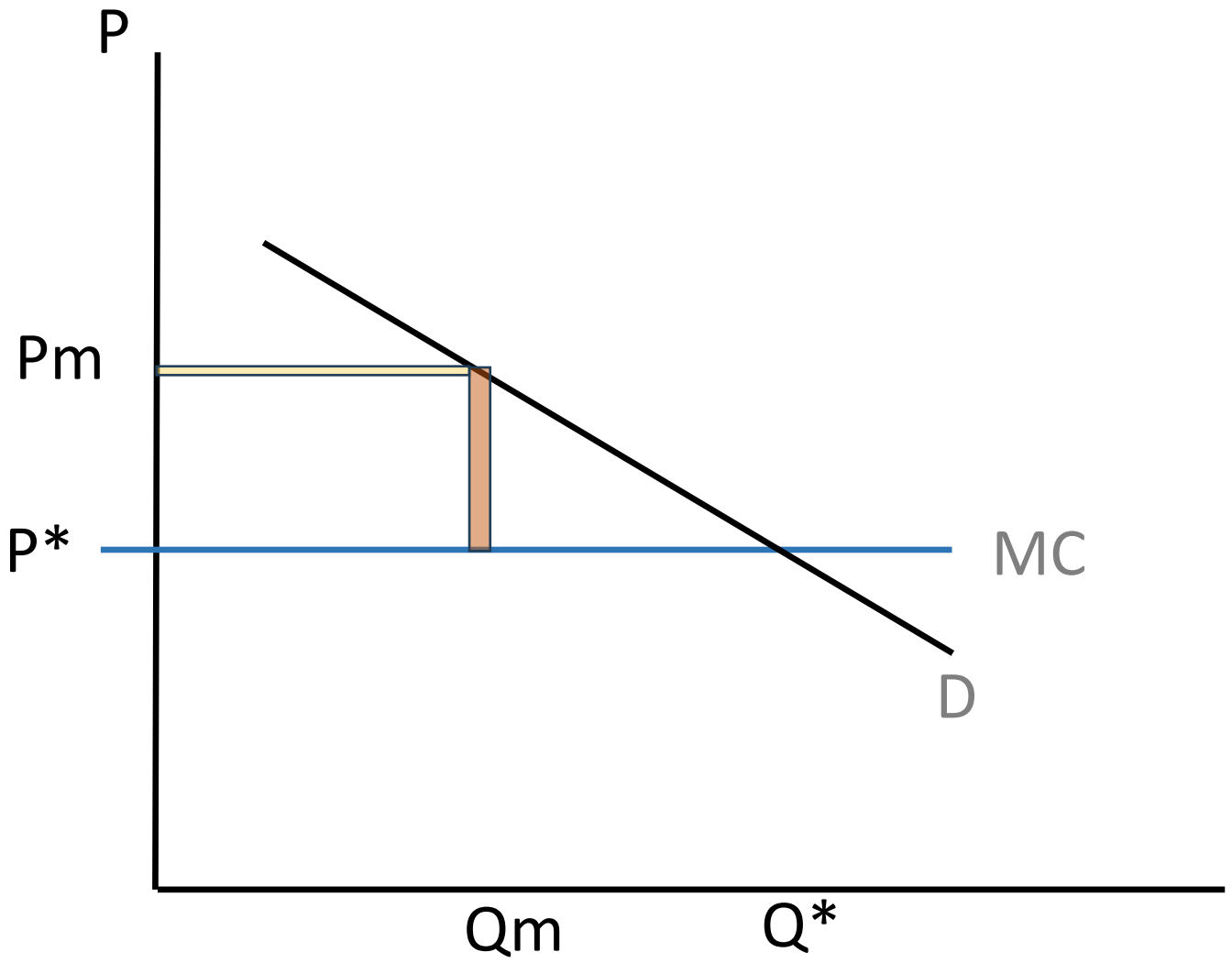
Energy Market Game
Lecture 2 – Market Power

BC Econ 3391

- Review results from first two days
  - Whose profits went up?
  - What was your strategy?
    - Did anyone bid *below* marginal cost for any plants? Why?
    - Did anyone bid *above* marginal cost? Which plants? Did it work?
  - Now that you see the price, do you wish you bid differently?

