

ISO Markets and Capacity Products

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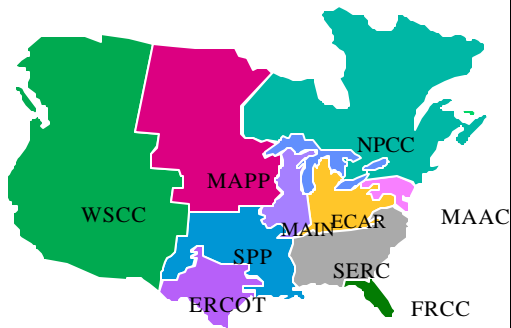
Fifth Annual POWER Conference,
 March 17, 2000, Berkeley, California

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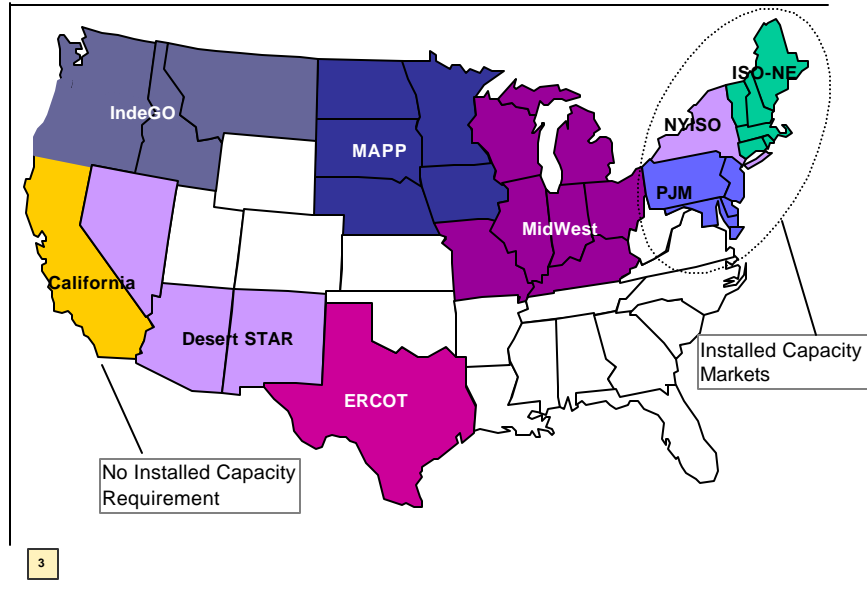
NERC Regions

	July 1998 MW	Percent
ECAR	90,330	14.73%
ERCOT	46,268	7.55%
FRCC (Florida)	32,440	5.29%
MAAC	46,524	7.59%
MAIN	44,991	7.34%
MAPP	27,895	4.55%
NPCC	51,000	8.32%
NY	28,900	4.71%
ISO-NE	22,100	3.60%
SERC	134,561	21.94%
Entergy	21,972	3.58%
Southern	37,440	6.11%
TVA	25,155	4.10%
VACAR	49,994	8.15%
SPP	35,592	5.80%
WSCC	103,614	16.90%
NWPP	32,472	5.30%
Rocky Mtn	7594	1.24%
AZ, NM, Southern NV	18,967	3.09%
California	44,581	7.27%
	613,215	100.00%



Data excludes Canada and Mexico

ISO Initiatives



Reliability Standards

- Reliability = Adequacy + Security
- Example of an Adequacy Standard
 - “Each areas resources will be planned in such a manner that, after the allowance for scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring regions, and capacity and/or load relief from operating procedures, the probability of disconnecting non-interruptible customers will be no more than once in ten years.” -*NPCC criteria on generation adequacy*

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Types of Capacity Payments

- Installed Capacity (ICAP) Payments
 - Used to ensure long-term generation adequacy
 - Used in PJM, ISO-NE and NYISO, not used in California
- Ancillary Services (AS) Capacity Payments
 - Used to ensure short-term generation adequacy
 - Used in California (since April 1, 1998) and ISO-NE (since May 1, 1999) and NYISO, Limited use in PJM
- Reliability Must Run (RMR) Payments
 - Designed to address local reliability (security) problems
 - May sometimes be used to ensure short term generation adequacy
 - Not all RMR payments are capacity payments
- Generators can use the same capacity for selling ICAP and energy. However, they must choose between selling energy, AS and RMR.

