

Simple-Offer vs. Complex-Offer Auctions in Deregulated Electricity Markets

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Motivation

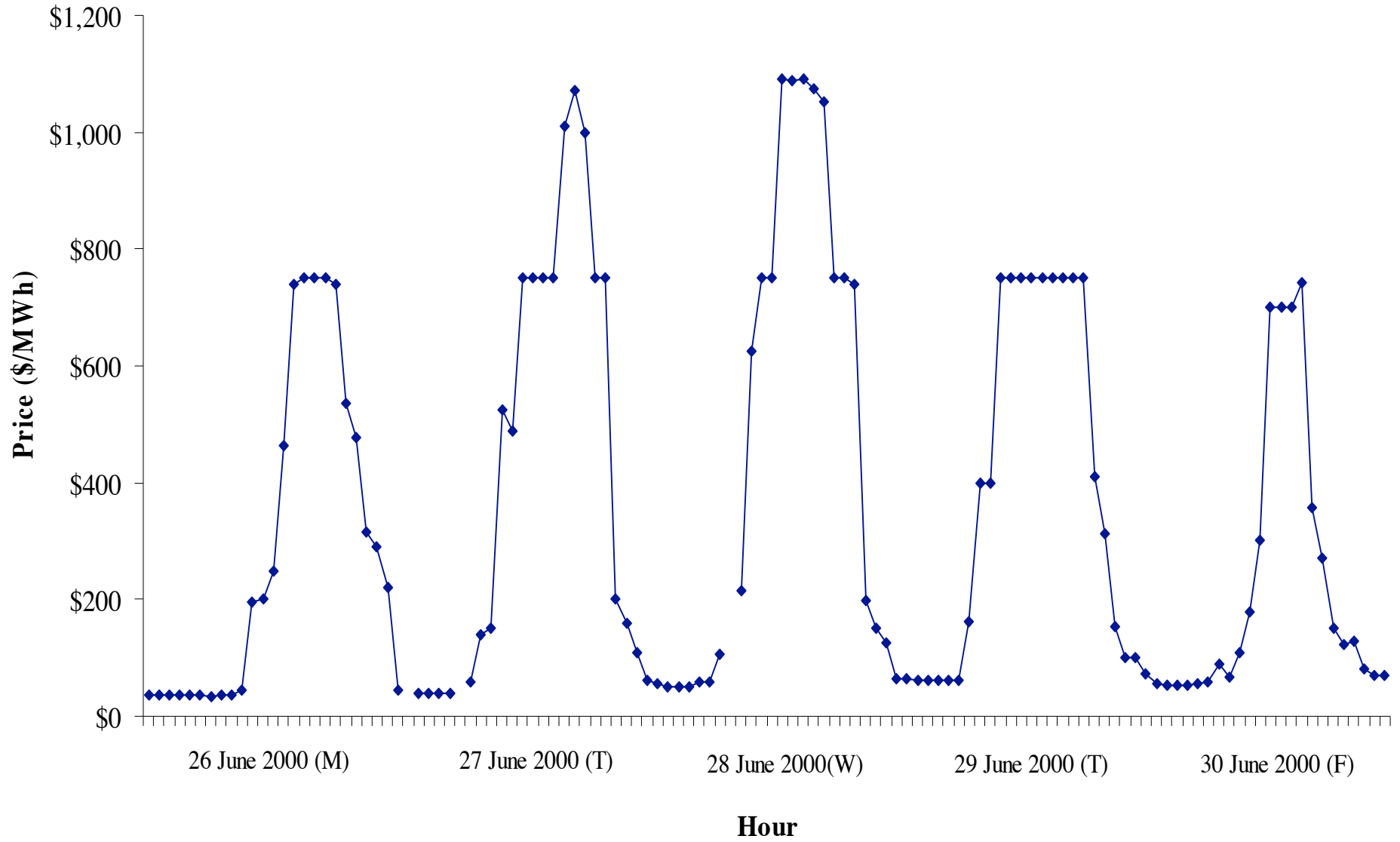
- In April 2003 the U.S. Federal Energy Regulatory Commission proposed the *Wholesale Power Market Platform (WPMP)* for adoption by all U.S. wholesale power markets.
 - Envisions day-ahead, real-time, and ancillary service markets maintained by an ISO or RTO.
- White Paper: “The Federal Energy Regulatory Commission’s core mission under the Federal Power Act is to achieve wholesale electricity markets that produce just and reasonable prices and work for customers.”

Motivation

- The summer 2000 meltdown in the California wholesale power market is thought to have resulted in part from strategic generator behaviors encouraged by inappropriate market design features.

Motivation

Unconstrained Day-Of/Hour-Ahead Market



Some Questions

- What market design features foster competitive behavior in the market?
- How different market rules affect outcomes if a market becomes more concentrated?
- Do competing suppliers end up offering their actual electricity generation costs?

Objective

- To compare the performance of two auction mechanisms – a complex offer auction and a simple offer auction - when *suppliers* act strategically.
- Criteria:
 - Price to consumers
 - Efficiency
 - Price volatility
 - Risk of losses

Overview of Wholesale Power Markets in the U.S.

- ISOs run daily auctions to allocate generation contracts to the suppliers of electric power:
 1. Suppliers submit complex-offers to the ISO
 - Offer structure: quantities, energy prices, plant start-up fees, and technical constraints.
 2. Buyers (LSEs) submit bids to the ISO.
 3. An ISO runs a market clearing algorithm that allocates generation contracts ensuring that the system demand and reserve requirements are met over a particular time period.
 4. Each selected supplier is paid his offered start-up fees and the *market clearing price* - *MCP* - (not the offered price!) for supplied units of electricity.
- It is a uniform-price sealed complex-offer auction.

