

Mid Term Wind Forecasting Requirements: Wind Capacity Contribution Methodology

Wind Power Integration in Ontario Standing Committee
February 20, 2008

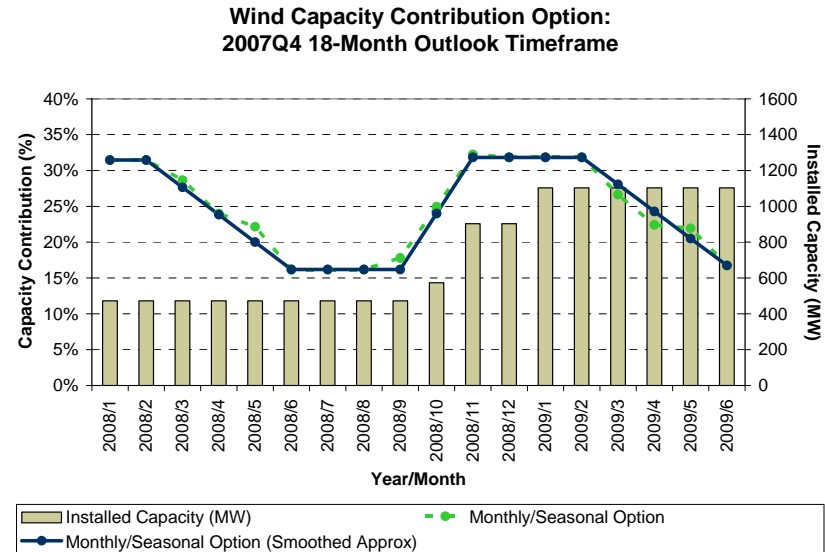


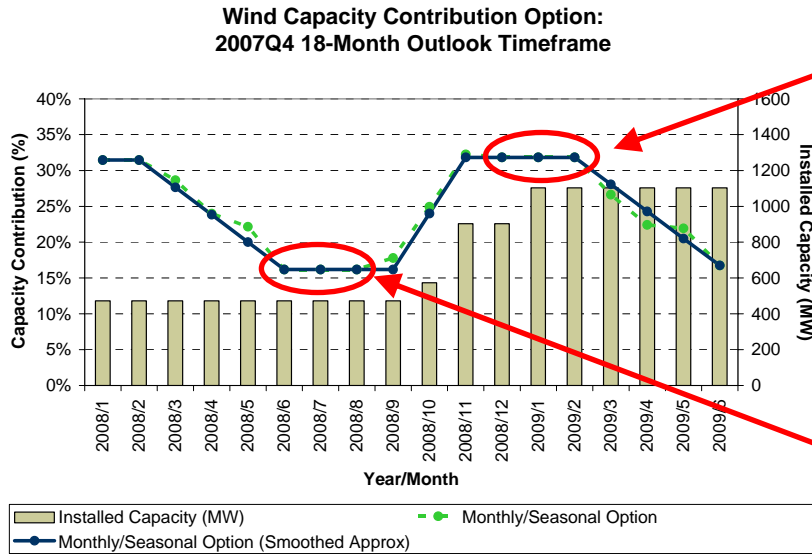
- Wind Capacity Contribution (WCC) Review
 - Definition & Determination
 - Previous Proposed Method
 - Median Values & Probability Distributions
- WCC: New Proposed Method
 - Addition of Historical Actual Data
 - Minimum of Modeled vs. Actual
 - Process for Updating values
 - Tracking performance
- Next Steps
- Comments and Feedback

Wind Capacity Contribution (WCC):

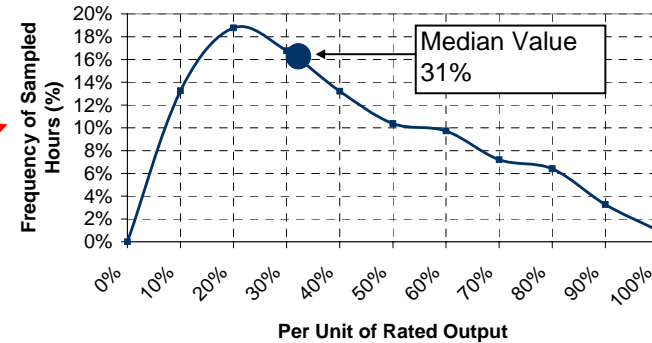
- Amount of wind output that is assumed to be available during periods of peak demand
- Measure of available capacity for use in resource adequacy modelling:
 - 18-Month Outlook (L&C model)
 - Ontario Reliability Outlook (MARS model)
 - Other studies
- Deterministic (L&C) and Probabilistic (MARS) representations
- Determination via historical data (2 potential sources):
 - 10 years of simulated wind output data (AWS Truewind)
 - Actual wind farm output data since March 2006

- Simulated historical wind output data (10 year history)
- Average top 5 contiguous peak demand hours for Winter and Summer seasons, shoulder period months
- Deterministic median values (shown) are associated with probability distributions of wind output

