RESOURCE ADEQUACY OBLIGATIONS

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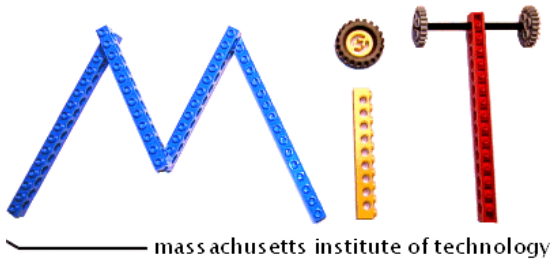

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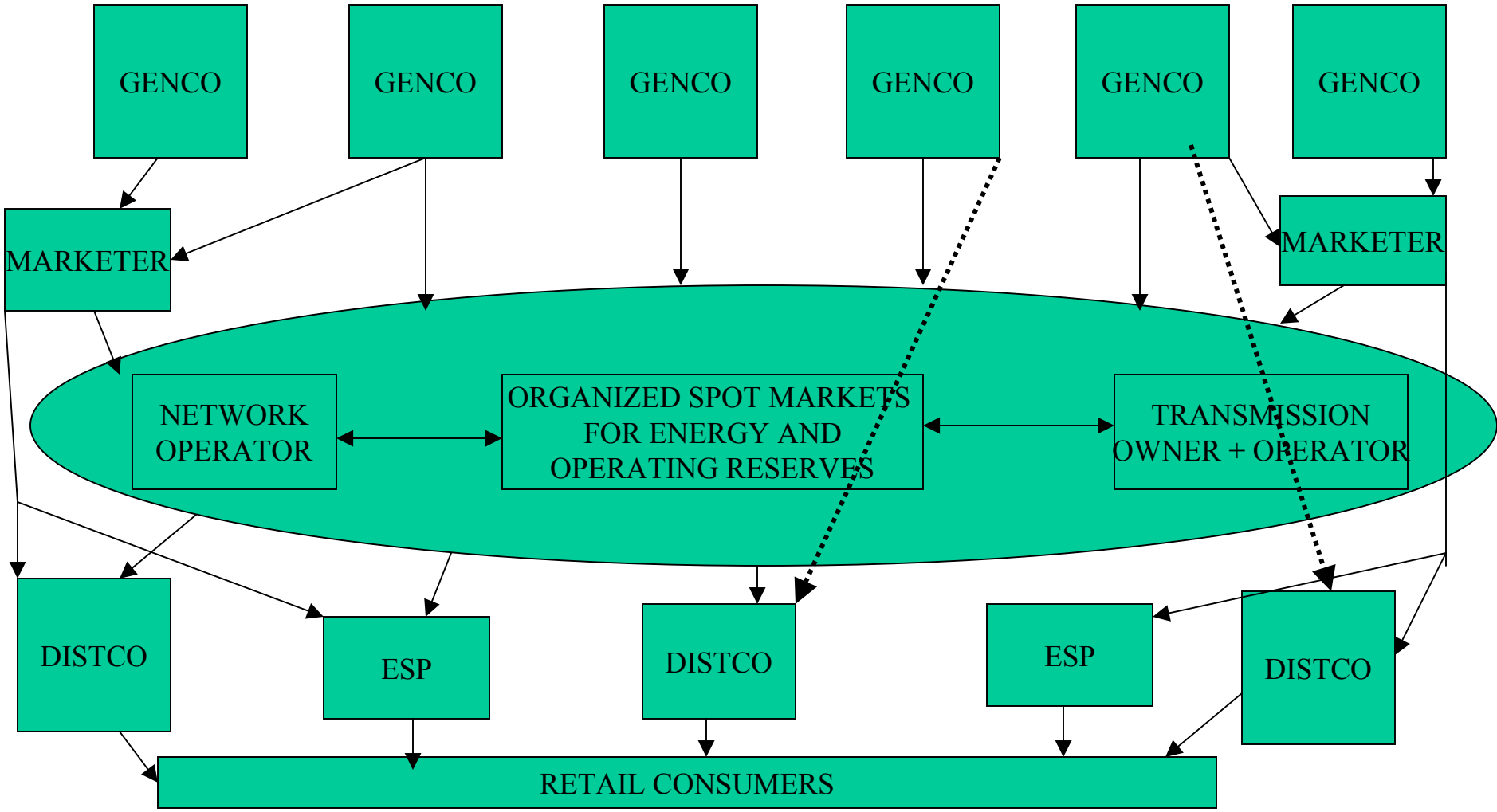
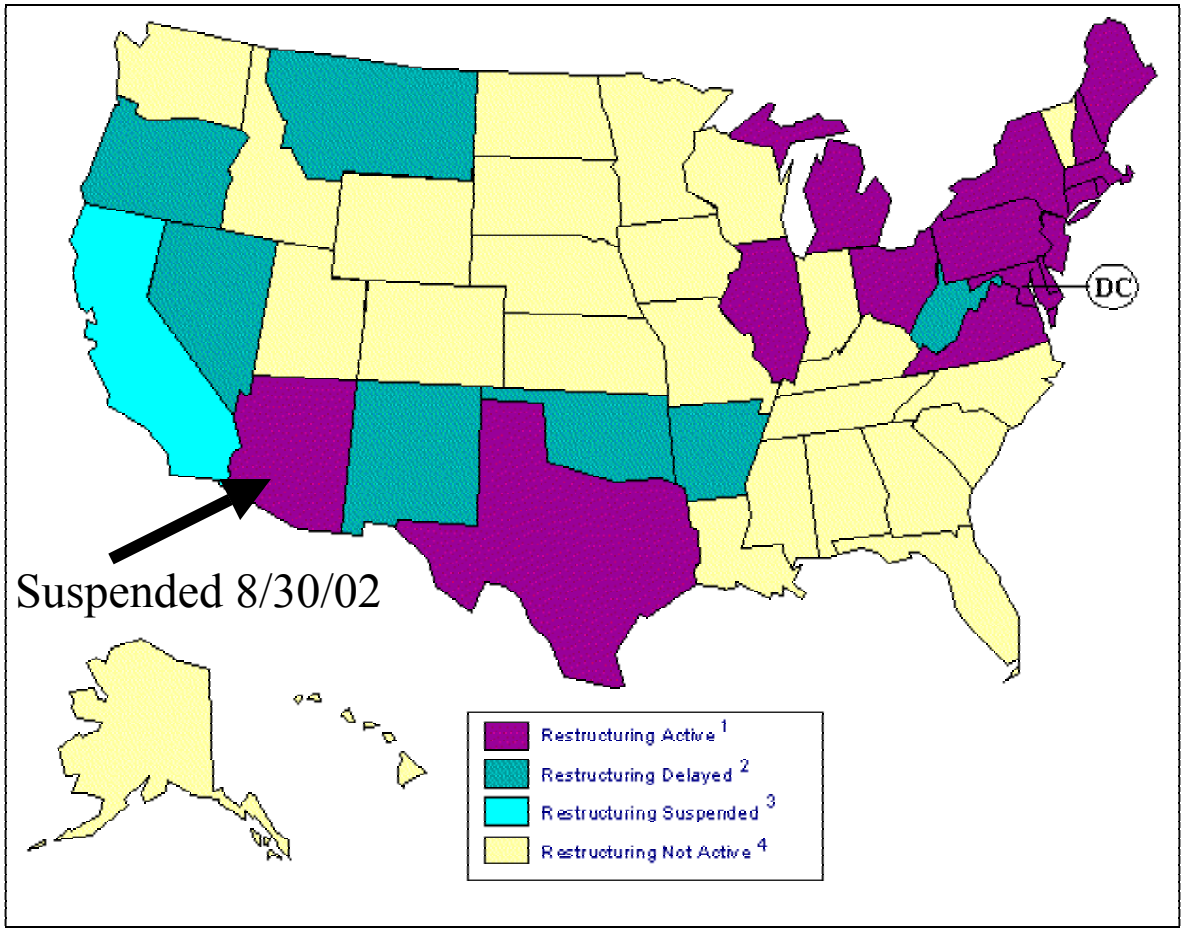
COMPREHENSIVE REFORM VISION
COMPETITIVE WHOLESALE + RETAIL MARKETS



