Colombia’s Forward Energy Market

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Goals of electricity markets

- Short-run efficiency
  - Least-cost operation of existing resources
- Long-run efficiency
  - Right quantity and mix of resources

Three Markets

- Short term (hourly)
  - Spot energy market
- Medium term (1 to 3 years)
  - Bilateral contracts
  - *Forward energy market*
- Long term (4 to 20 years)
  - Long-term contracts
  - Capacity market (thermal system)
  - *Firm energy market (hydro system)*

Medium term:

Buy ahead; reduce risk

Purpose of market

- Improve efficiency of bilateral market for forward energy
  - Limited competition and high transaction costs
    - Local, fragmented markets
    - Non-standard contracts
  - Self-dealing between utility and affiliate supplier
- Centralized market with standard product

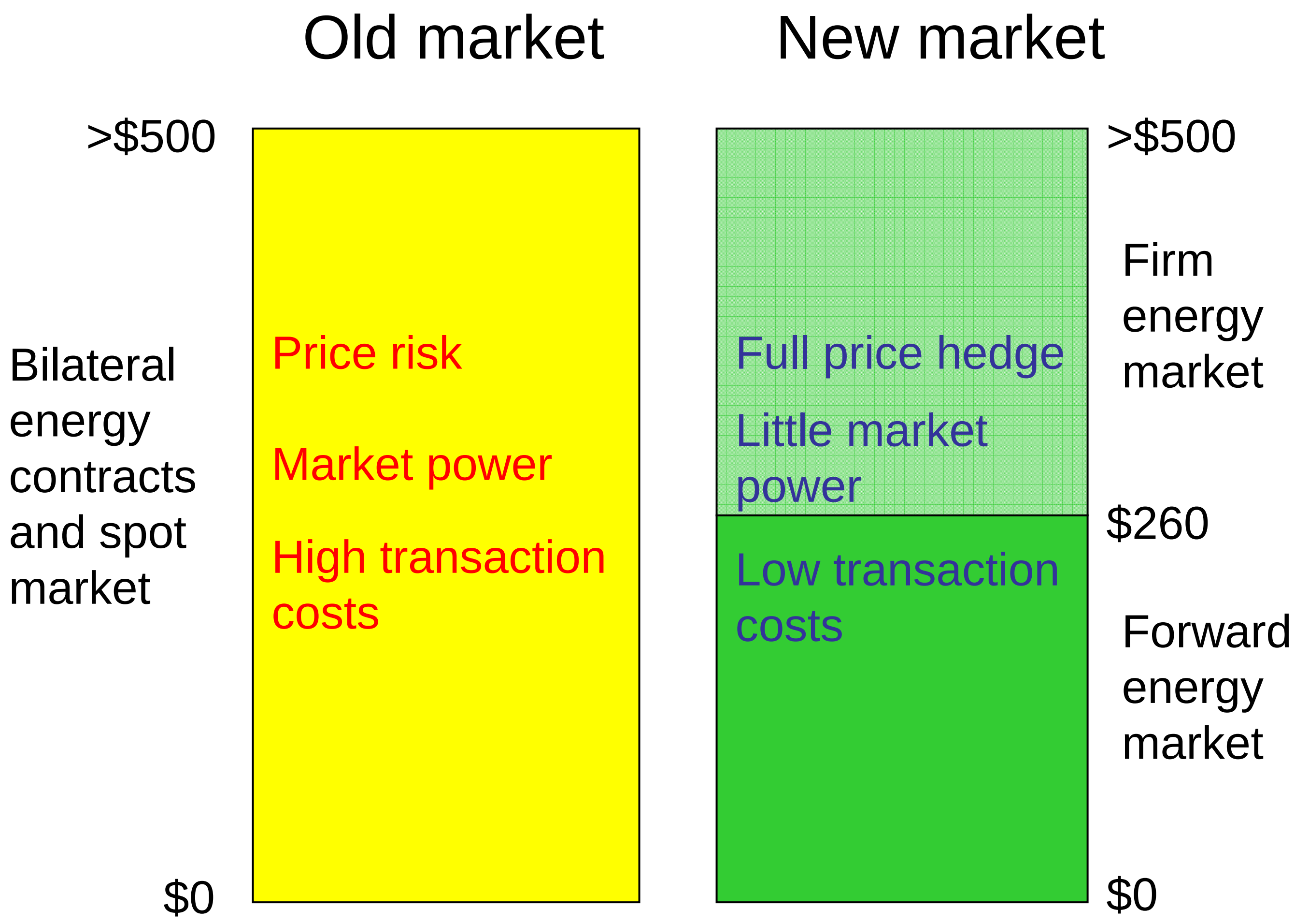
Two products, one auction

- Regulated customers (68% of load)
  - *Small* customers *without* hourly meters
  - *Passive* buyers in auction
- Nonregulated customers (32% of load)
  - *Large* customers *with* hourly meters
  - *Active* buyers in auction

