POLCUS – private outdoor light customers (number)

POLKWH – private outdoor light sales (kWh)

POLPRI – private outdoor light, average revenue per kWh ($/kWh)

RESCUS – residential customers (number)

RESKWH – residential sales (kWh)

RESPRI – residential price, average revenue per kWh ($/kWh)

SGDCUS – small general demand customers (number)

SGDKWH – small general demand sales (kWh)

SGDPRI – small general demand price, average revenue per kWh ($/kWh)

SGNDCUS – small general non-demand customers (number)

SGNDKWH – small general non-demand sales (kWh)

SGNDPRI – small general non-demand price, average revenue per kWh ($/kWh)

Economic Variables

CPI – the consumer price index for Guam (1992 = 100)

EMP – total civilian non-agricultural employment on Guam (number)

GDPEMP – Real GDP per Employee (number)

Weather Variables

BILLCDD65 – billing month cooling degree days calculated at the International Airport based on a comfort threshold of 65 degrees F (degree-days)

BILLCDD68 – billing month cooling degree days calculated at the International Airport based on a comfort threshold of 68 degrees F (degree-days)

BILLCDD80 – billing month cooling degree days calculated at the International Airport based on a comfort threshold of 80 degrees F (degree-days)

CDD65 – calendar month cooling degree-days calculated at the International Airport based on a comfort threshold of 65 degrees F (degree-days)

CDD80 – calendar month cooling degree-days calculated at the International Airport based on a comfort threshold of 80 degrees F (degree-days)

Categorical Variables

CHATAAN1 – the calendar month in which typhoon Chataan occurred (binary)

CHATAAN2 – the calendar month following the month in which typhoon Chataan occurred (binary)

CHATAAN3 – the second calendar month following the month in which typhoon Chataan occurred (binary)

EARTHQUAKE2 – the month in which an earthquake occurred (binary)

EARTHQUAKE3 – the month in which an earthquake occurred (binary)

PAKA1 – the calendar month in which typhoon Paka occurred (binary)

PAKA2 – the calendar month following the month in which typhoon Paka occurred (binary)

PAKA3 – the second calendar month following the month in which typhoon Paka occurred (binary)

PONGSONA1 – the calendar month in which typhoon Pongsona occurred (binary)

PONGSONA2 – the calendar month following the month in which typhoon Pongsona occurred (binary)

PONGSONA3 – the calendar month following the month in which typhoon Pongsona occurred (binary)

TingTing1 – the calendar month following the month in which typhoon TingTing occurred (binary)

STR06 – unnamed storm in 2006 (binary)

APR98 – the calendar month April 1998 (binary)

APR04 – the calendar month April 2004 (binary)

AUG03 – the calendar month August 2003 (binary)

DEC01 – the calendar month December 2001 (binary)

FEB01 – the calendar month February 2001 (binary)

FEB02 – the calendar month February 2002 (binary)

FEB03 – the calendar month February 2003 (binary)

FEB06 – the calendar month February 2006 (binary)

JAN01 – the calendar month January 2001 (binary)

JAN04 – the calendar month January 2004 (binary)

JAN06 – the calendar month January 2006 (binary)

JUL98 – the calendar month July 1998 (binary)

JUL06 – the calendar month July 2006 (binary)

JUN97 – the calendar month June 1997 (binary)

JUN98 – the calendar month June 1998 (binary)

JUN03 – the calendar month June 2003 (binary)

JUN05 – the calendar month June 2005 (binary)

MAR98 – the calendar month March 1998 (binary)

MAR09 – the calendar month March 2009 (binary)
MAY00 – the calendar month May 2000 (binary)
MAY02 – the calendar month May 2002 (binary)
MAY04 – the calendar month May 2004 (binary)
NOV98 – the calendar month November 1998 (binary)
NOV99 – the calendar month November 1999 (binary)
OCT99 – the calendar month October 1999 (binary)
OCT00 – the calendar month October 2000 (binary)
OCT03 – the calendar month October 2003 (binary)
OCT06 – the calendar month October 2006 (binary)
SEP97 – the calendar month September 1997 (binary)
SEP98 – the calendar month September 1998 (binary)
SEP99 – the calendar month September 1999 (binary)
SEP00 – the calendar month September 2000 (binary)
SEP01 – the calendar month September 2001 (binary)
SEP05 – the calendar month September 2005 (binary)

JAN – the calendar month January (binary)
FEB – the calendar month February (binary)
MAR – the calendar month March (binary)
MAY – the calendar month May (binary)
JUN – the calendar month June (binary)
AUG – the calendar month August (binary)
OCT – the calendar month October (binary)

Appendix C: Current Estimated Equations In the GPA Sales and Load Forecasting Model

This appendix contains the most recent documented version of the GPA econometric sales and load model. As discussed above, the regression solutions were estimated in the EViews econometric modeling language.

Residential Customers

```
================================================================
Dependent Variable: RESCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1994M12 2012M04
Included observations: 209 after adjustments
Convergence achieved after 20 iterations
================================================================
        Variable          CoefficienStd. Errort-Statistic  Prob.
================================================================
           C              -4961.683   12973.78  -0.382439   0.7025
    @MOVAV(EMP(-14),1)     335.3377   154.3126   2.173106   0.0309
@MOVAV(GDP(-1)/EMP(-1),3)  385239.1   102403.9   3.761956   0.0002
          PAKA1           -20525.29   849.8321  -24.15217   0.0000
          PAKA2           -46149.00   848.0129  -54.42017   0.0000
          OCT99            11596.49   721.3398   16.07632   0.0000
          MAR98           -9326.551   865.0377  -10.78167   0.0000
          APR98           -4710.980   861.9655  -5.465393   0.0000
          AR(1)            0.875075   0.038433   22.76880   0.0000
================================================================
R-squared                  0.933607    Mean dependent var 37746.31
Adjusted R-squared         0.930951    S.D. dependent var 3644.639
S.E. of regression         957.7061    Akaike info criteri16.60907
Sum squared resid          1.83E+08    Schwarz criterion  16.75299
Log likelihood            -1726.647    F-statistic        351.5459
Durbin-Watson stat         1.509638    Prob(F-statistic)  0.000000
================================================================
Inverted AR Roots               .88
================================================================
```

Small General Non-Demand Customers

```
============================================================
Dependent Variable: SGNDCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1992M11 2012M04
Included observations: 234 after adjustments
Convergence achieved after 8 iterations
============================================================
     Variable      CoefficienStd. Errort-Statistic  Prob.
============================================================
        C          3433.484   142.4763   24.09863   0.0000
      PAKA1       -2017.166   100.6214  -20.04708   0.0000
      PAKA2       -4732.990   101.2336  -46.75314   0.0000
      OCT99        1172.582   99.97175   11.72914   0.0000
      SEP99       -183.0890   99.97175  -1.831407   0.0684
       FEB         31.05801   19.53370   1.589970   0.1132
      AR(1)        0.945249   0.021839   43.28239   0.0000
============================================================
R-squared           0.924234    Mean dependent var 3426.276
Adjusted R-squared  0.922231    S.D. dependent var 427.4273
S.E. of regression  119.1968    Akaike info criteri12.42889
Sum squared resid   3225190.    Schwarz criterion   12.53225
Log likelihood     -1447.180    F-statistic        461.5105
Durbin-Watson stat  2.115962    Prob(F-statistic)  0.000000
============================================================
Inverted AR Roots        .95
============================================================
```

Small General Demand Customers

```
================================================================
Dependent Variable: SGDCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1994M04 2012M04
Included observations: 217 after adjustments
Convergence achieved after 7 iterations
================================================================
```

Variable	CoefficienStd. Error	t-Statistic		Prob.
C	1125.020	765.1842	1.470260	0.1431
@MOVAV(EMP(-6),1)	7.094219	4.528391	1.566609	0.1189
@MOVAV(GDP(-5)/EMP(-5),1)	4566.694	4260.067	1.071977	0.2851
PAKA1	-466.7672	15.82364	-29.49809	0.0000
PAKA2	-1137.532	18.33654	-62.03637	0.0000
CHATAAN1	-323.7750	12.97671	-24.95047	0.0000
CHATAAN3	-345.2912	12.82190	-26.92980	0.0000
PONGSONA2	-151.8059	14.90114	-10.18754	0.0000
PONGSONA3	-147.6333	15.19573	-9.715450	0.0000
OCT99	281.7451	14.80491	19.03052	0.0000
SEP99	-167.4772	14.80538	-11.31191	0.0000
AUG03	134.9842	14.91115	9.052569	0.0000
JUL98	51.74032	12.97628	3.987300	0.0001
SEP03	133.5365	15.20711	8.781188	0.0000
OCT00	58.49577	12.82114	4.562448	0.0000
FEB98	451.6838	16.10573	28.04492	0.0000
DEC99	-41.69597	12.82326	-3.251590	0.0014
APR97	37.79825	13.18337	2.867116	0.0046
FEB04	-35.90789	13.24513	-2.711026	0.0073
NOV05	71.15456	12.82216	5.549343	0.0000
FEB	-4.960683	4.162462	-1.191767	0.2348
MAR	-8.856564	5.033966	-1.759361	0.0801
APR	-10.36143	5.346196	-1.938094	0.0541
MAY	-9.249359	5.007410	-1.847134	0.0663
JUN	-9.541690	4.002806	-2.383750	0.0181

```
         AR(1)           0.994205   0.005765   172.4479   0.0000
=================================================================
R-squared                0.995264    Mean dependent var 1302.214
Adjusted R-squared       0.994644    S.D. dependent var 247.0312
S.E. of regression       18.07932    Akaike info criteri8.739421
Sum squared resid        62430.58    Schwarz criterion  9.144386
Log likelihood          -922.2272    F-statistic        1605.430
Durbin-Watson stat       2.177979    Prob(F-statistic)  0.000000
=================================================================
Inverted AR Roots             .99
=================================================================
```

Large General Customers

```
============================================================
Dependent Variable: LGCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1994M02 2012M04
Included observations: 219 after adjustments
Convergence achieved after 9 iterations
============================================================
      Variable       CoefficienStd. Errort-Statistic  Prob.
============================================================
          C          -150.8754  144.3597  -1.045135  0.2972
  @MOVAV(GDP/EMP,2)   2154.754  1505.028   1.431704  0.1538
  @MOVAV(EMP(-1),4)   3.021971  1.956393   1.544665  0.1240
        PAKA1        -109.4173  5.665872  -19.31164  0.0000
        PAKA2        -111.2932  6.548273  -16.99581  0.0000
        PAKA3         108.0187  5.660590   19.08259  0.0000
        FEB02         481.6742  4.614645   104.3795  0.0000
        FEB03         90.76038  4.618536   19.65133  0.0000
        MAY04         59.52509  4.613493   12.90239  0.0000
        AUG03         23.07594  4.621903   4.992736  0.0000
        OCT03        -41.39989  4.620517  -8.960011  0.0000
        OCT00         62.83714  4.616245   13.61217  0.0000
        JAN04         43.05358  4.613861   9.331358  0.0000
        AR(1)         0.975256  0.015693   62.14434  0.0000
============================================================
R-squared             0.982623    Mean dependent var 145.8511
Adjusted R-squared    0.981521    S.D. dependent var 47.40539
S.E. of regression    6.444143    Akaike info criteri6.626013
Sum squared resid     8513.032    Schwarz criterion   6.842666
Log likelihood       -711.5484    F-statistic         891.7132
Durbin-Watson stat    2.069609    Prob(F-statistic)   0.000000
============================================================
Inverted AR Roots          .98
============================================================
```

Private Outdoor Lighting Customers

```
================================================================
Dependent Variable: POLCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1993M11 2012M04
Included observations: 222 after adjustments
Convergence achieved after 6 iterations
================================================================
         Variable        CoefficienStd. Errort-Statistic  Prob.
================================================================
            C             349.0997   214.3999   1.628264   0.1050
@MOVAV(GDP(-1)/EMP(-1),1) -247.6135   1938.541  -0.127732   0.8985
      @MOVAV(EMP,1)        4.180647   2.657744   1.573006   0.1172
          PAKA1           -232.0816   15.21044  -15.25804   0.0000
          PAKA2           -623.2472   17.53046  -35.55225   0.0000
          PAKA3            197.3810   15.19555   12.98939   0.0000
         CHATAAN1          88.89774   12.44231   7.144796   0.0000
         CHATAAN3          90.21548   12.45701   7.242145   0.0000
          SEP99           -241.1350   12.44538  -19.37547   0.0000
          NOV99           -187.7242   12.44237  -15.08749   0.0000
           MAY             5.750214   2.933300   1.960322   0.0513
          AR(1)            0.902950   0.030180   29.91854   0.0000
================================================================
R-squared                  0.936269    Mean dependent var 586.9667
Adjusted R-squared         0.932931    S.D. dependent var 64.72760
S.E. of regression         16.76298    Akaike info criteri8.528761
Sum squared resid          59009.47    Schwarz criterion  8.712690
Log likelihood            -934.6925    F-statistic        280.4638
Durbin-Watson stat         2.718514    Prob(F-statistic)  0.000000
================================================================
Inverted AR Roots               .90
================================================================
```

Small General Non Demand Customers

```
============================================================
Dependent Variable: GSSNDCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1994M03 2012M04
Included observations: 218 after adjustments
Convergence achieved after 18 iterations
============================================================
     Variable      CoefficienStd. Errort-Statistic  Prob.
============================================================
        C           606.9433   332.6218   1.824725   0.0695
 @MOVAV(EMP(-3),3)  0.894083   5.315550   0.168201   0.8666
       PAKA1       -821.1754   16.38644  -50.11311   0.0000
       PAKA2       -823.4013   18.92076  -43.51841   0.0000
       PAKA3        319.3235   16.38642   19.48708   0.0000
    EARTHQUAKE3    -343.0384   13.38558  -25.62747   0.0000
       FEB01        786.0534   13.38131   58.74265   0.0000
       OCT99        656.0315   13.38039   49.02932   0.0000
       SEP00       -722.9443   13.38410  -54.01517   0.0000
       MAY02        38.77886   16.42560   2.360880   0.0192
       MAR02       -92.21539   16.42554  -5.614146   0.0000
       APR02       -133.6244   18.98099  -7.039903   0.0000
       AR(1)        0.979994   0.015515   63.16370   0.0000
============================================================
R-squared           0.983816    Mean dependent var 683.8087
Adjusted R-squared  0.982869    S.D. dependent var 143.1297
S.E. of regression  18.73379    Akaike info criteri8.756316
Sum squared resid   71945.79    Schwarz criterion  8.958144
Log likelihood     -941.4385    F-statistic        1038.486
Durbin-Watson stat  2.330298    Prob(F-statistic)  0.000000
============================================================
Inverted AR Roots        .98
============================================================
```

Small General Demand Customers

```
============================================================
Dependent Variable: GSSDCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1993M10 2012M04
Included observations: 223 after adjustments
Convergence achieved after 8 iterations
============================================================
      Variable       CoefficienStd. Errort-Statistic  Prob.
============================================================
          C           291.0289   155.5655   1.870780   0.0628
  @MOVAV(GDP/EMP,1)   2349.617   2536.266   0.926408   0.3553
        PAKA1        -410.9982   12.60602  -32.60332   0.0000
        PAKA2        -462.9525   12.66900  -36.54215   0.0000
        OCT99         325.0033   10.82633   30.01972   0.0000
        FEB01         424.0765   11.13407   38.08819   0.0000
        SEP00        -408.5055   10.83794  -37.69217   0.0000
        JUL06        -176.9655   10.82625  -16.34596   0.0000
        MAR98        -100.4829   12.67240  -7.929269   0.0000
        JUN05         74.11854   10.82680   6.845839   0.0000
        APR98        -62.72562   12.56904  -4.990485   0.0000
         FEB          6.947814   2.600402   2.671823   0.0081
        AR(1)         0.948908   0.020005   47.43354   0.0000
============================================================
R-squared             0.969714    Mean dependent var 415.8444
Adjusted R-squared    0.967983    S.D. dependent var 83.40843
S.E. of regression    14.92454    Akaike info criteri8.300419
Sum squared resid     46775.81    Schwarz criterion  8.499043
Log likelihood       -912.4967    F-statistic        560.3161
Durbin-Watson stat    2.235781    Prob(F-statistic)  0.000000
============================================================
Inverted AR Roots          .95
============================================================
```

