ieso
Power to Ontario.
On Demand.

Growing Wind in Canada: An Ontario Perspective on Wind

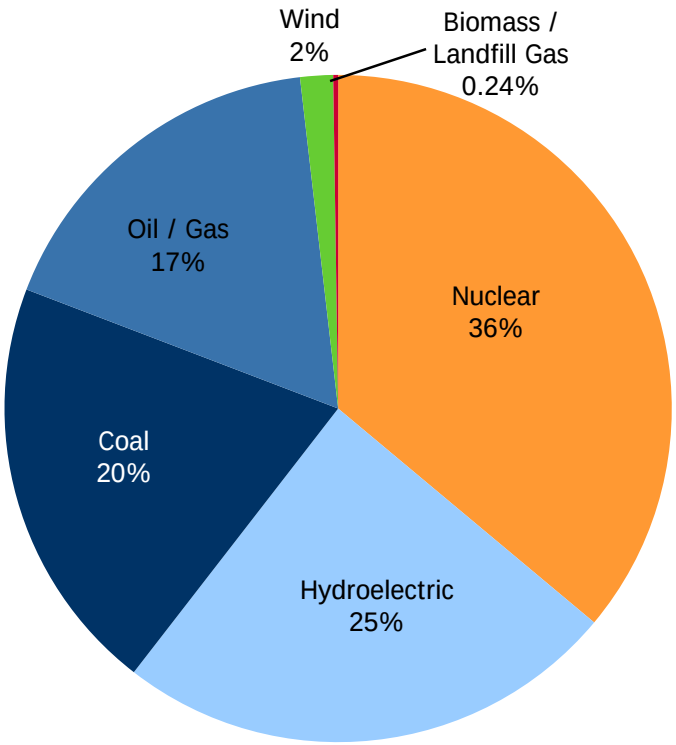
Dr. Khaqan Khan, Ontario's IESO
CanWEA 2008: Annual Conference and Trade Show
October 20, 2008

Role of the IESO

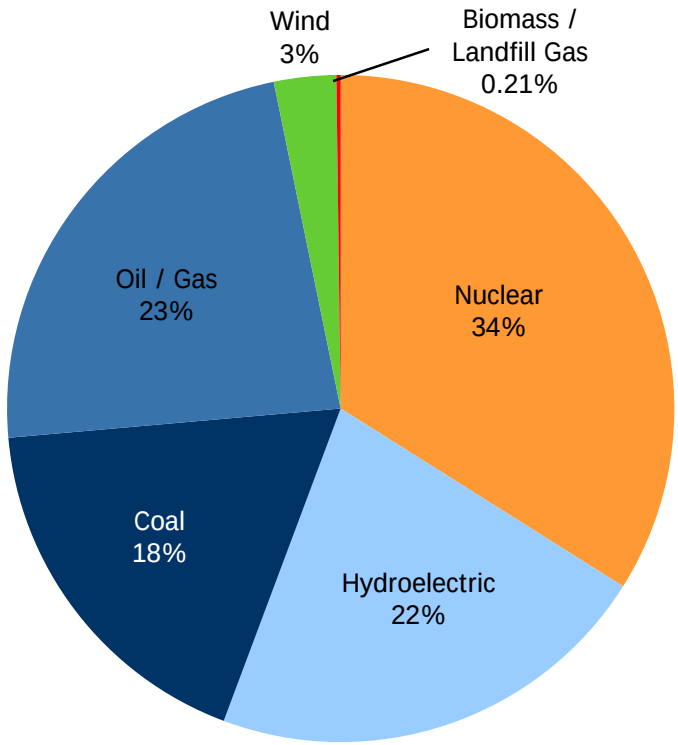
- Maintain reliability
- Manage Ontario's integrated electricity system
- Direct electricity flow within Ontario and across borders
- Operate the wholesale electricity market
- Oversee response to power system emergencies
- Forecast supply and demand, assess and report on electricity system reliability
- Establish reliability standards and enforce compliance

