ADVANTICA

Improving Forecasts

Introduction

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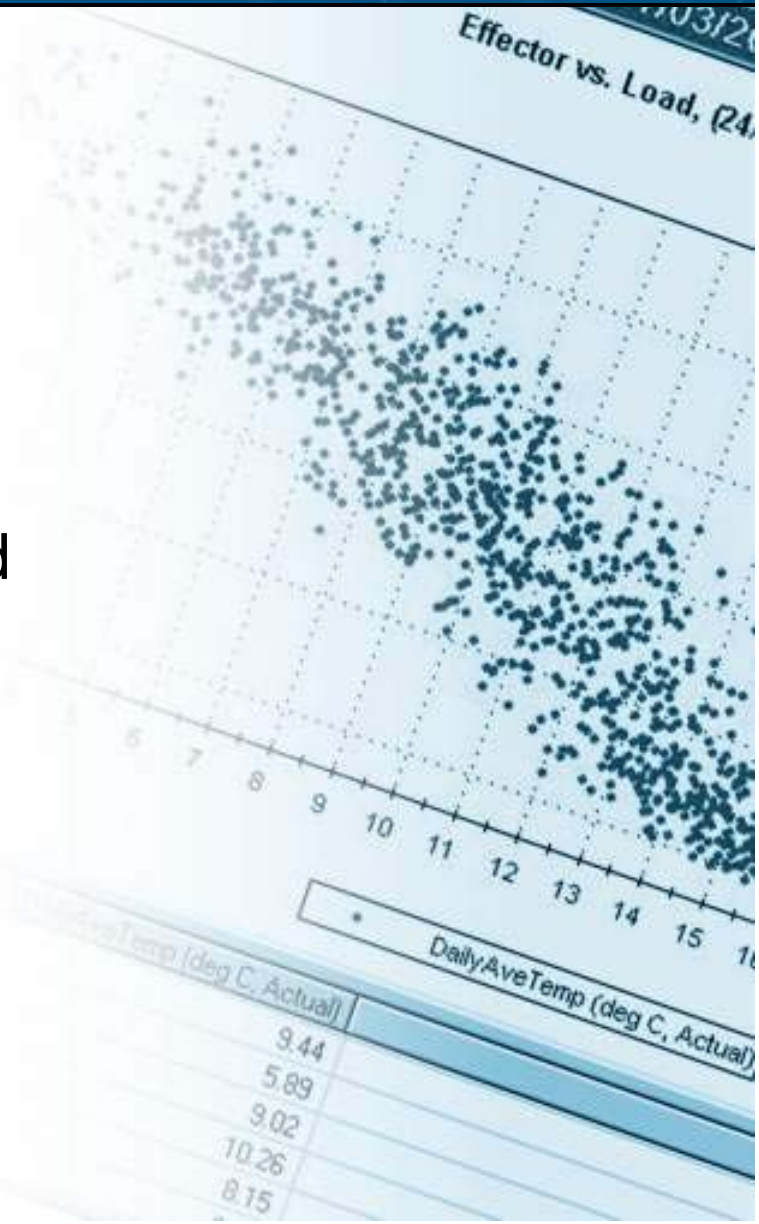
- One of the powerful features of Forecaster is the ability to try out and test different predictors easily
- The Scenario Analysis Module provides facilities to copy meters, assign and test new predictors and try out different scenarios
- Improved predictors can then be deployed very quickly on the live system



Introduction

- In this example, we will show how Forecaster can be used to improve the forecast performance for a small part of a gas network
- Initially, the model being used to forecast the gas demand for the next day is quite simple
- The forecast is based on the average of the previous 2 weeks load using the load from the same day of the week

Looking at Performance

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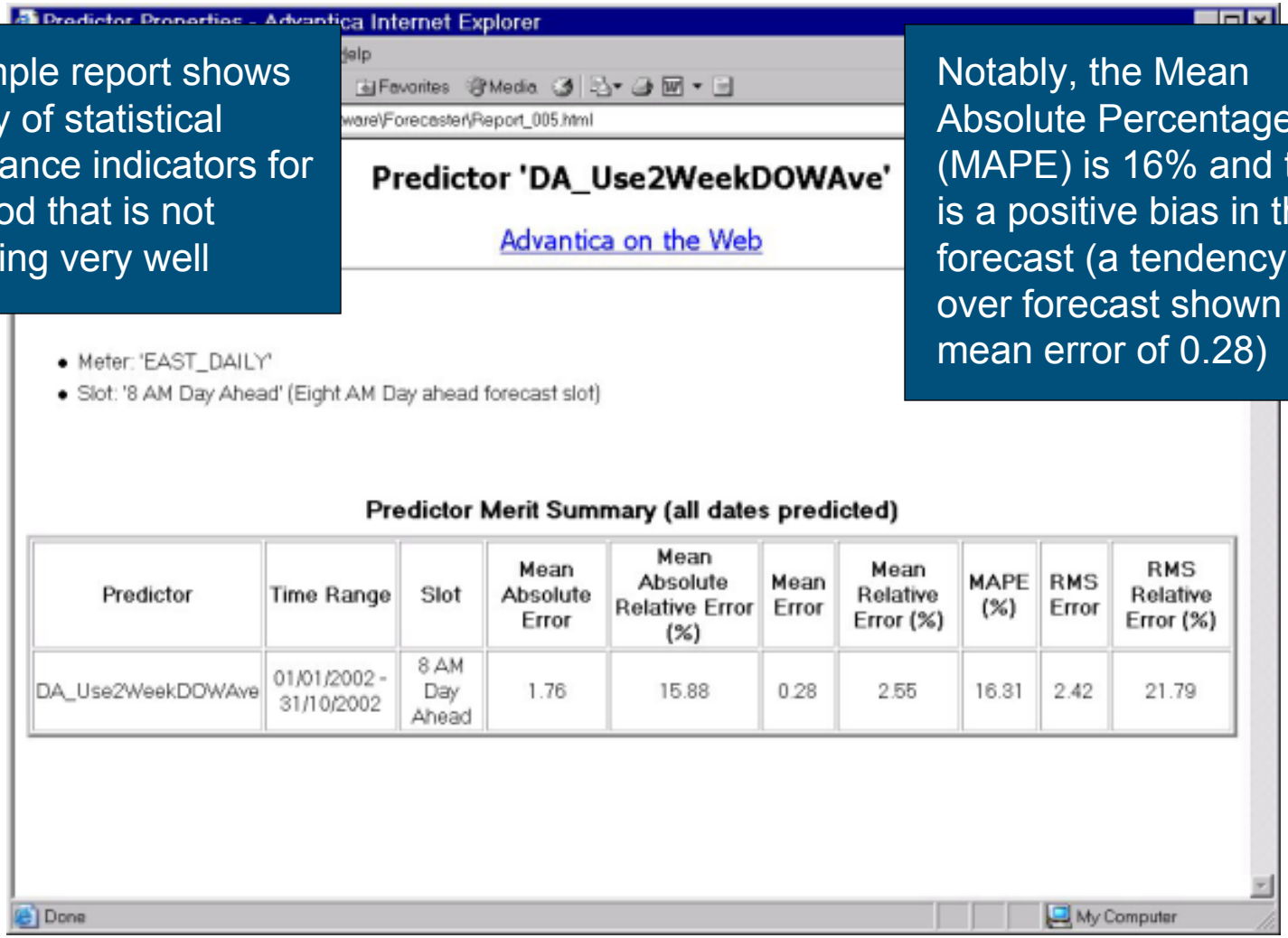
This simple report shows a variety of statistical performance indicators for the period that is not performing very well