STATUS OF COMPREHENSIVE REFORM PROGRAMS: STATE



IDEAL WHOLESALE "ENERGY ONLY" MARKET

SUPPLY-SIDE

- Efficient competitive markets for energy *and* operating reserves (AS) where all suppliers receive market clearing prices that reflect the competitive marginal (opportunity) cost of supplies that clear the market including any marginal "scarcity" costs

- Efficient management of congestion and associated locational pricing for energy and operating reserves

- Complete set of liquid competitive forward markets for energy and AS to allow sellers and buyers to allocate market risks efficiently

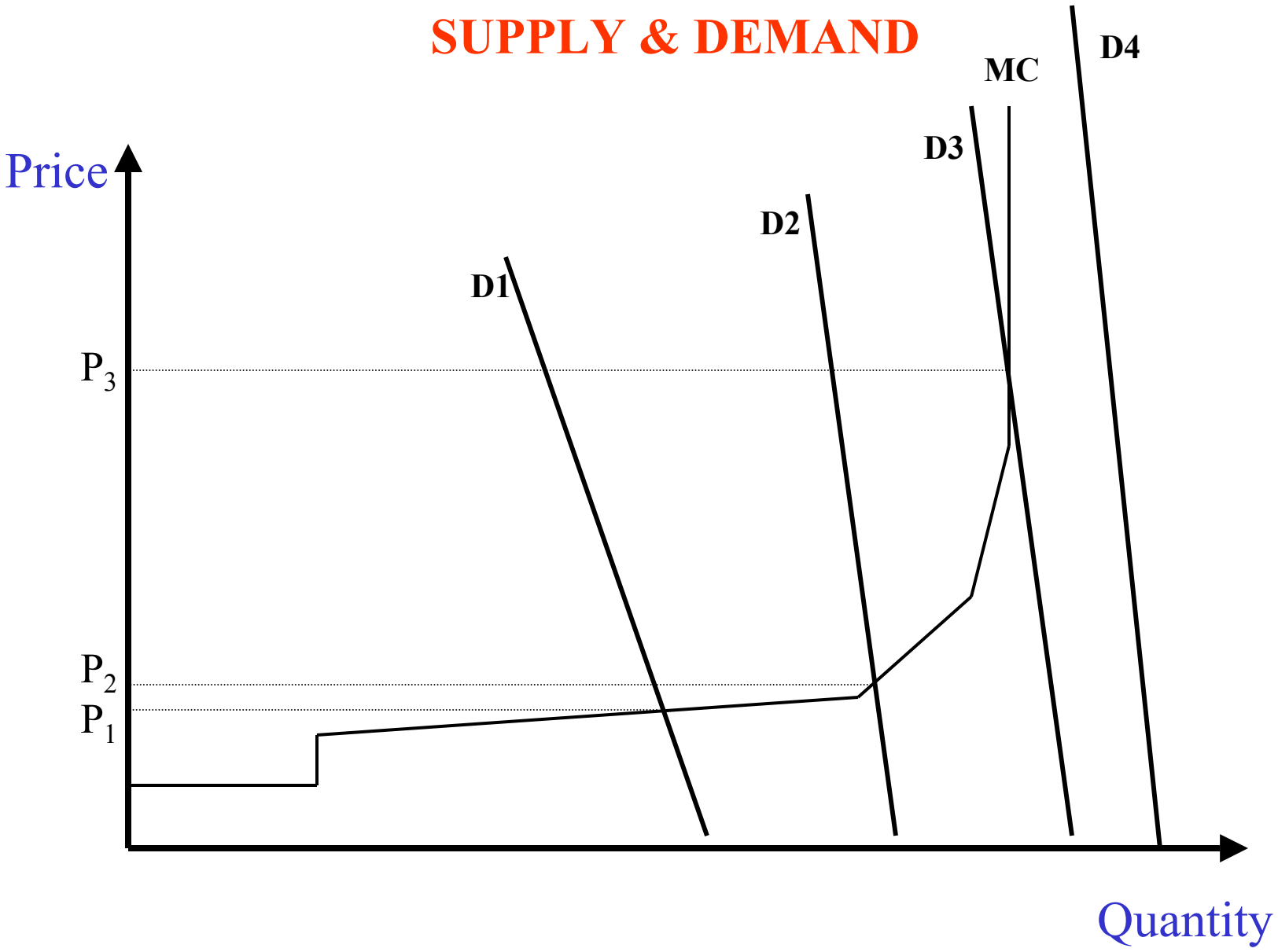
- No supplier market power

IDEAL WHOLESALE "ENERGY ONLY" MARKET

