



Foresight and an Innovative Power Monitoring System Help Delphi Complex Survive the Northeast's Power Grid Collapse



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At 3 a.m. on Friday, August 15, Joe Torr knew he was in for a tough day.

Arriving long before dawn at Delphi Corporation's massive Flint East manufacturing complex in Michigan, where he is site facility engineer and energy coordinator, Torr and his team faced the aftermath of the biggest power failure in the nation's history.

The cascading failure of the power grid serving the northeastern United States and southern Canada the previous afternoon had caused wild swings in voltage but little damage beyond shutting down some equipment at the automotive parts manufacturing facility. But Consumers Energy, the local electric utility, had warned that Friday might bring a different story.

When Torr made his first call to the utility at that pre-dawn hour, his worst expectations were confirmed. With a hot summer's day expected and power plants still down across the grid, Consumers Energy predicted it would have to shut off all power to the Delphi site unless it could achieve a major reduction in energy consumption.

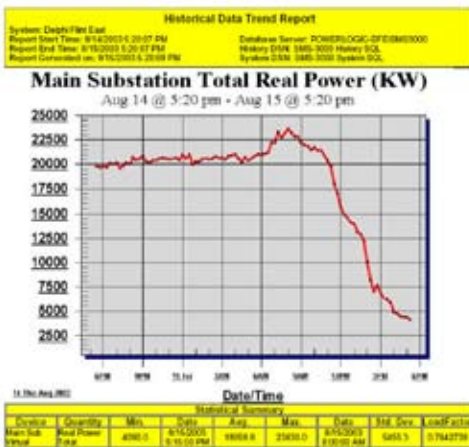
By the end of the day, thanks to an innovative web-based power monitoring system, Delphi had reduced its power draw on the utility from a typical day's 25 megawatts to just over four megawatts. More important, the organized shutdown Torr and his team achieved left equipment at Flint East unscathed. "With computers running everything today, you can do serious damage to electronic equipment if it's not turned off in an orderly fashion," said Torr.

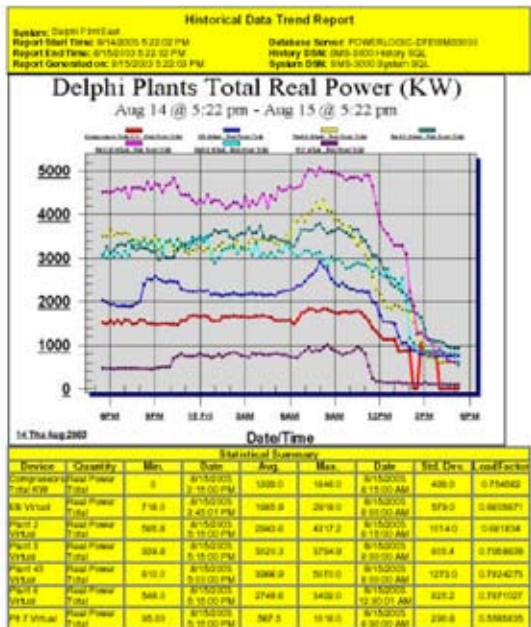
Friday, 8 a.m.

"Once everyone got in to work, we asked them to reduce all non-critical items like air conditioning and lighting," explained Laura Bricault, utility monitoring system administrator for the Delphi East facility. "Our consumption actually peaked at 8 a.m. that day at 24 megawatts.

"We started noticing a significant curtailment in usage by 10 a.m., when we got down to 21 megawatts," she said. Bricault was able to watch consumption dropping from the computer on her desk, which is connected over Delphi's Intranet to the facility's Square D® PowerLogic® power monitoring system from Schneider Electric. Monitors constantly report power consumption by equipment throughout the 4.6 million square foot manufacturing complex.

The power monitors are connected to more than 120 different devices, from electrical transformers and substations to other heavy energy users like the air compressors, water towers, chillers and electric furnaces that are vital to manufacturing processes.





Virtual meters for each plant displaying the curtailment of Aug. 15. Note the minimum and maximum values in the table below for each plant.

“With more than 100 buildings at the Flint East site, it’s impossible to keep track of our power system manually,” said Torr. “Our web-based PowerLogic® system lets us keep tabs on our electric consumption in real time. Being able to report actual consumption to Consumers Energy throughout the day is what made an orderly shutdown possible.”

Friday, 11:30 a.m.

“Consumers Energy had a conference call at 11 a.m. with all their power plants, so when I called in at 11:30, they were pretty sure they would have to black us out by 1 p.m.,” said Torr. He consulted with Flint East’s site manager and plant managers, and then began an orderly shutdown.

“They looked at the manufacturing schedules for the various plants and decided that the oil filter plant could be shut down immediately since their manufacturing schedule was not as tight as some of the other facilities,” explained Torr. “Although we were already down to 16 megawatts, we also decided to cancel the entire second production shift for the entire complex.”