Allocation Algorithms

1. Traditional **Offer Cost Minimization (OCM)**
2. **Simple Offer Auction (SOA)**

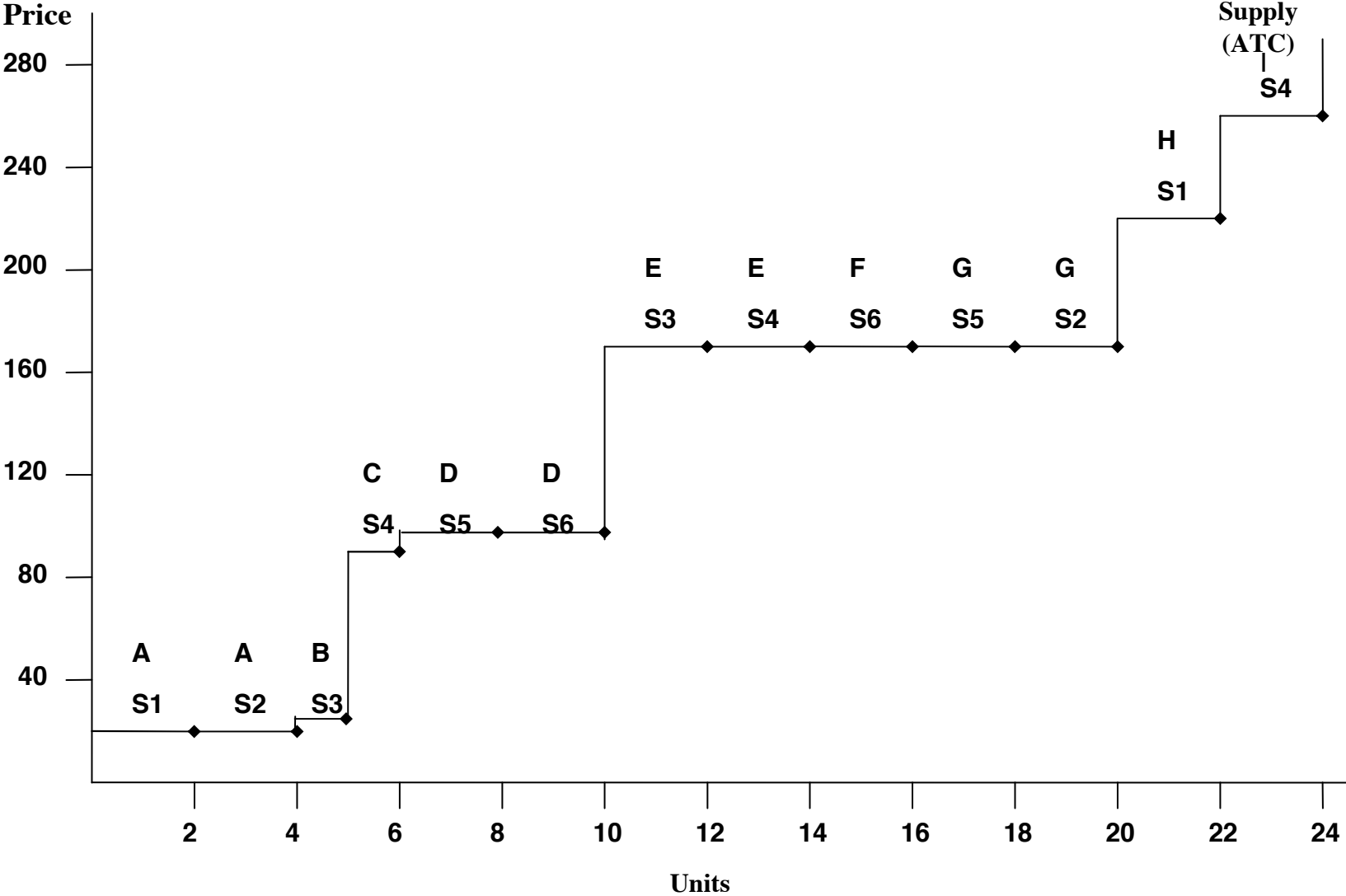
Offer Cost Minimization Auction

- The ISO minimizes the total offered cost of electricity, as if all selected sellers would be paid their offered prices and fees.
- *Sequentially*, after the offers are selected, a uniform MCP is determined as the highest accepted price for that period.
- All selected sellers receive their individual start-up fees and the uniform market clearing price for the supplied electricity during that period.

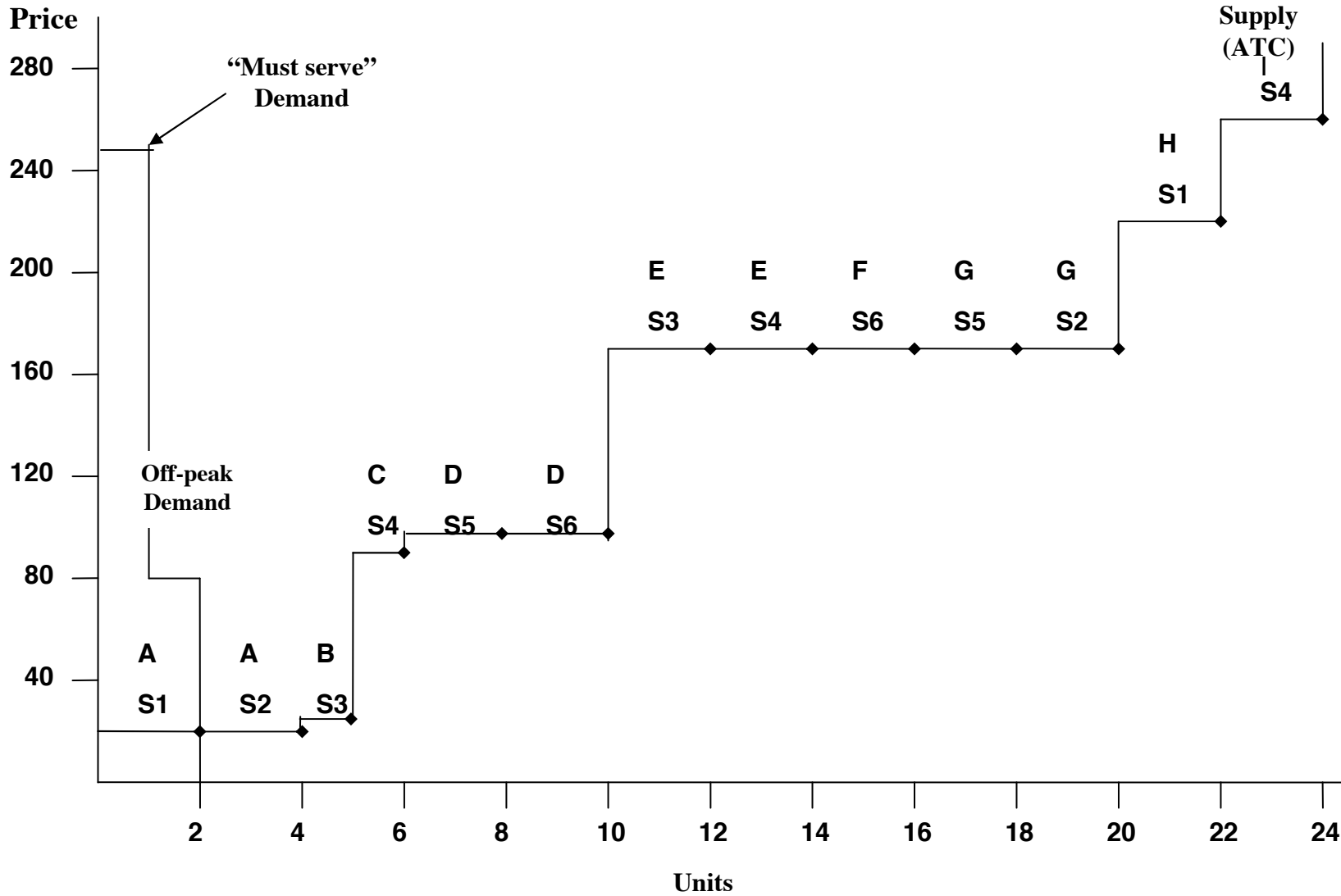
Simple Offer Auction

- The sellers can recover their generation costs – both fixed and variable – only through a uniform MCP.
- The ISO minimizes the total offered cost.
- Concerns about possible losses.

