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# **Inside Alberta's Wholesale Electricity Market**

# *Competitive Electricity Market in Alberta*

- Industry structure
- The AESO
- Transacting in energy market
- Pool price history/examples
- Operations and Reliability
- Transmission moving forward
- Wholesale market refinements - implementation

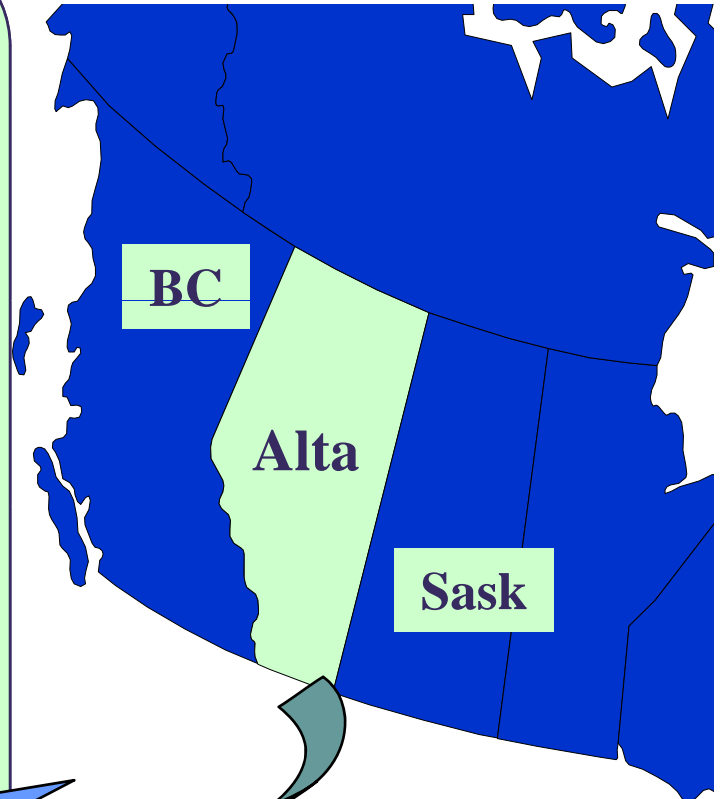


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# *Alberta's Electric Industry*

- More than 21,000 km transmission
- Single control area of 660,000 km<sup>2</sup>
- Interties to B.C. (up to 800 MW) & Sask. (up to 150 MW)
- Over 280 generating units
- 9,580 MW system peak
- About 200 market participants
- 11,734 MW internal generation capacity net to grid



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# Alberta's Electricity Generation



GREEN  
POWER



COAL-FIRED  
PLANTS



NATURAL  
GAS-FIRED PLANTS



HYDRO  
POWER

Woodwaste

Wind

Coal-fired  
generation

Gas fired  
generation

Hydro

Other

Megawatts  
(MW)

133

298

5770

4604

899

30

**Total generation available**  
(net capacity to grid)

**11,734**

**Transmission  
Interconnections**

**British Columbia**

**Import Export**

**0-780 0-800**

**Saskatchewan**

**0-150 0-60**

System conditions may cause the actual interconnection capabilities to vary within these ranges.

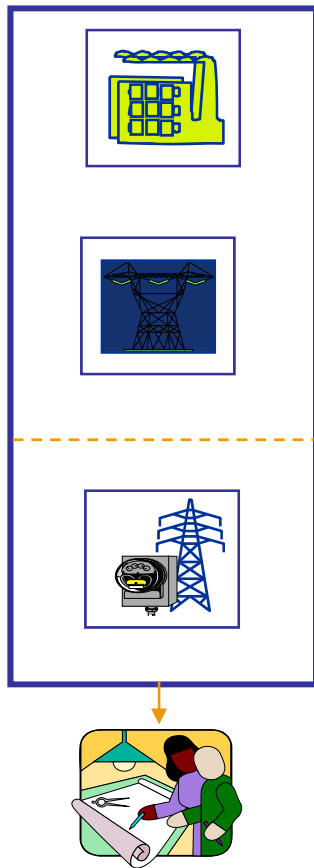


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# Industry Model Post-Restructuring