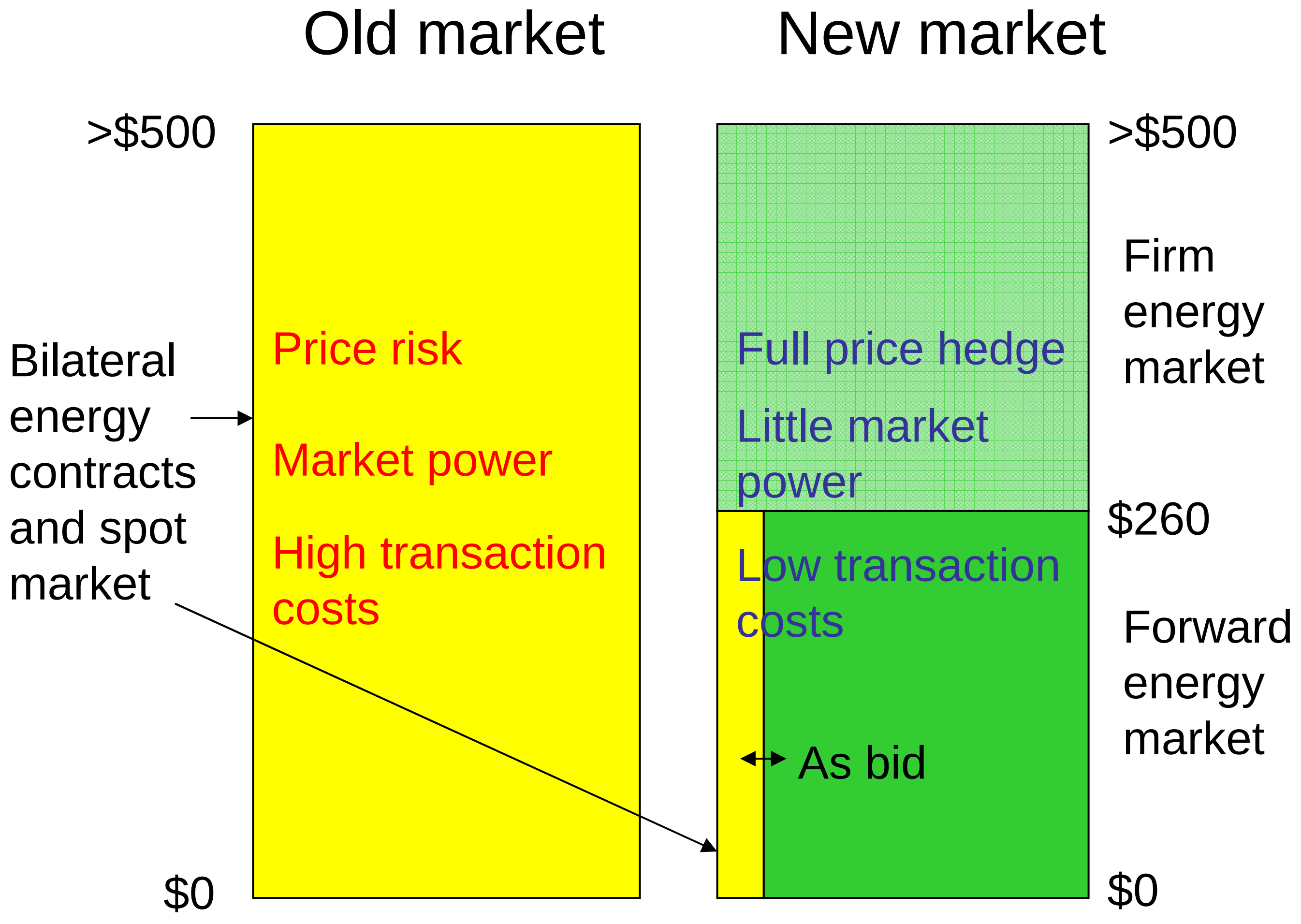
Regulated product: Energy share of regulated load