Predictor	Time Range	Slot	Mean Absolute Error	Mean Absolute Relative Error (%)	Mean Error	Mean Relative Error (%)	MAPE (%)	RMS Error	RMS Relative Error (%)
DA_Use2WeekDOWAve	01/01/2002 - 31/10/2002	8 AM Day Ahead	1.76	15.88	0.28	2.55	16.31	2.42	21.79

Notably, the Mean Absolute Percentage Error (MAPE) is 16% and there is a positive bias in the forecast (a tendency to over forecast shown by the mean error of 0.28)

Classifying Behaviour

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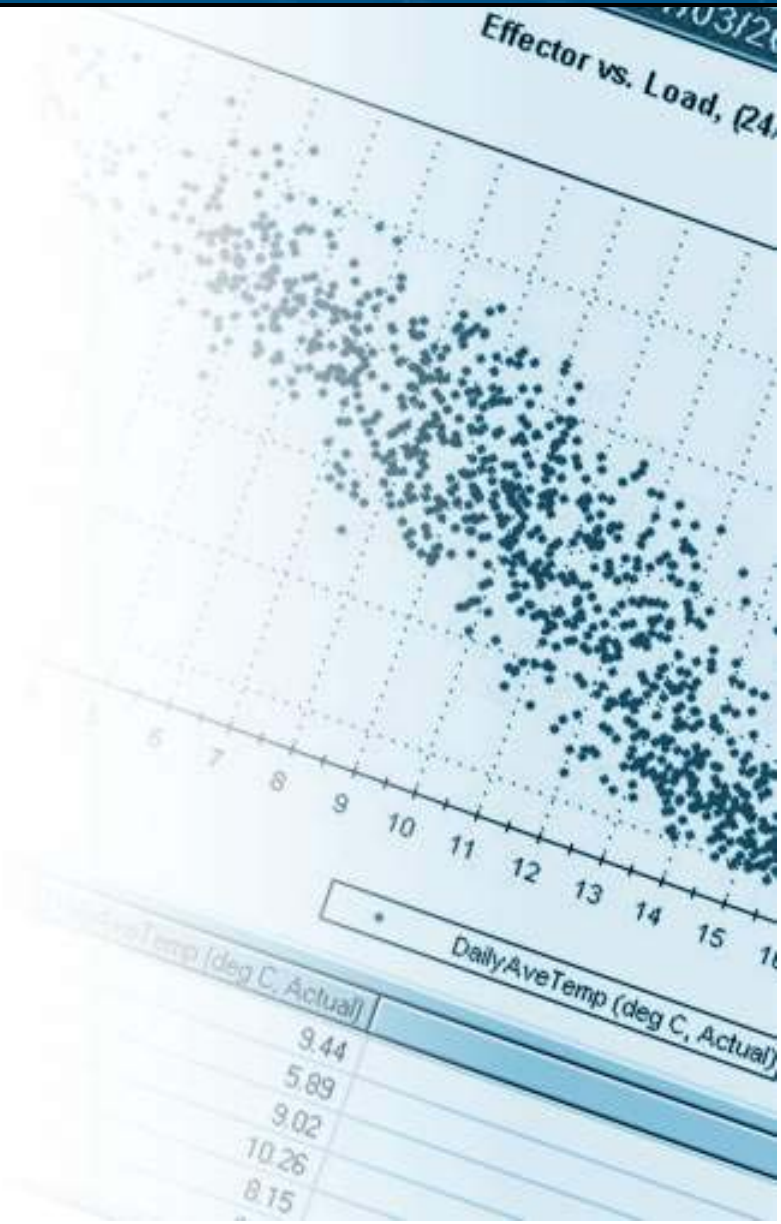
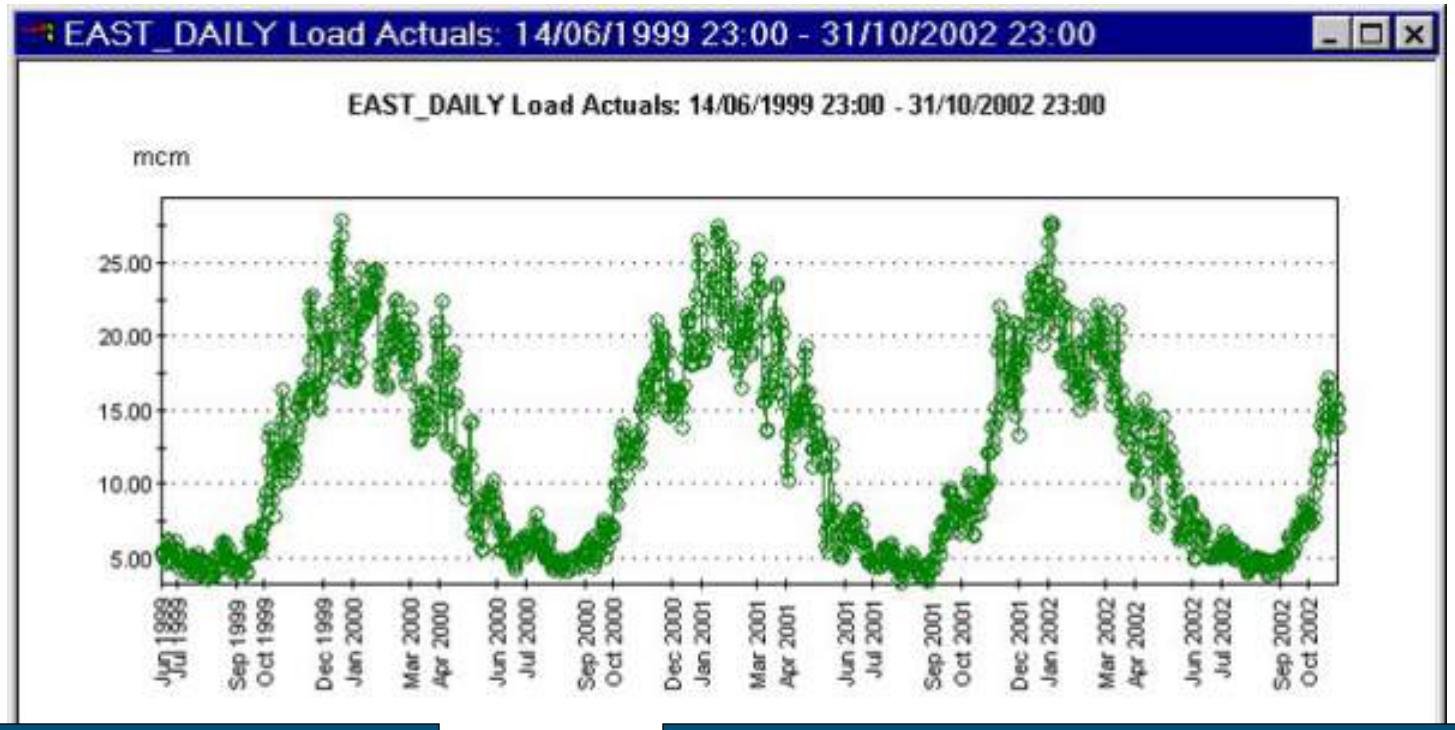
- The performance is indeed not very good, so what can we do?
- First we need to look at the load profile and try to classify it's behaviour
- Then we look at what other factors affect it and try out a predictor that may work better