## Vertically Integrated Utility



competitive forces



natural monopoly



natural monopoly



competitive forces



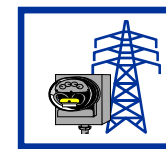
## Functional Separation



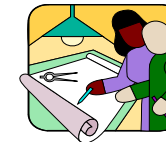
Generation



Transmission



Distribution

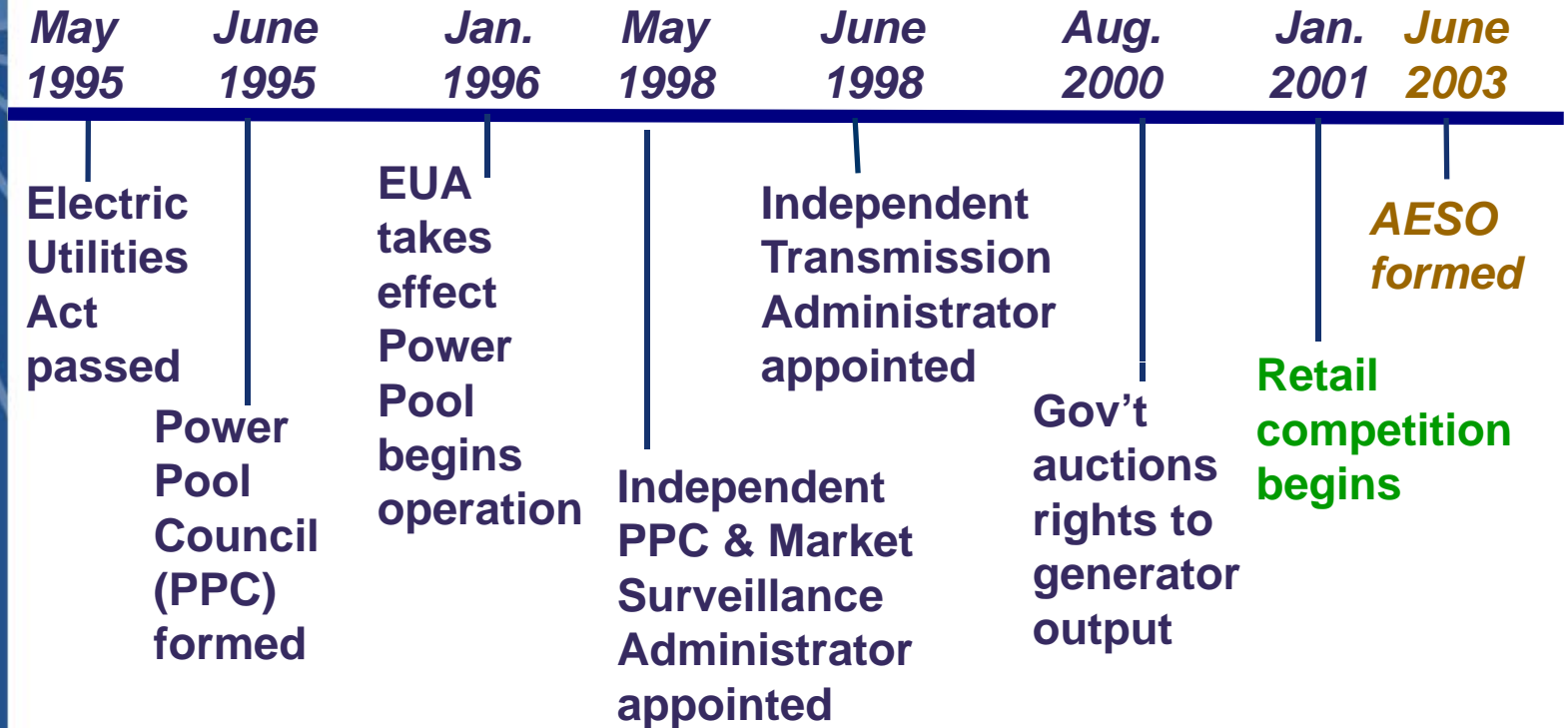


Retail



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# Evolution to Competition Timeline



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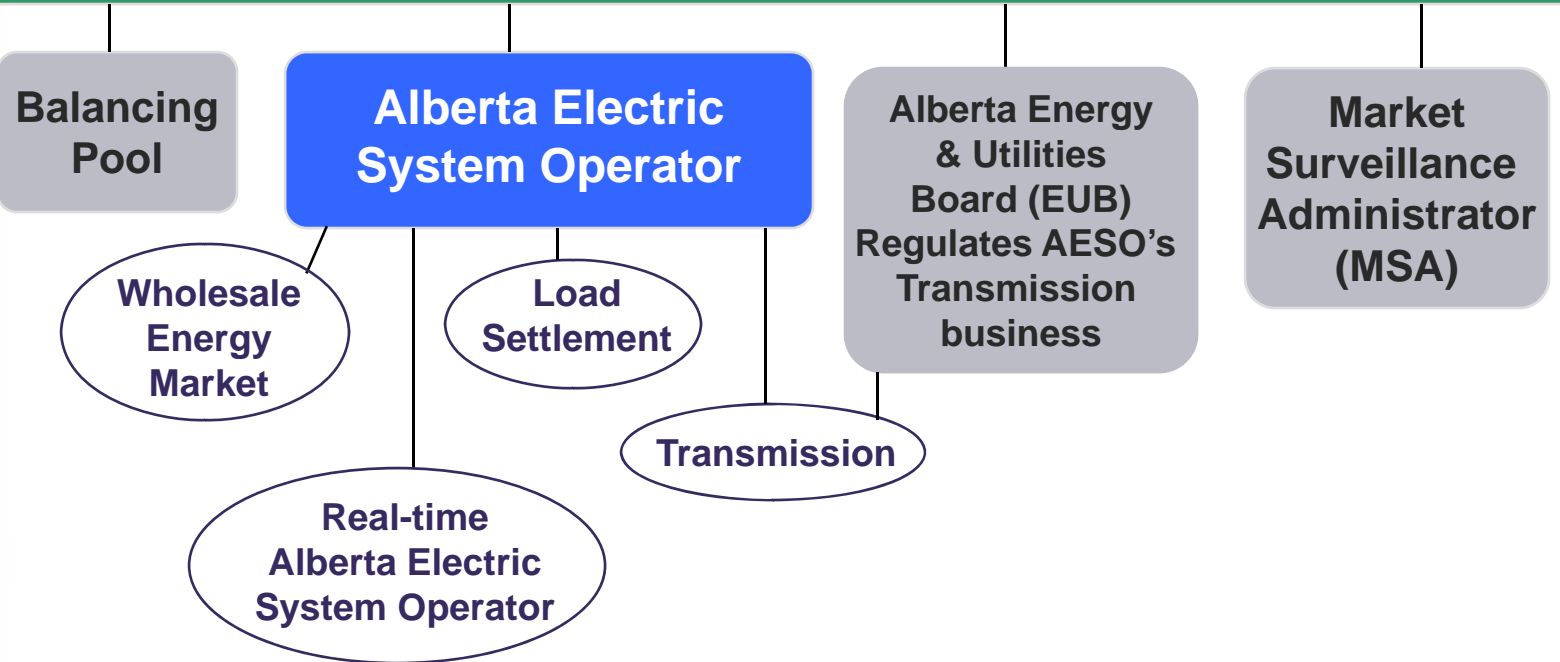
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# Industry Structure

## Electric Utilities Act

### Minister of Energy

Appoints Board members , MSA & EUB Chair



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## *The Alberta Energy and Utilities Board (EUB)*

- The EUB is an independent, quasi-judicial agency of the Alberta government
- It will continue to regulate transmission additions and tariffs
- Investigates and rules on regulated rate disputes and transmission system access problems
- Issues environmental and siting approvals for new generation projects
- Approves the distribution and regulated rate option tariffs



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## *Market Surveillance Administrator*

- Performs on-going monitoring of Alberta's electricity markets to ensure efficient and fair operation of the markets and compliance with all rules, laws and regulations
- Resolves issues before they become complaints
- Responds to formal complaints and assesses penalties where appropriate
- Makes recommendations to the AESO regarding the rules and procedures



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## *Balancing Pool*

- Markets unsold power purchase agreement (PPA) capacity to participants and distributes net proceeds from sales to consumers
- Manages the unsold PPAs and will assume control if a PPA holder defaults on a PPA
- Ultimately returns profits it acquires to Alberta consumers



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## **The AESO – Core Business Functions**

## *Who Is the AESO?*

- Statutory organization: integration of previous Power Pool and Transmission Administrator functions
- Not-for-profit
- Revenue generated from energy trading charge and transmission tariff
- Holds no commercial interests - independent
- Impartial - no affiliation with industry
- Transmission regulated by the Energy and Utilities Board
- Governed by independent board appointed by the Minister of Energy



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## *AESO Core Business Functions*