- Pay as demand contract
- Supplier bids for % of regulated load
- Supplier that wins 10% share has an obligation to serve 10% of regulated load in each hour
- Deviations between hourly obligation and supply settled at the spot energy price

Price coverage of regulated customer



Price coverage of nonregulated customer



Regulated demand participation

- Participation is mandatory and passive (no active bidding of demand)
- Regulated customer may decide to become a nonregulated customer
  - Purchases hourly meter
  - Actively participates in auction
- But switch to nonregulated status is permanent

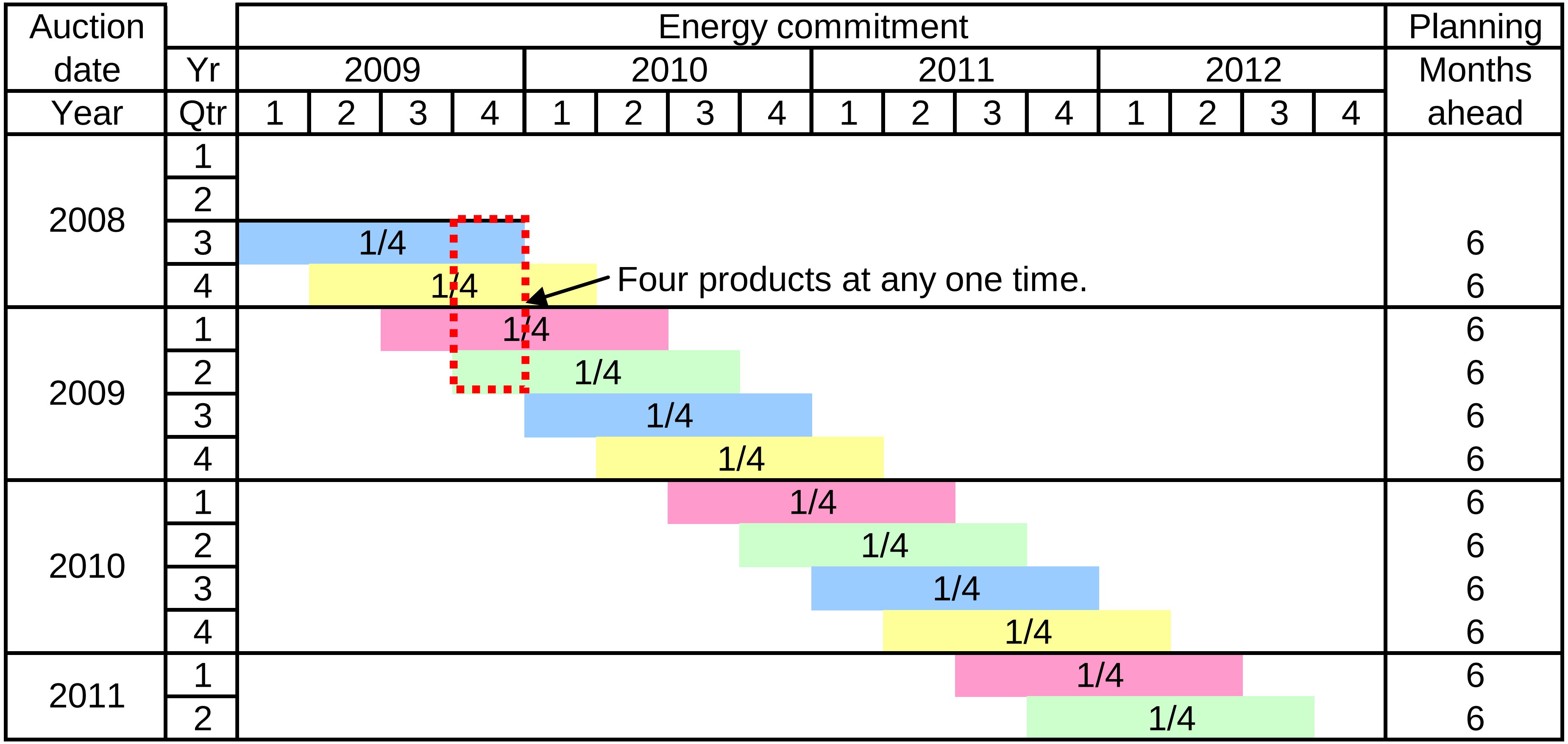
Nonregulated demand participation

- Nonregulated demand participates in the same auction
  - Single nonregulated product
- Product: *expected* energy, not *actual* energy
  - Hourly, but based on expected energy demand
  - Hedges expected energy demand, but exposes customer to spot price *on the margin*
  - Requires hourly meter (and demand management)
- Participation benefits both regulated and nonregulated customers, as well as suppliers
  - Improved liquidity and price formation

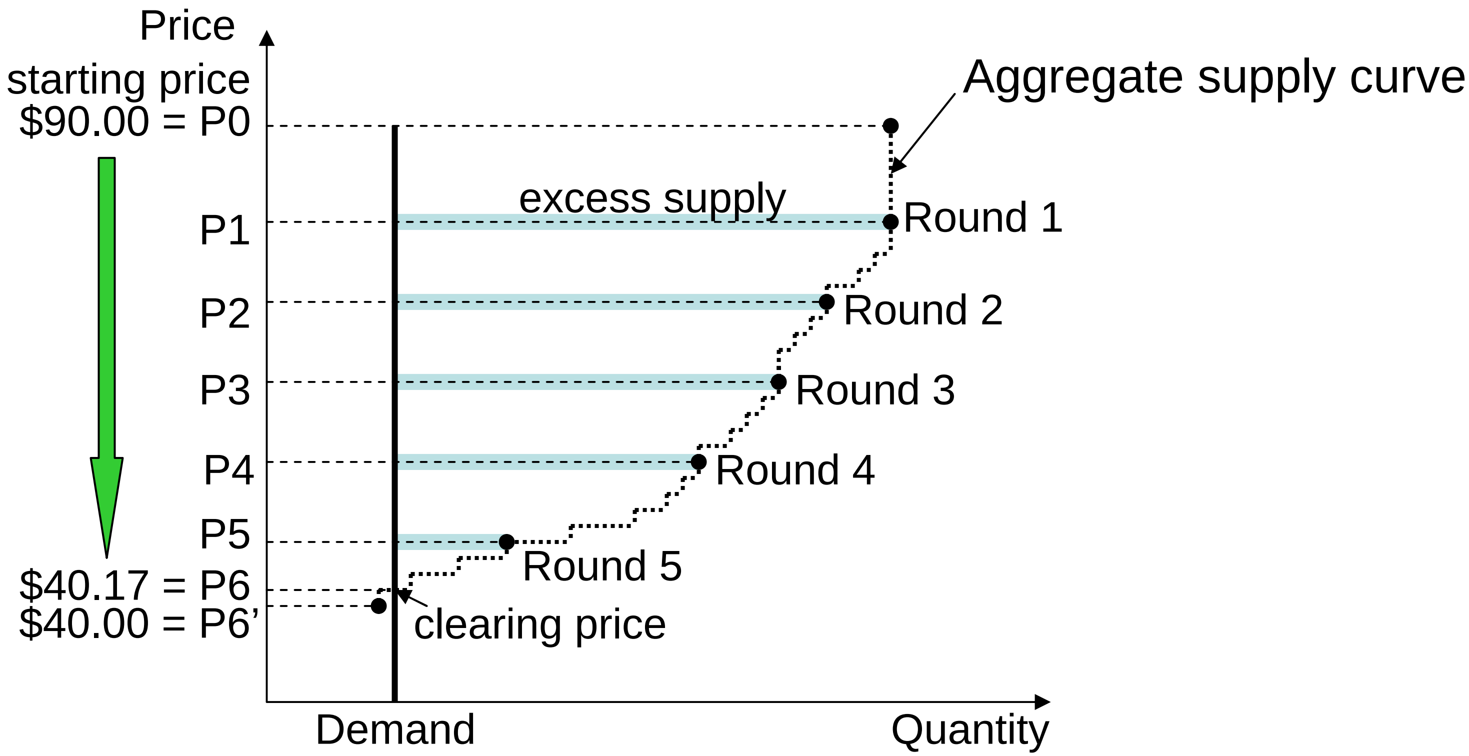
Quarterly 2-year contracts, annual rolling

