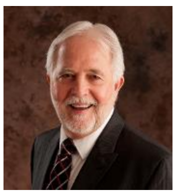
GTTSi

Global Technical Training Services, Inc. Newsletter



The State of the Industry

Sid Crouch, GTTSi Chief Technical Consultant

Federal subsidies for clean energy are projected to cut electricity emissions in half by 2030, but "***Houston, we have a problem***". This cannot happen unless our transmission capacity expands twice as fast (***see article p.2***). The volume of these projects is overwhelming the grid's transmission and distribution system. For example, plans to install 3,000 acres of solar panels in Kentucky and Virginia have been delayed for years, and wind farms in Minnesota and North Dakota have been abruptly canceled. In 2021, more than 8,100 energy projects, the majority of which being wind, solar, and battery**,** were waiting for permission to connect to their respective electric grids. This was up from 5,600 projects the prior year. The PJM Interconnection, the nation's largest regional grid, had so many ***grid connection application requests*** that they announced a freeze on new applications until 2026. Today it takes ~4 years for a developer to get approval, 2X the time it took a decade ago. If a company does get approval, they often face hurdles even more difficult and costly, such as providing their own transmission lines and upgrades, because the local grid is at capacity and can't accommodate additions. According to Lawrence Berkeley National Laboratory, fewer than one-fifth of solar and wind proposals make it through the ***interconnection queue***. The Inflation Reduction Act did little to address barriers such as permit holdups, local opposition to gaining "right of way", or land purchase constraints. Unless these obstacles are resolved, the $370 billion in federal subsidies won't translate into the deep emissions cuts our lawmakers had envisioned.

I welcome your comments or questions - sid.crouch@gttsi.com

Highlights

Minority and Woman-Owned MWBE Business Enterprise

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RENEWABLE POWER AVAILABLE BUT WITH NOWHERE TO GO

Today in the U.S. we have ~1530 miles of high voltage direct current (*HVDC*) lines. Why is this important? Because HVDC lines are the kind of transmission lines needed to optimize transmission of renewable energy from their remote locations to our grid.

Note: A high-voltage direct current (HVDC) transmission line, sometimes called an electric superhighway, uses direct current (DC) for electric power transmission, in contrast with the more common alternating current (AC) transmission systems.

Most HVDC links use voltages between 100 kV (kilovolts) and 800 kV. HVDC allows power transmission between AC transmission systems that are not synchronized. Since the power flow through an HVDC link can be controlled independent of the phase angle between source and load, it can stabilize a network against disturbances due to rapid changes in power. HVDC also allows the transfer of power between grid systems running at different frequencies, such as 50 and 60 Hz. This improves the stability and economy of each grid by allowing the exchange of power between previously incompatible networks.

High voltage is used for electric power transmission to reduce the energy lost in the resistance of the wires. For a given quantity of power transmitted, doubling the voltage will deliver the same power at only half the current.

P (power) = I (current) x E (voltage)

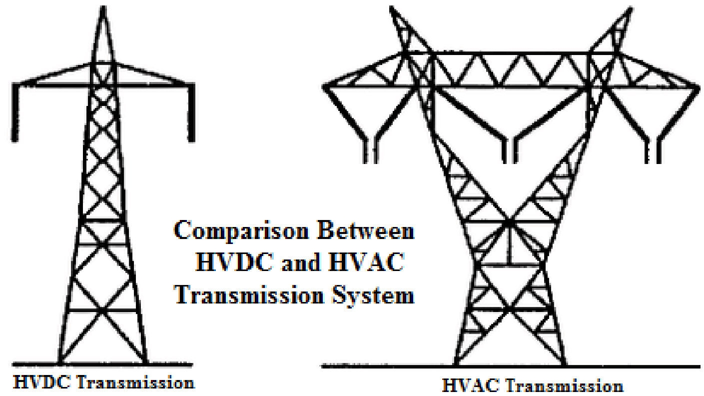

Photo Credit: Electrical Deck

Power is lost in transmission due to the heat generated as the current flows through the wires and is called “line losses”. The “line losses” or power lost due to heat, is proportional to the current squared, therefore using half the current at double the voltage will reduce the line losses by a factor of 4.