- Operate a competitive wholesale electricity market
- Direct real-time operation of the provincial electric grid including imports and exports, all while maintaining a safe & reliable system
- Plan and develop the transmission system and identify the need for upgrades and additions
- The AESO is accountable for the administration and regulation of the provincial load settlement
- Non-discriminatory access for load and generation customers to the transmission system



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## *Wholesale Energy Market*

- Receives and manages bids and offers from participants
- Prepares day-ahead schedule and six-day forecast of the pool price
- Determines and dispatches energy merit order
- Carries out the financial settlement and reporting
- Credit monitoring
- Market information availability
- Schedules generation and loads to provide system services
- Calculates and communicates hourly pool price
- Market rules



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## *Ancillary Services*

- Procured and dispatched by AESO
- Reserves (regulating, spinning and supplemental) procured from independent third party market as well as over-the-counter arrangements
- “Merit order” provided to AESO System Controller to utilize as required to maintain reserves
- Other ancillary services procured through service contracts or tariff terms and conditions



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## *Long-term Transmission Planning*

- Develop 10-year detailed transmission plan
- Develop a 20-year Outlook
- Ensuring adequate transmission capability
- Enabling competition and facilitating new investment in load and generation



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## *Transmission Role*

- Provides open, non-discriminatory access to grid
- Contracts with transmission facility owners to provide service
- Connects customers (supply and load)
- Designs tariffs for system access (regulated)
- Sets standards for transmission system operation
- Long-term and short-term system planning



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## *Settlement*

- **Load Settlement:** The hourly allocation of the total energy delivered to retailers, so financial settlement can be completed
- **Energy Market Settlement:** Collecting from retailers for energy delivered to pay suppliers for power provided
- **Transmission Settlement:** Allocates all credits/charges associated with the AESO's transmission services



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## *Real-Time Electric System Operator*

- Ensures the safe, reliable and economic operation of the provincial power system
- Matches supply with demand by dispatching generators and price-responsive bids according to the merit order set by the AESO
- Provides direction to transmission facility owners to coordinate the operation of the transmission system
- Dispatches ancillary services
- Schedules imports and exports



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# Transmission Moving Forward

## *Transmission Mandate*

Timely approval and construction of required transmission facilities to:

- Continue to provide safe, reliable and economic open access transmission service
- Ensure transmission facilitates an openly competitive wholesale electricity market

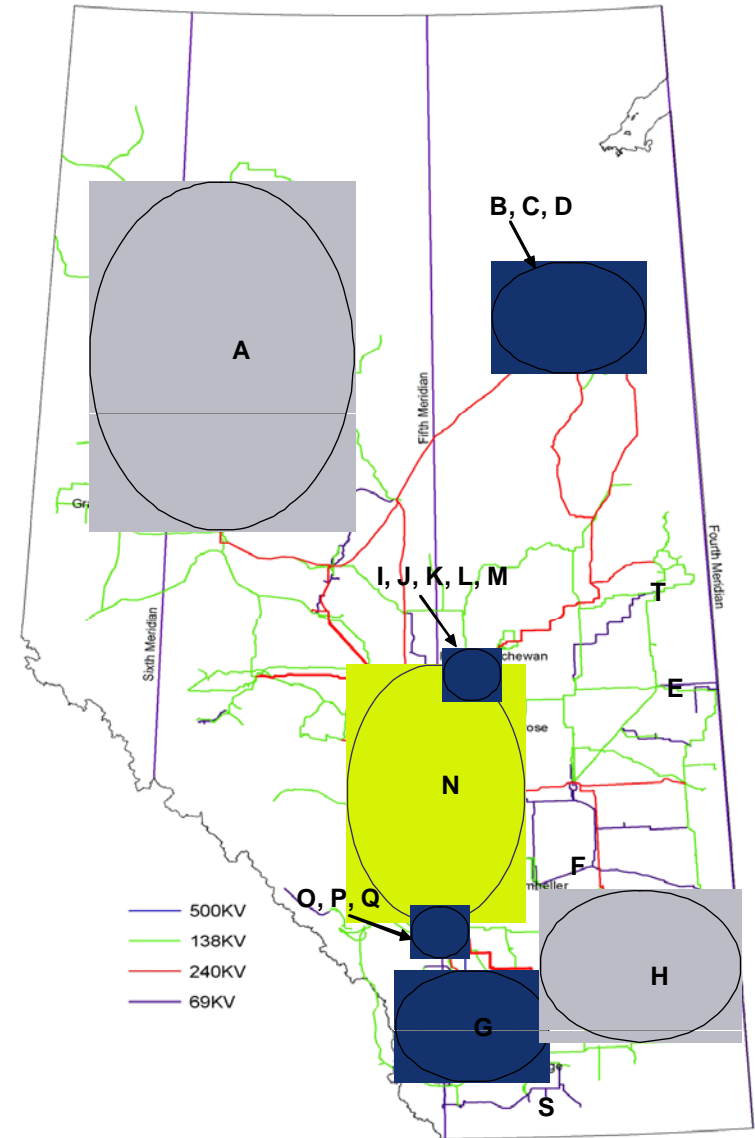


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# Major Transmission Initiatives

- Ongoing quarterly reports on website
- Edmonton to Calgary Reinforcement
- SW Alberta
- Downtown Edmonton
- NW Alberta
- SE Alberta
- Fort McMurray/Fort Saskatchewan
- Calgary area



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## *New Approaches*

- Enhanced consultation process
  - The “right” process for the “right” project
  - Successful pilot of extensive stakeholder approach in NW Alberta – no hearing required; facilities approved
  - Broader consultation at each stage
  - Greater transparency of process, input and feedback
- Enhanced visibility of planning priorities
  - Quarterly transmission planning reports on AESO website
  - Quarterly reporting of approved projects
  - Additional specific project reporting commitments on significant projects



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## *Summary*

- Some major successes in recent EUB approvals
- Making good progress on key priorities
- New methods to consult more effectively with stakeholders – transparent, open, often and early
- Appreciate cooperation and patience from stakeholders in helping us test the new process
- Timely updates for Edmonton to Calgary project



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# Transacting in Alberta's Energy Market

# Hourly Real-Time Market



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# *Spot Market Operation*

## Day-Ahead Submissions

- Bid/offers received by noon
- Price is firm
- Can be a “price-taker” if they do not want to bid/offer a price for their energy
- Each unit can use 7 price-quantity pairs for each hour
- Schedules published by 1600h (4:00 p.m.)



