# 1N Blackouts

### Notes

#### Impact card is poor although the rest is fine. If they don’t answer that you’re home clear. Just read this if you want something real short.

#### Only read against US affs.

## 1N

#### Current plant closures are stressing grids but are so far small enough they haven’t caused power outages, Loveless 7-26

“Heat is on, but the power grid is holding” Bill Loveless, for USA TODAY 7:46 p.m. EDT July 26, 2016 http://www.usatoday.com/story/money/columnist/2016/07/26/heat-but-power-grid-holding/87444628/

The retirement of coal and nuclear power plants in the U.S. over the last few years has raised concerns that the electric power industry might fail to deliver when demand for power heightens — such as during a blistering heat wave. But for the most part, that’s not the case this week as a so-called “heat dome” leaves the eastern and central parts of the U.S. sweltering with temperatures of 95 degrees or more and feeling as though it’s much hotter. “So far, so good,” said Michael Bryson, the vice president for systems operations at PJM Interconnection, the operator of the largest electric grid in the U.S. “Our transmission and generation have been performing very well.” PJM, which coordinates transmission and operates a wholesale electricity market in a region covering 13 states and the District of Columbia, recorded a high point for demand of nearly 152,000 megawatts on Monday and forecast a peak of 145,600 megawatts on Tuesday as temperatures tapered off a bit. One megawatt is enough to power 800 to 1,000 homes. That corresponds with PJM’s forecasts of peak demand this summer, and falls well within the 184,000 megawatts of installed generating capacity in the system that serves Ohio, Pennsylvania, Virginia and West Virginia, among other states. The story is similar across other regions to the north, south and west of PJM’s market where the massive heat wave has lingered, Bryson said in an interview. While some local disruptions have occurred, such as severe thunder storms that combined with the searing weather to black out 14,000 Con Edison customers in New York, the bulk power system has been running relatively smoothly. “They’re all in a similar position as us,” Bryson said of the other grid operators. “We’re kind of stressing the system a little bit, but all of us are in pretty good shape.”

#### New early closures puts strain on nat gas that can’t keep up in stressful seasons – supply is tight and demand would be higher – causes blackouts, IER 14’

“The UK and U.S. Northeast Face a Pending Energy Shortage” APRIL 15, 2014. Institute for Energy Research. The Institute for Energy Research (IER) is a not-for-profit organization that conducts intensive research and analysis on the functions, operations, and government regulation of global energy markets.

