

**ECONOMIC COST OF THE AUGUST 14<sup>TH</sup> 2003  
NORTHEAST POWER OUTAGE: PRELIMINARY ESTIMATE**

**WHITE PAPER**

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Placing a dollar value on *electric service reliability* is nothing new to the electric power industry. Electric utilities recognize that when the lights go out, critical social services are disrupted and great inconveniences can occur to businesses and individuals. Electric utilities have studied the value that their customers place on electric service reliability since the early 1970s. In fact, many utilities are required to provide such estimates of electric service “reliability” to their state commissions prior to investing in their own transmission and distribution systems.

### **OUTAGE SCENARIO**

Based on North American Electricity Council (NERC) estimates, 61,800 MW of load was lost in the power outage that started at 4:11 p.m. Thursday.<sup>1</sup> As of 8 a.m. Friday morning. (16 hours later), NERC estimated that 48,800 MW had been restored and 13,000 had still not been restored. Hence, 13,000 MW of load experienced a longer than 16-hour outage.

Based on our knowledge of the value that various studies have shown consumers place on electric service reliability,<sup>2</sup> we estimate the cost of the August 14th 2003 outage, as conventionally analyzed in the utility industry, to be the following:

- Assuming that half of the load (*i.e.*, 30,900 MW) was lost for 4 hours then restored while the other half (*i.e.*, 30,900 MW of load) was lost for 8 hours, *Brattle* estimates that the cost of the outage (as of 8 a.m. Friday morning) was about \$6 billion. Most of this cost (about 66%) is from the continuing outage beyond 4 hours.
- This assumes industry-wide averages for the affected customer mix and typical outage costs for retail electricity customers in a specific utility service area, which may not exactly match the characteristics of the affected consumers in this instance. Each outage of course has unique features as to precisely how it interrupts commercial and personal lives.

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<sup>1</sup> See August 14, 2003 Power Outages – Update 8/15/2003 11:00 a.m. at [www.nerc.com](http://www.nerc.com).

<sup>2</sup> These value estimates are based on the SCE 2000 Value of Service Reliability Study. Prepared for Southern California Edison Company. September 2000.

In fact, as of 8 a.m. Friday morning (*i.e.*, 16 hours after the outage started), 13,000 MW of load still had not been restored. Therefore, our estimate of the cost of the outage is conservative. From the information available as of Friday morning, the cost of the outage (both direct and inconvenience) is likely to be in excess of \$6 billion.

## **COMPONENTS OF OUTAGE COSTS**

Customer value for electric service reliability is related to the costs that electricity consumers (or retail customers) incur when their electricity is interrupted. The cost of an interruption is much lower for a residential consumer than for a business consumer. Likewise, the costs associated with an outage increase as electricity consumption increases. Timing also matters.

### **Residential Consumers**

Residential customers consume about 35% of total electric energy in the U.S. For them, the cost of an outage is primarily related to the costs of inconvenience in their home. For example, activities might be cancelled, work at home might be interrupted, plans might be delayed, *etc.*

For these types of consumers, the value of an outage is generally determined by what a residential customer would be willing to pay to avoid the outage, estimated via surveys. These surveys generally show that for residential consumers, the average cost of an outage ranges from about \$3.75 for a short 1-hour weekday outage in the summer to about \$8 for a longer, 8-hour weekday outage.

Another way to look at the cost of an outage is how much consumers would be willing to pay to avoid an unserved kWh. These estimates range from about \$3.50 per unserved kWh for a 1-hour summer weekday outage starting at 6 p.m., to \$1.75 per unserved kWh for a 4-hour summer weekday outage starting at 5 p.m., and about \$1 per unserved kWh for an 8-hour summer weekday outage starting at 1 p.m. A typical (non electric heat) household uses an average of 1 to 2 kilowatts of electricity in an hour.

Of course, these costs are not the same for everyone. In particular, they vary with characteristics such as health conditions, age, whether children are at home, and whether or not the home has air-conditioning.

### **Business Consumers**

For business consumers of electricity, an outage causes the accumulation of unproductive labor costs, material costs, equipment costs, and restart costs. Many also face foregone revenues, especially if they have services that cannot be delayed (such as restaurants). While business consumers might experience some energy and other savings, the overall effect is usually a large net cost. These costs vary by sector, by the length of the outage, and by the size of the customers.

For business consumers an economic worksheet approach is typically used to estimate the cost of an outage. The following cost and savings components are estimated: labor costs, material costs, equipment costs, restart costs, other costs; these are offset by savings in labor, materials, and, of course, energy. Then a net cost value (*i.e.*, costs minus savings) is estimated.

- For smaller business consumers, *e.g.*, with a dozen or so employees and a few million dollars of annual revenue, the average cost of an outage event varies from about \$148 for a short 1-hour weekday outage in the summer to about \$476 for a long 8-hour weekday outage. The highest costs among the smaller business customers are in the manufacturing sector where the cost of a short 1-hour weekday outage is about \$188 in the summer and the cost of an 8-hour weekday outage is about \$538. Of course, these outage costs increase as electricity consumption increases.
- In terms of unserved kWh, average cost estimates for these smaller business consumers are about \$19 per unserved kWh for a one-hour summer weekday outage, \$14 per unserved kWh for a 4-hour summer weekday outage, and \$11 per unserved kWh for an 8-hour summer weekday outage.
- For a large business consumer (defined as a company consuming more than 2.5 million kWhs of electricity annually, averaging around 500 employees and about \$100 million in revenues), the average cost associated with a short 1-hour weekday outage in the summer is about \$63,000. This skyrockets to about \$1.5 million when the summer weekday outage increases to 8 hours in length. The sector least affected

by an outage is continuous process manufacturing. That is because most continuous process manufacturing facilities (like hospitals) typically have on-site backup electricity generation.

- For large business consumers, the average cost per unserved kWh is about \$36 for a 4-hour summer weekday outage starting at 5 p.m. In a recent survey, this cost was found to vary from a low of \$2 per unserved kWh for continuous process manufacturing to a high of \$47 per unserved kWh for the retail, food, and services sector.

On a nation-wide basis, about equal amounts of power are consumed by the numerous, mostly commercial smaller business customers and large, more industrial, business customers. Again, our calculations assume that the recent outage affects a typical cross-section of U.S. customers.