

# Alberta Electric System Operator

## Forecasting Overview

IEEE

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Reliable **Power**

Reliable **Markets**

Reliable **People**



# Topics for Today



- Overview of Alberta Electric Industry
- Role of Independent System Operator
- Why forecast?
- Forecasting periods
  - What are the forecasts?
  - How accurate are they?
  - Transmission Planning Underway
- How is the information used?
- Questions

# Alberta's Electric Industry

- **9,710 MW peak and 80% LF**

- **11,875 MW total generation**



COAL-FIRED  
PLANTS

5,893 MW



GREEN (Wind)  
POWER 523 MW



NATURAL  
GAS-FIRED PLANTS

4,412 MW



GREEN (Other renewables)  
POWER 178 MW



HYDRO  
POWER

869 MW

- **Over 280 generating units**
- **Wholesale market with about 200 market participants**
- **> 21,000 km of transmission**
- **Inter-ties BC (up to 780 MW) & Sask. (up to 150 MW)**



# Alberta Electric System Operator (AESO)



- Established in 2003 through the Electric Utilities Act to integrate the Power Pool of Alberta and the Transmission Administrator
- Non-profit agency independent of all other electricity marketplace participants
- Governed by an independent board appointed by the Minister of Energy
- Regulated by the Alberta Utilities Commission (previously EUB)
  - Transmission Tariff
  - Transmission Development and Need Identification Documents
- Fees are paid through the Pool Trading Charge and the Transmission Tariff
- Performs “Independent System Operator” function - 250 employees



# Role of the AESO



- **Independent System Operator** for the Alberta Interconnected Electric System
  - **Markets:** develop and operate Alberta's real-time wholesale energy market to facilitate fair, efficient and open competition
  - **Transmission System Development:** plan and develop Alberta's transmission system to ensure continued reliability and facilitate the competitive market and investment in new supply
  - **Transmission System Access:** provide system access for both generation and load customers
  - **System Operations:** direct the reliable operation of Alberta's power grid



- The Independent System Operator (ISO) in Alberta has a mandate to provide several forecasts
- Three forecasts provided are:
  - Short term forecast (STLF) – real time to 14 days
  - Mid term forecast (MTLF) – current month to 18/24 months
  - Long term forecast (LTLF) – 2 years to 20 years
- The forecasts are used by the ISO and industry in decision making

# Why Forecast?



- In general, forecasts allow decisions to be made
- Forecasts closer to 'now' are generally more accurate
- Risk increases as a forecasting period increases. Good long term forecasts are needed, more than ever
- Forecasting accuracy depends on:
  - The method of forecasting
  - The choice of inputs and variability of inputs
  - The nature of the product forecasted

# Why Forecast?...2



- Some forecast examples:
  - Weather
  - Outcome of sports events
  - Stock market, price forecasts
- Weather – is accurate for the ‘short’ term and for seasons. It gets tricky to predict the temperature three weeks from now. And Global warming...?
- Sports – who forecasted the Giants would win?
- Stock market – many stock predictions have been tried and failed. Markets will grow generally, but how specifically? Commodity price?

# Why Forecast?...3



- For electricity, forecasting growth is important for at least two reasons:
  - Shorter term – reliability - operational excellence
  - Longer term – development of infrastructure
- Short term – the system operators require a load forecast in order to ensure enough generation is available. The market requires a load forecast to ensure enough generation is bid. The ISO requires a forecast to ensure ancillary service commitments are met.

# Why Forecast?...4



- Longer Term – growth in the system requires new capital (transmission and generation). Development of infrastructure depends on an accurate forecast of appropriate granularity and timeframe (hourly for 20 years)
- Accuracy is assessed regularly. Forecast is generated annually. Corrections made when warranted

- Forecasting electricity consumption and growth requires different techniques for different purposes
- Different forecasts are used in different time frames to increase accuracy and reduce risk

## Focus

- Short Term: Keep lights on, costs low
- Mid Term: administer costs, operational flexibility
- Long Term: development of systems, huge capital in generation and transmission

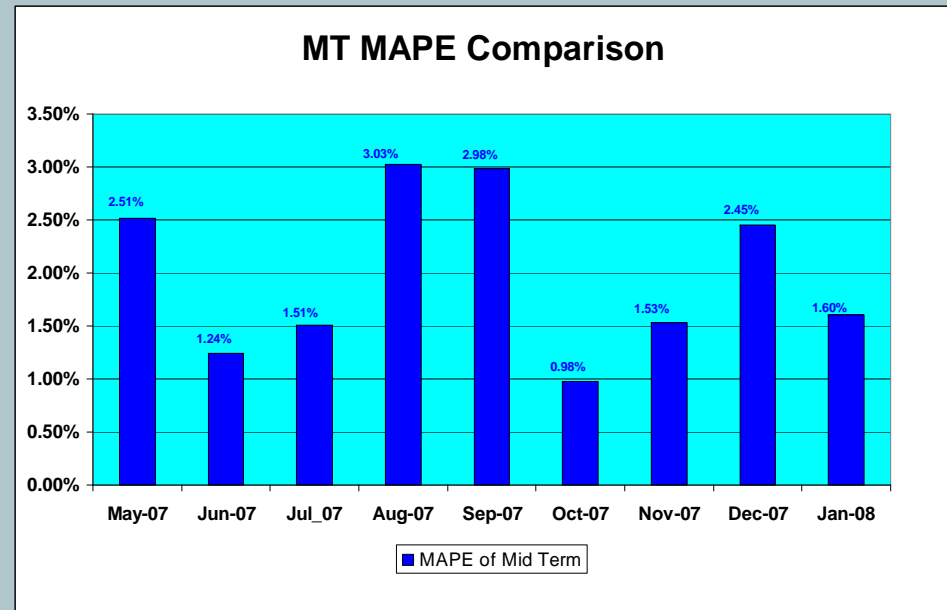
# Short Term Load Forecast (STLF)



- The STLF in Alberta is an hourly forecast used for 14 days
- Inputs: Hourly weather forecast from 4 distinct regions; historical load; specific data (hydro, inter-ties, holidays, etc)
- Outputs: hourly load; AS forecast
- Platform: SCADA system, neural network
- Accuracy: ~1-2%

# Mid Term Load Forecast (MTLF)

- MTLF is an assessment to be used for <24 months. Primary focus is operational coordination, tariff development, business plans
- Outputs: hourly load (overall or by point of delivery) AS forecast; losses



# Long Term Load Forecast (LTLF)



- LTLF - an hourly forecast used for 20 years (88 million points). Primary focus is for all long term planning (build long lead assets) and business models
- Inputs: new projects; historical load; economy information (large effect), SCADA/Metered data
- Outputs: hourly load (by point of delivery)
- Platform: Econometric models; load shapes and non-coincident peaks
- Accuracy: ~1-3% for energy and demand
- A – Actual, F – Forecast, C – Capacity (MW), E – Energy (GW.h)
- \* - system may peak late in 2008

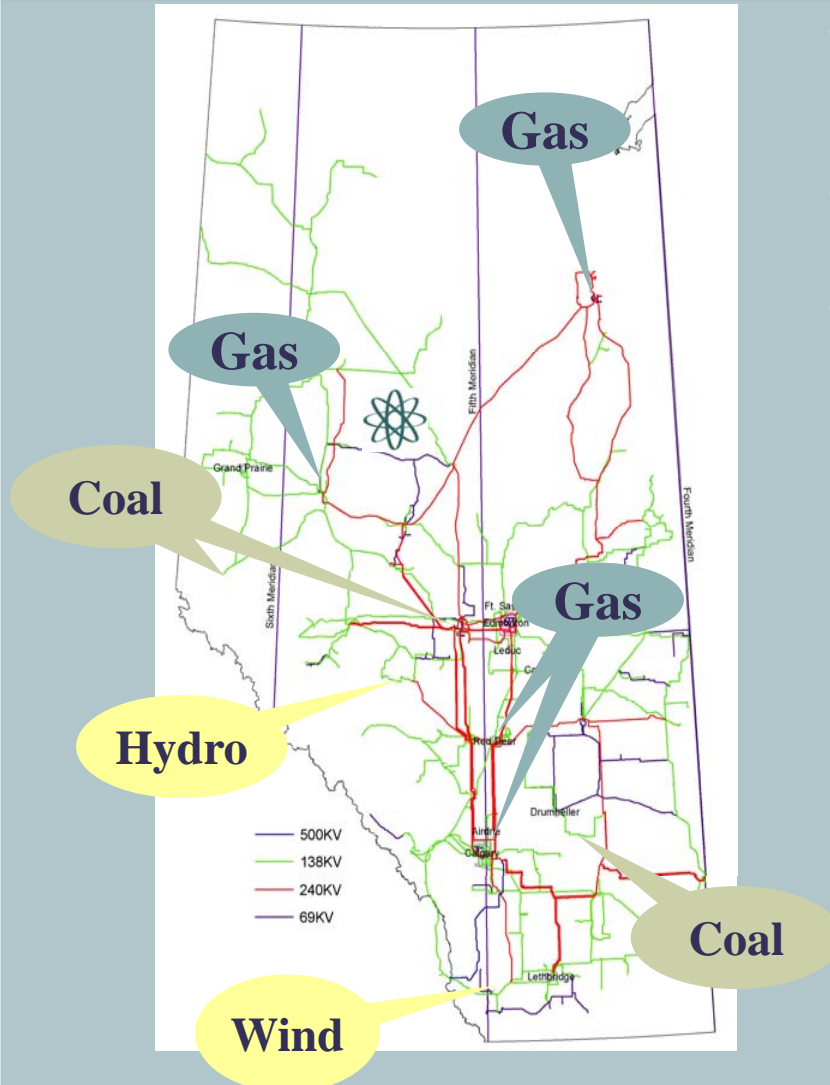
Period	C/E	Delta	%
2007 A	9466 MW		
2008 A, Jan	9710 MW	+244	2.6
2008 F* ...	9727 MW	+261	2.8
2005 Feb – 2006 Jan	66,421 GW.h	-	-
2006 Feb – 2007 Jan	69,452 GW.h	3,030	4.6
2007 Feb – 2008 Jan	69,788 GW.h	336	0.5

# Challenges in Powering Alberta

- Alberta is leading North America in load growth
  - Growth in demand is equal to adding two cities the size of Red Deer each year - about 3% per year
  - Adequate supply in the near term but need 3,800 MW by 2016
- Over the last 20 years, power demand in Alberta has doubled but no major upgrades to the transmission backbone!
  - *Need transmission* to interconnect load and generation for adequate supply and for reliability



# Transmission Planning – A Long Term View



- Need a flexible, reliable and open transmission system wherever suppliers and consumers are located
- Transmission must keep pace with Alberta's resource based economy
- Developing new transmission can be challenging:
  - Need to consider a wide range of generation scenarios – market driven
  - Take a long term view 10 and 20 year plans
  - Some generation may be built in 18-24 months but transmission may take 5-8 years
  - Need to consult in a comprehensive and open manner on access issues
  - Transmission is critical infrastructure and excellent value
    - Facilitates competitive generation market
    - \$500 million N-S 500 kV line results in about a 70¢/month increase in a "typical" residential consumer's bill

# LTLF - Transmission System Development...2



- Location of new generation driven by market
- Transmission additions:
  - Meet needs of new generation and load, and
  - Meets the needs of the system by reinforcement
  - Merchant transmission may also occur (internal or external to AIES)
- ISO ensures the reliability of the system while not knowing with certainty where the next generation may occur
- Forecasts (load and generation additions) assist in transmission planning by allowing various scenarios to be examined