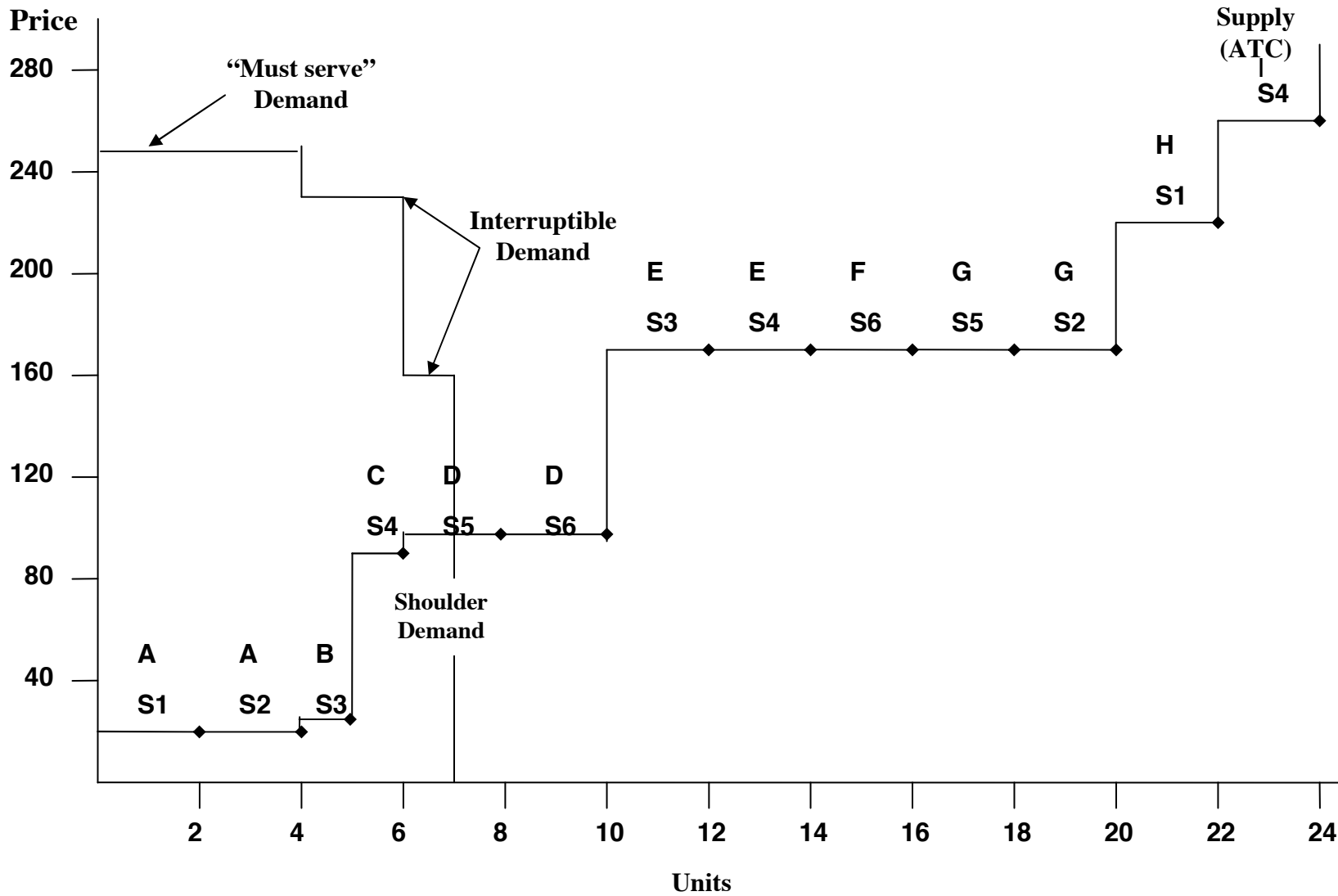
Environment: Supply



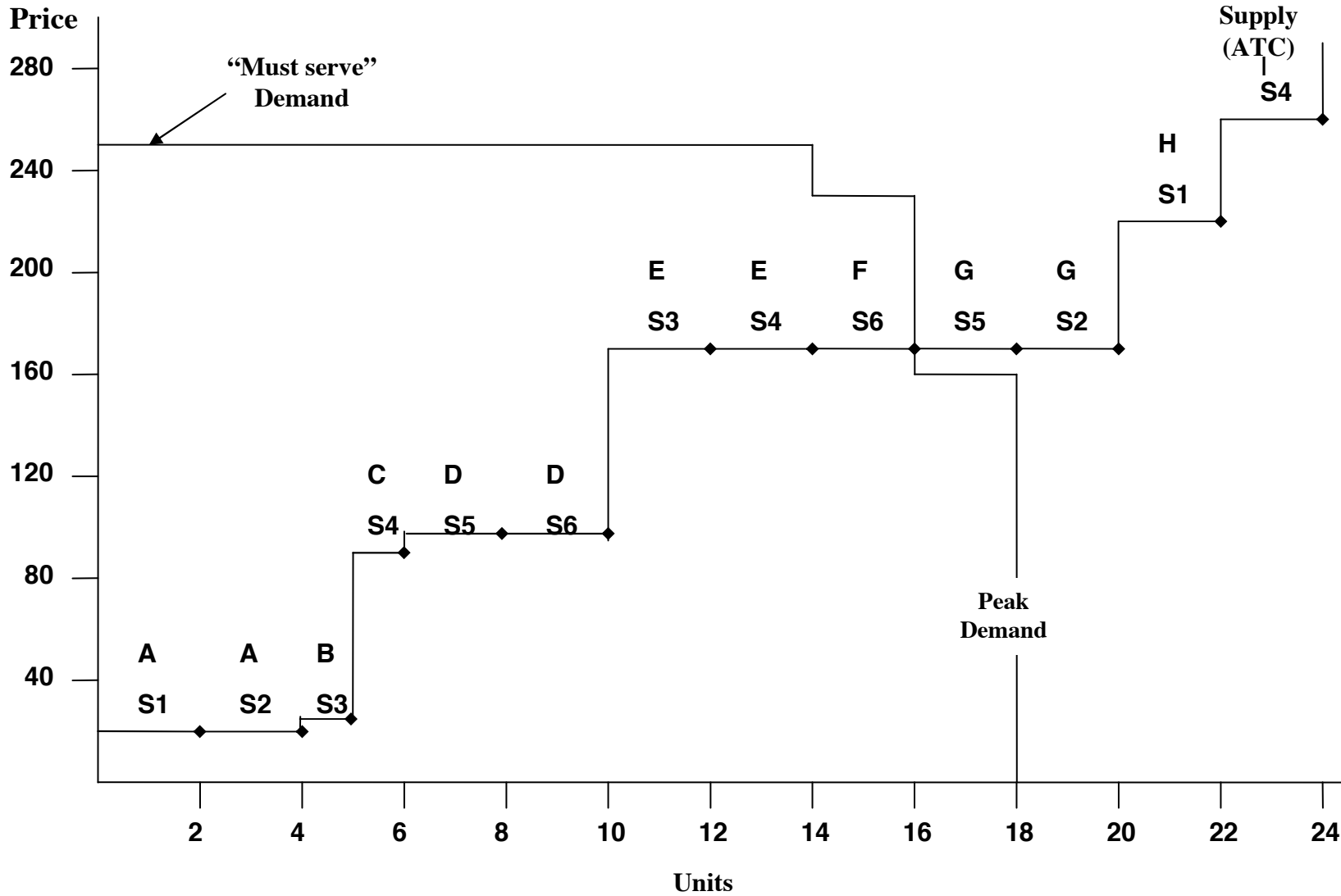
Environment: Off-Peak Demand



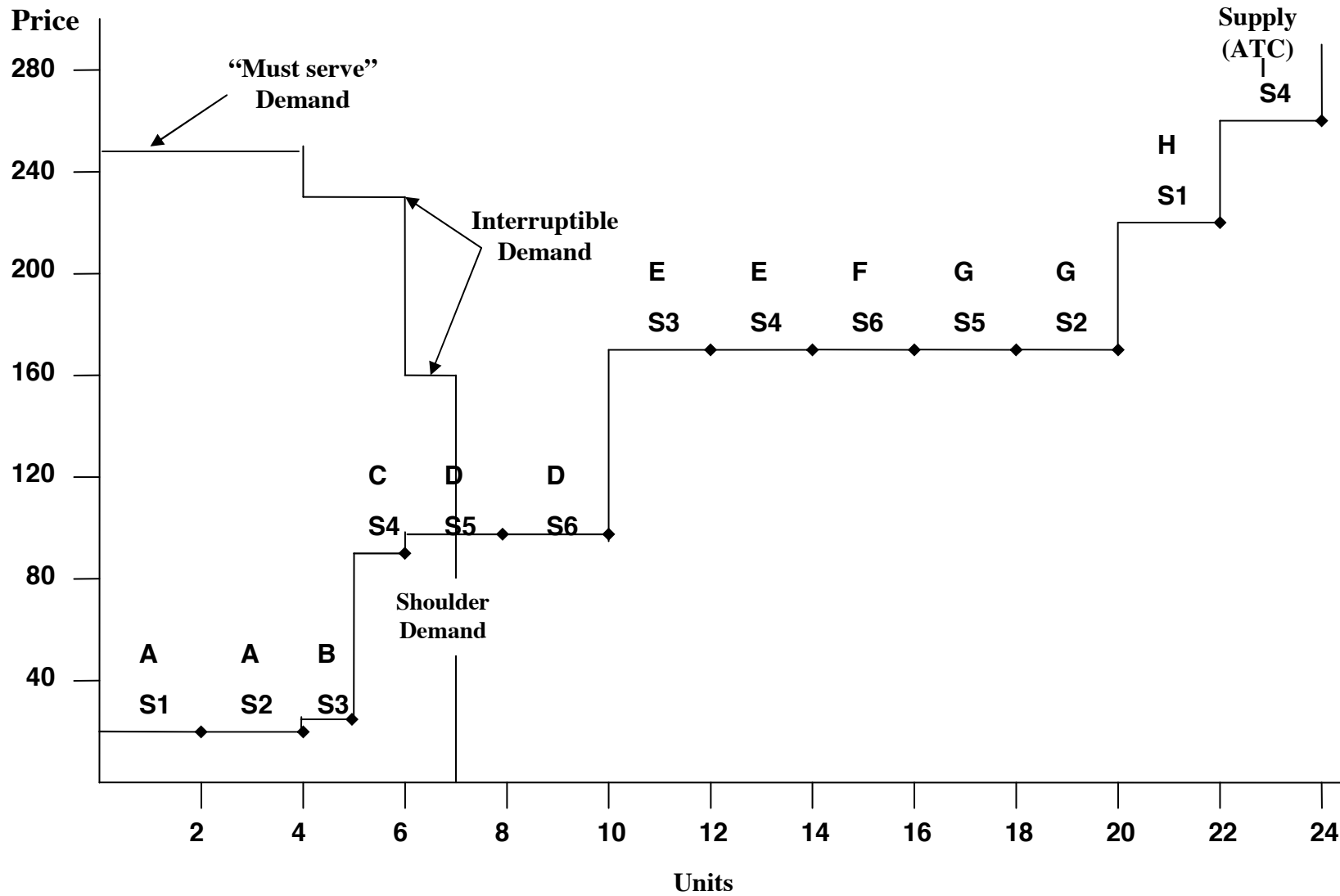