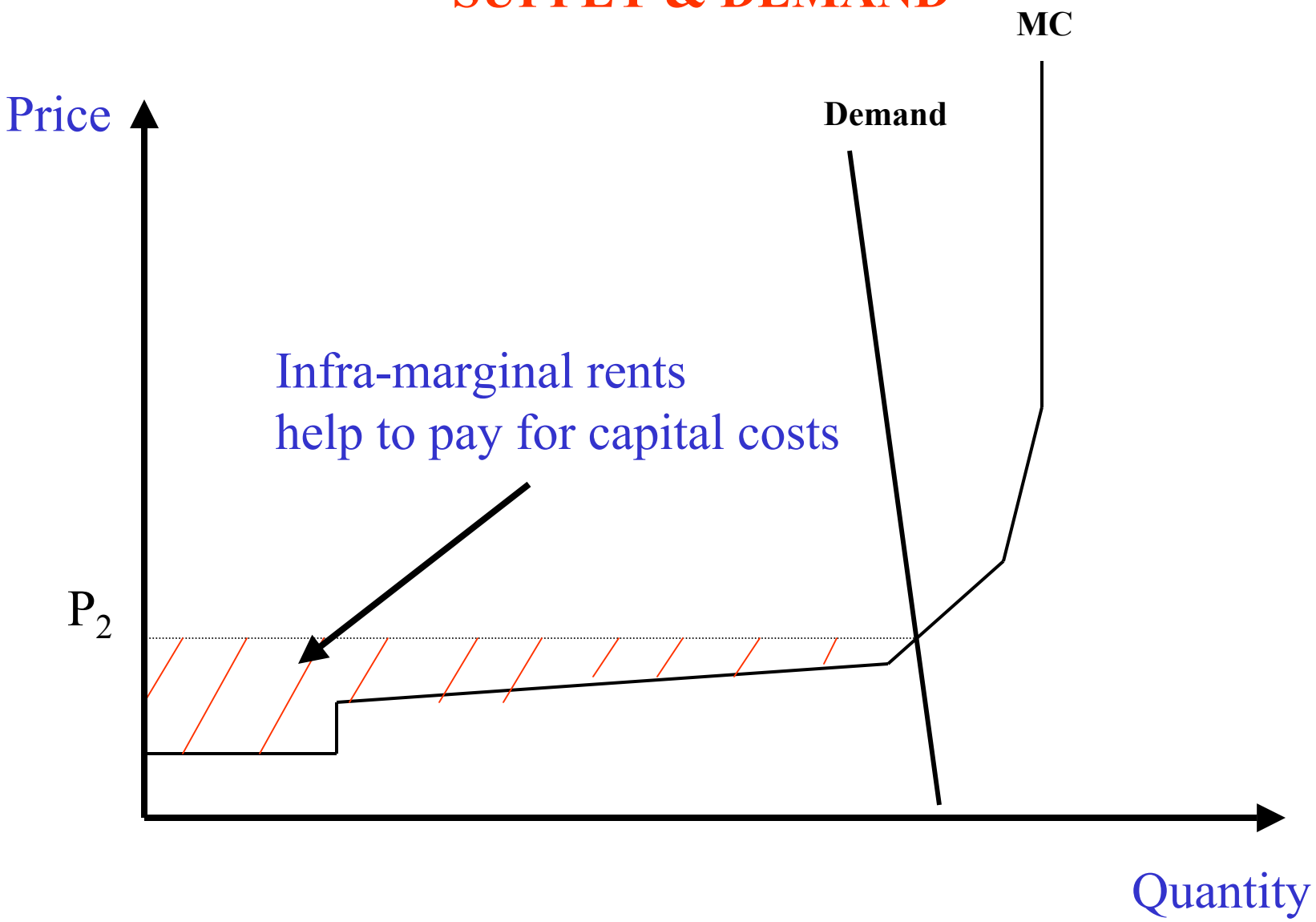
DEMAND-SIDE

- Demand reflects consumers' willingness to pay for reliability (value of reducing consumption) at all times
- Consumers can "see" and respond to short-term variations in prices for energy and ancillary services
- Supply is always rationed by price (or willingness to pay) so that there are no involuntary "blackouts" imposed on consumers
- Operating reserve requirements and associated operating reliability are fully compatible with consumers' willingness to pay for reliability
- Buyers and sellers have a full range of financial and contractual products available to manage market risks over relevant horizons
- No buyer market power