P (power) = I^2 (current) x R (resistance)

Line losses in transmission lines can also be reduced by decreasing the resistance. This can be done by increasing the size of the conductor(s); however, larger conductors are heavier and much more expensive.

HVDC cannot be used in our practical everyday applications (***motors and lighting***); therefore HVDC converters are used to convert the HVDC to HVAC (***high voltage alternating current***). HVDC converters are capable of converting up to two gigawatts (GW) and with voltage ratings of up to 900 kV, even higher voltage ratings are technically feasible. A complete converter station may contain several converters connected in series and/or parallel to achieve the *(continued)*

voltages needed. Transformers are then used to change the AC voltage levels to the voltages needed for the end-use equipment.

Although much has been done to accelerate the growth of renewables, this has not occurred with transmission lines – emphasis on their development has been left behind. Transmission growth over the past two decades has been about 1.5% and during the past five years it has decreased to about 1%. To meet our decarbonization ambitions, transmission growth will have to be ramped up to about 6% annually. According to the DOE (***Department of Energy***) our transmission and distribution infrastructure needs to expand 60% by 2030 and may need to triple by 2050. It seems doubtful that this can be accomplished as many obstacles stand in the way.

According to Lawrence Berkeley National Laboratory the volume of new electric capacity waiting to be connected to the grid is "growing dramatically." At the end of 2022, power projects capable of collectively generating 2,040 gigawatts (***GW)*** were in the queue, meaning that they had filed grid connection requests (***see the State of Industry article***) and were in various stages of planning or construction. This was more than the installed 1,250 GW capacity of the entire US power plant fleet. Over 95% of this energy capacity was from renewables - solar, wind, and battery storage – and sadly, only ~15% of these projects were completed. The average time it takes for a project to reach completion, from start to grid connection, is increasing. Projects that came online in 2022 took 5 years; in 2015, it was 3 years; and in 2008 it was less than 2 years.

One reason it is difficult to secure permits is the ability to gain access or purchase the needed land. This is often obstructed by people who object to power lines being draped across their skies or viewable environment. Some local and state governments have even passed legislation blocking eminent domain in order to protect local interests. Federal efforts to create an inter-state transmission corridor, in which swathes of land would be designated to host transmission infrastructure, have likewise been stymied in some cases by the states.

Another reason is that it is difficult to integrate thousands of small solar, wind, and battery storage projects, distributed widely across the US, onto the grid, due to their remote locations. For example, wind farms are usually built in the gusty wind corridors that are in sparsely populated areas; hydropower projects are located further from towns and cities than natural gas or nuclear power stations. The greater the distance, the longer the power lines that need to be laid, increasing not only the cost but also the probability of opposition to obtaining permits for purchasing or gaining access to the land needed to accommodate the infrastructure necessary to support these power lines.

In January 2022, the DOE announced their *Building a Better Grid Initiative* to improve the power grid with $20 billion in funding. However, J.P. Morgan doesn't expect this to have any dramatic affect for renewables in the near future because they believe that the addition of more HVDC transmission lines will not begin until 2026. This is much too late to really help achieve the so-called "climate goals" for 2030. By contrast, India is projected to increase their transmission capacity eightfold by 2026.

Our opportunity to make the transition is slipping away. It will take a constituted effort to create an environment where transmission lines can be built to accommodate the surge of renewable capacity that is available. It can be done, but LEADERSHIP at the highest levels must gather all the constituents together and create a comprehensive plan to make it happen.

GTTSi TEAM MEMBER HIGHLIGHT: GEOFFREY TOBIAS

Meet GTTSi employee, Geoffrey Tobias.

Geoffrey has 40+ years of expertise in planning, management of maintenance activities in electrical distribution, power generation operations, and nuclear operations. His expertise extends from planning through delivery, defining workplace hazards, organizing and coordinating projects, monitoring safety, assisting project construction personnel, and material procurement.