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Ensuring Generation Adequacy

- Basic Assumptions
 - Demand and Supply must be balanced at all times
 - If there is inadequate generation capacity, new supply cannot be brought forth regardless of price (in the absence of demand elasticity); cause for market failure
 - A need to ensure generation adequacy and guarantee of supply
- Who is responsible?
 - Prior to restructuring and retail competition, individual utilities were responsible for ensuring that there is sufficient capacity to meet future load
 - With vertical disintegration and retail competition, who should be responsible?
 - Who has the obligation to serve?

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Ensuring Generation Adequacy

- Approach 1
 - Establish a capacity payment (used in Latin America, Spain)
 - How does one set the right level of capacity payments?
- Approach 2
 - All Load Serving Entities (LSEs) should share the responsibility
 - This can be done by imposing an obligation to arrange for Installed Capacity (ICAP)
 - This is the approach followed in PJM, New York and New England
 - Approach 2 may end up being similar to Approach 1
- Approach 3
 - Rely on energy market prices as signals for new investment in generation
 - Used in California with some caveats

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Perspectives on Capacity Payments

- Historical reasons
 - Generator fixed costs difficult to recover from variable energy costs
 - Does not apply under market based pricing and uniform price auctions
 - The generator's view
 - Capacity payments can be an additional and more predictable revenue stream that is accounted for in power plant investment decisions
 - A basic reluctance to eliminate ICAP although this may be changing
 - The trader's view
 - ICAP is one more product to trade
 - However, capacity payments can decrease the volatility in energy markets
 - Higher volatility in energy prices means more arbitrage opportunities for traders
- May be willing to eliminate ICAP for more opportunities in energy trading

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Perspectives on Capacity Payments

- The retailer's view
 - Market prices (day ahead and longer term forwards) should be the primary signals for new generation investment
 - Higher energy prices provide incentives for shifting demand from peak to off-peak hours, helps improve short-term adequacy
 - Separate capacity and energy payments may be compared to separate demand and energy charges. There is no need for a separate demand charge in commodity prices with the introduction of hourly energy prices
 - Higher volatility in energy prices creates more opportunities for Energy Service Providers (ESPs) to offer products that insulate customers from the volatility to the extent they so desire. *To dampen volatility artificially penalizes the customer who is willing to trade uncertainty for lower expected costs.*

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Setting Installed Capacity Obligations

- In general Installed Capacity obligations are a function of the peak load of the load serving entity. This could be a
 - a function of annual peak load,
 - a function of seasonal peak load, or
 - a function of monthly peak load.
- Some amount of a reserve margin is also included in the obligation

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Structure of PJM ICAP Markets

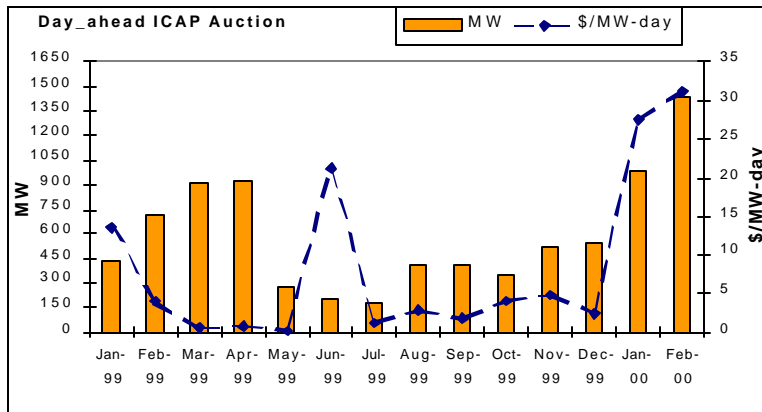
- Load Serving Entities (LSEs)/buyers may procure ICAP
 - (a) bilaterally,
 - (b) through PJM ICAP auctions
 - daily
 - monthly
 - multi-month

- Load Serving Entities that are short on ICAP must pay a default rate, Capacity Deficiency Rate (CDR), to the ISO (\$58/kW per year or \$158/MW-day)

- Revenues collected from application of CDR flow to generators that are long on ICAP
 - Creates incentive for generators to withhold ICAP and avoid selling at prices below CDR