Classifying Behaviour



The load profile for about 3 years of historical data is shown

What sort of load pattern does this meter show????

There is clearly a seasonal pattern with peak demand occurring in the winter months

This load is probably temperature sensitive – we can use Forecasters charting tools to confirm this

Classifying Behaviour

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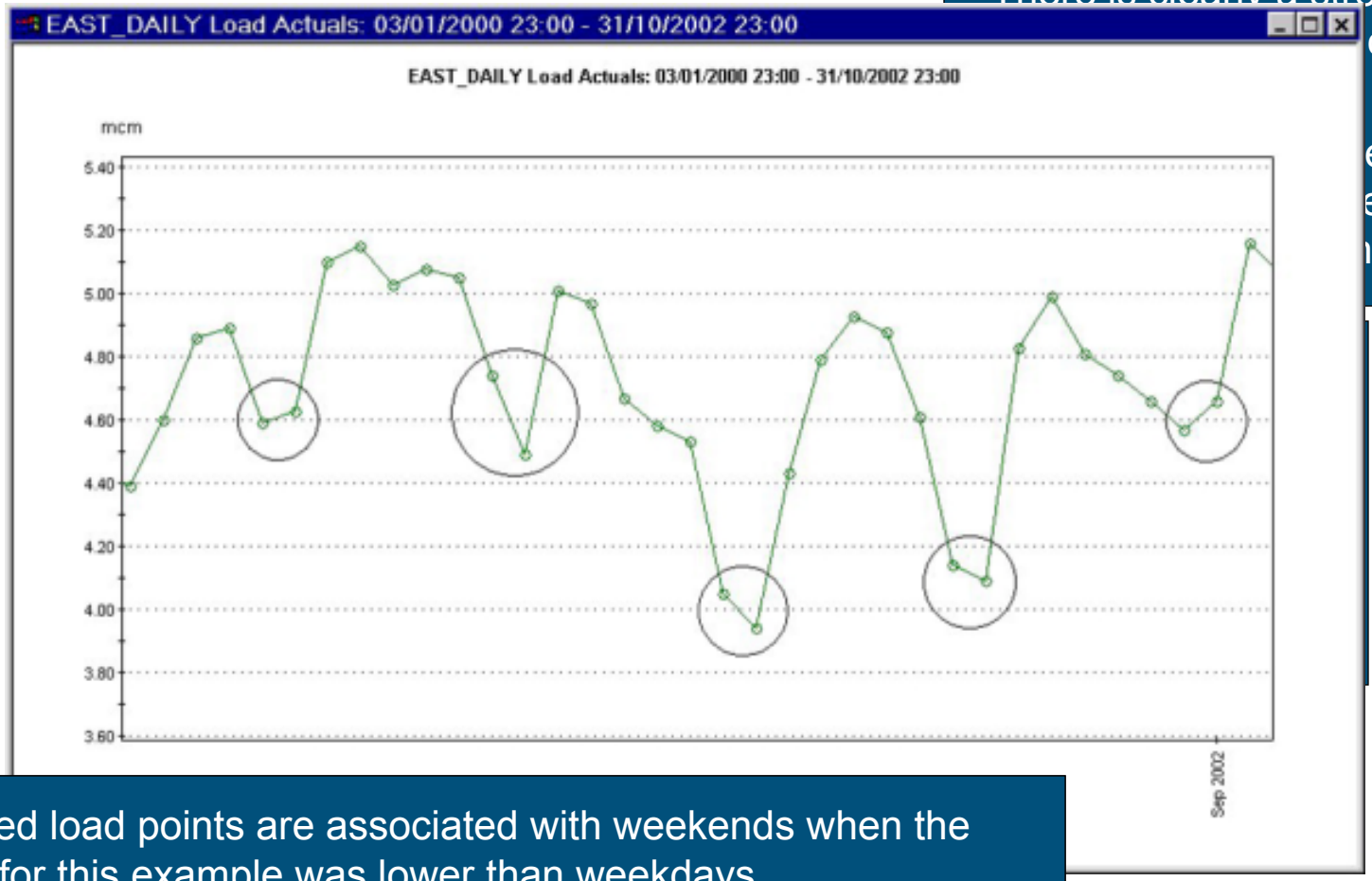