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## *Offers and Bids*

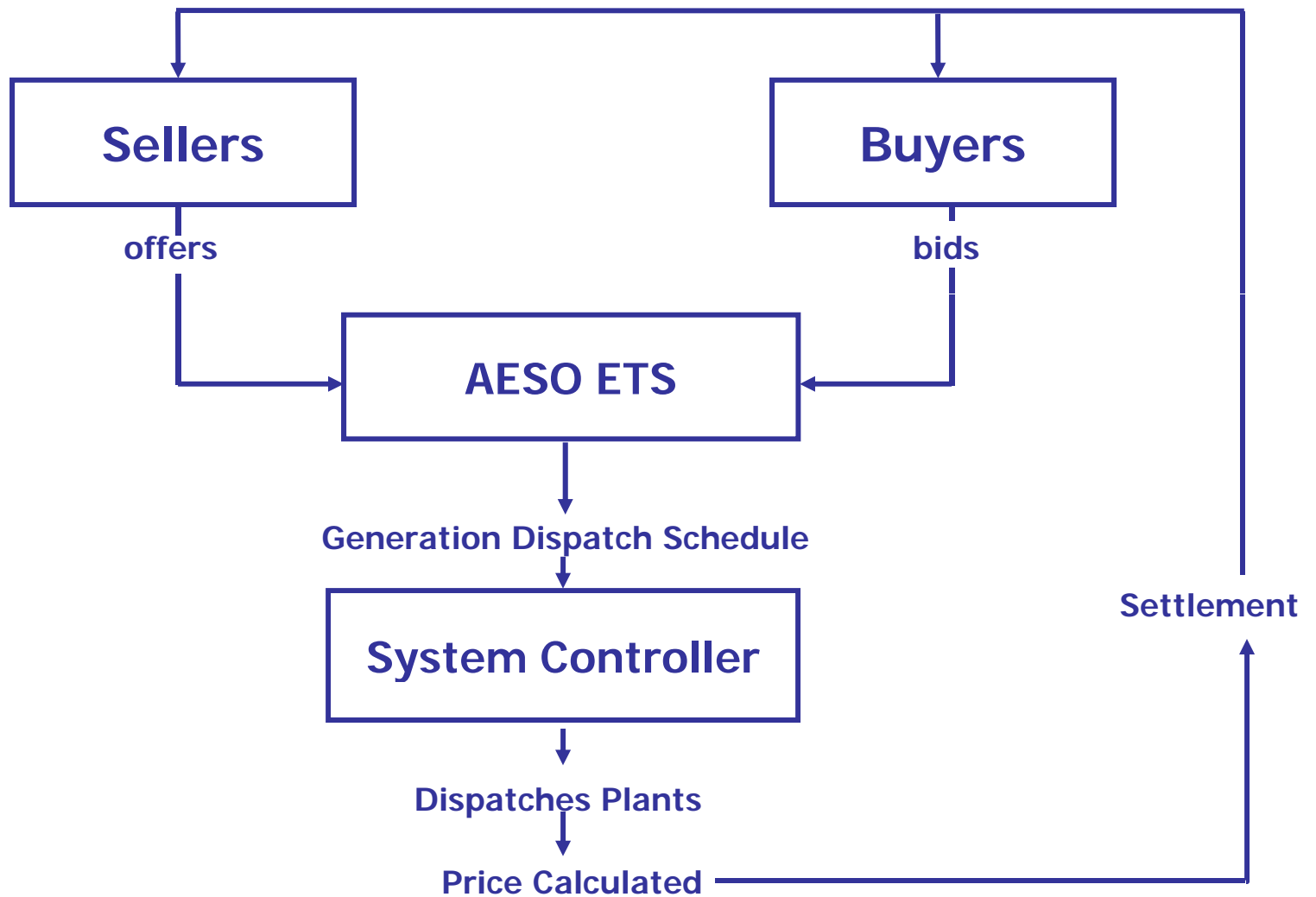
- The AESO accepts offers to sell power and bids to buy power through the secure, web based Energy Trading System (ETS)
- The offers are ordered from least to most expensive to create the merit order
- The system controller uses the least cost offers in the merit order to supply demand in real time



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# Spot Market



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## *Imports and Exports*

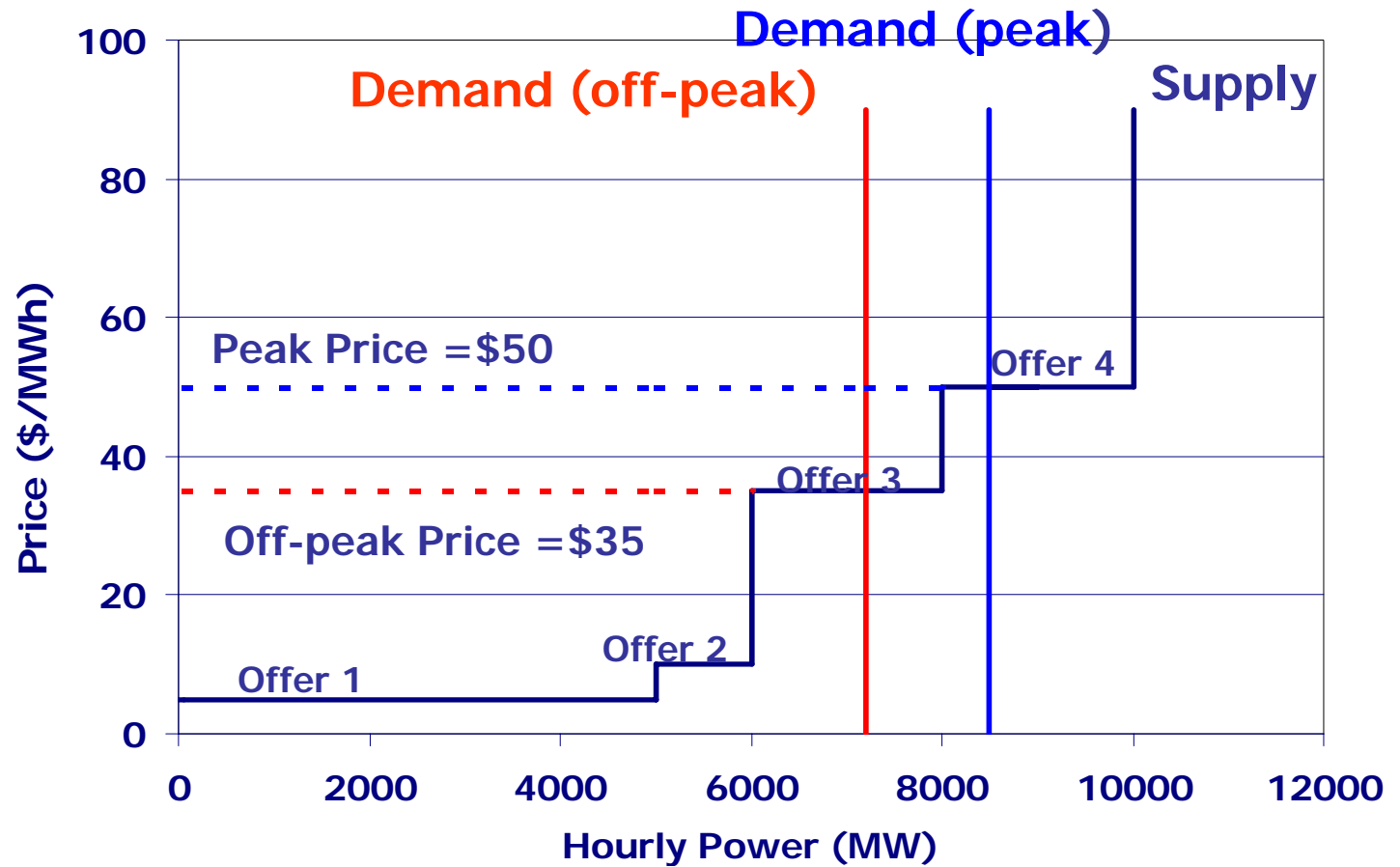
- There is a tieline to B.C which provides access to the U.S. NW and a 150 MW tie line into Saskatchewan
- Imports are price takers and are offered into the AESO at \$0/MWh to ensure dispatch
- Exports are price takers and bid into the AESO at \$999.99/MWh to ensure they are dispatched to supply external contracts



