```
fuel data = pd.read csv('fuel ferc1.csv')
fuel data
                                       utility_id_ferc1
                          record id
                                                             report year
          f1_fuel_1994_12_1_0_7
0
                                                                      1994
         f1 <u>fuel</u> <u>1994</u> <u>12</u> <u>1</u> <u>0</u> <u>10</u>
1
                                                          1
                                                                      1994
2
           f1 fuel 1994 12 2 0 1
                                                          2
                                                                      1994
           f1_fuel_1994 12 2 0 7
                                                          2
3
                                                                      1994
                                                         2
4
         f1 fuel 1994 12 2 0 10
                                                                      1994
                                                       . . .
        f1 fuel 2018 12 12 0 13
29518
                                                        12
                                                                      2018
        f\overline{1} fue\overline{1} 201\overline{8} 1\overline{2} 1\overline{2} \overline{1} 1
29519
                                                        12
                                                                      2018
        f1 <u>fuel</u> <u>7018</u> <u>12</u> <u>12</u> <u>1</u> <u>10</u>
29520
                                                        12
                                                                      2018
        f1 fuel 2018 12 12 1 13
                                                        12
29521
                                                                      2018
       f1 fuel 2018 12 12 1 14
29522
                                                        12
                                                                      2018
             plant name ferc1 fuel type code pudl fuel unit
fuel_qty_burned \
                       rockport
                                                     coal
                                                                  ton
5377489.0
        rockport total plant
                                                     coal
                                                                  ton
10486945.0
                         gorgas
                                                     coal
                                                                  ton
2978683.0
                           barry
                                                     coal
                                                                  ton
3739484.0
                      chickasaw
                                                      gas
                                                                  mcf
40533.0
. . .
                                                                  . . .
                                                      . . .
                             . . .
. . .
           neil simpson ct #1
29518
                                                                  mcf
                                                      gas
18799.0
29519 cheyenne prairie 58%
                                                      gas
                                                                  mcf
806730.0
29520
            lange ct facility
                                                                  mcf
                                                      gas
104554.0
29521
              wygen 3 bhp 52%
                                                     coal
                                                                  ton
315945.0
              wygen 3 bhp 52%
29522
                                                      gas
                                                                  mcf
17853.0
        fuel mmbtu per unit fuel cost per unit burned
0
                        16.590
                                                           18.59
1
                        16.592
                                                           18.58
2
                        24.130
                                                           39.72
3
                        23.950
                                                           47.21
4
                         1.000
                                                            2.77
                         1.059
                                                            4.78
29518
```

```
29519
                       1.050
                                                      3.65
29520
                                                      4.77
                       1.060
29521
                      16.108
                                                      3.06
29522
                       1.059
                                                      0.00
       fuel cost per unit delivered
                                        fuel cost per mmbtu
0
                                 18.53
                                                        1.121
1
                                 18.53
                                                        1.120
2
                                 38.12
                                                        1.650
3
                                 45.99
                                                        1.970
4
                                                        2.570
                                  2.77
. . .
