

Electric Power Reliability

Has Deregulation Affected it?

How?

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By Jack Casazza

President – American Education Institute

8208 Donset Drive

Springfield, VA 22152 – 703/569-3579

JackCasazza@aol.com

www.ameredinst.org – www.pest-03.org –

www.obligationsneeded.com

(Qualifications are attached)

For additional information and references see the available the August 2005 report "Contributions of the Restructuring of the Electric Power Industry to the August 14,2003 Blackout" by Casazza, Delea and Loehr

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Reliability is Measured By:

- Frequency of power interruption;
- Duration of power interruptions; and
- Size of power interruption.

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Declining Reliability

- Costs peoples lives
- Create large economic losses
- Loss of industry and jobs
- Increased costs - insurance

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How Has Reliability Been Affected by Deregulation and Restructuring?

- Reliability has declined
 - Major blackouts
 - Reserve margins have declined
 - National economic penalties between \$5 and \$10 billion

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Electric Power Systems

- Characteristics affecting reliability:
 - Electricity must be produced and delivered the instant it is needed
 - Electricity cannot be stored
 - This is different from any other business or system
 - Power flow divides along paths in accordance with Kirchoff's laws, not contracts or operator's scheduling

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Power Systems (cont.)

- Power flow can be limited by conductor heating, low voltages, or system stability
 - A transmission line can be needed for stability even when carrying no power. (What is incentive to install such a line?)
- Three regional grids in United States
 - Operation in synchronism in each grid
 - Changes in any system in grid affects all other systems in grid
 - Each grid a “single machine”

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Power Systems (cont.)

- Decisions by one participant to add or retire generation, remove a unit for maintenance affects all transmission lines and operation of other plants in grid -- effect decreasing with distance.
- Scheduling of transmission and substation additions affects other transmission lines in grid.

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Power Systems (cont.)

- Coordination required in planning, design and operation of systems
 - Coordination problems increase as number of participants increase
- Operation controlled by limiting amount of power allowed to flow through various facilities so that system will continue operation for the contingencies specified in the reliability standards
 - Redispatch of generation as needed to maintain reliability

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Power Systems (cont.)

- Requires skilled work force properly educated and trained
 - Planning facilities
 - Operating decisions
- Equipment requires adequate maintenance and replacement as it ages

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Contribution of Restructuring and Deregulation to Decline in Reliability

- Change in Federal Government focus from the reliability of the power system to the operation on the market
 - Example: DOE National Transmission Studies
- Focus on transmission congestion problems (a market limitation) not on reliability problems
- Failure to recognize that competition requires interconnection and interconnection requires coordination
 - Competitors don't like to coordinate

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Causes of Decline (cont.)

- Change in industry focus from coordination to competition with major concern being immediate profits rather than reliability
- Severe reductions in manpower and maintenance expenditures in generation and transmission organization to improve profits
 - Reduced staff, technical and operating
 - Reduced training
 - 25% reduction in national maintenance expenditures
 - Large increases in time between scheduled maintenance
 - Reduced university educational programs (lack of jobs for students)
 - Lack of institutional knowledge, including lessons from past

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Causes of Decline (cont.)

- Change in qualifications of senior managers away from technical knowledge to marketing and financial skills
- Planning departments split up or disbanded losing best technical knowledge available.
- Increase in complexity increasing difficulty in planning and operating
 - More participants in power system decisions, each having own profit incentive:
 - PJM – 10 members in 1993 – now 350 members
 - NY ISO – 245 participants
 - New England – 237 participants

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Causes of Decline (cont.)

- Functional separation of integrated utilities into separate generation, transmission and distribution companies complicated:
 - Provision of reactive supply
 - Installation of under frequency relaying (on distribution system) needed for large generation outages
 - Planning and operation

Installation of adequate generation capacity at risk.
Incentives to reduce capacity margins (lower ICAP) to increase profits

Installation of new generation delayed until potential profits can be seen as more certain, risking failure to install when needed¹³

Causes of Decline (cont.)

- Installation of generation at locations with highest profit potential, not location with greatest system reliability benefits
- Failure to coordinate new generator locations with gas system supply risks
 - Greatest reliability risk now can be loss of gas supply line to a number of power plants
- Reductions in funding for research for development of new technologies
 - Why pay for research that may benefit a competitor?

Conclusions

Reliability of Electric Power Supply has been harmed by deregulation and is still at risk

- Deregulation is resulting in development of system by balkanized additions, not system optimization, Steps to increase coordination in future developments are needed. The market can not do it.
 - Provide needed additional skilled labor and training
 - Monitor maintenance expenditure from FERC reports to determine trends
 - Engineers Need to become politically more active
 - Educate public, media and government on how systems operate and effect of proposed policies on costs and reliability
 - Work to insure appointment of technically competent people to key government positions, boards of directors, etc.
- Development of qualification standards needed