

Control Number: 27706



Item Number: 425

Addendum StartPage: 0

RECEIVED

PROJECT NO. 27706

\$ \$ \$ \$ 2010 DEC 20 AL 9: 14

REPORTS OF THE ELECTRIC RELIABILITY COUNCIL OF TEXAS

PUBLIC UTILITY COMMISSION MISSION FILING CLEWE OF TEXAS

ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.'S NOTICE OF ACCEPTANCE OF A TIER 3 TRANSMISSION PROJECT

Pursuant to ERCOT Protocol Section 3.11.4.9(1), Electric Reliability Council of Texas, Inc. (ERCOT) files this Notice of ERCOT's acceptance of a Tier 3 transmission project submitted by Garland Power and Light, as reflected in Attachments A and B. ERCOT is prepared to provide the Commission with any additional information it may request regarding this matter.

Respectfully Submitted,

TT

Chad V. Seely ' Vice President and General Counsel Texas Bar No. 24037466 (512) 225-7035 (Phone) (512) 225-7079 (Fax) chad.seely@ercot.com

Juliana Morehead Assistant General Counsel Texas Bar No. 24046474 (512) 225-7184 (Phone) (512) 225-7079 (Fax) juliana.morehead@ercot.com

125

Gibson Hull Associate Corporate Counsel Texas Bar No. 24106844 (512) 225-7179 (Phone) (512) 2257079 (Fax) gibson.hull@ercot.com

ERCOT 7620 Metro Center Drive Austin, Texas 78744

ATTORNEYS FOR ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.

Attachment A



Taylor 2705 West Lake Drive Faylor, TX 765/4 T 512.248.3000 Austin 7620 Metro Center Drive Austin, TX 78744 T 512.225 7000

...... ercot.com

December 17, 2019

Mr. Juan S. Santos Transmission Planning Manager Garland Power and Light 510 W. Avenue B Garland, Texas 75040

Jeremy Harrelson Transmission Superintendent Texas Municipal Power Agency P.O. Box 7000 Bryan, TX 77805-7000

RE: McCree Substation Reliability Upgrades Project

Dear Mr. Santos and Mr. Harrelson:

The Electric Reliability Council of Texas (ERCOT) Regional Planning Group (RPG) has reviewed and accepted the following Tier 3 transmission project in accordance with ERCOT Protocol Section 3.11.4:

McCree Substation Reliability Upgrades Project:

- Upgrade the 138-kV facilities at the existing McCree substation owned by GP&L
- Upgrade the 345-kV facilities at the existing McCree substation owned by TMPA.
- Install a new second 345/138-kV transformer at the McCree substation. This new transformer will be connected to the substation facilities owned by GP&L and TMPA.
- Upgrade the existing McCree Centerville Oates 138-kV line and Marquis Shiloh 138-kV line owned by GP&L.

Should you have any questions please contact me at any time.

Sincerely,

D. W. Rickerson Vice President, Grid Planning and Operations Electric Reliability Council of Texas

cc:

Bill Magness, ERCOT Warren Lasher, ERCOT Jeff Billo, ERCOT Shun Hsien (Fred) Huang, ERCOT Sun Wook Kang, ERCOT Juliana Morehead, ERCOT

Attachment B



Garland Power & Light GARLAND'S MCCREE SUBSTATION RELIABILITY UPGRADES TO INCLUDE ADDITION OF A 345/138KV, 600 MVA AUTOTRANSFORMER Document Number: JSS 20102019001

Garland's McCree Substation Reliability Upgrades to Include Addition of a 345/138kV, 600 MVA Autotransformer

Garland Power & Light

14-Nov-19

Prepared by:

Juan S. Santos PhD. PE Danh Huynh MSEE



Document Number: JSS 20102019001

Contents

EXECUTIVE SUMMARY	3
PROJECT DESCRIPTION, COST, AND IN-SERVICE DATE	4
BACKGROUND	5
PLANNING DATA CORRECTION	7
DESCRIPTION OF PROBLEM	8
ALTERNATIVE CONSIDERED	11
LOAD FLOW RESULTS FOR ALTERNATIVES	12
SUMMARY OF LOAD FLOW RESULTS	19
SUBSYNCHRONOUS RESONANCE (SSR) IMPACT	20
ADDITIONAL CONSIDERATIONS	21
APPENDIX 1: ESTIMATED COST BREAK- DOWN	24
APPENDIX 2: MCCREE SUBSTATION DESIGN	25
APPENDIX 3: SUMMARY OF STUDY CASES	26
APPENDIX 4: LOAD FLOW RESULTS	26
APPENDIX 5: SSR TRANSMISSION TOPOLOGY DATA	28
APPENDIX 6: GP&L SINGLE POINT OF CONTACT	29