Since it was just an hour before the shift was to begin at 2 p.m., many of the workers had to be met at the gate and told to go home.

Friday, 1:45 p.m.

“We were now down to 12.2 megawatts, about 50 percent of normal consumption, but the utility was asking for more” said Bricault. “I have a virtual setting for each plant on my computer, showing what equipment is located in each facility. After looking at what was still on, we called each of the plants, telling them to shut down all the process, and most facility equipment.”

Less than an hour after the directive was given, Flint East was using just seven megawatts of electricity.

“We saw a glitch at 2:45 when the monitoring system detected that an air compressor had accidentally been turned back on, but as soon as it was turned off we went back down to seven megawatts,” said Torr.

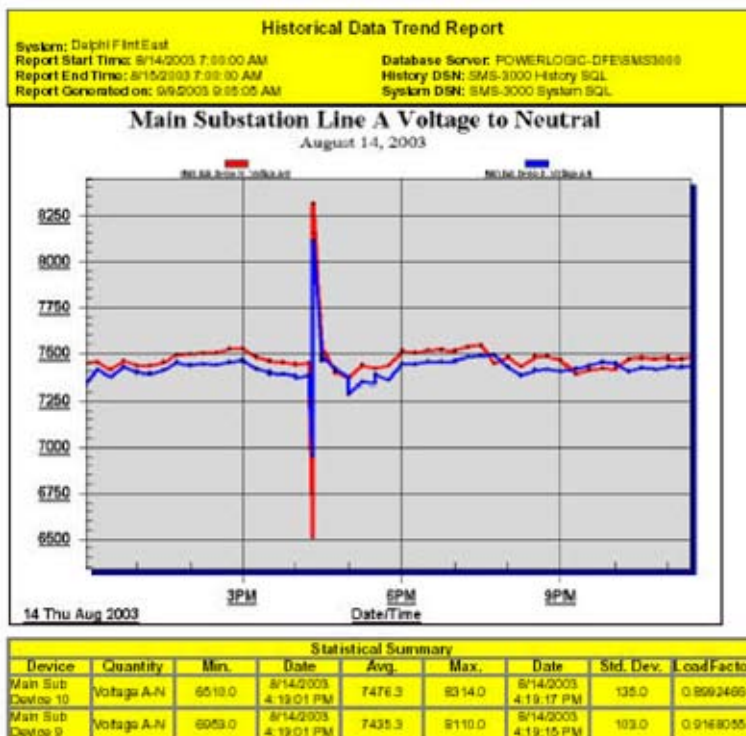
As Bricault continued to monitor the energy consumption charts on her computer screen and identify the power usage of every substation on the site, calls were placed to each plant manager to look for additional equipment that could be turned off. “At 5:15 p.m. we were down to 4.1 megawatts,” she said.

Friday, 5:30 p.m.

“At 5:30 Consumers Energy called to say the crisis was over,” said Torr. “It had started raining in the western part of the state, reducing power demand as the ambient temperature cooled. The utility had also begun to receive more power from the grid. We could begin turning equipment on again.”

Now the Delphi team faced an even bigger challenge: getting everything back up and running in time for the Saturday morning shift, when they needed to make up for the lost production.

“People started coming in around 10 p.m. to restart the air compressors, which are centrally controlled and take a long time to get back up to the right pressure,” said Torr, “but each individual plant had to organize its own power-up.”



Typical voltage to neutral readings at the Main Substation are just below 7500. However, on Aug. 14 at 4:19 PM the grid failure sent voltages into a “sag-swell” condition. Subsequently, the monitoring system went to an alarm condition and automatically paged appropriate maintenance personnel.

“A lot of behind-the-scenes equipment has to be turned on before you can begin production,” he explained, “like water cooling towers, air conditioning that’s critical to different areas and the electric furnaces used to make spark plugs, which have to be brought back up to the right temperature for the manufacturing process.”

The Flint East complex ran at about 60 percent of typical consumption on Saturday, and by Monday morning everything was back to normal.

