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September 2019 Newsletter



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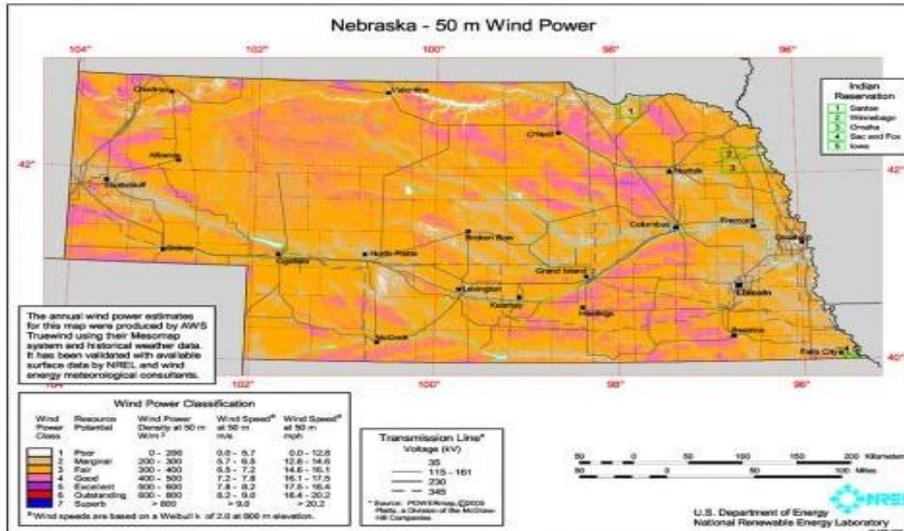


Did you know Labor Day's roots began in the late 19th century? In 1882 - as the trade and labor movement grew – two groups, the Knights of Labor and the Central Labor Union, organized a parade to

celebrate "Labor Day" in New York City. As the labor movement gained momentum Oregon, in 1887, became the first state to recognize it as an official public holiday. But by the time it became an official "federal holiday", in 1894, thirty states were already celebrating it as an official public holiday.

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Nebraska Expands Wind Power - 300MW Mulligan 1 Wind Farm



Near Lincoln, Nebraska, IEA (Infrastructure and Energy Alternatives) and EDF Renewables North America, plan to build the Milligan 1 Wind Farm – construction to START in September and it is expected to be operational by November 2020. This 300 MW-\$98 million projects will have 99 wind turbines – Vestas V110, Siemens 129, and Siemens 145 turbines. It will deliver power to the Southwest Power Pool - enough power to service 115,000 homes.”

IEA (Infrastructure and Energy Alternatives) and EDF Renewables North America plan to build a wind farm in southeastern Nebraska (Saline County).

The Milligan 1 Wind Farm is a 300 MW - \$98 million – project. It will have a total of 99 wind turbines, delivering power to the Southwest Power Pool electric grid - enough electric power to service 115,000 homes.

The Milligan 1 Wind Farm, located near Nebraska’s

capital city of Lincoln, will utilize a variety of different wind turbines - Vestas V110, Siemens 129, and Siemens 145 turbines.

EDF Renewables North America is the lead developer for the project, and construction is scheduled to begin in September with full operation expected by November 2020.

EDF Renewables North America has over 30 years of experience with renewables and a market

leading independent power producer and service provider.

IEA will support the project with their engineering and construction expertise - turbine foundations, turbine access roads, MV collection system, wind turbine installation and construction, and maintenance. IEA has assembled more than 7,200 wind turbines across North America.

In 2018, according to the American Wind Energy Association, the U.S. wind power industry increased its overall capacity by 8% to 96,433 MW – enough electricity to power more than 30 million homes.

The EIA (Energy Information Administration) has forecast that wind power electric generation will average 295 billion kilowatt-hours (kWh) in 2019 and 335 billion kWh in 2020.



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TVA's Vision – Reduce Carbon Emission by 70% - Includes Nuclear



“TVA plans to reduce their carbon emissions by 70% from the 2005 levels, by 2030. After four years of efficiency increases, solar power production, over 200 equipment modifications at Browns Ferry Nuclear Plant, and the addition of Watts Bar - Unit 2, they have already reduced their carbon emissions by 58% from 2005 levels. But President & CEO, Jeffrey Lyash says the greatest contribution in the reduction of carbon emissions will come from their nuclear fleet.”

TVA (Tennessee Valley Authority) continues to make progress in their plans to decrease carbon emissions by 70%, from 2005 levels by 2030.

After completion of a long-term commitment, which took four years and \$475 million, Browns Ferry Nuclear Station's output has increased by 14% or 465 MW's - requiring over 200 equipment modifications to three nuclear reactor units. When you couple this with their increases in efficiency, the addition of solar power production and the addition of Watts Bar-Unit 2, just two years ago, they have reduced carbon emission by 58% from 2005 levels.

And by 2030, with TVA's plans for additional increases in efficiency and solar power generation, their carbon emissions will be reduced by 70% from the previous 2005 levels.

TVA's President & CEO, Jeffrey Lyash (**pictured on the right**) says to achieve zero-carbon emissions will require

cost-effective alternatives – as TVA still relies on coal and natural gas generation and will continue do so over the next 20 years. In fact, we see the contribution to our electric generation as 15% from coal and 20% from natural gas for these next 20 years.

"Our objective is to lower our carbon intensity as much as we can, but doing it cost effectively," Lyash said.



TVA's plans include shut down of the final coal unit at the Paradise Fossil Plant, pictured below, by 2020,



and shutter Bull Run Steam Plant, pictured below, by 2023.



Coal provided 66% of TVA's power back in the 80's but has dropped to only 18% - just last year

TVA directors recently held a meeting to discuss and vote on their new integrated resource plan – looking forward to 2038. If it is approved, there will be further reductions in TVA's carbon emissions.

TVA already contracted 674 MW's of solar power to meet Google's and Facebook's data center needs (**construction at one of the Google data centers is pictured below**).



This April, in Millington, TN a 53 MW solar facility became operational and in May, TVA and Silicon Ranch placed into operation a 5 MW community solar project near Telford, TN. In addition, TVA has requested proposals for 200 MW's of additional solar.

CEO Lyash added, that although TVA is increasing efficiency and adding solar power production, the greatest contribution in their reduction of carbon emissions will come from our "nuclear fleet".

DOE Funding Increases Research for Continuous Fusion Operation



“Recent funding by the DOE has been awarded to increase research into sustaining steady-state or continuous operation of fusion reactors. Nuclear fusion is the process of making a single heavy nucleus from two lighter nuclei. This fusion – nuclear reaction - releases a large amount of energy and results in a nucleus that is heavier than either of the starting nuclei. The illustration on the right – shows the fusion of Deuterium and Tritium that results in the production of Helium, and the release of ENERGY and a Neutron.”

The U.S. Department of Energy (DOE) recently announced several funding awards based on their 2019 budget. A list of the awards can be found by going to <https://science.osti.gov/Funding-Opportunities>.

\$6.7 million in funding will be awarded to projects lasting up to three years in duration. These projects range from developing new means of controlling plasma instabilities, to improving diagnostics, to advancing the understanding of material erosion that takes place inside fusion reactors.

Projects were selected by a competitive peer review under the DOE Funding Opportunity Announcement, “Collaborative Fusion Energy Research in the DIII-D National Program,” sponsored by the [Office of Fusion Energy Sciences](#) within DOE’s Office of Science.

\$14 million in funding was awarded to 10 university-led research projects using the DIII-D Tokamak National Fusion Facility, in San Diego, CA.

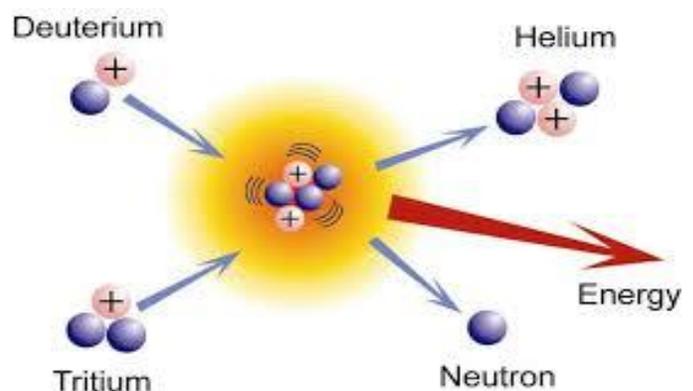
One of the major goals of this research is to develop

methods of sustaining steady-state or continuous operation of fusion reactors, an essential step toward eventually making nuclear fusion a practical energy source. “Fusion remains one of the world’s most promising potential sources of energy,” said under-secretary for science Paul Dabbar. “This research—aimed at achieving steady-state operation of fusion reactors—will be an important milestone on the road to sustainable energy from fusion.”

The research focuses on high-priority challenges in “magnetic confinement” of plasma (*a hot mixture of ions and free electrons*) on the pathway toward eventual development of a contained, self-sustaining fusion reaction. This research will be performed on the DIII-D Tokamak, the largest magnetically confined plasma facility in the United States, operated by General Atomics.

The DIII-D Tokamak (*pictured on the left*) is so-named because the plasma is shaped like the letter D. Earlier work by General Atomics demonstrated that certain shapes suppressed instabilities in the plasma, which led to much higher plasma pressures and performance. This shaping is now widely used on modern designs - called “Advanced Tokamaks”.

These Advanced Tokamaks are characterized by operation at high plasma β through strong plasma shaping, active control of various plasma instabilities, and achievement of steady-state current and pressure profiles – producing high energy confinement for high fusion gain (*ratio of fusion power to heating power*) or in other words, **PRODUCING MORE ENERGY THAN THEY ARE CONSUMING.**



Current BESS Cost - Makes 100% Renewables Unachievable !



“Wind and solar require a grid that can smooth-out and balance their fluctuations – “grid flexibility” – because renewables can’t react to the grid. Instead, the grid must adjust to whatever output they can provide. Most everyone agrees, the most promising way to provide “grid flexibility” with renewables is through battery energy storage systems (BESS). But the technology with battery-based energy storage systems (BESS) needs a 90% reduction in current costs to make them “cost effective”. So, today, 100% renewables are unachievable – due to its cost.”

As the electric grid changes – the question that is asked ... Can we meet our electrical needs with 100% renewables?

Some believe YES, but it will require energy storage and savvy management of the demand. Some say NO, because renewables will ultimately fall short, and even with energy storage, they will need assistance from nuclear power, natural gas, coal, or some other electrical source to meet our energy needs – 24/7.

Wind and solar, alone, cannot provide our energy needs because the weather or time of day can vary their output. Wind and solar require help with a grid that can smooth-out and balance the fluctuations – “grid flexibility”. In other words, renewables can’t react to the grid, instead, the grid must adjust to whatever output they can provide.

Most everyone agrees that the most promising way to provide “grid flexibility” is through energy storage – mainly battery energy storage systems (BESS).

So now the question has become ... How much would it cost to have enough BESS to allow for 100% renewables? In order to determine this a model was developed after research, review, and assessment of over 20 years of grid data – this model is called EAF (equivalent availability factor).

100% EAF means that the grid system (*renewables plus storage*) can match supply to the demand, 100% of the time - providing baseload demands plus any intermediate and peaking power demands, during real-world conditions, every hour of every day, for 20 years.

Since no power system is 100% reliable – outages, brownouts, and blackouts will occur – especially over a 20-year timeframe. So, a more realistic, though still an extremely high benchmark, model was chosen - 95% EAF. But even at 95% EAF, utilizing today’s energy storage cost added to the renewable’s generation cost, the total cost was well beyond what we are paying now.

Other things were then considered, that could enhance grid flexibility outside of BESS, and the most promising were load flexibility, enhanced long-distance transmission, and dispatchable renewables.

Load flexibility is dependent on the transition of the nation’s electric systems to smart grid technology - allowing grid system operators to shift demand-side energy consumption, when required.

Enhanced long-distance transmission will require changes along our transmission network that will enable grid system operators to move energy from one region (where

more energy is available than needed) to another (where the energy is needed).

Dispatchable renewables are renewables that can work like today’s “peaker” units – using facilities like hydro and pump storage to supply the short-term spikes in demand.

In summary, the research at MIT (*Massachusetts Institute of Technology*), published in the journal *Joule*, found that the technologies with battery-based energy storage systems (BESS) would need a 90% reduction in their current costs to make them cost effective.

Today, both cost and storage capabilities are incapable of meeting the grid system demands.

In addition, the grid infrastructure needs changes to accommodate “grid flexibility”. But, as technology improves, and the need to achieve 95% EAF grows – it can be accomplished. But to do it now in unachievable and very costly.



Did You Know?



“That DEPCOM Power has begun construction for one of Louisiana’s largest solar power projects? It is expected to be operational in the 2nd quarter of 2020. This 50MW facility – Capital Region Solar – will have 197,000 solar panels, located on 560 acres in the West Baton Rouge Parish. Entergy Louisiana will take the power from Capital Region Solar under a 20-year power purchase agreement.”



	<p>That according to South Carolina’s Attorney General, Alan Wilson, the remainder of the 1 metric ton of plutonium at the Savannah River Site (SRS) has been shipped out of South Carolina. The U.S. Energy Department was ordered in 2017 to remove that much plutonium by January. Federal court records indicate that half of it was sent to Nevada’s NNSA site but where the other half has gone has not been disclosed. South Carolina sued the federal agency after it halted a plan, to turn plutonium once used to make nuclear weapons into fuel, for nuclear reactors. Based on that suit, the Energy Department still owes South Carolina \$200 million in fines for failure to meet their commitment.</p>
	<p>That the Public Service Commission in Georgia is currently finishing up their review of Georgia Power’s Integrated Resource Plan (IRP). It is a three-year update to the 20-year energy plan for Georgia Power Company, and the biggest growth opportunity for Georgia’s energy mix will be solar power. Although, Georgia had no solar capacity in 2010 - based on current plans Georgia will have close to 5,000 megawatts of solar by 2024.</p>
	<p>That the Freeport LNG plant in Texas will start loading its first LNG cargo very soon, as an empty LNG tanker is in route to the facility. Freeport LNG is slated to eventually export 13.9 million tons of LNG and they were scheduled to begin commercial production in September. To have the facility begin operation ahead of schedule would be a rare occurrence, as the industry is ridden with delays and cost overruns.</p>
	<p>That Dominion Energy employees are currently moving into their new 20-story office building called 600 Canal Place. It is located next to the company’s One James River Plaza building at 701 E. Cary Street. Dominion began moving employees into 600 Canal Place last month and plans to complete the move this September. The 960,000-square-foot building will house 1,200 employees and overlook the James River and downtown Richmond. Dominion Energy plans to demolish the office tower located at One James River Plaza in downtown Richmond and have filed for permission with the city of Richmond.</p>
	<p>That around the world eleven million people worked in renewable energy in 2018, according to recent analysis from the International Renewable Energy Agency (IRENA). This represents an increase of 700,000 compared to 2017. And in the U.S., more than 12,000 jobs were added in 2018 for solar – a greater increase is expected for 2019.</p>
	<p>That there is new leadership at Pacific Gas & Electric (PG&E) - Andrew M. Vesey, global industry veteran with 35 years of utility experience, will take PG&E through their Chapter 11 bankruptcy reorganization period. Most recently he was managing director and CEO of Sydney-based AGL Energy Ltd. – prior to that – he served leadership roles at AES Corp., Entergy Corp. and Niagara Mohawk Power Corp, while starting his career at Consolidated Edison in New York.</p>

Andrew M. Vesey

Ohio Lawmakers Pass HB 6 - Reliability & Renewables - 85¢/month !



“After five years, Ohio lawmakers have passed HB6 (House Bill 6) - a subsidy bill that will require Ohio residential customers to pay a monthly surcharge of 85¢, and industrial plants up to \$2,400/month. It will provide \$150 million, annually, beginning with quarterly payments in April 2021 for Perry and Davis-Besse Nuclear Stations and \$20 million, annually, for solar projects, such as, the six large solar fields in Hardin County and southern Ohio. The Senate revision brought down rates by reducing the renewable energy standards to 8.5% and the energy efficiency mandate to end in 2020.”

Finally, after five years, Ohio lawmakers passed HB 6 (*House Bill 6*) to save the state’s nuclear plants.

This subsidy bill will require Ohio residential customers to pay a monthly surcharge of 85¢, and industrial plants will pay up to \$2,400/month.

\$150 million (annually) will go to FirstEnergy Solutions (FES), beginning with quarterly payments in April 2021 for their Perry and Davis-Besse nuclear plants.

\$20 million (annually) will go to solar projects, such as, the six large solar fields in Hardin County and southern Ohio.

Passage of HB 6 will also provide nearly \$50 million per year in new customer-paid subsidies to the Ohio Valley Electric Corporation (OVEC), which operates two large coal-burning power plants, Kyger Creek (Galia County, OH) and Clifty Creek (Madison, IN) built in 1955. This will result in surcharges for OVEC customers of up to \$1.50 per month for residential consumers and \$1,500 for major industrial users.

FirstEnergy Solutions, owner of both Perry and Davis-Besse Nuclear Stations - which directly employs ~1,400 - announced over a year ago, that it would have to shut-down and close these two nuclear stations (*Davis-Besse in 2020 and Perry in 2021*) without outside funding. So, FES

had already begun preparations for post-shutdown operations as required by the Nuclear Regulatory Commission (NRC).

Passage of HB 6 also reduced the state's renewable energy mandate. The Ohio Senate said they passed this revision of the renewable energy mandate to reduce the electric rate subsidy. The previous standard would require 12.5% of renewable energy sources by 2026 – but this Senate revision reduced the standard to 8.5% of renewable energy sources by 2020, 6 years earlier.

HB 6 does nothing to re-open the state for the development of utility-scale wind farms, but it does allow manufacturers to contract on-site wind turbines generating up to 20 MW's, provided the power is used on-site. This was an attempt in renewing the development of wind power, as in 2014, lawmakers added restrictive provisions that have stymied wind power projects ever since.

Nuclear advocates have cheered the bill's passage, but other groups have begun to point out its misgivings and some have vowed to put it to a referendum vote in 2020.

The *Nature Conservancy* said, HB 6 is a step back from what we had in statute for the clean energy standards.

Ohioans Against Corporate Bailouts have filed their second summary petition with the Ohio Attorney General (AG) in seeking a referendum on the 2020 ballot. If the petition is approved, by both the AG and the Ohio Secretary of State, they will need 265,774 valid signatures to qualify for the ballot.

The *Nuclear Energy Institute* said, the decision echoes the support we've seen in Connecticut, New Jersey, Illinois, and New York and reaffirms the major role nuclear energy has in lowering carbon emissions by providing carbon-free emissions.

Passage also allowed FES to begin the process of rescinding deactivation orders for Perry and Davis-Besse, and resume plans for refueling Davis-Besse in the spring of 2020.

One concern, associated with the delay past June 30th, was Davis-Besse's availability this winter. You might recall the Polar Vortex experienced in Ohio last winter. Then, Davis-Besse and Perry proved their reliability and resiliency by providing power to ~1.7 million Ohioan homes without disruption, while many in the neighboring states were without power and temperatures well below zero. So, many of FES's customers believe having Davis-Besse and Perry available this winter is important for Ohio!



NRC Approves Final Rule on MDBE (SECY-16-0142)



The NRC (Nuclear Regulatory Commission) has approved its final rule on the Mitigation of Design Basis Events (MDBE) or SECY-16-0142.

Pictured on the left is a FLEX Building with some of its associated equipment, located at one of Southern Company's nuclear power plants – Plant Hatch.

This rule, based on “lessons learned” from the March 2011 Fukushima Daiichi accident, requires U.S. commercial reactor operators to maintain resources and procedures needed to cool a reactor’s core and spent fuel pool, as well as preserve the reactor’s containment and the sites ability to transfer heat to the environment, following an event that disables a site’s normal and emergency electrical power sources. This ruling also requires the maintenance of equipment that can reliably measure spent fuel pool water levels following a severe event and the preservation of resources needed to protect the core, containment, and spent fuel pool from external hazards.

Although approved, two NRC Commissioners - Jeff Baran and Stephen Burns – shared concerns over omission of several elements from the “Draft – Final Rule” that centered on the belief that FLEX equipment, at some of the nuclear plant sites, would not be protected against their reevaluated hazards. Several senators sided with them on this concern, but Chairwoman, Kristine Svinicki, submitted a letter to Senator Feinstein explaining the decision – “The pros of the commissions majority approach in the final rule are that it retains the FLEX equipment that is already in place at every operating plant in the U.S., allows for case-by-case determinations about further enhancements to the plant or the FLEX equipment, is risk-informed and performance-based, provides licensees flexibility to address site specific hazards and configurations, reflects lessons learned since the proposed rule was issued, and has proven to be effective at maintaining safety.” In addition, Chairwoman Svinicki, along with NRC Commissioners Caputo and Wright, said that the decision to further enhance FLEX equipment at a given site will still be made on a case-by-case basis using current data, as is stated within the final rule, and their decision to omit certain requirements from the final rule was made in accordance with the NRC’s Backfit Rule.

To learn more visit - <https://www.nrc.gov/reactors/operating/ops-experience/post-fukushima-safety-enhancements/file>:

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