Geoffrey is currently on assignment at Plant Vogtle as a member of the Construction Management Team for the Vogtle Project. His background in Field Engineering, ITP Testing, Construction, and Project Management makes him a perfect fit for this project.

Unit 4 Hot Functional Testing at Plant Vogtle was announced completed on May 1. Photo Credit: Georgia Power Company

He was previously certified as a (***NQA-1)*** Test Engineer at Y-12 in Oak Ridge, TN and re-certified at Vogtle for his work on Unit 4.

At Vogtle, Geoffrey assisted the Area Managers and General Superintendents with the construction schedule, using resources like Maximo, Navisworks, Documentum, Set Route, and Microsoft Office software.

Geoffrey performed walkdowns during various phases of construction. Whenever a problem was noted, he promptly provided input on how to solve it, and in some cases, initiated a condition report (***CR***) and/or an engineering service report (***ESR***), when necessary.

Geoffrey's input to the Penetration Seal Team helped them meet the established deadline for Hot Functional Testing (***HFT***). His experience, expertise, and attention to detail was essential in processing the test packages for completion, needed for the ITP Closure Group to ensure systems and controls were ready for HFT.

Geoffrey's contributions have not gone unnoticed by Southern Company, the Construction Management Team, and GTTSi. We are so proud of Geoffrey and grateful he is a member of our GTTSi Team.

Geoffrey is just one of the many industry experts at GTTSi - check us out at www.gttsi.com or on LinkedIn www.linkedin.com/company/gttsi

EPA TARGETS OUR NATION'S FOSSIL FUELED POWER PLANTS

The EPA (***Environmental Protection Agency***) is proposing regulations on the control of carbon emissions from our nation's electric power plants. If it becomes regulation, it will be the first time the EPA has limited carbon emissions from power plants, which they claim is 25% of our greenhouse gas emissions.

Most of our 3,400 coal-fired and natural gas-fired power plants would be affected as the regulation would require these plants to reduce, capture, or eliminate greenhouse gas emission by 2040. Carbon capture is currently used by <20 plants.

This regulation does not require carbon-capture technology but instead, sets a limit or cap on the pollution rate. This allows the plant operators to choose the technology they would employ, or in some cases, switch to a different fuel source, such as green hydrogen which does not emit these gases or changeover to nuclear, perhaps utilizing the new SMR (***small modular reactor***) technology.

The EPA said they intend to be flexible, setting various targets based on the size of the power plant and whether it is used intermittently or as a baseload provider. Plants already scheduled for closure most likely wouldn't comply since the implementation timeframe is 2040.

According to the EIA (***Energy Information Administration***), roughly 60% of our electricity was generated by fossil fuels, like coal, natural gas, and oil this past year. If we add in nuclear, the number approaches 80%.

The EPA claims that the incorporation of the tailpipe emission controls (forcing the transition to ***electric vehicles***), methane leak controls from oil and gas wells, this proposal of power plant emission controls, and the IRA (***Inflation Reduction Act***) will put the U.S. on track to cut greenhouse gas emissions in half by 2030 and stop the addition of carbon dioxide to the atmosphere by 2050.

This proposal will meet stiff opposition due to many factors. These fossil plants provided 60% of our electricity in 2022 - 2,554 billion kW-hours ***(kWh)*** or 2,554 million MW-hours (***MWh***). How do we replace that and at what cost, especially when we add the expected surge in electricity demand with the transition to electric vehicles?

How long can we tolerate rolling blackouts or brownouts, which seems inevitable, with all these changes?

If we replace the loss with renewables, they will need energy storage. What will that cost? Current estimates are $300 to $600 per kWh.

If we replace the loss with SMR technology, what will that cost? Current estimates are $3,000 per kW.

Can you or our businesses tolerate electric rates that are 2 to 3 times their current value? Clearly there is much to consider!

