Transmission Rights and Market Power

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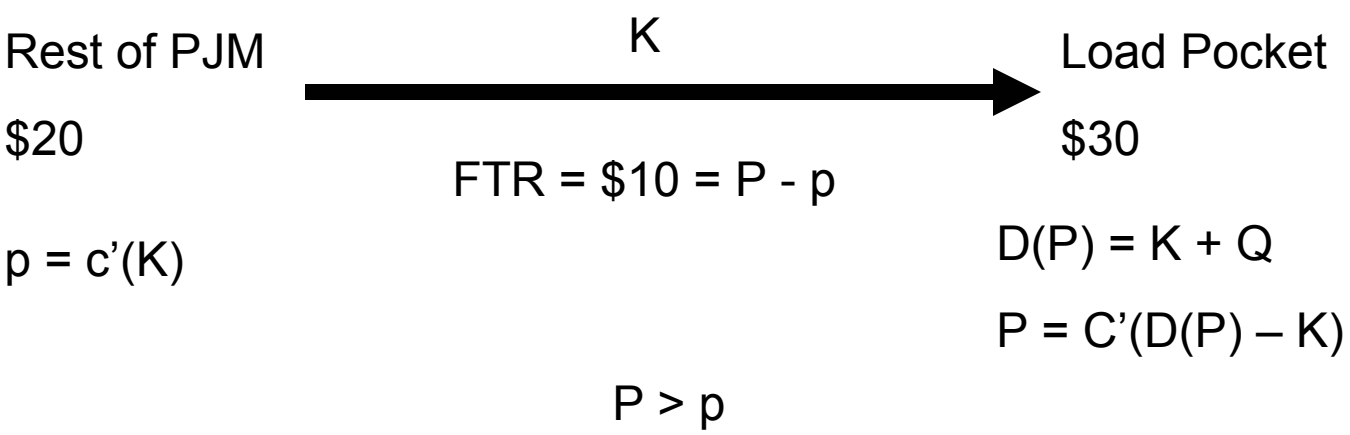
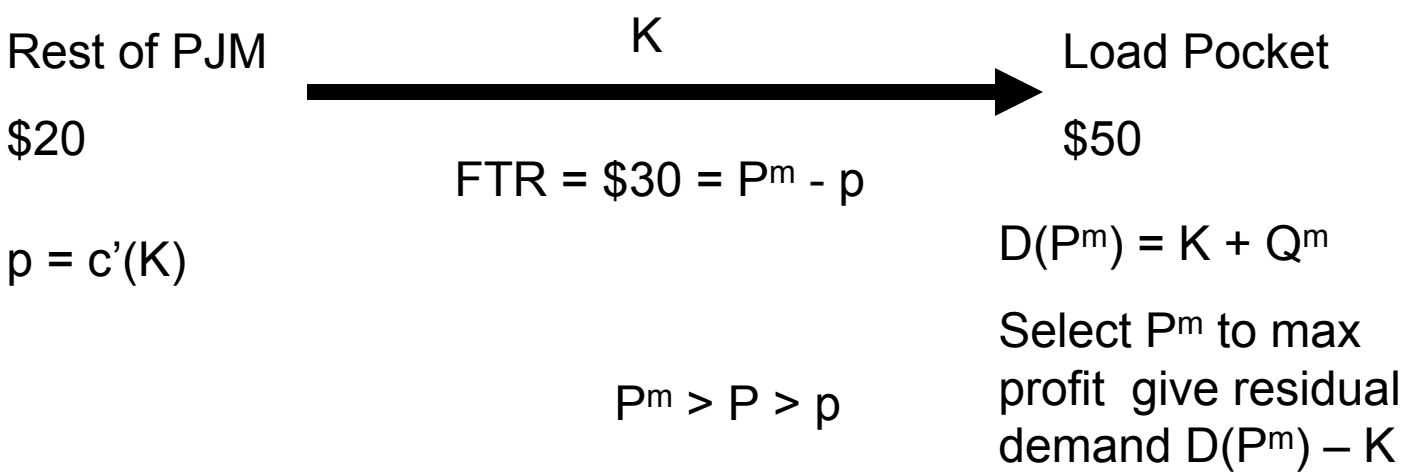
Joskow-Tirole, Rand J. 2000 Transmission Rights and Market Power

- FTRs pay holder difference in energy prices between congested and uncongested node
- FTRs motivated as hedge of congestion risk
- FTRs also impact incentive for market power
- Purchase FTR to hedge or
  Purchase FTR to enhance market power?

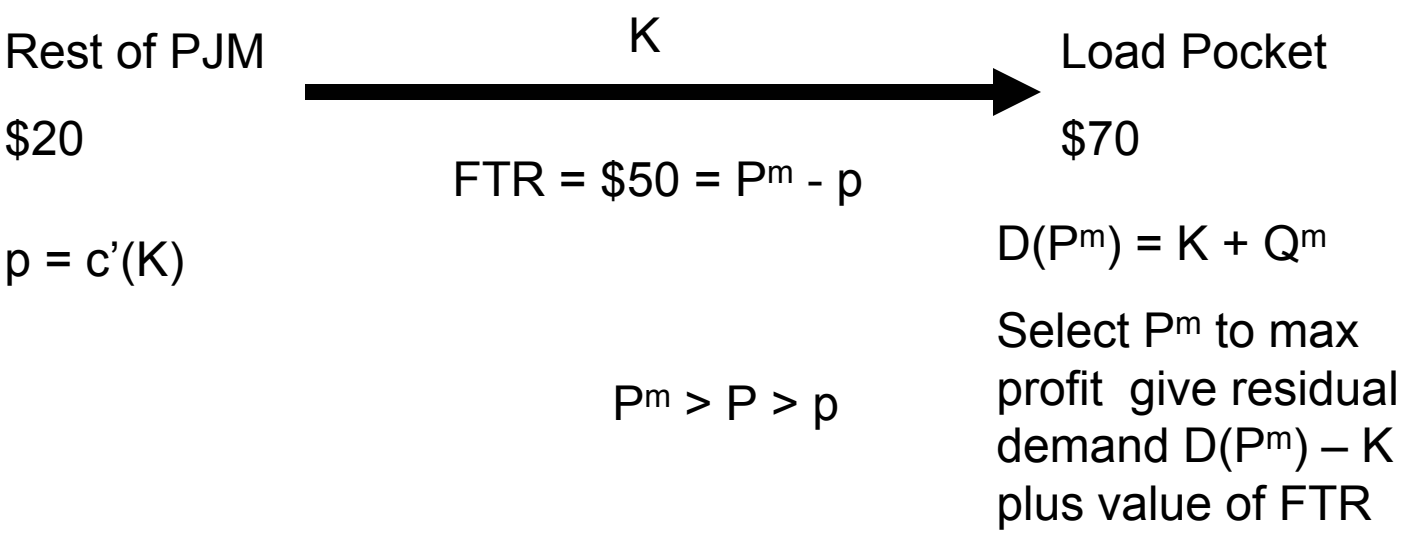
Two Node Network: Perfect Competition



Two Node Network: Monopoly in Load Pocket



Monopoly Buys FTRs

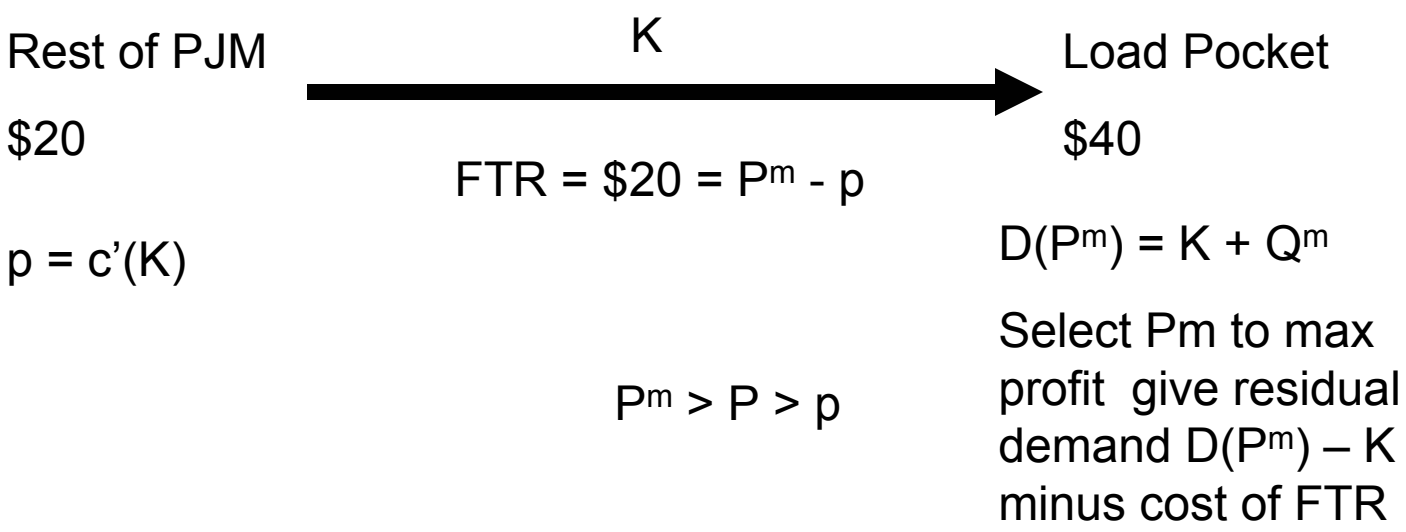


If own all FTRs, then line does nothing to reduce price.