Market Power

Review of monopoly power

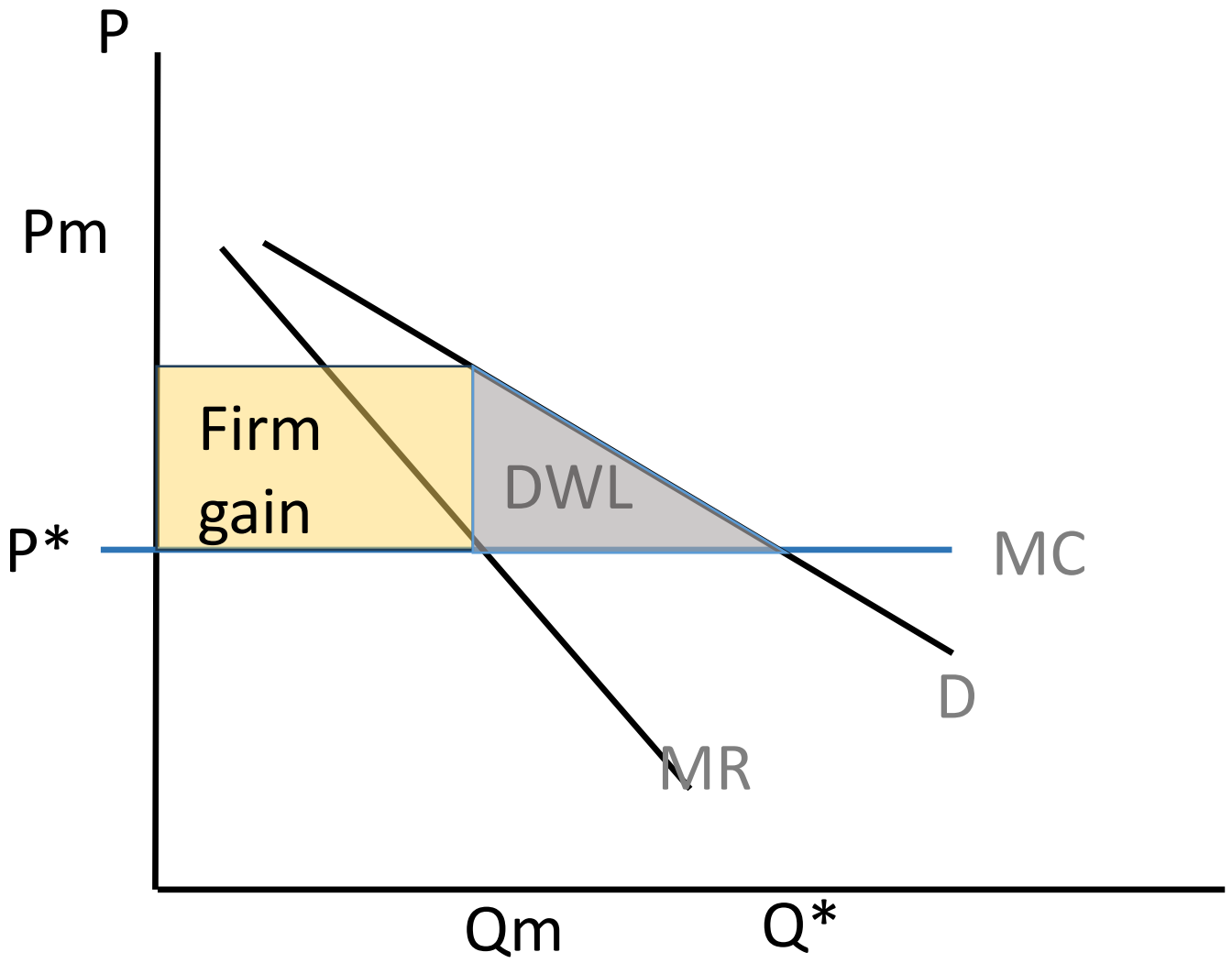


- Consider a monopolist currently supplying the social optimum quantity Q*
- What are it's incentives to reduce quantity / increase price?
- Trades off losses from fewer sales against increased profit on remaining

Formally

- Profit = P(Q)*Q – Cost(Q)
- Max profit by taking derivative wrt to Q
  - dP/dQ*Q + P – MC = 0
- Marginal Revenue = MC

Monopoly quantity and social welfare loss



<u>Market power leads to two distortions</u>

1. Quantity is too low.
   - Consumers value output Q* - Qm range more than it costs to produce, but it isn't supplied (DWL)
2. The price is too high.
   - This isn't an efficiency loss, but does have equity implications.

