# The Economic Impacts of the August 2003 Blackout

**Prepared by the Electricity Consumers Resource Council (ELCON) - February 9, 2004**

This paper summarizes recent efforts to quantify the total economic costs of the August 2003 Blackout. These estimates are shown to be consistent with post-blackout surveys of affected manufacturers and businesses. The paper concludes with examples of impacts to major industries and attempts to put a face on the economic consequences of this unfortunate debacle.

The August 14, 2003 Blackout started shortly after 4 PM EDT and resulted in the loss of 61,800 MW of electric load that served more than 50 million people. The footprint of the blackout on both sides of the US-Canadian border includes large urban centers that are heavily industrialized and important financial centers (*e.g.,* New York City and Toronto). Nearly half the Canadian economy is located in Ontario and was affected by the blackout. Service in the affected states and provinces was gradually restored with most areas fully restored within two days although parts of Ontario experienced rolling blackouts for more than a week before full power was restored.[1]

Other major North American blackouts in 1965 and 1977, and the 2000-2001 California Electricity Crisis, produced a sizable library of studies and analyses of the direct and indirect economic costs of power outages on regional economies. Based on the much-studied 1977 New York City blackout, ICF Consulting estimated the total economic cost of the August 2003 blackout to be between $7 and $10 billion.[2] These figures are based on estimates of direct costs per kWh of the power outage (*e.g.,* losses due to food spoilage, lost production and overtime wages) and indirect costs due to the secondary effects of the direct costs.[3] According to ICF, the estimates are corroborated by more recent simulation studies of potential outages in California.

Anderson Economic Group (AEG) estimates the likely total cost to be between $4.5 and $8.2 billion with a mid-point of $6.4 billion. This includes $4.2 billion in lost income to workers and investors, $15 to $100 million in extra costs to government agencies (*e.g.,* due to overtime and emergency service costs), $1 to $2 billion in costs to the affected utilities, and between $380 and $940 million in costs associated with lost or spoiled commodities.[4]

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[1] U.S.-Canada Power System Outage Task Force, *Causes of the August 14th Blackout: Interim Report,* November 2003, p. 1; James McCarten, CNEWS, December 31, 2003

[2] ICF Consulting, "The Economic Cost of the Blackout: An Issue Paper on the Northeastern Blackout, August 14, 2003."

[3] *Impact Assessment of the 1977 New York City Blackout*, SCI Project 5236-100, Final Report, Prepared for the U.S. Department of Energy, July 1978, pp. 2-4.

[4] Anderson, Patrick L. and Ilhan K, Geckil, "Northeast Blackout Likely to Reduce US Earnings by $6.4 Billion," AEG Working Paper 2003-2, August 19, 2003

The U.S. Department of Energy (DOE) has published a total cost estimate of about $6 billion.[5] This number is the most frequently cited cost estimate in press coverage of the blackout.

In a separate study completed shortly after August 14, the Ohio Manufacturers' Association (OMA) estimated the direct costs of the blackout on Ohio manufacturers to be $1.08 billion.[6] Some 12,300 manufacturing companies in the state (representing approximately 55% of the manufacturers in Ohio) were impacted with an average estimated direct cost of nearly $88,000 each. All companies reporting indicated that the blackout caused a "complete shutdown in operations." The average duration of a plant shutdown was 36 hours. Over a third of the companies reported that the outage also disrupted deliveries from suppliers and deliveries to customers. The study was based on a survey of OMA members and the results have a sampling error of plus or minus 5%.

The OMA study noted that other indirect costs also resulted from the blackout, including:

1. The diversion of significant amounts of capital investment from new job-producing investments to blackout protection systems; and
2. Lower bottom lines resulting from lost production will reduce the value of those companies' securities.

The OMA results are consistent with the ICF and AEG estimates given that the Ohio study only captures impacts on the manufacturing sector and not commercial or public sector costs. The blackout affected parts of eight states and the Canadian province of Ontario. The OMA survey confirms that the event's economic cost is reasonably measured in the "billions" of dollars.

A second post-blackout study underway by CrainTech (a business news publisher), Case Western Reserve University's Center for Regional Economic Issues and Mirifex Systems LLC has produced some preliminary results based on a survey of businesses in Ohio, New York, Pennsylvania, Michigan, Wisconsin and Southern Canada. These findings include:[7]

1. A quarter of the businesses surveyed (24%) lost more than $50,000 per hour of downtime (*i.e.,* $400,000 for an 8-hour day). And 4% of the businesses lost more than $1 million for each hour of downtime.