Government Street Light Customers

```
==============================================================
Dependent Variable: GSLCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1994M02 2012M04
Included observations: 219 after adjustments
Convergence achieved after 12 iterations
==============================================================
      Variable       CoefficienStd. Errort-Statistic  Prob.
==============================================================
          C          -50.18628   65.60601  -0.764965   0.4452
  @MOVAV(EMP(-3),1)   1.332566   0.820191   1.624703   0.1057
  @MOVAV(GDP/EMP,5)   425.9871   689.3261   0.617976   0.5373
        PAKA1        -57.36586   2.930290  -19.57685   0.0000
        PAKA2        -58.61853   3.383047  -17.32714   0.0000
        PAKA3         45.17192   2.930032   15.41687   0.0000
        FEB01         57.45875   2.393750   24.00366   0.0000
        SEP00         42.11362   2.465545   17.08086   0.0000
        JUL98        -30.46302   2.393463  -12.72759   0.0000
         SEP          1.553519   0.581638   2.670940   0.0082
        AR(1)         0.959062   0.019701   48.68064   0.0000
==============================================================
R-squared             0.938501    Mean dependent var 53.84566
Adjusted R-squared    0.935545    S.D. dependent var 13.05746
S.E. of regression    3.315038    Akaike info criteri5.283738
Sum squared resid     2285.811    Schwarz criterion  5.453965
Log likelihood       -567.5693    F-statistic        317.4184
Durbin-Watson stat    2.499011    Prob(F-statistic)  0.000000
==============================================================
Inverted AR Roots          .96
==============================================================
```

Government Street Light Customers

```
============================================================
Dependent Variable: GSSLCUS
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1994M07 2012M04
Included observations: 214 after adjustments
Convergence achieved after 22 iterations
============================================================
      Variable       CoefficienStd. Errort-Statistic  Prob.
============================================================
          C          -8145.902  5978.418  -1.362551   0.1745
  @MOVAV(EMP(-6),4)   23.59511  40.28052   0.585770   0.5587
  @MOVAV(GDP/EMP,1)   102723.7  33635.86   3.053995   0.0026
        PAKA1        -996.5655  92.48425  -10.77552   0.0000
        FEB01         1201.579  92.09876   13.04663   0.0000
        JAN06        -784.9382  106.4437  -7.374207   0.0000
        FEB06        -395.6069  106.4435  -3.716591   0.0003
        NOV99        -268.8218  92.76061  -2.898016   0.0042
        SEP99        -231.1811  92.95280  -2.487080   0.0137
         OCT          61.04824  22.01672   2.772813   0.0061
        AR(1)         0.996070  0.011344   87.80419   0.0000
============================================================
R-squared             0.946472   Mean dependent var 620.8734
Adjusted R-squared    0.943835   S.D. dependent var 548.4745
S.E. of regression    129.9840   Akaike info criteri12.62273
Sum squared resid     3429854.   Schwarz criterion  12.79575
Log likelihood       -1339.632   F-statistic        358.9389
Durbin-Watson stat    1.802285   Prob(F-statistic)  0.000000
============================================================
Inverted AR Roots          1.00
============================================================
```

Residential Sales

```
==========================================================================
Dependent Variable: RESKWH
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1997M01 2012M04
Included observations: 184 after adjustments
Convergence achieved after 16 iterations
==========================================================================
             Variable             CoefficienStd. Errort-Statistic  Prob.
==========================================================================
                C                 35438167   4142497.   8.554785   0.0000
        BILLCDD68*RESCUS          1.902535   0.135009   14.09189   0.0000
@MOVAV(RESPRI(-3)/(CPI(-3)/112.3977-90280766  11200463  -8.060450   0.0000
       @MOVAV(RESCUS(-3),3)      -172.1978   126.4771  -1.361493   0.1751
             CHATAAN1            -8980077.   3162976.  -2.839122   0.0051
             CHATAAN2            -9724618.   3117078.  -3.119786   0.0021
             PONGSONA1           -28139946   3129821.  -8.990914   0.0000
             PONGSONA2           -17276291   3120996.  -5.535505   0.0000
               SEP99              16925012   3098976.   5.461486   0.0000
               JUN99              10887611   3082193.   3.532424   0.0005
               AR(1)              0.136208   0.079043   1.723214   0.0866
==========================================================================
R-squared                         0.719057    Mean dependent var 41342055
Adjusted R-squared                0.702818    S.D. dependent var 5691306.
S.E. of regression                3102582.    Akaike info criteri32.79129
Sum squared resid                 1.67E+15    Schwarz criterion  32.98349
Log likelihood                   -3005.799    F-statistic        44.27839
Durbin-Watson stat                2.005075    Prob(F-statistic)  0.000000
==========================================================================
Inverted AR Roots                      .14
==========================================================================
```

Small General Non Demand Sales

Dependent Variable: SGNDKWH
Method: Least Squares
Date: 06/10/12 Time: 20:44
Sample (adjusted): 1996M10 2012M04
Included observations: 187 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2337072.	1085474.	-2.153043	0.0327
BILLCDD65*SGNDCUS	3.692233	0.277006	13.32907	0.0000
@MOVAV(SGNDPRI(-1)/(CPI(-1)/112.397	-2775099.	497078.2	-5.582821	0.0000
EARTHQUAKE2	5541924.	765487.6	7.239730	0.0000
PONGSONA1	-3381059.	771517.7	-4.382348	0.0000
PONGSONA2	-1945447.	770776.8	-2.524008	0.0125
CHATAAN2	-1640480.	771668.9	-2.125885	0.0349
MAR97	-3726594.	774365.8	-4.812447	0.0000
JAN97	-3044490.	774160.4	-3.932635	0.0001
NOV96	-1608417.	775399.6	-2.074307	0.0395
@MOVAV(EMP(-3),3)	35576.85	17864.79	1.991451	0.0480

R-squared	0.671472	Mean dependent var	5241316.
Adjusted R-squared	0.652805	S.D. dependent var	1293899.
S.E. of regression	762407.5	Akaike info criteri	29.98337
Sum squared resid	1.02E+14	Schwarz criterion	30.17344
Log likelihood	-2792.445	F-statistic	35.97223
Durbin-Watson stat	1.260886	Prob(F-statistic)	0.000000

Small General Demand Sales

```
==========================================================================
Dependent Variable: SGDKWH
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1996M09 2012M04
Included observations: 188 after adjustments
==========================================================================
            Variable            CoefficienStd. Errort-Statistic  Prob.
==========================================================================
               C                 19867968   1057422.   18.78907   0.0000
       BILLCDD65*SGDCUS          3.779691   1.290774   2.928236   0.0039
@MOVAV(SGDPRI/(CPI/112.3977),1) -22577137   5149027.  -4.384739   0.0000
             PAKA1              -7684845.   1633774.  -4.703737   0.0000
             PAKA2              -10308594   1744109.  -5.910521   0.0000
            CHATAAN1            -6838493.   1591327.  -4.297352   0.0000
           PONGSONA1            -12279757   1571471.  -7.814179   0.0000
           PONGSONA2            -9404268.   1583629.  -5.938428   0.0000
             SEP98               6442769.   1598761.   4.029850   0.0001
             DEC01              -6044581.   1596273.  -3.786684   0.0002
              FEB               -810815.9   425727.4  -1.904542   0.0585
              OCT                723692.9   411491.7   1.758706   0.0804
==========================================================================
R-squared                        0.612770    Mean dependent var 16823933
Adjusted R-squared               0.588568    S.D. dependent var 2437554.
S.E. of regression               1563520.    Akaike info criteri31.42448
Sum squared resid                4.30E+14    Schwarz criterion  31.63106
Log likelihood                  -2941.901    F-statistic        25.31906
Durbin-Watson stat               1.583509    Prob(F-statistic)  0.000000
==========================================================================
```

Large General Sales

```
==========================================================
Dependent Variable: LGKWH
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1992M11 2012M04
Included observations: 234 after adjustments
Convergence achieved after 15 iterations
==========================================================
     Variable      CoefficienStd. Errort-Statistic  Prob.
==========================================================
         C          25067461  1104980.   22.68590   0.0000
    CDD65*LGCUS     22.88598  13.92318   1.643732   0.1016
       SEP96       -44671388  3453730.  -12.93424   0.0000
       PAKA1       -31764999  3490285.  -9.100975   0.0000
       PAKA3       -13405557  3657141.  -3.665584   0.0003
     PONGSONA1     -17851604  3452566.  -5.170532   0.0000
     CHATAAN1      -7228743.  3452999.  -2.093468   0.0374
       OCT00        12521035  3486242.   3.591557   0.0004
        FEB        -2732433.  801849.2  -3.407664   0.0008
       AR(1)        0.460117  0.061690   7.458582   0.0000
==========================================================
R-squared           0.594336    Mean dependent var 26029393
Adjusted R-squared  0.578037    S.D. dependent var 5847070.
S.E. of regression  3798179.    Akaike info criteri33.17974
Sum squared resid   3.23E+15    Schwarz criterion  33.32740
Log likelihood     -3872.029    F-statistic        36.46459
Durbin-Watson stat  2.198540    Prob(F-statistic)  0.000000
==========================================================
Inverted AR Roots        .46
==========================================================
```

Private Outdoor Light Sales

```
========================================================================
Dependent Variable: POLKWH
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1996M10 2012M04
Included observations: 187 after adjustments
Convergence achieved after 9 iterations
========================================================================
          Variable            CoefficienStd. Errort-Statistic  Prob.
========================================================================
               C              -30560.68   41696.92  -0.732924   0.4646
@MOVAV(POLPRI/(CPI/112.3977),1)-34895.21   10949.65  -3.186878   0.0017
         EARTHQUAKE3          -202756.7   19721.94  -10.28077   0.0000
          PONGSONA1           -59272.85   19594.43  -3.024985   0.0029
            JUN99              101275.2   19734.63   5.131851   0.0000
      @MOVAV(EMP(-10),1)       1884.625   686.3214   2.745980   0.0066
            AR(1)              0.373751   0.069938   5.344011   0.0000
========================================================================
R-squared                      0.472521    Mean dependent var 64238.51
Adjusted R-squared             0.454939    S.D. dependent var 28239.63
S.E. of regression             20848.82    Akaike info criteri22.76470
Sum squared resid              7.82E+10    Schwarz criterion  22.88565
Log likelihood                -2121.499    F-statistic        26.87435
Durbin-Watson stat             2.113994    Prob(F-statistic)  0.000000
========================================================================
Inverted AR Roots                   .37
========================================================================
```

General Service Small Non Demand Sales

Dependent Variable: GSSNDKWH
Method: Least Squares
Date: 06/10/12 Time: 20:44
Sample (adjusted): 1996M09 2012M04
Included observations: 188 after adjustments

Variable	Coefficien	Std. Error	t-Statistic	Prob.
C	-1143551.	504737.2	-2.265636	0.0247
CDD80*GSSNDCUS	5.934211	1.501495	3.952202	0.0001
@MOVAV(GSSNDPRI/(CPI/112.3977),1)	-675892.5	176896.7	-3.820831	0.0002
PAKA1	-2211071.	386879.6	-5.715139	0.0000
PAKA2	1254329.	387033.5	3.240879	0.0014
JUN99	1827621.	380770.9	4.799793	0.0000
SEP97	-1759933.	382717.1	-4.598521	0.0000
JUN97	-1348420.	384437.6	-3.507512	0.0006
SEP98	-1369848.	385878.6	-3.549946	0.0005
OCT	307617.7	99692.43	3.085668	0.0024
@MOVAV(EMP(-5),3)	37974.98	8331.824	4.557824	0.0000

R-squared	0.499227	Mean dependent var	1192675.
Adjusted R-squared	0.470935	S.D. dependent var	520023.3
S.E. of regression	378248.7	Akaike info criteri	28.58122
Sum squared resid	2.53E+13	Schwarz criterion	28.77059
Log likelihood	-2675.635	F-statistic	17.64536
Durbin-Watson stat	1.345930	Prob(F-statistic)	0.000000

General Service Small Demand Sales

```
==========================================================================
Dependent Variable: GSSDKWH
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1996M12 2012M04
Included observations: 185 after adjustments
Convergence achieved after 14 iterations
==========================================================================
             Variable              CoefficienStd. Errort-Statistic  Prob.
==========================================================================
                 C                  8082307.   705258.8   11.46006   0.0000
         BILLCDD80*GSSDCUS          35.56334   12.05839   2.949262   0.0036
@MOVAV(GSSDPRI(-2)/(CPI(-2)/112.397-1799196.   2526914.  -0.712013   0.4774
             PONGSONA1             -5463111.   1459722.  -3.742570   0.0002
             PONGSONA2             -3618580.   1465653.  -2.468919   0.0145
               PAKA2                6174105.   1581525.   3.903893   0.0001
               SEP97               -10336826   1398971.  -7.388877   0.0000
               AR(1)                0.318628   0.080822   3.942338   0.0001
==========================================================================
R-squared                           0.368091    Mean dependent var 8470820.
Adjusted R-squared                  0.343101    S.D. dependent var 1804612.
S.E. of regression                  1462626.    Akaike info criteri31.27165
Sum squared resid                   3.79E+14    Schwarz criterion  31.41090
Log likelihood                     -2884.627    F-statistic        14.72911
Durbin-Watson stat                  1.990584    Prob(F-statistic)  0.000000
==========================================================================
Inverted AR Roots                        .32
==========================================================================
```

Government Large Sales

```
==========================================================================
Dependent Variable: GSLKWH
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1997M01 2012M04
Included observations: 184 after adjustments
Convergence achieved after 11 iterations
==========================================================================
            Variable              CoefficienStd. Errort-Statistic  Prob.
==========================================================================
                C                  9261504.   689078.2   13.44043   0.0000
          CDD80*GSLCUS             213.9142   68.77673   3.110271   0.0022
@MOVAV(GSLPRI(-2)/(CPI(-2)/112.3977-11614077  2804370.  -4.141421   0.0001
              PAKA1               -7330697.   1392980.  -5.262598   0.0000
            CHATAAN1              -2999962.   1375782.  -2.180550   0.0306
            PONGSONA1             -4821059.   1379933.  -3.493691   0.0006
              APR98               -4175801.   1408308.  -2.965119   0.0035
              NOV98                7056301.   1464513.   4.818189   0.0000
              SEP01                9659749.   1440659.   6.705089   0.0000
               JUN                -747544.1   399922.9  -1.869221   0.0633
              AR(1)               -0.081353   0.083724  -0.971682   0.3326
==========================================================================
R-squared                          0.462179    Mean dependent var 7055938.
Adjusted R-squared                 0.431091    S.D. dependent var 1818440.
S.E. of regression                 1371578.    Akaike info criteri31.15874
Sum squared resid                  3.25E+14    Schwarz criterion  31.35094
Log likelihood                    -2855.604    F-statistic        14.86683
Durbin-Watson stat                 1.952431    Prob(F-statistic)  0.000000
==========================================================================
Inverted AR Roots                      -.08
==========================================================================
```

Government Street Light Sales

```
==========================================================================
Dependent Variable: GSSLKWH
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 1996M12 2012M04
Included observations: 185 after adjustments
Convergence achieved after 14 iterations
==========================================================================
            Variable            CoefficienStd. Errort-Statistic  Prob.
==========================================================================
                C                789218.8    52567.10   15.01355   0.0000
       GSSLCUS*BILLCDD68         0.360137    0.128273   2.807597   0.0056
@MOVAV(GSSLPRI/(CPI/112.3977),3) -65354.92   13711.33  -4.766489   0.0000
              PAKA1             -1102966.    188143.6  -5.862363   0.0000
              MAY00              5726345.    179117.4   31.96979   0.0000
              APR04             -2180489.    179262.2  -12.16368   0.0000
              JUN99              1316065.    179146.8   7.346290   0.0000
              JAN01              482497.9    185727.6   2.597880   0.0102
              SEP00             -924694.2    181925.5  -5.082819   0.0000
               JAN               178169.5    51819.42   3.438277   0.0007
               FEB               112586.9    50117.53   2.246457   0.0259
              AR(1)              0.514694    0.065518   7.855733   0.0000
==========================================================================
R-squared                        0.873316    Mean dependent var 873381.5
Adjusted R-squared               0.865261    S.D. dependent var 548076.1
S.E. of regression               201181.2    Akaike info criteri27.32446
Sum squared resid                7.00E+12    Schwarz criterion  27.53335
Log likelihood                  -2515.513    F-statistic        108.4186
Durbin-Watson stat               2.348524    Prob(F-statistic)  0.000000
==========================================================================
Inverted AR Roots                     .51
==========================================================================
```