Monopoly selects P^m to max profit given full demand $D(P^m)$

$Profit(P^m) = P^m(D(P^m) – K) – C(D(P^m) – K) + (P^m – p)K$

Monopoly Sells FTRs

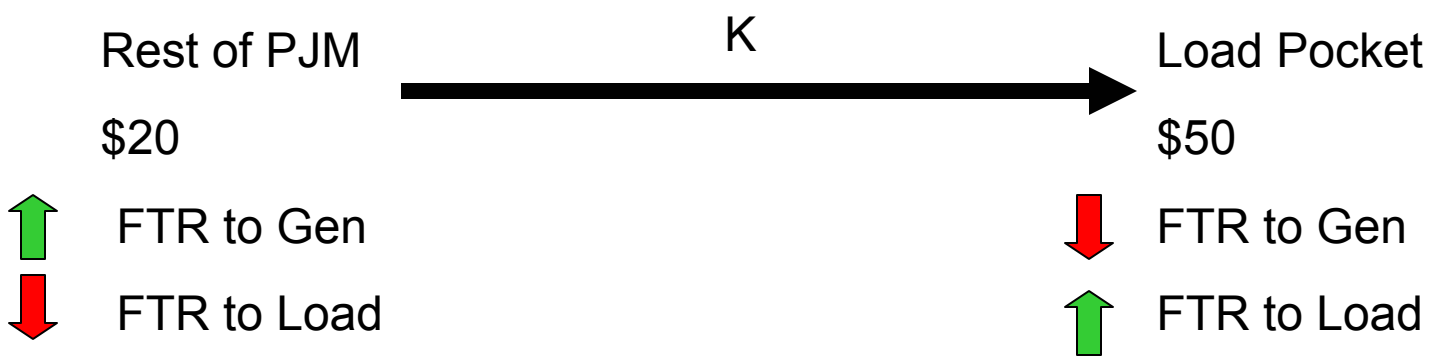


If sell FTRs, then less incentive to exercise market power.

If bundle FTR with capacity, then no incentive to exercise market power:

$Profit(P^m) = P^m(D(P^m) – K) – C(D(P^m) – K) – (P^m – p)(D(P^m) – K)$

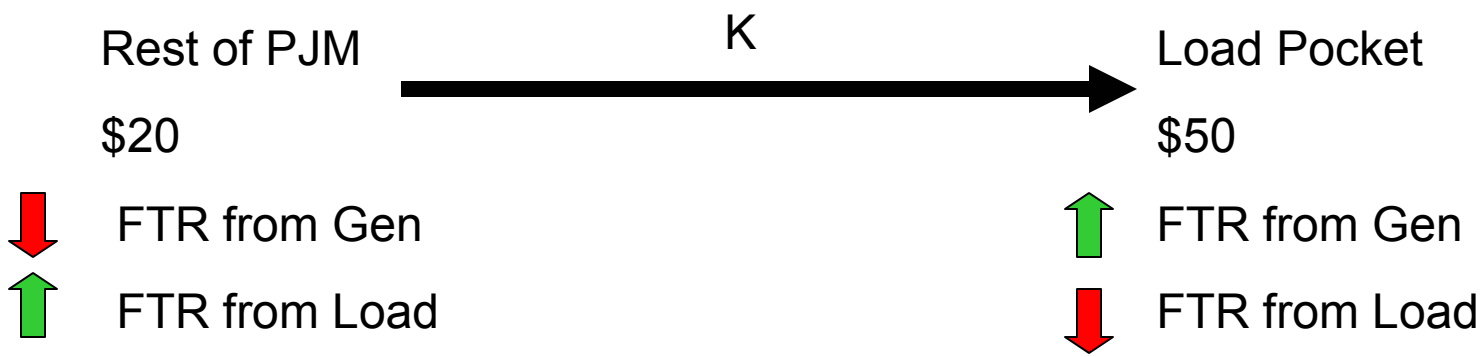
Summary: FTR Purchase



FTR purchase creates extra incentive to expand output (demand)

FTR purchase creates extra incentive to curtail output (demand)