[5] "Transforming the Grid to Revolutionize Electric Power in North America," Bill Parks, U.S. Department of Energy, Edison Electric Institute's Fall 2003 Transmission, Distribution and Metering Conference, October 13, 2003

[6] Ohio Manufacturers' Association, August 29, 2003

[7] Mirifex Systems LLC, Case Western Reserve University and CrainTech, November 5, 2003

2. Almost 11% of firms say the blackout will affect their decision-making with regards to either growth at the current location or relocation to another.

The Detroit Regional Chamber estimated the financial loss to the Detroit region resulting from the blackout will reach $220 million. The Chamber collaborated with the University of Michigan's Institute of Labor and Industrial Relations in the analysis.[8]

An important indirect—and impossible to quantify—cost of the blackout was the "cascading" consequences on regions outside of the blackout footprint created by manufacturers' *just-in-time* (JIT) production scheduling. Delivery times for parts and materials to assembly plants are timed to meet scheduled production and thus minimize or eliminate the cost of inventory.

From a public policy perspective—in the U.S. or Canada—it really does not matter if the total economic damages are $4 billion, $6 or $10 billion, or anywhere in between. The point is that this type of event is unconscionable to the extent that a single utility's failure to properly trim trees is deemed the "root cause" of the August 14 Blackout.

Nonetheless, until a more comprehensive analysis of the 2003 Blackout is performed, the AEG and ICF estimates are reasonable placeholder values. However, any subsequent study will likely produce cost estimates with the same order of magnitude given the results of recent post-blackout surveys.

# Examples of Impacts on Specific Industries

The remainder of this paper is a compilation of reported impacts on specific facilities of manufacturing companies and other organizations. This information is based on trade press or media coverage of the blackout unless otherwise noted. This is not a comprehensive survey but the results are illustrative of the serious consequences of a blackout on North American industry.

## Motor Vehicle & Automotive Parts Industries

At least 70 auto and parts plants and several offices were shutdown by the August 14 Blackout, idling over 100,000 workers.[9]

**General Motors Corporation** reported that the blackout affected approximately 47,000 employees at 19 manufacturing facilities and three parts warehouses in Michigan, Ohio and Ontario.[10]

[8] Transmission & Distribution World, October 1, 2003

[9] Detroit Free Press, August 16, 2003

[10] General Motors Corporation, August 18, 2003

The **Ford Motor Company** reported that 23 of Ford's 44 plants in North America were shutdown, as were numerous office, engineering and product development facilities in southeastern Michigan. Other facilities were affected by disruptions in parts supply lines.[11] At Ford's casting plant in Brook Park, Ohio, the outage caused molten metal to cool and solidify inside one of the plant's furnaces. The company reported that a week would be required to clean and rebuild the furnace.[12]

The North American operating units of **DaimlerChrysler AG**, lost production at 14 of its 31 plants. Six of those plants were assembly plants with paint shops. All the vehicles that were moving through the paint shop at the time of the outage had to be scrapped. The company reported that, in total, 10,000 vehicles had to be scrapped.[13]

The **Honda Motor Company** reported that its Canadian assembly plant in Alliston, Ontario, was shutdown as a result of the blackout.[14]

Auto suppliers **Lear Corporation**, **ArvinMeritor Inc.**, and **Delphi Corporation** had facilities that were affected by the blackout, including Delphi's huge Flint East manufacturing complex.[15]

Three **Neff-Perkins Company** manufacturing plants, located in Lake, Geauga, and Ashtabula counties, Ohio, lost production from 4:10 pm on August 14 until 7:00AM on August 15. The company also shut down certain presses and air conditioning in the office areas to comply with the local utility's request to cut back power consumption.[16] Neff-Perkins is a manufacturer of custom-molded rubber and plastic parts for the automotive and controls industries.

## Petroleum Refineries

The blackout affected at least eight oil refineries in the U.S. and Canada. The loss of production at the damaged refineries threatened a gasoline shortage in the Detroit Metropolitan Area, creating the potential for a broader energy emergency. As a result the Governor of Michigan issued two Declarations of Energy Emergency on August 22 that, in part, suspended certain air quality regulations that might have exacerbated a gasoline shortage.[17]

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[11] Ford Motor Company, August 17, 2003

[12] Cleveland Plain Dealer, August 16, 2003

[13] Detroit Free Press, August 22, 2003

[14] Detroit News, August 15, 2003

[15] Detroit News, August 19, 2003; Plant Engineering Magazine, "How One Plant Survived the Blackout," November 1, 2003

[16] Andy Budd, Controller, Neff-Perkins Company, August 15, 2003

[17] Michigan PSC Report on August 14th Blackout, November 2003, p. 74

Affected refineries and their production capacities included:

- **Marathon Oil Corporation** – 76,000 barrels per day (bpd) at Detroit, Michigan[18]
- **BP PLC** – 160,000 bpd at Toledo, Ohio[19]
- **Sunoco Inc** – 140,000 bpd at Toledo, Ohio. The refinery also produces cumene feedstock for the company's phenol plant in Frankford, Pennsylvania.[20]
- **Imperial Oil Ltd.** – Two refineries: 119,000 barrels per day at Sarnia, Ontario, 118,000 bpd at Nanticoke, Ontario.[21]
- **Petro-Canada** – 90,000 bpd at Oakville, Ontario. [22]
- **Shell Canada Ltd.** – 75,000 bpd refinery at Sarnia, Ontario.[23]
- **Suncor Energy Inc.** – 70,000 bpd at Sarnia, Ontario.[24]

The main pipeline network for Canadian oil shipments to the U.S. Midwest and southern Ontario—operated by **Enbridge Inc**.—was also crippled by the blackout. Much of the 2 million bpd system, the world's longest for crude oil and petroleum products shipments, was shut down east of Lake Superior. Enbridge reported that it was forced to cut volumes moving to its terminal at Superior, Wisconsin, from Alberta to prevent overfilling storage tanks.[25]

The blackout was responsible for triggering emergency shutdown procedures at the **Marathon Oil Corporation**'s Marathon Ashland refinery about 10 miles south of Detroit. During those procedures, a carbon monoxide boiler failed to shut down properly, causing a small explosion and the release of a mixture of hydrocarbons and steam. As a pre-cautionary measure, police evacuated a one-mile strip around the 183-acre complex and forced hundreds of residents to seek shelter elsewhere. The Marathon refinery can process 76,000 barrels of crude oil per day into a variety of petroleum products. Approximately half the production from the refinery is gasoline designed to meet the air quality requirements in southeastern Michigan. Full production was not restored at the refinery until eight days after the onset of the outage. During

[18] Houston Business Journal, August 18, 2003

[19] Id.

[20] Chemical Week, August 20, 2003

[21] Standard & Poor's Utilities & Perspectives, August 25, 2003, Vol. 12, No. 34, page 11.

[22] Id.

[23] Id.

[24] Id.

[25] Reuters, August 18, 2003

that time the company was unable to deliver to the local market approximately 500,000 barrels of gasoline and other products.[26]

## Steel Industry

**United States Steel**'s Great Lakes Works, the company's second largest plant, resumed production on August 18, four days after the country's worst blackout knocked the plant off line. U.S. Steel is the largest integrated steel maker in the country. The Great Lakes Works is located in Ecorse and River Rouge, Michigan.[27]

**Rouge Industries Inc.** reported that its huge Dearborn, Michigan, plant was completely shutdown for 24 hours with only limited power for several days thereafter. The company lost the equivalent of four days' worth of production.[28]

The **International Steel Group Inc.** reported that its Cleveland Works was shut down by the blackout and did not restart steel production until four days later. When the plant lost power, 1,250 tons of molten iron had to be dumped into two slag pits along the west bank of the Cuyahoga River. ISG said that the plant suffered some damage as a result of the outage.[29]

**AK Steel Corporation**'s Manfield, Ohio, facility lost power at 4:15 PM on the day of the blackout. The plant's melt shop had six heats of steel in process, all of which were lost. Also in Manfield, **Bunting Bearings Corporation**, a manufacturer of bronze, plastic, powdered metal and aluminum bearings and solid bars, could not cast for four days. [30]

**BCS Cuyahoga LLC** reported that its Cleveland plant was shutdown until August 18. When the power failed, plant personnel had to manually fill the water-cooling jackets on the reheat furnaces to prevent damage.[31]

An explosion and fire caused significant damage to **Republic Engineered Products**' No. 3 Blast Furnace in Lorain, Ohio, as a result of the blackout. No one was injured due to the explosion. Within 15 to 30 minutes after the outage began, the plant lost the ability to cool the iron inside the furnace and the molten metal burned through the side of the structure and started spilling inside the building. Several fires erupted sending an orange-gray plume of smoke that was visible throughout the city. Company officials refused to allow firefighters on the premise, but the company's workers were able to successfully contain the fires. The company announced that it expected to

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[26] Michigan PSC Report on August 14th Blackout, pp. 81-82

[27] Pittsburgh Business Times, August 18, 2003

[28] American Metal Market, August 19, 2003

[29] Id.; Cleveland Plain Dealer, August 16, 2003

[30] Metal Industry News, September 2003

[31] Id.