29518
                                  4.78
                                                        9.030
29519
                                  3.65
                                                        6.950
                                  4.77
29520
                                                        8.990
29521
                                 14.76
                                                        1.110
29522
                                  0.00
                                                       11.680
[29523 rows x 11 columns]
import pandas as pd
fuel data.describe(include= 'all' )
                        record_id
                                    utility_id_ferc1
                                                         report year
                                        29523.000000
                                                        29523.0\overline{0}0000
count
                            29523
unique
                            29523
                                                  NaN
                                                                  NaN
        f1 fuel 2003 12 193 2 6
top
                                                  NaN
                                                                  NaN
freq
                                                  NaN
                                                                  NaN
                              NaN
                                           118.601836
                                                         2005.806050
mean
std
                              NaN
                                            74.178353
                                                            7.025483
                              NaN
                                             1.000000
                                                         1994.000000
min
                                                         2000.000000
25%
                              NaN
                                            55.000000
50%
                              NaN
                                           122.000000
                                                         2006.000000
75%
                                           176.000000
                                                         2012,000000
                              NaN
                                           514,000000
max
                              NaN
                                                         2018.000000
       plant name ferc1 fuel type code pudl fuel unit fuel gty burned
count
                   29523
                                         29523
                                                    29343
                                                               2.952300e+04
                                              6
                                                         9
unique
                     2315
                                                                         NaN
top
               big stone
                                                       mcf
                                                                         NaN
                                            gas
freq
                      156
                                         11486
                                                     11354
                                                                         NaN
                     NaN
                                            NaN
                                                       NaN
                                                               2.622119e+06
mean
                     NaN
                                            NaN
                                                       NaN
                                                               9.118004e+06
std
```

min	NaN	NaN	NaN	1.000000e+00
25%	NaN	NaN	NaN	1.381700e+04
50%	NaN	NaN	NaN	2.533220e+05
75%	NaN	NaN	NaN	1.424034e+06
max	NaN	NaN	NaN	5.558942e+08
count unique top freq mean std min 25% 50% 75% max	fuel_mmbtu_per_unit fuel_co 29523.000000 NaN NaN NaN 8.492111 10.600220 0.000001 1.024000 5.762694 17.006000 341.260000	208 2854 -276 5 26 47	_burned \ .000000 NaN NaN NaN NaN .649031 .490090 .080000 .207000 .113000 .000000	
count unique top freq mean std min 25% 50% 75% max	fuel_cost_per_unit_delivered 2.952300e+04 NaM NaM 9.175704e+02 6.877593e+04 -8.749370e+02 3.778500e+02 1.737100e+02 4.213700e+02 7.964521e+06	4 29 N N N 2 2 4 2 2 9 1	_per_mmbtu 523.000000	
record_ utility report_ plant_n fuel_ty fuel_un fuel_dty fuel_mm fuel_co	_id_ferc1 0 year 0 ame_ferc1 0 pe_code_pudl 0			

```
fuel cost per mmbtu
                                  0
dtype: int64
#use groupby to count the sum of each unique value in the fuel unit
column
fuel data.groupby( 'fuel unit' )[ 'fuel unit' ].count()
fuel data[[ 'fuel unit' ]] = fuel data[[ 'fuel unit' ]].fillna(value=
fuel data.isnull().sum()
record id
                                 0
                                 0
utility id ferc1
report year
                                 0
                                 0
plant name ferc1
fuel type code pudl
                                 0
fuel unit
                                 0
                                 0
fuel atv burned
fuel mmbtu per unit
                                 0
fuel cost per unit burned
                                 0
fuel cost per unit delivered
                                 0
fuel cost per mmbtu
                                 0
dtype: int64
fuel_data.groupby( 'report_year' )[ 'report_year' ].count()
#group by the fuel type code year and print the first entries in all
the groups formed
fuel data.groupby( 'fuel type code pudl' ).first()
                                   record id utility id ferc1
report year \
fuel type code pudl
                                                             1
coal
                      f1 fuel 1994 12 1 0 7
1994
                                                             2
                     f1 fuel 1994 12 2 0 10
gas
1994
                                                             2
nuclear
                      f1 fuel 1994 12 2 1 1
1994
oil
                      f1_fuel_1994_12_6_0_2
                                                             6
1994
                     f1 fuel 1994 12 11 0 6
                                                            11
other
1994
                      f1 fuel 1994 12 9 0 3
                                                             9
waste
1994
                     plant name ferc1 fuel unit fuel gty burned \
fuel type code pudl
coal
                              rockport
                                             ton
                                                        5377489.0
                            chickasaw
                                             mcf
                                                          40533.0
gas
nuclear
                     joseph m. farley
                                             kgU
                                                           2260.0
```

```
oil
                          clinch river
                                              bbl
                                                             6510.0
                                              bbl
other
                            w.f. wyman
                                                            55652.0
waste
                          b.l. england
                                              ton
                                                             2438.0
                      fuel mmbtu per unit fuel cost per unit burned \
fuel type code pudl
coal
                                 16.590000
                                                                 18.590
                                                                  2,770
gas
                                  1.000000
nuclear
                                  0.064094
                                                                 28.770
                                                                 32,130
oil
                                  5.875338
other
                                  0.149719
                                                                 14.685
waste
                                  0.015939
                                                                 34.180
                      fuel cost per unit delivered fuel cost per mmbtu
fuel_type_code_pudl
coal
                                             18.530
                                                                     1.121
                                              2.770