Auction date		Energy commitment												Planning
	Yr	2010				2011				2012				Months
Year	Qtr	1	2	3	4	1	2	3	4	1	2	3	4	ahead
2008	4	1/8								2 products, 8 prices at any one time.				14
2009	1	1/8												11
	2	1/8												8
	3	1/8												5
	4					1/8								14
2010	1					1/8								11
	2					1/8								8
	3					1/8								5

Rolling quarterly auction for 1-year commitment
(6-month planning period)



Descending clock auction



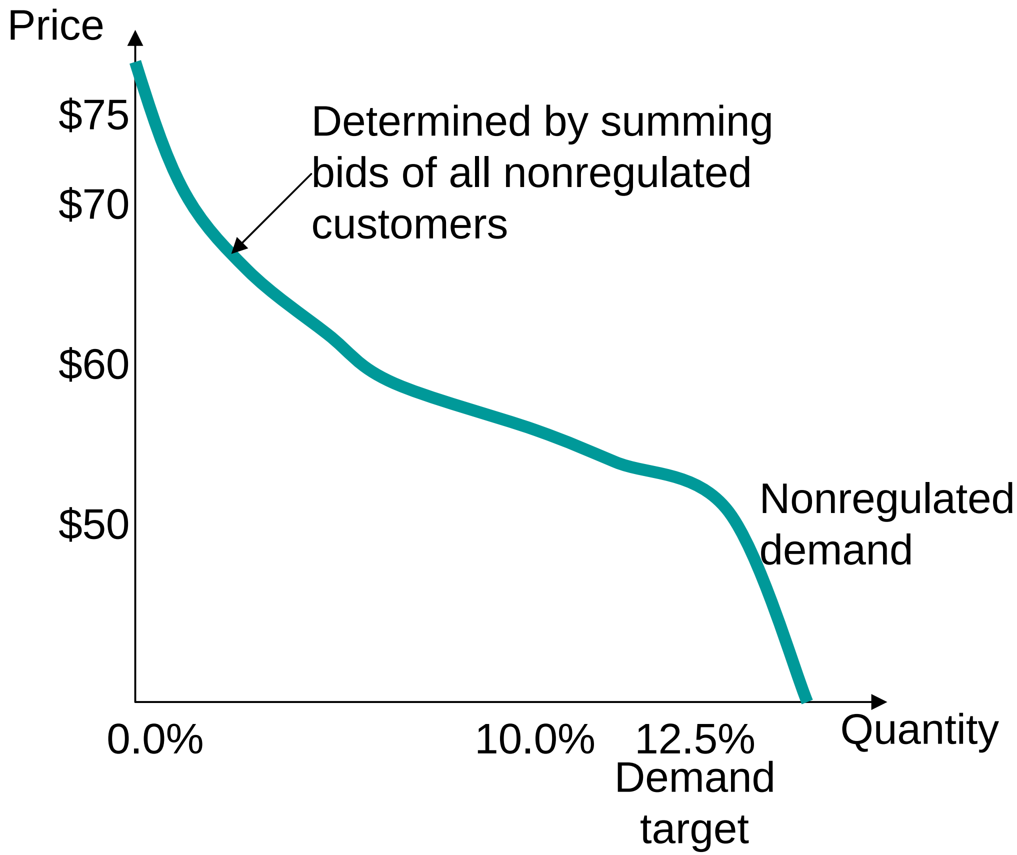
Activity rule

- A bidder can only maintain or reduce its *aggregate* quantity as price falls (aggregate supply curve upward sloping)
- Allows full substitution between Regulated and Nonregulated products
- Bidders can express any linear substitution between products
- Any price separation reflects difference in serving regulated load and nonregulated load

Handling differences among nonregulated customers

- Customer forecasts demand for every hour
- Customer rate is auction clearing price scaled by quality factor of each nonregulated customer
- Quality factor reflects expected cost difference (at spot price) for particular customer
- Each supplier receives its share of payments
- Supplier obligation is its share of aggregate nonregulated *expected* load