resume production at Lorain by the middle of September.[32] Republic is North America's leading producer of special bar quality (SBQ) steel. On October 6, 2003, Republic announced that it had been forced to file for protection under Chapter 11 of the U.S. Bankruptcy laws. It cited the August 14 explosion and fire at Lorain as a contributing factor.[33]

**Nucor-Auburn**, the merchant bar mini-mill in Auburn, New York, operated by **Nucor Corporation**, shut down its rolling mill and melt shop during the outage. Operations were resumed the following week.[34]

Steelmaker **Dofasco Inc.**, the largest single-site consumer of electricity in Ontario, was affected both by the blackout and requests from the Independent Market Operator (IMO) to curb consumption to facilitate power restoration in the province. The plant, located in Hamilton, Ontario, experienced a fire that resulted in a damaged Coke Plant when power was interrupted on August 14. Other Canadian steel mills that were affected are: **Algoma Steel Inc.,** an integrated steel producer based in Sault Ste. Marie, Ontario; **Stelco Inc**., Canada's largest steel producer, with integrated mills in Hamilton and Nanticoke, Ontario; and two mills operated by **Gerdau AmeriSteel Corporation** in Whitby and Cambridge, Ontario.[35]

## Chemical Industry

Over thirty chemical, petrochemical and oil refining facilities are located in the "Chemical Valley" area near Sarnia, Ontario. All the plants suffered some form of outage resulting in the flaring of products at most of the facilities. Massive clouds of black smoke were visible throughout the area. Estimates of the cost to producers in the Valley range from $10 to $20 million per hour of outage.[36]

**Nova Chemicals Corporation** reported that plant outages resulting from the August 14 Blackout reduced third-quarter earnings by $10 million or 12 cents per share. The power outage hit production at its Corunna, Moore Township, Sarnia, and Sti. Clair River, Ontario, and Painesville, Ohio, facilities. Nova stated that it lost a total of 150 million pounds of ethylene and co-products, polyethylene (PE), styrene and expandable polystyrene (EPS) production by the time its facilities returned to normal. The company declared *force majeure* on ethylene co-product deliveries from Corunna. Nova restarted

[32] Cleveland Plain Dealer, August 15, 2003; Association for Iron & Steel Technology, August 16 and August 28, 2003

[33] Republic Engineered Products LLC, October 6, 2003

[34] American Metal Market, August 19, 2003

[35] Id.

[36] Detroit Free Press, August 15, 2003

its ethylene plant at Corunna and its styrene plant at Sarnia, as well as portions of its Moore Township complex about a week after the outage began.[37]

**DuPont** reported that all five plants in Ontario were downed by the blackout. The company produces nylon and nylon intermediates at Kingston and Maitland, specialty polymers at Sarnia, polyethylene films at Whitby, and automotive finishes at Ajax. Three DuPont facilities in the U.S. were also affected by the blackout. DuPont said that sodium and lithium production at Niagara Falls and operations in Buffalo, NY, where Corian® solid surfaces and Tedlar® PVF film are manufactured, were shut down on Thursday, August 14, but were back to full power by Thursday night. Its automotive finishes facility in Mount Clemens, Michigan, suffered a complete outage but started to receive power a day later.[38] The facility at Kingston, Ontario, was down for more than a week.[39]

**Bayer Canada** reported that the blackout idled butyl rubber and nitrile butyl rubber operations in Sarnia, Ontario.[40]

**BASF** reported that its large polymers facility in Wyandotte, Michigan, was shut down as a result of the blackout.[41] BASF Wyandotte operations is a leading producer of plastics and the world's second largest producer of vitamins.

**Dow Chemical**'s chemicals and plastics operation in Sarnia, Ontario, was shut down on August 14 and was not able to restart production until the following Monday, August 18. The company produces polystyrene, polyethylene, interpolymers and acrylic latex at the site. Dow also reported that its industrial biotechnology facility, **DowPharma**, in Stony Brook, NY, was affected by the blackout.[42]

**BP** reported that disruptions to its petrochemical production were limited to its 140-million lbs/year butanediol plant in Lima, Ohio. The plant was restarted the day after the blackout started.[43]

**Imperial Oil Ltd.**, a subsidiary of **ExxonMobil**, reported that its aromatics and polyethylene production at its Samia, Ontario, site was disrupted.[44]

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[37] Chemical Week, August 27, 2003

[38] Chemical Week, August 20, 2003

[39] Chemical Week, August 27, 2003; Chemical & Engineering News, August 25, 2003

[40] Chemical Market Reporter, September 1, 2003

[41] Chemical & Engineering News, August 25, 2003

[42] Chemical Week, August 20, 2003; Chemical & Engineering News, August 25, 2003

[43] Id.