                                                                     2.570
gas
nuclear
                                              0.000
                                                                     0.450
                                             23.444
oil
                                                                     5.469
other
                                             15.090
                                                                     2.335
waste
                                             34.180
                                                                     1.072
fuel df1 = fuel data.iloc[ 0 : 19000 ].reset index(drop= True )
fuel df1
                                   utility id ferc1
                       record id
                                                      report year
          f1 fuel 1994 12 1 0 7
0
                                                             1994
         f1 fuel 1994 12 1 0 10
1
                                                   1
                                                             1994
2
          f1 fuel 1994 12 2 0 1
                                                   2
                                                             1994
          f1 fuel 1994 12 2 0 7
                                                   2
3
                                                             1994
4
         f1 fuel 1994 12 2 0 10
                                                   2
                                                             1994
. . .
                                                 . . .
                                                               . . .
        f1 fuel 2009 12 182 1 9
18995
                                                 182
                                                             2009
       f1 fuel 2009 12 182 1 10
18996
                                                 182
                                                             2009
18997
       f1 fuel 2009 12 182 1 13
                                                 182
                                                             2009
18998
       f1 fuel 2009 12 182 1 14
                                                 182
                                                             2009
         f1 fuel_2009_12_79_0_1
                                                 79
18999
                                                             2009
           plant name ferc1 fuel type code pudl fuel unit
fuel qty burned \
                    rockport
                                             coal
                                                         ton
5377489.0
```

```
rockport total plant
                                              coal
                                                          ton
10486945.0
                      gorgas
                                              coal
                                                          ton
2978683.0
                       barry
                                              coal
                                                          ton
3739484.0
                   chickasaw
                                                          mcf
                                               gas
40533.0
. . .
                                                . . .
                                                           . . .
. . .
18995
                   lake road
                                                          mcf
                                               gas
340857.0
                   lake road
                                               oil
18996
                                                          mcf
771.0
18997
                 iatan (18%)
                                              coal
                                                          ton
414142.0
18998
                 iatan (18%)
                                               oil
                                                          bbl
5761.0
18999
                                              coal
                                                          ton
                    montrose
2050919.0
       fuel_mmbtu_per_unit
                              fuel_cost_per_unit_burned
0
                  16.590000
                                                   18.590
1
                  16.592000
                                                   18.580
2
                  24.130000
                                                   39.720
3
                  23.950000
                                                   47.210
4
                   1.000000
                                                    2.770
                                                    4.711
                   1.000000
18995
18996
                                                   84.899
                   5.801544
18997
                  16.718000
                                                   18.509
18998
                   5.537910
                                                   83.636
18999
                  17.160000
                                                   29.629
       fuel cost per unit delivered fuel cost per mmbtu
0
                               18.530
                                                       1.121
1
                               18.530
                                                       1.120
2
                               38.120
                                                       1.650
3
                               45.990
                                                       1.970
4
                                2.770
                                                       2.570
                                4.711
18995
                                                       4.711
                               84.899
18996
                                                      14.634
                               17.570
                                                       1.107
18997
                               72.280
                                                      15.102
18998
18999
                               28.330
                                                       1.727
[19000 rows x 11 columns]
fuel df2 = fuel data.iloc[ 19000 :].reset index(drop= True )
```

```
record id utility id ferc1 report year
        f1 fuel 2009 12 79 0 2
0
                                                            2009
        f1 fuel 2009 12 79 0 4
                                                 79
1
                                                            2009
2
        f1 fuel 2009 12 79 0 5
                                                 79
                                                            2009
3
        f1_fuel_2009_12_79_0_7
                                                 79
                                                            2009
       f1 fuel 2009 12 79 0 10
4
                                                 79
                                                            2009
10518
       f1 fuel 2018 12 12 0 13
                                                 12
                                                            2018
       f1 fuel 2018 12 12 1 1
                                                 12
10519
                                                            2018
       f1_fuel_2018_12_12_1_10
10520
                                                 12
                                                            2018
10521
       f1 fuel 2018 12 12 1 13
                                                 12
                                                            2018
10522
       f1_fuel_2018_12_12_1_14
                                                 12
                                                            2018
           plant_name_ferc1 fuel_type_code_pudl fuel_unit
fuel qty burned \
                    montrose
                                              oil
                                                         bbl
22912.0
                  hawthorn 5
                                             coal
1
                                                         ton
2408123.0
                  hawthorn 5
                                                         mcf
                                              gas
82141.0
             hawthorn 6 & 9
3
                                                         mcf
                                              gas
1701680.0
             hawthorn 7 & 8
4
                                              gas
                                                         mcf
82601.0
. . .
                                                         . . .
         neil simpson ct #1
10518
                                                         mcf
                                              gas
18799.0
10519 cheyenne prairie 58%
                                                         mcf
                                              gas
806730.0
10520
          lange ct facility
                                              gas
                                                         mcf
104554.0
10521
            wygen 3 bhp 52%
                                             coal
                                                         ton
315945.0
10522
            wygen 3 bhp 52%
                                                         mcf
                                              gas
17853.0
       fuel mmbtu per unit
                             fuel cost per unit burned
0
                   5.770422
                                                  65.443
1
                  16.782000
                                                  18.598
2
                                                   6.238
                   1.000000
3
                   1.000000
                                                   4.885
4
                   1.000000
                                                   5.383
                   1.059000
                                                   4.780
10518
10519
                   1.050000
                                                   3.650
10520
                   1.060000
                                                   4.770
```

```
16.108000
                                                   3.060
10521
                   1.059000
                                                   0.000
10522
                                      fuel_cost per mmbtu
       fuel cost per unit delivered
0
                               67.540
                                                     11.341
1
                               18.310
                                                      1.108
2
                                6.238
                                                      6.238
3
                                4.885
                                                      4.885
4
                                                      5.383
                                5.383
. . .
                                  . . .
                                                         . . .
                                4.780
10518
                                                      9.030
10519
                                3.650
                                                      6.950
10520
                                4.770
                                                      8.990
10521
                               14.760
                                                      1.110
10522
                                0.000
                                                     11.680
[10523 rows x 11 columns]
fuel data.iloc[ 19000 :]
                                  utility id ferc1
                                                     report year
                      record id
        f1 fuel 2009 12 79 0 2
19000
                                                 79
                                                             2009
19001
        f1 fuel 2009_12_79_0_4
                                                 79
                                                             2009
        f1 fuel 2009 12 79 0 5
                                                 79
19002
                                                             2009
        f1 fuel 2009 12 79 0 7
19003
                                                 79
                                                             2009
       f1 fuel 2009 12 79 0 10
19004
                                                 79
                                                             2009
                                                . . .
       f1 fuel 2018 12 12 0 13
29518
                                                 12
                                                             2018
       f1 fuel 2018 12 12 1 1
29519
                                                 12
                                                             2018
29520
       f1 fuel 2018 12 12 1 10
                                                 12
                                                             2018
       f1_fuel_2018_12_12_1_13
29521
                                                 12
                                                             2018
29522
       f1 fuel 2018 12 12 1 14
                                                 12
                                                             2018
           plant_name_ferc1 fuel_type_code_pudl fuel_unit
fuel_qty_burned \_\
19000
                    montrose
                                               oil
                                                         bbl
22912.0
19001
                  hawthorn 5
                                              coal
                                                         ton
2408123.0
                  hawthorn 5
19002
                                               gas
                                                         mcf
82141.0
             hawthorn 6 & 9
19003
                                                         mcf
                                               gas
1701680.0
19004
             hawthorn 7 & 8
                                                         mcf
                                               gas
82601.0
. . .