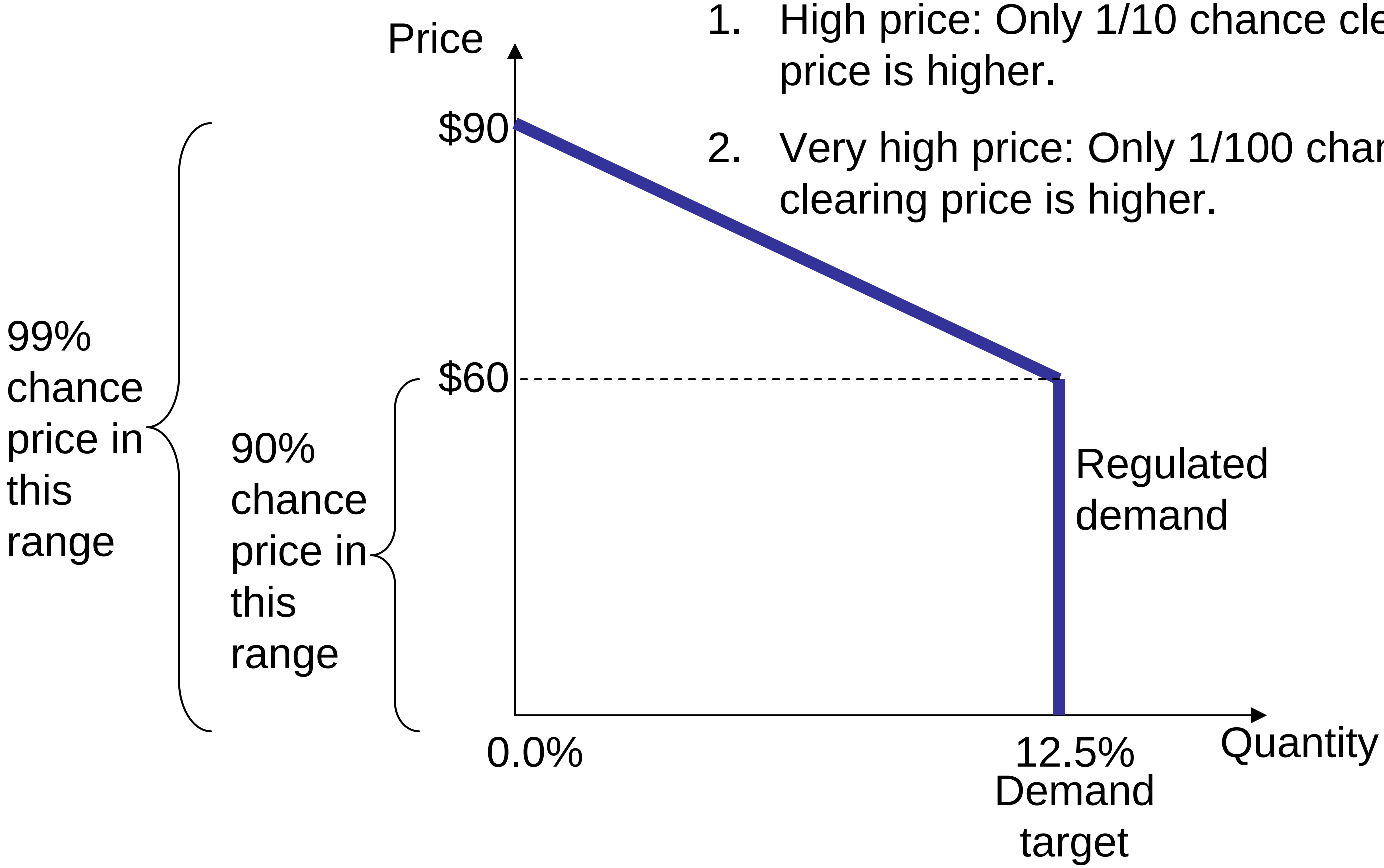
Demand curve for nonregulated product is submitted before auction by each nonregulated customer



Administrative demand curve for regulated product addresses insufficient competition

Demand curve determined by two prices:

1. High price: Only 1/10 chance clearing price is higher.
2. Very high price: Only 1/100 chance clearing price is higher.



Variations

- Product
  - Hourly take-or-pay following load shape
- Auction
  - Begin with just the regulated product
  - First auction in 2009

Conclusion

Market design is important

- Simplify, improve liquidity
- Address potential market failures
- Motivate demand response with forward contracts that hedge expected load
  - Customer exposed to spot price on margin
  - Yet enjoys all the risk benefits of forward contracting