Environment: Shoulder 1 Demand



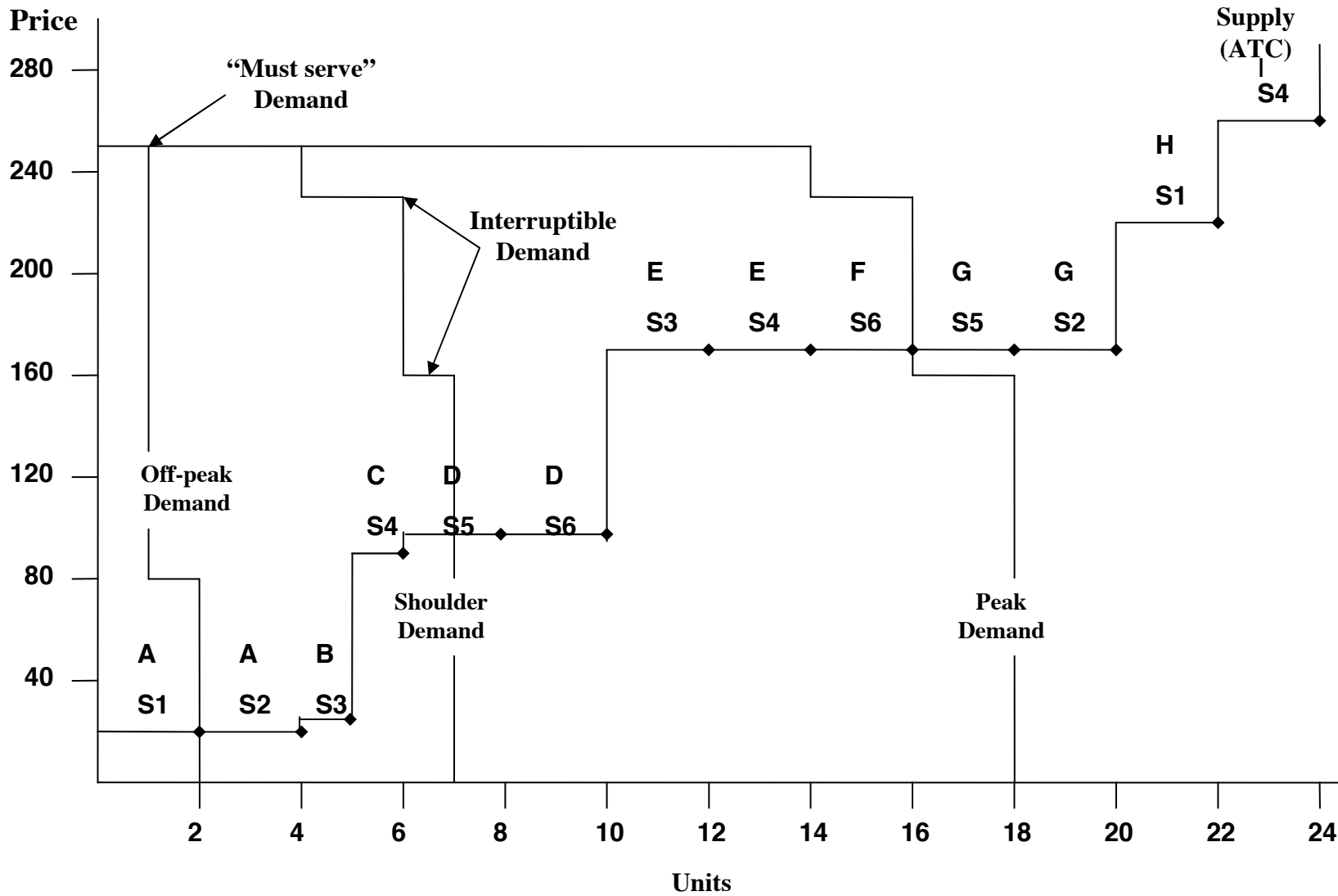
Environment: Peak Demand



Environment: Shoulder 2 Demand



Environment: Demand & Supply

