 842.11334
> Fold 3 - mape: 6.08401
> Fold 3 - smape: 5.90377 -----
----- > Fold 4 - r2_score_train: 0.00000
> Fold 4 - r2_score_test: 0.49189
> Fold 4 - rmse: 1165.33142
> Fold 4 - mae: 987.44101
> Fold 4 - mape: 7.99869
> Fold 4 - smape: 7.58697 -----
----- > Fold 5 - r2_score_train: 0.00000
> Fold 5 - r2_score_test: 0.61815 > Fold 5 - rmse: 1002.87930
> Fold 5 - mae: 804.69328
> Fold 5 - mape: 6.04410

```



```
> Fold 5 - smape: 6.06361 -----
----- > Fold 6 - r2_score_train: 0.00000
> Fold 6 - r2_score_test: 0.50830
> Fold 6 - rmse: 1125.78518
> Fold 6 - mae: 936.89603
> Fold 6 - mape: 7.46272
> Fold 6 - smape: 7.36516 -----
----- > Fold 7 - r2_score_train: 0.00000
> Fold 7 - r2_score_test: 0.28434
> Fold 7 - rmse: 1375.28225
> Fold 7 - mae: 1070.44793
> Fold 7 - mape: 8.07362
> Fold 7 - smape: 8.41766 -----
----- > Fold 8 - r2_score_train: 0.00000
> Fold 8 - r2_score_test: 0.27187
> Fold 8 - rmse: 1340.11802
> Fold 8 - mae: 1097.09469
> Fold 8 - mape: 10.20192
> Fold 8 - smape: 9.44013 -----
----- > Fold 9 - r2_score_train: 0.00000
> Fold 9 - r2_score_test: 0.54587 > Fold 9 - rmse: 1262.16961
> Fold 9 - mae: 1031.89572
> Fold 9 - mape: 9.28754
> Fold 9 - smape: 8.87707 -----
----- > Fold 10 - r2_score_train: 0.00000
> Fold 10 - r2_score_test: 0.54507
> Fold 10 - rmse: 1489.20706
> Fold 10 - mae: 1185.28364
> Fold 10 - mape: 9.00326
> Fold 10 - smape: 9.35435 -----
----- > Fold 11 - r2_score_train: 0.00000
> Fold 11 - r2_score_test: 0.77470
> Fold 11 - rmse: 947.04679
> Fold 11 - mae: 759.30602
> Fold 11 - mape: 6.32298
> Fold 11 - smape: 6.25971 -----
----- > Fold 12 - r2_score_train: 0.00000
> Fold 12 - r2_score_test: 0.26750
> Fold 12 - rmse: 2599.20662
> Fold 12 - mae: 1960.15924
> Fold 12 - mape: 12.11868
> Fold 12 - smape: 13.28668 -----
----- > Fold 13 - r2_score_train: 0.00000 > Fold 13 -
r2_score_test: 0.60253
> Fold 13 - rmse: 2305.95652
> Fold 13 - mae: 1774.93893
> Fold 13 - mape: 11.97762
> Fold 13 - smape: 11.15807 -----
----- > Fold 14 - r2_score_train: 0.00000
> Fold 14 - r2_score_test: 0.84852
> Fold 14 - rmse: 1191.11494
> Fold 14 - mae: 962.06590
> Fold 14 - mape: 6.28458
> Fold 14 - smape: 6.15303 -----
```

```

----- > Fold 15 - r2_score_train: 0.00000
> Fold 15 - r2_score_test: 0.76621
> Fold 15 - rmse: 1715.23825
> Fold 15 - mae: 1410.97661
> Fold 15 - mape: 7.74872
> Fold 15 - smape: 7.88859 -----
----- > Fold 16 - r2_score_train: 0.00000
> Fold 16 - r2_score_test: 0.61293
> Fold 16 - rmse: 2300.14394
> Fold 16 - mae: 2035.62884
> Fold 16 - mape: 14.05588
> Fold 16 - smape: 13.05893 -----
----- > Fold 17 - r2_score_train: 0.00000
> Fold 17 - r2_score_test: 0.76089
> Fold 17 - rmse: 1719.67562
> Fold 17 - mae: 1514.42945
> Fold 17 - mape: 10.75902
> Fold 17 - smape: 10.23687 -----
----- > Fold 18 - r2_score_train: 0.00000
> Fold 18 - r2_score_test: 0.52966
> Fold 18 - rmse: 1603.41339
> Fold 18 - mae: 1379.59317
> Fold 18 - mape: 11.34858
> Fold 18 - smape: 10.62323 -----
----- > Fold 19 - r2_score_train: 0.00000
> Fold 19 - r2_score_test: 0.68059
> Fold 19 - rmse: 1136.29851
> Fold 19 - mae: 937.13919
> Fold 19 - mape: 7.79276
> Fold 19 - smape: 7.41949 -----
----- > Fold 20 - r2_score_train: 0.00000
> Fold 20 - r2_score_test: 0.71034
> Fold 20 - rmse: 905.66967
> Fold 20 - mae: 716.55468
> Fold 20 - mape: 5.58390
> Fold 20 - smape: 5.60652 -----
-----

```

Average scores for all folds:

```

> r2_score_train: 0.00000 (+ 0.00000)
> r2_score_test: 0.58763 (+ 0.16377)
> rmse: 1439.23003 (+ 466.42862)
> mae: 1173.86384 (+ 376.52368)
> mape: 8.59157 (+ 2.36966)
> smape: 8.41931 (+ 2.25075)
-----

```

```

--- 953.051 seconds --- the end of the file.

```