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# Merit Order Dispatch



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## *Generation Revenue*

- The pool price is the arithmetic average of the 60 one minute system marginal prices
- Only those offers accepted generate power and receive the AESO pool price
- All offers accepted receive the same price, the pool price, not the price offered



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## *Physical Bilateral Market*

- Buyers and sellers in Alberta can hedge their price of power by engaging in bilateral contracts
- There is a physical requirement to deliver the electricity or buy the shortfall from the AESO
- These contracts specify the quantity, the price, the buyer, the seller and the term of the contract
- These contracts can be completed directly between buyer and seller or through the Watt-Ex exchange



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## *How a Bilateral Contract Works*

- 1) The seller would offer power into the AESO in order for their plant to be dispatched
- 2) Buyer and seller would register a contract with the AESO so buyer/seller will not pay/receive pool price for volumes consumed/generated
- 3) This contract is called a Net Settlement Instruction (NSI)



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## *Marketers*

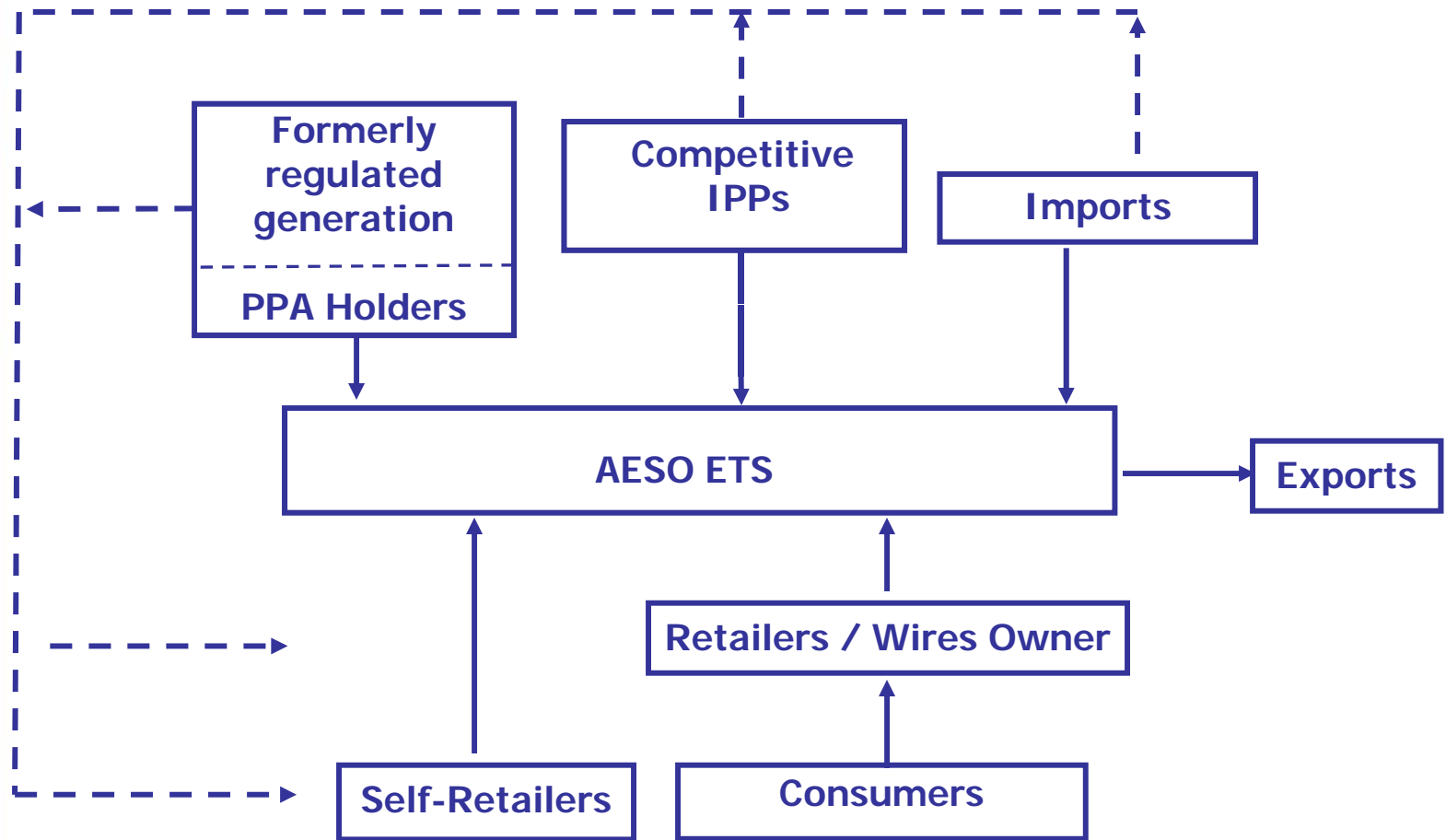
- Marketers wholesale the output of generating units to retailers, wire service providers and end-use customers through bilateral contracts
- Marketers in Alberta are primarily importers and entities selling under Net Settlement Instructions (NSI) (mostly PPA holders)