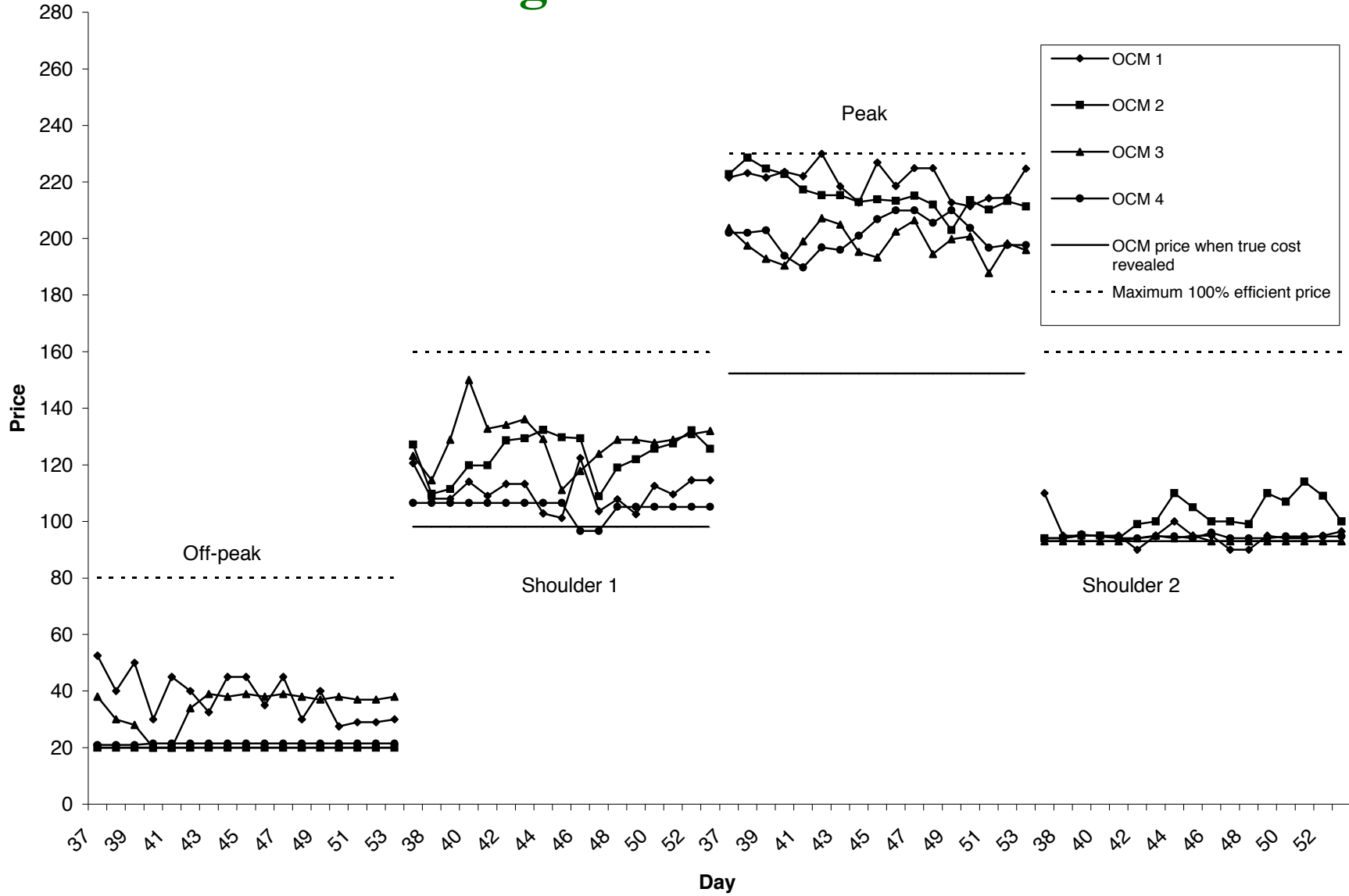


Treatments

- Experimental Design (No. of Sessions; No. of Trading Days per Session)

	OCM	SOA
<i>No Power</i>	(4; 53)	(4; 53)
<i>Power</i>	(4; 53)	