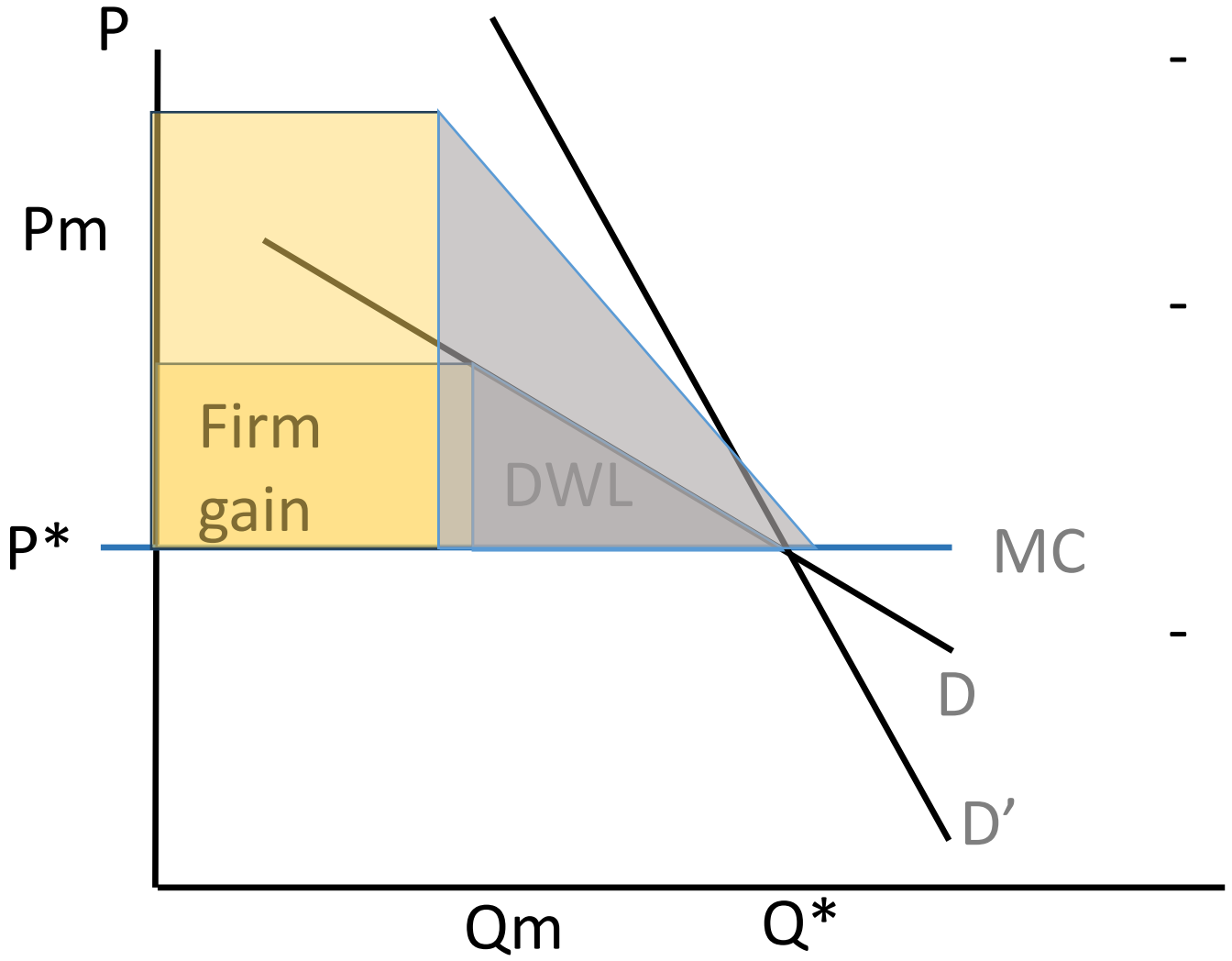
When are these effects large?

- Profit = P(Q)*Q – Cost(Q)
- Max profit by taking derivative wrt to Q
  - dP/dQ*Q + P – MC = 0
- Convert markups (P – MC) into % by dividing by P
  - (P – MC)/P = - (dP/P)*(Q/dQ)
- (dQ/Q)/(dP/P) = (% change Q)/(% change P) = demand elasticity
- Lerner Index: % markup = 1/ elasticity
  - Implication: Markups (P-MC) are larger <u>when demand is inelastic</u>

Question: Do you think electricity demand is very elastic or inelastic?

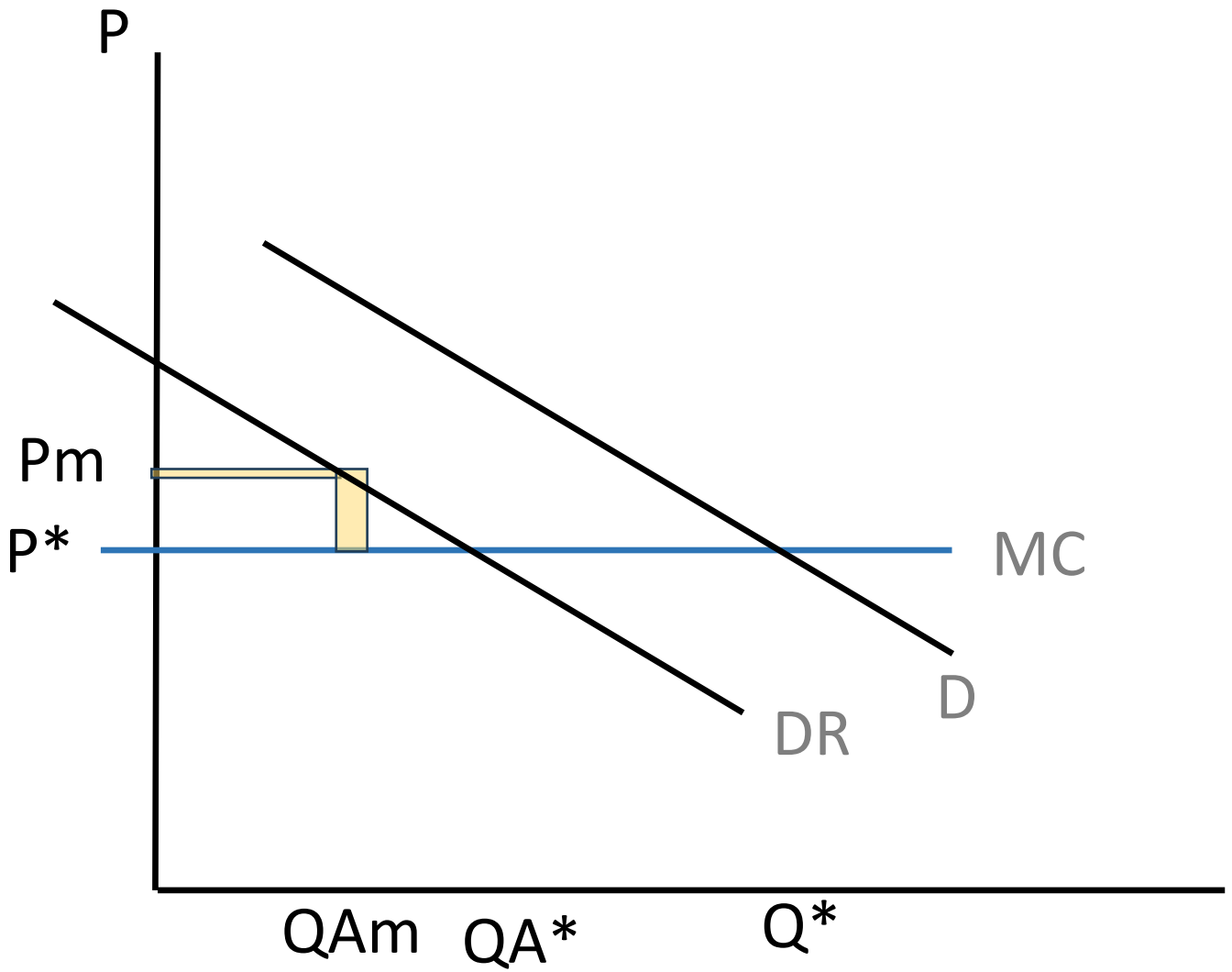
- Why?