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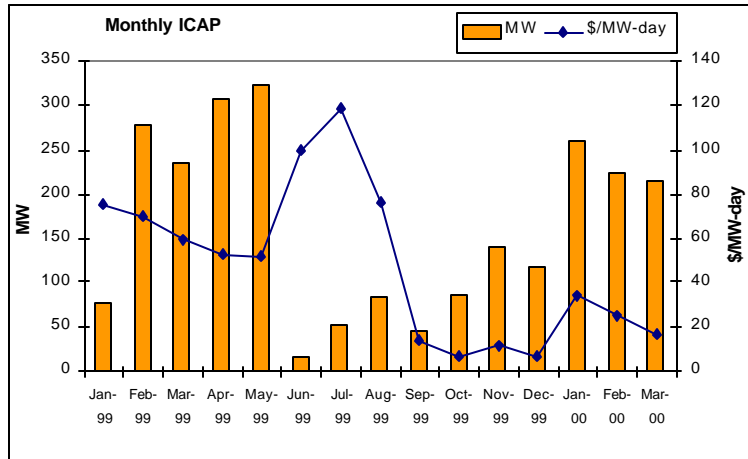
PJM Day-Ahead ICAP Auctions



All generators with long positions are mandated to offer their unsold ICAP in the daily auction

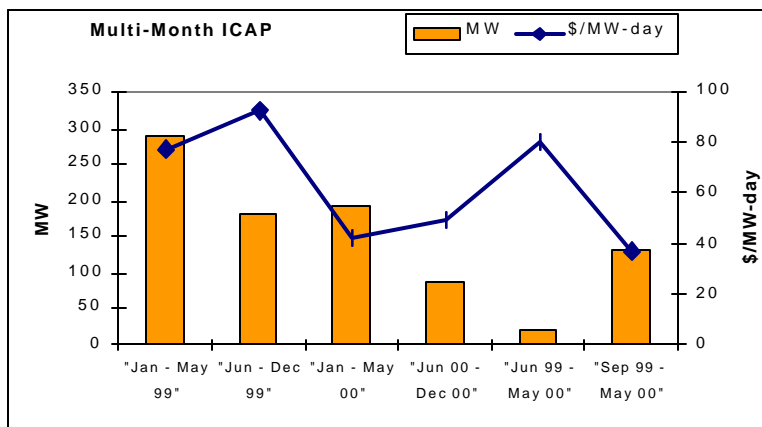
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PJM Monthly ICAP Auctions



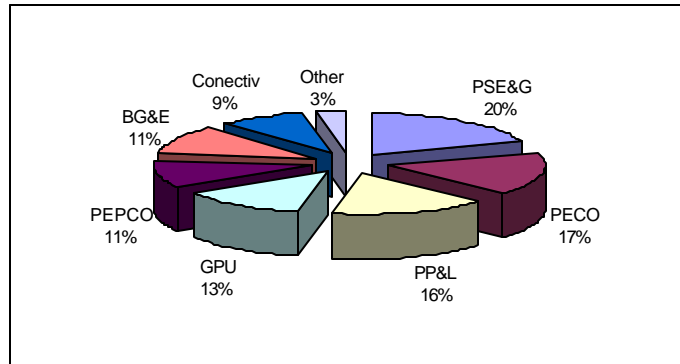
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Multi-month ICAP Auctions



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Capacity Ownership in PJM



Source: RDI PowerDat database. Data reflects ownership prior to GPU's generation divestiture. GPU sold most of its generation assets to Sithe and AmerGen. It sold its 50 percent interest in Homer City to Edison Mission Energy. Sithe recently agreed to sell the assets it acquired from GPU to Reliant.

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Why ICAP does not ensure adequacy in PJM

- Units that are not on-line can count towards ICAP
- Neighboring systems (ECAR) do not have an ICAP requirement or a cap on energy prices.
- Energy prices in an energy only system (ECAR) can be higher than in a energy plus capacity system.
- Generators have incentives to sell into neighboring system (ECAR) by de-listing during peak periods.
- The net effect is that capacity is unavailable when it is needed the most.

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ICAP hurts retail competition

- ICAP implies LSEs have to pay twice for the same power
- Absence of ex-post adjustments based on actual load can reduce incentives for managing peak demand
- Utilities determine ICAP obligations for everyone including their competitors
- Annual ICAP obligations can act as a barrier to entry

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Other ICAP Problems

- No locational variation in ICAP prices
- Energy price difference (LMP) signals can be dampened by ICAP
- Allocation of FTRs is dependent on designation of ICAP resources

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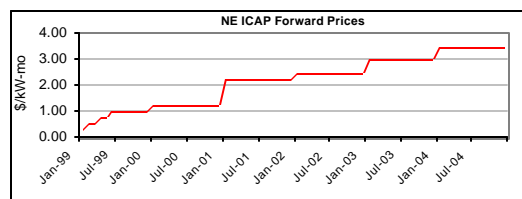
ICAP Markets New York