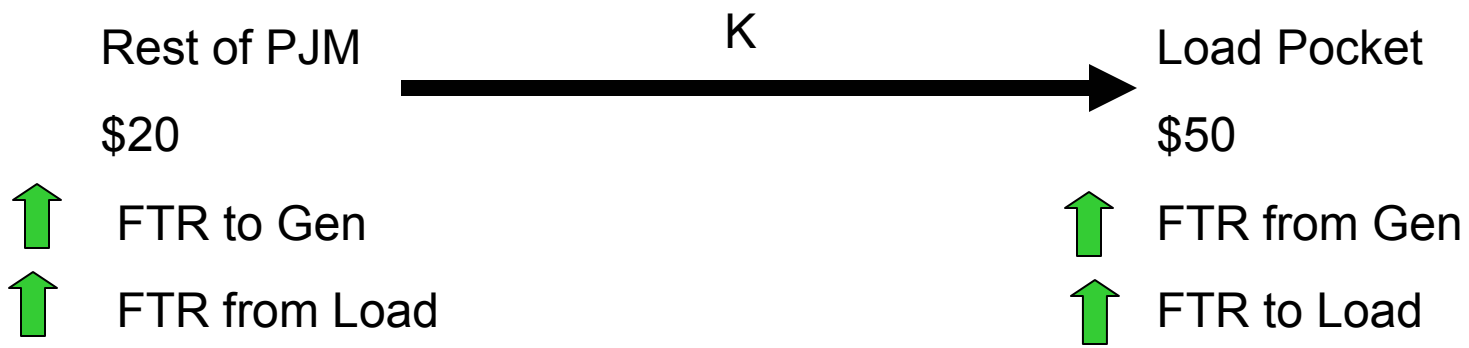
Summary: FTR Sale



FTR sale creates extra incentive to expand output (demand)

FTR sale creates extra incentive to curtail output (demand)

FTR consistent with hedging



FTR purchase reduces exposure to volatile load pocket price

FTR sale reduces exposure to volatile load pocket price

FTR Policy

- FTR purchase/sale consistent with hedging is good
  - FTR to Gen out of load pocket from Load in pocket
  - FTR from Gen in load pocket to Load out of pocket
    - Also commits Gen in load pocket to operate efficiently
- FTR purchase/sale to enhance market power is bad (and anticompetitive)
  - FTR purchase by Gen in load pocket
  - FTR sale by Gen out of load pocket
- FTR construction/assignment matters
  - Summer/winter FTRs if congestion shifts
  - FTRs to exporting Gen from importing Load

PJM Application to Load Pockets (with Steve Stoft)

- Needed generation in load pockets asks to retire (insufficient revenues)
- Long term subsidy auction to identify least cost resources for adequate capacity
- Issues
  - Lumpy resources
  - Market power in load pocket
  - Competition between Line and Gen

Simple Subsidy Auction

- Resources (Line and Gen) bid required subsidy
- All bids below market clearing subsidy win and receive clearing price
- Favors cheap peakers, since ignores impact on energy price in pocket
  - More expensive Line may reduce total costs (subsidy + energy)

FTR Subsidy Auction

- Resources offer capacity bundled with FTR
  - FTR = max (0, Pg – P) where
    - Pg = load pocket energy price
    - P = PJM energy price
- Line/Baseload rewarded for reducing energy price
- Reduced risk for Line and Baseload
- Eliminates incentive to exercise market power
- Problem: Peaker risk
  - FTR sale introduces unhedged risk for Peaker (Pg above P but less than MC of Peaker)

Capped FTR Subsidy Auction

- Resources offer capacity bundled with FTR
  - FTR = max (0, Pg – P) where
    - Pg = load pocket energy price
    - P = PJM energy price
  - Annual FTR payments capped at subsidy
- No downside risk for Peaker
- But market power problem reappears when resources are most scarce

FTR Subsidy Auction with Bottom Capped

- Resources offer capacity bundled with FTRs
  - Top FTR = max (0, Pg – max(P, C))
  - Bottom FTR = max (0, min(Pg, C) – P) where
    - Pg = load pocket energy price
    - P = PJM energy price
    - C = MC of typical peaker
  - Annual Bottom FTR payments capped at subsidy
- No downside risk for Peaker
  - Top FTR is hedged by Peaker so no need to cap

Benefits of FTR Subsidy Auction with Bottom Capped

- Line and Gen compete on equal basis
- Lumpiness handled well
- Risk reduced for most (all?) resources
- Market power reduced
  - In energy market
  - In subsidy auction

Subsidy Auction Design

- Auction with externalities
  - Bidders care who wins
    - Line wins implies lower FTR cost
    - Peaker wins implies higher FTR cost
  - Both price and quantity discovery is important
    - Descending clock with QLine, QPeaker displayed
    - Package auction (bids depend on composition of winners)

Importance of FTRs and Forward Contracts

- Hedge risks (promote efficient investment)
- Mitigate market power (promote efficient spot markets)

Other Applications

Resource adequacy alternatives

- ACAP or ICAP markets
  - Doesn't help with market power so add AMP
- Forward purchase of portfolio of energy options (Chao and Wilson 2003)
  - Must bid obligation assures resource adequacy
  - Contracting when supply more responsive
  - Adds demand response mitigating market power
  - Reduces dependence on AMP