TEST YOUR ENERGY KNOWLEDGE

1. Which of the countries will emit the greatest share of carbon emissions predicted for 2023?
a. India
b. European Union
c. United States
d. China

2. What energy source can produce 656 billion kilowatt-hours with the least amount of steel?
a. Solar
b. Wind
c. Natural gas
d. Nuclear

3. Which energy source will produce the most energy in the US for 2023?
a. Natural gas
b. Oil
c. Nuclear
d. Coal

4. What percentage of America's electricity will be produced from wind in 2023?
a. 6%
b. 11%
c. 16%
d. 26%

5. What energy source has the largest death print (***kills the most people per kilowatt-hour produced***)?
a. Nuclear
b. Natural gas
c. Coal
d. Wind

6. What energy source has the smallest death print (kills the fewest people per kilowatt-hour produced)?
a. Nuclear
b. Natural gas
c. Coal
d. Wind

7. How long ago were the uranium atoms, used today in all nuclear reactors, created?
a. 1.7 billion years
b. 4.5 billion years
c. 6.3 billion years
d. 13.8 billion years

8. Which country will build the most nuclear power plants in 2023?
a. Russia
b. South Korea
c. China
d. United States

9. Where would be the best place to build new wind farms to produce the most power per turbine?
a. Washington State
b. Tornado Alley
c. Georgia
d. Southeast Texas

10. Adjusting for "all-in" costs of load following integration with energy storage, transmission requirements, and renewable integration – which energy source is the cheapest for producing electricity? (Taxpayer subsidies do not reduce costs, they just shift costs from ratepayers to taxpayers)
a. New solar
b. New natural gas
c. New wind
d. Existing nuclear

11. Which type of new power plants built in 2023 will collectively generate the most power?
a. Coal
b. Natural gas
c. Wind
d. Solar

12. We have over 80,000 dams along the rivers in the US. How many are equipped to produce power?
a. 3%
b.10%
c.15%
d.20%

Answer Key 1. d. China, 2. d. Nuclear, 3. b. Oil, 4. b. 11%, 5. c. Coal, 6. a. Nuclear, 7. c. 6.3 billion years 8. c. China, 9. b. Tornado Alley, 10. d. Existing nuclear, 11. b. Natural gas, 12. a. 3%

GTTSI CHIEF TECHNICAL CONSULTANT VISITS COMANCHE PEAK

GTTSi Chief Technical Consultant, Sid Crouch, recently visited Comanche Peak in Glen Rose, Texas. Sid was there to consult with the client and the GTTSi employees working there. Sid said, "It was a good visit and always great to be at Comanche Peak. The people there are very professional, knowledgeable, and also very warm and open to talking about their operations."

Since Sid was involved with the startup of Unit 2 working directly with the Operations Manager and helped with the training for all the Initial Licensed Reactor Operators and Senior Reactor Operators, Sid conveyed that "It was almost like going home again."

Sid said it was really rewarding to see our employees "paying it forward" with the NEO (Nuclear Equipment Operator), OLLP (Operator License – License Prep) , and ILOT (Initial Licensed Operator Training) classes.

Visiting the procurement and training organization was enlightening. Concerning training, Sid discussed the current contracts, the Initial License Operator Audit Exam, and how GTTSi can add additional value to the Comanche Peak programs. With procurement, Sid was able to meet the GTTSi direct contact, Ms. Krystal Day, for the very first time.

Dee McGaughey – Simulator Training
(RO, SRO, BOP)

Jimmy Barnard – Simulator Training
(Shift Supervisor and STA)

JUNE 2023

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GTTSi Job Board

GTTSi has been providing professional services to the energy and nuclear industry since 1980. We are an MWBE (***minority woman-owned business enterprise***) and have served over 80% of the US commercial nuclear facilities, 8 Federal agencies and prime contractors, and one foreign government. If you are qualified and interested in any of the job opportunities listed below, please contact us at ginfo@gttsi.com or call **864.882.3111.**

- Transmission & Substation Engineer -Remote
- Electrical Engineer -Turbine Experience -Waynesboro, GA
- Mechanical Engineer -Turbine Experience-Waynesboro, GA
- Commissioning Manager -Juno Beach, FL
- Battery Energy Storage Engineer -Juno Beach, FL

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