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Day 1, Session 2:

Capacity Market Fundamentals

- ➢ What's broken?
- ➢ The gold standard: EO/VoLL
- ➢ The Right Technology Mix
- ➢ Can an EO | CM handle reserves?
- ➢ Auctions
- ➢ A CM in 4 easy steps
- ➢ Major considerations

What's Broken?

The Fundamental Failure of Power Markets:

- Consumers don't respond to price in real time
  ➔ Sometimes **price cannot "clear the market"** (make demand = supply)
  ➔ So a standard competitive market is impossible
- Economics ➔ **That market will "fail."** (a technical term)

Bonus problems:

- (1) Repower with gas, (2) Renewables
- (Not fundamental. They just make the standard market failure more risky)

A Standard ("Perfectly") Competitive Market

- ❖ Has one price (at a time) that causes
  - ➔ Efficient (1) production and (2) consumption
  - ➔ Efficient (3) investment
  - ➔ One price does three things at once, perfectly!
    - –Adam Smith's invisible hand ("The Hand of God")

- ❖ Perfectly competitive markets don't need:
  - ➢ A regulator to set the price cap, or
  - ➢ A market for production capacity (e.g. a car factory)

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Why the Perfectly-Competitive-Market Idea Matters

- “Perfect competition” provides our design target
- We just try to come as close as possible
- The theory of competitive markets is slightly tricky
- So I will describe an almost-realistic, semi-perfect, power market:

  The Energy-Only market with a VoLL price cap

- It’s much easier to use as **our design target** than is economic theory.
- So: Design our Capacity Market (CM) to mimic the EO/VoLL market.

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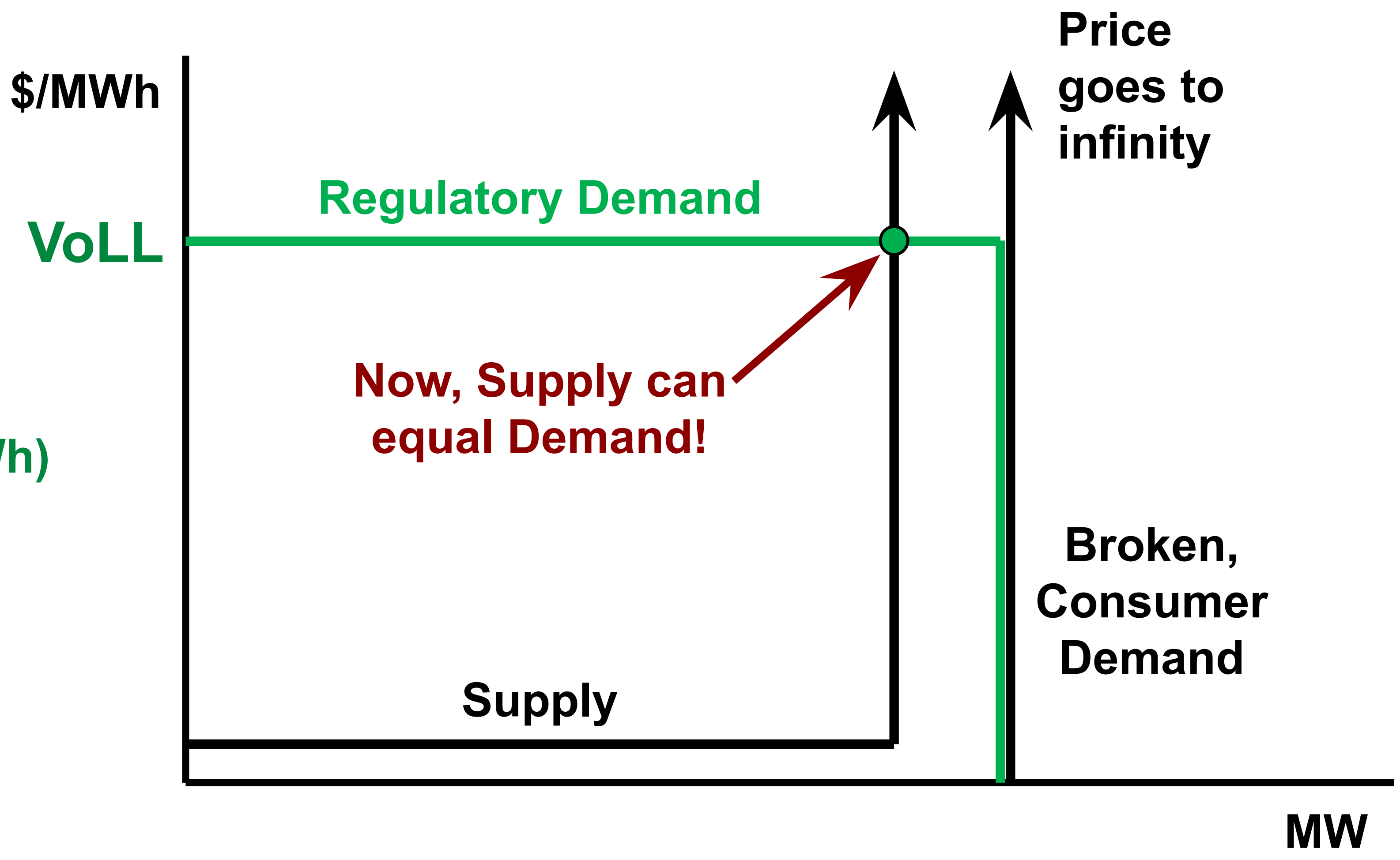
Market Failure & E.O. Market Fix

Value of Lost Load to the avg. Loser

(~$15,000/MWh)



The Energy-Only Gold Standard (EO/VoLL)

- Assumptions:
  1. Just a real-time energy market (no reserve or capacity market)
  2. Perfect competition (no market power)
  3. The regulator caps the demand curve at VoLL
  4. No one cares about risk (they are “risk neutral”)
  5. In Alberta – no transmission constraints.

The Energy-Only Gold Standard (EO/VoLL) (#2)

- Power supply and capacity are right
- Consumer demand is right on average
- Second-order effects are still problematic:
  - **Risk**
  - **Market Power**
- VoLL
  - ➢ The only time a peaker gets paid more than Variable Cost (VC) is during hours of load shedding, when the price is set to VoLL. **That’s risky**. (Only 3 events between 2006 – 2017)
  - ➢ VoLL **attracts market power**.

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Why EO/VoLL Standard Is So Useful

- When we want to know:
  - Should a generator get credit for X? (e.g. providing reserves)
  - Is a certain incentive strong enough?
  - What should the CM price be?
  - Do we need market power to attract reserves?
- We don’t need to use econ theory from scratch
- Just ask: What does an EO/VoLL market do?
- That gives the right answer. (But not for risk or market power.)