Monopoly prices are likely to be particularly high in electricity



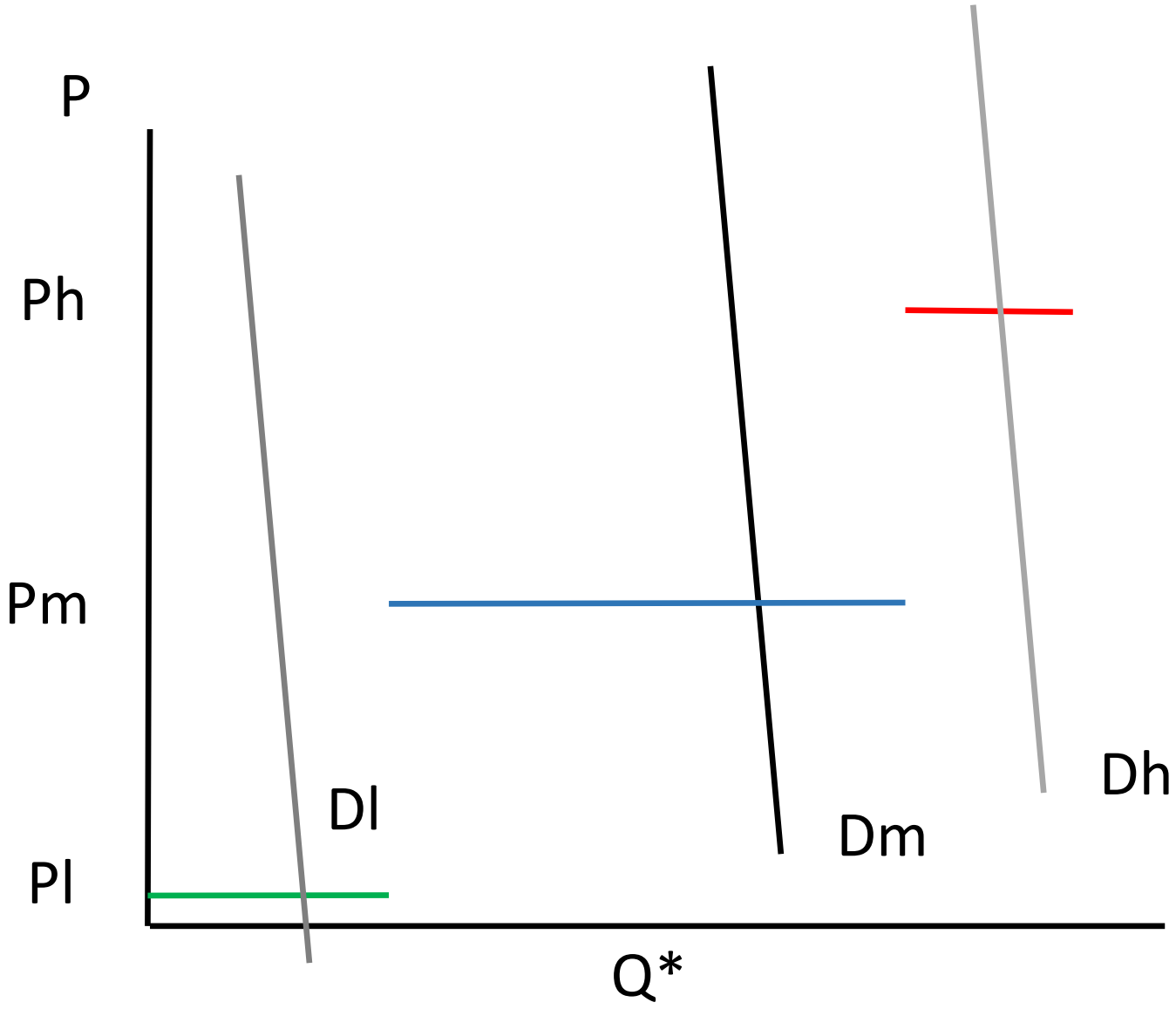
- Although the corollary to that is that DWL from inefficiently low Q is likely not so large
- This implies monopoly power mainly results in a large transfer from producers to consumers
- This is a major political issue..

How does competition help?