IESO & Wind Power Installed Capacity

Today



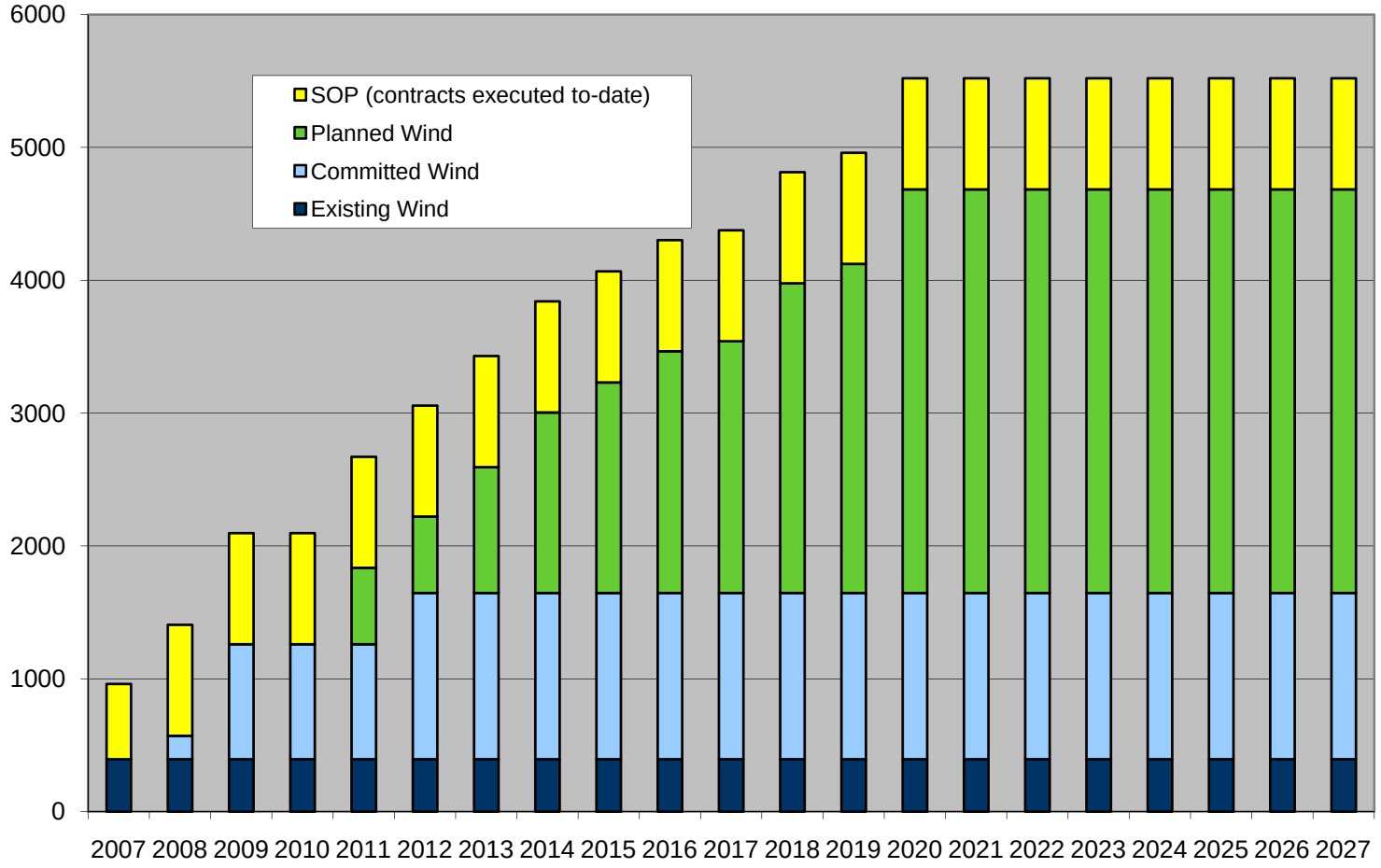
2009



Wind Projects in Ontario

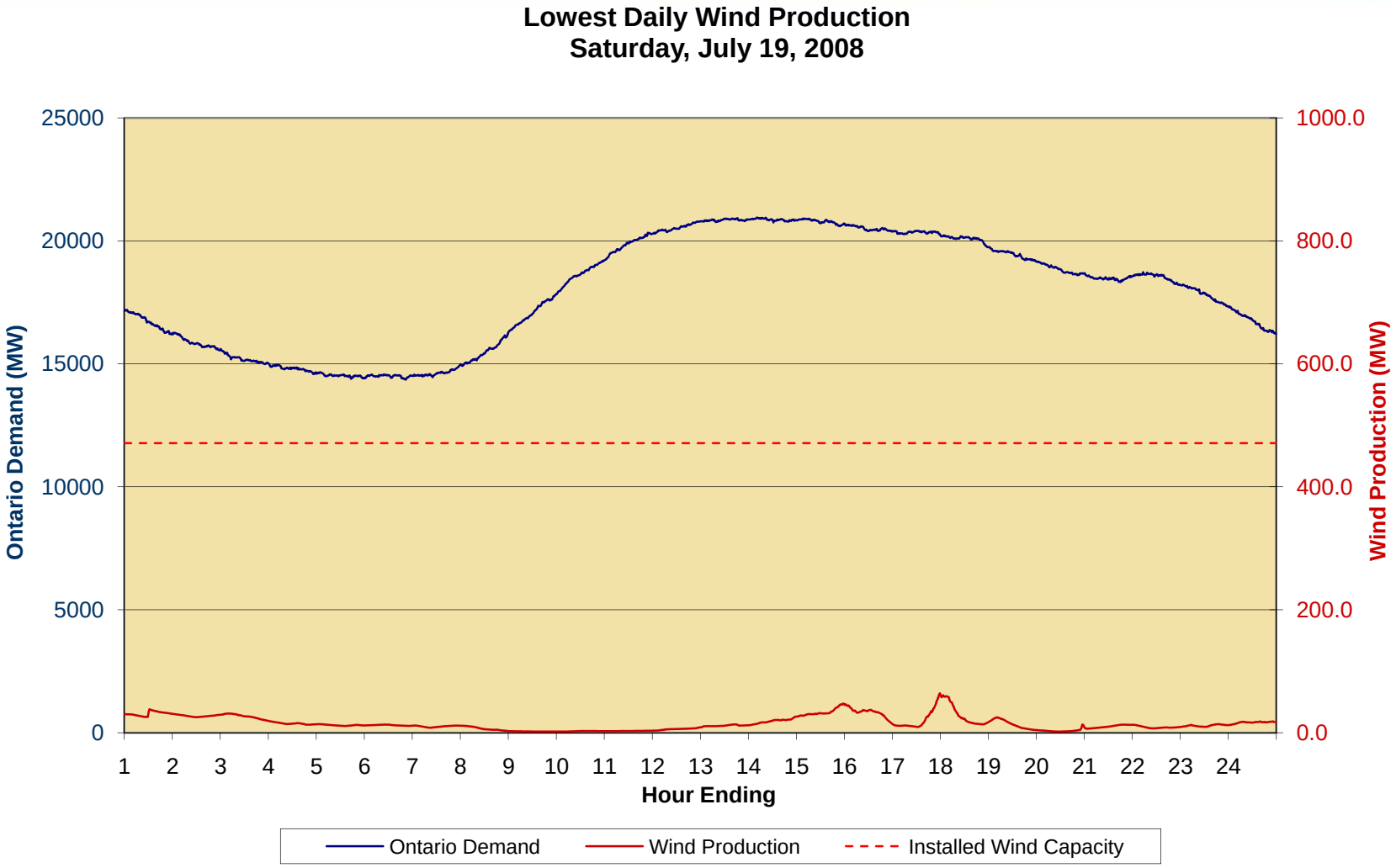
Wind Additions under the IPSP

- Plan shows installed capacity peaking at over 3000 MW in 2015 and over 4500 MW in 2020 (excluding distributed* wind generation)