Navy Sales

==

Dependent Variable: NAVYKWH

Method: Least Squares

Date: 06/10/12 Time: 20:44

Sample (adjusted): 1992M11 2012M04

Included observations: 234 after adjustments

Convergence achieved after 11 iterations

==

Variable	Coefficien	Std. Error	t-Statistic	Prob.
C	28718344	667908.4	42.99743	0.0000
PAKA1	-9719375.	1434669.	-6.774648	0.0000
CHATAAN1	-14820555	1733690.	-8.548562	0.0000
CHATAAN2	-3862570.	1981347.	-1.949467	0.0525
CHATAAN3	23722209	1705399.	13.91006	0.0000
PONGSONA1	-11686450	1434403.	-8.147258	0.0000
JUN03	-9086113.	1419206.	-6.402248	0.0000
MAY04	-4702100.	1437395.	-3.271265	0.0012
MAY02	-4019743.	1437064.	-2.797192	0.0056
FEB	-2724072.	312459.0	-8.718176	0.0000
MAY	879358.1	341318.9	2.576353	0.0106
JUL	962530.6	382119.1	2.518928	0.0125
AUG	878345.2	379472.1	2.314650	0.0216
OCT	1218848.	320055.6	3.808237	0.0002
DEC	1114137.	329313.1	3.383217	0.0008
AR(1)	0.821483	0.037772	21.74823	0.0000

==

R-squared	0.808058	Mean dependent var	28957205
Adjusted R-squared	0.794851	S.D. dependent var	3988716.
S.E. of regression	1806626.	Akaike info criteri	31.71775
Sum squared resid	7.12E+14	Schwarz criterion	31.95401
Log likelihood	-3694.976	F-statistic	61.18383
Durbin-Watson stat	2.513405	Prob(F-statistic)	0.000000

==

Inverted AR Roots .82

Navy Monthly Peak Hour Demand

```
============================================================================
Dependent Variable: MWNAVY
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 2000M11 2012M04
Included observations: 138 after adjustments
Convergence achieved after 11 iterations
============================================================================
             Variable              CoefficienStd. Errort-Statistic  Prob.
============================================================================
                 C                 -24.80002   12.01719  -2.063713   0.0411
        @MOVAV(EMP(-10),4)          1.090668   0.227410   4.796051   0.0000
@MOVAV(NAVYPRI(-12)/(CPI(-12)/112.3-7.982288   11.50896  -0.693572   0.4892
     @MOVAV(GDP(-8)/EMP(-8),1)      159.9170   113.5744   1.408037   0.1616
             CHATAAN1              -5.645767   2.003700  -2.817671   0.0056
               SEP05               -5.746791   2.002014  -2.870505   0.0048
                JAN                -1.838329   0.665745  -2.761310   0.0066
                FEB                -1.556317   0.739567  -2.104361   0.0373
                MAR                -2.613513   0.665481  -3.927257   0.0001
               SEP03                5.892999   2.111620   2.790748   0.0061
               JUL03                3.757868   2.016645   1.863426   0.0647
               AR(1)                0.506516   0.079425   6.377311   0.0000
============================================================================
R-squared                           0.651835    Mean dependent var 46.82163
Adjusted R-squared                  0.621440    S.D. dependent var 3.641711
S.E. of regression                  2.240645    Akaike info criteri4.534345
Sum squared resid                   632.5815    Schwarz criterion  4.788889
Log likelihood                     -300.8698    F-statistic        21.44523
Durbin-Watson stat                  2.177413    Prob(F-statistic)  0.000000
============================================================================
Inverted AR Roots                        .51
============================================================================
```

Civilian Monthly Peak Hour Demand

```
==========================================================================
Dependent Variable: MWCIV
Method: Least Squares
Date: 06/10/12   Time: 20:44
Sample (adjusted): 2000M11 2012M04
Included observations: 138 after adjustments
Convergence achieved after 8 iterations
==========================================================================
             Variable              CoefficienStd. Errort-Statistic  Prob.
==========================================================================
                 C                   256.2897   42.13616   6.082415   0.0000
        @MOVAV(EMP(-8),3)           -0.052696   0.793806  -0.066384   0.9472
@MOVAV(RESPRI(-2)/(CPI(-2)/112.3977-187.5435   53.59464  -3.499295   0.0006
            PONGSONA2               -43.52454   5.120084  -8.500748   0.0000
            PONGSONA3               -18.94825   5.136338  -3.689057   0.0003
              OCT06                 -11.17602   4.325298  -2.583872   0.0109
              JUL06                 -8.120081   4.356758  -1.863790   0.0647
               JAN                  -5.275548   1.551170  -3.401012   0.0009
               MAY                   4.614179   1.308053   3.527518   0.0006
               FEB                  -6.416651   1.745006  -3.677151   0.0003
               MAR                  -5.407031   1.542475  -3.505426   0.0006
               AUG                   2.822754   1.323568   2.132685   0.0349
              MAR04                  11.02264   4.509705   2.444205   0.0159
              AR(1)                  0.686819   0.066457   10.33477   0.0000
==========================================================================
R-squared                            0.759538    Mean dependent var 213.3421
Adjusted R-squared                   0.734328    S.D. dependent var 10.13942
S.E. of regression                   5.226195    Akaike info criteri6.241170
Sum squared resid                    3386.826    Schwarz criterion  6.538138
Log likelihood                      -416.6408    F-statistic        30.12879
Durbin-Watson stat                   2.244965    Prob(F-statistic)  0.000000
==========================================================================
Inverted AR Roots                         .69
==========================================================================
```