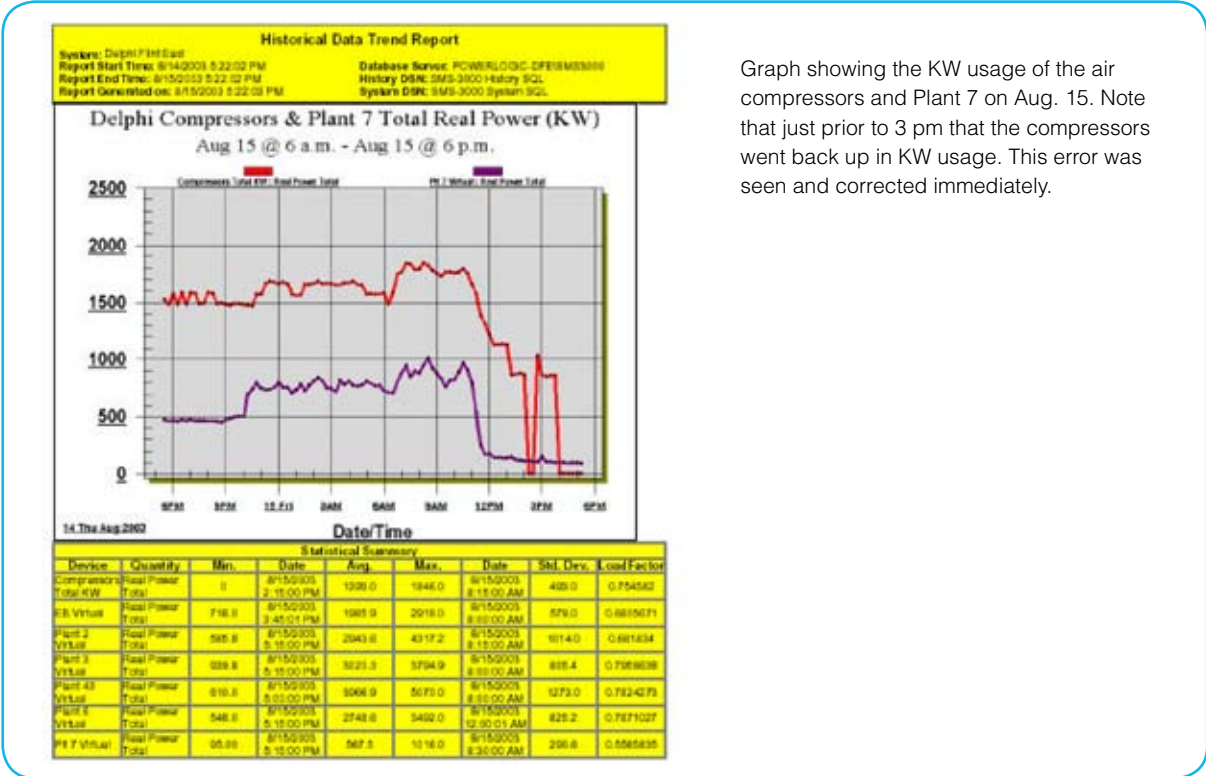
“When we bought the PowerLogic system back in 1997, we never had this kind of scenario in mind,” said Torr. “We’ve had curtailments before, but they’ve never told us we could be completely shut down.”

Like most companies that install a power monitoring system, Delphi’s primary goal was to reduce energy costs. As more plant engineers at the site recognized the value of the information being generated, additional monitors were added to equipment beyond the electrical distribution system, such as the compressed air system.

“The site has five air compressors, which represent 10 percent of our total electrical usage,” Bricault explained. “By monitoring them we found that we only needed two compressors on the weekends. We also hooked up the electrical furnaces and found we could occasionally dial them back to a lower set point to reduce energy costs. Next we plan to add the water cooling towers, which are powered by big 150 to 250 hp motors.”

The power monitoring system has also proved its usefulness beyond the electrical system. “We extended it to natural gas last year,” explained Bricault. “With prices rising rapidly, we’ve spent more through June this year than our entire natural gas bill in 2002. Obviously, we’re actively looking for new ways to reduce our gas consumption.”

Although the PowerLogic system is now used primarily to monitor energy consumption, Torr and his team are also exploring ways to use it to bring more equipment, such as lighting, under central control. “We could make load shedding and shifting much faster that way and cut energy costs even more.”



Graph showing the KW usage of the air compressors and Plant 7 on Aug. 15. Note that just prior to 3 pm that the compressors went back up in KW usage. This error was seen and corrected immediately.

Torr said the ability to monitor and control power is more important than ever. “The world has changed a lot in the last few years for many reasons and the power supply could be more erratic in the future. There’s a great deal of uncertainty now about power – where you’re buying it from, the stability of the power grid, the reliability of local supplies when all the different power systems are tied together. There’s more vulnerability than ever before.”

According to Larry Rygiel, area sales manager for power management systems for Schneider Electric, many companies like Delphi are recognizing the true economic value of power monitoring. “If they use the system as it was intended, like Delphi has done, plant engineers can save their companies millions of dollars. “Power monitoring is about more than just metering power usage to allocate bills or determine manufacturing costs,” he said. “By connecting monitors to your entire energy system, you can identify the patterns of consumption that will really allow you to get control over your costs.”

Rygiel said putting the PowerLogic system on the web last year was a critical turning point for Delphi. “Now everyone – from individual maintenance people to plant managers – sees the same information. It’s like logging onto AOL. Everyone sees the same screens simultaneously, so you can take action quickly.

“When it comes to utility monitoring,” he added, “Delphi’s Flint East complex has been a real innovator.”

Never more so than on August 15.

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