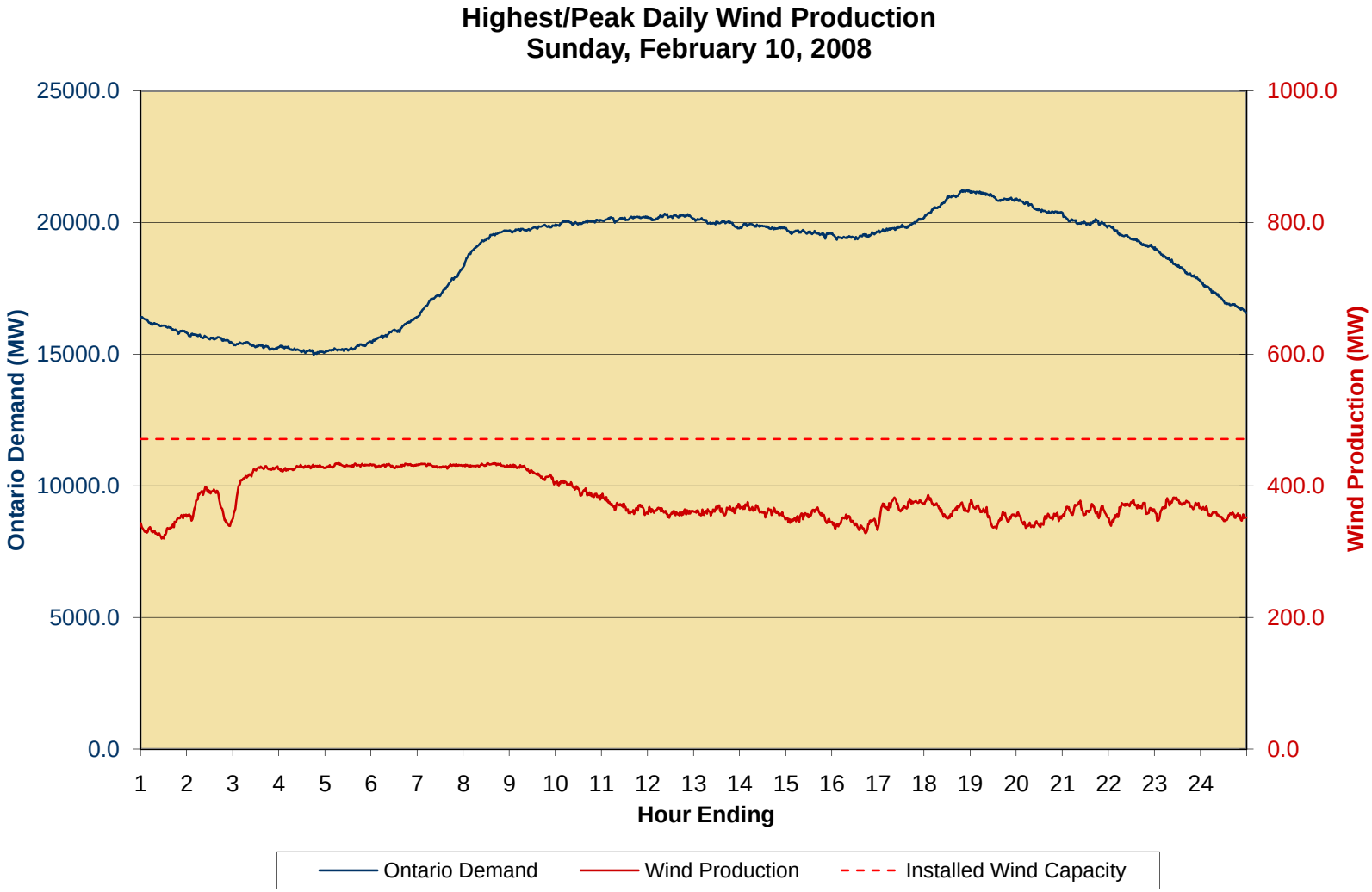
*SOP – Standard Offer Program (Renewable generation projects ≤ 10 MW)