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# Alberta's Bilateral Market



Bilateral Deals



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## *Watt-Ex Forward Market*

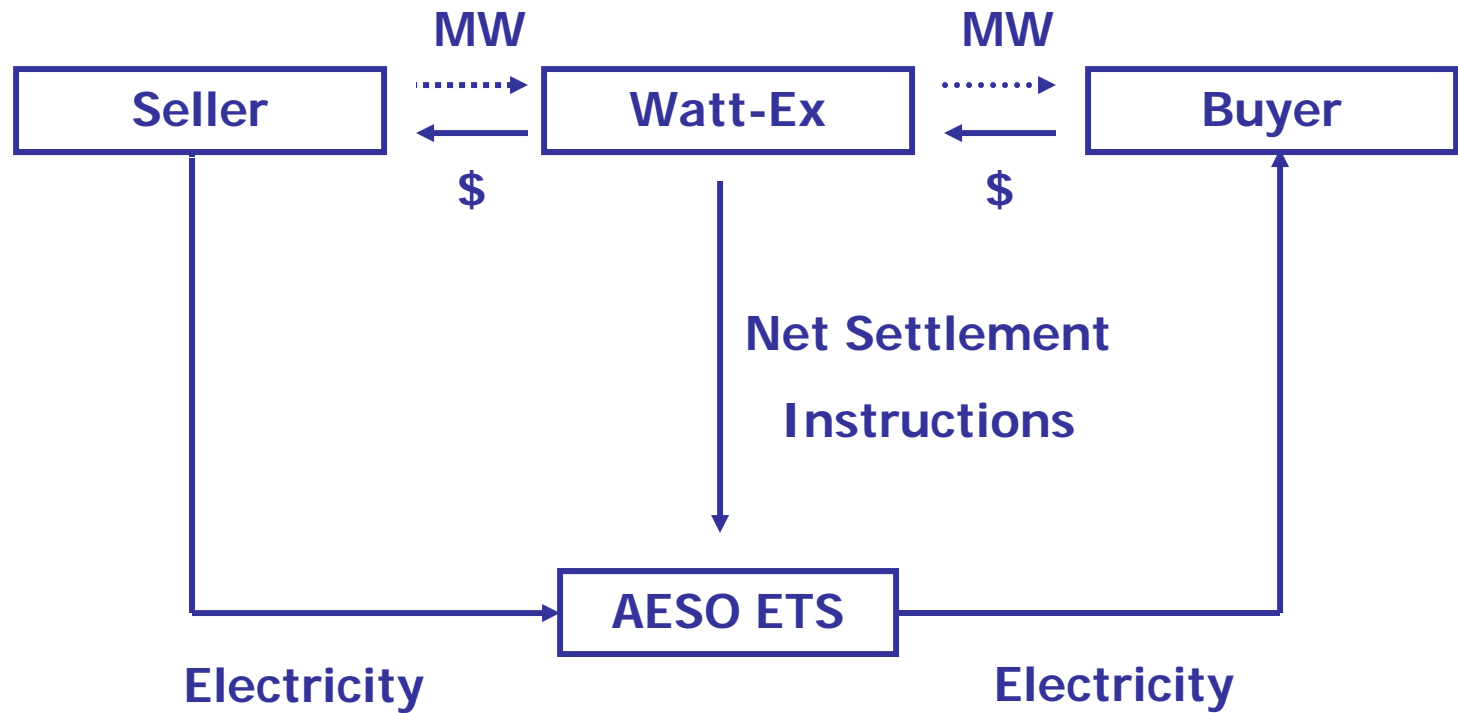
- Watt-Ex facilitates forward bilateral transactions between buyers and sellers
- Watt-Ex also publishes a forward price curve showing the prices parties are willing to buy and sell power for future delivery



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# *Watt-Ex Forward Transaction*



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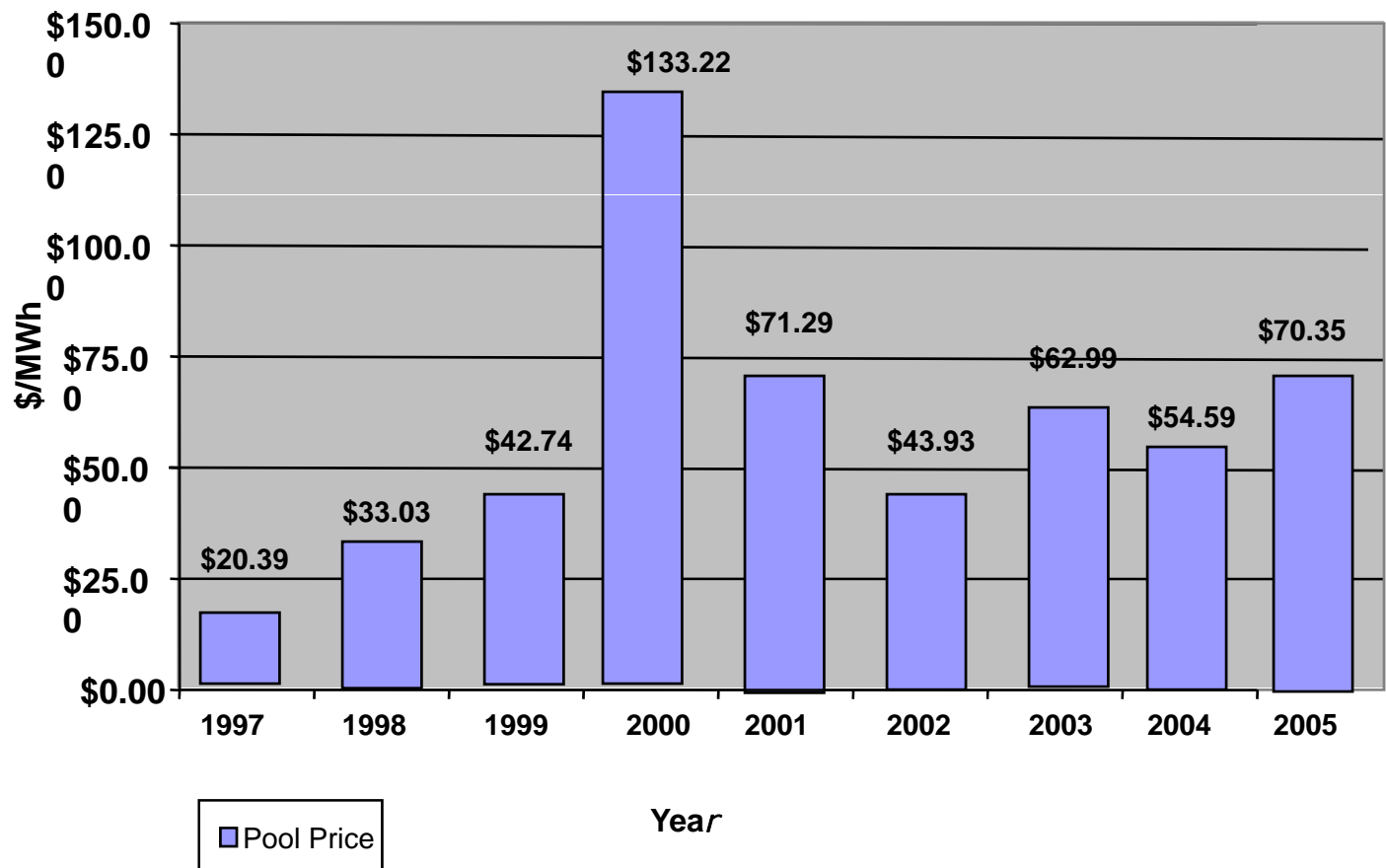
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## **Alberta Pool Price History/Examples**