. . .
29518
         neil simpson ct #1
                                                         mcf
                                               gas
18799.0
29519 cheyenne prairie 58%
                                               gas
                                                         mcf
```

```
806730.0
           lange ct facility
29520
                                                             mcf
                                                  gas
104554.0
29521
             wygen 3 bhp 52%
                                                coal
                                                             ton
315945.0
29522
             wygen 3 bhp 52%
                                                  gas
                                                             mcf
17853.0
        fuel mmbtu per unit
                                fuel cost per unit burned
                    5.7\overline{70422}
19000
                                                     65.443
19001
                                                     18.598
                   16.782000
19002
                    1.000000
                                                      6.238
19003
                    1.000000
                                                      4.885
19004
                    1.000000
                                                      5.383
. . .
                                                         . . .
                                                      4.780
                    1.059000
29518
                                                      3.650
29519
                    1.050000
29520
                                                      4.770
                    1.060000
29521
                   16.108000
                                                      3.060
29522
                    1.059000
                                                      0.000
        fuel cost per unit delivered
                                          fuel cost per mmbtu
19000
                                 67.540
                                                         11.341
                                 18.310
19001
                                                          1.108
19002
                                  6.238
                                                          6.238
19003
                                  4.885
                                                          4.885
                                  5.383
                                                          5.383
19004
. . .
                                                            . . .
                                    . . .
29518
                                  4.780
                                                          9.030
29519
                                  3.650
                                                          6.950
29520
                                  4.770
                                                          8.990
29521
                                 14.760
                                                          1.110
29522
                                  0.000
                                                         11.680
[10523 rows x 11 columns]
fuel data.iloc[ 0 : 19000 ]
                         record id
                                     utility id fercl
                                                          report year
           f1 fuel 1994 12 1 0 7
0
                                                      1
                                                                  1994
          f1 \overline{1} fuel \overline{1} 994 \overline{1}2 1 0 10
1
                                                      1
                                                                  1994
           f1_fuel_1994_12_2_0_1
2
                                                      2
                                                                  1994
           f1 fuel 1994 12 2 0 7
                                                      2
3
                                                                  1994
4
          f1 fuel 1994 12 2 0 10
                                                      2
                                                                  1994
18995
         f1 fuel 2009 12 182 1 9
                                                    182
                                                                  2009
       f1 fuel 2009 12 182 1 10
                                                    182
18996
                                                                  2009
        f1 fuel 2009 12 182 1 13
18997
                                                    182
                                                                  2009
        f1_fuel_2009_12_182_1_14
18998
                                                    182
                                                                  2009
18999
          f1 fuel 2009 12 79 0 1
                                                     79
                                                                  2009
```

```
plant_name_ferc1 fuel_type_code_pudl fuel_unit
fuel_qty_burned
                                               coal
                     rockport
                                                           ton
5377489.0
       rockport total plant
1
                                               coal
                                                           ton
10486945.0
                       gorgas
                                               coal
                                                           ton
2978683.0
                        barry
                                               coal
                                                           ton
3739484.0
                   chickasaw
                                                           mcf
                                                gas
40533.0
. . .
                                                            . . .
. . .
18995
                   lake road
                                                           mcf
                                                gas
340857.0
18996
                   lake road
                                                oil
                                                           mcf
771.0
18997
                 iatan (18%)
                                               coal
                                                           ton
414142.0
18998
                 iatan (18%)
                                                oil
                                                           bbl
5761.0
18999
                                                           ton
                    montrose
                                               coal
2050919.0
       fuel mmbtu per unit
                               fuel cost per unit burned
0
                  16.590000
                                                    18.590
1
                  16.592000
                                                    18.580
2
                  24.130000
                                                    39.720
3
                  23.950000
                                                    47.210
4
                   1.000000
                                                     2.770
. . .