Wind Performance & Variability
Lowest Day



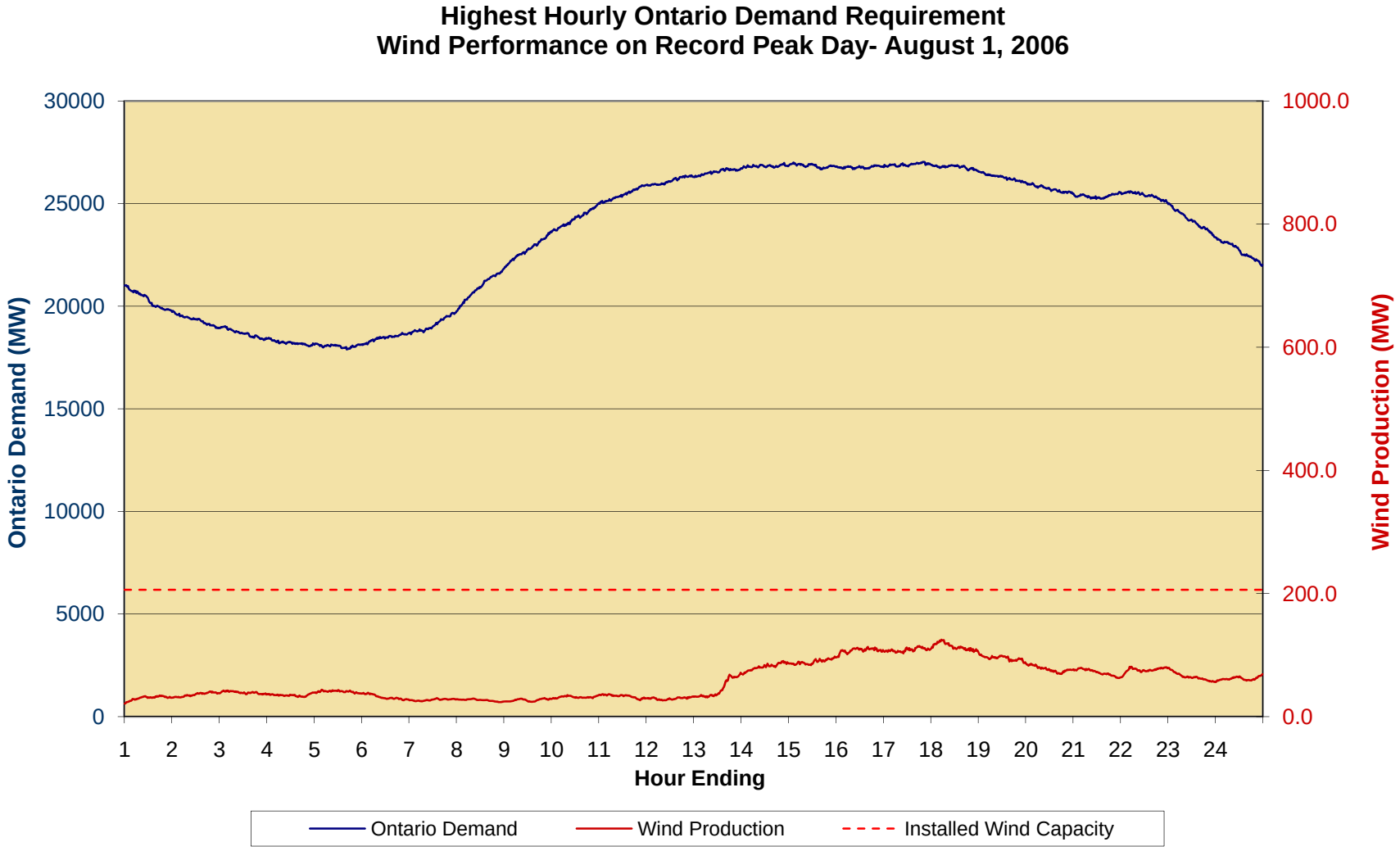
Wind Production Peak: 2 MW, Daily Peak Demand: 21,000 MW

