Intervention in Electricity Markets

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Overview

- Energy only market and market failure
  - Missing market for insurance
  - Market power
- Alberta's experience with an energy only market
- Reducing emissions through subsidized renewals

Rationale for Administrative Intervention: Supply Inadequacy

- Loss of load or loss of energy
- Administrative standard
  - 1 hour in 10 years for loss of load
  - 0.0011%
- Market design gives rise to missing money problem
  - Price caps to control market power
- Market capacity less than administrative standard
- Inadequate reserve margins or supply inadequacy
- Capacity market appears to be the preferred solution

Supply Adequacy

- Administrative standard is arbitrary
  - Ex ante optimization with ex post failure is not, unfortunately perhaps, defensible
  - Ex post failure to be avoided on “my watch”
- Nervous politicians and (some) generators incentives to form a coalition for excessive supply adequacy
  - Capacity procurement raises revenues to industry

Missing market

- Real time perfectly inelastic demand
- Supply shortfall rotating black outs are likely and often they are random
  - Quality of service is the same for all load or relatively undifferentiated across large classes of customers
- Electricity is differentiated by time and place and can be differentiated by quality, i.e., reliability of supply
- Regulatory provision of supply adequacy
  - one size fits all: same size, colour and size of shoes
- Capacity "markets" administrative demand curve
  - Demand curve created by government fiat
  - Alberta case government fiat enshrining minimum goal of 0.0011% loss of load
  - Engineering standard from the early days of the electricity industry

Markets reveal information

- Markets are a decentralized mechanism that reveals and aggregates information
- Price signal value
  - Marginal cost of production
  - Willingness to pay, i.e., value consumers place on the margin for:
    - more of a good
    - higher quality, i.e., more certain supply
- Central planning does not work because it cannot reveal and communicate relevant information as circumstances change and which require changes in the allocation of resources for efficiency

Competitive markets and supply adequacy

- Assume: Competitive retailers and competitive generators
- Assume technology exists to discontinue customers individually
- Retailer offers comprise
  - energy price and insurance against price volatility
  - insurance against supply shortage
  - insurance premium determines order of disconnect
- Disconnect consumers with revealed lower value for grid power first
  - Low-cost ability to switch to alternatives or have low willingness to pay for electricity
- Priority Pricing

Market for supply adequacy

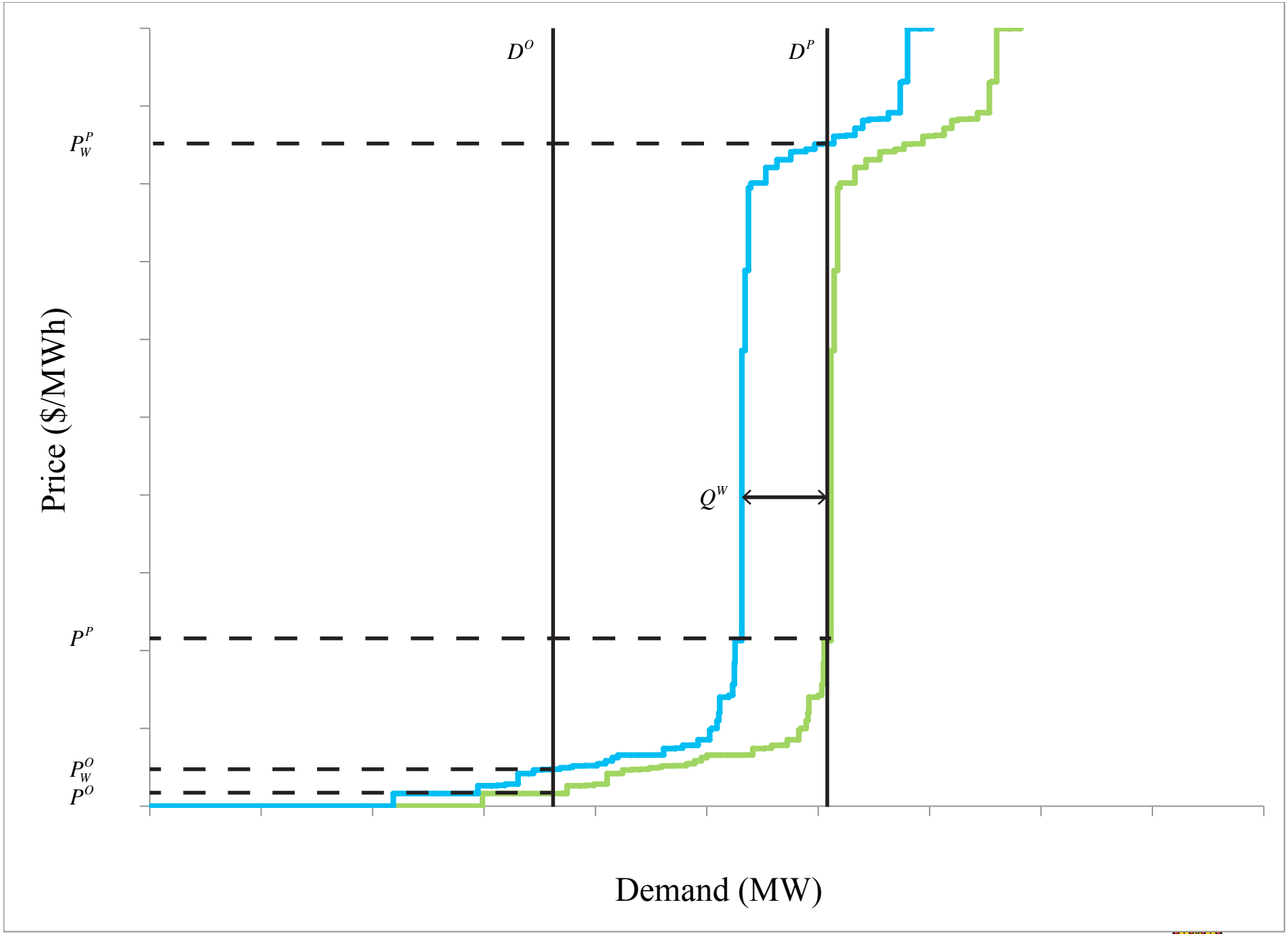
- Retailers quote a menu of insurance premiums and probability of supply pairs
- Higher insurance premiums, higher probabilities of supply
- Retailers required to contract for supply, i.e., insure sufficient capacity that they meet the promised probability of supply
- Consumers can compare the value of higher likelihood of supply with its costs
- Higher probability involves a higher cost, retailer has to contract for more capacity
- Information on the efficient level of capacity revealed in competitive retail markets
- Requires correct mix of technology and market design
- Consumers face the cost of higher quality: let the market work

Rationale for Administrative Intervention: Market power

- Market power ability to profitably raise price over competitive levels.
- What is the competitive level when there are sunk fixed costs?
- Short run behavioural measures false positives:
  - Price over short run marginal cost in energy market for an hour not appropriate
  - Recover sunk fixed costs over the year, will require minimum level of aggregate rents
- Profitable entry but no entry forthcoming was the MSA test in Alberta

Exercise of Market Power in the AIES

- Physical withholding is not permitted
  - All available capacity must be offered
- Economic withholding is permitted
  - Economic withholding involves offering at a sufficiently high price that it is unlikely to be dispatched
  - Effectively withhold capacity from the market
- Trade off determines profitability
  - Increase in price for dispatched generation
  - Lost margin from withheld capacity
- Increase in price depends mostly on the elasticity of supply above the marginal supplier
- Profitability depends on extent of inframarginal supply, i.e. portfolio considerations, including its financial position



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Ability to exercise market power

- In most hours the ability to exercise market power is limited
  - Low demand (e.g. overnight, moderate weather)
  - High availability of competing supply (e.g. few thermal outages, high wind, a lot of water)
- In a few hours generators can meaningfully influence prices
  - The market clears on a steep section of the supply curve where a small change in supply can significantly change price
- For example, average price 2009-2012 was $60/MWh. If the top 5% of hours is excluded the average price falls to $33/MWh.

Energy only market in Alberta: Market performance

- Annual Pool Price Statistics ($/MWh)

Year	2011	2012	2013	2014	2015	2016	2017
Average Pool Price	$76.22	$64.32	$80.19	$49.42	$33.34	$18.28	$22.19
On-peak Average	$102.22	$84.72	$106.13	$61.48	$40.73	$19.73	$24.46
Off-peak Average	$24.22	$23.51	$28.29	$25.28	$18.55	$15.37	$17.64

Energy only market in Alberta: Market performance

- Capacity Investment

Year	System Capacity	AIL Daily	Summer Peak	Winter Peak
2013	14,568	8,841	10,063	11,139
2014	16,151	9,127	10,419	11,229
2015	16,304	9,162	10,520	10,982
2016	16,423	9,057	10,244	11,458
2017	16,626	9,426	10,852	11,473

Energy only market in Alberta: Supply adequacy

- Supply Cushion

Year	Average Supply Cushion	Number of Months Minimum is Zero
2012	1,571	6
2013	1,495	7
2014	1,931	1
2015	2,246	0
2016	2,337	1
2017	2,156	2

Energy only market in Alberta: Supply adequacy

- Reserve Margin

Year	2012	2013	2014	2015	2016	2017
With Intertie Capacity	31	32	33	48	46	48
Without Intertie Capacity	21	22	23	36	45	38

Energy only market in Alberta: Supply adequacy

- Two Year Probability of Supply Adequacy

	2015-2017	2017-2019
Hours with a Shortfall	0	0
Largest Shortfall	0	1 MW
Unserved Energy	0	2.46 MW

Unique features of Alberta

- What are they?
  - Transmission policy requires no congestion
  - High percentage industrial and commercial load
    - Significant cogeneration
- Why demand for capacity market?

Climate Leadership Plan

- Political marketing has costs if the form of the message drives policy reform: 30 in 30 [30% renewables in 2030] may be easily understandable but ultimately cost matters
- Source of institutional change in electricity sector
- The energy market was not broken

Renewable subsidization

- Concern is that renewable subsidization will result in havoc to the energy only market
- Not substituting base load coal with another low short run marginal cost source of supply with the same effective capacity
- Backstop wind with natural gas: very expensive insurance policy and high cost to reduce emissions
- Subsidize generation capacity as well as renewables!
- Efficient reduction in emissions? Seems not likely relative to other alternatives