Garland Light & Power

Page 2 of 29



Document Number: JSS 20102019001

EXECUTIVE SUMMARY

ERCOT RTP suggested in the 2018 RTP report that there is a need for a new 600 MVA autotransformer at the McCree substation. In ERCOT's 2019 RTP report, due to load growth it was also suggested that growth in the east Dallas area required additional improvements beyond the McCree Autotransformer. As an alternative to the McCree transformer and for long-term reliability, ERCOT RTP proposes two upgrades 2019NC-21 and 2019NC-8. Both of the upgrades are outside of the Garland metro area. 2019-NC8, Prairie Creek Switch-Mesquite Forney Road-Thornton East Tap-Oates and 2019-NC21, Royse Switch-Fate- Rockwall Aluminum Tap-Dalrock Road 138 kV line upgrades are owned by Oncor.

Garland preformed independent studies to verify the impact of 2019NC-21 and 2019NC-8 transmission line upgrades and found additional overloads and a planning data oversight/error in the load flow cases that demonstrate the ongoing reliability necessity for the T2 McCree autotransformer along with additional line upgrades.

Based on this study, Garland is requesting approval of a second (T2) 600 MVA, 345/138-kV autotransformer at McCree. The McCree substation is a key station for providing support for both the Oncor and Garland system. Included in this request are two minor transmission line upgrades, McCree–Centerville-Oates and Marquis – Shiloh 138kV lines. Both lines are interrelated to the McCree autotransformer and local reliability. Lines are rated at 218 MVA and combined length is approximately 5.4 miles. This request is to support reliability for local load growth and for future expansion.



Document Number: JSS 20102019001

PROJECT DESCRIPTION, COST, AND IN-SERVICE DATE

McCree Substation upgrade and 600 MVA autotransformer. Due to the age and system requirements, Garland recommends upgrading the McCree substation to support new autotransformer. These upgrades include modifying the138kV ring-bus to a breaker-and-a-half configuration, upgrading the existing breakers from 50kA to 63kA, and replacing the control house. Furthermore, associated with adding the new autotransformer are two line upgrades.

This project requires the following equipment:

- 1. GP&L McCree Substation upgrades
 - 8 138kV circuit breakers (because fault current increase)
 - 1 138kV circuit switcher and 18 138kV disconnect switches
 - Shiloh and Centerville T-Line A-frames relocated to the new middle rung.
 - New Control House, 125VDC System to include: 13 protection panels, 2 Communication panels, 1 metering panel
- 2. GP&L Transmission upgrades
 - Upgrade McCree Centerville-Oates 138kV line upgrade such that its new emergency rating is at least 478 MVA. The planning estimate to upgrade the 4.7-mile line is \$940k.
 - Upgrade Marquis Shiloh 138kV line upgrade such that its new emergency rating is at least 478 MVA. The planning estimate to upgrade the 0.7-mile line is \$140k.
- 3. TMPA Substation upgrades
 - 600MVA Autotransformer XFMR
 - TMPA McCree 345kV upgrades
 - New 345kV circuit breaker and 345kV switches

Estimated cost is 4M for new transformer, additional substation upgrades for the 138kV system is 13M (see appendix for cost break-down summary), cost of line upgrades 1.1M

Total estimated cost 18.2M

Expected In-Service date is FY2023.



Document Number: JSS 20102019001

BACKGROUND

Based on the 2017 ERCOT RTP studies and starting with the 2019 summer peak, the Ben Davis 345/138-kV autotransformer T1 was reported by ERCOT RTP as overloading under the outage of the 345/138-kV autotransformer T2 at Ben Davis, followed by the outage of McCree 345/138 kV autotransformer and vice-versa (NERC P6 N-1-1). As a solution, ERCOT RTP suggested upgrading the autotransformer T1 from its 448 MVA rating to at least 600MVA rating with an estimated in service date of 5/1/19 (summer 2019). Replacing the Ben Davis autotransformer was delayed due to construction and substation flooding concerns. The following year, in the 2018 ERCOT RTP, it was recommended that a second McCree 600MVA autotransformer be provided. Garland confirmed these result with an internal studies. At the time, both projects were considered as tier 4 project, that is less then <15M, and under Garland's purview to build. To support ERCOT RTP process, Garland has spent both time and effort to meet ERCOT RTP's suggested In-Service dates.