- Imagine the market contains one large firm (A), and many small firms
- Efficient outcome involves A supplying half the market
- A has fewer **inframarginal** units to benefit from an increase in the price
- It still exerts some market power, but Pm here is lower than before

Consider a dispatch curve with 3 types of capacity



Marginal costs

Gas

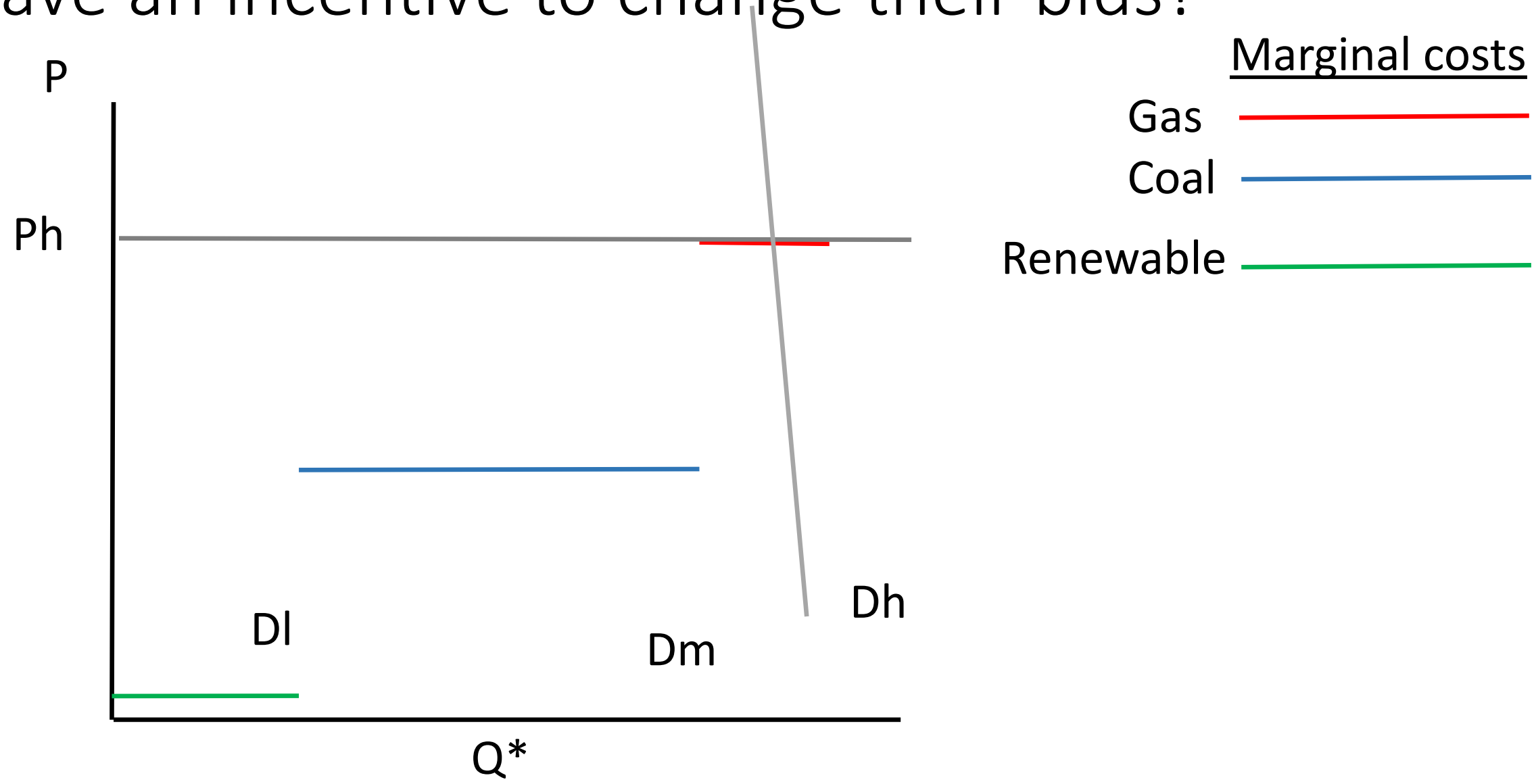