Appendix D: The GPA Sales and Load Forecasting Model Driver

The following is the EViews model driver program that has been written by P&L Economics, Inc. The purpose of the model driver is to import the most current data, re-estimate the functional relationships and prepare an updated draft forecast quickly and easily.

```
'**********************************************************
'*
'*        Forecast Update program written by K. Farney
'*          and Modified Extensively By Matt Prickett
'*          and David Vermeire
'*                 September 13,2011
'*
'*
'*       This version for August '11 Budget cycle
'*
'*
'**********************************************************


'Set name of internal data file.
%INTERNAL               = "GPA Data 120528.XLS"
%WEATHER                = "Guam Monthly Weather 120603.xls"
%FORECAST               = "GUAM Economics 110821.XLS"
%SCENARIO               = "Scenarios 110605.xls"
%DATADIRECTORY          = "C:\Users\Doc\Documents\Guam Power Authority\Sales Model\Data\"
%WEATHERDIRECTORY       = "C:\Users\Doc\Documents\Guam Power Authority\Sales
Model\Weather\"
%DOCUMENTATIONDIRECTORY = "C:\Users\Doc\Documents\Guam Power Authority\Sales
Model\Documentation\"
%STARTFORECAST          = "2012:05"
%REALPRICE              = "Retail Price Model 110825.XLS"
```

```
' Do some date algebra to create file name suffixes
%d     = @date
%day   = @mid(%d,4,2)
%month = @left(%d,2)
%year  = @right(%d,2)
%tag   = %year + %month + %day
%now   = %year + ":"    + %month


' Change to the working directory
cd %DATADIRECTORY


db Test{%tag}

' Create a workspace
wfcreate(wf = Test{%tag}) m 1992:10 2026:12



cd %DATADIRECTORY
pagecreate(page= Quarterly) q 1993q1 2026q4

read(b83, s=Sheet1) %FORECAST MIG POPULATION EMP CEMP MEMP WEMP REMP TPEMP FIREEMP GOVEMP
FEDEMP STEMP UNEMP TLF TLFEMP UNLF LFPR TPBANK BUSBANK GDP CPI


'Read in Scenarios Data
smpl 2009q1 2026q4
read(cn7,  s=ScenarioII, t) %SCENARIO EMP_1
read(cn13, s=ScenarioII, t) %SCENARIO GDP_1
read(cn7,  s=ScenarioIII,t) %SCENARIO EMP_2
read(cn13, s=ScenarioIII,t) %SCENARIO GDP_2
'read(cn4,  s=ScenarioIII,t) %SCENARIO POPULATION_2
read(cn7,  s=ScenarioIV, t) %SCENARIO EMP_3
read(cn13, s=ScenarioIV, t) %SCENARIO GDP_3
'read(cn4,  s=ScenarioIV, t) %SCENARIO POPULATION_3
read(cn7,  s=ScenarioV,  t) %SCENARIO EMP_4
read(cn13, s=ScenarioV,  t) %SCENARIO GDP_4
'read(cn4,  s=ScenarioV,  t) %SCENARIO POPULATION_4
```

```
'*****************************************************************
'******** 090831 DV - Moved up from section with other read statements
'*****************************************************************
'* Read weather data
pagecreate(page=WeatherMonth) m 1976:1 2026:12
cd %WEATHERDIRECTORY
smpl 86:02 %now
read(b268, s=Monthly Data) %WEATHER CDD65     CUMCDD65  NGCDH     THI       HI
BILLCDD65
read(i268, s=Monthly Data) %WEATHER CDD68     CDD70     CDD72     CDD75     CDD80
CDD85
read(r268, s=Monthly Data) %WEATHER BILLCDD68 BILLCDD70 BILLCDD72 BILLCDD75 BILLCDD80
BILLCDD85 BILLCDD79 BILLCDD84



series monthseries = @datepart(@date, "mm")



cd %DATADIRECTORY
pagecreate(page=Monthly) m 1992:10 2026:12

for %LINKC CDD65 CDD68 CDD70 CDD75 CDD80 BILLCDD65 BILLCDD68 BILLCDD70 BILLCDD75
BILLCDD80 NORMCDD65 NORMCDD68 NORMCDD70 NORMCDD75 NORMCDD80 NORMBILLCDD65 NORMBILLCDD68
NORMBILLCDD70 NORMBILLCDD75 NORMBILLCDD80 BILLCDD85 BILLCDD79 BILLCDD84 BILLCDD85
BILLCDD79 BILLCDD84 THI HI
     link {%LINKC}
     {%LINKC}.linkto(c=sum) WeatherMonth::{%LINKC}
next
unlink *

for %LINK EMP POPULATION CPI GDP EMP_1 GDP_1 EMP_2 GDP_2 POPULATION_2 EMP_3 GDP_3
POPULATION_3 EMP_4 GDP_4 POPULATION_4
     link {%LINK}
     {%LINK}.linkto(c=i) quarterly::{%LINK}
next

' Read Sales data from internal data warehouse
smpl 92:10 %now
read( B11, s=TimeSeriesData, t) %INTERNAL RESKWH SGNDKWH SGDKWH LGKWH POLKWH AUXKWH
read( B19, s=TimeSeriesData, t) %INTERNAL GSSNDKWH GSSDKWH GSLKWH GSSLKWH
```

```
read( B25, s=TimeSeriesData, t) %INTERNAL NAVYKWH

' Read Number Of Customers
smpl 92:10 %now
read( B31, s=TimeSeriesData, t) %INTERNAL RESCUS   SGNDCUS SGDCUS LGCUS POLCUS
read( B39, s=TimeSeriesData, t) %INTERNAL GSSNDCUS GSSDCUS GSLCUS GSSLCUS
read( B45, s=TimeSeriesData, t) %INTERNAL NAVYCUS

'Read Revenue data from internal data werehouse
read(B71 , s=TimeSeriesData, t) %INTERNAL RESREV SGNDREV SGDREV LGREV POLREV AUXREV
read(B79 , s=TimeSeriesData, t) %INTERNAL GSSNDREV GSSDREV GSLREV GSSLREV
read(B85 , s=TimeSeriesData, t) %INTERNAL NAVYREV

'Read in Typhoon and Accounting Dummies
series DAY = @DATE
series JAN96=@RECODE(DAY=@DATEVAL("1/1/1996",  "MM/DD/YYYY"),1,0)
series FEB96=@RECODE(DAY=@DATEVAL("2/1/1996",  "MM/DD/YYYY"),1,0)
series MAR96=@RECODE(DAY=@DATEVAL("3/1/1996",  "MM/DD/YYYY"),1,0)
series APR96=@RECODE(DAY=@DATEVAL("4/1/1996",  "MM/DD/YYYY"),1,0)
series MAY96=@RECODE(DAY=@DATEVAL("5/1/1996",  "MM/DD/YYYY"),1,0)
series JUN96=@RECODE(DAY=@DATEVAL("6/1/1996",  "MM/DD/YYYY"),1,0)
series JUL96=@RECODE(DAY=@DATEVAL("7/1/1996",  "MM/DD/YYYY"),1,0)
series AUG96=@RECODE(DAY=@DATEVAL("8/1/1996",  "MM/DD/YYYY"),1,0)
series SEP96=@RECODE(DAY=@DATEVAL("9/1/1996",  "MM/DD/YYYY"),1,0)
series OCT96=@RECODE(DAY=@DATEVAL("10/1/1996", "MM/DD/YYYY"),1,0)
series NOV96=@RECODE(DAY=@DATEVAL("11/1/1996", "MM/DD/YYYY"),1,0)
series DEC96=@RECODE(DAY=@DATEVAL("12/1/1996", "MM/DD/YYYY"),1,0)
series JAN97=@RECODE(DAY=@DATEVAL("1/1/1997",  "MM/DD/YYYY"),1,0)
series FEB97=@RECODE(DAY=@DATEVAL("2/1/1997",  "MM/DD/YYYY"),1,0)
series MAR97=@RECODE(DAY=@DATEVAL("3/1/1997",  "MM/DD/YYYY"),1,0)
series APR97=@RECODE(DAY=@DATEVAL("4/1/1997",  "MM/DD/YYYY"),1,0)
series MAY97=@RECODE(DAY=@DATEVAL("5/1/1997",  "MM/DD/YYYY"),1,0)
series JUN97=@RECODE(DAY=@DATEVAL("6/1/1997",  "MM/DD/YYYY"),1,0)
series JUL97=@RECODE(DAY=@DATEVAL("7/1/1997",  "MM/DD/YYYY"),1,0)
series AUG97=@RECODE(DAY=@DATEVAL("8/1/1997",  "MM/DD/YYYY"),1,0)
series SEP97=@RECODE(DAY=@DATEVAL("9/1/1997",  "MM/DD/YYYY"),1,0)
series OCT97=@RECODE(DAY=@DATEVAL("10/1/1997", "MM/DD/YYYY"),1,0)
series NOV97=@RECODE(DAY=@DATEVAL("11/1/1997", "MM/DD/YYYY"),1,0)
series Paka1=@RECODE(DAY=@DATEVAL("12/1/1997", "MM/DD/YYYY"),1,0)
series Paka2=@RECODE(DAY=@DATEVAL("1/1/1998",  "MM/DD/YYYY"),1,0)
series Paka3=@RECODE(DAY=@DATEVAL("2/1/1998",  "MM/DD/YYYY"),1,0)
series Paka4=@RECODE(DAY=@DATEVAL("3/1/1998",  "MM/DD/YYYY"),1,0)
```

```
series MAR98=@RECODE(DAY=@DATEVAL("3/1/1998",  "MM/DD/YYYY"),1,0)
series APR98=@RECODE(DAY=@DATEVAL("4/1/1998",  "MM/DD/YYYY"),1,0)
series MAY98=@RECODE(DAY=@DATEVAL("5/1/1998",  "MM/DD/YYYY"),1,0)
series JUN98=@RECODE(DAY=@DATEVAL("6/1/1998",  "MM/DD/YYYY"),1,0)
series JUL98=@RECODE(DAY=@DATEVAL("7/1/1998",  "MM/DD/YYYY"),1,0)
series AUG98=@RECODE(DAY=@DATEVAL("8/1/1998",  "MM/DD/YYYY"),1,0)
series SEP98=@RECODE(DAY=@DATEVAL("9/1/1998",  "MM/DD/YYYY"),1,0)
series OCT98=@RECODE(DAY=@DATEVAL("10/1/1998", "MM/DD/YYYY"),1,0)
series NOV98=@RECODE(DAY=@DATEVAL("11/1/1998", "MM/DD/YYYY"),1,0)
series DEC98=@RECODE(DAY=@DATEVAL("12/1/1998", "MM/DD/YYYY"),1,0)
series JAN99=@RECODE(DAY=@DATEVAL("1/1/1999",  "MM/DD/YYYY"),1,0)
series FEB99=@RECODE(DAY=@DATEVAL("2/1/1999",  "MM/DD/YYYY"),1,0)
series MAR99=@RECODE(DAY=@DATEVAL("3/1/1999",  "MM/DD/YYYY"),1,0)
series APR99=@RECODE(DAY=@DATEVAL("4/1/1999",  "MM/DD/YYYY"),1,0)
series MAY99=@RECODE(DAY=@DATEVAL("5/1/1999",  "MM/DD/YYYY"),1,0)
series JUN99=@RECODE(DAY=@DATEVAL("6/1/1999",  "MM/DD/YYYY"),1,0)
series JUL99=@RECODE(DAY=@DATEVAL("7/1/1999",  "MM/DD/YYYY"),1,0)
series AUG99=@RECODE(DAY=@DATEVAL("8/1/1999",  "MM/DD/YYYY"),1,0)
series SEP99=@RECODE(DAY=@DATEVAL("9/1/1999",  "MM/DD/YYYY"),1,0)
series OCT99=@RECODE(DAY=@DATEVAL("10/1/1999", "MM/DD/YYYY"),1,0)
series NOV99=@RECODE(DAY=@DATEVAL("11/1/1999", "MM/DD/YYYY"),1,0)
series DEC99=@RECODE(DAY=@DATEVAL("12/1/1999", "MM/DD/YYYY"),1,0)
series JAN00=@RECODE(DAY=@DATEVAL("1/1/2000",  "MM/DD/YYYY"),1,0)
series FEB00=@RECODE(DAY=@DATEVAL("2/1/2000",  "MM/DD/YYYY"),1,0)
series MAR00=@RECODE(DAY=@DATEVAL("3/1/2000",  "MM/DD/YYYY"),1,0)
series APR00=@RECODE(DAY=@DATEVAL("4/1/2000",  "MM/DD/YYYY"),1,0)
series MAY00=@RECODE(DAY=@DATEVAL("5/1/2000",  "MM/DD/YYYY"),1,0)
series JUN00=@RECODE(DAY=@DATEVAL("6/1/2000",  "MM/DD/YYYY"),1,0)
series JUL00=@RECODE(DAY=@DATEVAL("7/1/2000",  "MM/DD/YYYY"),1,0)
series AUG00=@RECODE(DAY=@DATEVAL("8/1/2000",  "MM/DD/YYYY"),1,0)
series SEP00=@RECODE(DAY=@DATEVAL("9/1/2000",  "MM/DD/YYYY"),1,0)
series OCT00=@RECODE(DAY=@DATEVAL("10/1/2000", "MM/DD/YYYY"),1,0)
series NOV00=@RECODE(DAY=@DATEVAL("11/1/2000", "MM/DD/YYYY"),1,0)
series DEC00=@RECODE(DAY=@DATEVAL("12/1/2000", "MM/DD/YYYY"),1,0)
series JAN01=@RECODE(DAY=@DATEVAL("1/1/2001",  "MM/DD/YYYY"),1,0)
series FEB01=@RECODE(DAY=@DATEVAL("2/1/2001",  "MM/DD/YYYY"),1,0)
series MAR01=@RECODE(DAY=@DATEVAL("3/1/2001",  "MM/DD/YYYY"),1,0)
series APR01=@RECODE(DAY=@DATEVAL("4/1/2001",  "MM/DD/YYYY"),1,0)
series MAY01=@RECODE(DAY=@DATEVAL("5/1/2001",  "MM/DD/YYYY"),1,0)
series JUN01=@RECODE(DAY=@DATEVAL("6/1/2001",  "MM/DD/YYYY"),1,0)
series JUL01=@RECODE(DAY=@DATEVAL("7/1/2001",  "MM/DD/YYYY"),1,0)
series AUG01=@RECODE(DAY=@DATEVAL("8/1/2001",  "MM/DD/YYYY"),1,0)
```

```
series SEP01=@RECODE(DAY=@DATEVAL("9/1/2001",  "MM/DD/YYYY"),1,0)
series OCT01=@RECODE(DAY=@DATEVAL("10/1/2001", "MM/DD/YYYY"),1,0)
series DEC01=@RECODE(DAY=@DATEVAL("12/1/2001", "MM/DD/YYYY"),1,0)

series Earthquake1=@RECODE(DAY=@DATEVAL("11/1/2001", "MM/DD/YYYY"),1,0)
series Earthquake2=@RECODE(DAY=@DATEVAL("12/1/2001", "MM/DD/YYYY"),1,0)
series Earthquake3=@RECODE(DAY=@DATEVAL("1/1/2002",  "MM/DD/YYYY"),1,0)
series FEB02=@RECODE(DAY=@DATEVAL("2/1/2002",        "MM/DD/YYYY"),1,0)
series MAR02=@RECODE(DAY=@DATEVAL("3/1/2002",        "MM/DD/YYYY"),1,0)
series APR02=@RECODE(DAY=@DATEVAL("4/1/2002",        "MM/DD/YYYY"),1,0)
series MAY02=@RECODE(DAY=@DATEVAL("5/1/2002",        "MM/DD/YYYY"),1,0)
series JUN02=@RECODE(DAY=@DATEVAL("6/1/2002",        "MM/DD/YYYY"),1,0)
series Chataan1=@RECODE(DAY=@DATEVAL("7/1/2002",     "MM/DD/YYYY"),1,0)
series Chataan2=@RECODE(DAY=@DATEVAL("8/1/2002",     "MM/DD/YYYY"),1,0)
series Chataan3=@RECODE(DAY=@DATEVAL("9/1/2002",     "MM/DD/YYYY"),1,0)
series OCT02=@RECODE(DAY=@DATEVAL("10/1/2002",       "MM/DD/YYYY"),1,0)
series NOV02=@RECODE(DAY=@DATEVAL("11/1/2002",       "MM/DD/YYYY"),1,0)
series Pongsona1=@RECODE(DAY=@DATEVAL("12/1/2002",   "MM/DD/YYYY"),1,0)
series Pongsona2=@RECODE(DAY=@DATEVAL("1/1/2003",    "MM/DD/YYYY"),1,0)
series Pongsona3=@RECODE(DAY=@DATEVAL("2/1/2003",    "MM/DD/YYYY"),1,0)

series FEB03=@RECODE(DAY=@DATEVAL("2/1/2003", "MM/DD/YYYY"),1,0)
series MAR03=@RECODE(DAY=@DATEVAL("3/1/2003", "MM/DD/YYYY"),1,0)
series APR03=@RECODE(DAY=@DATEVAL("4/1/2003", "MM/DD/YYYY"),1,0)
series MAY03=@RECODE(DAY=@DATEVAL("5/1/2003", "MM/DD/YYYY"),1,0)
series JUN03=@RECODE(DAY=@DATEVAL("6/1/2003", "MM/DD/YYYY"),1,0)
series JUL03=@RECODE(DAY=@DATEVAL("7/1/2003", "MM/DD/YYYY"),1,0)
series AUG03=@RECODE(DAY=@DATEVAL("8/1/2003", "MM/DD/YYYY"),1,0)
series SEP03=@RECODE(DAY=@DATEVAL("9/1/2003", "MM/DD/YYYY"),1,0)
series OCT03=@RECODE(DAY=@DATEVAL("10/1/2003", "MM/DD/YYYY"),1,0)
series NOV03=@RECODE(DAY=@DATEVAL("11/1/2003", "MM/DD/YYYY"),1,0)
series DEC03=@RECODE(DAY=@DATEVAL("12/1/2003", "MM/DD/YYYY"),1,0)
series JAN04=@RECODE(DAY=@DATEVAL("1/1/2004", "MM/DD/YYYY"),1,0)
series FEB04=@RECODE(DAY=@DATEVAL("2/1/2004", "MM/DD/YYYY"),1,0)
series MAR04=@RECODE(DAY=@DATEVAL("3/1/2004", "MM/DD/YYYY"),1,0)
series APR04=@RECODE(DAY=@DATEVAL("4/1/2004", "MM/DD/YYYY"),1,0)
series MAY04=@RECODE(DAY=@DATEVAL("5/1/2004", "MM/DD/YYYY"),1,0)
series JUN04=@RECODE(DAY=@DATEVAL("6/1/2004", "MM/DD/YYYY"),1,0)
series Tingting1=@RECODE(DAY=@DATEVAL("7/1/2004", "MM/DD/YYYY"),1,0)
series Tingting2=@RECODE(DAY=@DATEVAL("8/1/2004", "MM/DD/YYYY"),1,0)
series Tingting3=@RECODE(DAY=@DATEVAL("9/1/2004", "MM/DD/YYYY"),1,0)
series OCT04=@RECODE(DAY=@DATEVAL("10/1/2004", "MM/DD/YYYY"),1,0)
```

```
series NOV04=@RECODE(DAY=@DATEVAL("11/1/2004", "MM/DD/YYYY"),1,0)
series DEC04=@RECODE(DAY=@DATEVAL("12/1/2004", "MM/DD/YYYY"),1,0)
series JAN05=@RECODE(DAY=@DATEVAL("1/1/2005", "MM/DD/YYYY"),1,0)
series FEB05=@RECODE(DAY=@DATEVAL("2/1/2005", "MM/DD/YYYY"),1,0)
series MAR05=@RECODE(DAY=@DATEVAL("3/1/2005", "MM/DD/YYYY"),1,0)
series APR05=@RECODE(DAY=@DATEVAL("4/1/2005", "MM/DD/YYYY"),1,0)
series MAY05=@RECODE(DAY=@DATEVAL("5/1/2005", "MM/DD/YYYY"),1,0)
series JUN05=@RECODE(DAY=@DATEVAL("6/1/2005", "MM/DD/YYYY"),1,0)
series JUL05=@RECODE(DAY=@DATEVAL("7/1/2005", "MM/DD/YYYY"),1,0)
series AUG05=@RECODE(DAY=@DATEVAL("8/1/2005", "MM/DD/YYYY"),1,0)
series SEP05=@RECODE(DAY=@DATEVAL("9/1/2005", "MM/DD/YYYY"),1,0)
series OCT05=@RECODE(DAY=@DATEVAL("10/1/2005", "MM/DD/YYYY"),1,0)
series NOV05=@RECODE(DAY=@DATEVAL("11/1/2005", "MM/DD/YYYY"),1,0)
series DEC05=@RECODE(DAY=@DATEVAL("12/1/2005", "MM/DD/YYYY"),1,0)
series JAN06=@RECODE(DAY=@DATEVAL("1/1/2006", "MM/DD/YYYY"),1,0)
series FEB06=@RECODE(DAY=@DATEVAL("2/1/2006", "MM/DD/YYYY"),1,0)
series MAR06=@RECODE(DAY=@DATEVAL("3/1/2006", "MM/DD/YYYY"),1,0)
series APR06=@RECODE(DAY=@DATEVAL("4/1/2006", "MM/DD/YYYY"),1,0)
series MAY06=@RECODE(DAY=@DATEVAL("5/1/2006", "MM/DD/YYYY"),1,0)
series JUN06=@RECODE(DAY=@DATEVAL("6/1/2006", "MM/DD/YYYY"),1,0)
series JUL06=@RECODE(DAY=@DATEVAL("7/1/2006", "MM/DD/YYYY"),1,0)
series AUG06=@RECODE(DAY=@DATEVAL("8/1/2006", "MM/DD/YYYY"),1,0)
series SEP06=@RECODE(DAY=@DATEVAL("9/1/2006", "MM/DD/YYYY"),1,0)
series OCT06=@RECODE(DAY=@DATEVAL("10/1/2006", "MM/DD/YYYY"),1,0)
series NOV06=@RECODE(DAY=@DATEVAL("11/1/2006", "MM/DD/YYYY"),1,0)
series DEC06=@RECODE(DAY=@DATEVAL("12/1/2006", "MM/DD/YYYY"),1,0)
series JAN07=@RECODE(DAY=@DATEVAL("1/1/2007", "MM/DD/YYYY"),1,0)
series FEB07=@RECODE(DAY=@DATEVAL("2/1/2007", "MM/DD/YYYY"),1,0)
series MAR07=@RECODE(DAY=@DATEVAL("3/1/2007", "MM/DD/YYYY"),1,0)
series APR07=@RECODE(DAY=@DATEVAL("4/1/2007", "MM/DD/YYYY"),1,0)
series MAY07=@RECODE(DAY=@DATEVAL("5/1/2007", "MM/DD/YYYY"),1,0)
series JUN07=@RECODE(DAY=@DATEVAL("6/1/2007", "MM/DD/YYYY"),1,0)
series mar09=@RECODE(DAY=@DATEVAL("3/1/2009", "MM/DD/YYYY"),1,0)
series feb98=@RECODE(DAY=@DATEVAL("2/1/1998", "MM/DD/YYYY"),1,0)
series jul02=@RECODE(DAY=@DATEVAL("7/1/2002", "MM/DD/YYYY"),1,0)

series STR06=1
series STR06=@RECODE(DAY=@DATEVAL("1/1/2006","MM/DD/YYYY"),0,1)
smpl 06:2 %now
series STR06=STR06(-1)

smpl 92:10 %now
```

```
'Create Monthly Dummies

for %mdum JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

   series  {%mdum} =  @DATEPART(@DATE,"MM")

next

JAN= @RECODE(JAN=1, 1,0)

FEB= @RECODE(FEB=2, 1,0)

MAR= @RECODE(MAR=3, 1,0)

APR= @RECODE(APR=4, 1,0)

MAY= @RECODE(MAY=5, 1,0)

JUN= @RECODE(JUN=6, 1,0)

JUL= @RECODE(JUL=7, 1,0)

AUG= @RECODE(AUG=8, 1,0)

SEP= @RECODE(SEP=9, 1,0)

OCT= @RECODE(OCT=10, 1,0)

NOV= @RECODE(NOV=11, 1,0)

DEC= @RECODE(DEC=12, 1,0)


' Read Prices

smpl 92:10 %now

'smpl 92:10 %startforecast

read(B4, s=Base Prices) %REALPRICE RESPRI SGNDPRI SGDPRI LGPRI POLPRI AUXPRI TNGPRI X
GSSNDPRI GSSDPRI GSLPRI GSSLPRI TGPRI TCPRI NAVYPRI Y SWPRI

smpl 92:10 2025:12

read(B4, s=Base Prices) %REALPRICE RESPRI_0 SGNDPRI_0 SGDPRI_0 LGPRI_0 POLPRI_0 AUXPRI_0
TNGPRI_0 X_0 GSSNDPRI_0 GSSDPRI_0 GSLPRI_0 GSSLPRI_0 TGPRI_0 TCPRI_0 NAVYPRI_0 Y_0
SWPRI_0

read(B4, s=Base Prices) %REALPRICE RESPRI_1 SGNDPRI_1 SGDPRI_1 LGPRI_1 POLPRI_1 AUXPRI_1
TNGPRI_1 X_1 GSSNDPRI_1 GSSDPRI_1 GSLPRI_1 GSSLPRI_1 TGPRI_1 TCPRI_1 NAVYPRI_1 Y_1
SWPRI_1

read(B4, s=Low Prices)  %REALPRICE RESPRI_2 SGNDPRI_2 SGDPRI_2 LGPRI_2 POLPRI_2 AUXPRI_2
TNGPRI_2 X_2 GSSNDPRI_2 GSSDPRI_2 GSLPRI_2 GSSLPRI_2 TGPRI_2 TCPRI_2 NAVYPRI_2 Y_2
SWPRI_2

read(B4, s=High Prices) %REALPRICE RESPRI_3 SGNDPRI_3 SGDPRI_3 LGPRI_3 POLPRI_3 AUXPRI_3
TNGPRI_3 X_3 GSSNDPRI_3 GSSDPRI_3 GSLPRI_3 GSSLPRI_3 TGPRI_3 TCPRI_3 NAVYPRI_3 Y_3
SWPRI_3

read(B4, s=High Prices) %REALPRICE RESPRI_4 SGNDPRI_4 SGDPRI_4 LGPRI_4 POLPRI_4 AUXPRI_4
TNGPRI_4 X_4 GSSNDPRI_4 GSSDPRI_4 GSLPRI_4 GSSLPRI_4 TGPRI_4 TCPRI_4 NAVYPRI_4 Y_4
SWPRI_4



'Read Monthly Peak Hour Demands

smpl 95:1 %now

read(ac3, s=TimeSeriesData, t) %INTERNAL MWGPA


smpl 00:10 %now

read(ct6,  s=TimeSeriesData, t) %INTERNAL MWNAVY
```

```
smpl 00:10 %now

genr MWCIV = MWGPA-MWNAVY




cd %DATADIRECTORY


smpl 92:10 %now

' Begin echoing terminal session to a TXT file.


%OFN = %DOCUMENTATIONDIRECTORY + "Regressions " + %tag + ".TXT"

output(t,o) %OFN

pon



'Estimate Customer Equations

'smpl 1997:1 2009:6

equation EQRESCUS.LS   rescus   c ar(1) @movav(emp(-14),1) @movav(gdp(-1)/emp(-1),3)
paka1 paka2 oct99    mar98 apr98

equation EQSGNDCUS.LS  sgndcus  c ar(1) paka1 paka2 oct99    sep99 feb

equation EQSGDCUS.LS   sgdcus   c ar(1) @movav(emp(-6),1)  @movav(gdp(-5)/emp(-5),1)
paka1 paka2 chataan1 chataan3 pongsona2 pongsona3 oct99 sep99 aug03 jul98 sep03 oct00
feb98 dec99 apr97 feb04 nov05 feb mar apr may jun

equation EQLGCUS.LS    lgcus    c ar(1) @movav(gdp(-0)/emp(-0),2) @movav(emp(-1),4) paka1
paka2 paka3  feb02 feb03 may04 aug03 oct03 oct00 jan04

equation EQPOLCUS.LS   polcus   c ar(1) @movav(gdp(-1)/emp(-1),1) @movav(emp(-0),1) paka1
paka2 paka3  chataan1 chataan3 sep99 nov99 may

equation EQGSSNDCUS.LS gssndcus c ar(1) @movav(emp(-3),3)         paka1 paka2 paka3
earthquake3 feb01 oct99 sep00 may02 mar02 apr02

equation EQGSSDCUS.LS  gssdcus  c ar(1) @movav(gdp(-0)/emp(-0),1) paka1 paka2 oct99 feb01
sep00 jul06 mar98 jun05 apr98 feb

equation EQGSLCUS.LS   gslcus   c ar(1) @movav(emp(-3),1)         @movav(gdp(-0)/emp(-
0),5)   paka1 paka2 paka3 feb01 sep00 jul98 sep

equation EQGSSLCUS.LS  gsslcus  c ar(1) @movav(emp(-6),4)         @movav(gdp(-0)/emp(-
0),1)   paka1 feb01 jan06 feb06 nov99 sep99 oct



'Estimate Sales Equations

'smpl 92:10 09:6

equation EQRESKWH.LS   reskwh   c ar(1) billcdd68*rescus  @movav(respri(-3)/(cpi(-
3)/112.3977),1) @movav(rescus(-3),3)  chataan1 chataan2 pongsona1 pongsona2 sep99 jun99

'smpl 96:9 09:6

'equation EQSGNDKWH.LS  sgndkwh  c billcdd65*sgndcus @movav(sgndpri(-1)/(cpi(-
1)/112.3977),1)  earthquake2 pongsona1 pongsona2 chataan2 mar97 jan97 nov96

equation EQSGNDKWH.LS  sgndkwh  c billcdd65*sgndcus @movav(sgndpri(-1)/(cpi(-
1)/112.3977),1)  earthquake2 pongsona1 pongsona2 chataan2 mar97 jan97 nov96  @movav(emp(-
3),3)
```

```
'equation EQSGDKWH.LS   sgdkwh   c billcdd65*sgdcus  @movav(emp(-13),3) @movav(sgdpri(-0)/(cpi(-0)/112.3977),1) paka1 paka2  chataan1    pongsona1 pongsona2 sep98 dec01 feb oct

equation EQSGDKWH.LS   sgdkwh   c billcdd65*sgdcus  @movav(sgdpri(-0)/(cpi(-0)/112.3977),1) paka1 paka2  chataan1    pongsona1 pongsona2 sep98 dec01 feb oct

'smpl 93:1 09:6

equation EQLGKWH.LS    lgkwh    c ar(1) cdd65*lgcus       sep96 paka1 paka3 pongsona1 chataan1  oct00 feb

equation EQPOLKWH.LS   polkwh   c ar(1)             @movav(polpri(-0)/(cpi(-0)/112.3977),1)   earthquake3  pongsona1 jun99 @movav(emp(-10),1)

'smpl 96:10 09:6

'equation EQGSSNDKWH.LS gssndkwh c  cdd80*gssndcus @movav(gssndpri(-0)/(cpi(-0)/112.3977),1)  paka1 paka2 jun99 sep97 jun97 sep98 oct @movav(emp(-5),3)

'equation EQGSSNDKWH.LS gssndkwh c ar(1)             cdd80*gssndcus @movav(gssndpri(-0)/(cpi(-0)/112.3977),1)  paka1 paka2 jun99 sep97 jun97 sep98 oct

equation EQGSSNDKWH.LS gssndkwh c  cdd80*gssndcus @movav(gssndpri(-0)/(cpi(-0)/112.3977),1)  paka1 paka2 jun99 sep97 jun97 sep98 oct @movav(emp(-5),3)

'smpl 99m1 09:6

equation EQGSSDKWH.LS  gssdkwh  c ar(1)             billcdd80*gssdcus @movav(gssdpri(-2)/(cpi(-2)/112.3977),1)  pongsona1 pongsona2   paka2 sep97

'smpl 97:6 09:6

equation EQGSLKWH.LS   gslkwh   c ar(1)             cdd80*gslcus @movav(gslpri(-2)/(cpi(-2)/112.3977),2)   paka1   chataan1 pongsona1 apr98 nov98 sep01 jun

equation EQGSSLKWH.LS  gsslkwh  c ar(1)             gsslcus*billcdd68 @movav(gsslpri(-0)/(cpi(-0)/112.3977),3)   paka1  may00 apr04 jun99 jan01 sep00 jan feb

'smpl 92:10 09:6

'equation EQNAVYKWH.LS  navykwh  c paka1 chataan1 chataan2  chataan3 pongsona1 jun03 may04 may02 feb @movav(emp(-1),1) may jul aug oct dec

equation EQNAVYKWH.LS  navykwh  c ar(1) paka1 chataan1 chataan2  chataan3 pongsona1 jun03 may04 may02 feb may jul aug oct dec



'Estimate MW Equation

'smpl 00:1 09:6

equation EQMWNAVY.LS mwnavy c ar(1) @movav(emp(-10),4) @movav(navypri(-12)/(cpi(-12)/112.3977),1) @movav(gdp(-8)/emp(-8),1)  chataan1 sep05 jan feb mar sep03 jul03

equation EQMWCIV.LS  mwciv  c ar(1) @movav(emp(-8),3)  @movav(respri(-2)/(cpi(-2)/112.3977),2)    pongsona2 pongsona3   oct06 jul06 jan may feb mar aug mar04


poff



'Add section to calculate price forecasts

smpl 1992:10 2026:12

for %PRICE  RESPRI SGNDPRI SGDPRI LGPRI POLPRI AUXPRI GSSNDPRI GSSDPRI GSLPRI GSSLPRI NAVYPRI

     {%PRICE} = @recode({%PRICE}=na,{%PRICE}(-12)*(CPI/CPI(-12)),{%PRICE})
```

```
next


smpl 1992:10 2026:12
genr NORMBILLCDD65 = 0
genr NORMCDD65 = 0
genr NORMBILLCDD68 = 0
genr NORMCDD68 = 0
genr NORMBILLCDD80 = 0
genr NORMCDD80 = 0
genr NORMTHI = 0
genr NORMHI = 0

'Enter Normal Weather Here -- 30 year Billing Weather is entered.
NORMBILLCDD65.fill(o=1993:1,l)    501.0, 463.5, 472.2, 510.4, 538.0, 551.4, 541.2, 530.1,
513.5, 516.8, 523.6, 517.0
NORMCDD65.fill(o=1993:1,l)        487.0, 439.9, 504.6, 516.2, 559.8, 543.1, 539.4, 520.8,
506.3, 527.3, 519.9, 514.0
NORMBILLCDD68.fill(o=1993:1,l)    408.8, 374.6, 383.4, 418.9, 446.5, 459.9, 449.7, 437.1,
422.0, 425.3, 432.1, 426.2
NORMCDD68.fill(o=1993:1,l)        394.0, 355.2, 411.6, 426.2, 466.8, 453.1, 446.4, 427.8,
416.3, 434.3, 429.9, 422.5
NORMBILLCDD80.fill(o=1993:1,l)     43.6,  28.2,  34.6,  55.8,  81.5,  94.9,  86.0,  70.0,
61.9,  65.4,  70.7,  63.6
NORMCDD80.fill(o=1993:1,l)         31.2,  25.3,  43.9,  67.7,  95.4,  94.5,  77.6,  62.3,
61.5,  69.4,  72.0,  55.2
NORMTHI.fill(o=1993:1,l)           76.2,  75.7,  76.1,  77.1,  78.0,  78.4,  78.2,  78.1,
78.1,  78.2,  78.1,  77.3
NORMHI.fill(o=1993:1,l)            84.5,  83.9,  84.9,  86.9,  89.0,  89.8,  89.0,  88.3,
88.3,  88.4,  88.6,  86.9


for %WEATHERR BILLCDD65 CDD65 BILLCDD68 CDD68 BILLCDD80 CDD80 THI HI
     {%WEATHERR} = @recode({%WEATHERR}=na,NORM{%WEATHERR},{%WEATHERR})
next


' Extend monthly dummies
for %MON JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN96 FEB96 MAR96 APR96 MAY96
JUN96 JUL96 AUG96 SEP96 OCT96 NOV96 DEC96 JAN97 FEB97 MAR97 APR97 MAY97 JUN97 JUL97 AUG97
SEP97 OCT97 NOV97 Paka1 Paka2 Paka3 Paka4 APR98 MAY98 JUN98 JUL98 AUG98 SEP98 OCT98 NOV98
DEC98 JAN99 FEB99 MAR99 APR99 MAY99 JUN99 JUL99 AUG99 SEP99 OCT99 NOV99 DEC99 JAN00 FEB00
MAR00 APR00 MAY00 JUN00 JUL00 AUG00 SEP00 OCT00 NOV00 DEC00 JAN01 FEB01 MAR01 APR01 MAY01
JUN01 JUL01 AUG01 SEP01 OCT01 Earthquake1 Earthquake2 Earthquake3 FEB02 MAR02 APR02 MAY02
JUN02 Chataan1 Chataan2 Chataan3 OCT02 NOV02 Pongsona1 Pongsona2 Pongsona3 MAR03 APR03
MAY03 JUN03 JUL03 AUG03 SEP03 OCT03 NOV03 DEC03 JAN04 FEB04 MAR04 APR04 MAY04 JUN04
Tingting1 Tingting2 Tingting3 OCT04 NOV04 DEC04 JAN05 FEB05 MAR05 APR05 MAY05 JUN05 JUL05
AUG05 SEP05 OCT05 NOV05 DEC05 JAN06 FEB06 MAR06 APR06 MAY06 JUN06 JUL06 AUG06 SEP06 OCT06
NOV06 DEC06 JAN07 FEB07 MAR07 APR07 MAY07 JUN07 STR06 dec01 mar09 feb03 feb98 mar98
```

```
     {%MON} = @recode({%MON}=na,{%MON}(-12),{%MON})
next



'Create Add Factors
smpl 1992:10 2041:12
genr rescus_a     =  74 - 102
genr sgndcus_a    =  38 -  34
genr sgdcus_a     =  14 -  14
genr lgcus_a      =   6 -   5
genr polcus_a     = -16 +   4
genr gssndcus_a   =   2 -   3
genr gssdcus_a    =   0 -   1
genr gslcus_a     =  -1 +   1
genr gsslcus_a    = -13 -  13 - 1

genr reskwh_a     = -  886000 +   86000
genr sgndkwh_a    = -  924000 +   67500
genr sgdkwh_a     = - 1259000 +  188500
genr lgkwh_a      = - 1582000 + 1561500
genr polkwh_a     = -    7000 -     400
genr gssndkwh_a   = -  702000 -    3100
genr gssdkwh_a    = -  635000 -   57400
genr gslkwh_a     = -  597000 +  220000
genr gsslkwh_a    =     79000 +     300
genr navykwh_a    = - 2998000

smpl 2010:11 2010:11
'genr reskwh_a = 2510000-3000000

smpl 2010:12 2010:12
'genr reskwh_a = 2510000-5000000

smpl 2011:1 2011:1
'genr reskwh_a = 2510000-5500000

smpl 2011:2 2011:2
'genr reskwh_a = 2510000-11000000

smpl 2011:3 2011:3
'genr reskwh_a = 2510000-3500000
```

```
smpl 2011:4 2011:4
'genr reskwh_a = 2510000-3500000

smpl 2011:9 2011:9
'genr reskwh_a = 2510000-4750000



'Create the Model
%OSN =%DATADIRECTORY + "Regressions " + %tag + ".XLS"
%modname = "GuamForecast"
model {%modname}

for %eqname     EQRESCUS EQSGNDCUS EQSGDCUS EQLGCUS EQPOLCUS EQGSSDCUS EQGSLCUS EQGSSLCUS EQGSSNDCUS EQRESKWH EQSGNDKWH EQSGDKWH EQLGKWH EQPOLKWH EQGSSNDKWH EQGSSDKWH EQGSLKWH EQGSSLKWH EQNAVYKWH EQMWNAVY EQMWCIV
     {%modname}.merge {%eqname}
next

'Holding Street Light Customers constant
smpl 2009:08 2026:12

for %CON GSSLCUS GSSNDCUS GSSDCUS

{%CON} = @recode({%CON}=na, {%CON}(-1), {%CON})

next

'smpl 92:10 2026:12
'genr GSSLCUS_0 = GSSLCUS
'genr GSSLCUS_1 = GSSLCUS
'genr GSSLCUS_2 = GSSLCUS
'genr GSSLCUS_3 = GSSLCUS
'genr GSSLCUS_4 = GSSLCUS

'genr GSSNDCUS_0 = GSSNDCUS
'genr GSSNDCUS_1 = GSSNDCUS
'genr GSSNDCUS_2 = GSSNDCUS
'genr GSSNDCUS_3 = GSSNDCUS
'genr GSSNDCUS_4 = GSSNDCUS

'genr GSSDCUS_0 = GSSDCUS
'genr GSSDCUS_1 = GSSDCUS
```

```
'genr GSSDCUS_2 = GSSDCUS
'genr GSSDCUS_3 = GSSDCUS
'genr GSSDCUS_4 = GSSDCUS



'Prepare the Baseline forecast
smpl %STARTFORECAST 2026:12

@add(v) rescus   rescus_a
@add(v) sgndcus  sgndcus_a
@add(v) sgdcus   sgdcus_a
@add(v) lgcus    lgcus_a
@add(v) polcus   polcus_a
@add(v) gssndcus gssndcus_a
@add(v) gssdcus  gssdcus_a
@add(v) gslcus   gslcus_a
@add(v) gsslcus  gsslcus_a

@add(v) reskwh   reskwh_a
@add(v) sgndkwh  sgndkwh_a
@add(v) sgdkwh   sgdkwh_a
@add(v) lgkwh    lgkwh_a
@add(v) gssndkwh gssndkwh_a
@add(v) gssdkwh  gssdkwh_a
@add(v) polkwh   polkwh_a
@add(v) gslkwh   gslkwh_a
@add(v) gsslkwh  gsslkwh_a
@add(v) navykwh  navykwh_a

{%modname}.addassign(v) rescus
{%modname}.addassign(v) sgndcus
{%modname}.addassign(v) sgdcus
{%modname}.addassign(v) lgcus
{%modname}.addassign(v) polcus
{%modname}.addassign(v) gssndcus
{%modname}.addassign(v) gssdcus
{%modname}.addassign(v) gslcus
{%modname}.addassign(v) gsslcus

{%modname}.addassign(v) reskwh
{%modname}.addassign(v) sgndkwh
```

```
{%modname}.addassign(v) sgdkwh
{%modname}.addassign(v) lgkwh
{%modname}.addassign(v) gssndkwh
{%modname}.addassign(v) gssdkwh
{%modname}.addassign(v) polkwh
{%modname}.addassign(v) gslkwh
{%modname}.addassign(v) gsslkwh
{%modname}.addassign(v) navykwh


{%modname}.solve(s=d,i=a)

'Forecast Baseline Revenues
genr RESREVF  = RESKWH_0  * RESPRI
genr SGNDREVF = SGNDKWH_0 * SGNDPRI
genr SGDREVF  = SGDKWH_0  * SGDPRI
genr LGREVF   = LGKWH_0   * LGPRI
genr POLREVF  = POLKWH_0  * POLPRI
genr GSSNDREVF= GSSNDKWH_0* GSSNDPRI
genr GSSDREVF = GSSDKWH_0 * GSSDPRI
genr GSLREVF  = GSLKWH_0  * GSLPRI
genr GSSLREVF = GSSLKWH_0 * GSSLPRI
genr NAVYREVF = NAVYKWH_0 * NAVYPRI

for %REVENUE RESREV SGNDREV SGDREV LGREV POLREV GSSNDREV GSSDREV GSLREV GSSLREV NAVYREV
        {%REVENUE} = @recode({%REVENUE}=na, {%REVENUE}F,{%REVENUE})
next


'Forecast MWGPA
genr MWGPA_0      = MWCIV_0+MWNAVY_0
genr EMP_0        = EMP
genr GDP_0        = GDP

smpl 1995:1 2026:12
for %MW MWGPA
        {%MW}_0 = @recode({%MW}_0=na, {%MW},{%MW}_0)
next



'Forecast the Low Tourism and Low Infastructure Scenario
```

```
{%modname}.scenario(n, a=_1) "Low Tourism and Infastructure Scenario"

pageselect quarterly
smpl 2009q1 2026q4
read( cn7, s=ScenarioII,t) %SCENARIO EMP
read(cn13, s=ScenarioII,t) %SCENARIO GDP
read( cn4, s=ScenarioII,t) %SCENARIO POPULATION

pageselect monthly
smpl 1993:1 2026:12
link emp
emp.linkto(c=i)        quarterly::emp
link gdp
gdp.linkto(c=i)        quarterly::gdp
link population
population.linkto(c=i) quarterly::population


'Prepare the Low Tourism and Low Infastructure forecast
smpl %STARTFORECAST 2026:12

{%modname}.solve(s=d,i=a)

'Forecast Baseline Revenues
genr RESREV_1  = RESKWH_1  *RESPRI
genr SGNDREV_1 = SGNDKWH_1 *SGNDPRI
genr SGDREV_1  = SGDKWH_1  *SGDPRI
genr LGREV_1   = LGKWH_1   *LGPRI
genr POLREV_1  = POLKWH_1  *POLPRI
genr GSSNDREV_1= GSSNDKWH_1*GSSNDPRI
genr GSSDREV_1 = GSSDKWH_1 *GSSDPRI
genr GSLREV_1  = GSLKWH_1  *GSLPRI
genr GSSLREV_1 = GSSLKWH_1 *GSSLPRI
genr NAVYREV_1 = NAVYKWH_1 *NAVYPRI

smpl 1992:10 2026:12
for %REVENUE RESREV SGNDREV SGDREV LGREV POLREV GSSNDREV GSSDREV GSLREV GSSLREV NAVYREV
        {%REVENUE}_1 = @recode({%REVENUE}_1=na, {%REVENUE},{%REVENUE}_1)
next

'Forecast MWGPA
genr MWGPA_1      = MWCIV_1+MWNAVY_1
```

```
'genr EMP_1        = EMP
'genr GDP_1        = GDP

smpl 1995:1 2026:12
for %MW MWGPA
       {%MW}_1 = @recode({%MW}_1=na, {%MW},{%MW}_1)
next

'Forecast the Marines Delayed to 2017 Scenario
{%modname}.scenario(n, a=_2) "High Tourism and Low Infastructure Scenario"

pageselect quarterly
smpl 2009q1 2026q4
read(cn7, s=ScenarioIII,t) %SCENARIO EMP
read(cn13, s=ScenarioIII,t) %SCENARIO GDP
read(cn4, s=ScenarioIII,t) %SCENARIO POPULATION

pageselect monthly
smpl 1993:1 2026:12
link emp
emp.linkto(c=i) quarterly::emp
link gdp
gdp.linkto(c=i) quarterly::gdp
link population
population.linkto(c=i) quarterly::population


'Prepare the Marines Delayed until 2017 forecast
smpl %STARTFORECAST 2026:12

{%modname}.solve(s=d,i=a)


'Forecast Baseline Revenues
genr RESREV_2  = RESKWH_2*RESPRI
genr SGNDREV_2 = SGNDKWH_2*SGNDPRI
genr SGDREV_2  = SGDKWH_2*SGDPRI
genr LGREV_2   = LGKWH_2*LGPRI
genr POLREV_2  = POLKWH_2*POLPRI
genr GSSNDREV_2= GSSNDKWH_2*GSSNDPRI
genr GSSDREV_2 = GSSDKWH_2*GSSDPRI
genr GSLREV_2  = GSLKWH_2*GSLPRI
```

```
genr GSSLREV_2 = GSSLKWH_2*GSSLPRI
genr NAVYREV_2 = NAVYKWH_2*NAVYPRI

smpl 1992:10 2026:12
for %REVENUE RESREV SGNDREV SGDREV LGREV POLREV GSSNDREV GSSDREV GSLREV GSSLREV NAVYREV
       {%REVENUE}_2 = @recode({%REVENUE}_2=na, {%REVENUE},{%REVENUE}_2)
next

'Forecast MWGPA
genr MWGPA_2      = MWCIV_2+MWNAVY_2

smpl 1995:1 2026:12
for %MW MWGPA
       {%MW}_2 = @recode({%MW}_2=na, {%MW},{%MW}_2)
next


'Forecast the Low Tourism and High Infastructure Scenario
{%modname}.scenario(n, a=_3) "Low Tourism and High Infastructure Scenario"

pageselect quarterly
smpl 2009q1 2026q4
read(cn7, s=ScenarioIV,t) %SCENARIO EMP
read(cn13, s=ScenarioIV,t) %SCENARIO GDP
read(cn4, s=ScenarioIV,t) %SCENARIO POPULATION

pageselect monthly
smpl 1993:1 2026:12
link emp
emp.linkto(c=i) quarterly::emp
link gdp
gdp.linkto(c=i) quarterly::gdp
link population
population.linkto(c=i) quarterly::population


'Prepare the Low Tourism and High Infastructure forecast
smpl %STARTFORECAST 2026:12

{%modname}.solve(s=d,i=a)
```

```
'Forecast Baseline Revenues
genr RESREV_3= RESKWH_3*RESPRI
genr SGNDREV_3= SGNDKWH_3*SGNDPRI
genr SGDREV_3= SGDKWH_3*SGDPRI
genr LGREV_3= LGKWH_3*LGPRI
genr POLREV_3= POLKWH_3*POLPRI
genr GSSNDREV_3= GSSNDKWH_3*GSSNDPRI
genr GSSDREV_3= GSSDKWH_3*GSSDPRI
genr GSLREV_3= GSLKWH_3*GSLPRI
genr GSSLREV_3= GSSLKWH_3*GSSLPRI
genr NAVYREV_3= NAVYKWH_3*NAVYPRI

smpl 1992:10 2026:12
for %REVENUE RESREV SGNDREV SGDREV LGREV POLREV GSSNDREV GSSDREV GSLREV GSSLREV NAVYREV
        {%REVENUE}_3 = @recode({%REVENUE}_3=na, {%REVENUE},{%REVENUE}_3)
next

'Forecast MWGPA
genr MWGPA_3      = MWCIV_3+MWNAVY_3

smpl 1995:1 2026:12
for %MW MWGPA
        {%MW}_3 = @recode({%MW}_3=na, {%MW},{%MW}_3)
next



'Forecast the High Tourism and High Infastructure Scenario
{%modname}.scenario(n, a=_4) "High Tourism and High Infastructure Scenario"

pageselect quarterly
smpl 2009q1 2026q4
read(cn7,  s=ScenarioV,t) %SCENARIO EMP
read(cn13, s=ScenarioV,t) %SCENARIO GDP
read(cn4,  s=ScenarioV,t) %SCENARIO POPULATION

pageselect monthly
smpl 1993:1 2026:12
link emp
emp.linkto(c=i) quarterly::emp
link gdp
gdp.linkto(c=i) quarterly::gdp
```

```
link population
population.linkto(c=i) quarterly::population



'Prepare the High Tourism and High Infastructure forecast
smpl %STARTFORECAST 2026:12

{%modname}.solve(s=d,i=a)



'Forecast Baseline Revenues
genr RESREV_4= RESKWH_4*RESPRI
genr SGNDREV_4= SGNDKWH_4*SGNDPRI
genr SGDREV_4= SGDKWH_4*SGDPRI
genr LGREV_4= LGKWH_4*LGPRI
genr POLREV_4= POLKWH_4*POLPRI
genr GSSNDREV_4= GSSNDKWH_4*GSSNDPRI
genr GSSDREV_4= GSSDKWH_4*GSSDPRI
genr GSLREV_4= GSLKWH_4*GSLPRI
genr GSSLREV_4= GSSLKWH_4*GSSLPRI
genr NAVYREV_4= NAVYKWH_4*NAVYPRI

smpl 1992:10 2026:12
for %REVENUE RESREV SGNDREV SGDREV LGREV POLREV GSSNDREV GSSDREV GSLREV GSSLREV NAVYREV
        {%REVENUE}_4 = @recode({%REVENUE}_4=na, {%REVENUE},{%REVENUE}_4)
next

'Forecast MWGPA
genr MWGPA_4      = MWCIV_4 + MWNAVY_4

smpl 1995:1 2026:12
for %MW MWGPA
        {%MW}_4 = @recode({%MW}_4=na, {%MW},{%MW}_4)
next



smpl 2001:1 2026:12

'Store forecast in a Spreadsheet called "Forecast %NOW.XLS"
%OSN = %DATADIRECTORY + "Forecast " + %tag + ".XLS"
```

```
' Write Results to FORECAST spreadsheet output file

smpl 2001:1 2026:12

write(t=xls) %OSN RESCUS_0  SGNDCUS_0  SGDCUS_0  LGCUS_0    POLCUS_0  GSSNDCUS_0
GSSDCUS_0 GSLCUS_0   GSSLCUS_0 RESKWH_0 _

                  SGNDKWH_0 SGDKWH_0   LGKWH_0   POLKWH_0   polKWH_0  GSSNDKWH_0
GSSDKWH_0 GSLKWH_0   GSSLKWH_0 NAVYKWH_0 _

                  RESPRI    SGNDPRI    SGDPRI    LGPRI      POLPRI    polPRI
GSSNDPRI  GSSDPRI    GSLPRI    GSSLPRI _

                  NAVYPRI   BILLCDD65  MWGPA_0   RESREV     SGNDREV   SGDREV      LGREV
POLREV     polREV    GSSNDREV _

                  GSSDREV   GSLREV     GSSLREV   NAVYREV    RESCUS_1  SGNDCUS_1
SGDCUS_1  LGCUS_1    POLCUS_1  GSSNDCUS_1 _

                  GSSDCUS_1 GSLCUS_1   GSSLCUS_1 RESKWH_1   SGNDKWH_1 SGDKWH_1    LGKWH_1
POLKWH_1   polKWH_1  GSSNDKWH_1 _

                  GSSDKWH_1 GSLKWH_1   GSSLKWH_1 NAVYKWH_1  MWGPA_1   RESREV_1
SGNDREV_1 SGDREV_1   LGREV_1   POLREV_1 _

                  polREV_1  GSSNDREV_1 GSSDREV_1 GSLREV_1   GSSLREV_1 NAVYREV_1
RESCUS_2  SGNDCUS_2  SGDCUS_2  LGCUS_2 _

                  POLCUS_2  GSSNDCUS_2 GSSDCUS_2 GSLCUS_2   GSSLCUS_2 RESKWH_2
SGNDKWH_2 SGDKWH_2   LGKWH_2   POLKWH_2 _

                  polKWH_2  GSSNDKWH_2 GSSDKWH_2 GSLKWH_2   GSSLKWH_2 NAVYKWH_2   MWGPA_2
RESREV_2   SGNDREV_2 SGDREV_2 _

                  LGREV_2   POLREV_2   polREV_2  GSSNDREV_2 GSSDREV_2 GSLREV_2
GSSLREV_2 NAVYREV_2  RESCUS_3  SGNDCUS_3 _

                  SGDCUS_3  LGCUS_3    POLCUS_3  GSSNDCUS_3 GSSDCUS_3 GSLCUS_3
GSSLCUS_3 RESKWH_3   SGNDKWH_3 SGDKWH_3 _

                  LGKWH_3   POLKWH_3   polKWH_3  GSSNDKWH_3 GSSDKWH_3 GSLKWH_3
GSSLKWH_3 NAVYKWH_3  MWGPA_3   RESREV_3 _

                  SGNDREV_3 SGDREV_3   LGREV_3   POLREV_3   polREV_3  GSSNDREV_3
GSSDREV_3 GSLREV_3   GSSLREV_3 NAVYREV_3 _

                  RESCUS_4  SGNDCUS_4  SGDCUS_4  LGCUS_4    POLCUS_4  GSSNDCUS_4
GSSDCUS_4 GSLCUS_4   GSSLCUS_4 RESKWH_4 _

                  SGNDKWH_4 SGDKWH_4   LGKWH_4   POLKWH_4   polKWH_4  GSSNDKWH_4
GSSDKWH_4 GSLKWH_4   GSSLKWH_4 NAVYKWH_4 _

                  MWGPA_4   RESREV_4   SGNDREV_4 SGDREV_4   LGREV_4   POLREV_4
polREV_4  GSSNDREV_4 GSSDREV_4 GSLREV_4 _

                  GSSLREV_4 NAVYREV_4  MWNAVY_0  MWNAVY_1   MWNAVY_2  MWNAVY_3
MWNAVY_4  MWCIV_0    MWCIV_1   MWCIV_2 _

                  MWCIV_3   MWCIV_4    EMP_0     EMP_1      EMP_2     EMP_3       EMP_4
GDP_0      GDP_1     GDP_2 _

                  GDP_3     GDP_4      CPI


stop

close all objects

exit
```