Following ERCOT NPRR837, upgrading the transformers are no longer under Garland's purview. NPRR837 becomes effective on July 1, 2020 and requires that this project be classified as Tier 3 and require RPG review.

TMPA and Garland jointly own the McCree substation; 345kV infrastructure is owned by TMPA and 138kV portion is owned by Garland. The McCree substation was originally commissioned in YR1980's (approximately 40 years ago) as a 138kV station. As the Garland electrical system developed, the original 138kV line from Ben Davis to McCree was converted to 345kV (YR2000), and along with the transmission line, the McCree and Ben Davis stations were upgraded to accommodate the 345kV system. That is, the original footprint for the station is based on a 138kV layout, as the station developed, upgrades were based on the immediate needs of the system, breakers, and control house were retrofitted as required. This substation now accommodates two 345kV lines, a 600 MVA 138/345 kV transformer, three 138kV lines, two 69kV lines, a 69/138 kV transformers and two 69/13kV distribution transformers.

Additional engineering studies have uncovered system upgrades that are focused on the 138kV reliability. The current McCree configuration has outgrown existing system requirements and Garland proposes to convert the 138kV ring-bus for a more reliable breaker-and-a- half configuration. The 138kV breakers have outlived their usefulness and due to short circuit requirements, the 138kV breakers will need to be replaced with 63kA rated breakers. Furthermore, for safety considerations the control house warrants improvements, it is at the end of its 40 year expected life.

Currently, for the city of Garland, the McCree substation is one of two 345kV ties, the Ben Davis to the North and McCree substation, located in the South. The following diagram shows the



Document Number: JSS 20102019001

existing McCree substation arrangement. In this diagram, red represents 345kV lines, blue represents 138kV lines and green is 69kV.





Garland Power & Light GARLAND'S MCCREE SUBSTATION RELIABILITY UPGRADES TO INCLUDE ADDITION OF A 345/138KV, 600 MVA AUTOTRANSFORMER Document Number: JSS 20102019001

PLANNING DATA CORRECTION

The planning oversight/error is due to an on-going reporting of the Ben Davis autotransformer "Extreme Duty" rating and due to the fact that the replacement of the Ben Davis autotransformer has been delayed.

The original planning of this facility was assumed that the existing Ben Davis facility was capable of accommodating the new transformer to include oil containment, the added weight on the pad and location. In addition, it was also assumed that the flooding issue at Ben Davis substation would be mitigated and the substation would be secure by the required In-Service date. These assumptions proved to be incorrect. Garland reported the concern and provided a mitigation plan that accepts loss of life due to overloading of the autotransformer. Using engineering judgment, Garland placed a temporary Extreme Duty rating on the Ben Davis T1 transformer.

Moreover, following the proposed in-service date Garland transmission planning assumed that the new autotransformer would replace the existing autotransformer and applied the new rating of 600 MVA for the Ben Davis autotransformer. The original in-service date was before summer peak of YR2018. The rating changes are used in future studies including the SSWG and the ERCOT RTP cases.

Due to the future in-service date and following ERCOT NPRR837, upgrading the transformer is no longer under Garland's purview. The Ben Davis project requires ERCOT RPG approval and it is no longer appropriate to assume that the Ben Davis autotransformer will be replaced before ERCOT RPG approval. This device has not been replaced and the actual rating should be the original 448 MVA.



Garland Power & LightDocument Number:GARLAND'S MCCREE SUBSTATION RELIABILITYJSS 20102019001UPGRADES TO INCLUDE ADDITION OF A 345/138KV,600 MVA AUTOTRANSFORMER

DESCRIPTION OF PROBLEM

For the 2024 and 2025 RTP Summer NNC base Cases, outage of the Ben Davis T2 autotransformer results in overloading of the Oates – Centerville 138kV transmission line and the Ben Davis T1 autotransformer.