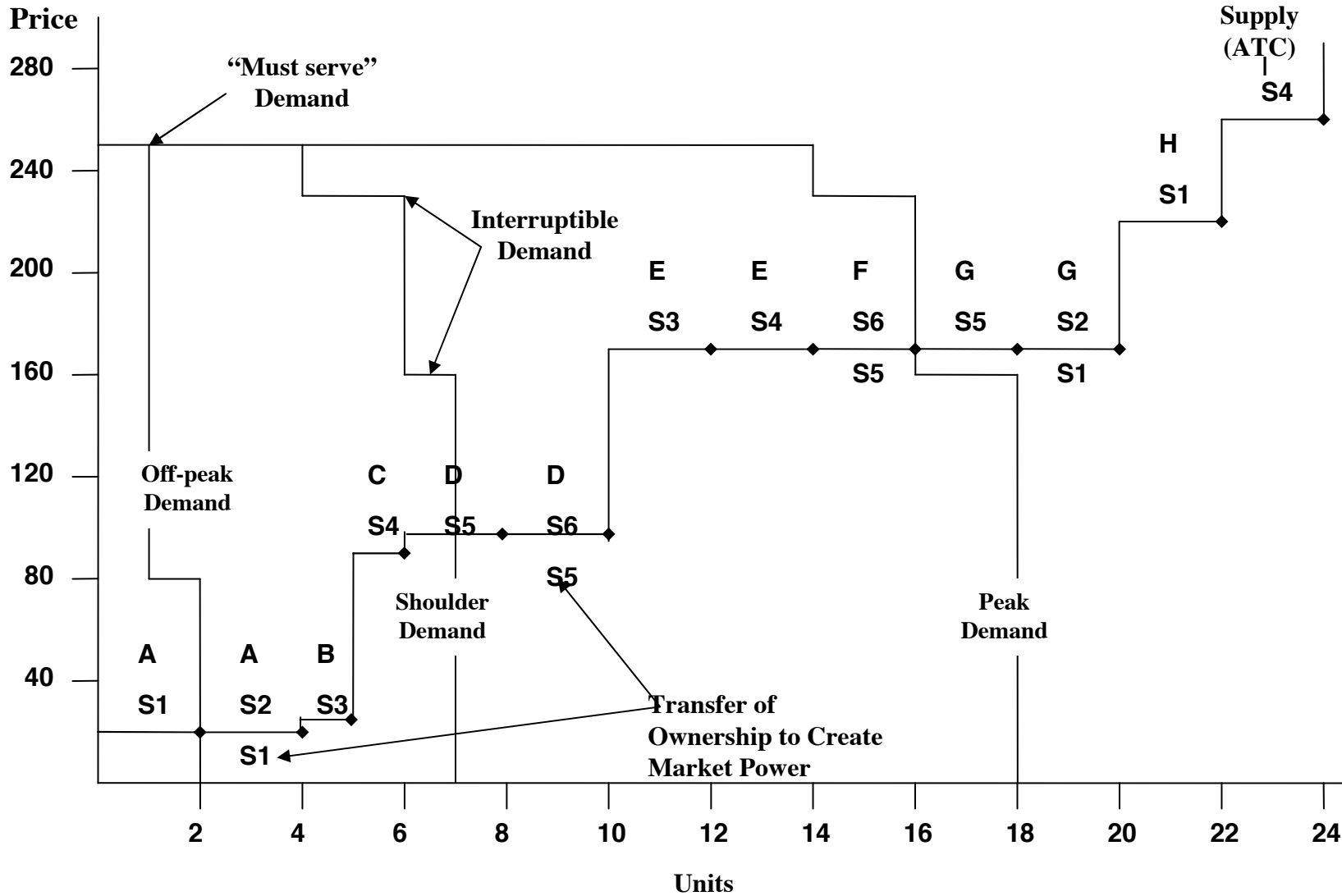
Findings: OCM/No Power



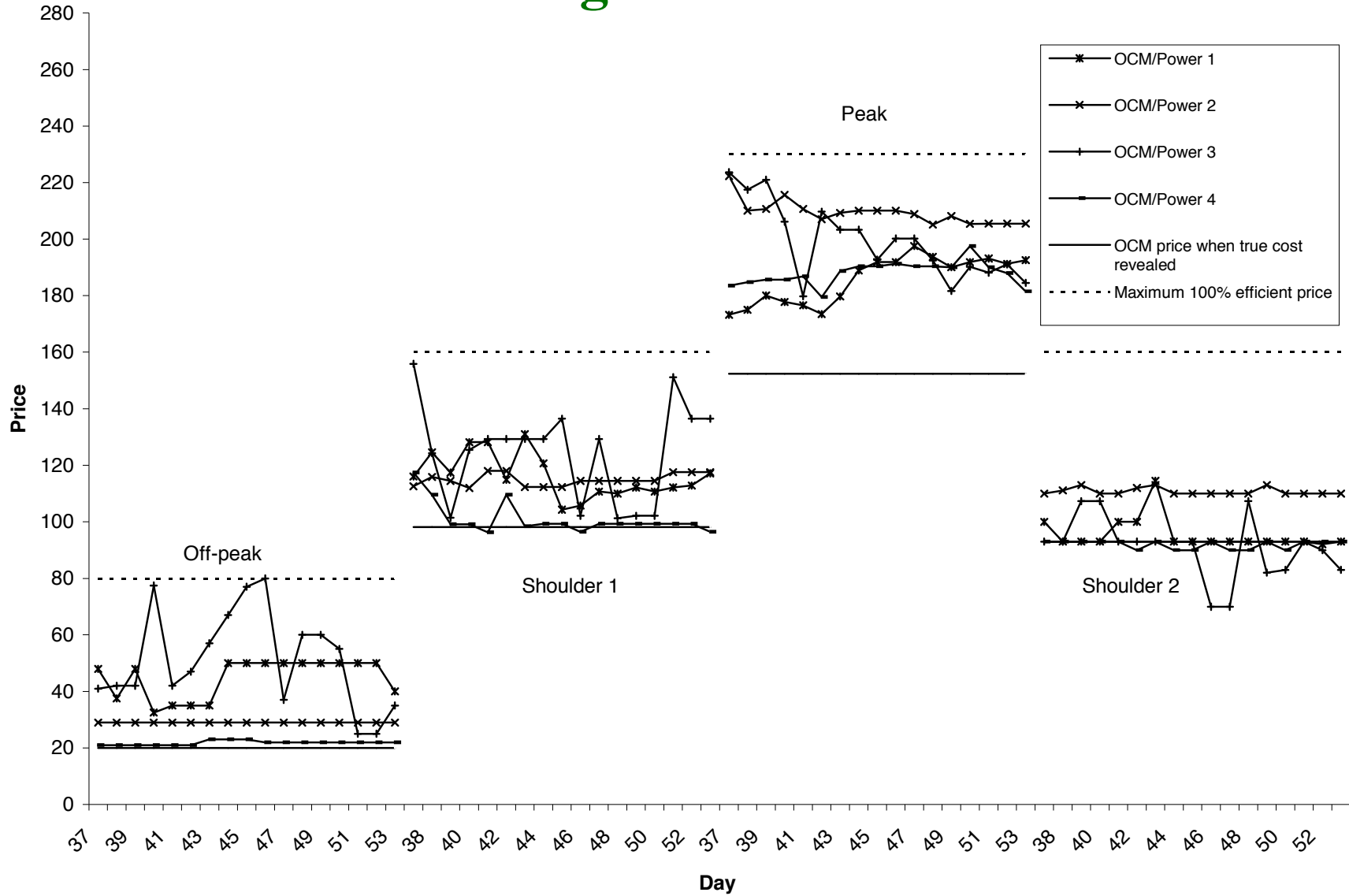
Findings

1. The OCM auction does not elicit true cost telling, with an exception of shoulder 2 periods.
2. The supracompetitive buyer prices in the OCM auction are due to the heightened offers on both start-up fee and seller price dimensions.