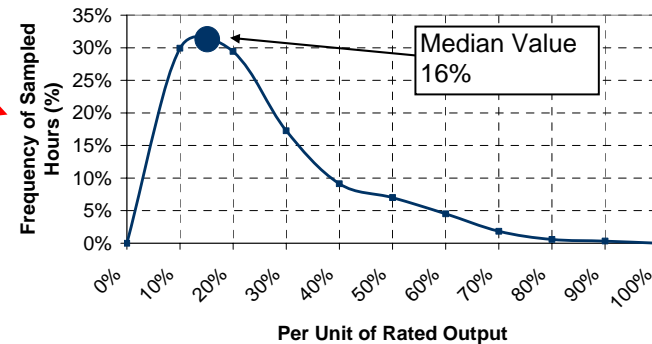




**Probability Distribution Function
Simulated 10Yr Historical Data - Winter**



**Probability Distribution Function
Simulated 10Yr Historical Data - Summer**



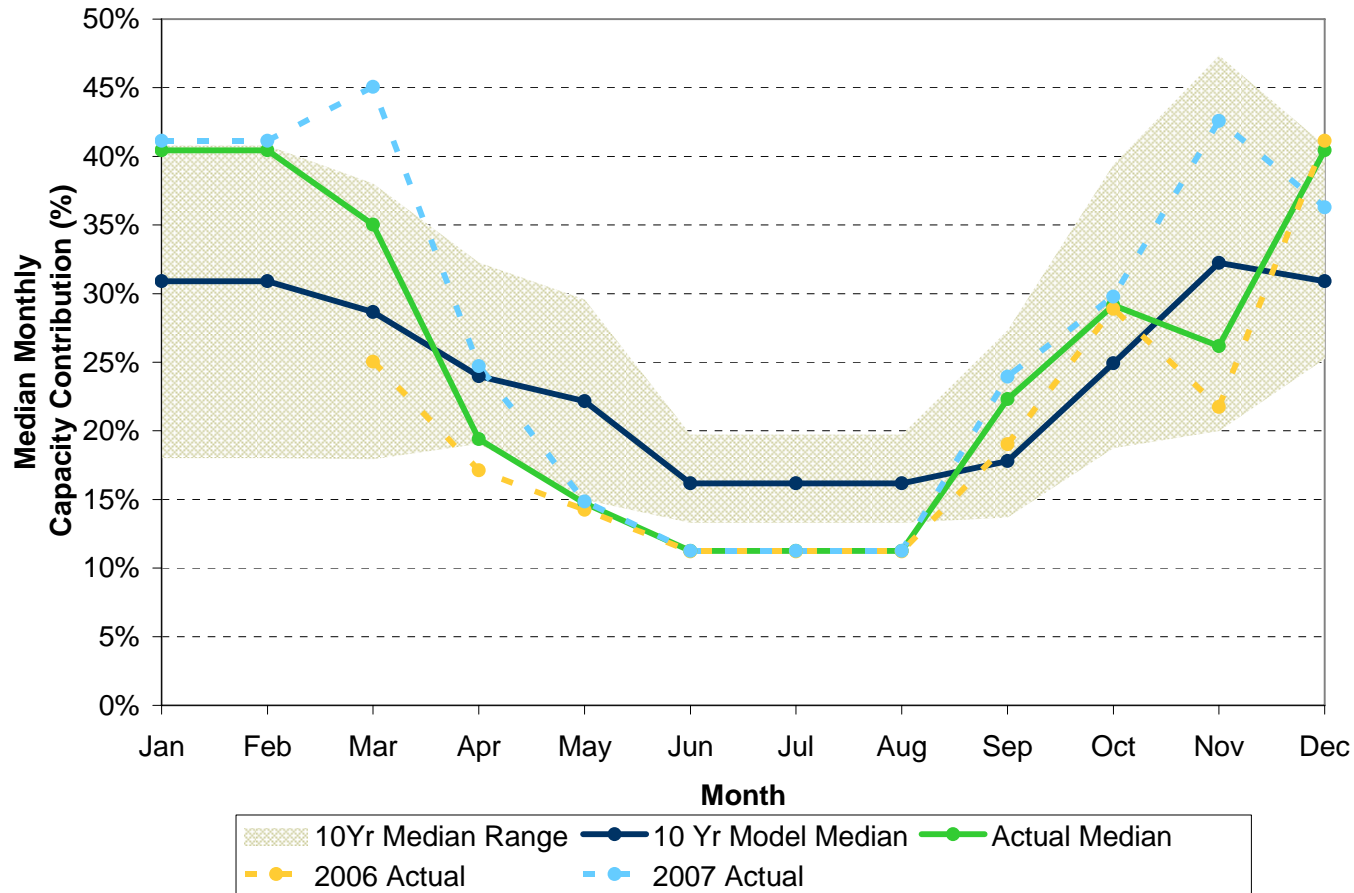
Deterministic

Probabilistic

- Previous Proposed Method did not consider actual performance data from existing wind farms
- Actual wind output data was sampled using method described in slide 4 (top 5 contiguous demand hours, Winter/Summer/shoulder period months)
- Probability distributions and median values derived from these samples
- Data limited to existing wind farms only – future planned wind farms sites not accounted for