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The circled load points are associated with weekends when the demand for this example was lower than weekdays

In forecaster, we can account for day of week effects, seasons and the diminishing effect of higher temperatures on demand

Cloning

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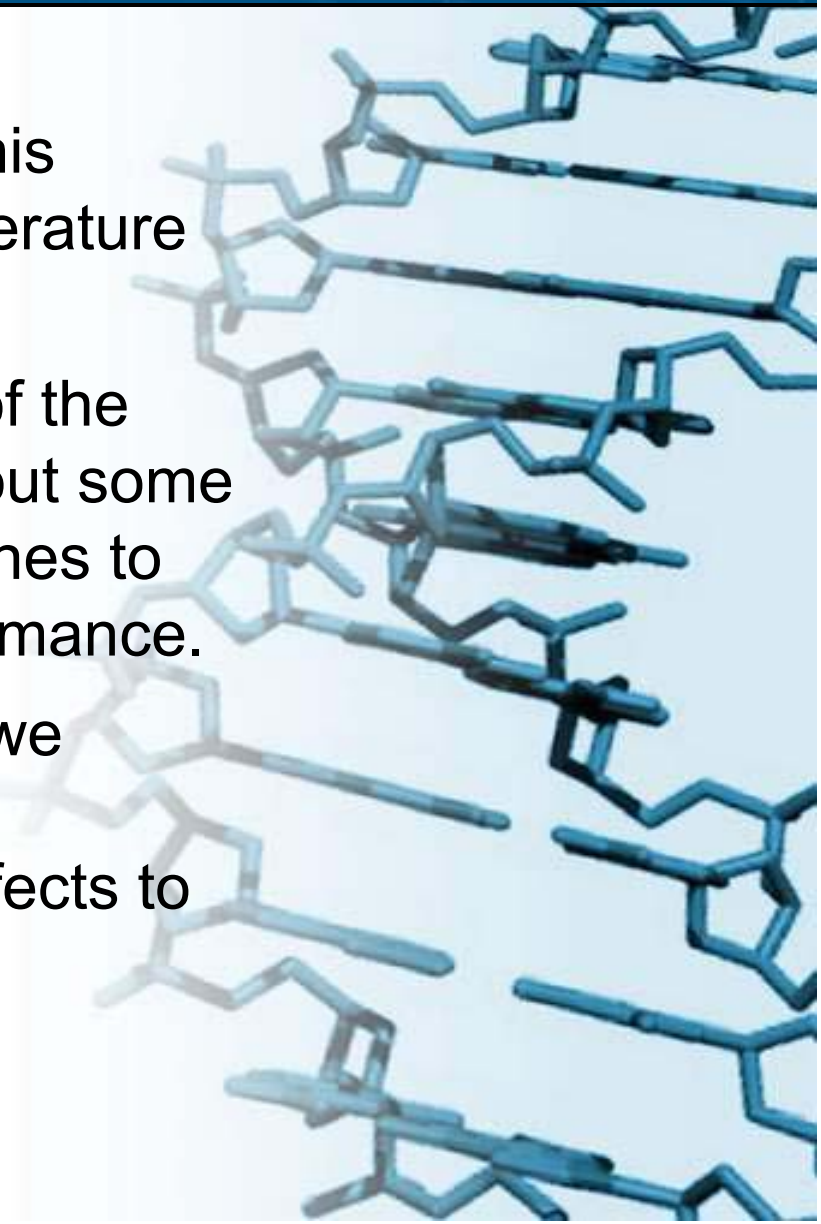
- We have now established that this customers load is strongly temperature sensitive and cyclic
- The next step is to take a copy of the meter (called “cloning”) and try out some of Forecasters other model engines to see if we can improve the performance.
- The next sequence shows how we assign a regression model using temperature and day of week effects to improve the demand forecast…



Cloning

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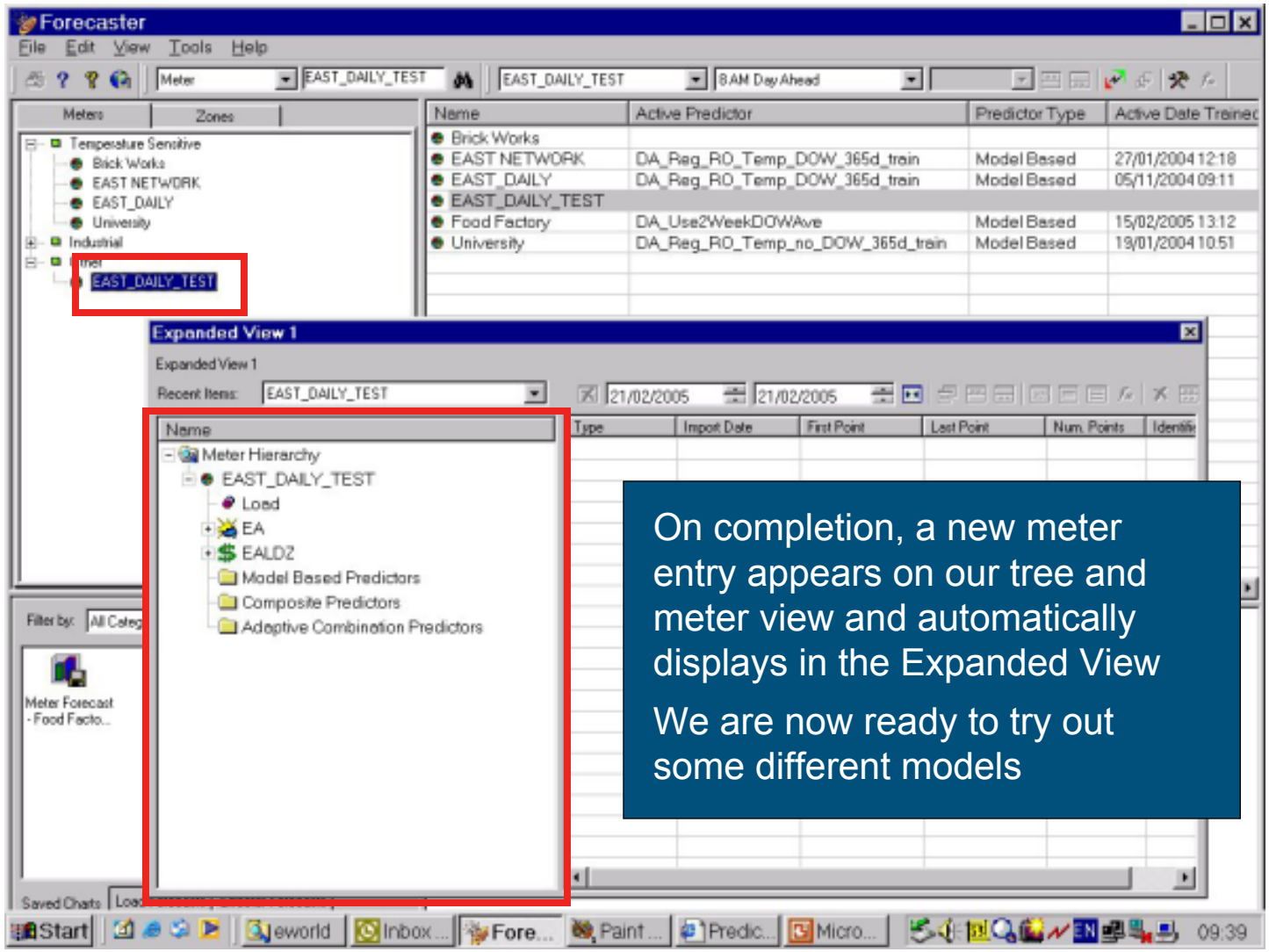