- The NY-ISO will also impose an ICAP obligation on all Load Serving Entities.
- ICAP obligations can vary by location, e.g. an LSE serving load in New York must procure 85 percent of its ICAP from in-city generators
- ICAP obligations are a function of seasonal peak instead of annual peak
- A higher level of CDR (called ICDC, Installed Capacity Deficiency Charge) applies
 - \$105/kW per year (all zones except New York City)
 - \$150/kW per year (New York City)
- CDR Revenues do not automatically flow to generators, instead the ISO will use them to lower it's administrative charge
 - eliminates perverse incentives for generators to withhold ICAP
- Allows ex-post adjustments based on actual load

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ICAP Markets in New England

- ICAP (along with OPCAP) was one of two markets that the ISO-NE started operating since it's "first effective date" (July 1, 1997). Energy and Ancillary Services markets followed on "second effective date" (May 1, 1999)
- ICAP obligations are set monthly
- Since February 1999, there is no price cap in the ICAP market
- ICAP market has cleared at zero price for some time
- ICAP will be eliminated in 2002



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Adequacy of Supply in California

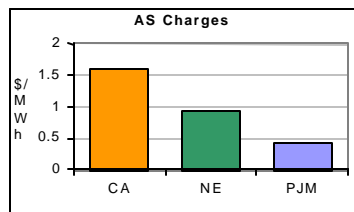
- Reliability through markets (Energy and Ancillary Services)
- Exceptions
 - Price caps
 - lower than those in regions with ICAP
 - Reliability Must Run (RMR) Generation

“The ISO shall ensure efficient use and reliable operation of the transmission grid with achievement of planning and operating reserve criteria no less stringent than those established by the WSCC and NERC” -AB1890

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Ancillary Services Charges

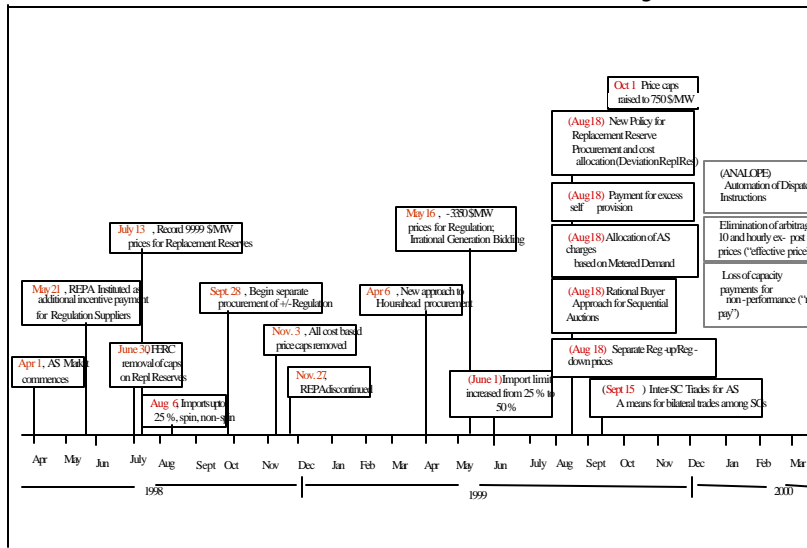
- Ancillary Services charges in California have been higher than those in other ISOs
- New York (not shown here) has witnessed some extremely high AS prices and charges recently



AS charges for California are based on invoices from April 98 - July 99.
ISO-NE AS charges are based on invoice estimates from May 1 – Sept 20, 1999.
PJM AS charges are based on historical estimates published by PJM in 1998.

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AS Markets: New Markets Need Adjustments



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RMR Costs

Approximate above market RMR costs in California.
 PG&E and SCE figures are for 12/98-11/99, SDG&E figures are based on estimates for 2000

Utility	Transmission Revenue Requirement	RMR costs (\$)	Annual GWh Sales	\$/MWh
PG&E	346,000,000	317,000,000	77453	4.10
SCE	213,000,000	136,507,000	77300	1.77
SDG&E	121,000,000	50,700,000	16446	3.08

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Summary

- Generation adequacy solutions that involve setting Installed Capacity (ICAP) obligations may not be all that different from approaches that use capacity payments
- Imposing an ICAP obligation may not ensure generation adequacy
- Differences in designs for dealing with adequacy among neighboring systems may not endure
- Generation adequacy solutions that do not use capacity payments/obligations are more compatible with the goals of electric competition and restructuring