WCC - New Proposed Method

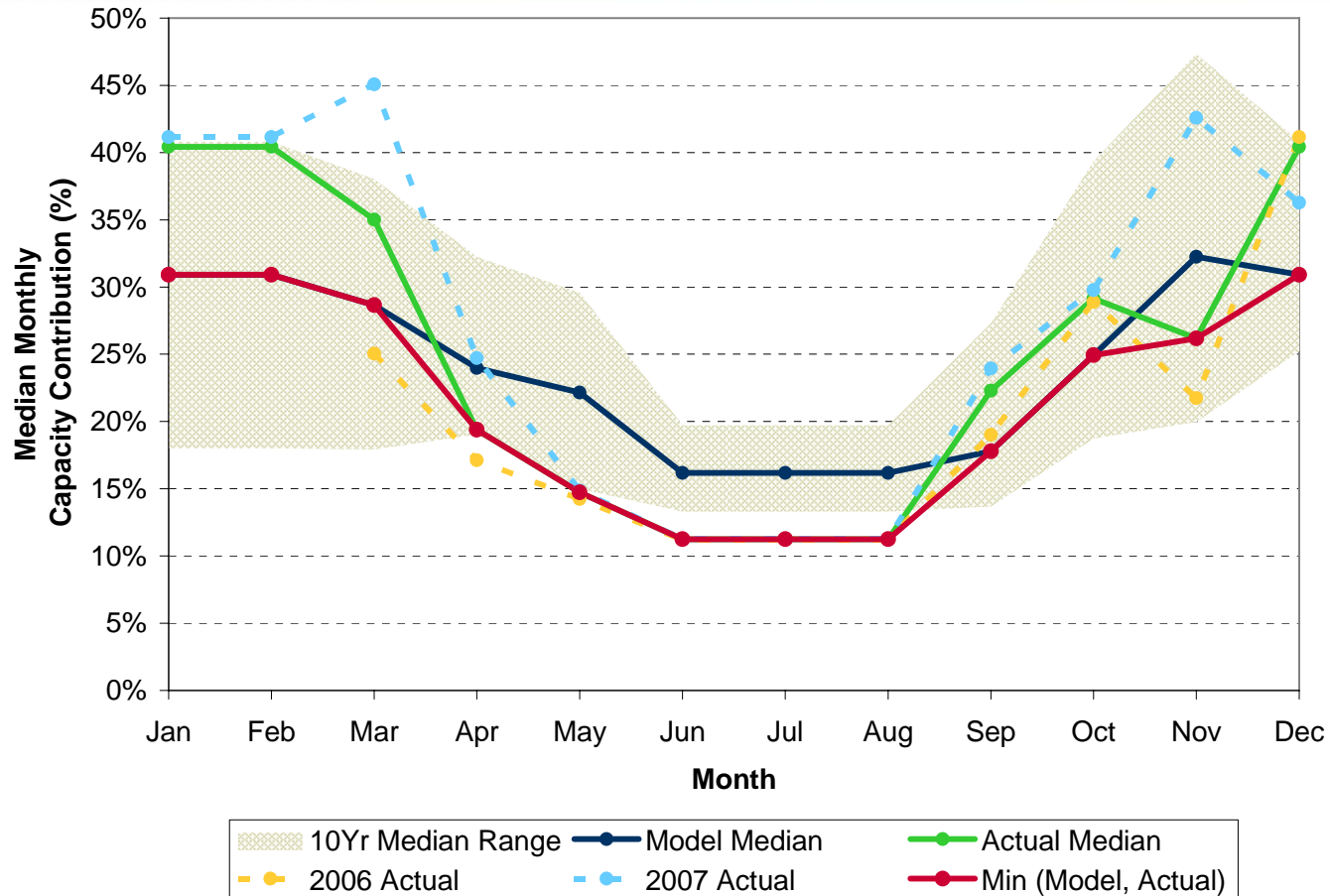
Addition of Historical Actual Data



Some of the actual data (median values) fall outside the range of the modeled data

WCC - New Proposed Method

Minimum of Modeled vs. Actual



A conservative measure of taking the minimum median value (simulated wind model, actual farms data) for each season or month is applied (re: Outage Planning and Reliability needs)

- Retain 10-year simulated wind output data set – update zonal installed capacities as new wind farms come online
- Accumulate actual wind output data for existing and new wind farms as they become operational
- Using updated data, revise WCC probability distributions and associated median values on a (quarterly, semi-annual, annual) basis
- Once 10 years of actual wind output data has been accumulated, begin process to phase out simulated data

- Expect that as actual wind output data accumulates, WCC will self-adjust according to reflect actual experience
- Continue to monitor and report evolving industry best practices:
 - NERC
 - NPCC
 - Other Regional/ISO studies
- Adjust WCC methodology, if and when required
 - e.g. appropriate to use Median as deterministic WCC value? Consider *Effective Load Carrying Capability* (ELCC)

- Standing Committee's Finalization (re: Feb 20 meeting)
- IESO approval
- Implementation of WCC into Resource Adequacy models and IESO reports
 - 18-Month Outlook
 - Ontario Reliability Outlook
 - Other studies

Thank you.
Any questions?