Wind Performance & Variability
Highest Day



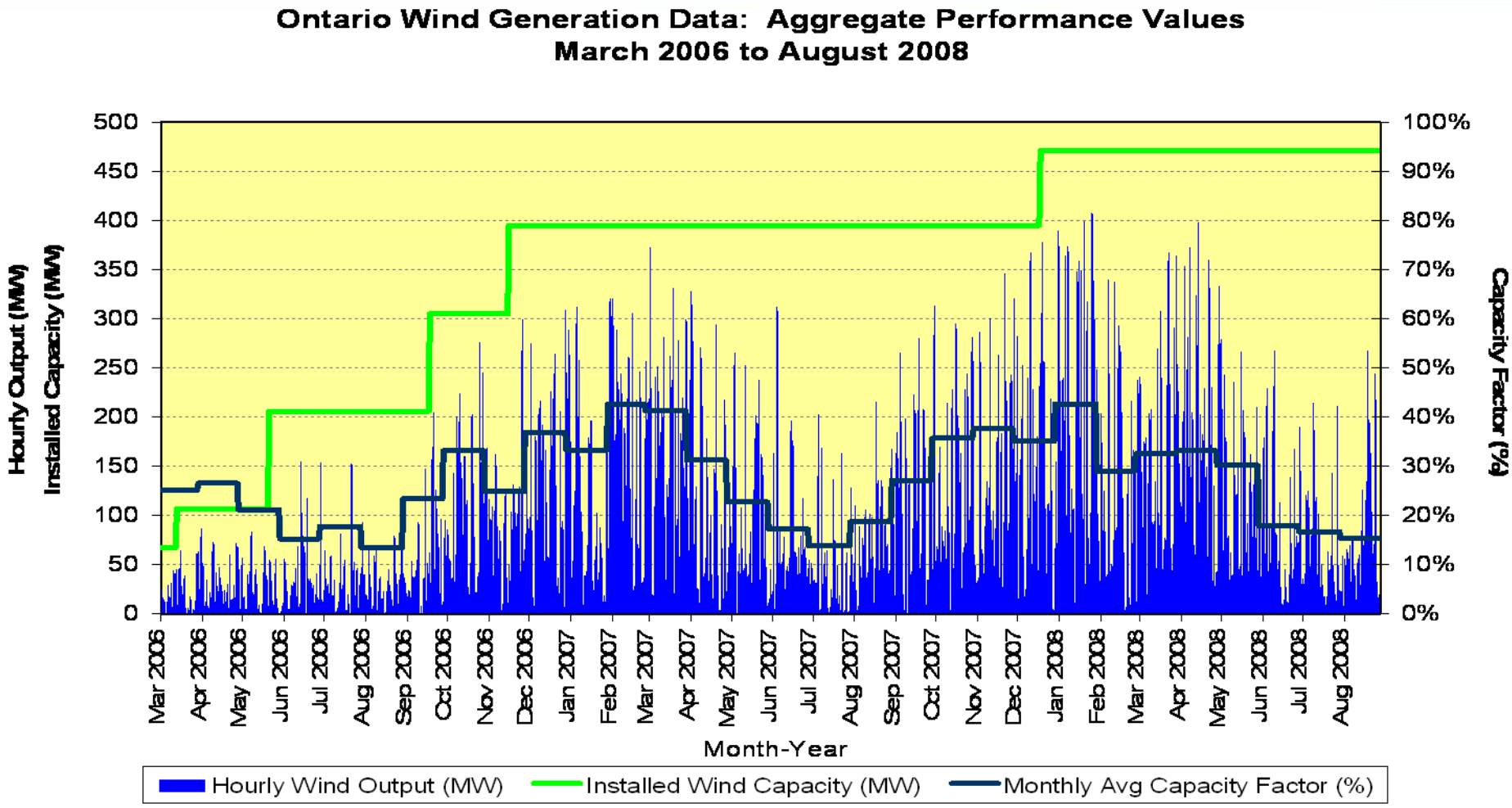
Wind Production Peak: 435 MW, Daily Peak Demand: 21,000 MW

Wind Performance & Variability
Peak Record Day



Wind Production Peak: 125 MW (installed wind 200 MW), Daily Peak Demand: 27,005 MW

Wind Performance & Variability: Capacity Factors



Lowest Monthly Capacity Factor (CF): 13.5%(Aug/06), Highest Monthly CF: 43%(Jan/08)

Lowest Summer CF: 13.5%(Aug/06) Highest Summer CF: 19 % (Aug/07)

Distributed Generation (DG)

- Increased adoption of DG in Ontario
  - OPA has signed contracts for over 750 MW of wind DG
- Hydro One and other distributors have queue of potential projects
- IESO has launched stakeholder effort to develop solutions for embedded generation issues
- Poses unique operating and forecasting challenges to system
  - Visibility
  - Reliability
  - Necessary performance standards

Ontario Wind Standing Committee – Key Recommendations

- Operability (sufficient controllable generation, load following, ramping capability and operating reserve needs to be available to offset wind variability) – analysis underway
- Surplus baseload generation (addition of large amounts of intermittent generation during low load conditions poses challenges for system operation. Alternative arrangements such as storage capacity need to be analyzed)
- Transmission Infrastructure (significant transmission investments are required to enable energy wind sources in remote areas)
- Investigating incentives and compliance with forecasted obligations

Capturing Uncertainty - Wind Forecasting
Wind Committee's Recommendations

- Centralized wind forecasting:
  - Current wind penetration and forecasting errors do not necessitate need for a centralized wind forecasting system, at this stage. Options open to wind participants re: third party forecasting
- Development of wind forecast performance measures
  - Investigate industry standard methodologies
  - Acceptable level of forecast error
- Evaluating Forecasting Methodologies
  - near term, real time, mid term, long term
  - mid term wind forecasting capacity value (using the lesser of the median of simulated wind data over a 10 year history versus actual wind farm data over an approximate 2 year history)
- Analysing cost to the market of wind forecast error

Looking Ahead

- Wind and renewables are a welcome addition to supply Ontario's electricity needs
- Implementation of action plans to remove potential barriers for wind integration
- Continued wind power forecasting monitoring
- Actively involved with other North American forums in wind studies including:
  - North American Electric Reliability Corporation (NERC) Integration of Variable Generation Task Force (IVGTF)
  - ISO/RTO Council (IRC) Wind Task Force
  - NERC Reliability Assessment Sub-committee (RAS)
  - Canadian Wind Integration Working Group (CWIWG)
  - Natural Resources Canada stakeholder committee and
  - Northeast Power Coordinating Council (NPCC) Coordination of Planning (CP-8) forum.
- Challenge for System Operators (System reliability must be maintained while integrating increased penetration of wind into the system)