                                                       . . .
                    1.000000
                                                     4.711
18995
                                                    84.899
18996
                   5.801544
18997
                  16.718000
                                                    18.509
18998
                   5.537910
                                                    83.636
                  17.160000
18999
                                                    29.629
       fuel_cost_per_unit_delivered
                                        fuel cost per mmbtu
0
                                18.530
                                                        1.121
                                18.530
1
                                                        1.120
2
                                38.120
                                                        1.650
3
                                45.990
                                                        1.970
4
                                 2.770
                                                        2.570
                                 4.711
                                                        4.711
18995
18996
                                84.899
                                                       14.634
                                17.570
18997
                                                        1.107
18998
                                72.280
                                                       15.102
```

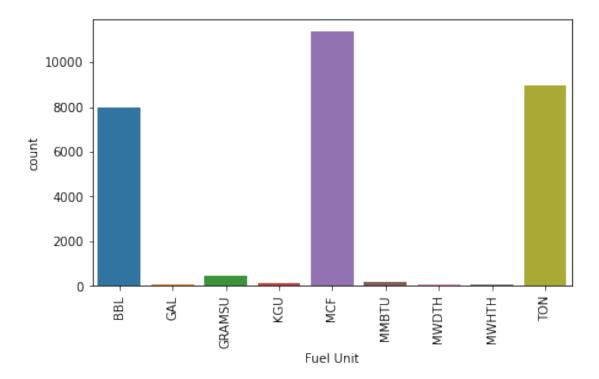
```
18999 28.330 1.727
```

```
[19000 \text{ rows } \times 11 \text{ columns}]
assert len(fuel data) == (len(fuel df1) + len(fuel df2))
#an inner merge will lose rows that do not match in both dataframes
pd.merge(fuel df1, fuel df2, how= "inner" )
Empty DataFrame
Columns: [record id, utility id ferc1, report year, plant name ferc1,
fuel type code pudl, fuel unit, fuel qty burned, fuel mmbtu per unit,
fuel cost per unit burned, fuel cost per unit delivered,
fuel cost per mmbtu]
Index: []
#outer merge returns all rows in both dataframes
pd.merge(fuel df1, fuel df2, how= "outer" )
                       record id utility id ferc1
                                                        report year \
          f1 fuel 1994 12 1 \overline{0} 7
0
                                                    1
                                                                1994
1
         f1 fuel 1994 12 1 0 10
                                                    1
                                                               1994
2
         fl fuel 1994 12 2 0 1
                                                    2
                                                               1994
          f1 fuel 1994 12 2 0 7
3
                                                    2
                                                               1994
         f1_fuel_1994 12 2 0 10
4
                                                    2
                                                               1994
                                                  . . .
       f1 fuel 2018 12 12 0 13
29518
                                                   12
                                                               2018
        f1_fuel_2018_12_12_1_1
29519
                                                   12
                                                               2018
       f1 fuel \overline{2}018 \overline{1}2 \overline{1}2 \overline{1} \overline{1}0
29520
                                                   12
                                                               2018
       f1 fuel_2018_12_12_1_13
29521
                                                   12
                                                               2018
29522
      f1 fuel 2018 12 12 1 14
                                                   12
                                                               2018
            plant name ferc1 fuel type code pudl fuel unit
fuel_qty_burned \
                     rockport
                                                coal
                                                            ton
5377489.0
       rockport total plant
                                                coal
                                                            ton
10486945.0
                       gorgas
                                                coal
                                                            ton
2978683.0
                        barry
                                                coal
                                                            ton
3739484.0
                    chickasaw
                                                            mcf
                                                 gas
40533.0
. . .
                           . . .
                                                 . . .
                                                            . . .
. . .