The United Kingdom and the U.S. Northeast may have something in common going into next winter—a possible energy shortage. Both countries are closing existing power plants—coal-fired and nuclear—in favor of renewable and natural gas generating technologies. In the United States, the Independent System Operator in New England has warned that generating capacity is extremely tight with the future closure of the Vermont Yankee nuclear power plant and several coal-fired power plants in Massachusetts. Likewise, in the UK, 8,200 megawatts of coal-fired power plants have been shuttered, with an additional 13,000 megawatts at risk over the next 5 years. The UK’s energy regulator is worried that the amount of capacity over peak demand next year will be just 2 percent—a very scary low amount for those charged with keeping the lights on. The U.S. Northeast Power Struggle Both nuclear power and coal-fired power plants are retiring prematurely in New England due to onerous regulations and competition from low cost natural gas-fired generating plants. The Vermont Yankee nuclear power plant (604 megawatts), which supplies 4 percent of New England’s power and three-fourths of Vermont’s electricity, is expected to retire at the end of this year concurrent with the end of its fuel cycle. Entergy, the plant’s owner, cites a number of financial factors for the retirement including increased costs to comply with new federal and regional regulations and competition from natural gas power plants. However, Vermont Yankee has been opposed by state political figures for some time, and many have cheered its closure after years of criticizing its operation. Also, U.S. nuclear power plants are plagued with competition from negative power prices from wind energy due to the federal Production Tax Credit (PTC) that provides a 10-year subsidy for qualified wind units. Because Vermont Yankee is operated as a merchant generator, its costs cannot be recovered through regulated cost-of-service rates.[i] New England expects more than 1,369 megawatts of coal-fired generating capacity to be retired between 2013 and 2016. Dominion Energy Resources is planning to retire the nearly 750-megawatt Salem Harbor coal- and petroleum-fired power plant in Massachusetts this year due to the Northeast states antagonism toward coal (i.e. the Regional Greenhouse Gas Initiative), the costs of compliance of new environmental regulations, and declining profits for coal-fired units in New England.[ii] To keep operating its coal-fired power plants, the company would need to spend millions of dollars on environmental equipment to comply with EPA regulations. In southeastern Massachusetts, the Brayton Point power plant, the largest coal-fired power plant in New England, is expected to be shut down in 2017 due to EPA’s onerous regulations. Reliability experts are noting that the New England grid is entering risky territory. It currently gets 52 percent of its electricity from natural gas. There is currently enough natural gas pipeline capacity during non-winter months to supply New England utilities. But, this past winter, the lack of pipeline infrastructure resulted in the need to rely on nuclear, coal, and petroleum to meet demand from the extreme cold weather. The spot price of natural gas was so high that it was less expensive to generate electricity from petroleum. At a recent hearing, Senator Lisa Murkowski noted, “… 89 percent of the coal electricity capacity that is due to go offline was utilized as that back-up to meet demand this winter.”[iii] With the early retirements of nuclear and coal-fired power plants cutting back on supply diversity, the New England grid is becoming dangerously reliant on natural gas for its generating capacity. The Independent System Operator New England recommended against the closure of the 1500 megawatt Brayton Point facility because the plant is needed to ensure reliability.[iv] NE Energy Infrastructure Source: Energy Information Administration, http://www.eia.gov/todayinenergy/detail.cfm?id=12851 After the colder-than-average winter, natural gas stockpiles are low. According to the Energy Information Administration, on average over the past five years, natural gas stockpiles totaled 3.832 trillion cubic feet by the end of October going into the winter heating season. This past winter, natural gas inventories dropped by 2.92 trillion cubic feet between the end of October and March 21, making it the fastest pace of withdrawals for any U.S. heating season since 1995. The extreme cold weather pushed stockpiles to their lowest level in 11 years. That large withdrawal means that about 3 trillion cubic feet of natural gas will need to go into storage during the warm-weather months to cover expected winter demand. By the end of October, it is expected that stockpiles may increase to close to 3.5 trillion cubic feet, about 300 billion cubic feet less than the high achieved over the past 5 years, putting even more stress on having adequate supplies for next winter.