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September 2021 Newsletter



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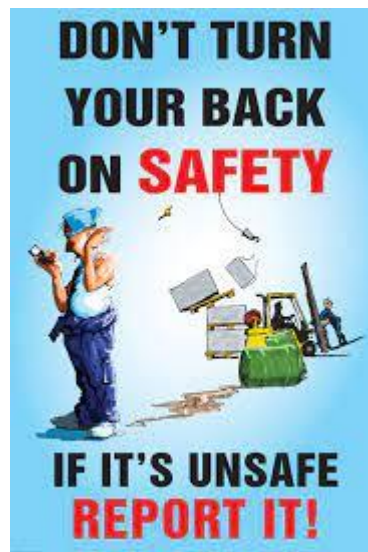
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Time is Running Out for Illinois – Loss of Energy, Jobs, & Revenue



“Without some agreement on a comprehensive energy package Exelon will be forced to shut down and decommission Byron and Dresden – a loss of 1,500 full time employees, 2000 supplemental workers during refueling outages (most from union halls), \$63 million in annual taxes, and 30% of Illinois carbon-free energy. Illinois Senator Sue Rezin (38th District), a strong advocate of state support for nuclear, is cautiously optimistic that a final deal can be reached and voted on before their fall adjournment.”

Exelon’s four nuclear plants serving Chicago and northern Illinois—Braidwood, Byron, Dresden, and LaSalle—are approaching a combined 41 years, or 15,000 consecutive days, of continuous service. However, unless Illinois lawmakers can put together some energy legislation to keep Byron and Dresden operating, they will have to be shut down and decommissioned this fall.

Sarah Downs, executive director of the Byron Area Chamber of Commerce said, “These nuclear plants provide everything residents have asked for: jobs, reliable and environmentally friendly power generation, and a solid tax base for local communities. Other states wish they had this much baseload, carbon-free energy to power their businesses and homes.”

These Exelon plants run close to 100 percent of the time in the summer and the winter. When the electricity use is high you can depend on them to continue generating this

much needed power, while solar only averages operability at 20 percent of the time and wind only 30 percent of the time. Surely, consumers and legislators can see the importance of reliable, carbon-free energy based on the recent extreme weather events experienced across the U.S. and especially in the Midwest. accentuated by the prevalence of extreme weather brought on by climate change.”

According to Exelon, the Illinois nuclear fleet (***which includes the Clinton and Quad Cities plants***) provides 90 percent of the state’s clean energy and serves as an essential complement to the state’s other clean energy resources, “The workers at our plants are the best in the industry and operate our nuclear units at world-class levels of safety and reliability, ensuring we remain on line when our communities need our electricity the most,” said Dave Rhoades, Exelon Generation’s chief nuclear officer. “Powering Illinois with clean energy 24 hours a day, seven days a week is a hallmark of our zero-carbon nuclear fleet.”

During the June PJM Interconnection capacity auction, Exelon Generation reported in a filing with the Securities and Exchange Commission, that three of their Illinois nuclear power plants—Byron, Dresden, and Quad Cities—did not

clear the auction. According to PJM, the auction procured 144,477 MW of resources for the period of June 1, 2022, through May 31, 2023, at a total cost of \$3.9 billion—\$4.4 billion less than in the most recent auction, in 2018 – securing commitments for power at \$50/MW-day for much of its footprint, compared with the previous auction’s \$140/MW-day—a decrease of 64 percent.

Although the General Assembly’s current legislative session has not reached a decision on an energy bill, Illinois Senator Sue Rezin (***38th District***), a strong advocate of state support for nuclear, is cautiously optimistic that a final deal can be reached and voted on before their fall adjournment.

Time is running out - without some agreement on a comprehensive energy package that would provide compensation for the clean power provided by Byron, Dresden, and Braidwood, Exelon will be forced to shut down and decommission their economically challenged facilities at Byron and Dresden, in the fall of 2021. Notification of this was provided to the PJM Interconnection back in June.



Australian Tesla Battery Fire - Fuels Concerns Over Lithium Risks



“A 13-ton Tesla Megapack caught fire at the Geelong, Victorian Big Battery Energy Project site in Australia, during its initial testing (pictured above). The “Victorian Big Battery Energy Project” has 210 Tesla Megapacks, each capable of storing up to 450 megawatt-hours of energy for their electric grid. It took 150 firefighters and four days to contain the blaze. This event coupled with the 38 others that have occurred since 2018 are causing concerns over the risks associated with Lithium-ion batteries.”