On completion, a new meter entry appears on our tree and meter view and automatically displays in the Expanded View

We are now ready to try out some different models

Adding a Predictor

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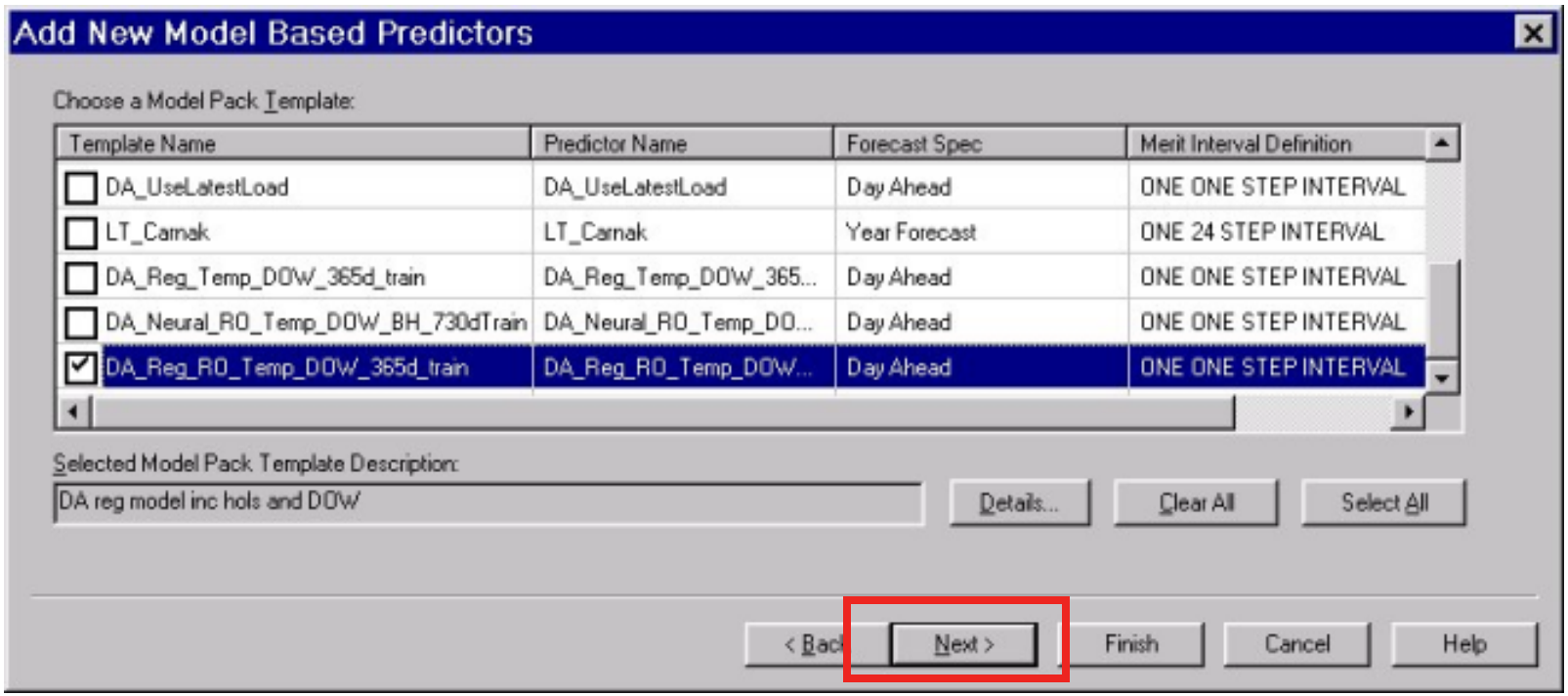

