



***Thoughts on Open
Questions in Power
Network Resource
Allocation***

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Critique of Power Market Literature to Date

- *In striving for relevance, power literature has focused most strongly on those questions that are realistic within regulatory constraints imposed by Federal Energy Regulatory Commission(FERC).*
- *FERC rules have proven highly non-stationary, with underlying premises subject to challenge.*
- *As academics, should we not accept risk of short term irrelevance for shot at analytically reframing (and ultimately better answering) the questions?*

Advertising for Tomorrow

- *In hope of keeping a few strong souls on hand for tomorrow's talks...*
- *Tom Overbye today briefly samples from what he has in store for tomorrow, to give overview of August 2003 failure. I'm told tomorrow's talk will be augmented with audio of control center conversations leading up to the blackout ("Houston, we have a problem...").*
- *My own talk for tomorrow will look at a particular model for analytically capturing cascading failure as a sequence of dynamic "phase transitions."*

Key Question #1:

IS Transmission a Natural Monopoly?

- *Some aspects here are inevitably qualitative - Are there barriers to entry? Is there need for eminent domain to condemn property? etc.*
- *But question of ability to collect monopoly rents is approachable analytically. Given its importance, deserves active attention.*

Is Transmission a Natural Monopoly?

Naïve Shot at Analytic Approach

CONFESSION: as a control/dynamics aficionado, previous to this workshop, the nature of Vickery-Clark-Groves auctions were unknown to me.

Let me see if I can here prove the premise that a little knowledge is a dangerous thing...

Is Transmission a Natural Monopoly?

Naïve Shot at Analytic Approach

Operational optimization problem in power is almost always examined with so-called “n-1 contingency constraints;” i.e., solution is constrained by requiring system’s ability to operate with any one major transmission line failed.

Hence, we already routinely perform the key computation underlying a V-C-G auction for transmission service!!!!

Is Transmission a Natural Monopoly?

Naïve Shot at Analytic Approach

- *Attractive features of V-C-G auction mechanism seem to be that it gives incentive for service provider to reveal true cost in offer to sell, while making payments that indicate degree to which seller's monopoly power must be "bought off."*
- *Question: are not the outcomes of sequence of hypothetical V-C-G auctions indicators of whether provision of a good is better served in natural monopoly?*

Is Transmission a Natural Monopoly?

Naïve Shot at Analytic Approach

Proposal: would not a blue sky analyses of transmission markets under V-C-G auctions be an informative exercise, despite lack of “relevancy” under FERC rules?

Issue #2:

Treatment of Substitutable Goods

- *In many markets, transmission access to remote generation resources is substitutable good for local generation service.*
- *If transmission **is** judged a natural monopoly, it must have welfare maximizing decision making tools (and legal protection) to decide when to provide its service instead of (and typically to the detriment of) generation market players.*

Issue #2:

Treatment of Substitutable Goods

- *How do policies for providing transmission provision (pricing or otherwise) interact with market mechanism design for generation; i.e. is it not plausible that generation markets might need to be (re-)designed jointly with transmission service design?*
- *And in all these cases, what is analytic prediction of efficiency loss (relative to idealized central optimization)? To this observer, power literature seems to have done very little of this in comparison to communications literature.*

Issue #3:

Mitigating Poorly Known Risk

- *Blackouts like August 2003 initiated by near simultaneous rare events, for which underlying probability distributions are non-stationary and poorly known (hmmm... much like FERC policy)*
- *How to find operating strategies that most effectively mitigate against such risks? How to define “fair” allocation of cost for risk mitigation?*
- *Closest analogy lies in insurance industry facing natural disasters, but this less than satisfactory.*

Issue #4:

Design of Incentives for Investment

- *Much attention in current literature paid to designing pricing mechanisms to provide incentive for transmission investment.*
- *Opinion: cart before horse. First answer natural monopoly - YES or NO. If YES, pricing as incentive for transmission is superfluous - regulatory authority drives investment there. But impact of transmission pricing on market-driven GENERATION investment would seem a crucial question.*