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How an EO/VoLL Market Works

1. Scarcity Rents
2. Missing Money
3. Why a Capacity Market works

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How Should an Elastic E.O. Market with Responsive Demand Work?

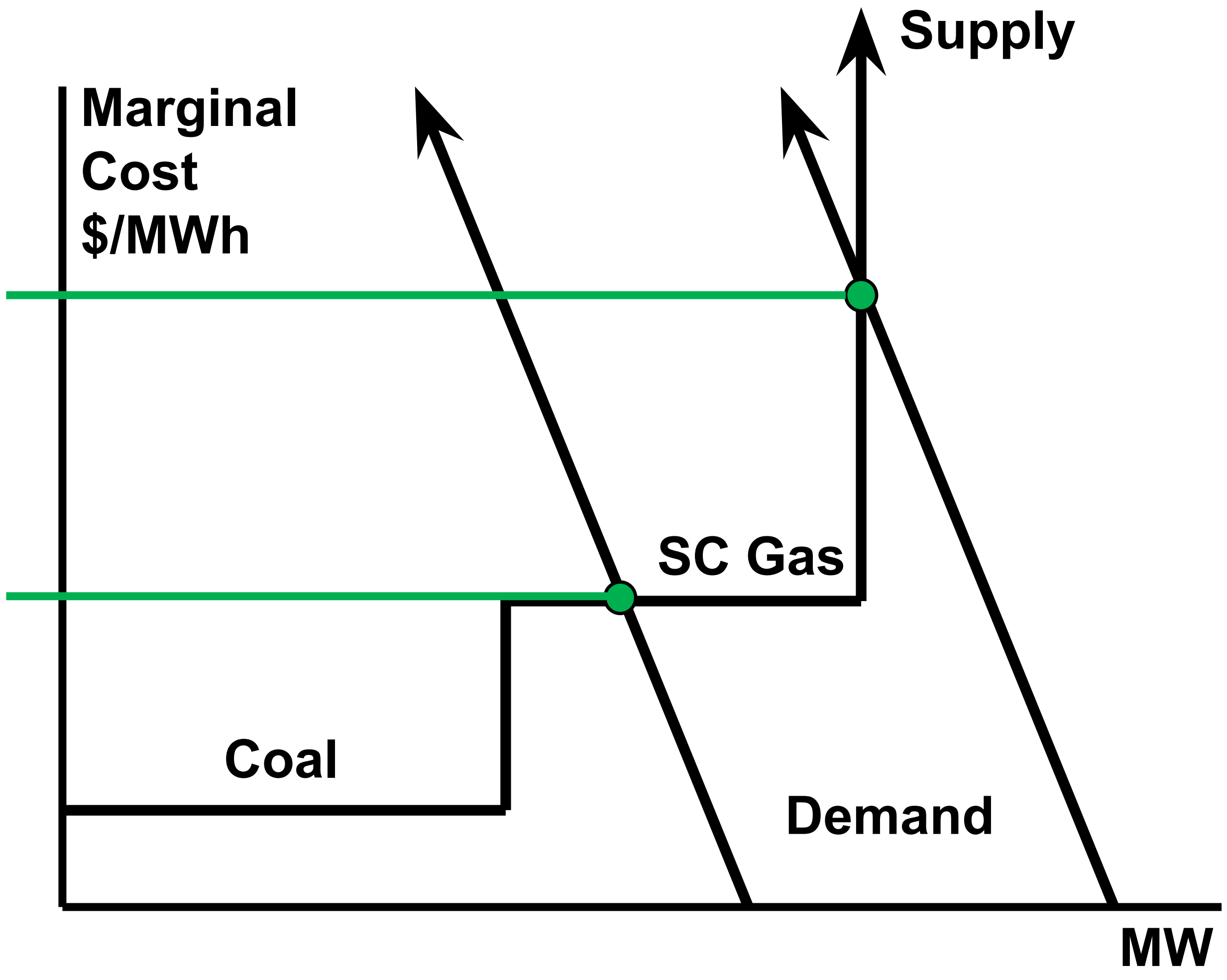
No price cap.

Supply x Demand

Coal gets the most scarcity rents.

These pay for high fixed costs

100% adequacy.



How Does an EO/Low-Cap Market Work?

P = $150 for 10% of year
P = $50 for 30%.   P = $20 for 60%

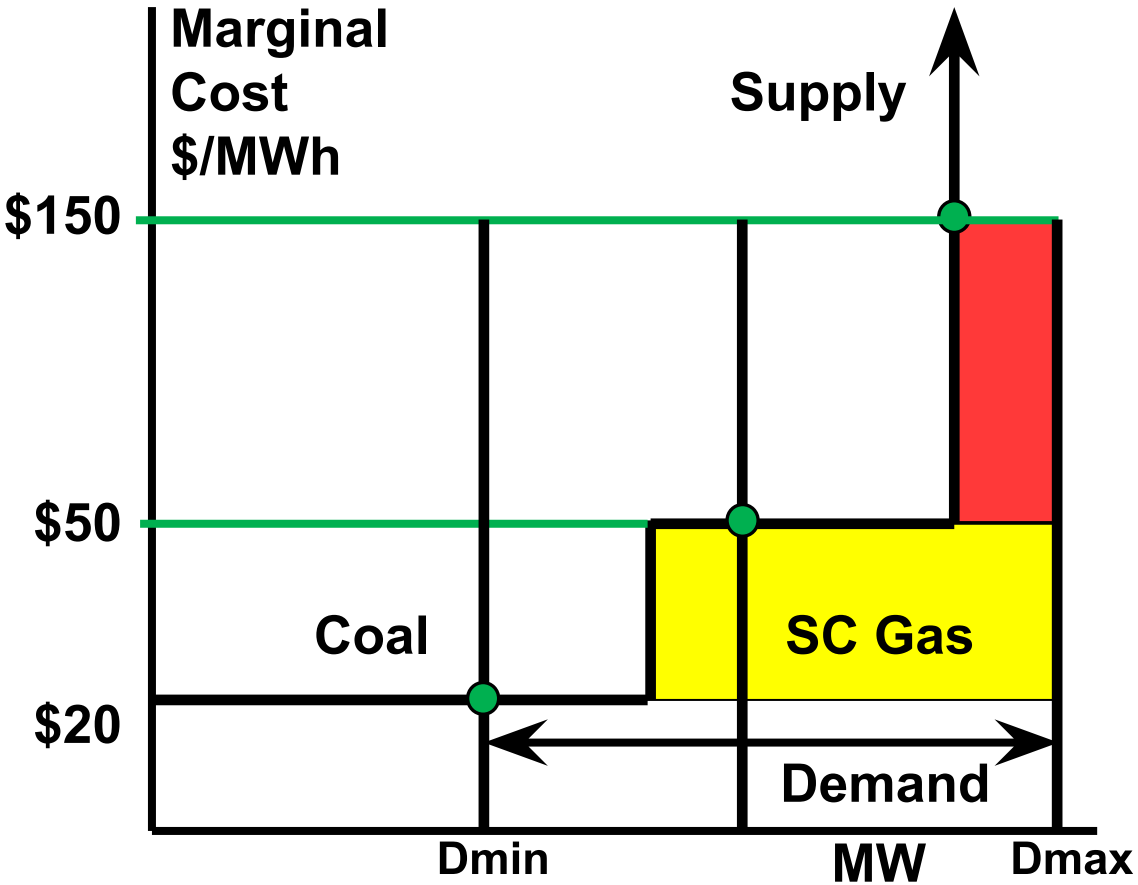
Red = $100 × 10% × 9000hr/year
Red = $90,000 Scarcity Rent

Yellow = $30 × 40% × 9000
Yellow = $108,000 Scarcity Rent

Red + Yellow = $198,000 Coal SR

Gas Fixed Cost = $90,000
Coal Fixed Cost = $198,000

EO Market in Equilibrium



Demand is spread from Dmin to Dmax

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CONE and Net CONE

- Cost of New Entry

  For Single Cycle Gas = $90,000/MW-year

  For Coal = $198,000/MWy

- Net CONE = (CONE) – (Energy Scarcity Rents)

  For Single Cycle Gas = $0 / MWy

  For Coal = $0 / MWy

How Does an EO/VoLL Market Work?

P = $150 **$1050**, 1% of year
P = $50, 39%. P = $20, 60%

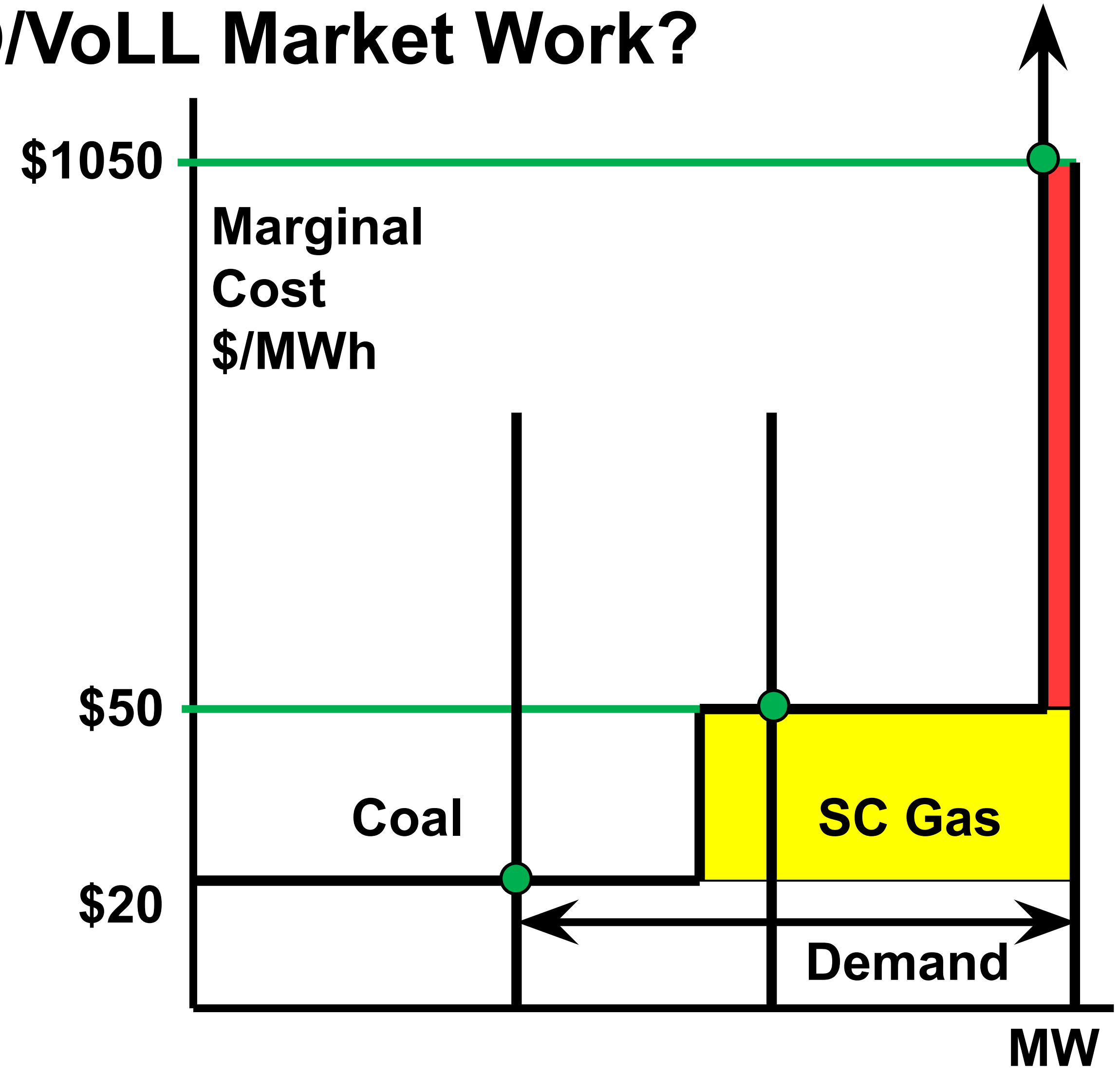
Red = $1000 × 1% × 9000h/year
Red = $90,000 Scarcity Rent

Yellow = $30 × 40% × 9000
Yellow = $108,000 Scarcity Rent

Red + Yellow = $198 Coal SR

Gas Fixed Cost = $90,000
Coal Fixed Cost = $198,000

EO Market in Equilibrium



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CONE and Net CONE

- No change in CONE or Net-CONE
  - Because Scarcity Rents stayed the same

- So where do positive Net-CONEs come from?

1. Depress the price cap
2. Buy capacity in a auction
3. This cuts off the top of the price-cap rents.
4. And all generators lose that scarcity rent.

Push Price-Cap Down, Buy More Capacity in a CM

P = \$150, **1%** of year
P = \$50, 39%. P = \$20, 60%

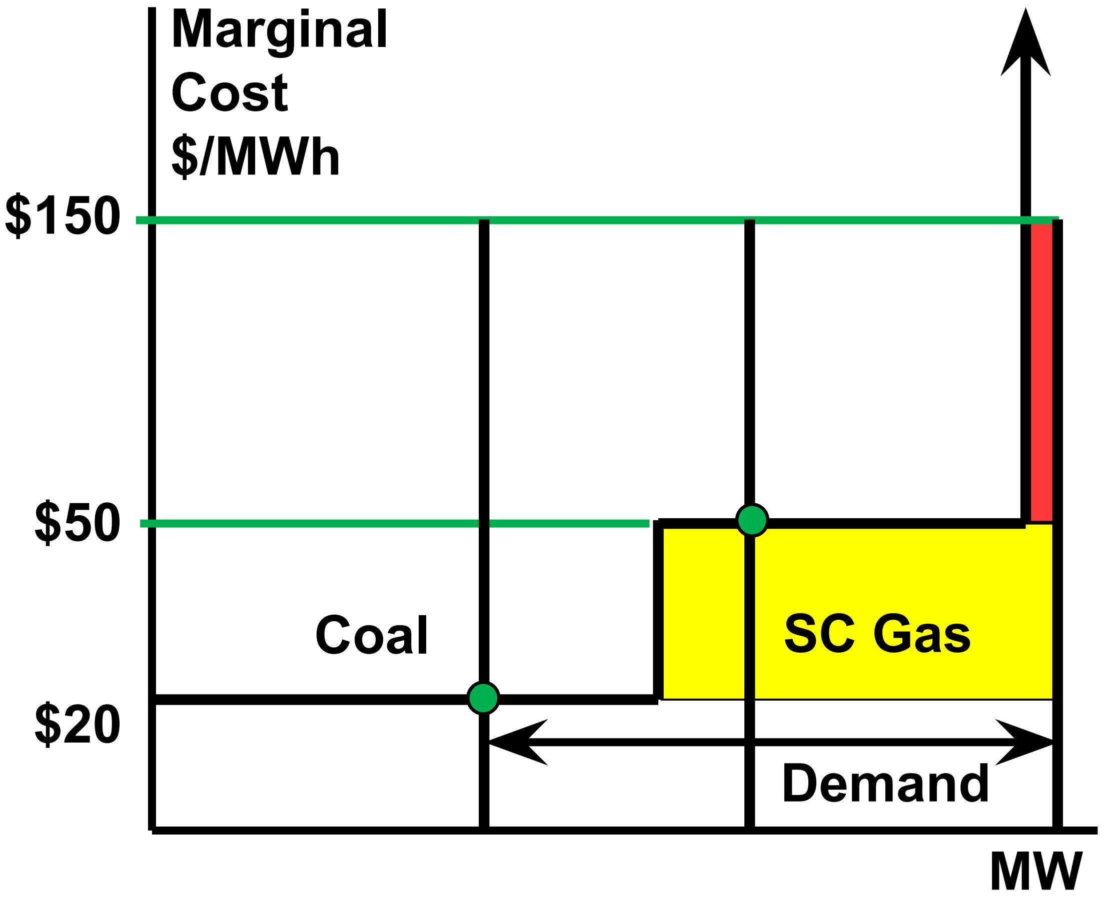
Red = \$100 × 1% × 9000h/year
Red = \$9,000 Scarcity Rent

Yellow = \$30 × 40% × 9000
Yellow = \$108,000 Scarcity Rent

Red+ Yellow = \$117,000 Coal SR

Gas Fixed Cost = \$90,000
Coal Fixed Cost = \$198,000

EO Market **NOT** in Equilibrium
(too much capacity)



CONE and Net CONE

- Red Scarcity Rent drops from $90,000 to $9,000
  All types of generation lose $81,000 / MWh
  That's the missing money (MM)
- Net-CONE = (CONE) – (Energy Scarcity Rents)
  Single Cycle Gas = $90,000 − $9,000 = $81,000/MWy
  For Coal = $198,000 – $117,000 = $81,000/MWy
- Net-CONE = MM = missing Scarcity Rents
- And that's what the CM auction price should be.

Missing Money Defined

- **Missing Money** is the money missing from the energy market, due to a low price cap, from an energy market with an ideal level and mix of capacity.
- It's also the missing scarcity rent of every type of generator when the generation set is optimal, but the price cap is less then VoLL.

Why a Capacity Market Works

- A CM pays all types of capacity the same amount

  And a low energy price-cap takes the same amount of scarcity rent from all types, because they all run during a blackout.
- But that's not quite true. Some only show up half the time, so we define their UCAP to be half of their name-plate capacity.
- They only lose scarcity rents when they show up.
- So they only lose half the scarcity rent that their name-plate would suggest.
- So, to mimic an EO/VoLL, the CM only pays them for half their name-plate capacity.

Why a Capacity Market Works (2)

- It works because it mimics an EO/VoLL and that works.
- When checking a CM design,

  Just ask – What would an EO/VoLL do?

(But this doesn’t work for questions about risk and market power, because EO/VoLL markets don’t work well for those problems.)

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Getting the Technology Mix Right

1. What if there are too many peakers
2. What happens when more coal is built
3. What should the CM price be?

Can the Market Fix Itself?

- Our examples have assumed that the efficient set of generation already existed. So they all covered their Fixed Costs.
- I didn’t show that this produced power the cheapest way.
- But Perfect Competition is great, so of course, that’s true.

- Now I will assume the we have the wrong mix of generator types, and the wrong amount of generation, and see if these markets can fix themselves.

What If: Too Much Gas, too Little Coal in a CM?

And too little Reliability

P = \$150, 3% of year

P = \$50, 39% **49%**. P = \$20, 60% **48%**

Red = \$100 × 3% × 9000h/year

Red = \$27,000 Scarcity Rent

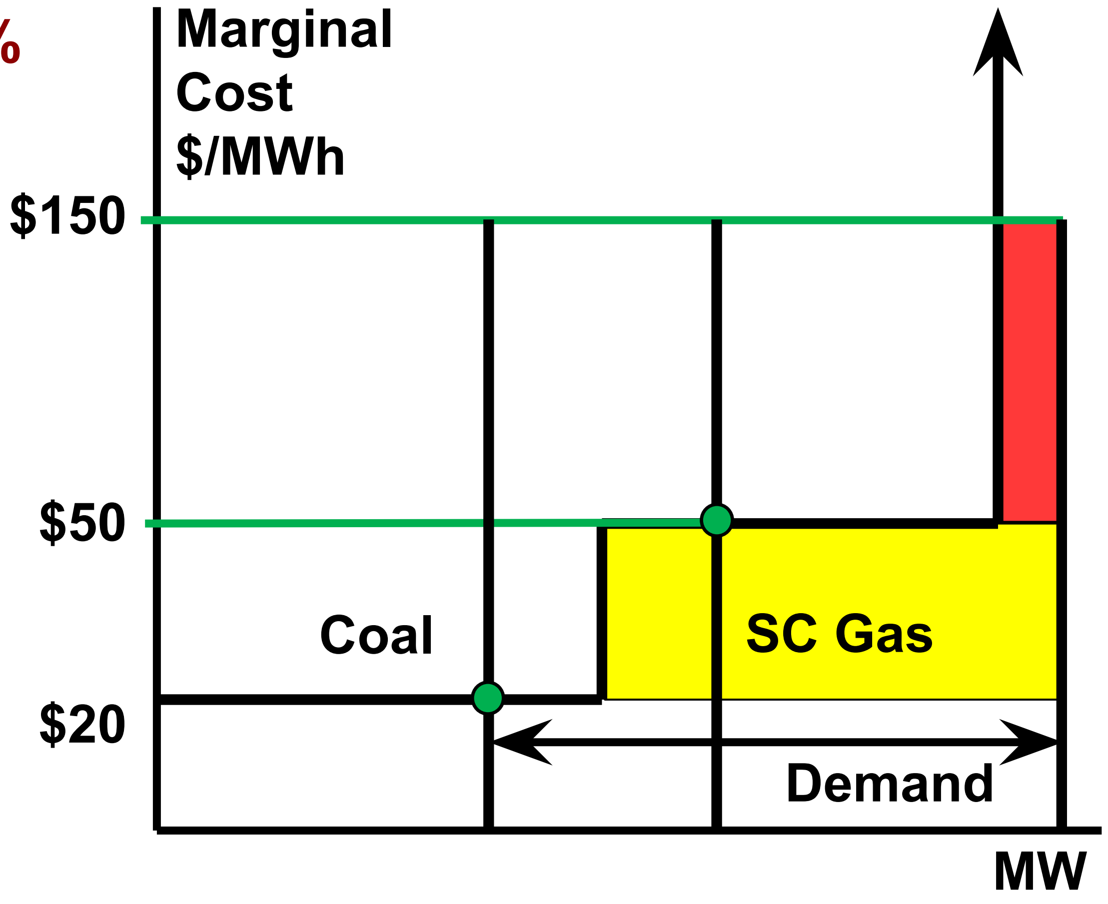
Yellow = \$30 × 52% × 9000

Yellow = \$140,400 Scarcity Rent

Red+ Yellow = \$167,400 Coal SR

Gas Fixed Cost = \$90,000

Coal Fixed Cost = \$198,000



CONE and Net CONE

- Red Scarcity Rent = $27,000
- Yellow Scarcity Rent = $140,400
- Red + Yellow Scarcity Rent = $167,400
- CONE – (Energy Scarcity Rents) = Net-CONE

Single Cycle Gas = $90,000 – $27,000= $63,000/MWy

For Coal = $198,000 – $167,400 = $30,600/MWy

- In a CM, MM still = $81,000.

What Happens When The Mix Is Wrong?

- Load is covered by 49% Gas and 48% Coal (and 3% nothing)
- But ideal is 39% Gas and 60% Coal.
- So, What happens?
- Both EO/VoLL and CM will correct the mix, but
- The EO/VoLL will do it more harshly.

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What Happens When The Mix Is Wrong? (#2)

- **In a CM**, both types of generation get
  - Scarcity rent (at $150 cap) + Missing Money

    SR + MM
- Gas gets $27,000 + $81,000 = $108,000 > CONE = $90,000
- Coal gets $167,400 + $81,000 = $248,000 > CONE = $198,000
- Both want to invest. That's dangerous, and they know it.
- Let's assume just Coal invests 4% new capacity
- In an EO/VoLL, they both get an extra $162,000 and overbuild.

What Happens When The Mix Is Wrong? (#3)

- **In an EO/VoLL**, both types of generation get
  - Red Scarcity Rent = \$1000/MWh × 3% × 9000h = \$270,000/MW
  - Yellow Scarcity Rent = \$140,400/MWh (same as for CM)

- Gas gets “Red”: \$270,000 > CONE = \$90,000
- Coal gets both: \$410,400 > CONE = \$198,000
- Both want to invest. That’s dangerous, and they know it.
- But the temptation my be too great.

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Investors Build 4% Coal

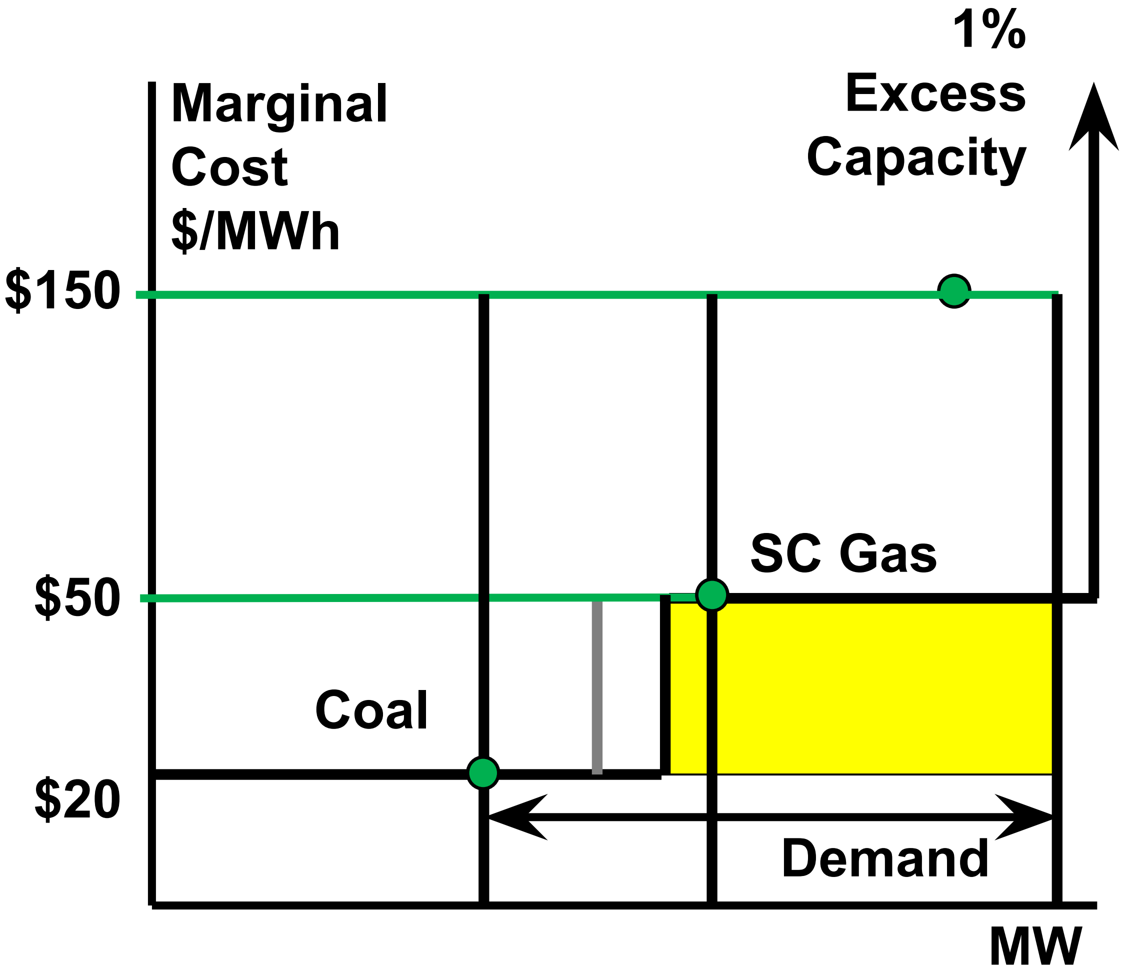
P = \$150, 0% of year
P = \$50, 48%. P = \$20, 48% **52%**

Red = \$0 × 0% × 9000h/year
Red = \$0 Scarcity Rent

Yellow = \$30 × 48% × 9000
Yellow = \$129,600 Scarcity Rent

Red+ Yellow = \$129,600 Coal SR

Gas Fixed Cost = \$90,000
Coal Fixed Cost = \$198,000



What Happens with More Coal?

- $27,000 peak Scarcity Rent vanishes from the energy market within the CM framework.
- $270,000 peak Scarcity Rent vanishes from EO/VoLL market
- The CM should keep paying $81,000 MM (or just a bit less).

	CONE (FC)	Scarcity Rent	Net-Cone	Capacity Payment (MM)
Gas	$90,000	$0	$90,000	$81,000
Coal	$198,000	$129,600	$68,400	$81,000

What Happens with More Coal? (#2)

	CONE (FC)	Scarcity Rent	Net-Cone	Capacity Payment (MM)
Gas	$90,000	$0	$90,000	$81,000
Coal	$198,000	$129,600	$68,400	$81,000

- EO market prevents new investment because both lose Net-Cone.
- CM market prevents new investment because it simply stops buying new gen.
- In a capacity market framework:

  Gas is ***losing*** only $9,000, not losing $90,000.

  Coal is ***making*** $12,600,   not losing $68,400

Getting to the Right Mix

- Both CM and EO/VoLL will resume buying the right kind of capacity once some capacity retires, and will end up with the optimal mix.
- That's a little bit amazing, especially for the EO/VoLL
- It only has a real-time electricity price but it:
  1. Balances supply and demand
  2. Dispatches the least-cost generation
  3. Buys the right amount of reliability
  4. And gets investors to build the least-cost mix of generators
- Could "The Hand of God" also provide perfect operating reserves?

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What Should the CM Price Be?

- ➢ The long-run average CM price (P_{CM}) needs to be the MM.
- ➢ That's what it takes to support peakers. And you need peakers.
- ➢ That's also what's needed for every generator in the optimal mix.

- ➢ If a large new coal plant overshoots required capacity, and next year none is needed, should the capacity price drop to zero?
- ➢ No, the coal investor would foresee that and double its bid.

- ➢ Keeping P_{CM} equal to the current (gradually changing) MM all the time would be ideal.

How to Control the CM Price

- The outcome of the annual auctions should determine the CM price.
- But this determination can be made in many ways.
- CM price could just be set equal to the auction-clearing price each year and zero when no new capacity is purchased (not a good idea).
- Or CM could be adjusted towards the clearing price each year.
- The demand curve can be different shapes, etc.
- It’s too soon to worry about the details, except for one:

  ➔ New capacity (or upgrades) should determine the price
- For now, I will only focus on what would be a good outcome, not how to make that happen.

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What Should the CM Price Be? (#2)

- Moving P_{CM} toward true Net-CONE will help estimate and track the changing value of MM
- If P_{CM} gets off track (say too low, P_{CM} < MM on average).
- Investors will see this and raise their offers.
- Investors will keep P_{CM} on track – in the long run.
- But it's best not to make that hard for them.
- It's good to keep adjusting P_{CM} toward the lowest accepted offer, because MM does change slowly.

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Can an EO or CM Handle Reserves?

1. Why an EO/VoLL ***automatically*** incentivizes reserves
2. A good CM will provide the same incentives.

Does a CM Market Incentivize Reserves?

- Don’t we need special incentives from a market for reserves?
- Nope. We just need to help coordinate reserves.
- So we still need a reserve (ancillary services) market.
- But, we don’t need to add market power for good performance!
- A perfect EO/VoLL market is our gold standard.

  So I will check what it does.

Does a "Perfect" EO/VoLL Market Work?

- I said: "Yes."
- But maybe I was ignoring start-up costs and reserves ?!
- Surely we need a reserve market to pay generators to sit around and be ready in case of an emergency.
- Why would a generator spend good money to start up and then prevent the emergency so that we don't need to pay it $15,000/MWh?

- **If EO/VoLL doesn't incentivize reserves, our CM won't.**

Blackouts Not Prevented by EO: An Example

1. Without reserves:
   A 20% chance of a 4-hour black tomorrow afternoon
2. Q MW of reserves will reduce that to (4 – Q / 50) hours.
3. It costs $200/MW to start those reserves.
   They make nothing if there is no blackout.

- Do we want 200 MW of reserves ➔ (4 – 200/50) hr = No Blackout?
- Generation owners won't prevent all blackouts.

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So What Happens?

- ➢ Assume small generators compete to supply reserves, and …
  1. Cost to start = $200/MW
  2. **VoLL = $2,050**, (VC = $50)
  3. Blackout = 20% chance of (4 – Q/50) hours
- ➢ Scarcity rent = $2050 – $50 = $2000/MWh
- ➢ More reserves ➔ Less scarcity rent
- ➢ Provide reserves up to break-even

  For 1 more MW: 20% × (4 – Q/50) × $2,000 = $200

  Q = total quantity of reserves provided

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So What Happens? (#2)

- Provide reserves up to break-even

  $20\% \times (4 - Q/50) \times \$2{,}000 = \$200$

  $\$400 \times (4 - Q/50) = \$200$

  $\$1600 - \$8\ Q = \$200$

  $\$1400 = \$8\ Q \rightarrow Q = 175 \rightarrow (4 - 3.5)$ hours of blackouts

- **80% of the time the reserves lose their startup costs.**
- 20% of the time they make just enough to cover the other 80%
- Blackout are reduced from 4 hours to 0.5 hours

Did the EO/VoLL Induce the Right Amount?

- Yes, we calculated the break-even amount of reserves.
- Cost per MW is constant, but benefit per MW goes down to zero
- Fewer reserves will make blackouts last longer and increase the benefit per MW of reserves. So break-even is optimal.
- **So the EO/VoLL provides exactly the right level of reserves!**

- But an EO/VoLL is not perfect. There will still be problems:

  (1) market power, (2) costs of risks, (3) coordination problems

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The Moral of the Story of Reserves

- As long as there's even on more MW available, the price paid should be the marginal-cost of producing power – $50/MW in this case.

  Supply = Demand ➔ P = $50/MWh
- When we run out of generation and are forced to black someone out, they would pay $2050/MWh to get back their unserved energy. So the price should be $2050/MWh.

  If the demand curve had a slope: Supply = Demand ➔ P = $2050/MWh
- Yes, providing reserves helps prevent blackouts. Having a reserve supply of hotel rooms helps prevent shortages when big conferences come to town.
- Paying the competitive (supply=demand) price all the time, solves the reserve problem correctly, without a regulator inventing a reserve market.

Why We Need an AS Market for Reserves

- **Not to give ad-hoc gifts of market power from the AESO.**
- **Not to attract more reserves on average.**
- The suppliers of reserves need (1) coordination and (2) information.
  1. How many others are providing reserves?
  2. Don’t make the little guys calculate the chance of blackouts.
  3. True for all types of (except perhaps regulating) reserves.
- So the AESO should buy reserves to provide both #1 and #2.
- Having a good EO or CM market, should approximately pay for reserves and make them quite cheap to buy.

What If We Did Pay for Reserves? (#2)

- Instead of paying the reserve generator for $2000 for being available during the half hour of unserved energy,
- We could pay $50/MWh for being Available during the 20 worrisome hours.
- That's $200 per day of 4 worrisome hours. So it could work.

What If We Did Pay for Reserves? (#2)

- ➢ Paying for reserves, means paying for generators do be present during worrisome hours (consumers don’t care if the ISO is worried).
- ➢ That’s less well targeted than an EO or CM market that just pays for energy provided during blackouts (what consumers care about.)
- ➢ With poor targeting (paying for reserves) things can go wrong.

1. What if the blackouts were caused by a reserve generator being unavailable. It gets paid for 4 out of five days and never provides any help with unserved energy.
2. What if the generator cost more to start, but could pick out the highest-risk days and just show up on those days? It’s there 100% when needed, but only for 20% of the “worrisome” hours with reserve payments.

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Auctions

1. First-Price Auctions
2. Second-Price Auctions

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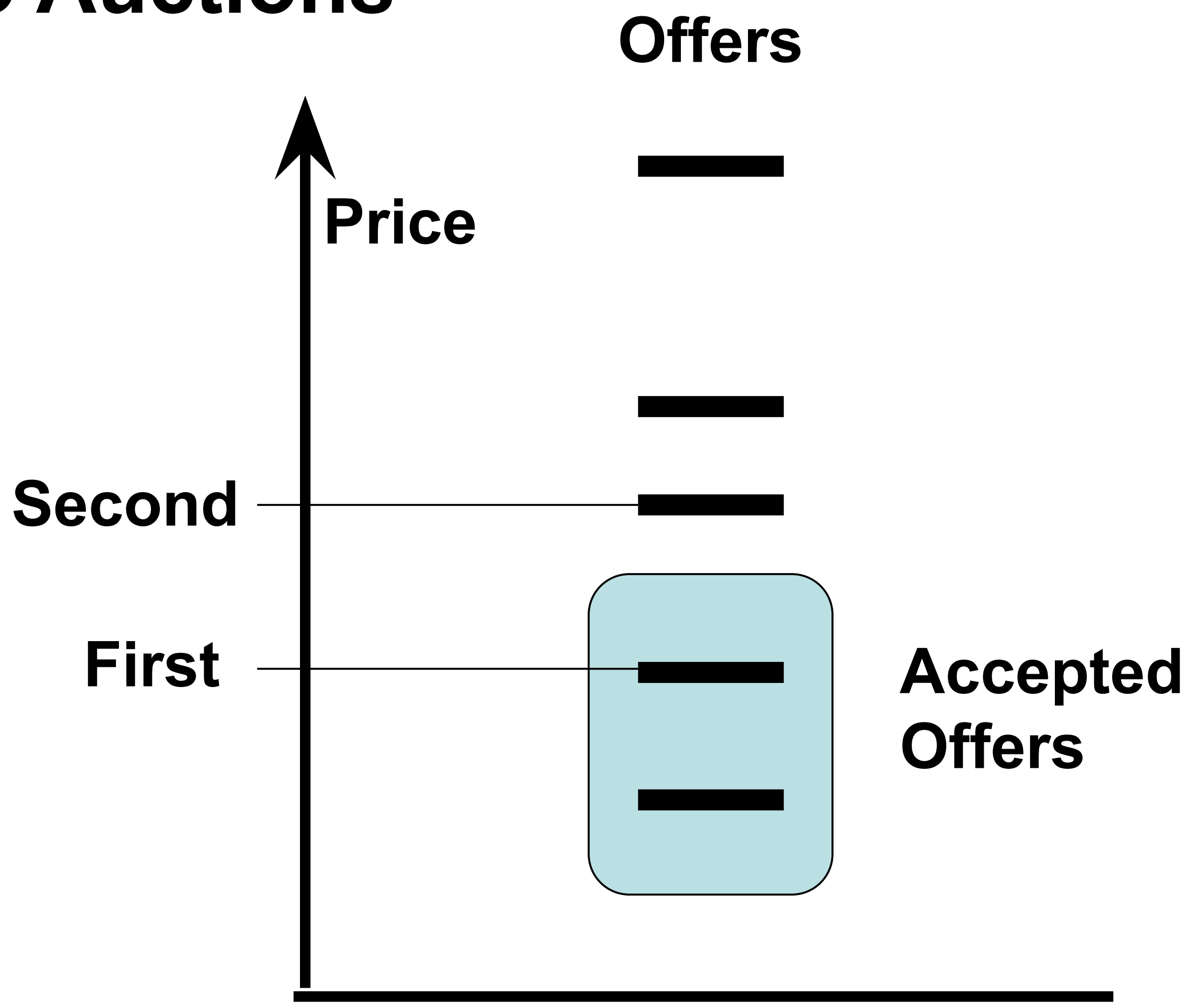
Two Auctions

- The AESO CM auction is a first price auction.
- It causes bidders not to be truthful.
- A second price auction pays all accepted bids the price of the offer that would have been accepted next.
- It can lead to truthful bidding.



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A First-Price Auction Experiment #1

1. You are selling a new generator that costs you $50.
2. You can offer any whole number price.
3. I will randomly offer some price $51, $52 … $100. (in a tie, you win)
4. You own two existing generators (with sunk costs)
5. They will be paid the winning offer price.
6. So will your new generator, if you win.

A First-Price Auction Analysis

- Offer \$X, your chance of winning = (101–X)/50. Chance lose = (X–51)/50
- If you win you make \$(3 X – 50)
- If you lose you make between 2 (X–1) and 2×51 ➔ X + 50 on average.
- So maximize (3X – 50) (101 – X)/50 + (X + 50) (X – 51)/50
- $d(-2X^2 + (303+50+50-51)X)/dX = 0$
- – 4X + 352 = 0 ➔ **Your optimal offer = \$88**
- X = 352/4 = \$88. You win 13/50 of the time (3×88–50) or (2×\$69)

  ➔ Your average profit = **\$158**
- **If you enter a competitive offer of \$50, you win and make \$100 + 0**

A First-Price Auction Experiment #2

1. Same as #1, except there will be a third offer just $2 higher than my offer.
2. It will never win.
3. It will never set the price.
4. Nothing changes.

We will not compare this auction to an auction that's identical except that it pays "second price" instead of "first price."

(Without the third offer you would have a motive to offer extremely high so that you would lose, but set an extremely high CM price for your two existing plants. That's unrealistic, because in reality there will be many offers.)

A Second-Price Auction Experiment

1. The same as the First-Price Auction Experiment #2
2. Except:
3. Your existing generators will each be **paid the lowest losing** offer price.
4. If you win, your new generators will also be paid that price.

A Second-Price Auction Analysis

- Say I offer $X
- If you win, all of your generators will be paid $X (my losing offer)
- If you lose, your two existing gens will be paid the loosing offer, either
  1. $X + $2 if you bid higher than $X+$2, or
  2. $X + $1 if you bid in between – that's highly unlikely, so I ignore it.
- So your choice is: win with P = $X or lose with P = $X+2
- Better to win and get paid for 3 generators.
- To be sure you win, bid $51. On average, P = $77. Profit = $154 + $27

  Instead of P = $74, and profit = $158

Second-Price Auction Summary

- Those examples were unrealistic because you were bidding strategically, and taking my distribution of bids into account. But I was not being strategic.
- If I had been, I would have bid lower in the second price auction and the price and profits would have been lower.
- But there are three basic facts we can learn from these examples.

Second-Price Auction Summary

- In a second-price auction bidders make much more honest offers.
- Since the honest offers are lower, the clearing price turns out about the same on average.
- Because the offers are honest in a second-price auction, the generators that are truly least cost win the auction.
- In a first-price auction there is lots of guessing about what others might offer, so offers are not clearly connected to costs, and the high cost generator may end up winning. In the end, the consumer pays, as always.

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A Capacity Market in 4 Easy Steps

1. But first: How does a real EO market work?
2. The goals of a capacity market
3. Steps: Payments / Auction / UCAP / Update incentive

How Does a Real EO Market Work

- Price is capped 10 times too low
- Peakers live mainly off of market power
- Those without market power, get market-power income anyway

- If the system is low on capacity, market power increases
- If the system has a surplus of capacity, market power decreases

- **Reliability** depends on market power
- Which depends on supplier concentration and mitigation rules

Goal of a Capacity Market (CM)

1. Stop using market power to determine reliability
   ➔ Reduce reliability risk & investor risk
2. Reduce year-to-year risk (profit does not depend on emergencies)
3. Stop over/under-building risk

❖ **All this benefits consumers, not investors, because:**

➢ Consumers pay for the cost of investor risk

➢ Consumers suffer reliability risk

Design a CM in 4 Easy Steps

1. **Capacity payments** replace "missing money" from a low price cap
   → CM payments perfectly mimics EO payment distribution.
2. **Hold an auction** to buy reliable total capacity,
   → A competitive auction minimizes the cost of reliability.
3. **Measure UCAP** correctly
   → Your goal is: hold down unserved energy
   → Only pay for "capacity MWs" that reduce unserved energy.
4. **Update UCAP** annually and add current-year **Penalties & Rewards**
   → mimics EO/VoLL performance incentives

Level 1 CM Design (add capacity payments)

Design:

1. Start with perfect VoLL-cap market design, and drop the cap to ~ $300
2. **Replace random scarcity rents with steady capacity payments.**

Why it Works (in a cartoon market)**:**

- When the cap drops from VoLL (~15,000) to ~300 that takes the same amount of money away from every generator. That’s the Missing Money.
- Because “all” generators run during blackouts.
- A CM gives each generator the same amount of money.
- As long as it gives back MM to each MW of capacity, nothing has changed.

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Level 2 CM Design (target reliability)

What's Different:

1. You don't know VoLL. So you don't know "missing money"
2. You know required reliability. Engineers estimate needed capacity.

Change in Design from Level 1:

- **Buy that much capacity in a one-price competitive auction.**

Benefits:

- **If you're right about reliability, you don't need VoLL**
- The auction determines the VoLL that corresponds to that reliability.

Level 3 CM Design (measure capacity)

What's Different:

1. You don't know how often generators will show up in emergencies.

Change in Design from Level 2:

- **Estimate uniform capacity (UCAP)**
- **Based on 5-year moving average of power supplied in emergencies.**

New Benefit:

- More accurate reliability
- Generators paid the right amount so the right types are built

Level 4 CM Design (performance incentives)

What's Different:

1. Generators won't spend extra to show up for emergencies.
2. An old generator may do nothing and collect some capacity payments.

Change in Design from Level 3:

- Estimate current-year delivered capacity
  Use it to adjust UCAP ➔ provides VoLL performance incentives
- Pay rewards and charge penalties for over- and under-performance relative to estimated UCAP

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Major Considerations

1. Risk
2. Market Power
3. Measuring UCAP
4. Is the CM just an add-on

Risk Is a Big Deal

- Risk at least doubles the cost of capital (a large part of power costs) compared to the risk-free rate.
- If you impose risk on **new generators,** it raise the CM price

  And consumers must pay that to **all existing generators.**
- That’s expensive.

- A solid CM reduces market risk
- A wobbly new CM increases regulatory risk

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Market Power

- ❖ A low-cap EO market requires market power to attract capacity
- ❖ In a CM, energy market power is a pure negative
- ❖ In particular, it is not needed to induce reserves
- ❖ To limit market power in the energy market
  1. Cap the energy prices much lower (or something similar)
- ❖ To limit market power in the CM
  1. Don’t let existing generation “help” determine the CM price.
  2. Cap annually increases in the CM price for existing capacity.

Measure UCAP

- UCAP: The number of MW that a unit will deliver on average during times with unserved energy (EEA3).
- There have only been 3 EEA events in 12 years. That's too small a sample for accurate measurement.
- So, measure similar hours, but check how capacity types perform in similar vs. actual EEA hours, and correct for biases.

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CM-Lite – Just an Add-on

- CM-Lite ➔ Keep $1000 cap & market power of Alberta's EO market (EO/MP)
- EO/MP buys enough capacity on average, but it's erratic
- With CM-Lite, **Net-**CONE is often $0, and always hard to estimate
- What happens with EO/MP + CM-Lite?

1. No one knows. This has not been tried or designed before.
2. CM-Lite might shut off most EO market power and take over, because of constant, slight overinvestment.
3. You might get a stronger boom-bust cycle. Or ??