B Environmental Strategic Plan

Environmental Strategic Plan (ESP)

NOVEMBER 2012

ENVIRONMENTAL STRATEGIC TEAM

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TABLE OF CONTENTS

1. INTRODUCTION

The Guam Power Authority (GPA) has adopted an Environmental Strategic Plan (ESP) to guide its actions through the next five years as it strives to continue to maintain an environmentally sound effort to provide safe, affordable electrical power to the people of Guam.

Recently, the environmental requirements of the US Environmental Protection Agency (USEPA) and the Guam Environmental Protection Agency (Guam EPA) have made a step change in demands on GPA to provide a clean environment for the people and environment of Guam. Because of the large number of increasing requirements it is important for GPA to have an orderly plan so that decisions on meeting the new requirements are made in a reasoned and timely manner rather than responding to the latest rule on an ad hoc basis because time to comply is short. This document sets out a road map for the next five years to provide context for individual compliance decisions.

2. PURPOSE OF THE PLAN

2.1 Background

GPA currently has an Environmental Policy (Appendix A) which guides compliance with current environmental requirements. The Planning and Regulatory Division ensures the application of this policy throughout the Authority. With the Environmental Strategic Plan (ESP), this policy is enhanced to address planning and proactive preparation for upcoming regulations.

2.2 Purpose

It is GPA's intention to meet the regulations under each of the Environmental Acts of the United States.

GPA intends to do this in a way that maximizes the environmental benefits of its actions to the people of Guam and preserves or enhances the environment of Guam.

This ESP first reviews the known objectives and requirements of the environmental agencies and then presents the GPA plan for meeting those objectives and requirements. The document will continually develop as new environmental requirements and regulations are introduced, or as current environmental requirements and regulations are updated.

3. US EPA STRATEGIC PLAN

The US EPA published its Strategic Plan[1] in September of 2010. The plan outlines a wide range of objectives, some of which apply to Guam and others which do not. The following is a summary of the objectives and potential issues for Guam and GPA.

3.1 Taking Action on Climate Change

US EPA's plan is to reduce Greenhouse Gas Emissions (GHG) from manmade sources. The immediate and foreseeable impacts of this initiative on GPA are as follows:

1. GPA must provide an annual report on its GHG emissions; these will be public. This requirement already exists, and GPA is complying with the reporting provisions having submitted its first report in March of 2011 and second report in March 2012. The EPA data base shows that 97,195 Metric Tonnes (MT) of Carbon Dioxide Equivalent (CO2e) were reported for Cabras and 189,601 MT CO2e were reported for Tanguisson. GPA needs to insure that each year these are complete and calculated correctly. Fines are possible for misreporting. No emission limits flow from this reporting rule.

2. Modifications to the existing power plants which trigger New Source Review (increases in emissions) or new fossil fuel power plants will require Best Available Control Technology (BACT) determinations for GHG emissions. In general, BACT has been confined to use of the most energy efficient practices which harmonize energy goals and GHG goals. Projects such as the re-commissioning of the Dededo Combustion Turbine Plant might be subject to these new requirements. So far, the requirements do not specify a change in fuel, i.e. if the proposed project is for oil firing, the BACT process does not require consideration of natural gas, but that may change. Every effort to increase fuel efficiency (reducing CO2 emissions) should be taken in these projects so that permitting can go smoothly. GPA will have to prepare application material which address energy efficiency. Energy efficiency projects could include any energy use at the generating station. Longer permitting times can be expected.

3. US EPA has proposed to promulgate a revised New Source Performance Standard (NSPS) for electric generation sources specifically for GHG emissions reductions which might also apply to existing power plants with projects such as those included in the re-commissioning Dededo Combustion Turbine Plant. The Proposal was made in the spring of 2012. Previews of the NSPS suggest that energy efficiency projects at the plants will be the subject of the NSPS and include the possibility of specifying use of natural gas. The proposed limit was 1000 lbs of CO_2 per Megawatt hour. GPA must follow this regulatory effort closely.