Coal

Renewable

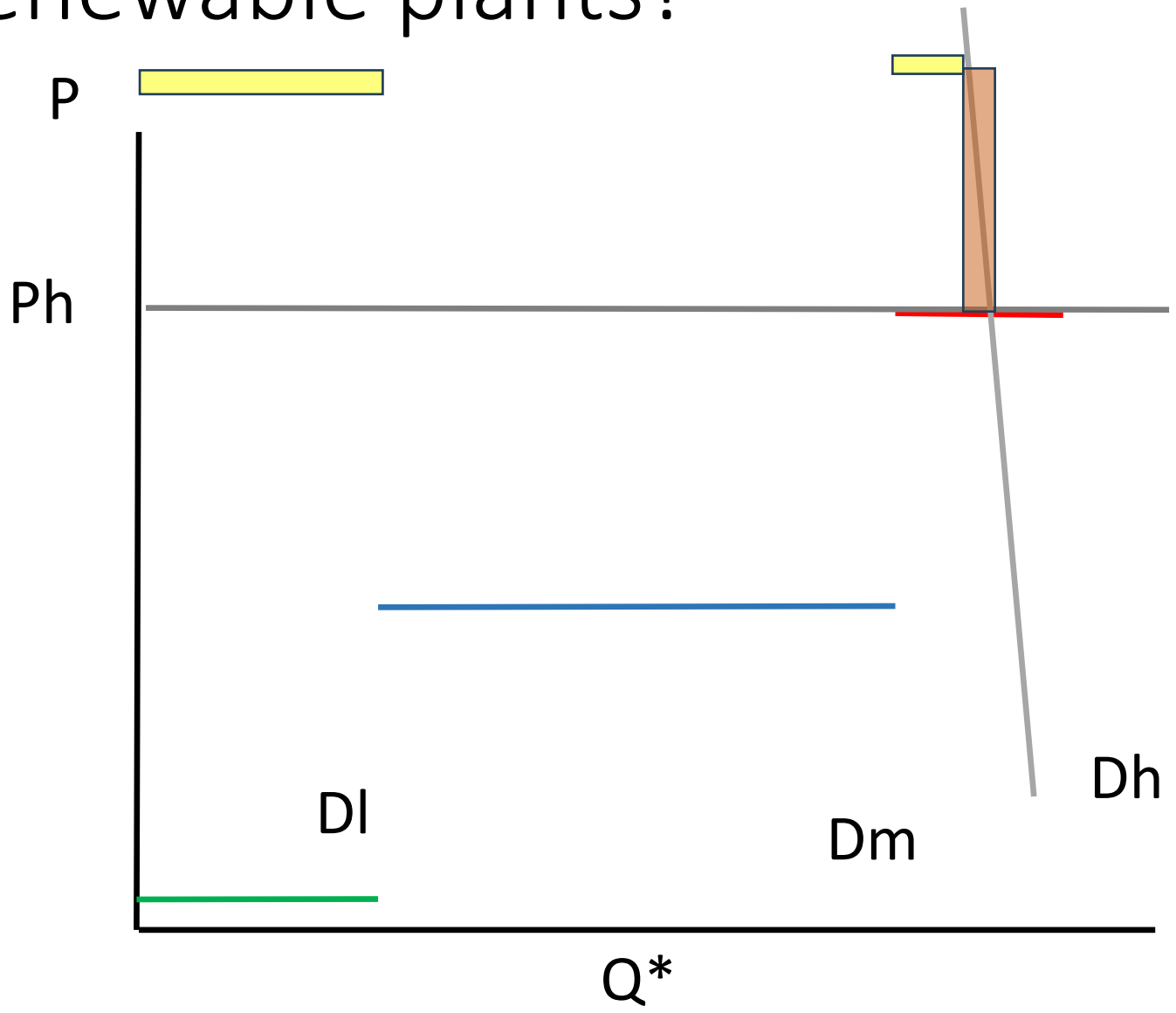
How it's supposed to work:

- Plants bid their true MC into the auction
- Cheapest MC plants produce.
- Price to customers is the MC of the last producer

Consider a high (h) demand period. Which plants have an incentive to change their bids?



What if the same firm owns the gas and renewable plants?