We then click next to train the model…

Training the Predictor

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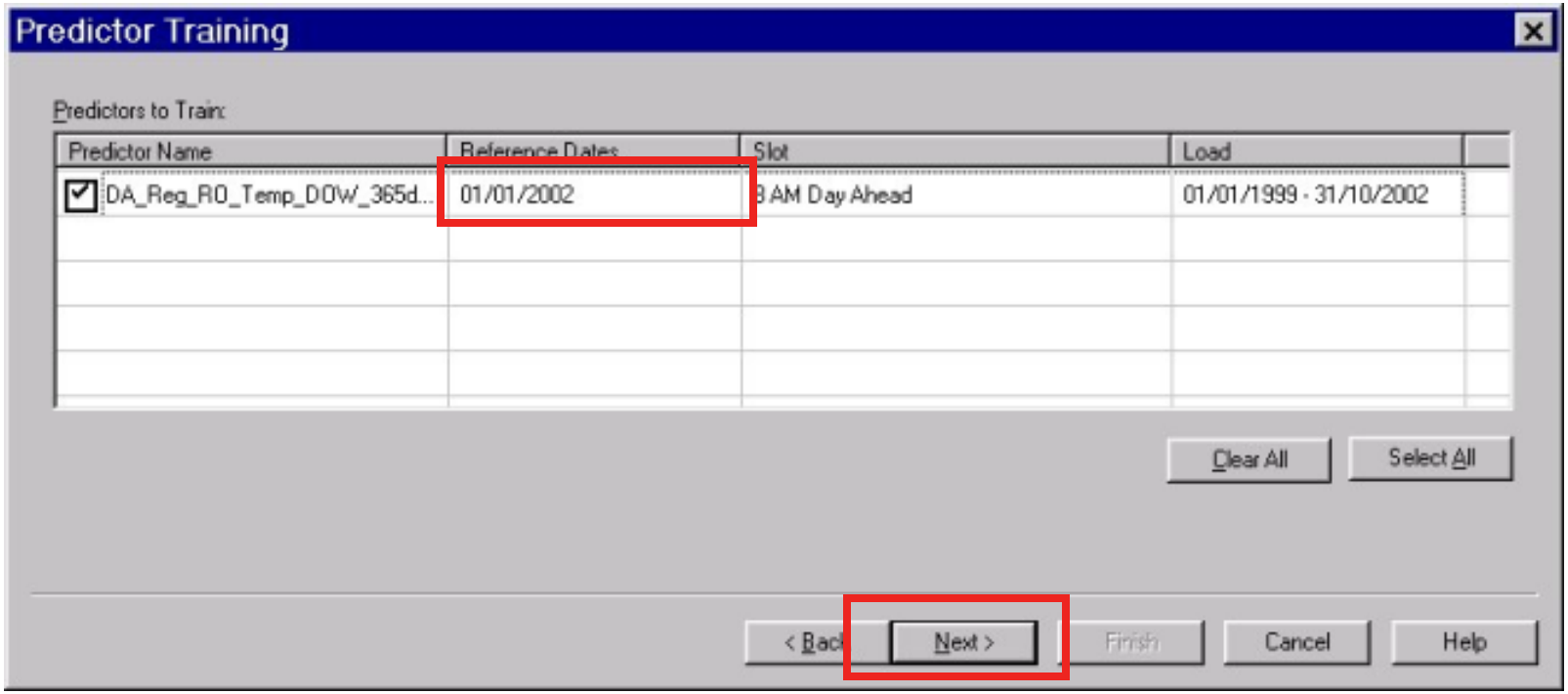

To train the model, we enter the Reference Date as the point at which the model is to be trained and click next…

Activating the Predictor

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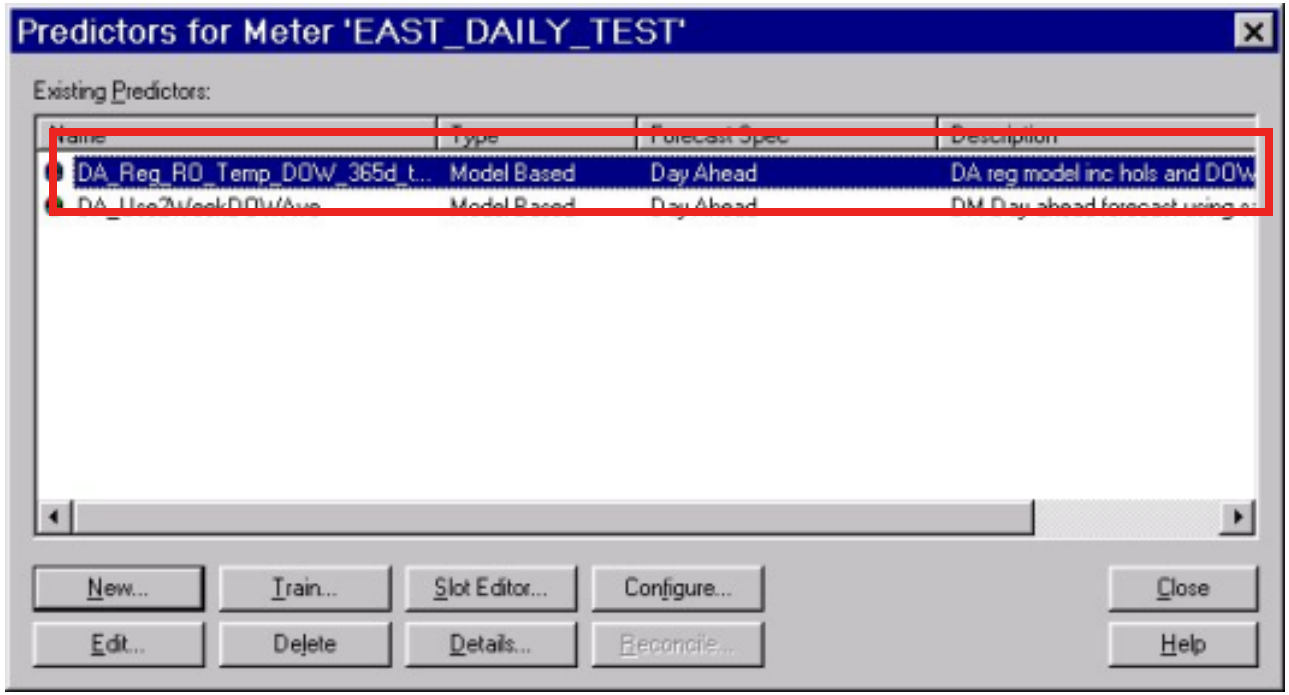