Environment: Market Power



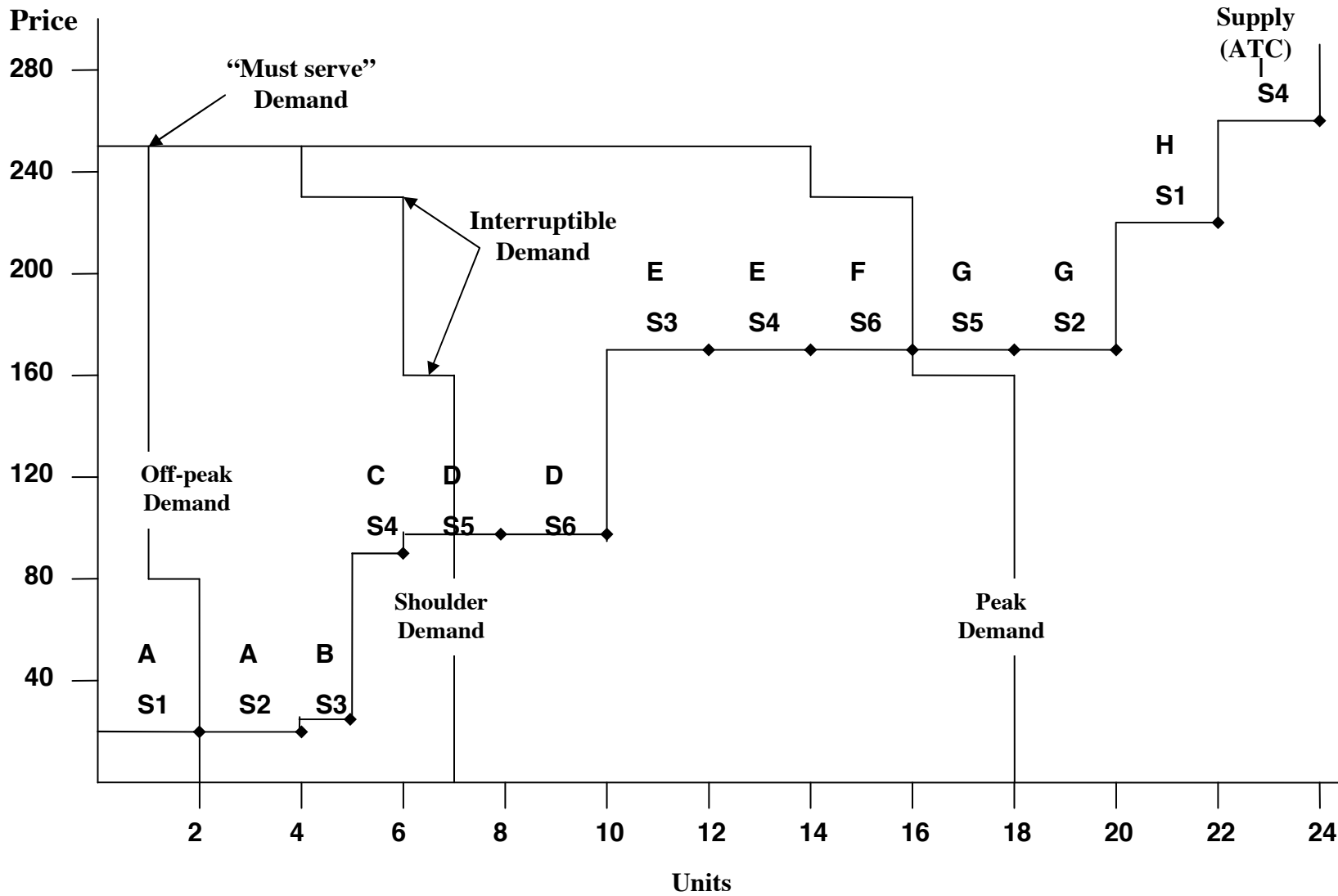
Findings: OCM/Power



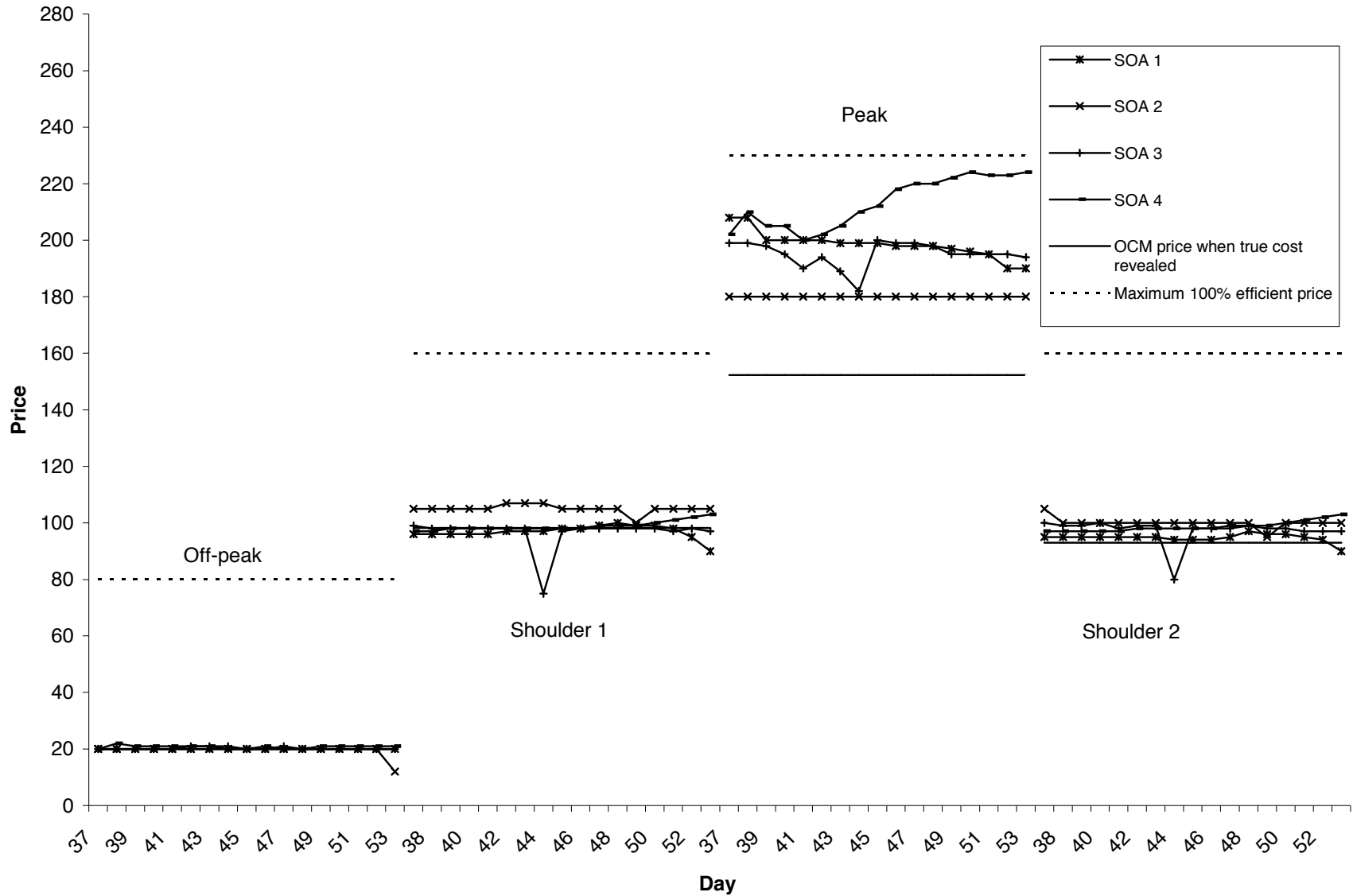
Findings

3. The buyer prices in the *No Power* treatments approach the prices in the *Power* treatments in a complex offer auction.

Environment: Demand & Supply

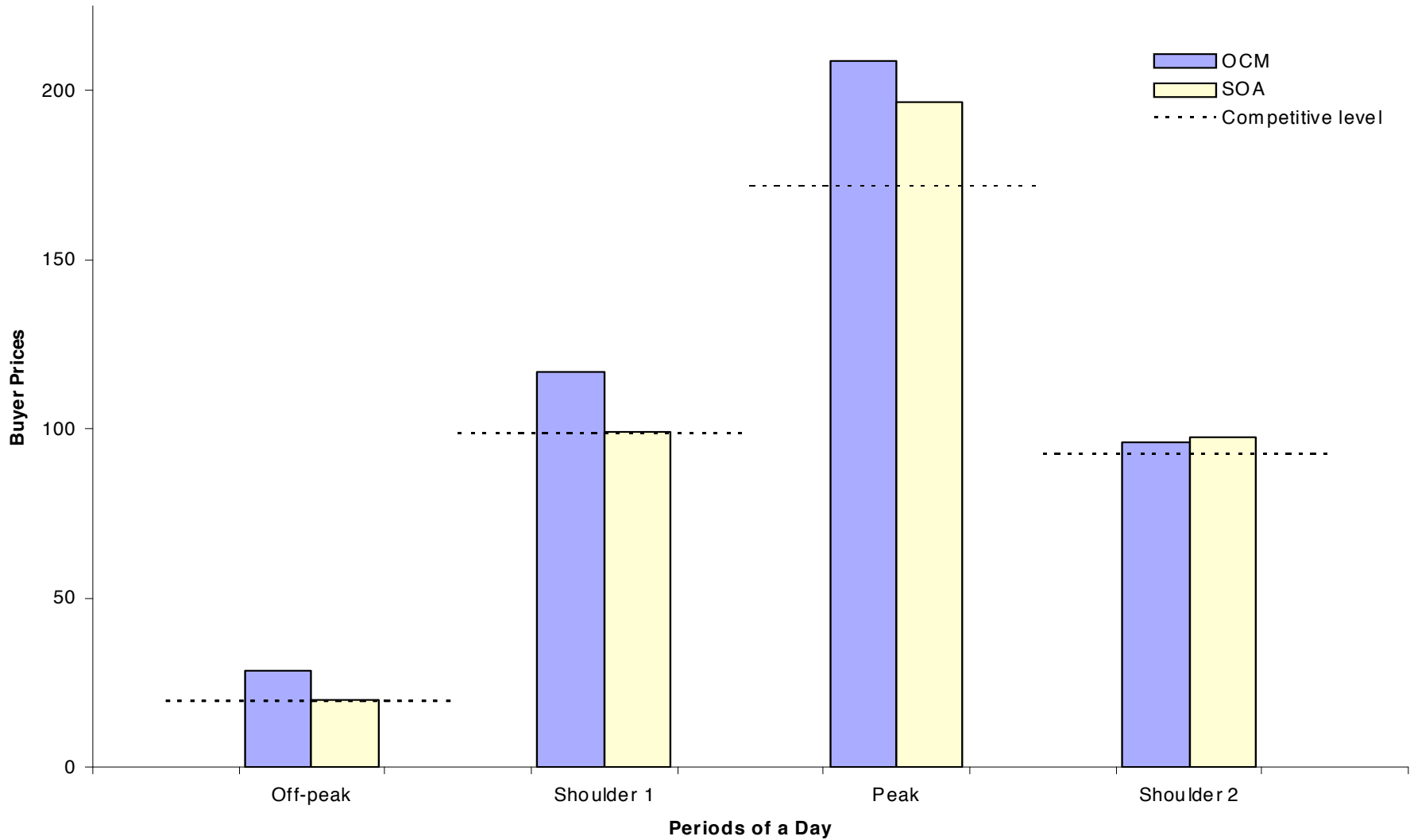


Findings: SOA/No Power



Findings

4. The SOA results in lower buyer prices than the OCM.



Conclusions

- The good intentions of the complex offer auction are to help recover the avoidable fixed costs and reasonably appear to be benign, but the unexamined assumption of policy that people truthfully reveal their costs in a competitive environment have unintended consequences.

Conclusions

- The complex offer auction is not a truth revealing mechanism and does not easily elicit competitive behavior.
- The simple offer auction generates less strategic behavior and results in lower electricity prices than the complex offer auction.

Conclusions

- Keep market institutions simple!
- Allowing market participants to reveal more information and trying to make use of that information also opens more opportunities to act strategically.
- If there is a way to strike it rich, the market participants find it.

Let's take a look at your data!