4. There is a push toward energy efficiency. Therefore, moving toward more efficient operations throughout the Balance of Plant throughout GPA is one source of reductions, whether it is in backup power generation, facility lighting, air conditioning, energy star appliances, water heating, etc. A complete baseline and reductions can be reported consistent with the national Climate Registry for calculations. The primary measure will be fuel use per electric output. A baseline per plant is advisable. Prior actions which reduced energy use should be cataloged.

5. A major focus of US EPA's GHG plans is on reductions of GHG from automobiles and trucks as well as off-road vehicles. To this end US EPA is proposing substantial increases in the miles per gallon requirements for such vehicles. GPA could be involved in such an effort for Guam. The switch to Ultra Low Sulfur Diesel (ULSD) fuel is an example of GPA's lead role in this effort. A further progress to electric vehicles might be next. Final rule on this proposal has not yet been promulgated.

6. US EPA's goals include assisting communities in making adaptations to potential global warming effects. The potential effects on Guam would primarily be increased sea surface temperature. This would lead to increased atmospheric temperature on Guam and air conditioning load. Whether increase in sea surface temperature would lead to more frequent typhoons is a matter of scientific debate, but it is possible. The other potential global warming effect on Guam is an increased sea surface height. There are significant consequences for the Cabras and Tanguisson power plants themselves if there are significant sea level rises, but there are also consequences for the entire island. There is presently no timeline on this effort.

3.2 Improving Air Quality

US EPA has already taken several actions to strengthen the national Ambient Air Quality Standards (NAAQS) and contemplates further actions. These have significant effects on air quality on Guam and for GPA. By pollutant, these are the changes:

1. Sulfur Dioxide (SO_2): EPA added a new 1-hour average NAAQS which is, in the cases of Cabras and Tanguisson, 6 to 7 times more restrictive than the old NAAQS, i.e. requiring at least six times greater reduction in emissions to meet the NAAQS. This adds to the current problem that the Piti and Tanguisson areas are non-attainment for the old NAAQS. Additionally, EPA is considering that non-attainment with the NAAQS would be determined by modeling alone. This NAAQS is a significant challenge for GPA and will be discussed in more detail later. The Guam EPA is required by the rule to submit to US EPA a compliance plan by June 2013, however, EPA is still considering what portions of the compliance plan will need to be submitted on that date. Compliance with the NAAQS is required by June of 2017.

2. Nitrogen Dioxide (NO_2): EPA has added a new 1-hour average NAAQS which is seven to eight (7-8) times more restrictive than the old NAAQS. NO_2 concentrations have never previously been addressed on Guam. It is expected that every generation plant will have trouble complying with this new NAAQS.

3. Particulate Matter: EPA has promulgated a new NAAQS for particulate matter less than 2.5 microns in size. There are both stringent annual average and 24 hour average NAAQS. There have never been $PM_{2.5}$ measurements taken on Guam. There were some PM_{10} measurements taken in 1999-2000 at one location which were relatively low but did not measure the impact of the power plants. Because of fugitive dust sources and the presence of significant sea salt in the air, the situation may be important. EPA proposed a further reduction to the annual average NAAQS be made to a range of 11-13 $\mu g/m^3$.

   US EPA has a goal of studying and promulgating regulations directed at the emissions of black carbon. Since the emissions of oil firing contain black carbon, GPA's plants may be subject to such a rule. Rulemaking schedule has not yet been set. Control of particulate emissions would be expected.

4. There are also NAAQS for Carbon Monoxide, Ozone and Lead. Keeping in mind that RICE MACT required reduction in carbon monoxide for reciprocal internal combustion engines, these NAAQS are not expected to be attainment issues on Guam.

3.3 Guam Environmental Protection Agency

The Guam EPA seeks to enforce the US Environmental laws and provide a safe, clean environment for Guam.

4. GPA'S ENVIRONMENTAL STRATEGIC PLAN

GPA intends to publish this Environmental Strategic Plan (ESP) in November of 2012. This ESP illustrates GPA's progress in complying with current and upcoming regulatory requirements. It includes GPA's plans to address or mitigate the potential issues from and impacts of these regulatory requirements.

4.1 Air Quality Compliance

4.1.1 National Ambient Air Quality Standards (NAAQS)

4.1.1.1 Regulatory Requirements

Compliance with the goal of meeting the NAAQS is primarily measured by measurements of emissions from each generating station as required by the air quality permits issued by the Guam EPA. Appendix C lists all the activities undertaken by GPA to meet these emission limitations.

The following descriptions of air pollutants being measured under NAAQS is from the U.S. Environmental Protection Agency website.

Sulfur Dioxide

SO_2 is one of a group of highly reactive gasses known as "oxides of sulfur." The largest sources of SO_2 emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. SO_2 is linked with a number of adverse effects on the respiratory system.[1]

Nitrogen Dioxide

NO_2 is one of a group of highly reactive gasses known as "oxides of nitrogen," or "nitrogen oxides (NOx)." Other nitrogen oxides include nitrous oxide and nitric oxide. While EPA's National Ambient Air Quality Standard covers this entire group of NO_x, NO_2 is the component of greatest interest and the indicator for the larger group of nitrogen oxides. NO_2 forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system.[2]

[1] http://www.epa.gov/airquality/sulfurdioxide/

[2] http://www.epa.gov/air/nitrogenoxides/

Particulate Matter

"Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.[3]

4.1.1.2 *Situation Analysis*

The portions of Guam that are located within a 3.5 kilometer radius of the Cabras-Piti and Tanguisson power generating facilities are currently designated as non-attainment areas for the 24-hour average SO_2 NAAQS. That determination was made in the 1980's and has not been reconfirmed. That NAAQS and those non-attainment area designations will remain in effect until U.S. EPA approves a State Implementation Plan (SIP) that demonstrates attainment and maintenance of the new and more stringent 1-hour average SO_2 NAAQS.

Also, a number of new U.S. EPA regulations have been promulgated, such as the short term 1-hour average SO_2 and NO_2 and the new, lower $PM_{2.5}$ NAAQS which require States and U.S. Territories to reevaluate their SIPs to see if further action is necessary to ensure that the new NAAQS are met.

EPA first set standards for NO_2 in 1971, setting both a primary standard (to protect health) and a secondary standard (to protect the public welfare) at 0.053 parts per million (53 ppb), averaged annually. All areas in the U.S. meet the current (1971) NO_2 standards.

On January 22, 2010, EPA strengthened the health-based NO_2 NAAQS by setting a new 1-hour NO_2 standard at the level of 100 parts per billion (ppb). This level defines the maximum allowable concentration anywhere in an area. It will protect against adverse health effects associated with short-term exposure to NO_2.[4] This new standard is expected to be much stricter than the annual standard

[3] http://www.epa.gov/airquality/particlepollution/

[4] http://www.epa.gov/air/nitrogenoxides/pdfs/20100122fs.pdf

and it is likely that many major sources of NO_2 emissions will find it difficult to demonstrate compliance through dispersion modeling procedures. Considering the potential need to support an attainment demonstration, it seems prudent to include monitoring of NO_2 in the proposed monitoring plan. GPA proposes to include continuous monitors to determine NO_2 at representative sites in the vicinity of the GPA facilities as described in the following sections.

Based on its review of the air quality criteria and NAAQS for particulate matter, EPA promulgated revisions to the primary and secondary NAAQS for PM on October 16, 2006. With regard to primary standards for fine particles, EPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 micrograms per cubic meter ($\mu g/m^3$) and retaining the level of the annual $PM_{2.5}$ standard at 15 $\mu g/m^3$. With regard to primary standards for particles generally less than or equal to 10 µm in diameter (PM_{10}), EPA retained the 24-hour PM_{10} and revoked the annual PM_{10} standard. With regard to secondary PM standards, EPA made them identical in all respects to the primary PM standards, as revised.[5]

In March of 1999, GPA, the US EPA and the Guam EPA signed a consent agreement which establishes that compliance with the NAAQS for SO2 be maintained by a system which allows use of 2% sulfur residual oil fuel when the winds are blowing the emissions out to sea and the use of 1.19% sulfur residual oil when the winds are blowing toward the land.

GPA has provided ambient air quality monitoring of SO2 between 1995 and 2001. Much of this monitoring preceded the changes in emissions resulting from the Consent decree. The maximum concentrations measured at several locations during these various monitoring programs are as follows:

Nimitz Hill (3 hour)	270 ppb (707 $\mu g/m^3$)
Apra Heights (3 hour)	189 ppb (495 $\mu g/m^3$)
Piti mayor's Office (3 hour)	171 ppb (448 $\mu g/m^3$)
Dededo (1 hour)	160 ppb (419 $\mu g/m^3$)

These results show compliance with the 3 Hour average NAAQS. The results are, however, in excess of the new one hour average NAAQS.

In 2011 and 2012, Air quality Dispersion Modeling was performed in preparation for the submittal of an Ambient Air Quality Monitoring (AAQM) plan. This modeling was performed with the model AERMOD at maximum emission rates for all island power plants SO_2 sources. The results of the modeling are as follows:

[5] http://www.gpo.gov/fdsys/pkg/FR-2006-10-17/html/06-8477.htm

TABLE 1: AERMOD at MAXIMUM EMISSION RATES

Nimitz Hill

Period	Concentration (µg/m^3)	NAAQS (µg/m^3)
1-HR	2072.00	196
3-HR	2955.17	1300
24-HR	931.54	365
Annual	99.54	80

Tanguisson

Period	Concentration (µg/m^3)	NAAQS (µg/m^3)
1-HR	6516.90	196
3-HR	5447.60	1300
24-HR	2767.41	365
Annual	135.86	80

Despite the modeled analysis of concentrations over the standards, the Guam Power Authority, in working with their consultant, TRC Environmental, has reason to believe that because of the conservatisms in the modeling and the previous monitoring results that it is meeting the NAAQS at all locations on the island. Because there is no current monitoring program this supposition cannot be confirmed. In June 2012, GPA submitted an Ambient Air Quality Monitoring Plan to US EPA, and proposed that a monitoring program be established. GPA is awaiting EPA approval of the proposed program after which installation, operation and maintenance of the AAQM Program shall commence.

4.1.1.3 *Future Compliance Considerations*

GPA will have to expend more resources on compliance due in part to the new NAAQS.

First there is the need for a monitoring program including the permanent shelters needed for the monitors and the electrical supply for the stations. GPA will need additional manpower to run, maintain and analyze the data from the monitoring.

If the monitoring should find violations of the NAAQS, GPA will need to commit to emissions reductions to attain these NAAQS. These emission reductions could come in the form of air pollution control equipment, lower sulfur fuels or a change in oil fuels to natural gas.

4.1.1.4 *Proposed Actions*

- **Perform Air Quality Monitoring**

While dispersion modeling may be used to demonstrate compliance with the NAAQS, it has become increasingly difficult to demonstrate compliance with the much stricter NAAQS and the conservative nature of the available models. Therefore it is prudent, especially for areas that are already designated as non-attainment, to consider monitoring of actual conditions. Ambient air quality data, by itself cannot be used to demonstrate attainment of the new 1- hour SO_2 NAAQS. It can, however, be indispensable in assessing the accuracy and applicability of the required regulatory modeling analyses. Thus the monitoring plan includes a proposal to monitor the three newest and most important regulated pollutants with the strictest NAAQS requirements, SO_2, NO_2 and particulate matter, including PM10 and $PM_{2.5}$.

The proposed monitoring program includes monitoring of both $PM_{2.5}$ and PM_{10} at three locations on the Island to characterize the current conditions of ambient concentration of PM that can be used to support demonstrations of compliance with the NAAQS.

GPA submitted an Air Quality Monitoring Plan (AAQM) to Guam EPA and US EPA in June 2012 so that approval of the plan can be obtained to support compliance demonstration. Upon receiving approval, Air Quality Monitoring will commence.

- **State Implementation Planning**

The new SO_2 one hour NAAQS compliance process required Guam EPA to submit a proposal for attainment/non-attainment areas in June 2011. Guam EPA proposed that the island be declared "Unclassified", meaning that the EPA had no data on which to base a determination of the attainment status of the island.

The next step in the compliance process is slated for June 2013 at which time Guam EPA will be required to submit changes to the SIP to maintain the NAAQS. At some time after June 2013, US EPA may advise Guam that the NAAQS is not being met. This determination may come through modeling analysis or monitoring data and US EPA has yet to delineate exactly how this will be done. GPA should track these activities and assist Guam EPA with the modeling or monitoring data as needed.

If US EPA declares Guam or portions of Guam as not attaining the NAAQS Guam EPA will need to submit a State Implementation Plan for attaining compliance with the one hour SO_2 NAAQS. GPA will assist Guam EPA in the development of this plan. If one year's worth of monitoring data is available, this data will be used in the construction of this plan and hopefully limit the control of SO_2 emissions required from Cabras and Tanguisson. Air pollution emission control options are as follows:

1. Construction and operation of a SO_2 scrubber to remove the amount of SO2 required in order to meet the standard. Appendix B describes the costs and issues related to the construction of a scrubber.
2. Reduced the sulfur content of the fuel sufficiently to meet the NAAQS. Under this option the cost of fuel goes up.
3. Switch to liquefied natural gas imports for fuel. GPA should be prepared to estimate the costs of this fuel switch.

The deadline for compliance with the one hour SO_2 NAAQS is June 2017.

4.1.1.5 *Economic Impact*

The AAQM once begun is expected to cost $1,280,000 for outside contracting costs in the first year and an average of $730,000 per year in the next 4 years (total expected $3,845,000). Additional support and analysis efforts by GPA personnel can be expected to cost $100,000 per year.

The development of the SIP plans and consulting on NAAQS Redesignation will require almost $200,000 for outside consulting support over the next few years. The 2013 SIP requirements will take $50,000 for consulting support and the 2014-2015 period of SIP development will take on the order of $150,000 for consulting support.

4.1.2 *Green House Gas (GHG) Reporting*

4.1.2.1 *Regulatory Requirements*

GPA is required to provide an annual report on its GHG emissions that will be made public. GPA has been complying with the reporting provisions since March of 2011. GPA needs to insure that these are correct, complete and calculated correctly.

4.1.2.2 *Situation Analysis*

Given the current regulatory agenda, there is nothing in addition to reporting GHG emissions that is required of GPA, unless a new power generation unit is constructed or significant changes are made to existing generation units. In either case, GPA may be required to reduce GHG emissions by either increasing energy efficiency at existing stations or consider only natural gas as a fuel for new generation units (Guam is currently exempt from that proposed requirement).

4.1.2.3 *Future Compliance Considerations*

The current manpower requirements for reporting GHG emissions on a yearly basis will continue for the foreseeable future. No additional cost for GHG regulatory efforts would be needed unless a triggering change is made at an existing generation unit. If, so, a major capital cost may be incurred to build any required energy efficiency project, but that cost may be offset by the energy efficiency savings. If GPA changes fuel, the reporting requirements would remain the same.

From 2011 onward, changes in emissions of GHG greater than 75,000 tons per year of CO_2 equivalent emissions at any existing power plant facility will trigger the requirement for a new source review permit. This permit activity will include Best Available Control technology determinations for GHG emissions and force, at least, fuel efficiency requirements and at most, changes in fuels to those which emit less GHG, i.e. LNG. If EPA promulgates the currently proposed New Source Performance Standard for steam electric generation, GPA would be restricted to LNG as a fuel for any future generation projects.

4.1.2.4 Status and Progress

There are no current limits on GHG emissions for the existing generation fleet. Any energy efficiency projects undertaken now by GPA can be used as credits against future BACT requirements.

4.1.2.5 Economic Impact

There is no significant cost in reporting GHG emissions. No additional manpower or budget is required to support his requirement.

4.1.3 Maximum Achievable Control Technology

4.1.3.1 Regulatory Requirements

There are three recently promulgated MACT standards which apply to GPA and IPP power units on Guam. These are:

- **Steam Electric Generation**: On December 16, 2011 EPA promulgated MACT standards for steam electric generation units (also referred to as the Boiler MACT). These include Cabras 1 and 2 and Tanguisson 1 and 2. The standards require a significant reduction of metals and chloride emissions from these four units. The Federal register notice is set to appear in March. The compliance date is March 2014 with a potential for a one year extension. It appears that GPA will have to control metals emissions based on a recent CAA Information Collection Request ICR test at Cabras 1. In addition, Cabras 1 and 2 and Tanguisson 1 and 2 may have to control acid gases. Options for emissions controls are discussed more later. Fuel and stack testing will need to be done to verify compliance status. Further information is in Appendix C.
- **Diesel Engines**: EPA's new MACT standard for diesel engines applies to all the diesel engines of GPA and the IPPs. It requires that Carbon Monoxide (CO) emissions be controlled by 70%. Guam was exempted from the portion of the MACT which would have required a change of fuel. The compliance date is May 2013.