[v] The northeast already has the highest electricity prices in the country (outside of Alaska and Hawaii). Residential electricity rates are currently 45 percent higher in New England than the U.S. average. Phasing out these power plants prematurely will only increase electricity rates in New England. The UK Power Struggle The United Kingdom’s electricity consumption is roughly 1/12th of that in the United States, but policies there are leading to growing concerns about energy price and availability. The United Kingdom may encounter power shortages next winter because electric utilities are shuttering coal-fired power plants to comply with Europe’s carbon-emissions rules and have stopped their investment in new generating capacity. Over the past 15 months, 8.2 gigawatts of coal-fired power plants were shuttered and 13 gigawatts are at risk of closing by 2019. According to the UK’s energy regulator, the amount of electricity available over peak demand may drop below 2 percent next year, the lowest level in Western Europe.[vi] Beginning in January 2016, the European Union will require electric utilities to add further emission reduction equipment to plants or close them by either 2023 or when they have run for 17,500 hours. Only one UK electricity producer has chosen to install the required technology since the equipment is expensive, costing over 100 million pounds ($167 million) per gigawatt of capacity. Because the UK has built only one coal-fired power plant since the early 1970s, most of the existing coal-fired plants are expected to be shuttered. According to data from the Office of Gas and Electricity Markets in London, the capacity margin–the amount of excess supply above peak demand–may drop below 2 percent in 2015. Under normal weather conditions, the margin could drop below 4 percent during the winter months from over 6 percent now, but lower than average temperatures increase electricity demand and would thereby lower the capacity margin further. The United Kingdom was the first nation to introduce a carbon tax on fossil fuel combustion, which is in addition to the regional carbon trading system of the European Union. As a result, UK utilities are already paying the most among European countries for the right to emit carbon dioxide from burning fossil fuels. To ensure reliability and to remove uncertainty for utilities, the UK government froze the tax from 2016 through 2020 so that electric generator operators could make investment decisions regarding their coal-fired power plants. Another area of uncertainty for UK utilities is how a proposed market for providing backup electricity will work. According to the Department for Energy and Climate Change, electricity producers will be able to bid in an auction to take place this December to provide backup power for 2018. The program, called a capacity market, is expected to ensure sufficient capacity and security of supply. The Department estimates that the UK power industry needs around 110 billion pounds ($184 billion) of investment over the next 10 years. According to Deutsche Bank AG, UK power prices, which are one of the highest in Western Europe, are expected to increase by 39 percent in the next five years. The UK generates 12 percent of its electricity from renewable energy today, and plans to get 15 percent from renewables by the end of the decade. UK electricity consumers will pay an additional 120 pounds a year (about $200) to fund the move toward greener power generation on top of their current average electricity bill of 1,420 pounds ($2,376). Conclusion The UK and the U.S. Northeast have something in common in their quest for lower greenhouse gas emissions—a possible energy shortage and unreliability of their electricity grid–expected as soon as this coming winter. Shuttering coal-fired power plants in favor of renewable energy and natural gas-fired technology due to government policies and regulations has been the major cause of the concern. Further, government regulations and policies are also closing nuclear units in the United States bringing diversity of supply issues to the forefront. Electric grid operators in both areas are worrying that generating capacity next winter may be too little to meet demand, particularly if frigid weather should hit.

