Forecast procedure

1) Previous forecast recap and verification results
2) Weather briefing for next 24 hours
3) Forecast for next 24 hours

A company such as WE Energies must make sure that there is enough natural gas on hand to meet the customer demand and maintain pipe pressures. This is accomplished by making a forecast of the next day's gas demand, which is primarily a function of temperature and wind speed. The base price for natural gas is about $7 per dekatherm (Dth, 1 thousand cubic feet). If the temperature turns out to be warmer (or less windy) than expected, than the gas demand will be reduced. Storage capacity is limited, so this extra natural gas must be shed (sold) at a loss of $1 per Dth. Conversely, if the temperature is colder (or windier) than expected, then they need to buy extra gas at higher market prices (an extra $5 per Dth). They can protect against this cost to a degree by buying upfront (before the start of the gas year) some "swing volume" (extra gas available each day up to the purchased limit) at $100 per Dth (any additional natural gas beyond the swing will cost the extra $5 per Dth). How much "swing volume" to buy depends on your estimate of how large your forecast errors will actually be. You will make this choice before we begin forecasting for the WinterIM period.

Example #1. Suppose your forecast for 24-hour average temperature and wind translates to a required gas volume of 110,000 Dth. But the temperature is colder than expected, increasing demand by an additional 20,000 Dth. Without swing volume protection, then the gas cost for this day is:

110,000 Dth x $7/Dth +20,000 Dth x $12/Dth = $1,010,000

and for a perfect forecast, the gas cost would be:

130,000 Dth x $7/Dth = $910,000

so that the forecast error cost is:

$1,010,000 - $910,000 = **$100,000**

If 10,000 Dth swing volume was purchased at the beginning of the year, then this cost is:

10,000 Dth x $100/Dth over 365 days = $2,740 per day

and the gas cost for that same forecast is:

110,000 Dth x $7/Dth +swing(10,000 x $8/Dth + $2,740) + 10,000 Dth x $12/Dth = $972,740

for a forecast error cost of:

$972,740 - $910,000 = **$62,740**

In this case, the swing volume reduced the cost of the forecast error. At some point, however, increasing swing volume will be counterproductive.

Example #2. Suppose your forecast for 24-hour average temperature and wind translates to a required gas volume of 110,000 Dth. But the temperature is warmer than expected, decreasing demand by an additional 20,000 Dth. Then, the gas cost for this day is:

90,000 Dth x \$7/Dth +\$20,000 Dth x (\$7/Dth - \$6/Dth) = \$650,000

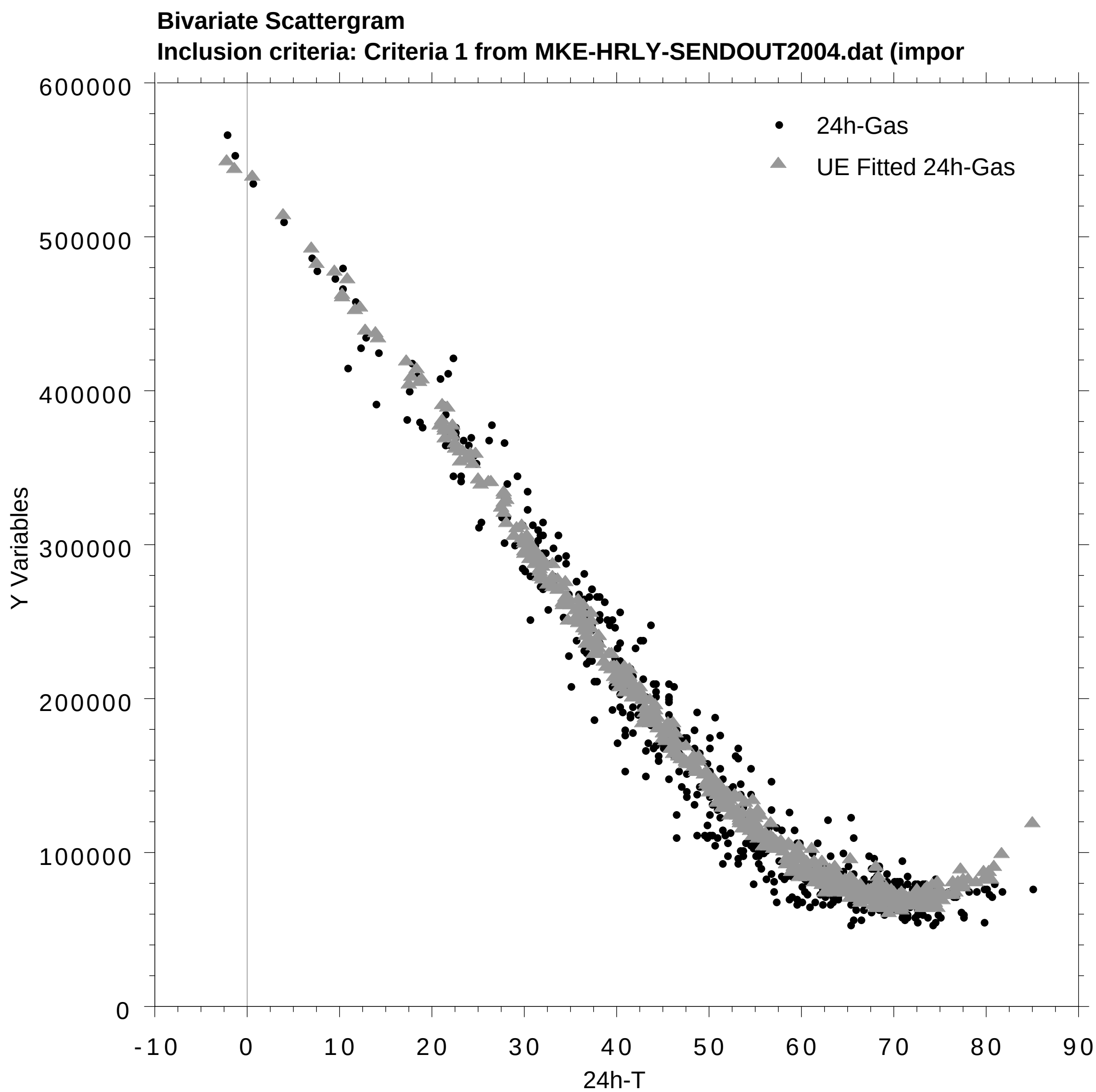
and for a perfect forecast, the gas cost would be:

90,000 Dth x \$7/Dth = \$630,000

for a forecast error cost of:

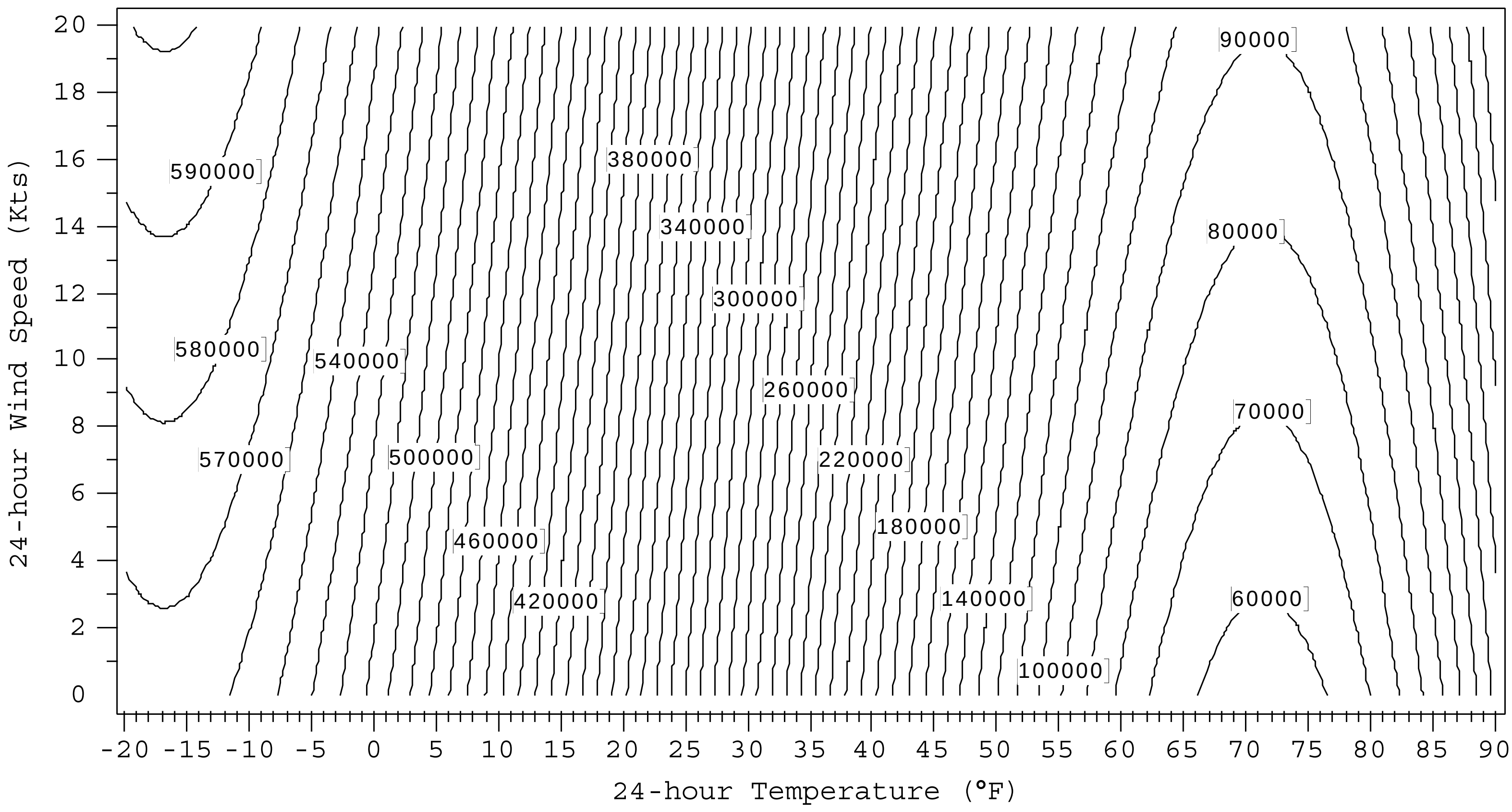
\$650,000 - \$630,000 = **\$20,000**

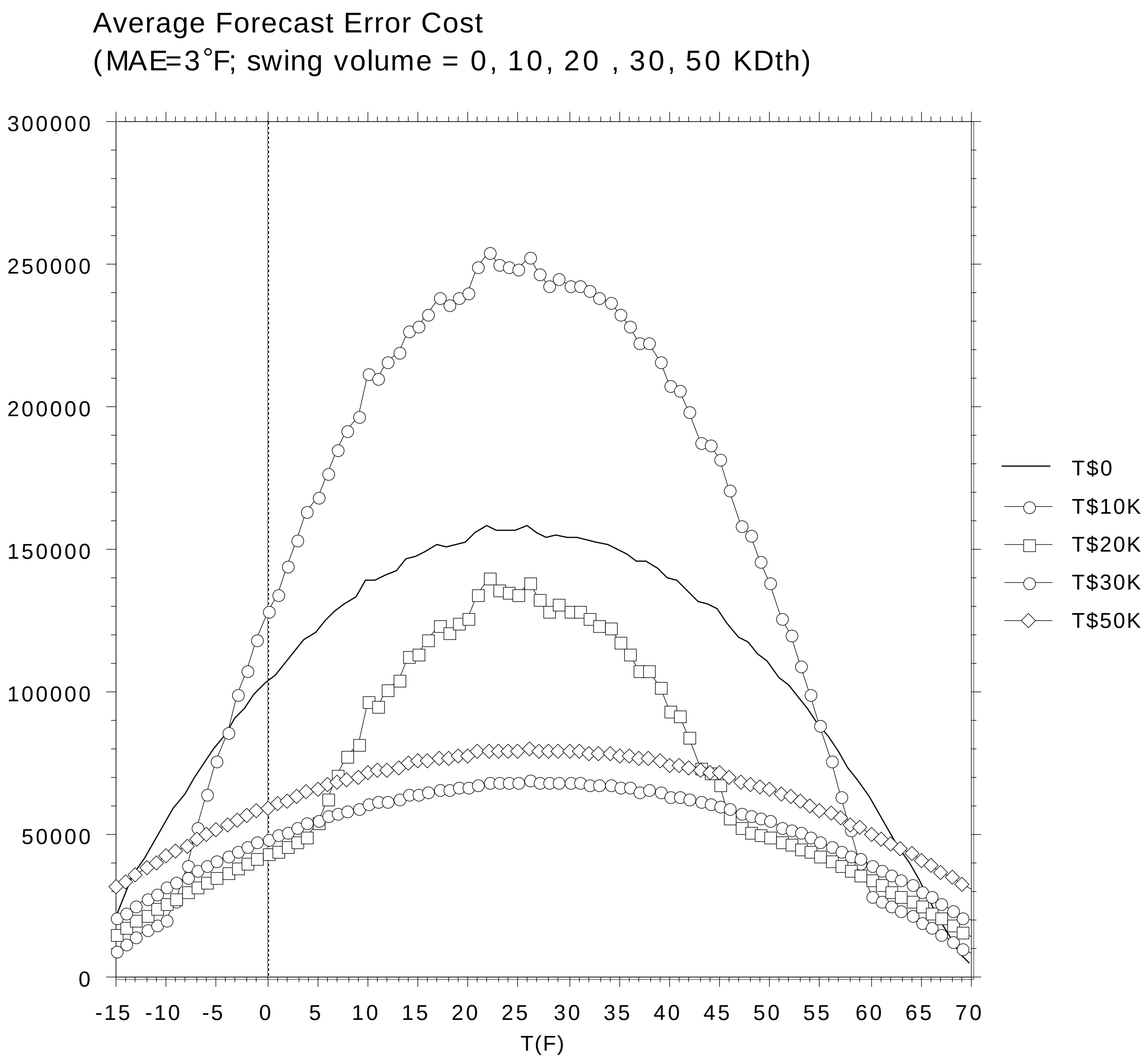
If, as in example #1, you had purchased swing volume, than you would be charged this as well, for a forecast error cost of \$20,000+\$2,740=\$22,740 (note that you are charged the swing volume daily cost, whether or not you need it).



Bivariate Scattergram
Inclusion criteria: Criteria 1 from MKE-HRLY-SENDOUT2004.dat (impor
24h-Gas
UE Fitted 24h-Gas
Y Variables
24h-T
600000
500000
400000
300000
200000
100000
0
-10
0
10
20
30
40
50
60
70
80
90

24-hour Gas Usage (dekatherms)




Average Forecast Error Cost
(MAE=3°F; swing volume = 0, 10, 20 , 30, 50 KDth)
300000
250000
200000
150000
100000
50000
0
-15
-10
-5
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
T(F)
T$0
T$10K
T$20K
T$30K
T$50K