Utilities around the world are relying on large lithium-ion batteries to store renewable energy from the wind and the sun.

Predominantly, they are using the same type of batteries (*lithium-ion*) as those used in electric cars to deliver power quickly to their respective electric grids. The facilities that house these batteries are called Battery Energy Storage Systems or BESS, and they are generally located near their source of power input.

The amount of BESS deployed last year rose by 62%, and the market is set to grow 27-fold by the end of this decade. However, there have been a total of 38 large lithium-ion battery fires since 2018, according to Paul Christensen, a professor at Newcastle University. Lithium-ion batteries can catch fire

after a process called “thermal runaway”, which results when a battery is overcharged causing the temperature to rise rapidly initiating an unstoppable chain reaction and the energy stored within the battery is suddenly released, which can result in a fire or explosion.

In April, a fire at a Beijing lithium-ion battery installation killed two firefighters and took 235 firefighters to control.

Last September a Liverpool lithium-ion battery, owned by Danish renewable energy company Orsted, caught fire in the middle of the night.

In 2019, a grid-scale lithium battery fire in Arizona, threw a firefighter more than 20 yards from the container door, leaving him with a brain injury and broken ribs. That fire started after a short circuit in one of the lithium-ion battery cells occurred, according to a report released after the incident.

Most recently, a 13-ton Tesla Megapack caught fire at the Geelong, Victorian Big Battery Energy Project site in Australia, during its initial testing. It started out as a fire on one battery pack, but spread to a second pack, located close to it.

The “Victorian Big Battery Energy Project” has 210 Tesla Megapacks, each capable of storing up to 450 megawatt-hours of energy for the electricity grid. It took 150 firefighters and four days to contain the blaze. The firefighters worked to extinguish the fire from the two batteries and their containers, while cooling the surrounding area shipping containers to prevent the fire from spreading further. In addition, officials issued a toxic smoke warning to the nearby communities. After four days of battling the blaze, the fire was finally under control, but firefighters remained on the scene over the next 24 hours as a precaution.

Lithium-ion battery fires are notoriously challenging to fight. Gaseous suppression and water systems simply are not effective. While fire suppression systems can slow fire growth and heat release, they are not sufficient to provide complete extinguishment once thermal runaway has started. The most effective method of extinguishing these types of fires requires large amounts of water applied for many hours or even days. In many locations, this is not desirable or even achievable.

“Thermal runaway” in a single cell can quickly spread, cascading to adjacent battery cells, and culminating into a catastrophic high heat release fire event and even an explosion. To prevent thermal runaway requires early detection of off-gases and/or smoke with immediate action to shut down the battery because when off-gassing occurs, temperatures will rapidly rise and produce smoke - at this point catastrophic failure is imminent. Therefore, timely detection and response is imperative.

Puerto Rico Considering Nuclear as Part of their “New Green Deal”



“Puerto Rico is considering small modular reactors and microreactors as part of their “Green New Deal”. A group of volunteers, “The Nuclear Alternative Project”, are working with legislators to get nuclear included into the mix. Renewables and natural gas-powered plants are already planned, and NAP believes nuclear is needed to support the renewables as a strong and reliable baseload for the long-term stable operation of the grid. The team is in talks with such developers including GEH Hitachi Nuclear, Westinghouse, NuScale and X-Energy.”

The September 2017 Category 5 Hurricane Maria devastated Dominica, Saint Croix, and Puerto Rico.

Maria ploughed across Puerto Rico leaving thousands dead, at least \$90 billion in damage, and 95% of the island without power. It took five months to restore power to 25% of the people and nearly a year to restore power to all the residents. Pictured above – progress after three years!

Two years later, in 2019, the U.S. territory of Puerto Rico approved an ambitious bill (**PS 1121**) which call for power restoration in Puerto Rico and to be produced from 100% renewable (**solar and wind**) by 2050, with 40% renewables by 2025, and it included a ban on coal plants by 2028, in what has been called the island’s own “Green New Deal”.

Although PS 1121 is focused on renewable energy, a group of volunteers have formed “The Nuclear Alternative Project” (**NAP**). They are trying to include nuclear into the mix as the island

moves into phase 2 of their power restoration project.

Angel Reyes, a Licensed Senior Reactor Operator and Shift Technical Advisor at Exelon Nuclear, and a leader of NAP said, “After Hurricane George in 1998, I remember we lost power for months and after, everyone was talking about how we’ve got to fix the system, to get it in better shape, but nothing happened. People know the grid is unstable and is unreliable. We’ve been having these issues for a long time.”

The project’s preliminary feasibility study for small modular reactors (**SMR’s**) and microreactors for Puerto Rico was released in May 2020, and the team of volunteers behind it is hoping they will be cleared by U.S. legislators to advance to the next stage in the coming months.

Puerto Rico has some of the most expensive electricity prices of any U.S. state, at 19.91 cents/KWh (**kilowatt-hour**) compared to the national average of 12.9 cents/KWh. It is that, as much as reliability, that is driving residents, who are some of the poorest in the United States, to seek alternatives.

Solar power, in particular, is being sold to the populace as a way to cut bills in an environmentally friendly manner. However, the NAP team point out, that not only can

the island spend weeks under cloud cover - boosting the case for a baseload generator - but solar will be expensive when energy storage is factored in, with a battery energy storage system.

NAP points out, that advanced nuclear is needed to support the renewables as a strong and reliable baseload for the long-term stable operation of the grid.

The island’s power company, PREPA, currently in the process of privatization, expects some 3,600 MW of power generation to come offline in the next 10 years and their transition plan includes a mix of renewables and natural gas-powered plants.

NAP claims SMRs and microreactors are cost competitive with natural gas generation from mobile gas units and combined cycle units. And now, both general population and politicians are coming around to the idea of bringing nuclear into the mix.

Reyes said if a nuclear power station had been around during Maria, the island would have still had some power available - a statement backed up by advanced nuclear developers, who claim their reactors are safe and designed to withstand huge environmental impacts, partly as a response to the disaster at Fukushima.

Exotic Tetraquark Particle Revealed at the Large Hadron Collider



“The latest discovery from the LHC is a “tetraquark” – believed to exist only during the first instants of the Universe, when all matter was compressed in an extremely tight space. Its mass is around 4 times that of a proton and was predicted within a margin of error nearly 3,000 times better than in the discovery of the Higgs boson, back in 2012. To date, the Large Hadron Collider has revealed a grand total of 62 non-elementary particles or hadrons but the search for more continues.”

The Large Hadron Collider (LHC), located near Geneva, Switzerland (*pictured below*) is most famous for its demonstration of the Higgs boson in 2012. This discovery slotted into place the final keystone of the current classification of elementary particles. But the LHC has also netted dozens of hadrons, those non-elementary particles - like protons and neutrons - are made of quarks. In fact, this latest discovery, “tetraquark”, makes a grand total of 62 non-elementary particles or hadrons revealed at the LHC.

The established pantheon of particles, called the standard model, describes the basic building blocks of matter and the fundamental forces that act on them. It includes six different varieties of quark, their six antimatter counterparts and several other elementary particles, including electrons and photons. The standard model also includes rules for how quarks form composite particles called hadrons. The quarks are held together by the strong nuclear force, one of the four fundamental

forces of nature. The two most common quarks in nature are called ‘up’ and ‘down’; their possible combinations include neutrons (*one up and two downs*) and protons (*two ups and one down*).

Protons are the only hadrons known to be stable in isolation — neutrons are stable only when they are incorporated into atomic nuclei. All other hadrons form only fleetingly, from the collision of other particles, and decay in a fraction of a second. The LHC creates new kinds of hadrons by causing high-energy, head-on collisions between protons.

Most of LHC’s new hadron types have been spotted by LHCb, one of the four giant detectors in the 27-kilometer circular tunnel that holds the LHC – *one of these detectors is (pictured above) being lowered into the tunnel*. This latest achievement unveiled the previously unknown hadron, made of four quarks, called a “tetraquark” – a four-quark hadron – called T_{cc} .

Scientists believe that tetraquarks probably existed only during the first instants of the Universe, when all matter was compressed in an

extremely tight space. Creating them anew will help physicists test their theories of how particles interact through the strong nuclear force.

The data revealed the new particle’s properties so precisely that they were stunned. “My first reaction was: it’s my mistake”. However, the particle’s mass, which is around 4 times that of a proton, was nailed with a margin of error nearly 3,000 times better than in the discovery of the Higgs boson.

The search for new hadrons will continue, as dozens of combinations of quarks can give rise to hadrons. Scientists at the LHC believe there are 50 possible 2-quark hadrons, all but one of which have been observed, and 75 possible quark triplets (*and as many triplets of antiquarks*), of which nearly 50 have been seen. We are certain all the others exist, but they are difficult to create. Moreover, for each combination of quarks, there is an almost limitless number of possible heavier ‘excited states’ — distinguished, for example, by how fast they spin — each classified as a separate particle.



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Did You Know?



That Kim Hanemann (pictured below), an executive who guided Public Service Electric & Gas through an aggressive program of expanding its transmission assets, has been named president of New Jersey's largest gas and electric utility. She will become the first woman to head the utility in its 118-year history. She joined the utility as an associate engineer out of Lehigh University in 1986 and most recently served as a senior vice president and chief operating officer of PSE&G.



NuScale Power has signed a memorandum of understanding (MOU) with Xcel Energy to explore feasibility of Xcel serving as its SMR (small modular reactor) plant operator.

That NuScale Power has signed a memorandum of understanding (MOU) with Xcel Energy to explore feasibility of Xcel serving as its SMR (small modular reactor) plant operator. The MOU does not include a formal operating agreement, but it creates a framework for negotiating definitive agreements for Xcel Energy and NuScale to work together. Xcel Energy was the first major energy provider to announce a 100% carbon-free vision and Pete Gardner, senior vice president and chief nuclear officer for Xcel Energy said, "We're excited to explore a potential partnership with NuScale that advances the next generation of nuclear energy, a technology that has the potential to provide the reliable, carbon-free electricity needed for a clean energy future." **Earlier this summer UAMP (Utah Associated Municipal Power) Systems announce their plans to downscale the size of their project with NuScale from 12 SMR's to 6 SMR's but did confirm their commitment to building the power at the Idaho National Laboratory, planned at this time for operation by 2030.**



FPL seeks 2nd License Renewal for St. Lucie Units 1&2 – they provide 1,002 MW's each.

That Florida Power & Light is working with the NRC (Nuclear Regulatory Commission) to renew the operating licenses for St. Lucie Nuclear Units 1 and 2. If approved, this would be the 2nd license renewal for these units - originally licensed in 1976 and 1983 with their current licenses set to expire in 2036 and 2043, respectively. **These two Combustion Engineering reactors, located on Hutchinson Island along Florida's east coast, provide 1,002 MW's (megawatts) each. Unit 1 is wholly owned by Florida Power & Light. FPL is majority owner of Unit 2, while Orlando Utilities Commission and Florida Municipal Power Agency are part owners.**



AES Indiana acquiring Petersburg Solar Project from NextEra Energy Resources LLC, a 250-MW / 180 MW-hour energy storage facility connected to their coal-fired Petersburg Generating Station

That AES Indiana, a subsidiary of the Fortune 500 company - AES Corporation, is acquiring the Petersburg Solar Project in Pike County, Indiana, from NextEra Energy Resources LLC, a division of Florida-based NextEra Energy. This 250-MW solar and 180 MW-hour energy storage facility will be connected to AES Indiana's existing 2.1-GW coal-fired Petersburg Generating Station. "The Petersburg Solar Project is a win-win solution that adds new technologies to our generation fleet, while also keeping economic benefits right here in Indiana," said Kristina Lund, AES Indiana President and CEO. "We are excited to evolve our long-time partnership with Pike County, a community that has helped support and power the needs of Indianapolis for 50 years." Assuming approval by Indiana state regulators, the project is planned for completion and operation by May 2024. The NextEra Energy Resources website describes the Petersburg Solar Project as totaling close to \$300 million worth of investment and employing 300 construction jobs.

\$1 Trillion Infrastructure Bill – Could be Boost for Nuclear & Vogtle?



“The \$1 trillion infrastructure package unveiled by the Senate includes more than \$150 billion to boost clean energy and promote “climate resilience” by making schools, ports, and other structures better able to withstand extreme weather events such as storms and wildfires. one carbon-free power generation resource which may get a boost is nuclear power. For now, the bill includes tax credits for existing reactor-fueled plants, which could help Southern Company in their quest to complete Vogtle Units 3 & 4, the nation’s only current nuclear project in progress.”

The US Senate passed two infrastructure measures, a \$3.5 trillion budget blueprint for “soft” infrastructure projects and a \$1 trillion infrastructure bill, however widening political divisions within the Democratic party could yet derail the entire legislative package.

The \$1 trillion infrastructure package unveiled by the Senate includes more than \$150 billion to boost clean energy and promote “climate resilience” by making schools, ports, and other structures better able to withstand extreme weather events such as storms and wildfires. However, it falls far short of the President’s pledge to transform the nation’s heavily fossil-fuel powered economy into a clean-burning one and stop climate-damaging emissions from U.S. power plants by 2035.

It omits the mention of a Clean Electricity Standard, a key element of the administration’s climate plan that would require the electric grid to replace fossil fuels with renewable sources such as solar, wind and hydropower.

However, one carbon-free power generation resource which may get a boost is nuclear power. For now, the bill includes tax credits for existing reactor-fueled plants, which could help Southern Company in their quest to complete Vogtle Units 3 & 4, the nation’s only current nuclear project in progress.

The White House says the bipartisan deal is just the first step, with the proposed \$3.5 trillion bill to meet the President’s promise to move the country toward carbon-free electricity, make America a global leader in electric vehicles and create millions of jobs in solar, wind and other clean-energy industries, supporters say.

For now, the focus is on the bipartisan deal, which includes \$550 billion in new spending for public works projects, \$73 billion of that to update the electric grid and more than \$50 billion to bolster infrastructure against cyberattacks and climate change. There’s also \$7.5 billion for electric charging stations.

Citing the deadly Texas power outages earlier this year, the White House touted spending to upgrade the nation’s power grid and boost renewable energy. An Energy Department study found that power outages cost the U.S. economy up to \$70 billion a year. The bill also invests in demonstration projects for

advanced nuclear reactors, carbon capture and storage and so-called clean hydrogen that can be burned with few emissions.

The bill offers “glimmers of hope” such as a multibillion-dollar commitment to clean up and remediate old oil wells and mines, said Janet Redman of Greenpeace USA.

One of the lead negotiators, Senator Rob Portman - Ohio, acknowledged that no one got everything they wanted in the bipartisan bill. “But we came up with a good compromise that’s going to help the American people” he said.

“This is about infrastructure”, Portman said at the White House. “This is roads and bridges, but also lots of other kinds of infrastructure, including broadband, our water system and our rail system — all of which is good for the economy. This will lead to more efficiency and higher productivity, more economic growth”.

But the cost to taxpayers will be great, as it is quite clear that the public debt will rise as a result of this bill. In fact, the Congressional Budget Office projects that deficits will reach two trillion dollars within 10 years. So, costs will surely have to be cut elsewhere. Here, we explain all that we know about this situation so far.



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CA Drought Forces Shutdown of the Hyatt Powerplant



As if Californians didn't have enough to worry about in their battle for dependable and reliable electric power - one of their hydropower plants, located at Lake Oroville, had to shut down due to drought – adding another hole in their defense against rolling blackouts.

The Hyatt Powerplant, a fixture at Lake Oroville since the reservoir was built in the late 1960s. is a major source of electricity for California and it was taken out of service due to low water levels.

“This is the first time the Hyatt Powerplant has gone offline as a result of low lake levels,” said Karla Nemeth, the agency director for the California Department of Water Resources (DWR).

The Hyatt Powerplant has the capacity to generate up to 750 megawatts of electricity, enough power for about a half-million households, although it typically produces about 400 megawatts. This shutdown was anticipated for months as the drought continued to worsen and the CAISO (California Independent System Operator), managers of California's power grid are struggling with the loss of almost 1000 megawatts of hydropower as reservoir levels plunge throughout the state.

Lake Oroville is just one-quarter full, well below the normal level for August, and in anticipation of the drought continuing the state had planned for its loss in both water and grid management, but a loss of 15% of their capacity it a tough hurdle to overcome.

The CAISO has been working furiously to avoid a repeat of last August's two nights of rolling blackouts and they have had several close calls this summer, but so far, has managed to keep the lights on. Keeping our fingers crossed for California.

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