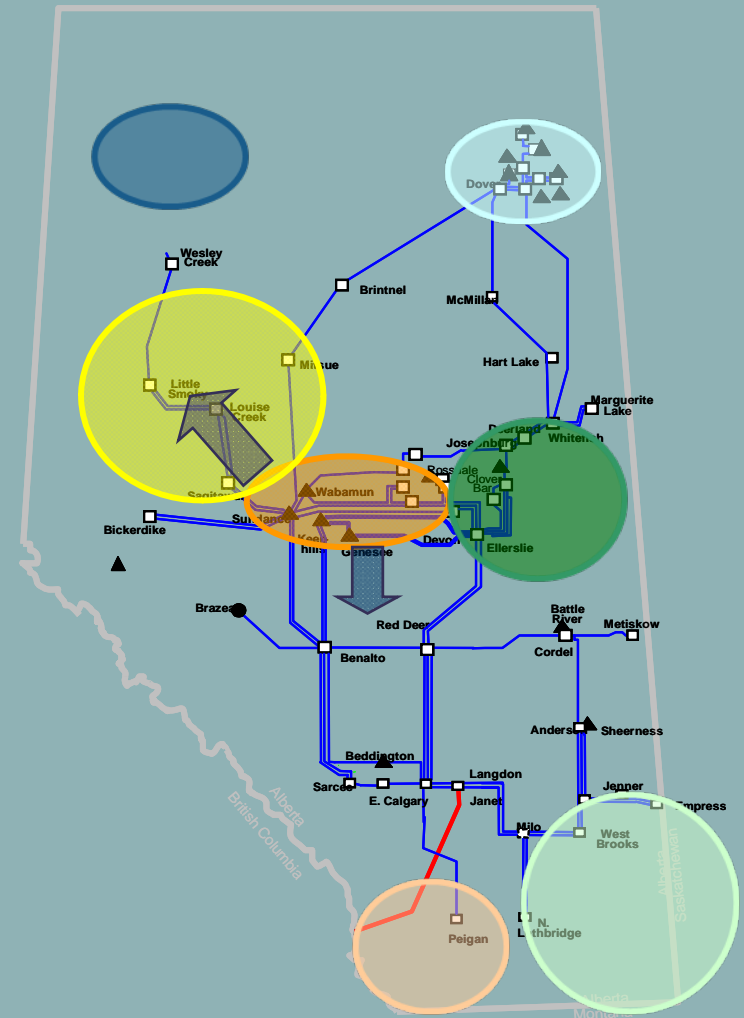
# LTLF - Transmission System Development

- **Approved Major transmission reinforcements**
  - City of Edmonton reinforcement
  - Southwest and Northwest system reinforcements
- **Plans Under Development**
  - Southeast region for reliability, interconnection of wind generation and restoration of the inter-tie with Saskatchewan
  - Fort McMurray area meet load growth and to service oilsands
  - Heartland region for planned bitumen upgraders
  - Edmonton to Calgary 500-kV reinforcement
  - Second Edmonton – Calgary 500 kV
  - Additional Inter-ties and merchant transmission lines



# LTLF - Transmission System Development...3

- KEG (Keephills, Ellerslie, Genesee) 
- North East (Fort McMurray) 
- Edmonton / Fort Saskatchewan 
- Rainbow 
- North West (Grand Prairie, Valleyview, Peace River) 
- South West 
- South East 



# Use of Forecasts



- ISO uses forecasts to ensure reliability, support decisions, and keep costs low:
  - Plan and operate the system;
  - Coordinate outages;
  - Confirm and support need applications
- Industry uses forecasts to plan their business:
  - plan generation additions;
  - add load;
  - run their power systems

# Questions?



- [www.aeso.ca](http://www.aeso.ca)