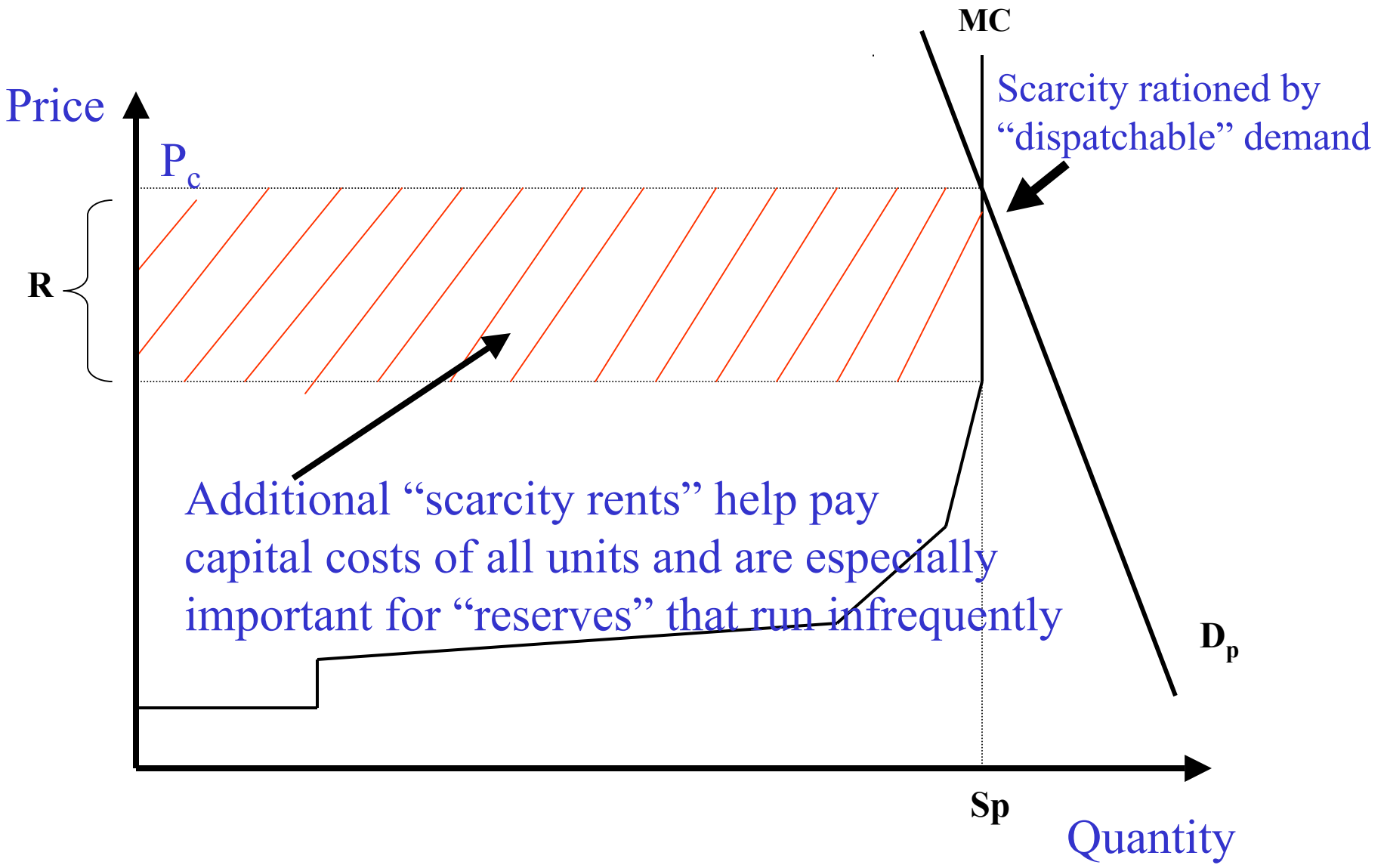
ELECTRICITY SUPPLY & DEMAND



ELECTRICITY
SUPPLY & DEMAND



RATIONING SCARCE CAPACITY



MARKET IMPERFECTIONS

- Consumer demand for reliability is not fully represented and leads to very inelastic demand in spot markets
  - Consumers do not "see" all relevant spot prices for energy and AS
  - Metering limitations and costs
  - Communications and consumer response limitations
  - Market design imperfections
  - Limitations on locational price differentials (large zones) and uplift "shmearing" of price signals

- Capacity is not price-rationed during true scarcity situations and can lead to "random" blackouts
  - Missing markets for differentiated value of reliability due to individual metering and control equipment
  - Practical limitations on how quickly markets can clear
  - Political constraints on very high prices
  - Results in free riding problems

MARKET IMPERFECTIONS

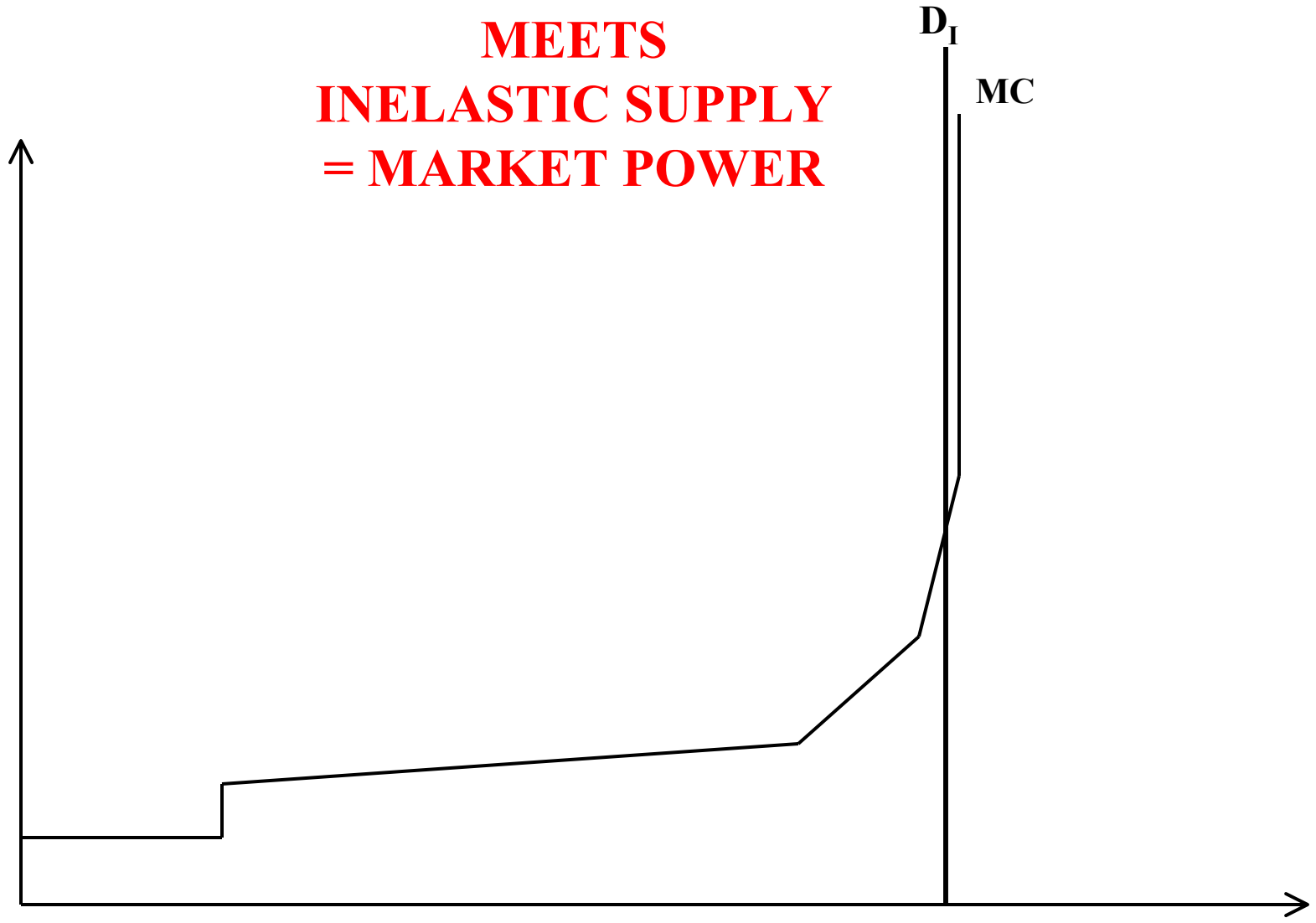
- Incomplete and illiquid markets for risk hedging/contracting arrangements undervalue rare events and long term investment benefits