Marginal costs

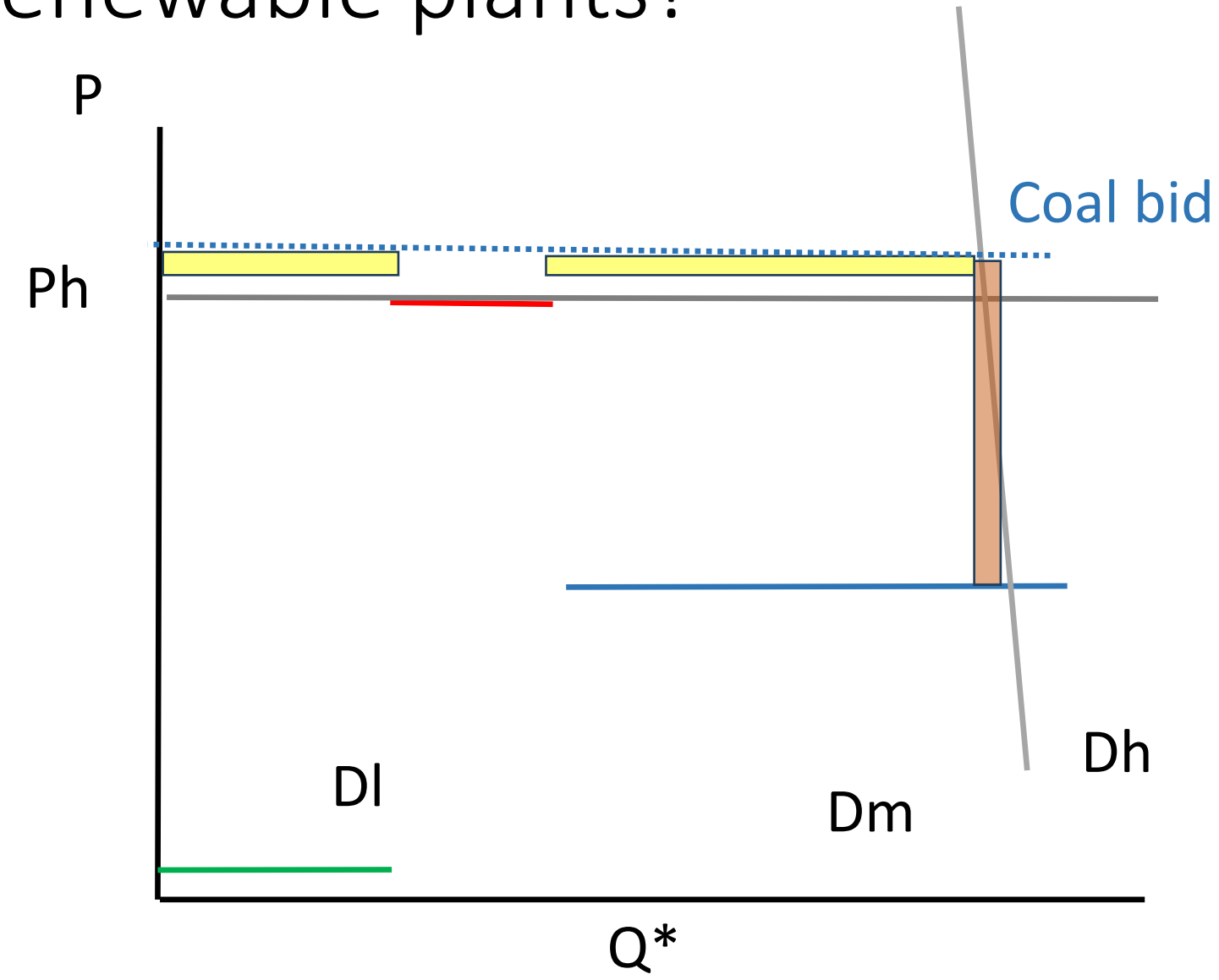
Gas

Coal

Renewable

The real incentives for bidding above cost here come when firms own both marginal and inframarginal capacity.

What if the same firm owns the **coal** and renewable plants?



Marginal costs

Gas

Coal

Renewable

The firm might be willing to move to the margin in order to raise price for its other plants.

This loss of **allocative efficiency** violate the primary goal of the system.

Collusion

- When marginal plants increase prices, they benefit **all plants**, not just those owned by the same firm
- This suggests firms might seek to encourage this behavior. But how?
- Actually sending transfers would likely result in jail time.
- Instead they might try to ”take turns” increasing prices / taking inframarginal plants offline
  - Ie if the coal plant bids high today, the gas plant might bid higher tomorrow
- How feasible do you think this is in the real world?
  - What are some challenges in implementing it?

Summary on market power

- In an undifferentiated product market (or a uniform price auction), prices are set by the marginal bidder
- In bidding / pricing above marginal cost, firms tradeoff sales to marginal buyers against increase prices on inframarginal ones
  - Incentives depend on how many marginal buyers there are (elasticity) and how many inframarginal ones there are (firm size)
- Same principles apply when there are multiple firms / plants.

Back to the energy game

- Revisit your fleet and bidding strategy with your team in light of today's discussion.
- Two more days of bidding:
  - Day 3 – Due tonight at 10 pm
  - Day 4 - Due tomorrow at 10 pm
- We will discuss the results in class Thursday
- **Thursday is also our first quiz**
  - Will cover everything up through the reading due Thursday
  - No books, notes etc. Do not even need a calculator.