

The Economic Value of Electricity Reliability

FY2001 Energy Storage Systems Peer Review

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National Importance of Electricity Reliability

- The assumption of uniformly and highly reliable electricity has been a cornerstone of modern U.S. economy
- New technologies are changing the boundaries between public and private interests in electricity reliability
- An increased government role in looking out for the public interest in electricity reliability is likely at least during the transition to a restructured industry
- Understanding the economic value of electricity reliability is a critical to informing public and private decisions



Overview of Project

- Objective is to develop robust estimates of the economic value of reliability that will help to inform DOE programmatic and policy decisions
- Project builds on findings from CERTS scoping study on economic value of reliability for EPRI
- Project initiated in Sep. 2001 - \$75k
- First year activities include
 - Create a database of utility interruption costs
 - Collect primary information on power quality frequency and costs*

* Separate ES project: “Power Quality Events in Silicon Valley”



CERTS Scoping Study for EPRI

The cost of unreliable electricity to the US economy

Outage Cost Literature Rev. – PQ and outages are a continuum

The changing reliability needs of the US economy

Commercial - Office Equipment – 2% of total US electricity

Industrial - Reliability Indicators – 43 4-digit SIC segments

Cleanroom Case Study – 10%/yr growth in floorspace

Customer options for and trends in addressing
reliability needs

Reliability Insurance – a financial *technology* for risk management

**“Scoping Study on Trends in the Economic Value of Electricity
Reliability to the U.S. Economy” LBNL-47911 <http://certs.lbl.gov>**



Utility Reliability & Process Uptime

“ ‘Nines’ are in the eyes of the beholder.”

Normal Utility

Premium Utility

<i>Normal Utility</i>			<i>Premium Utility</i>		
Normal Utility Events	Process Uptime 1 Hr Downtime per Event	Typical Applications	Premium Utility Events	Process Uptime 1 Hr Downtime per Event	Typical Applications
25 events/yr 22 @ ¼ sec 1 @ 2 secs, 1 @ 5 mins, 1 @ ½ hr, 2,107 sec/yr	25 Hrs total downtime / yr,	Plastics, PCs, Machinery, Textiles, Cell Towers, Residential	10 events/yr, 0.25 sec each 2.5 sec total / yr,	10 Hrs total Downtime / yr,	Semicon Mfg, Auto Mfg, Fiber Optic Cables, Web farms, Continuous Processes
99.99% 4-nines	99%, 2-nines		99.99999% 7-nines	99%, 2-nines	

Major disconnect exists between a utility and a ‘digital economy’ customer’s perception of reliability.



What is the Cost of Unreliable Electricity to the U.S. Economy?

“\$26 billion/yr.” Clemmensen, 1992

“\$50 billion/yr.” EPRI 1996, citing Clemmensen

“\$100 billion/yr. In five years” Banc of America
2000, citing EPRI

“\$119-164 billion/yr.” EPRI/Primen, 2001



Clemmensen's Original Calculation

“1.5-3 cents of every sales dollar is spent correcting power quality problems”

X

“US manufacturing sales were \$853.6 billion in 1987”

=

“the cost of power quality is \$25.6 billion per year in 1987 dollars”

Source: J. Clemmensen “A Systems Approach to Power Quality”
Proceedings of Power Quality '89, as cited in “Storing Power for
Critical Loads” IEEE Spectrum, June 1993



Recent Utility Interruption Cost Studies

- Southern California Edison (1987, 2000)
- Pacific Gas and Electric (1986, 1987, 1989, 1993, 1996)
- Southern Company (1987, 1990)*
- Niagara Mohawk (1985)
- Duke Power (1992, 1997)*
- Bonneville Power Administration (1987)
- Salt River Project (2000)*
- Puget Sound Energy (1999)
- Cinergy (1998)*
- Florida utility (1987)

25,000 customer responses



*Focus on cost of power quality events



Planned First Year Activities

- Develop white paper to enlist utility participation:
 - Benefit of comparison to competitors
 - Data on identity of utility and customers will be held confidential
 - Minimal direct cost in providing data
- Develop data management system/collect data
 - Mask customer ID, utility
 - Adjust costs to 2001 \$
 - Develop common data formats
 - Ensure data security
- Begin synthesizing interruption costs estimates
 - Customer damage cost functions (duration, customer class)
 - Variations in costs by sub-classes of customers
 - Changes in costs over time
 - Variations in costs by location, population density, climate