- Ambiguities in retail procurement responsibilities, retail market imperfections and regulatory opportunism and uncertainty affects contracting incentives and behavior and leads to short-term forward contracting

- Market power problems increase significantly as capacity constraints are approached so that distinguishing between "good" high prices and "bad" high prices may be controversial

- Overall, these imperfections could lead to too much or too little investment in generating capacity

INELASTIC DEMAND MEETS INELASTIC SUPPLY = MARKET POWER



REGULATORY AND INSTITUTIONAL IMPERFECTIONS

- FERC proposes to cap spot energy and AS prices to respond to inelastic demand and market power problems and implement other measures to control spot prices .
- Market power mitigation measures inevitably "clip" some high prices that truly reflect scarcity and VOLL (e.g. $5,000 Mwh) in an effort to constrain those that reflect market power
- Setting the "optimal" price caps (general and locational) and other market power mitigation measures is difficult
- ISO/RTO/ITP discretionary behavior can have big effects on prices for energy and AS especially during tight supply situations and have a significant effect on supplier revenue

IMPLICATIONS

- No markets satisfy all of the conditions for perfect competition
- Should understand which market and regulatory imperfections are important and their effects on investment incentives in electricity
- These market and regulatory imperfections affect equilibrium quantity and mix of generating capacity (retirements and new build) and "reliability" or "quality" of the supply system
- Likely that effects of these market imperfections and price mitigation today is likely lead to under- investment in new generating capacity (for load growth, reserves) and perhaps premature retirement of older units that could provide reserves

IMPLICATIONS

- Ideally, should fix the market and regulatory imperfections and allow energy and AS markets to clear to support generation investment. This should be a continuing goal!

- But this takes time and must confront challenging technical and political problems

- Placing some type of resource adequacy requirement on all LSEs makes sense at the present time but designing a good mechanism is not easy
  - Defining the right "reserve margin" is hard but the costs of too little are high compared to the costs of too much
  - Including demand response programs is important
  - Good enforcement mechanisms are very important
  - Must be compatible with uncertain state of retail competition and default service prices determined by state regulators
  - Costs must yield real net benefits in terms of increased reliability (demand response and generation investment)

SMD RESOURCE ADEQUACY PROPOSALS

- Recognizes that spot market prices alone will not signal the need for new resources in a timely fashion, especially with the proposed price caps (suggested $1000/Mwh + other mitigation), demand-side problems and free rider problems

- Proposes regional "resource adequacy" requirement for LSEs that involves a regional planning process and regional flexibility to define resource adequacy standards
    - Generation
    - Demand Response Resources
    - Transmission (deliverability) requirements for generation
    - Minimum requirements only; specifics left to states/regions

- But rejects ICAP requirement a la PJM in favor a new enforcement mechanism that bites only when there are shortages