Ben Davis T2 (MVA)	McCree T1 (MVA)	Ben Davis T1 – (MVA)	Oates – Centerville (MVA)
262.3 (44.5%)	313.4 (49.2%)	264.1(59.0%)	67.4 (30.9%)
Outage	358.1 (56.2%	352.2 (78.6%)	88.8 (40.7%)
321.3 (54.5%)	Outage	323.5 (72.2%)	155.3 (71.3%)
Outage	Outage	445.9 (99.5%)	198.1 (90.8%)

2022 Summer On- Peak with Ben Davis rating correction to 448 MVA

The following diagram highlights this system concern for 2022.



Document Number: JSS 20102019001



2024 Summer On- Peak with Ben Davis rating correction to 448 MVA

Ben Davis T2 (MVA)	McCree T1 (MVA)	Ben Davis T1 – (MVA)	Oates – Centerville (MVA)
296.2 (50.2%)	321.0 (50.4%)	271.7 (60.6%)	94.8 (43.5%)
Outage	368.1 (57.8%)	367.6 (82.1%)	119.4 (54.8%)
357.2 (60.5%)	Outage	328.2 (73.3%)	188.1 (86.3%)
Outage	Outage	459.5 (102.6%)	236.1 (108.3%)



Document Number: JSS 20102019001

For the future years, there were several 138kV transmission lines that were overloaded in the base case for N-1 conditions. For these lines, they are considered preexisting conditions, Garland has future plans to mitigate overloads. The following list of lines are under evaluation for upgrades:

- McCree Centerville 138kV overloads due to the outage of Shiloh-McCree 138kV transmission line outage, line is 2.7 miles long and rated at 218 MVA
- Centerville Oates 138kV line overloads due to the outage of the Ben Davis T2 transformer and the McCree T1 autotransformer, line is 2.0 miles long and rated at 218 MVA
- Shiloh-Marquis 138kV line overloads due to the due to the outage of the Plastipak-Shiloh 138kV line. This line is 0.7 miles long and is rated at 218 MVA



Document Number: JSS 20102019001

ALTERNATIVE CONSIDERED

ļ

The following list of system alternatives were considered to resolve overloads in the Garland area. For this area, three alternatives were compared for performance (see Appendix 5 for results).

Alternative 0: Do nothing. This is the base case results showing system overloads.

Alternative 1: Reconductor the Oates – Centerville 138kV transmission line such that minimum new emergency rating is at least 478 (to match Oncor's upgrades) . The Oates-Centerville is rated at 218 MVA and is approximately 2 miles long. (Estimated cost 0.4M)

Alternative 2: Upgrade the T1 autotransformer at Ben Davis substation with a minimum rating of 600 MVA. (Estimated cost 4M)

Alternative 3: Upgrade the T1 autotransformer at Ben Davis substation with a minimum rating of 600 MVA and reconductor the Oates – Centerville 138kV transmission line such that minimum new emergency rating is at least 478. (Estimated cost 4.4M)

Alternative 4: Install a new T2 autotransformer at McCree substation with a minimum rating of 600 MVA. (Estimated cost 4M)



UPGRADES TO INCLUDE ADDITION OF A 345/138KV, 600 MVA AUTOTRANSFORMER	GARLAND'S MCCREE SUBSTATION RELIABILITY UPGRADES TO INCLUDE ADDITION OF A 345/138KV,	JSS 20102019001	
---	---	-----------------	--

LOAD FLOW RESULTS FOR ALTERNATIVES

The following are highlights of the load flow results, for additional details see Appendix 5 of this report.

Alternative 1: Alternative 1 upgrades the Oates – Centerville 138kV line such that its new emergency rating is at least 478 MVA. Although, alternative reduced the overload for the critical outage of the Ben Davis T2 and McCree T1 outage, it was ineffective in supporting the Ben Davis T1 overload. For this critical outage, Ben Davis T1 overloads to 102% of its thermal B-rating.





Document Number: JSS 20102019001

For this alternative, the critical outage is N-1-1 of the Royse-Ben Davis with the McCree Centerville 345kV line outage (n-1-1). For this situation, the overload on Garland's line is decreased from the base case overload of 153% to 70% but also for this condition, Oncor's Thornton East-Prairie Switch is overloaded. This overload concern shows up in all of the proposed alternatives for a similar outage. The following diagram demonstrates this overload.



Alternative 2: Alternative 2 upgrades the Ben Davis T1 to 600 MVA. This alternative supports the N-1-1 outage for the Ben Davis T2 and McCree autotransformers but is ineffective in reducing the overload for the 138 kV Oates-Centerville line.

This alternative has additional concerns due to the location and accommodation of the new transformer to include the oil-retaining pit. Directly replacing the T1 transformer with a new transformer will require enlarging the oil-retaining pond. There is a sewer line beneath the foundation of the T1 transformer pad, which may require additional engineering and cost.

Garland Light & Power

Page 13 of 29



Garland Power & Light GARLAND'S MCCREE SUBSTATION RELIABILITY UPGRADES TO INCLUDE ADDITION OF A 345/138KV, 600 MVA AUTOTRANSFORMER	Document Number: JSS 20102019001	
---	-------------------------------------	--

Before any of this work can be performed, the substation needs to be secured from flooding by installing additional flood protection and elevating the control house. In total, since 2015 this substation has flooded four times. Initially, the flooding for this area was considered as a "hundred year" flood but now seems to be more of an annual event. Moreover, this substation is located in a FEMA controlled area and additional approval is needed from the Federal government before any construction in the Regulatory Floodway.





Document Number: JSS 20102019001

Alternative 3: Alternative 3 upgrades the T1 autotransformer at Ben Davis substation with a minimum rating of 600 MVA and reconductors the Oates – Centerville 138kV transmission line such that the minimum new emergency rating is at least 478.

The following diagram shows system performance for the key outage of the McCree T1 and Ben Davis T2 autotransformer.





Garland Power & LightDocument Number:GARLAND'S MCCREE SUBSTATION RELIABILITYJSS 20102019001UPGRADES TO INCLUDE ADDITION OF A 345/138KV,600 MVA AUTOTRANSFORMER

For Alternative 3, the following one-line diagram demonstrates overloading on the Centerville-McCree transmission line for the outage of the McCree-Shiloh line. Overload is at 132% of it 218 MVA B-rating.





Document Number: JSS 20102019001

Alternative 4: Alternative 4 installs a new T2 autotransformer at McCree substation with a minimum rating of 600 MVA. Similar to alternative 3, this alternative prevented overloading of the existing T1 Ben Davis autotransformer as shown in the diagram below.





Garland Power & Light GARLAND'S MCCREE SUBSTATION RELIABILITY UPGRADES TO INCLUDE ADDITION OF A 345/138KV,	Document Number: JSS 20102019001	
600 MVA AUTOTRANSFORMER		

Adding the additional 600 MVA T2 autotransformer increases the need to upgrade the Centerville- McCree line. Outage of the Centerville – Shiloh circuit results in overloading of the Centerville- McCree transmission line.





1

1

Garland Power & Light GARLAND'S MCCREE SUBSTATION RELIABILITY UPGRADES TO INCLUDE ADDITION OF A 345/138KV, 600 MVA AUTOTRANSFORMER Document Number: JSS 20102019001

SUMMARY OF LOAD FLOW RESULTS

None of the alternatives alone solved the load flow concerns in the area. For the four alternatives, there where common problems that are interdependent. For example, adding the additional T2 at McCree or upgrading the T1 transformer at Ben Davis does not remove the need to upgrade the Oates – Centerville – McCree 138kV line. Several N-1 and N-1-1 outages caused this line to overload. Furthermore, adding the new McCree autotransformer increased flow on the Marquis-Shiloh transmission line. Alternative 1, reconductoring the Oates – Centerville 138kV transmission line, was ineffective at preventing the Ben Davis T1 overload. In regards to meeting future reliability, both Ben Davis and McCree autotransformers had similar system performance (Alternatives 2 and 4). Both alternatives will require extensive substation upgrading; the Ben Davis upgrades based on flooding.

Considering the flooding issues at the Ben Davis substation, installing a new T2 autotransformer at McCree substation is the most reliable option. This option along with upgrading the Oates – Centerville – McCree and Marquis-Shiloh lines addresses local Garland issues.



Document Number: JSS 20102019001

SUBSYNCHRONOUS RESONANCE (SSR) IMPACT

Garland preformed a topology screening study to measure the risk of Subsynchronous Resonance $(SSR)^1$ with the proposed McCree substation upgrade. ERCOT Protocol Section 3.22.1 outlines that if the proposed project becomes radial to a series capacitors(s) in the event of less than 14 concurrent transmission Outages, a frequency scan assessment will need to be performed. The topology scan identifies the N-x outages that lead to the radial connection between the project and the series compensation devise. (See Appendix 7: Topology screening data). If the N-x number is less than 14 (x<=14) then there is minimum risk of SSR due to the upgrade.

This screening found that no additional SSR studies (frequency scan) are required beyond the SSR topology screening study. The table below demonstrates the number of outages for N-x conditions. In this table, the number 999 represents that a large threshold has been reached and no additional scanning is required.

Project Locat	ion	POI_bus	POI_kV	SC_name	POI-SC Distance	N-x	
MCCREE_5	345.00	973	345	EDISON	14		999
MCCREE_5	345.00	973	345	KOPPRL2E	8		29
MCCREE_5	345.00	973	345	WS-NAV	6		23
MCCREE_5	345.00	973	345	WS-SS	8		29
MCCREE_5	345.00	973	345	CROSS	7		29
MCCREE_5	345.00	973	345	GAUSS	7		27
MCCREE_5	345.00	973	345	DELSOL	20		999
MCCREE_5	345.00	973	345	RCKMD	7		25
MCCREE_5	345.00	973	345	CENIZO	17		999
MCCREE_5	345.00	973	345	HHGT	999		999
MCCREE_5	345.00	973	345	RIOHONDO	999		999
MCCREE_5	345.00	973	345	NEDIN	15		999
MCCREE_5	345.00	973	345	KIRCHHOF	9		30
MCCREE_5	345.00	973	345	WS-NAV&SS	7		27

¹ ERCOT Planning Guide Section 3.1.2.1(1)(e), and Protocol Section 3.22.1 provide reference details about Subsynchronous Resonance Vulnerability Assessment.



Document Number: JSS 20102019001

ADDITIONAL CONSIDERATIONS

For future expansion and load growth, Garland is planning to update the McCree substation. This modernize can be divided into three parts. 1) 138 kV "ring bus" conversion to "breaker-and-half", 2) upgrade of breakers to meet fault duty requirements, and 3) installation of Autotransformer for regional load growth. Sections of the upgrade can be done as independent small projects, but the ultimate design is intertied with other projects to meet long-term plans for the region.

The typical "ring bus" configuration provides for good reliability and operational flexibility but has a practically limitation of four positions (rungs). This limitation is due to the fact that two breakers are used to isolate a single line or bus fault. For ring-bus requirement beyond four positions, following a fault on the system, an additional fault can cause a unintended bus section or a transmission line outage. Currently, the McCree 138kV substation ring-bus accommodates six positions (rungs). Upgrading the ring-bus to breaker-and-a-half is good utility practice. The diagram below shows the current six-rung ring-bus arrangement.





Garland Power & LightDocument Number:GARLAND'S MCCREE SUBSTATION RELIABILITYJSS 20102019001UPGRADES TO INCLUDE ADDITION OF A 345/138KV,600 MVA AUTOTRANSFORMER

The following diagram shows the preferred configuration with a breaker-and-half scheme.



In regards to the McCree 138kV breakers, currently, the 138kV breakers are rated at 50kA. Breakers are required to interrupt both symmetrical and asymmetrical faults and should be rated at 1.15 times the expected fault current. The fault current at McCree is expected to reach approximately 40 kA by FY2021, with the acceptable safety margin of 46 kA. This breaker safety margin is reduced to 48 kA by 2025. It is reasonable engineering judgment to replace 50 kA breakers during the upgrade of the McCree substation configuration to 63 kA breakers. In addition, to accommodate future expansion, switches will need to be upgrade from 2000 A to 3000 A.

The table below is a summary of expected fault currents:

SP2021 834 IMCCREE8 138.00] 3PH THEVENIN IMPEDANCE, X/R (GHM)	<-SCHVA-> <-Sym I'' k rm5> /I/ Aw(1) 9588.65 (4016.0) = -77,97 Z+:/2.011/79.360, 3,32308	SP2025 x	<-5CMVA-> <-Sym 1''k rms> MVA AMP DEG 10007.28 (1807.4) -33.76 Z+:/1918/78.403, 4.87274
XX 968 [BENDAVI5_B 138.00] 3PH THEVENIN IMPEDANCE, X/R (OHM)	<pre><-SCHVA-> <-Sym I' k rms> /I/ Aw(1) W(A AWD DEG DEG0.78 (4439.1) - 37.65 2+:/1.819/78.930, 5.1129</pre>	XX 968 [SENDAVIS,8 138.00] ЭРН THEVENIN IMPEDANCE, X/R (ОНМ)	<-SCMVA-> <-Sym 1''k rms> /I/ AN(1) MVA AMP OEG 10859.62 (5133,4)33,39 Z+:/1.780/78.070,4.73299
XX 970 [BENDAVI5_5 345.00] 3PH THEVENIN IMPEDANCE, X/R (OHM)	<-SCHVA-> <-Sym I'k rms> /I/ AN(I) MVA ADD DEG 16762.72 (24052.1) -35.39 Z+:/7.128/79.808, 5.56208	XX 970 [EENDAVIS_5 345.00] 3PH THEVENIN IMPEDANCE, X/R (OHM)	<pre><-SCMVA-> <-Sym 1''k rms> /I/ AN(1) MVA</pre>
XX 973 [MCCREE_5 345.00] Эрн THEVENIN IMPEDANCE, X/R (ОНН)	<-5CNVA-> <-5ym 11 'k rms> /1/ AN(1) WVA 06G 17904.46 29962.7 -34.84 2+1/6.690/79.126, 3.30561	XX 973 [MCCRE_5 345.00] 3PH THEVENIN IMPEDANCE, X/R (OHM)	<pre><-SCMVA-> <-Sym 1' k rms> /2 AN(1) DEG DEG DEG State St</pre>

Garland Light & Power

Page 22 of 29



Garland Power & LightDocument Number:GARLAND'S MCCREE SUBSTATION RELIABILITYJSS 20102019001UPGRADES TO INCLUDE ADDITION OF A 345/138KV,600 MVA AUTOTRANSFORMER

A new control house is required due to the existing McCree control house being undersized for conversion, utilizing electromechanical relays as well as a 48 VDC system. The new control house will accommodate the conversion of the bus scheme from a ring-bus to a breaker-and-a-half. The conversion will replace all communication panels as well as all existing protection panels. Likewise, instrumentation cables will be replaced, they are also at the end of the 40 year expected life. Furthermore, addition of a second autotransformer will require two bus differential schemes, one autotransformer differential panel, and one line panel. This existing control house is outdated and cannot accommodate future expansion.

Garland Light & Power

1

ł

ł



Document Number: JSS 20102019001

Appendix 1: Estimated Cost Break- down

Category		Expense	Price per
Engineering		\$ 881,000.00	
Construction	TBD	\$ 5,500,000.00	
Equipment	Steel	\$ 600,000.00	\$ 150,000.00
	11Bkrs	\$ 2,035,000.00	\$ 185,000.00
	New Bus	\$ 20,000.00	
	GPL House	\$ 1,400,000.00	
	Relaying	\$ 75,000.00	\$ 25,000.00
	Panel	\$ 100,000.00	\$ 50,000.00
	Switches	\$ 360,000.00	\$ 20,000.00
	SA	\$ 40,000.00	\$ 20,000.00
	CVTs	\$ 40,000.00	\$ 20,000.00
	Trench	\$ 200,000.00	
	Road	\$ 600,000.00	
	Fence	\$ 1,060,000.00	
	Misc	\$ 400,000.00	
	XFMR	\$ 4,000,000.00	
Equipment		\$10,930,000.00	
Total		\$17,311,000.00	

Garland Light & Power

Page 24 of 29



Document Number: JSS 20102019001

APPENDIX 2: MCCREE SUBSTATION DESIGN





Document Number: JSS 20102019001

APPENDIX 3: SUMMARY OF STUDY CASES

Regional Transmission Plan power flow cases are used as a basis for the study and any associated changes that describe and allow accurate modeling of the proposed project. In the following cases, Garland has modified the Ben Davis T1 transformer rating to match correct data from the field. Case used for this study are from the RTP studies cases. Additional SSWG cases were also used to validate study with similar results.

2019RTP_2022_SUM_NNC_10012019

2019RTP_2024_SUM_NNC_10012019

2019RTP_2025_SUM_NNC_10012019

Included in the zip file are the cases used in the study, study IDV's to create cases and all files necessary to duplicate study.

(Appendix 3 provided as a separate Zip file)



1

i.

Garland Power & Light GARLAND'S MCCREE SUBSTATION RELIABILITY UPGRADES TO INCLUDE ADDITION OF A 345/138KV, 600 MVA AUTOTRANSFORMER Document Number: JSS 20102019001

APPENDIX 4: LOAD FLOW RESULTS

Appendix 4 includes excel summary tables for the 4 alternatives reviewed using the RTP. Also included in Appendix 4A. This appendix is a sensitivity study using the newest SSWG cases. Results using the RTP and SSWG case are very similar for the Garland system.

Appendix 4 - Study Results.zip

۔۔_[] Appendix 4A - Study Results for SSWG cases.zip



Document Number: JSS 20102019001

APPENDIX 5: SSR TRANSMISSION TOPOLOGY DATA

Series Capacitor bank date from the 2019RTP_2024_SUM_NNC_10012019 case. In the following table, off-line series capacitors are highlighted in yellow.

From Bus	Name	To Bus	To Bus	Id	R (pu)	X (pu)	B (pu)	In Service
170245	HHGT_1_5 345.00	170246	HHGT_2_5 345.00	S2	1E-05	-0.0468	0	1
17012	RCKYMD1_5 345.00	17013	RCKYMD2_5 345.00	2	0	-0.02604	0	1
17014	RCKYMD3_5 345.00	17015	RCKYMD4_5 345.00	2	0	-0.02604	0	1
68010	ROMNEY1_W 345.00	68020	ROMNEY1_E 345.00	SC	0	-0.02542	0	1
68030	KOPPRL1W 345.00	68040	KOPPRL1E 345.00	SC	0	-0.02542	0	1
68050	ROMNEY2_W 345.00	68060	ROMNEY2_E 345.00	SC	0	-0.02126	0	1
68070	KOPPRL2W 345.00	68080	KOPPRL2E 345.00	SC	0	-0.02126	0	1
8582	RIOHONDO7B 345.00	8902	RIOHONDO7C 345.00	S1	0	-0.02016	0	1
60616	EDISON7A 345.00	60618	EDISON7B 345.00	S1	0	-0.02016	0	1
60619	EDISON7C 345.00	60621	EDISON7D 345.00	S1	0	-0.02016	0	1
60700	GAUSS7A 345.00	60701	GAUSS7B 345.00	S1	0	-0.02016	0	0
60702	GAUSS7C 345.00	60703	GAUSS7D 345.00	S1	0	-0.02016	0	1
60704	KIRCHHOF7A 345.00	60705	KIRCHHOF7B 345.00	S1	0	-0.02016	0	1
60706	KIRCHHOF7C 345.00	60707	KIRCHHOF7D 345.00	S1	0	-0.02016	0	1
60708	OERSTED7A 345.00	60709	OERSTED7B 345.00	S1	0	-0.02016	0	0
60710	OERSTED7C 345.00	60711	OERSTED7D 345.00	S1	0	-0.02016	0	0
8901	NEDIN7B 345.00	8905	NEDIN7C 345.00	S1	0	-0.0201	0	1
80223	CENIZO7B 345.00	80225	CENIZO7C 345.00	S1	0	-0.0201	0	1
80307	DELSOL7C 345.00	80308	DELSOL7B 345.00	S1	0	-0.0201	0	1
79001	CROSS_W1 345.00	79002	CROSS_E1 345.00	SC	0	-0.01959	0	1
79003	CROSS_W2 345.00	79004	CROSS_E2 345.00	SC	0	-0.01959	0	1



Document Number: JSS 20102019001

APPENDIX 6: GP&L SINGLE POINT OF CONTACT

The following phone number and email address are provided as the single point of contact for response to ERCOT RPG and RPG participant questions or requests for additional information necessary for stakeholder review.

Juan S. Santos PhD PE Transmission Planning Manager Garland Power and Light 510 W. Avenue B Garland Texas 75040 Office: 972-205-2603 Cell: 281-785-5655 jsantos@gpltexas.org

Garland Light & Power

ī