[44] Id.

**Merck & Co.**'s pharmaceutical operations in Rahway, New Jersey, were interrupted by the blackout.[45]

Chlor-alkali producers **Olin Corporation** and **Occidental Chemical Company** shutdown their respective plants at Niagara Falls, NY, because of the blackout but were able to restart the plants by Saturday, August 16.[46]

Approximately ten **Praxair, Inc.** air separation plants in Connecticut, Michigan, New Jersey, New York, Ohio and Pennsylvania, as well as three in Ontario, Canada, were out of service as a result of the regional electricity failure at 4:11 p.m. on August 14, 2003. All plants either returned to service when power was restored or temporarily remained off-line at the request of the local utility on Friday and Saturday. Praxair plant operations and logistics responded to the sudden power outage safely and successfully. The North American Logistics Center in Tonawanda, NY, took steps to shift product deliveries to customers in the affected area.

**Linde Gas'** air separation plant in Bozrah, Connecticut, was interrupted most of the day Friday, August 15, and into Saturday because of the power outages elsewhere in the state and regions in ISO-New England.[47]

## Other Impacts on Industry and the Commercial and Public Sectors

**Alcan Inc.**, the world's second largest aluminum producer, reported that its cold-rolling plant in Kingston, Ontario, was shutdown by the blackout.[48]

**Revere Copper Products Inc.**, in Rome, New York, lost copper and alloy production as a result of the blackout.[49] The plant facilities include melting, casting, hot rolling, cold rolling extrusion, bar making and testing equipment.

Paper-maker **Domtar Inc.** shutdown its pulp mill in Espanola, Ontario, and a paper mill in Cornwall, Ontario, as a result of the blackout. Forestry company **Tembec Inc.** shutdown sawmills in Timmins,Cochrane, Huntsville and Hearst, Ontario, a pulp mill in Smooth Rock Falls, Ontario, and a newsprint mill in Kapuskasing.[50]

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[45] Chemical & Engineering News, August 25, 2003

[46] Id.

[47] Mike Kovach, US Linde Gas, August 18, 2003

[48] The Globe and Mail, August 16, 2003

[49] Metal Industry News, September 2003

[50] The Globe and Mail, August 16, 2003

The **National City Corporation** reported that across the bank's six-state franchise, approximately 174 branches were closed due to the power situation: 30 in Ohio, 134 in Detroit, Michigan and 10 in Pennsylvania.[51]

**Kroger Company**, the largest U.S. supermarket chain, reported that 60 of its stores were without power as a result of the August Blackout. Most of the stores were in Michigan.[52]

The **Associated Food Dealers of Michigan** estimates that over $50 million in perishable foods were lost due to the lack of refrigeration caused by the blackout.[53]

Local telephone service was also jeopardized by energy emergency created by the blackout. **SBC**, the dominant carrier in Michigan, requested assistance from Michigan's State Emergency Operations Center (SEOC) to locate supplemental supplies of petroleum liquids to assure the continued operation of the local telephone system. This fuel was needed for both standby generators and company vehicles to allow travel to remote locations to assure continued operation of telephone equipment.[54]

**Duane Reade Inc.**, the largest drug store chain in the metropolitan New York City area, reported that the August 14th Blackout forced the closure of all of the company's 237 stores. The company estimates that as a result of the interruption, lost sales totaled approximately $3.3 million.[55]

**Airports** were closed in Toronto, Newark, New York, Detroit, Cleveland, Montreal, Ottawa, Islip, Syracuse, Buffalo, Rochester, Erie, and Hamilton.[56]

The **New York City** comptroller's office estimated that losses topped $1 billion, including $800 million in gross city product. The figure includes $250 million in frozen and perishable food that had to be dumped. The Restaurant Association calculated that the city's 22,000 restaurants lost between $75 and $100 million in wasted food and lost business. Broadway lost approximately $1 million because of cancelled performances.[57] New York City's mayor estimated that the city would pay almost $10 million in overtime related to the outage.[58]

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[51] National City Corporation, August 15, 2003

[52] Detroit Free Press, August 16, 2003

[53] PRNewswire, August 18, 2003

[54] Michigan PSC Report on August 14th Blackout, November 2003, p. 75

[55] Duane Reade, August 22, 2003

[56] Toronto Star, August 16, 2003

[57] Associated Press, August 21, 2003, reported at www.smh.com.

[58] Gotham Gazette