#### Extinction – collapses information superhighway

IEEE 7 (Institute of Electrical and Electronics Engineers, Inc, “Reliability and Blackouts,” 4-25-2007)

“Without electrical power, urban life would cease to exist, the information age would become a faded memory, and industrial production would grind to a halt. The fastest way to ensure the collapse of the modern era would be to pull the plug and turn off the flow of electricity. Light, heat, and power would all stop. Civilization as we know it would come to an end.” Over the last century, consumer expectations of reliable electric service have increased. Outages which once were common place are now considered unacceptable due to the fact that interruptions may now impact millions of electricity customers, computers, and other electronic devices [2]. The August 2003 Blackout served to further prove an already well-known fact: a reliable supply of electricity is more than just a convenience, it is a necessity; the global economy and world’s very way of life depend on it [3]. Ensuring reliability of the electric power system is a particularly challenging task for electric companies; maintaining a high level of reliability requires constant commitment [3]. Providing reliable electricity involves real-time assessment, control, and coordination of electricity production at thousands of generators, moving electricity across and interconnected network of transmission lines, and ultimately delivering the electricity to millions of customers by means of a distribution network [4]. Reliability means the uninterrupted monitoring of diverse issues such as load forecasts; fuel supply, delivery, and transportation; political and communal stance on the construction of new generating capacity; electrical and mechanical status of operating equipment; future and present planning; and a number of other various issues [2]. According to the joint US-Canada Report on the August 14th, 2003 Blackout, reliable operation of the power grid is complex and demanding for two fundamental reasons: (1) electricity flows at close to the speed of light (186,000 miles per second) and is not economically storable in large quantities; and (2) without the use of control devices which are too expensive for general use, the flow of alternating current (AC) electricity cannot be controlled like a liquid or gas by opening or closing a valve in a pipe – electricity flows freely along all available paths from the generators to the loads in accordance with the laws of physics. Thus, maintaining reliability is a complex enterprise that requires trained and skilled operators, sophisticated computers and communications, and careful planning and design [4]. Preventing outages and blackouts is of utmost concern to the nation and the world. Some estimates claim that the costs of electric power outages are $26 billion each year in the US alone and have been increasing as the electric power industry is restructured [2]. The Electric Power Research Institute (EPRI) estimates that power outages and insufficient power quality cost the US economy over $119 billion per year [2, 5]. Not enough effort is put towards ensuring reliability; some argue that US electric reliability improvements have lagged behind other improvements, such as efficiency and conservation, and this lagging has compounded the occurrence of blackouts [6]. The North American Electric Reliability Corporation (NERC) is a non-governmental entity whose mission is to improve the reliability and security of the bulk power system in North America. To achieve that, NERC develops and enforces reliability standards; monitors the bulk power system; assesses future adequacy; audits owners, operators, and users for preparedness; and educates and trains industry personnel. NERC is a self-regulatory organization that relies on the diverse and collective expertise of industry participants. As the Electric Reliability Organization, NERC is subject to audit by the U.S. Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada [7]. NERC and its eight Regional Reliability Councils have developed system operating and planning standards for ensuring the reliability of a transmission grid. These standards are based on seven key concepts: (1) balance power generation and demand continuously; (2) balance reactive power supply and demand to maintain scheduled voltages; (3) monitor flows over transmission lines and other facilities to ensure that thermal limits are not exceeded; (4) keep the system in stable condition; (5) operate the system so that it remains in reliable condition even if a contingency occurs; (6) plan, design, and maintain the system to operate reliably; and (7) prepare for emergencies [4]. Casazza and Delea (2003) argue that to ensure electric reliability, the electricity industry must develop all plans in a multidimensional nature. Specifically, it is essential that the electric industry: (1) plan the electrical system to have enough generation, transmission, and distribution capacity; (2) design the system to reduce the probability of equipment failure; (3) operate the system to remain within safe operating margins; and (4) be prepared to restore the system quickly, in the event of a supply disruption [2]. Blackouts The US electrical power grid has experienced serious power failures on a number of occasions over the past forty years, each one creating panic and a warning of what may happen if blackouts become more frequent [1]. Interruptions in the supply of electricity to customers have been caused by disturbances to or malfunctions of the generation, transmission, and/or distribution of electricity [2]. Most power outages are cause by weather-related events, minor disturbances to the local distribution system (such as a car striking a distribution pole), or may be planned controlled or rotating outages to compensate for insufficient generation resources [2, 8]. On other occasions, massive power outages – or blackouts – can be caused by reliability issues. Even minor occurrences in the electric power grid can sometimes lead to catastrophic “cascading” blackouts. The loss of a single generator can result in an imbalance between load and generation, altering many flows in the electricity network. If there is a loss of generation within an area and there is not enough internal generation then the area transmission lines need to have enough capacity to transfer energy to supply the load and maintain acceptable system parameters. If the transmission ties do not have enough capacity, then the system reliability and security are at risk [9]. A "cascade" can occur on a power system if the balance between load, generation and transmission system flows is disrupted when one or more elements of the electrical grid (generator or transmission line) fails or trips out of service. When an element trips, existing power flows are instantaneously redistributed onto other elements of the grid according to the laws of physics, irrespective of state boundaries or ownership of the transmission facilities [9]. Many experts argue that technical issues are not the only player; that part of the reliability problem is energy deregulation itself, coupled with the end of guaranteed return on investment (ROI) [6]. In short, simple desire to make a profit may be fueling the occurrences of electric blackouts. Cascading blackouts are particularly damaging in today’s networked world; they seriously disrupt the nation’s information superhighway [1]. To compound the dilemma, in recent years, the increased deployment of personal computers has had the effect of putting additional stresses on the power grid in the US and other countries, making electricity shortages more likely in the future. The overall demand for digital power is increasing even faster than the greater efficiencies that are coming on line [1]. Major blackouts are more common than the US electricity industry would like to admit. Major North American blackouts occurred in 1965 and 1977; the interconnected electric grid covering nine western states collapsed twice in the summer of 1996; in 1999, the northeast experiences outages stemming from a heat wave and equipment failures; California experienced rolling blackouts in 2000 and 2001; and in 2003, the nation experienced the largest blackout in its history [6].

# 2N Extra/Extensions: