BEFORE THE
MISSISSIPPI PUBLIC SERVICE COMMISSION

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| SOUTHERN CROSS TRANSMISSION LLC<br><br>MPSC DOCKET NO. 2017-UA-079 | IN RE: | PETITION BY SOUTHERN CROSS TRANSMISSION LLC FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE PROPOSED SOUTHERN CROSS TRANSMISSION PROJECT |

# ATTACHMENT C

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# DIRECT TESTIMONY

OF

DERAL DANIS

ON BEHALF OF

SOUTHERN SPIRIT TRANSMISSION LLC

FEBRUARY 2023

**DIRECT TESTIMONY OF DERAL DANIS**

## I. INTRODUCTION AND EXPERIENCE

**Q1. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, EMPLOYER AND JOB TITLE.**

A. My name is Deral Danis. My business address is 1201 Louisiana Street, Suite 3200, Houston, Texas 77002. I work for Pattern Energy Group ("Pattern") as Senior Director of Transmission.

**Q2. ON WHOSE BEHALF ARE YOU TESTIFYING?**

A. I'm testifying on behalf of Southern Spirit Transmission LLC ("SST") and in support of the SST's Petition for a Certificate of Public Convenience and Necessity (the "Petition") for the Mississippi facilities which SST proposes to construct as part of the Southern Spirit Transmission Project (the "Project").

**Q3. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.**

A. I have Associate of Science and Bachelor of Science degrees in Electrical and Computer Engineering Technology from Purdue University and a Master of Science in Electrical and Computer Engineering from Kansas State University.

I have been working in the electrical power industry for over 17 years. I started my career as an operations engineer in Southwest Power Pool, Inc.'s ("SPP") operations control center as a NERC-certified Reliability Coordinator providing analytical support to SPP's control room operations personnel. I then moved into a role tasked with simulating the grid in the Southeastern U.S., including the Mississippi electric system, at Constellation Energy which provided wholesale load supply and portfolio management services to various municipal utilities and power cooperatives in the Southeast. In this role I helped optimize the ability to procure power and deliver it reliably to these utilities as well as participated in various stakeholder endeavors nationally and locally such as with the Midcontinent Independent System Operator, Inc. ("MISO") and the Southeastern Regional Transmission Planning group. Thereafter, I joined the team at Clean Line Energy Partners LLC ("Clean Line") as a Transmission Engineer where I focused on the grid integration, interconnection, and operations plans for Clean Line's portfolio of High Voltage Direct Current ("HVDC") transmission lines across the U.S. Following my time at Clean Line, I joined ConnectGen, LLC where I supported the development of renewable energy projects (i.e., wind, solar and energy storage) across the U.S., including interconnection and integration support, equipment procurement, contracting with Engineering, Procurement, and Construction ("EPC") contractors, and engineering design reviews, among other activities. More recently in my role as Senior Director of Transmission at Pattern, I have been leading a team of professionals tasked with analyzing the U.S. power grid to identify opportunities to develop new renewable energy projects and transmission assets that provide the best value for load serving entities while maintaining or enhancing grid reliability and resiliency. In this role I also focus on the interconnection and integration work on Pattern's transmission projects including the SunZia Transmission Project – a 3,000 MW, ±525-kV HVDC transmission link between New Mexico and Arizona – as well as the Southern Spirit Transmission Project. My resume is attached hereto as Exhibit DD - 1.

**Q4. HAVE YOU TESTIFIED PREVIOUSLY BEFORE THE MISSISSIPPI PUBLIC SERVICE COMMISSION?**

A. No.

**Q5. HAVE YOU REVIEWED THE PRIOR FILED TESTIMONY IN THIS DOCKET FROM DAVID PARQUET?**

A. Yes, I have.

**Q6. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

A. The purpose of my testimony is primarily to address:

1) the expected configuration of the Project,
2) an update on the planned base load capacity of the Project,
3) an update on the HVDC technology deployment approach for the Project,
4) the status of the interconnection work to integrate the Project into the existing bulk electric system and,
5) the operational plans for the Project.

**Q7. IS IT INTENDED FOR YOUR TESTIMONY TO SUPPLEMENT DAVID PARQUET'S TESTIMONY?**

A. No. Several aspects of the Project have changed since David Parquet's testimony was written and therefore my testimony will supersede that of Mr. Parquet's.

## II. OVERVIEW OF THE SOUTHERN SPIRIT TRANSMISSION PROJECT

**Q8. PLEASE EXPLAIN THE PROPOSED CONFIGURATION OF THE PROJECT IN MISSISSIPPI.**

A. The proposed facilities in Mississippi include the ±500-600-kVdc transmission line that will contain the HVDC transmission conductors, metallic return conductors, optical ground wires, and associated insulators and hardware. A family of structures representative of the typical tangent and turning angle structure have been developed by SST's engineering consultant Burns & McDonnell, Inc. and are provided as Exhibit DD - 2.

In addition to the HVDC transmission line facilities, an HVDC converter station will also be located in Choctaw County, Mississippi (the "Mississippi Converter Station") where energy will be converted from DC back to AC (and vice versa) to be transmitted to demand customers in Mississippi and beyond.

Adjacent to the Mississippi Converter Station will be a 500-kVac switching station (the "Mississippi Switching Station") where AC transmission lines can be interconnected to "pick-up" the energy that is transmitted to the Mississippi Converter Station.

The Mississippi Switching Station is proposed to interconnect to the electric grid in Mississippi at the nearby Wolf Creek Substation owned by Entergy Mississippi via a short 500-kVac transmission line (less than one mile).

**Q9. WHY IS THE PROJECT'S EASTERN CONVERTER STATION NOW BEING PROPOSED TO BE LOCATED IN CHOCTAW COUNTY, MISSISSIPPI?**

A. The Project will need to integrate into the bulk electric system of the Southeastern U.S. in such a way as to optimize the value of the transmission access rights that will become available to utilities in the Southeastern U.S. with an eye on both reliability and resiliency benefits.

In 2017, the Project's targeted interconnection strategy was predicated on obtaining access to the electric systems of Southern Company and the Tennessee Valley Authority ("TVA"). Today, it is contemplated that the robust MISO South demand region, as well as the region served by Southern Company in Mississippi, Alabama and Georgia, are better options to reliably integrate the Project facilities and, to do so in a timely manner, resulting in the ability to provide access to around-the-clock renewable energy options for utilities in the Southeast including in Mississippi. The new location of the eastern HVDC converter station in Choctaw County provides access to the MISO South demand region via a new 500-kV interconnection to Entergy Mississippi's 500-kV Wolf Creek Substation.

**Q10. ARE ADDITIONAL TRANSMISSION FACILITIES REQUIRED TO INTERCONNECT TO SOUTHERN COMPANY, TVA OR OTHER UTILITY SYSTEMS TO THE EAST?**

A. Yes. SST may eventually construct new 500-kVac transmission facilities to provide an access point for Southern Company, TVA and/or other utility systems to interconnect beyond the Mississippi Switching Station. When this plan is developed, SST (or another utility, as the case may be) expects to return to this Commission to seek approval, as required, for such additional transmission facilities.

**Q11. WHAT IS THE PROPOSED BASE LOAD CAPACITY OF THE PROJECT?**

A. The Project is expected to be capable of transmitting 3,000 MW of power in either direction (i.e., into Texas and/or into the Southeastern U.S.). In the 2017 filing, the petition focused on a smaller, 2,000 MW capacity of the Project to align with potential restrictions on the Texas end of the Project. Those restrictions, however, were significantly influenced by the type of HVDC technology previously contemplated and the associated voltage constraints in Texas. SST will be studying (with the Electric Reliability Council of Texas ("ERCOT")) both the 2,000 MW and 3,000 MW Project sizes to ensure the Project can achieve at least the 2,000 MW level; however, we are confident that the 3,000 MW level will be able to reliably integrate with the Texas grid.

**Q12. WHY WAS THE PROJECT DESIGNED TO UTILIZE HVDC TECHNOLOGY TO TRANSMIT POWER?**

A. There are several reasons why the Project was designed utilizing HVDC technology. First and foremost is the fact that one end of the line will connect into the electric system of ERCOT, which is electrically asynchronous from the other end of the line in the eastern interconnection. Asynchronous transmission grids cannot exchange power with one another over traditional alternating current ("AC") transmission facilities. HVDC facilities are currently installed between ERCOT and asynchronous grids from ERCOT including the Eastern Interconnection and Mexico. The Project will add to the existing transfer capability between ERCOT and its neighbors by using HVDC technology.

Secondly, HVDC technology allows for large power transfers over long distances while adding built-in redundancy to meet NERC TPL standards (e.g., "N-1") without having to build additional transmission lines. This is because an HVDC "bipole" – which is what the Project is being designed for – is really two independent electrical circuits. That is, each circuit ("pole") of an HVDC bipole can transfer half of the power of the full bipole even when the other pole is out of service. An AC transmission line transferring 3,000 MW has three electrical phases on each transmission tower. If one phase of the AC circuit is unavailable for power transfer, then the entire circuit can no longer transfer power. As such, an AC line in this case would be an N-1 contingency while a DC bipole would be an N-2 contingency. This is important because we operate the grid in the U.S. to be able to withstand the next N-1 contingency (and not necessarily for the more severe and rare N-2 contingency). While N-2 contingencies are analyzed in planning studies, they are not typically constraints in the operation of the power grid.

**Q13. WHY WAS THE PROJECT DESIGNED TO BE BIDIRECTIONAL?**

A. HVDC technology is inherently capable of bidirectional power flow. SST is ensuring that the Project is designed to be able to utilize this inherent capability so that the significant grid reliability and resiliency benefits, made possible by integrating HVDC transmission links into the bulk electric system, can be realized. As an example, ERCOT, as an electrical island separated from Mexico and the Eastern Interconnection, will benefit from the Project's ability to transfer power into ERCOT during supply scarcity events and/or to help facilitate the integration of additional renewable energy by sharing the balancing/integration burden with a larger electrical grid such as the Eastern Interconnection. Similarly, utilities in MISO South and the Southeast will benefit from the ability to receive power from ERCOT during scarcity events. Additionally, HVDC links, due to their ability to connect asynchronous regions, can become a "black start cranking path" to provide another tool for grid operators to restart regions of the electric grid after an event that results in cascading failures. With the various changes to the mix and location of both supply and demand across the U.S., the ever-present reliance on electricity and ongoing electrification of transportation, homes and businesses, as well as increasing risks to grid resiliency, HVDC transmission links will be important assets to the regions that integrate them.

**Q.14. WHAT NERC RELIABILITY STANDARDS ARE APPLICABLE TO SST?**

A. NERC regulates the reliability of the electric grid in the U.S. It performs this role through the creation of mandatory standards associated with the planning and operation of the bulk electric system ("BES")[1] and enforcement of those standards through its role as the Electric Reliability Organization under Section 215 of the Federal Power Act. SST, as a set of BES facilities, will also need to be planned and operated in accordance with NERC standards. NERC monitors compliance of its standards through its Regional Entities. SST will be under the jurisdiction of the SERC Reliability Corporation Regional Entity.

To delineate the roles and responsibilities of various entities that plan and operate portions of the electric system in North America, NERC defines various functional entities in its *Statement of Compliance Registry Criteria*[2]. When a new set of electric transmission and generation facilities are introduced to the electric system, it is important to ensure that the various responsibilities required to reliably integrate and operate those facilities are identified and formally registered with NERC prior to operation and to ensure proper ongoing coordination with other NERC-registered entities.

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[1] Visit the NERC BES definition at: https://www.nerc.com/pa/RAPA/Pages/BES.aspx

[2] The NERC Rules of Procedure, including the Statement of Compliance Registry Criteria, can be found online at: https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx

In the case of the Project, SST will need to register directly, or through contract-based services by third parties who will register, or are already themselves registered with NERC, to perform the functions of several of the functional entities including: Reliability Coordinator, Transmission Owner, Transmission Service Provider, Transmission Operator, Balancing Authority and Planning Coordinator. Each of these functional entities performs important functions that are tied to requirements within the various NERC reliability standards. As such, the Project will have obligations that need to be met by the owner, operator and contract service providers of the facilities and these parties may be subject to financial penalties should they fail to comply with such obligations. For any NERC-related services that a third party is providing to the Project on behalf of SST, clear delineation of responsibilities including interfaces with other utilities (for example) will be outlined in applicable contracts.

**Q15. WHAT IS THE STATUS OF THE INTERCONNECTION STUDIES REQUIRED FOR THE PROJECT?**

A. As the Project has two terminals, this discussion is separated into the western terminus (the "Louisiana Converter Station" located in Louisiana and connecting into Texas) and the eastern terminus (i.e., the Mississippi Converter Station).

*Western Terminus* – Initial study work has been performed by ERCOT in May and September, 2019. That study work was predicated on the best available technology at the time of the study. Today, HVDC technology has advanced whereby the studies performed in 2019 will need to be updated to reflect the additional flexibility and capabilities of the latest technology, specifically related to reactive power support. The study work with

ERCOT will be re-initiated in 2023. However, the previous study work provides a conservative set of results which are expected to look better after integration of the new technology is studied.

*Eastern Terminus* – an HVDC interconnection application and injection rights applications were submitted to MISO in September 2022 and are represented as 500 MW queue positions J2591, J2692 and J2698. The HVDC applications allow MISO to study the integration of the HVDC link without consideration of power exchange with the MISO grid. The injection rights applications allow MISO to then study the exchange of energy from the Project into MISO to identify any constraints and required mitigation of those constraints.

SST, as a FERC-jurisdictional entity that will eventually be a registered open access transmission service provider, has also reached out to its eventual neighbor in Mississippi and Alabama (i.e., Southern Company) to begin study work associated with interconnection into the Southern Company service territory. This study work will eventually result in SST submitting a wires-to-wires interconnection request to Southern Company at a location that optimizes the reliability and energy deliverability benefits to the broader grid in the Southeastern U.S. It is expected that the formal interconnection study work with Southern Company will begin in 2023.

## III. ANTICIPATED OPERATION OF THE SOUTHERN SPIRIT TRANSMISSION PROJECT

**Q16. HOW DO YOU EXPECT THAT THE PROJECT WILL OPERATE?**

A. The Project will be operated primarily in the west-to-east direction of flow (i.e., from Texas to Mississippi) to bring renewable energy from Texas into the Southeastern U.S. It is expected, however, that power will instead flow from east-to-west when circumstances warrant such as 1) when the Texas energy market prices are significantly higher than prices in the Southeastern U.S. – indicating energy scarcity in Texas and resulting in market signals to incentivize energy imports into Texas – and 2) if Texas experiences emergency conditions that require support from their neighboring utilities.

**Q17. AT WHAT VOLTAGE DOES SST PLAN TO OPERATE THE PROJECT?**

A. The HVDC transmission line facilities will be designed to operate at ±600-kVdc, however, it is expected that the HVDC transmission facilities will be operated at a nominal ±525-kVdc for the initial several years of operation. This plan allows for the HVDC transmission line to be designed for future expansion without requiring additional right-of-way or new transmission line facilities other than upgrades at each terminal (i.e., the Louisiana Converter Station and the Mississippi Converter Station).

**Q18. DOES THIS CONCLUDE YOUR TESTIMONY?**

A. Yes.

67899467.v1

STATE OF Texas

COUNTY OF Harris

Personally appeared before me, the undersigned authority in and for the jurisdiction aforesaid, DERAL DANIS, who after being by me first duly sworn stated that he is the Senior Director of Transmission for Pattern Energy Group LP, and that as such is fully authorized to make this affidavit; and further stated that the matters and things contained in the foregoing Direct Testimony are true, accurate, and correct as therein set forth to the best of his knowledge, information, and belief.

DERAL DANIS
SENIOR DIRECTOR OF
TRANSMISSION,
PATTERN ENERGY GROUP LP

SWORN TO AND SUBSCRIBED before me, this the 8th day of Feb., 2023.

NOTARY PUBLIC

My Commission Expires:
5-12-2023

SYLVIA LETICIA LOPEZ
Notary Public, State of Texas
Comm. Expires 05-12-2024
Notary ID 128977669

67488651.v1

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# EXHIBIT DD-1

# DERAL **DANIS**

## EXPERIENCE

**JUN 2021 – PRESENT**

### SENIOR DIRECTOR, TRANSMISSION, PATTERN ENERGY

Lead a team of professionals focused on the identification, evaluation, and integration of renewable energy, BESS, and transmission infrastructure projects for Pattern's North American development organization. Support project design and market integration to optimize origination and operations activities.

**NOV 2018 – JUN 2021**

### DIRECTOR, ENGINEERING, CONNECTGEN LLC

Lead a team of professionals with oversight of engineering design, solar module and transformer procurement, interconnection and transmission strategy, transmission system analytics, origination support, and RTO/ISO and utility interfacing.

**NOV 2010 – NOV 2018**

### DIRECTOR, TRANSMISSION, CLEAN LINE ENERGY PARTNERS

Managed interconnection and transmission strategy for Clean Line's multi-billion-dollar portfolio of high-impact transmission projects. Responsibilities included meeting with utilities and ISO/RTO personnel to advance grid impact and interconnection studies, writing and supporting testimony for state siting permits, managing engineering design, origination support, and development of operational plans.

**NOV 2007 – NOV 2010**

### MANAGER, CONSTELLATION ENERGY COMMODITIES GROUP

Supported trading, origination, and portfolio management activities for Constellation's southeastern generation and wholesale load supply deals through powerflow and production simulation analyses as well as transmission service analytics using webOASIS.

**NOV 2005 – NOV 2007**

### OPERATIONS ENGINEER, SOUTHWEST POWER POOL

As a NERC-certified operator, my role involved support of the Reliability Coordination and Market Operator functions of SPP. I learned where the handoff occurs between generation and transmission planning on one hand and operations and the other. Participated in the design and implementation of SPP's first energy market.

## EDUCATION

**MAY 2008**

### M.S. ELECTRICAL AND COMPUTER ENGINEERING, KANSAS STATE UNIVERSITY

**MAY 2005**

### B.S. ELECTRICAL AND COMPUTER ENGINEERING TECHNOLOGY, PURDUE UNIVERSITY

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DIRECT TESTIMONY

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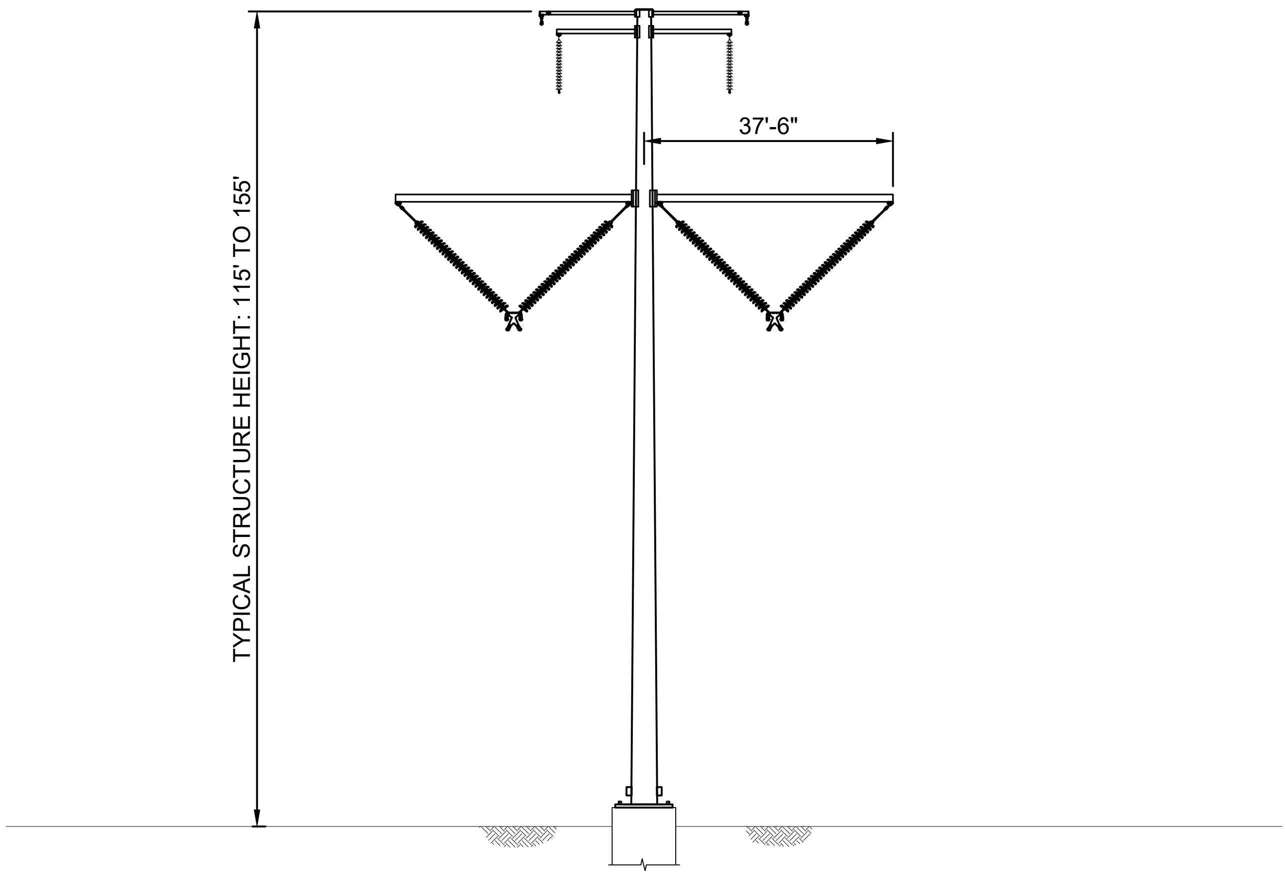
# EXHIBIT DD-2

NOT FOR CONSTRUCTION




## MONOPOLE TANGENT

(NOT TO SCALE)

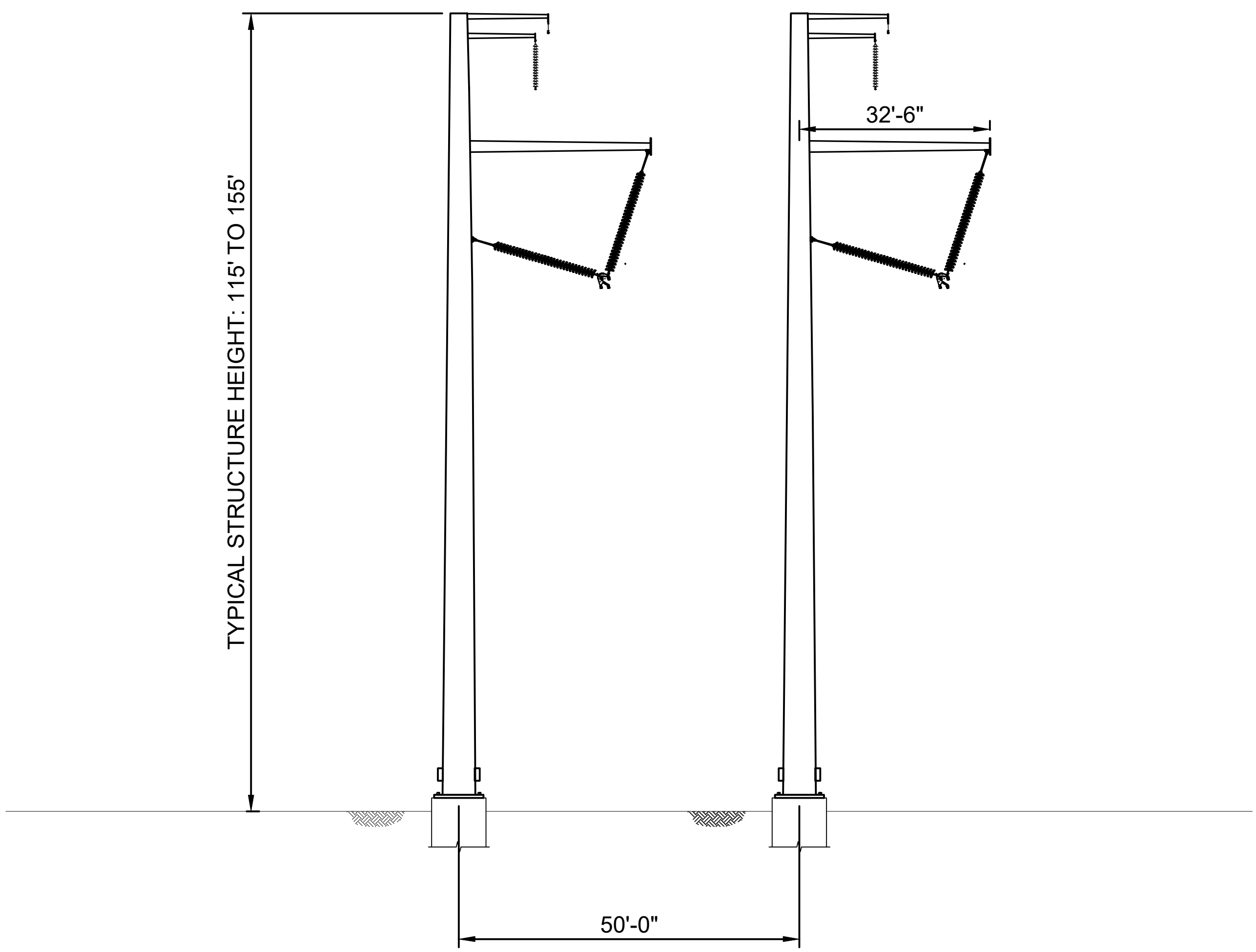


NOTES:
1. Heights shown are for a typical structure. Some structures may be outside of this range.
2. Arm length is approximate and may vary from final design.

Southern Spirit

Monopole Tangent
Southern Spirit
Transmission Project

NOT FOR CONSTRUCTION




# 2-POLE ANGLE

(NOT TO SCALE)

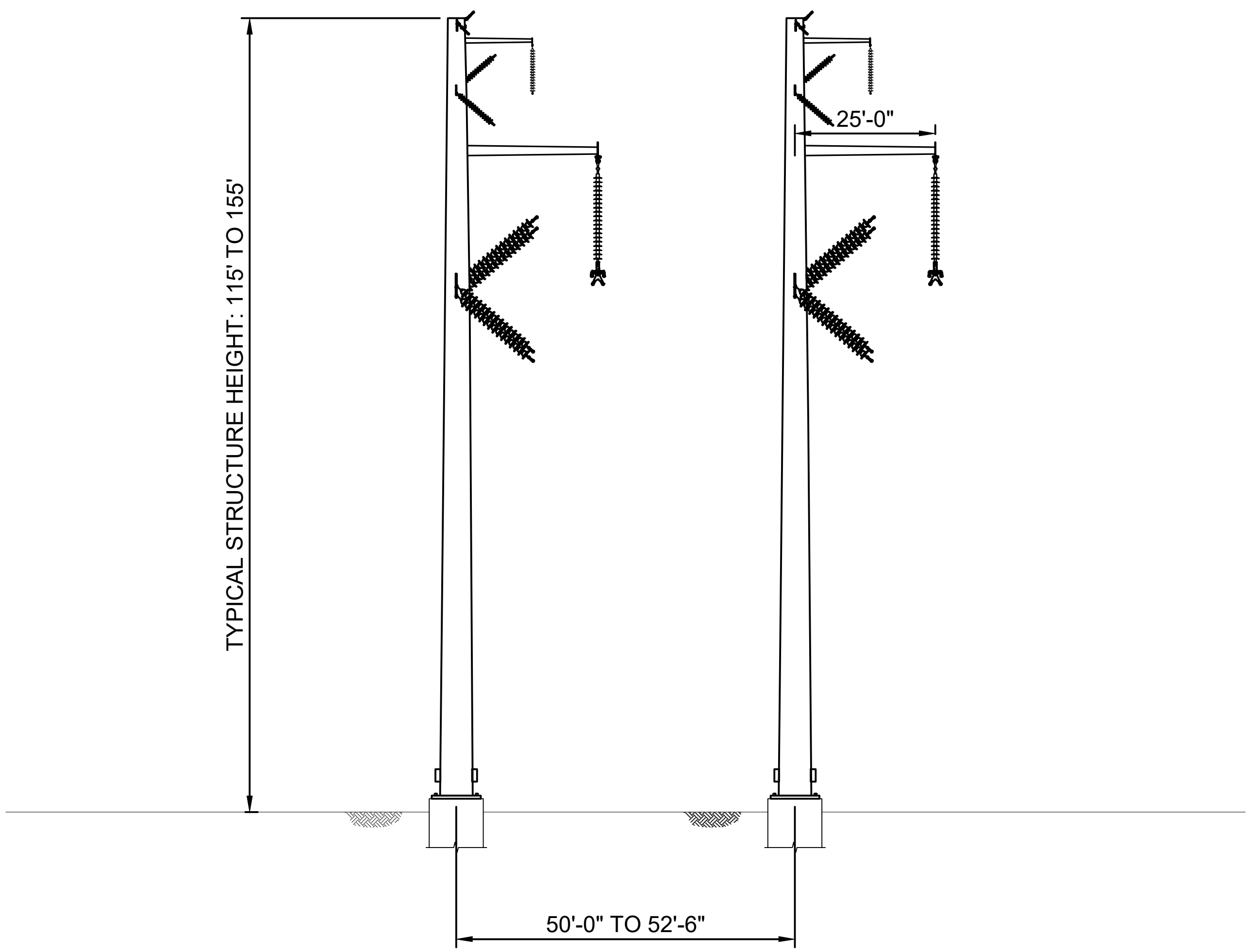
NOTES:

1. Heights shown are for a typical structure. Some structures may be outside of this range.
2. Pole spacing and arm lengths are approximate and may vary from final design.

Southern Spirit

2-Pole Angle
Southern Spirit
Transmission Project

NOT FOR CONSTRUCTION




## 2-POLE DEADEND

(NOT TO SCALE)

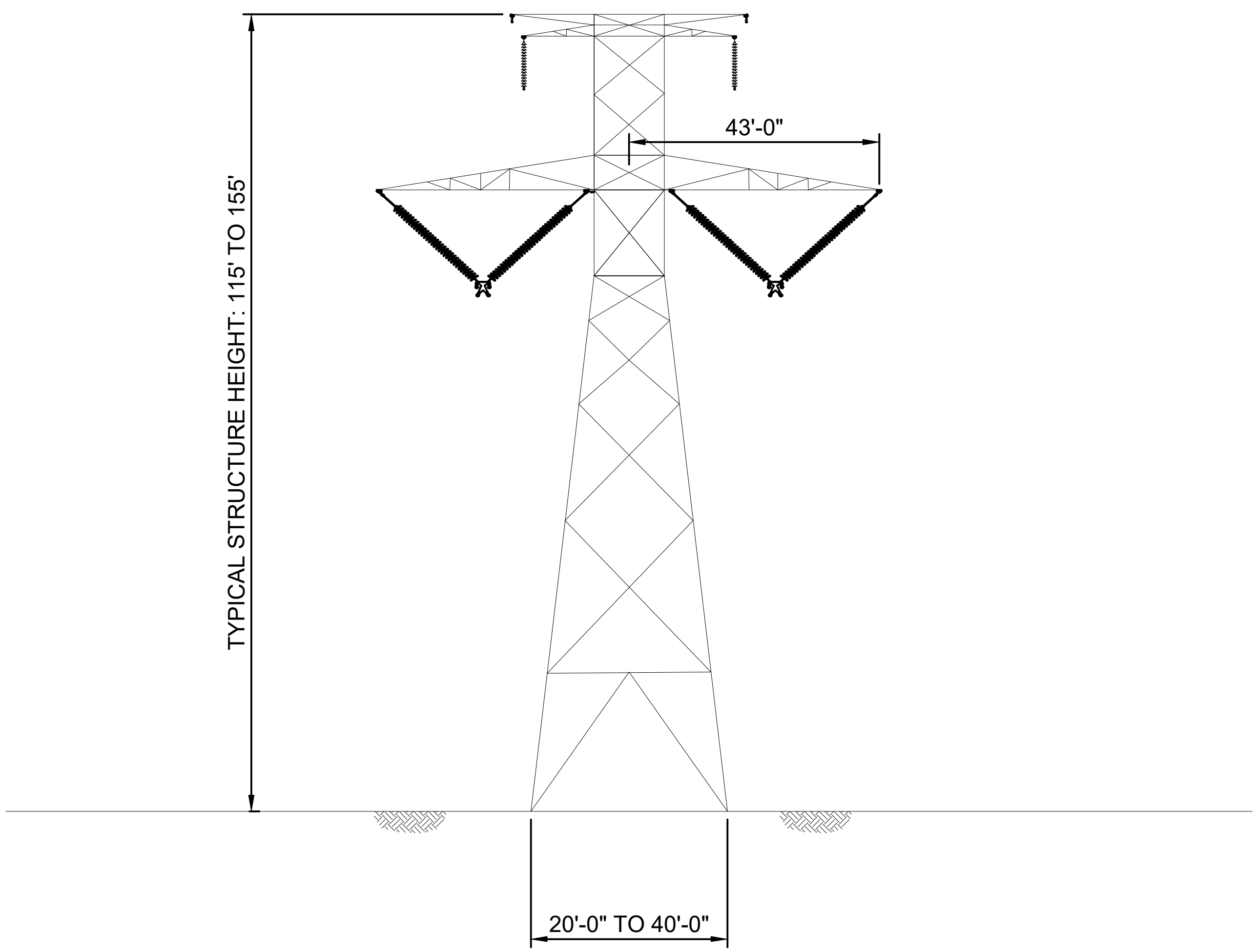
NOTES:

1. Heights shown are for a typical structure. Some structures may be outside of this range.
2. Pole spacing and arm lengths are approximate and may vary from final design.

Southern Spirit

2-Pole Deadend
Southern Spirit
Transmission Project

NOT FOR CONSTRUCTION




# LATTICE TOWER TANGENT

(NOT TO SCALE)

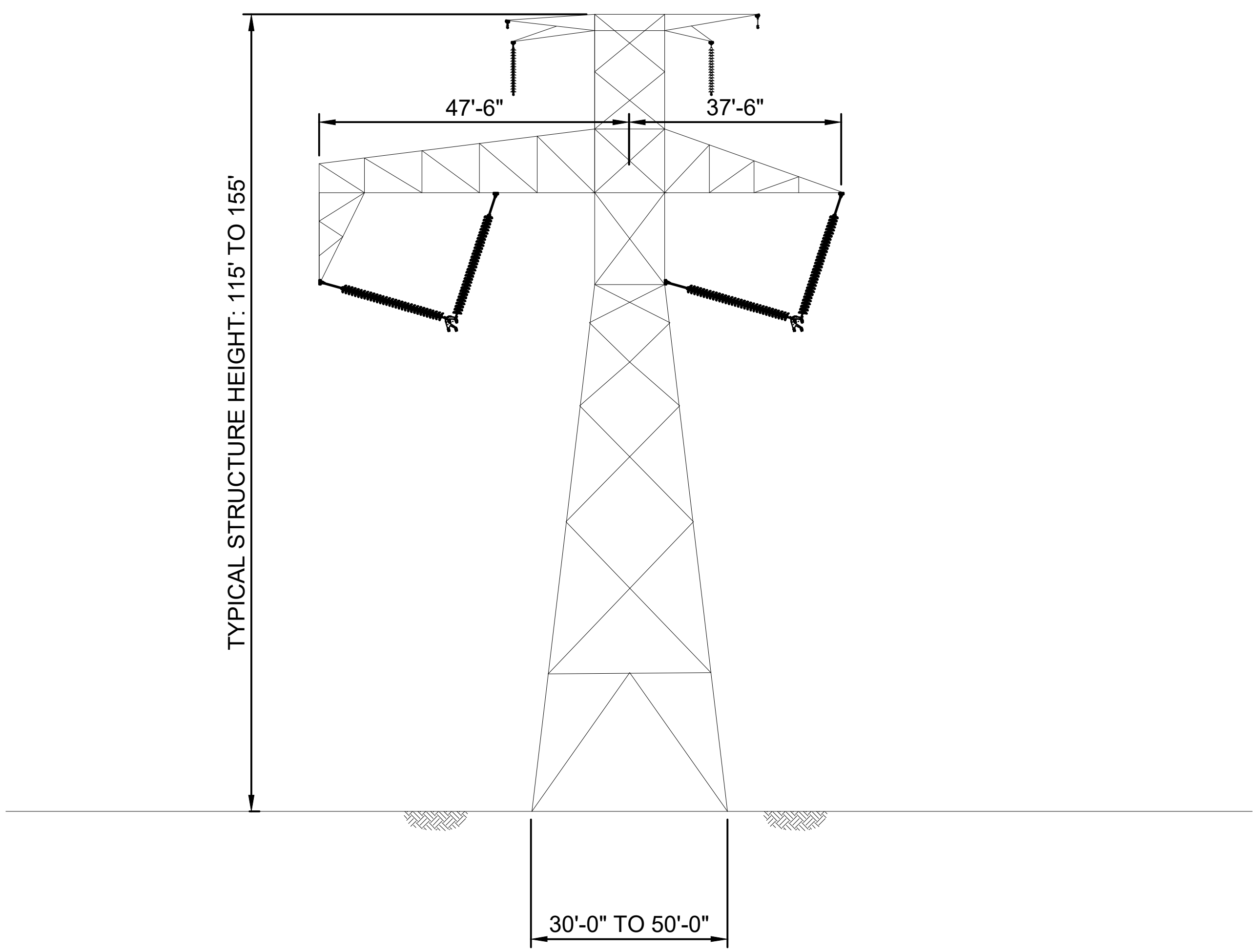
NOTES:

1. Heights shown are for a typical structure. Some structures may be outside of this range.
2. Arm lengths and tower base width are approximate and may vary from final design.

Southern Spirit

Lattice Tower Tangent
Southern Spirit
Transmission Project

NOT FOR CONSTRUCTION




# LATTICE TOWER ANGLE

(NOT TO SCALE)



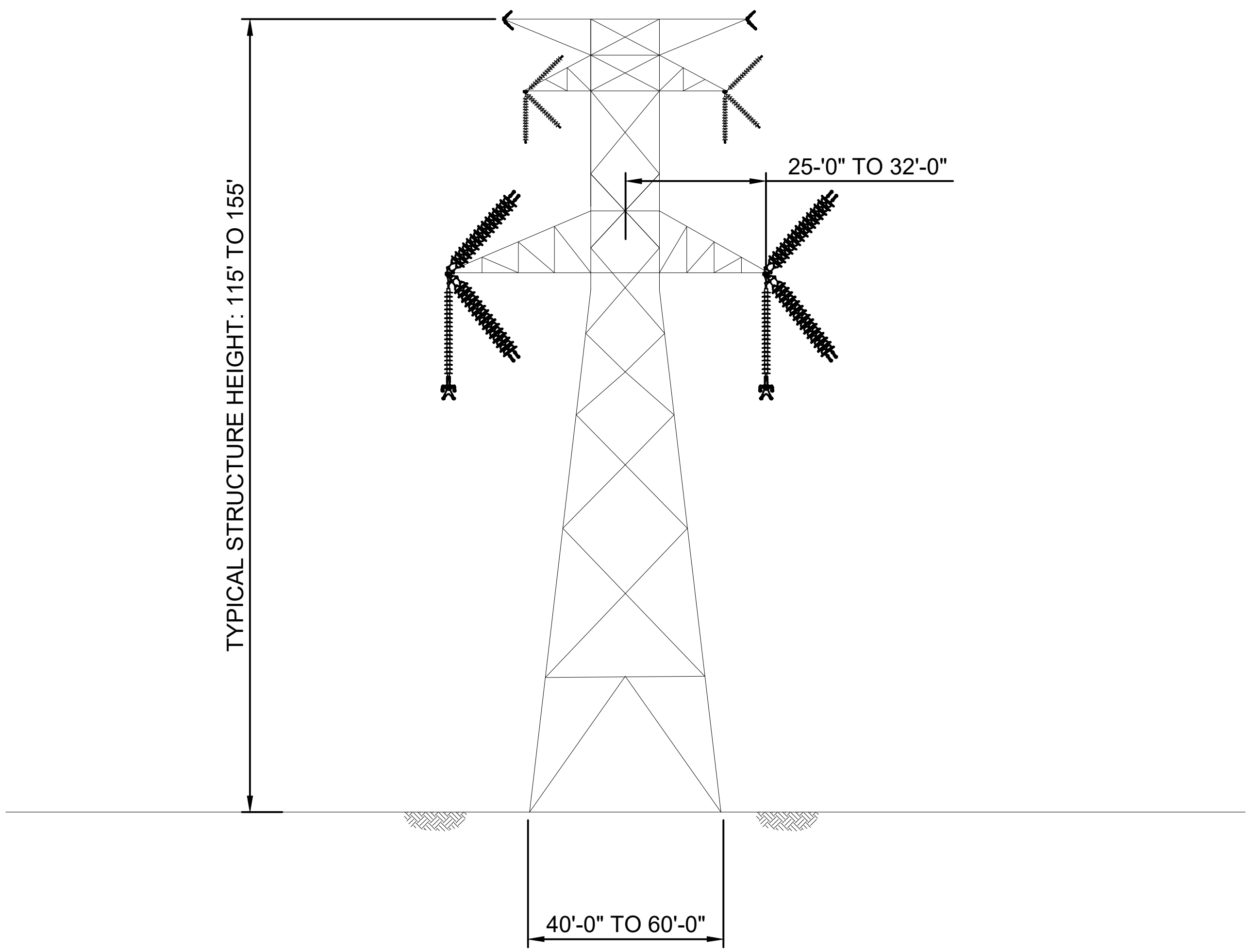
NOTES:

1. Heights shown are for a typical structure. Some structures may be outside of this range.
2. Arm lengths and tower base width are approximate and may vary from final design.

Southern Spirit

Lattice Tower Angle
Southern Spirit
Transmission Project

NOT FOR CONSTRUCTION




## LATTICE TOWER DEADEND

(NOT TO SCALE)



NOTES:

1. Heights shown are for a typical structure. Some structures may be outside of this range.
2. Arm lengths and tower base width are approximate and may vary from final design.

Southern Spirit

Lattice Tower Deadend
Southern Spirit
Transmission Project