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Capacity Credit Markets

- 1. Defining Capacity
 - 1. Historical Context
 - 2. Competitive Market Context
- 2. Market Construct \rightarrow Market Power
- 3. To Subsidize Generation?
- 4. Efficacy of ICAP Subsidy
- 5. Fundamental Flaw in ICAP Concept



ICAP – Invented for Regulators



Originally designed
 30+ years ago to
 satisfy state
 regulators

- Integrated Resource
 Plans
- Economies of Scale in Generation
- Avoiding Prudency Reviews
 - (Overbuilding)





Wholesale Energy Transactions Before Restructuring

- •Utilities would sell non-firm energy to neighboring utilities
- •"Split-savings" transactions were based on relative costs





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Market-Based Pricing After Restructuring





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Capacity is really a "call" option

Firm Energy

- Call Option

Non-Firm Energy

If the buyer of Firm Energy gives the Seller a call option, the buyer has Non-Firm Energy.

The price for a daily Call Option approaches and even exceeds the price of Firm Energy. The major variables that determine the option price are: (1) strike price relative to underlying commodity, (2) volatility of commodity price (3) time until strike deadline and (4) strike frequency





Call Option is Most of the Value







Call Option Cannot Be Separated from "Firm" Energy

It is impossible to eviscerate the call option from the price of Firm Energy because the call option is integral to Firm Energy.

Stripped of the embedded call option, Firm Energy would be worthless.



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NOBODY BUYS NON-FIRM





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Introducing Installed Capacity (ICAP) Credits Retailers

Retailers are forced to buy capacity credits *even if* they have firm energy purchases adequate to serve their entire demand

<u>Example</u>

Retailer's Demand = 1,000 MW

Retailer's Forward Purchases = 1,000 MW

→Retailer must purchase 1,180 MW of ICAP credits (18% reserve)

And: ICAP must be local (deliverability requirement)
→ Market Power









Vertical Supply/Demand Curve





Market Power Allows Sellers to Manage Price of ICAP to Protect Monopoly Price





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Current Situation in Northeast

Retailer: I've bought Firm energy from you, but I need some generation credits.

Generator: What are they worth to you?

Retailer: Absolutely nothing. I'll be fined if I don't have them.

Generator: How much is the fine?

Retailer: \$177/MW-Day

Generator: What do I have to do?

Retailer: Nothing that you aren't doing already. Point to a generator that can deliver energy into PJM a few hours a year when called, if your unit is available to operate.

Generator: Can I still sell Firm Energy "short"?

Retailer: I'd rather you not, but there's no way I can tell if you have. **Generator**: I think I can save you a few dollars.



Long-Term Supply/Demand

- ICAP is irrelevant
 - Too small a revenue stream to matter
 - Too uncertain to rely on
 - Supply increasing past the reserve margin has no ICAP value
 - Floors don't work either
 - New York ICAP model
 - Why? Funds spread too thin





Existing Generators Get Most of the ICAP Payment



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Over 5 years, only 7% of subsidy goes to new generators

If ICAP commands any price at all



New GenerationExisting Generation





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Do Existing Generators Need ICAP?

- Can generators cover fixed and variable expenses through firm energy sales?
- Are subsidies necessary to keep generators from going away when spot energy prices are low?
- ICAP proponents warn of a "revenue gap".





Estimating Option Value

- Generators have an option, in real-time, to generate or not to generate
 - This flexibility is extremely valuable both in the forward markets and in the hourly markets
 - The following two slides illustrate a very simple approach to extract this value





"Trading Around Assets" Cinergy Sep '99 Contract Selling at The Peak Yields \$8/MWh



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Explaining Option Value: Cinergy Sep '99 Contract Selling around bandwidth yields \$17

This approach is simple and yields much greater value.



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Generators Extracting Value

- This approach to extracting value to help pay the fixed costs of a generator is a simple method showing how generators can create value
 - Even in a low-volatility month like September
 - Using narrow, conservative trading rangesNo risk
- \$17/MWh for one month translates to \$70/kW-year from this tool alone





Examples We've Seen

- The next two slides show examples used by proponents of ICAP to explain why they need ICAP subsidies
 - Example 1: base-load, gas-fired plant
 - Example 2: peaking plant



Incomplete Example 1

Excludes Option Value 500 MW gas-fired combined cycle

- Fixed cost requirement (levelized)
- \$95 \$140 per kw-yr

- Expected net revenues:
 - energy market
 - uplift
 - <u>ancillary services</u>
 - total

<u>less</u> \$50 - \$70 per kw-yr¹ \$1 - \$1.5 per kw-yr² <u>\$2 - \$2.5 per kw-yr³</u> \$53 - \$74 kw-yr

<u>equals</u> \$21 - \$87 kw-yr

• revenue gap

However, our example showed September returning \$17/MWh which translates to \$5.78/kW-month. The same return over 12 months is \$69.36, and that doesn't even count off-peak hours and Saturdays! Obviously, this covers the "revenue gap".

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Incomplete Example 2

Excludes Option Value

125 MW gas-fired combustion turbine

- Fixed cost requirement (levelized)
- Expected net revenues:
 - energy market
 - uplift
 - <u>ancillary services</u>
 - total

\$60 - \$90 per kw-yr

<u>less</u> \$25 - \$40 per kw-yr¹ \$0.5 - \$1 per kw-yr² <u>\$2.5 - \$3 per kw-yr³</u> \$28 - \$44 kw-yr

• revenue gap

<u>equals</u> \$16 - \$62 kw-yr

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Here, the burden is even smaller. Clearly, the \$70 contribution of the option value covers the "revenue gap".



Will All Generators Turn Profits Without ICAP?

- Maybe not
 - Some may not be sophisticated enough to employ simple portfolio management techniques
- Still, generating equipment will not disappear
 Owners will learn how to manage better, or will sell to someone who can create more value



If Policy Makers Must Subsidize

- Limit subsidies to new generators
 - Just Like Economic Development
 - Only subsidize to attract new businesses
- Generator Objection: "But existing generators are providing the same service and reliability support as the new entrants"
 - And existing businesses are contributing to the economy, but that doesn't mean you subsidize them to stay put when you know they aren't going anywhere



Guarantee Payment Only to New Generators

- Pay new generators \$50/kW per year for the first five years of operation
- Fund through surcharge of \$0.002/kWh to all customers through a \$1.50/MWh charge to all suppliers that schedule through the ISO for delivery to retail customers
- Apply only when reserves drop below 15%





Price of New Generator Subsidy



Assuming paying subsidy off in 5 years, and: Maintaining Current Reserves at 17% Aggressive Load Growth of 2.5% No non-subsidized generation is built







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Generation Adequacy: A Simple Solution







Sellers Hedge Their Firm Energy Sales

Sell Most Generators Forward



Holding Some Generators in Reserve



Let's Call These "Forward Reserves"





Holding Generators for Forward Reserves Shifts the Supply Curve Left



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