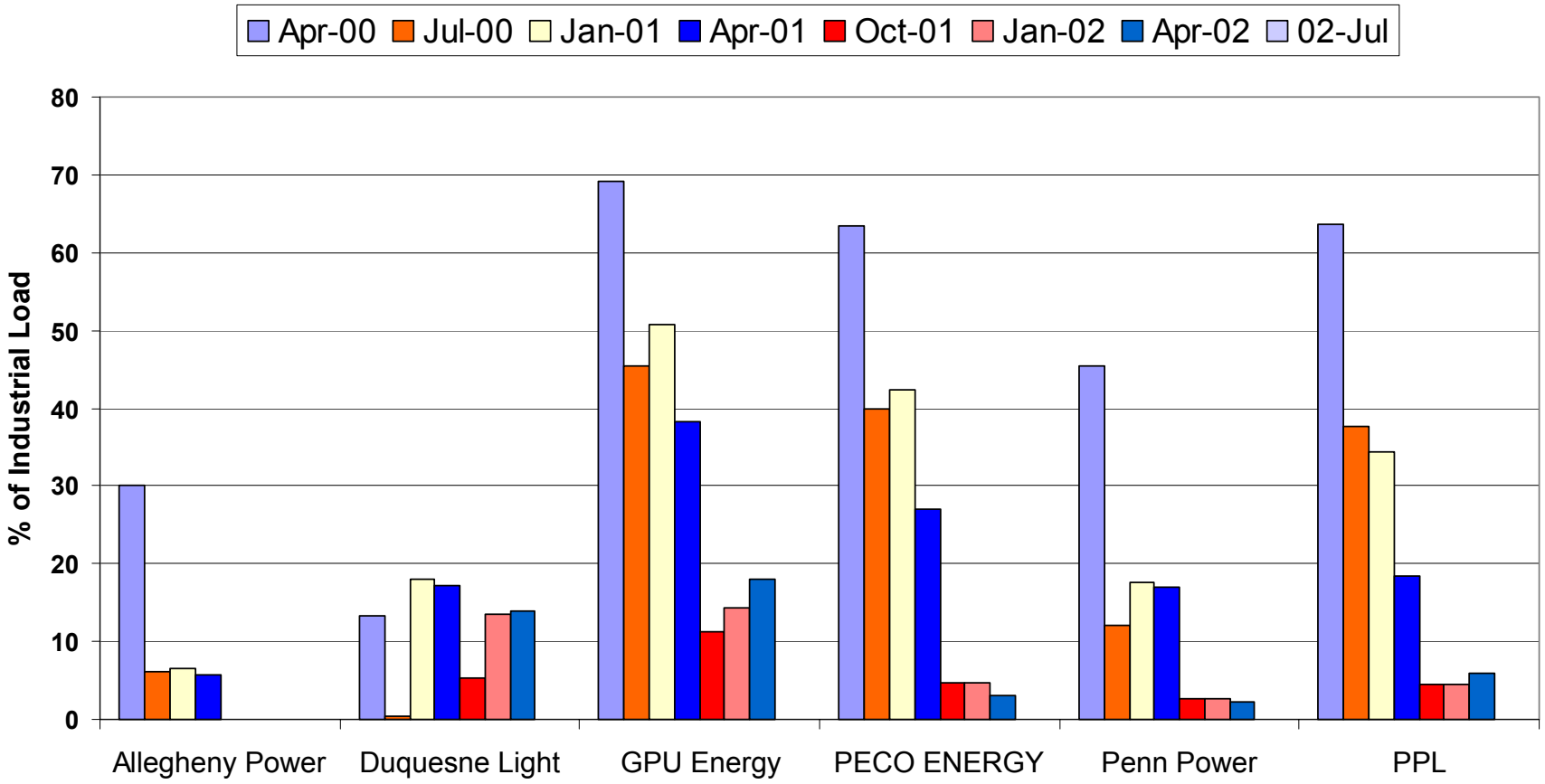
SMD RESOURCE ADEQUACY ENFORCEMENT

- Resource adequacy standards are proposed to be enforced in one of two ways instead of PJM ICAP:
  - Curtailment of loads of LSEs which fail to meet resource adequacy standards during emergencies
  - Penalty charges to LSEs which fail to meet resource adequacy and buy energy from the real time market during emergencies (e.g. $500/Mwh, perhaps rising as deficiency increases)