29518
          neil simpson ct #1
                                                            mcf
                                                 gas
18799.0
29519
       cheyenne prairie 58%
                                                            mcf
                                                 gas
806730.0
           lange ct facility
29520
                                                            mcf
                                                 gas
```

```
104554.0
             wygen 3 bhp 52%
29521
                                                  coal
                                                               ton
315945.0
29522
             wygen 3 bhp 52%
                                                               mcf
                                                   gas
17853.0
        fuel mmbtu per unit
                                fuel cost per unit burned
                       16.590
                                                        18.59
0
1
                                                        18.58
                       16.592
2
                                                        39.72
                       24.130
3
                                                        47.21
                       23.950
4
                        1.000
                                                         2.77
                                                         4.78
29518
                        1.059
29519
                        1.050
                                                         3.65
                                                         4.77
29520
                        1.060
                                                         3.06
29521
                       16.108
29522
                        1.059
                                                         0.00
        fuel cost per unit delivered
                                          fuel cost per mmbtu
0
                                   18.53
                                                           1.121
1
                                   18.53
                                                           1.120
2
                                   38.12
                                                           1.650
3
                                   45.99
                                                           1.970
4
                                    2.77
                                                           2.570
. . .
                                     . . .
                                                              . . .
                                    4.78
                                                           9.030
29518
29519
                                    3.65
                                                           6.950
29520
                                    4.77
                                                           8.990
29521
                                   14.76
                                                           1.110
29522
                                    0.00
                                                          11.680
[29523 rows x 11 columns]
#removes rows from the right dataframe that do not have a match with
the left
#and keeps all rows from the left
pd.merge(fuel df1, fuel df2, how= "left" )
                                      utility id ferc1
                         record id
                                                           report year
           f1 fuel 1994 12 1 \overline{0} 7
0
                                                        1
                                                                    1994
          f1_{\overline{1}} fuel \overline{1} 994 \overline{1} 2 \overline{1} \overline{0} \overline{1} 0
                                                        1
1
                                                                    1994