# Average Yearly Pool Price

2006 YTD Price = \$79.36/MWh



# *Price Drivers*

## **Supply conditions**

- Impact of hydroelectric power (Alberta and neighbouring markets)
- Performance and timing of new/existing generators
- Responsiveness of demand side
- Fluctuating natural gas prices
- Access on transmission interconnections



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# Wholesale Market Policy Refinements

# *Wholesale Market Review Summary*

- Short-Term Adequacy
- Long-Term Adequacy
- Interties
- Transmission Must-Run
- Operating Reserves
- Balancing Pool
- Market Power Mitigation
- Liquidity
- Intermittent Generation
- Credit
- Demand Response



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## *Strong Market Fundamentals*

- Alberta depends on the competitive market to provide an adequate supply of electricity
- Confidence in the market structure and operation is essential
  - Fair, efficient and openly competitive
  - Trusted index
  - The market structure must be sustainable and predictable, delivering long-term value
  - Market stability: five year *roadmap* for Alberta's market
- Collaborative approach with industry



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# Operations & Reliability

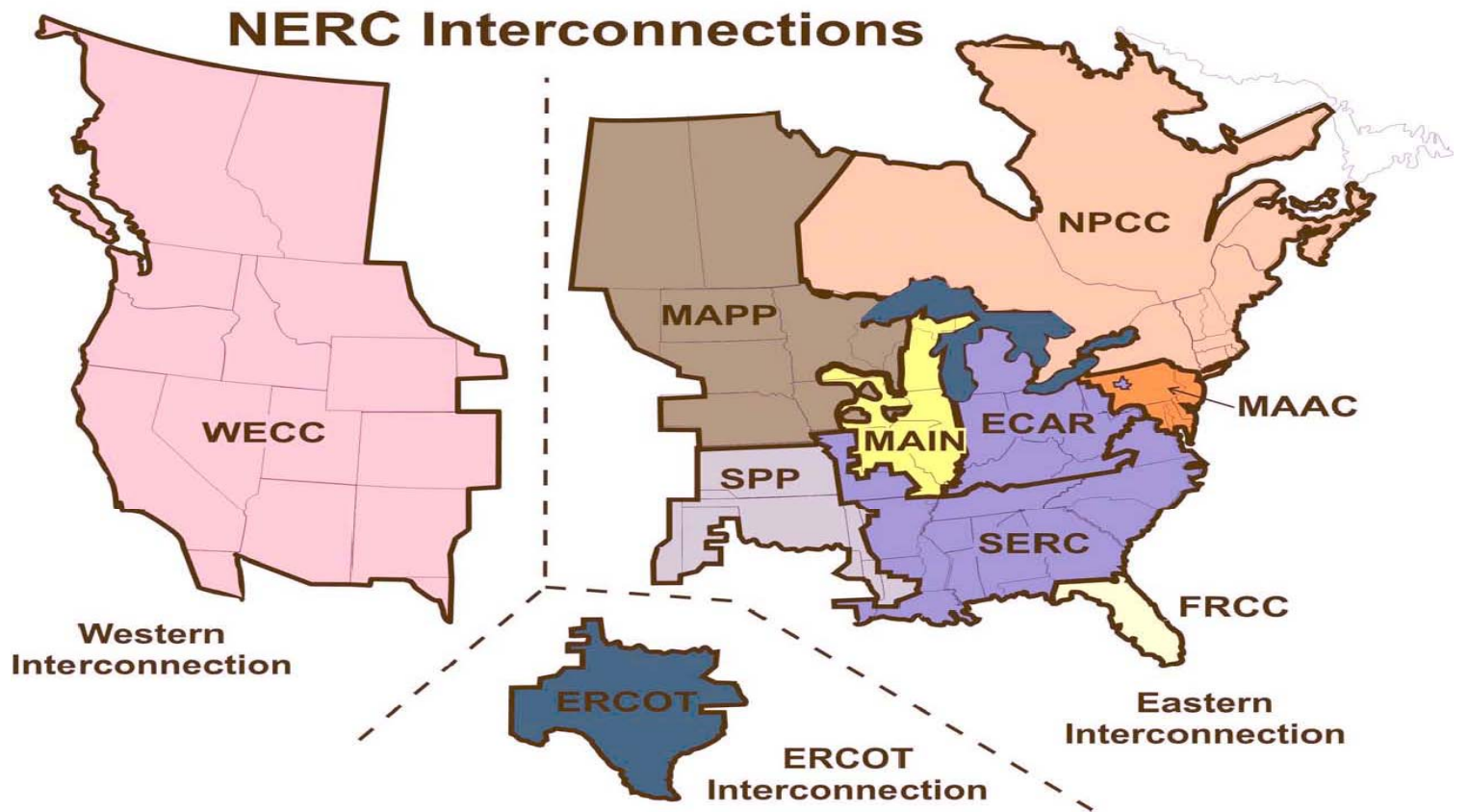
# *WESTERN INTERCONNECTION OVERVIEW*

- AESO Certified as a Control Area in July 2004
- AESO is ISO for province of Alberta
- Alberta first and only competitive/wholesale electricity market in Canada
- Under current NERC Functional Model structure
  - Regional Reliability Organization – Western Electricity Coordinating Council
  - Reliability Coordinator – Pacific NorthWest Security Coordination
  - AESO has registered for:
    - Balancing Authority
    - Transmission Operator
    - Planning Authority
    - Transmission Planner



