

IESO Demand Forecasting Performance

Presented to: Stakeholder Advisory Committee

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Demand Forecasting

- Methodology – current and future
- Performance - Measures/Statistics
- Benchmarking – ISO Counterparts
- Performance Improvements
- Future Challenges

Proposed Performance Measures

- Discussion re Ontario Power Generation submission

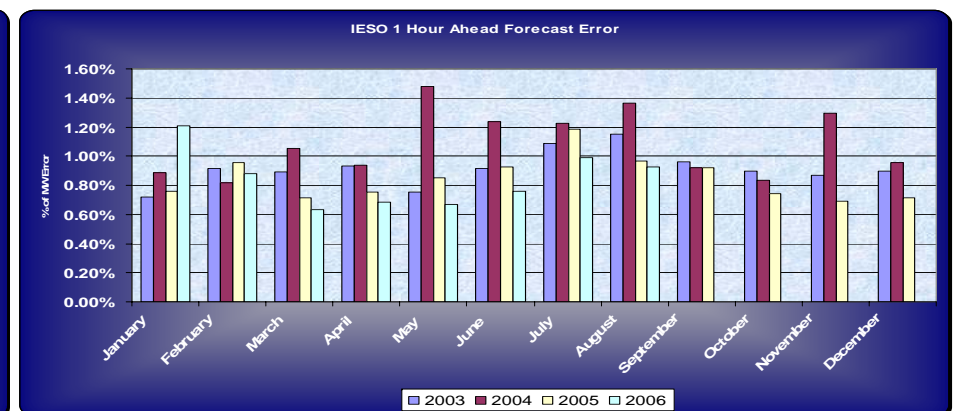
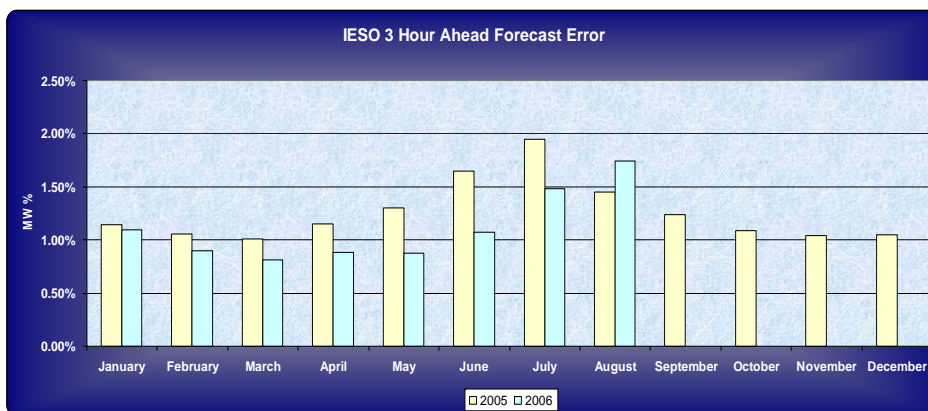
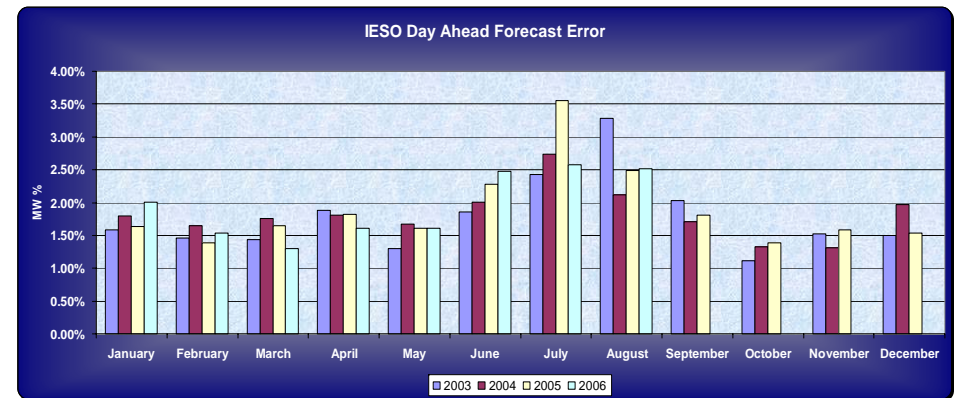
- IESO currently uses a Similar Day forecasting methodology
 - Similar Day Load Forecasting (SDLF) tool used to find similar days based on:
 - Temperature
 - Wind speed
 - Illumination
 - Day type
 - Similar days are normally chosen from a date range of +/- 14 days from forecast day and from the previous 4 years of data
 - Average Ontario Demand is forecast
 - Market Demand, which includes Exports, is not forecast
 - East and West systems are forecast separately
 - Forecasts for Day 1 to Day 10 are based on forecast weather

- IESO is investigating use of other demand forecasting tools:
 - Currently evaluating new tools that provide multiple forecast methods:
 - Neural network
 - Deterministic – similar day
 - New tools allow multiple forecasts to be created for comparison purposes and should assist in identifying outlier days
 - New tool approved as part of Energy Management System (EMS)/Market Information System (MIS) upgrade scheduled for completion in Q3 2007

- There are no industry standards for demand forecasting performance measures
- IESO has corporate performance measures for forecast error and forecast bias (day ahead, 3 hours ahead, 1 hour ahead)
- Additional measures are tracked and published for information:
 - On and off peak bias (all timeframes)
 - Number of days where absolute error exceeds 3% (all timeframes)
 - Maximum absolute error in any hour that exceeds 3% (all timeframes)

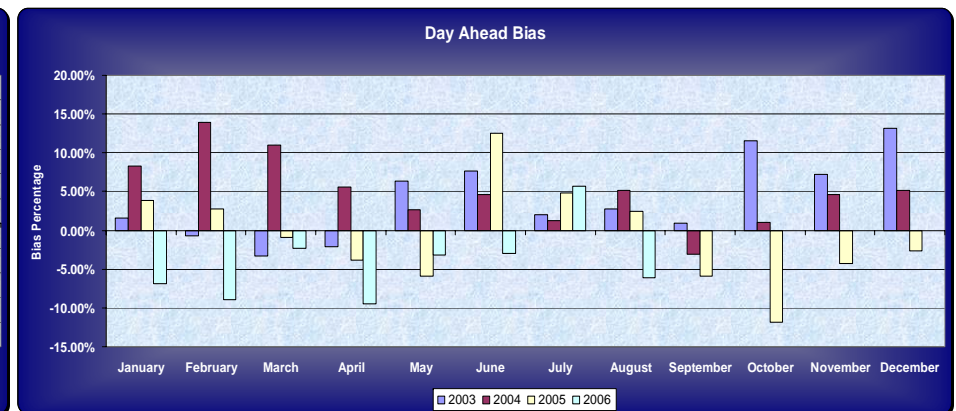
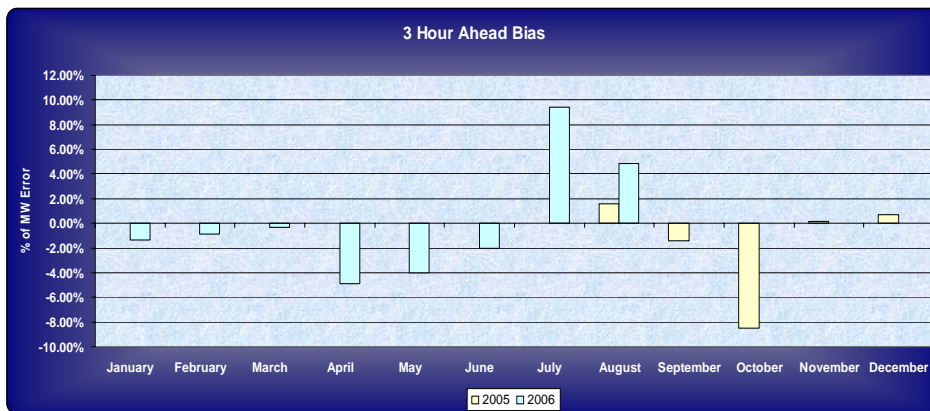
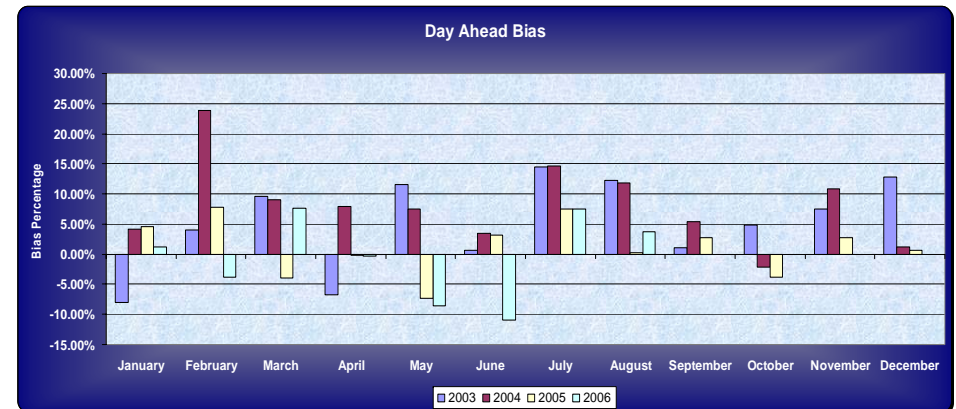
Demand Forecasting Performance Statistics – Forecast Error

Measure	Annual Target	Actual
Day Ahead Forecast Error	2.5%	<1.9% (2003 to date)
3 Hour Ahead Forecast Error	2%	< 1.2% (Aug 2005 to date)
1 Hour Ahead Forecast Error	1.5%	< .95% (2003 to date)



Demand Forecasting Performance Statistics – Forecast Bias

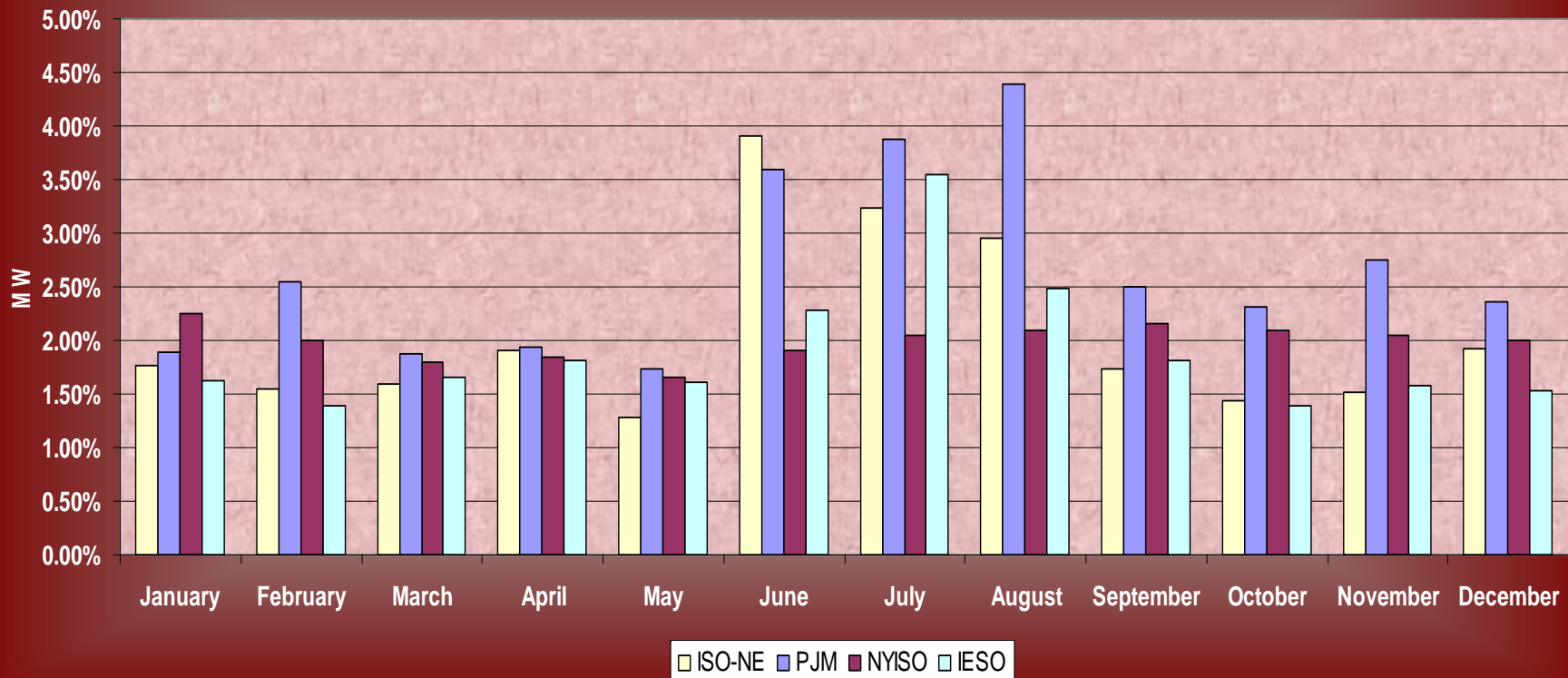
Measure	Annual Target	Actual
Day Ahead Forecast Bias	5%	<6.5% (2003 to date) <4.4% (2005 to date)
3 Hour Ahead Forecast Bias	5%	< 3.1% (Aug 2005 to date)
1 Hour Ahead Forecast Bias	5%	< 2.3% (2003 to date)



Comparison of Day Ahead Forecast Error

ISO	Measure	Target	Actual
ISO-NE	Day ahead forecast (by 10:00) Average monthly error 2003 to date	1.8%	1.9%
NYISO	Day ahead forecast of peak hour Average monthly error 2004 to date	2%	~ 2%
PJM	Day ahead forecast (8 hours ahead) of on and off peak hour achieved 80% of the time 2005 monthly average	3%	2.8%
IESO	Day ahead forecast (by 15:30) Average monthly error 2003 to date	2.5%	1.9%

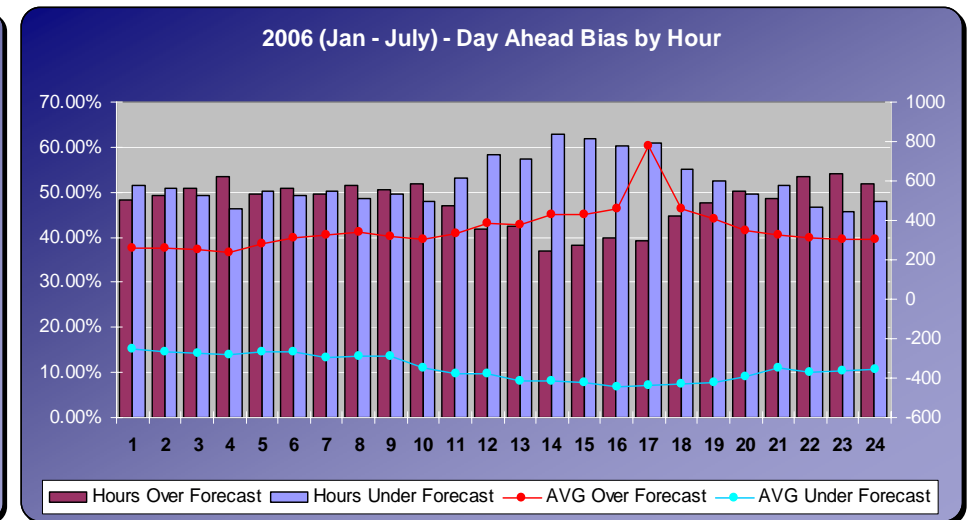
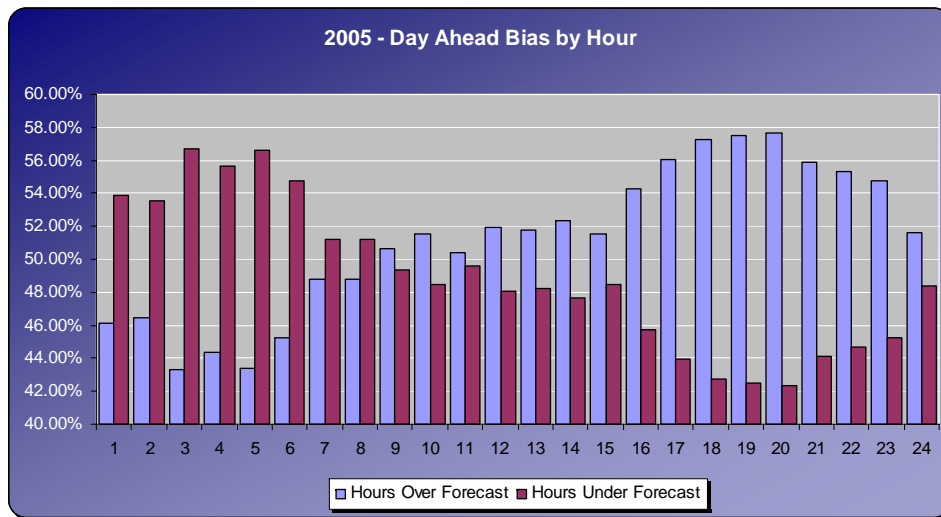
Day Ahead Forecast Error - 2005



- Forecasting performance improvements
 - Forecasters focusing on improving bias – substantial improvements since tracking began in 2003
 - MSP Reports noted:
 - “remarkable improvement in reducing the bias in the IESO’s demand forecast”
 - “One-hour ahead pre-dispatch demand forecast differences are now in the order of 1 percent. This may be as far as the IESO can go in reducing demand forecasts with its present set of forecasting tools”
 - Testing of an econometric model for day ahead forecasts that provides a confidence band to signal a need to re-evaluate underlying forecast assumptions
 - Evaluating a new forecasting tool - new tool approved as part of Energy Management System (EMS)/Market Information System (MIS) upgrade scheduled for completion in Q3 2007

- Demand forecasting will become more complex as a result of:
 - Increased dispatchable load participation
 - Price sensitive demand response
 - Conservation initiatives
 - Smart metering
- IESO tools and processes must be adaptable to allow these factors to be considered in demand forecasts and to track their impact

- Comments received from OPG:
 - Concern that demand forecast metrics do not provide sufficient incentives to improve forecast accuracy
 - Use of annual averages for error and bias can result in inaccuracies
 - Allows over forecasting during the on-peak hours and under forecasting during off-peak hours



OPG Recommendations

Category/Name	Measure	Criteria	Performance Standard
Day-Ahead Hourly Demand Forecast	Accuracy	Average absolute error for on-peak winter season	1.5%
		Average absolute error for on-peak summer season	1.5%
		Average bias range for on-peak winter season	+/- 2.5%
		Average bias range for on-peak summer season	+/- 2.5%
Day at hand hourly demand forecast - 3 hours ahead of dispatch hour	Accuracy	Average absolute error for on-peak winter season	1.5%
		Average absolute error for on-peak summer season	1.5%
		Average bias range for on-peak winter season	+/- 2.5%
		Average bias range for on-peak summer season	+/- 2.5%
Day at hand hourly demand forecast - 1 hour ahead of dispatch hour	Accuracy	Average absolute error for on-peak winter season	1.5%
		Average absolute error for on-peak summer season	1.5%
		Average bias range for on-peak winter season	+/- 2.5%
		Average bias range for on-peak summer season	+/- 2.5%

- Forecast models typically have errors in the range of 1 to 2% before including weather forecast error
- OPG back-casting has shown their model to have an error of approximately 1.5%
 - A target of 1.5% error in all time frames is not realistic/achievable
 - Current targets of 2.5% (day ahead), 2% 3 hours ahead & 1.5% 1 hour ahead) are realistic
 - Posted information tracks on and off peak performance without performance targets