The Manage Predictors summary dialog shows the new predictor ready for use

Generating Forecasts

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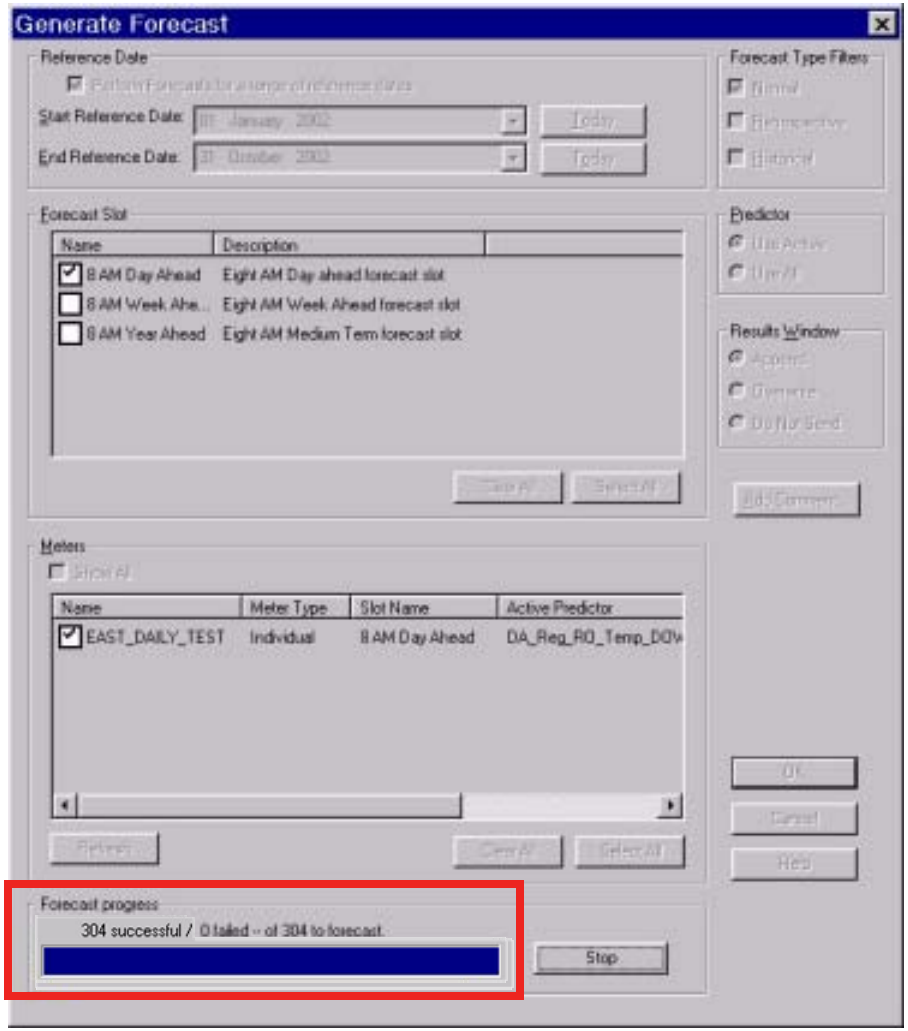

A range of dates to run the forecasts is entered…

Once completed…

Reviewing Performance

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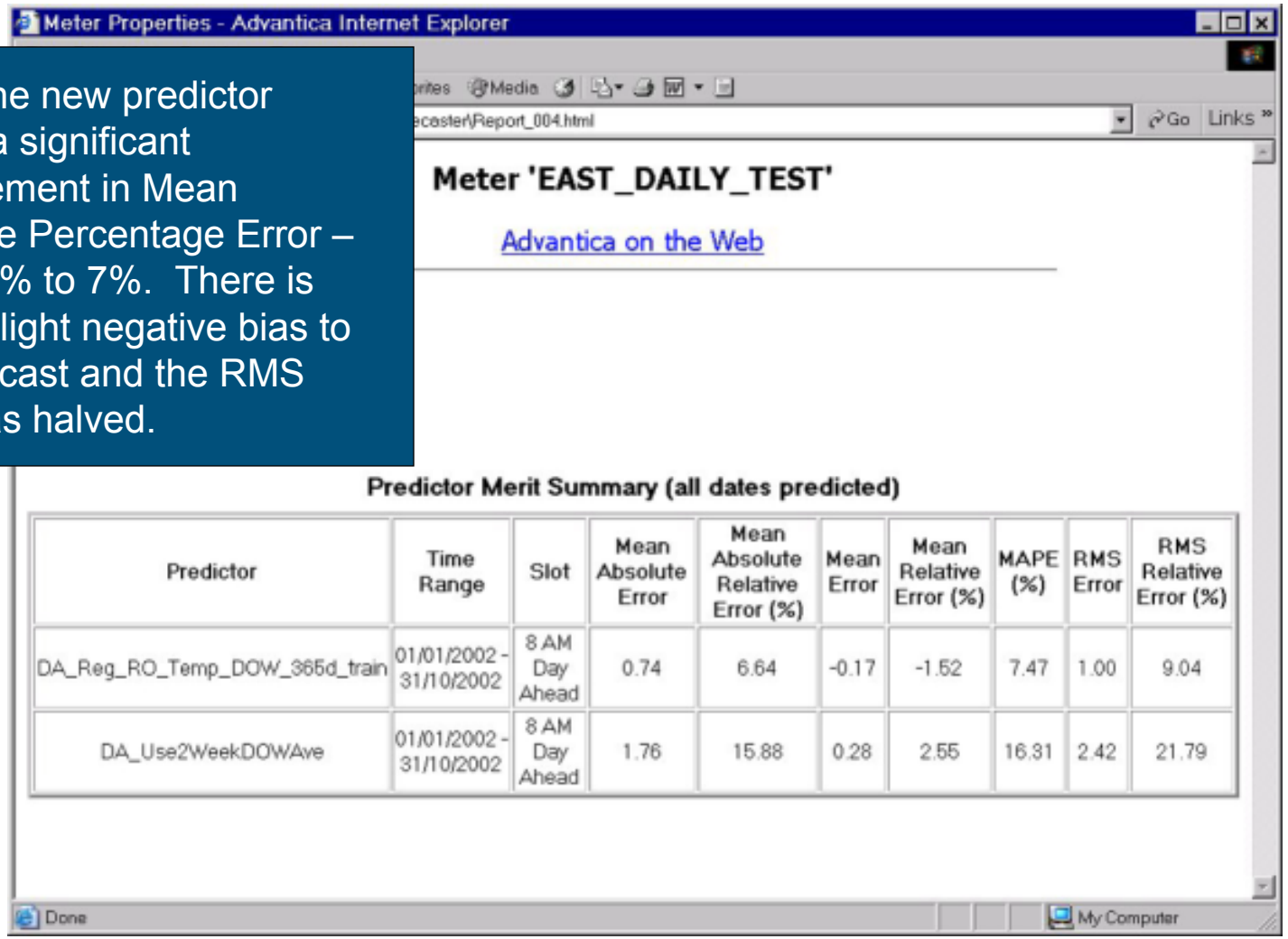
Using the new predictor shows a significant improvement in Mean Absolute Percentage Error – from 16% to 7%. There is now a slight negative bias to the forecast and the RMS error has halved.