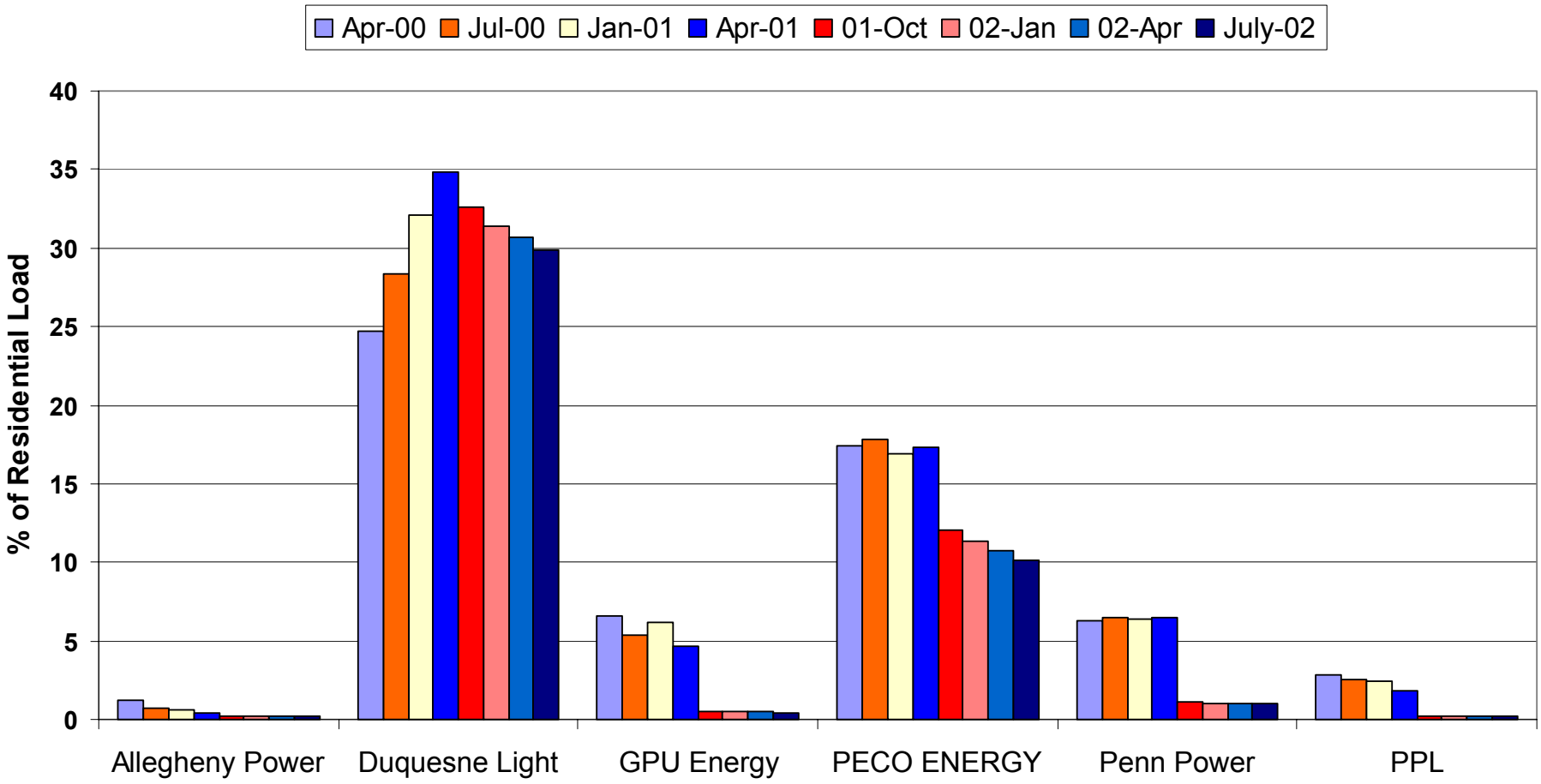
SMD RESOURCE ADEQUACY ENFORCEMENT

- This enforcement mechanism is unlikely to work:
  - It is not clear how this can be implemented in retail competition states
    - Future ESP role very uncertain
    - Customers come and go
    - Potential stranded cost problems for default LSE supplies
  - Can't easily curtail loads served by competitive ESP-LSEs
  - Probably not credible to curtail loads of individual LSEs during power supply emergencies ("share the burden" ethos)
  - Penalty charges would likely have to be much higher (e.g. $5000/Mwh) during emergencies to provide adequate incentives in most areas and these may not be politically viable

PENNSYLVANIA DIRECT ACCESS LOAD: INDUSTRIAL (%)



PENNSYLVANIA DIRECT ACCESS LOAD: RESIDENTIAL (%)



CURRENT ICAP PROGRAMS HAVE MANY PROBLEMS

- Enforcement mechanisms focus on the short-term rather than the long term
- Deficiency charges based on peaker method may not be optimal
- "Bang-bang" nature of hard reserve requirement. Capacity prices are either zero or at the cap
- Failure to include transmission deliverability and energy and/or operating reserve requirements undermines value of capacity
- Difficulties integrating demand response programs in ICAP
- Market power concerns

REFORM ICAP RATHER THAN REJECT IT

- Should be forward looking and focused on investment in new generation and demand response
- Recognize that "excess capacity" does not have zero value
- Include transmission deliverability and energy/AS supply obligations to provide real value
- It must apply to all LSEs
- It must be compatible with retail competition, default service obligations and retail ratemaking at the state level
  - Capacity rights and obligations follow the load (?)
- LSEs should have the option of making their own arrangements
- RTO can organize a "default" market for qualifying resources