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## *Relationships with Transmission Facility Owners*

- Must comply with standards and practices established by the AESO to enable the AESO to carry out its duties, responsibilities and functions
- Must provide the AESO with use of the owner's transmission facility for the purpose of carrying out the AESO's duties, responsibilities and functions



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## *Relationships with Generation Facility Owners*

- All Generator owners are Independent Power Producers
- More than 280 generation units connected to the transmission grid Interconnection agreements with generators
- Must comply with AESO Operating Policies and Procedures and Rules



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## *Facility Interconnection Agreements*

- Have an operating agreement with British Columbia Transmission Corporation for western intertie
  - BCTC ratings are coordinated through WECC approved processes
- Operate under the intent of an agreement with SaskPower on the eastern intertie



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## *Relationships with other Entities*

- Pacific Northwest Security Coordinator – Reliability Coordinator
- Northwest Power Pool – Reserve Sharing Group



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## *Energy Management System Facilities – Operations*

- EMS is linked to our ancillary services and energy market systems to exchange market information and enable control area (balancing area) functions such as:
  - maintaining supply demand balance – energy market dispatch
  - meet WECC and NWPP regulating and contingency reserve requirements
  - implement interconnection schedules and accounting
  - load forecasts
  - unit commitment



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# *Real-Time Electric System Operator*

## **Two functional responsibilities**

Operate the grid to NERC standards, WECC Minimum Operating Reliability Criteria and AESO Operating Policies and Procedures

- Registered as the Transmission Operator under the functional model
- System reliability for the integrated Alberta grid
- Coordinate transmission facility owner operations

Operate the Alberta market to the AESO Rules

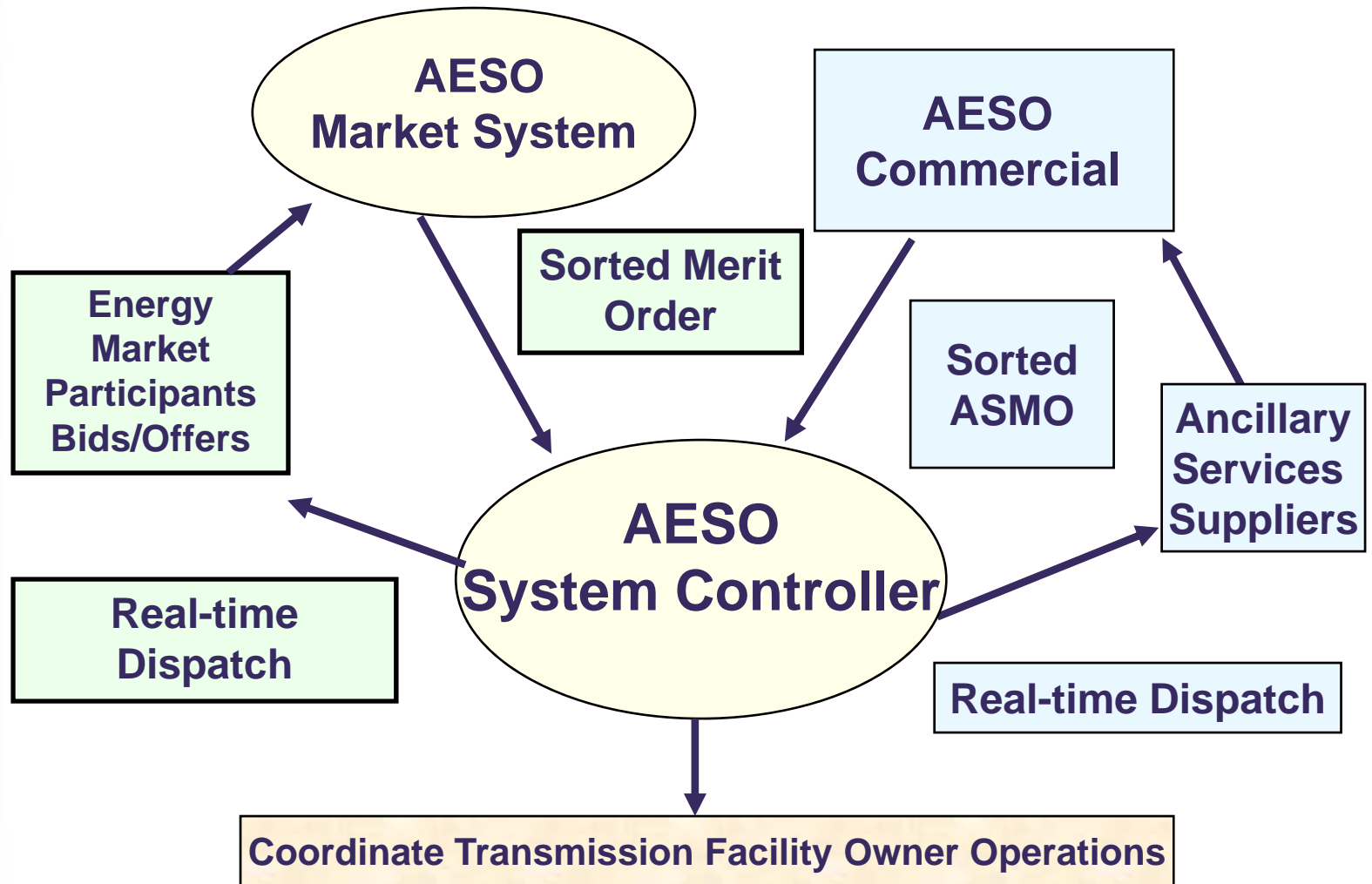
- Registered as Balancing Authority under the functional model
- Alberta markets provide the merit orders used to meet the supply/demand balance and ancillary services requirements



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## *Ancillary Services*

- Procured and dispatched by AESO
- Reserves (regulating, spinning and supplemental) procured from independent third party market as well as over-the-counter arrangements
- Ancillary Service Merit Order (ASMO) developed by 16:00 day ahead
- System Controller dispatches ASMO as required to maintain adequate operating reserves.
- System Controller doesn't see Ancillary Services costs (prices)



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## *Audit for Compliance with Reliability Standards*

- Self-assessment with WECC compliance Program
- NERC/WECC Readiness Audit
  - 2005 AESO recognized for best North American practice
- Reliability Management System Compliance



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## *Summary*

- Operate a competitive wholesale electricity market
- Direct real-time operation of the provincial electric grid including imports and exports, while maintaining a safe and reliable system
- Plan and develop the transmission system and identify the need for upgrades and additions
- Accountability for the administration and regulation of the provincial load settlement
- Non-discriminatory access to the transmission system



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