- **Combustion Turbines**: EPA's new MACT standard for combustion turbines (CT) does not apply directly to the GPA combustion turbines because none are located at major sources for Hazardous Air Pollutants (HAP). The MACT for CTs is important should a CT be modified triggering a New Source Review permit requirement, such as at Dededo. The determination of Best Available Control Technology would probably involve meeting the MACT requirements. This is discussed more in Section 4.2.1.

4.1.3.2 Situation Analysis

Based on ICR testing results, GPA is currently not complying with Non-Continental US Standards for Steam Electric Generation. TRC has provided options for GPA to consider in complying with this standard.

GPA is also subject to the RICE MACT for all fast track (medium speed) diesel units and the Cabras 3&4 and MEC 8&9 slow speed diesel units. GPA has applied to US EPA for a one year extension for the fast track diesels and exemption for the slow speed diesels.

4.1.3.3 Status and Progress

Steam Electric Generation

GPA has filed a notice of applicability for the Boiler MACT. The units subject to the rule are Cabras 1 & 2 and Tanguisson 1 & 2. Compliance requirements include the installation of Electrostatic Precipitators (ESP) on each unit. However, the NAAQS compliance requirements would require installation of scrubbers that would also address compliance issues with the Boiler MACT. The installation of the ESP would still require additional equipment to address the SO2 and other air quality standards two years later, however the scrubbers could address both but would require an earlier installation. The initial compliance date for the Boiler MACT is May 2015. It is expected that GPA could obtain a one year extension and request for an additional year which would place the installation date just a month before the NAAQS compliance date. This would allow GPA the additional timeframe to install required equipment and still meet both rules.

Diesel Engine

In August 2012 GPA filed a request for a one year extension from the RICE MACT for all the units burning Ultra Low Sulfur Diesel Fuel because there is not enough time to comply. In this same filing, GPA has requested an exemption for the slow diesel units (Cabras 3 & 4 and Piti 8 &9) firing residual fuel oil because compliance requires the changing of fuel or several hundred million dollars for compliance equipment.

4.1.3.4 Future Compliance Considerations

Appendices B and C illustrate GPA's options for complying with the Steam Electric Generation MACT rule and the RICE MACT.

4.1.3.5 Economic Impact

The Boiler MACT will cost approximately $48,400,000 for ESP installations on the Cabras and Tanguisson steam units. As indicated earlier, GPA could remove this cost entirely by advancing the installation of the NAAQS compliance equipment, scrubbers. The cost for the scrubbers is estimated at $220,000,000 for wet scrubbers or $362,000,000 for dry scrubbers. In addition, quarterly testing shall is estimated to cost $200,000 per year for all four steam units.

The RICE MACT is estimated to cost $2,200,000 in capital costs and $300,000 per year for compliance at the Ultra-Low Sulfur Diesel Units (assuming that the Dededo diesels are not included). At the slow speed diesels however, the cost would be $100,000,000 to $400,000,000 capital costs for control or more than $70,000,000 per year increase fuel and maintenance costs if fuel was converted to Ultra Low Sulfur Diesel.

4.1.4 Community Right to Know Act

4.1.4.1 Regulatory Requirements

GPA is required to file a Tier 2 and a Toxic Release Inventory annually for the previous year's emissions. The Toxic Release Inventory is submitted normally by July 1st, while the Tier 2 deadline is every March 1st.

4.1.4.2 On-going Compliance Activities

Annual development of the emissions inventory and submission of the forms is required.

4.1.4.3 Future Compliance Considerations

There are no foreseen changes in the Community Right to know Act requirements expected at this time.

4.1.4.4 Economic Impact

Emission inventory and submission costs are included in the annual Planning and Regulatory Division Budget. There are no additional economic impacts expected in complying with the regulatory requirements.

4.2 Water Quality Compliance

4.2.1 Regulatory Requirements

GPA is required to maintain and comply with a National Pollutant Discharge and Elimination System (NPDES) permit for both Cabras and Tanguisson because of the use of seawater in cooling and the discharge of heated water back to the ocean. Tanguisson has been issued a permit. Cabras is expecting to get the permit issued soon.

Renewal of the permits include the completion of requirements to meet the proposed changes to cooling water intake structures.

4.2.2 Situation Analysis

Protecting America's Waters
GPA has federal permits for its uses of water at the steam electric power plants, Cabras and Tanguisson. These are called National Pollutant Discharge and Elimination System (NPDES) permits. EPA proposed in March, 2011 to add to the requirements for steam electric utilities the elimination of once through cooling systems. Since both plants use deep ocean water gathered offshore and returned at higher temperature to the deep ocean environment, these proposed rules could require a major shift in water intake structures or the selection of a closed cycle cooling system (cooling towers). The Final 316(b) Phase II and Phase III Entrainment and impingement rule has been rescheduled for July of 2013. EPA secured an additional year to finalize standards for the cooling water intake structures under a modified settlement agreement. Compliance would need to be achieved when the facility NPDES permit is renewed or within 8 years, whichever is earlier.

The Spill Prevention Control and Countermeasures (SPCC) program is a significant point of emphasis with EPA and GPA is working to strengthen its SPCC plans.

4.2.3 Proposed Actions

GPA Water Resources

Given the potential for changes in 316(b) requirements under the Clean Water Act, GPA will be investigating whether its cooling water systems for Cabras and Tanguisson will need alteration to comply or whether closed cycle cooling systems will need to be employed.

4.2.4 Future Compliance Considerations

A detailed survey of the impacts of the cooling water intake system to the environment should be completed. The following details regarding extent of damage done to the environment should be included, such as:

- how many species and what quantity of species are taken into the system;
- the status and effectiveness of the current systems to avoid such intakes;
- design recommendations to solve issues and adverse impacts; and
- any exceedance of the limits set in the proposed rule shall be included in the Final rule expected July 27, 2013.

4.2.5 Economic Impact

The study is proposed at $300,000 including GPA resources. The engineering and construction of any corrections to the traveling grate systems are unquantifiable at this time.

4.3 Major Modifications or Upgrades

4.3.1 Regulatory Requirements

Whenever GPA decides to modify existing units, a determination should be made by GPA of the need for a federal New Source Review (NSR) permit.

An NSR permit requires that Best Available Control technology (BACT) be used to control emissions. Emissions subject to such controls include SO2, NOx, Particulate Matter, CO, hydrocarbons, metals and chlorine and fluorine. Most importantly, the BACT requirements now extend to GHG emissions. BACT is almost always more stringent than the New Source performance Standards (NSPS) for the subject source.

Currently, any SO2 emissions from Cabras-Piti or Tanguisson would be subject to additional requirements including off setting any new SO2 emissions. These requirements must be strictly adhered to because many utilities across the US have been sued by US EPA for non-compliance with these rules.

4.3.2 *Situation Analysis*

Most modifications at existing power plants would be subject to these rules. In addition, restarting a unit after virtual non-use for more than 5 years, such as the Dededo CT Units, require an NSR permit and a BACT evaluation.

4.3.3 *Proposed Action*

GPA should ensure that all modifications for existing power generation and other air pollutant emitting units are evaluated by Planning and Regulatory Division. A determination should be made of the likelihood of the need for a permit. If deemed necessary, outside experts should be consulted on the likelihood of the need for a permit.

Lastly, GPA should request an "applicability determination" from US EPA. Such determinations can take on the order of 60-90 days.

If GPA is pressed for time, a NSR application can be prepared under the assumption that an NSR permit is needed. Most straight forward NSR applications take 60-90 days to prepare and 6-9 months for US EPA to review and issue. The key point of the analysis is the BACT requirements for each pollutant and the modeling to demonstrate attainment.

4.3.4 *Economic Impact*

The cost of preparing a NSR permit application ranges from $50,000- 200,000 depending on the complexity of the project and the complexity of the modeling required by US EPA.

4.4 Installation of New Resources or Infrastructure

4.4.1 *Regulatory Requirements*

Whenever GPA decides to build a new unit, a determination should be made by GPA of the need for a federal New Source Review (NSR) permit. An NSR permit requires that Best Available Control technology (BACT) be used to control emissions. Emissions subject to such controls include SO2, NOx, Particulate Matter, CO, hydrocarbons, metals and chlorine and fluorine. Most importantly, the BACT requirements now extend to GHG emissions. BACT is almost always more stringent than the New Source performance Standards (NSPS) for the subject source. Currently, any SO2 emissions from Cabras-Piti or Tanguisson would be subject to additional requirements including off setting any new SO2 emissions. These requirements must be strictly adhered to because many utilities across the US have been sued by US EPA for non-compliance with these rules.

4.4.2 Situation Analysis

New units are subject to these rules regardless of the type of fuel to be used.

4.4.3 Proposed Action

GPA should insure that all new generation units and other air pollutant-emitting units be evaluated by the Planning and Regulatory Division. A determination should be made by GPA personnel of the likelihood of the need for a permit.

If deemed necessary, outside experts should be consulted on the likelihood of the need for a permit. Lastly, GPA should request an “applicability determination” from US EPA. Such determinations can take on the order of 60-90 days.

If GPA is pressed for time, a NSR application can be prepared under the assumption that an NSR permit is needed. Most straight forward NSR applications take 60-90 days to prepare and 6-9 months for US EPA to review and issue. The key point of the analysis is the BACT requirements for each pollutant and the modeling to demonstrate attainment.

The currently proposed NSPS for new electric generating units would impose the use of natural gas, however “non-continental” sources are proposed to be exempted.

Changes in fuel pipelines and fuel storage facilities are subject to SPCC plans and construction requirements that vary with the nature and size of the operation or tank.

Environmental personnel should be consulted on every project to determine if environmental requirements are triggered.

4.4.4 Economic Impact

The cost of preparing a NSR permit application ranges from $50,000- $200,000 depending on the complexity of the project and the complexity of the modeling required by US EPA.

4.5 Oil Pollution Act of 1990

4.5.1 Regulatory Requirements

The Cabras oil storage area and the pipeline to Tanguisson are subject to the requirement to have and maintain both a Facility Response Plan (FRP) for the actions to be taken in the event of an oil spill into waters of the US and a Spill Prevention and Control Plan (SPCC). The requirements for the contents of these documents change from time to time and GPA must keep up with the latest requirements and keep the documents up to date.

4.5.2 Situation Analysis

Currently GPA has the FRP and SPCC plans that are required.

4.6 GPA Energy Resources

4.6.1 Fuels and Air Quality

Currently Guam, and thus GPA, relies on only one category of generation fuel, oil. An objective of this plan is to make headway toward a wider option of fuels for electric power generation. The most logical environmental alternative is natural gas which would have to be imported as liquefied natural gas (LNG). LNG would have several environment advantages:

- No sulfur in the fuel and therefore a complete resolution of the SO_2 non-attainment issue.
- Lower NO_2 emissions because there is no nitrogen in the fuel (there would still be NOx emissions from the nitrogen involved in combustion of air).
- Lower Green House Gas (GHG) emissions because of more efficient use of the carbon in the fuel.
- Near elimination of particulate matter emissions, including metals.
- Replacement of oil pipelines with natural gas pipelines to the various plants, reducing the potential environmental impact of the pipelines.

The potential benefits to the environment of Guam call for consideration of LNG. The longest environmental deadline for a switch to LNG is June of 2017 which is the deadline for compliance with the SO_2 NAAQS. Nearer term deadlines can be addressed, if LNG is the goal.

If LNG is not available, continued reliance on oil will force several key environmental compliance decisions:

1. **Compliance with the SO_2 NAAQS will require reductions in SO2 emissions.**

   This can be done in three ways:

   A. Demonstrate through Ambient Air Quality Monitoring (AAQM) and modeling consistent with that monitoring that compliance can be attained through small reductions in the sulfur content of oil to the 1% range.
   B. Reduce sulfur content of oil to ppm ranges at significant cost to show attainment with current EPA modeling requirements.
   C. Adopt emissions controls on SO2 emissions (scrubbers) to reduce emissions.

   The selection of one of these three options must be made prior to Guam EPA's submission of a control plan the meet the SO2 NAAQS to EPA. GPA's SPORD and P&R Divisions are actively coordinating with Guam EPA with regards to significant dates and requirements regarding the NAAQS.

   Before 2017, GPA must make decisions on meeting the MACT standards which have earlier deadlines than the SO2 compliance.

   Work on compliance with the MACT for diesel engines must begin immediately to assure compliance be May 2013. It is expected that oxidation catalyst control devices would need to be installed, but stack testing to determine CO emissions is needed now for engineering planning.

   Compliance with the steam electric MACT at Cabras and Tanguisson will require a scrubber or electrostatic precipitator to remove metals and a dry sorbent to remove chlorides by April 2015 or, with an extension, April 2016. Because these dates precede the SO_2 compliance date, GPA will have to decide whether to switch to LNG or build a scrubber for SO2 control by 2015 or ask for an extension to 2017 for either of these compliance options. *(A properly designed scrubber for SO_2 would also be able to control metals and chloride emissions)*

   The need to address the air quality issues at specific plants can arise at any point in time if modifications to a specific plant are proposed which trigger New Source Performance Standards (NSPS), MACT and/or New Source Review (NSR). When these programs are triggered, the specific plant must come into compliance with all of the air quality regulations before the modifications can be implemented. For instance, the potential for refurbishing the combustion turbines at Dededo and bringing them back on line may require NSR and would thus require MACT and modeling analysis showing that it meets all the NAAQS. This would be a significant burden on the project and could lead to delays of 6 to 9 months while the permit was obtained. Such projects could trigger changes in fuel or controls before the overall strategy is set.

2. **Renewable / Alternative Resources**

   The appropriate environmental strategy is to support, encourage and participate in any new generation from alternative sources of energy.

   GPA has proposed and will continue to pursue the Seawater Air Conditioning Project. Technological and funding advances which would make this project viable will be continually investigated.

   GPA will continue its current Renewable Acquisition plan, issuing out the Phase II solicitation by early 2013. Guam has significant wind resources on the eastern side of the island and efforts to tap this source of energy will be pursued. However, biomass and waste to energy technologies may offer firm power which is more desirable.

   GPA will watch advances in wave power, solar power and nuclear power for advances which would make them viable options for Guam. The development of new modular (less than 60 MW) nuclear plants has the potential to make construction easier and cheaper and provide for much lower generation costs.

3. **Energy Use Reduction**

   GPA has already invested in energy use reduction programs and will continue to invest in these programs in order to reduce the demand and growth of demand.

4.7 Infrastructure and Asset Management

4.7.1 GPA Pipeline Management

The Planning and Regulatory Division completed yearly pipeline assessments for GPA's Fuel Supply System. The Central Maintenance Division is responsible for daily/continuous maintenance an inspections.

GPA recognizes the need for a more aggressive approach to the maintenance and operation of its fuel pipelines, in preparation for potential compliance requirements from federal agencies such as EPA or Depart of Transportation.

GPA intends to initiate a program for continuous improvement of its oil pipeline system. Activities may include pipeline assessment, smart pigging, integrity testing, and other activities related to improving pipeline condition, making it safer and less prone to leakage.

4.7.2 *GPA Automotive Fleet Management*

GPA will manage its automotive fleet to take advantage of new opportunities for energy use and emission reduction. In 2010 and 2011, GPA actively supported the transition to Ultra-Low Sulfur Diesel. The use of electric vehicles is another effort GPA could adopt in support of energy use and emission reduction for its automotive fleet.

4.7.3 *Good housekeeping*

The Planning and Regulatory Division ensures Good Housekeeping through regular inspection of the various GPA facilities, the purpose of which is to ensure that pollutants are not making their way into storm water runoff from GPA sites.

4.8 Community Involvement

4.8.1 *GPA Waste and Recycling Programs*

GPA has been working toward complete recycling of its power plant and office wastes and will continue adding to it as opportunities for recycling become available and cost effective.

4.8.2 *Cleaning up Communities and Advancing Sustainability*

Clean up means remediation or reuse of contaminated properties in environmentally sound ways and land preservation. EPA's goals with respect to electric utility wastes are directed at fossil fuel combustion wastes. GPA currently has no combustion wastes but may acquire such wastes as a result of using control devices for air emissions control. Such wastes are generally treated by Federal rule as exempt from the solid waste requirements. Should GPA begin producing such wastes, every effort should be made to either reuse the material or find acceptable ways to store or dispose of the material.

4.8.3 *Ensuring Chemical Safety and Preventing Pollution*

This EPA goal is focused on product chemical safety and not related to GPA activities. Pollution prevention, however, would be focused on the integrity and safety of GPA's oil pipelines. These programs also cover each generation location, the offices and any other operational property of GPA. GPA currently provides Toxic Release Inventory (TRI) reporting for the cleaning materials it uses.