Further Improvements

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- However, even though this predictor provides an improvement on the original, the customer still wants to try and reduce their forecasting error even further…
- We apply a Neural Network Predictor and an Adaptive Combination Predictor to see if further improvements can be made
- A similar process is followed as for the regression model, but to save time we will just look at the results

Reviewing Performance

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We can also look at the overall performance summary - this shows that the Adaptive Combination predictor outperforms any other individual predictor over time

Not only has the MAPE reduced, the forecast bias (mean error) is much closer to zero – both key factors in ensuring that the best forecasting performance can be achieved

Meter Properties - Advantica Internet Explorer

File Edit View Favorites Tools Help

Predictor Merit Summary (all dates predicted)

Predictor	Time Range	Slot	Mean Absolute Error	Mean Absolute Relative Error (%)	Mean Error	Mean Relative Error (%)	MAPE (%)	RMS Error	RMS Relative Error (%)
DA_Neural_RO_Temp_DOW_BH_730dTrain	01/01/2002 - 31/10/2002	8 AM Day Ahead	0.75	6.72	0.08	0.75	6.93	1.11	10.03
DA_Reg_RO_Temp_DOW_365d_train	01/01/2002 - 31/10/2002	8 AM Day Ahead	0.70	6.33	-0.04	-0.37	7.09	0.98	8.80
DA_Use2WeekDOWAve	01/01/2002 - 31/10/2002	8 AM Day Ahead	1.76	15.88	0.28	2.55	16.31	2.42	21.79
EAST_COMBO	01/01/2002 - 31/10/2002	8 AM Day Ahead	0.63	5.64	0.01	0.12	5.77	0.92	8.30

Done

My Computer

Deploying the Predictors

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- We have now completed our analysis and shown that the combination of the three different types of predictor will improve the forecast
- But how do we assign these new predictors to our original meter?

Deploying the Predictors

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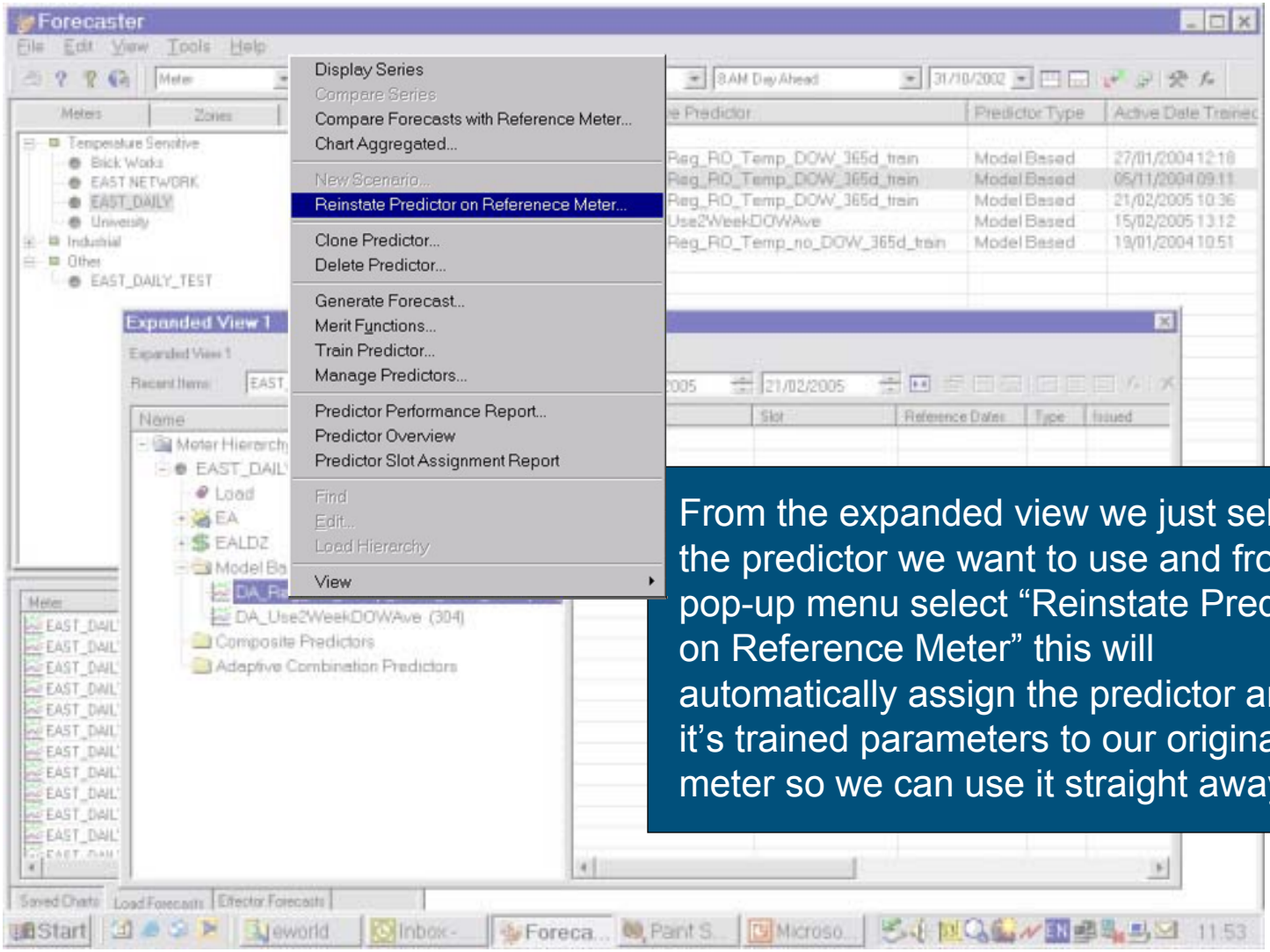

From the expanded view we just select the predictor we want to use and from the pop-up menu select “Reinstate Predictor on Reference Meter” this will automatically assign the predictor and all it’s trained parameters to our original meter so we can use it straight away!

Summary

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- Using Forecasters Scenario Analysis Manager allows clients to quickly identify poor forecast performance and take steps to improve it using a variety of modelling techniques
- No software changes were required
- Typically performance is assessed over at least 12 months to ensure performance improvements are consistent over time