           fl fuel 1994 12 2 0 1
                                                        2
2
                                                                    1994
3
           f1 fuel 1994 12 2 0 7
                                                        2
                                                                    1994
          f1_fuel_1994_12 2 0 10
                                                        2
4
                                                                    1994
                                                      . . .
                                                                     . . .
         f1 fuel 2009 12 182 1 9
                                                                   2009
18995
                                                     182
        f1 fuel 2009 12 182 1 10
18996
                                                     182
                                                                   2009
        f1 fuel 2009 12 182 1 13
18997
                                                     182
                                                                    2009
18998
        f1 fuel 2009 12 182 1 14
                                                     182
                                                                   2009
```

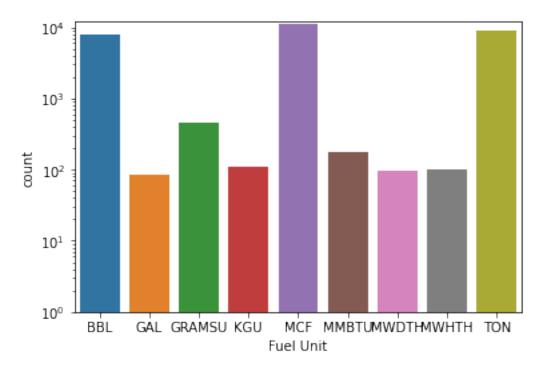
Conf. who has		fuel_type_code_pudl	fuel_unit	
fuel_qty_bu	rockport	coal	ton	
	kport total plant	coal	ton	
10486945.0	gorgas	coal	ton	
2978683.0 3	barry	coal	ton	
3739484.0 4 40533.0	chickasaw	gas	mcf	
 18995 340857.0	lake road	gas mcf		
18996 771.0	lake road	oil mcf		
18997 414142.0	iatan (18%)	coal ton		
18998	iatan (18%)	oil bh		
5761.0 18999 2050919.0	montrose	coal	ton	
fue ¹ 0 1 2 3 4	l_mmbtu_per_unit 16.590000 16.592000 24.130000 23.950000 1.000000		ourned \ 18.590 18.580 39.720 17.210 2.770	
18995 18996 18997 18998 18999	1.000000 5.801544 16.718000 5.537910 17.160000] 8	4.711 34.899 18.509 33.636	
fue ¹ 0 1 2 3 4	l_cost_per_unit_de	18.530 18.530 38.120 45.990 2.770	1.121 1.120 1.650 1.970 2.570	
18995 18996 18997		4.711 84.899 17.570	4.711 14.634 1.107	

```
18998
                            72.280
                                                15.102
18999
                            28.330
                                                 1.727
[19000 \text{ rows } \times 11 \text{ columns}]
pd.concat([fuel data, data to concat]).reset index(drop= True )
-----
                                        Traceback (most recent call
NameError
last)
<ipython-input-37-48aad84ddbc5> in <module>
----> 1 pd.concat([fuel data, data to concat]).reset index(drop=
True )
NameError: name 'data_to_concat' is not defined
#check for duplicate rows
fuel data.duplicated().any()
False
# Import plotting library
import matplotlib.pyplot as plt
import seaborn as sns
plt.figure(figsize=(7,4))
plt.xticks(rotation=90)
fuel unit = pd.DataFrame({'unit':['BBL', 'GAL', 'GRAMSU', 'KGU',
'MCF', 'MMBTU',
'MWDTH', 'MWHTH', 'TON'],
'count':[7998, 84, 464, 110, 11354, 180, 95, 100, 8958]})
sns.barplot(data=fuel unit, x='unit', y='count')
plt.xlabel('Fuel Unit')
Text(0.5, 0, 'Fuel Unit')
```



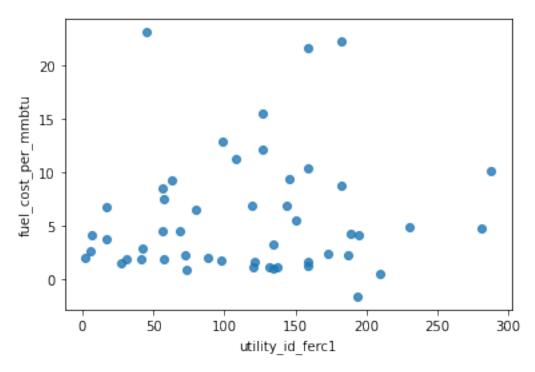
```
g = sns.barplot(data=fuel_unit, x='unit', y='count')
g.set_yscale("log")
g.set_ylim(1, 12000)
plt.xlabel('Fuel Unit')
```

Text(0.5, 0, 'Fuel Unit')



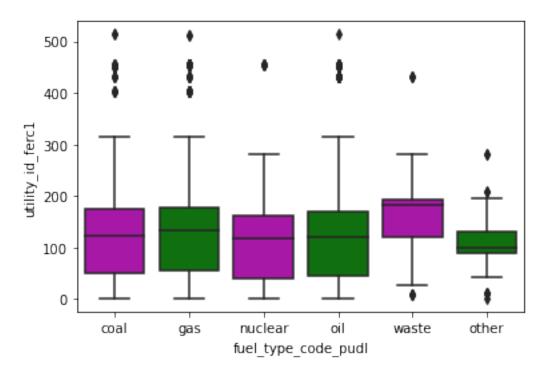
```
# Select a sample of the dataset
sample_df = fuel_data.sample(n=50, random_state=4)
sns.regplot(x=sample_df["utility_id_ferc1"],
y=sample_df["fuel_cost_per_mmbtu"],
fit reg=False)
```

<AxesSubplot:xlabel='utility_id_ferc1', ylabel='fuel_cost_per_mmbtu'>



```
sns.boxplot(x="fuel_type_code_pudl", y="utility_id_ferc1",
palette=["m", "g"], data=fuel_data)
```

<AxesSubplot:xlabel='fuel_type_code_pudl', ylabel='utility_id_ferc1'>



sns.kdeplot(sample_df['fuel_cost_per_unit_burned'], shade=True,
color="b")

<AxesSubplot:xlabel='fuel_cost_per_unit_burned', ylabel='Density'>

