# DPA-2024-MARCH-1924

## Delivery Point Network Study

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By SPP Engineering, Transmission Services

# REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION | COMMENTS |
|---|---|---|---|
| 07/01/2024 | SPP | Original | |
| | | | |
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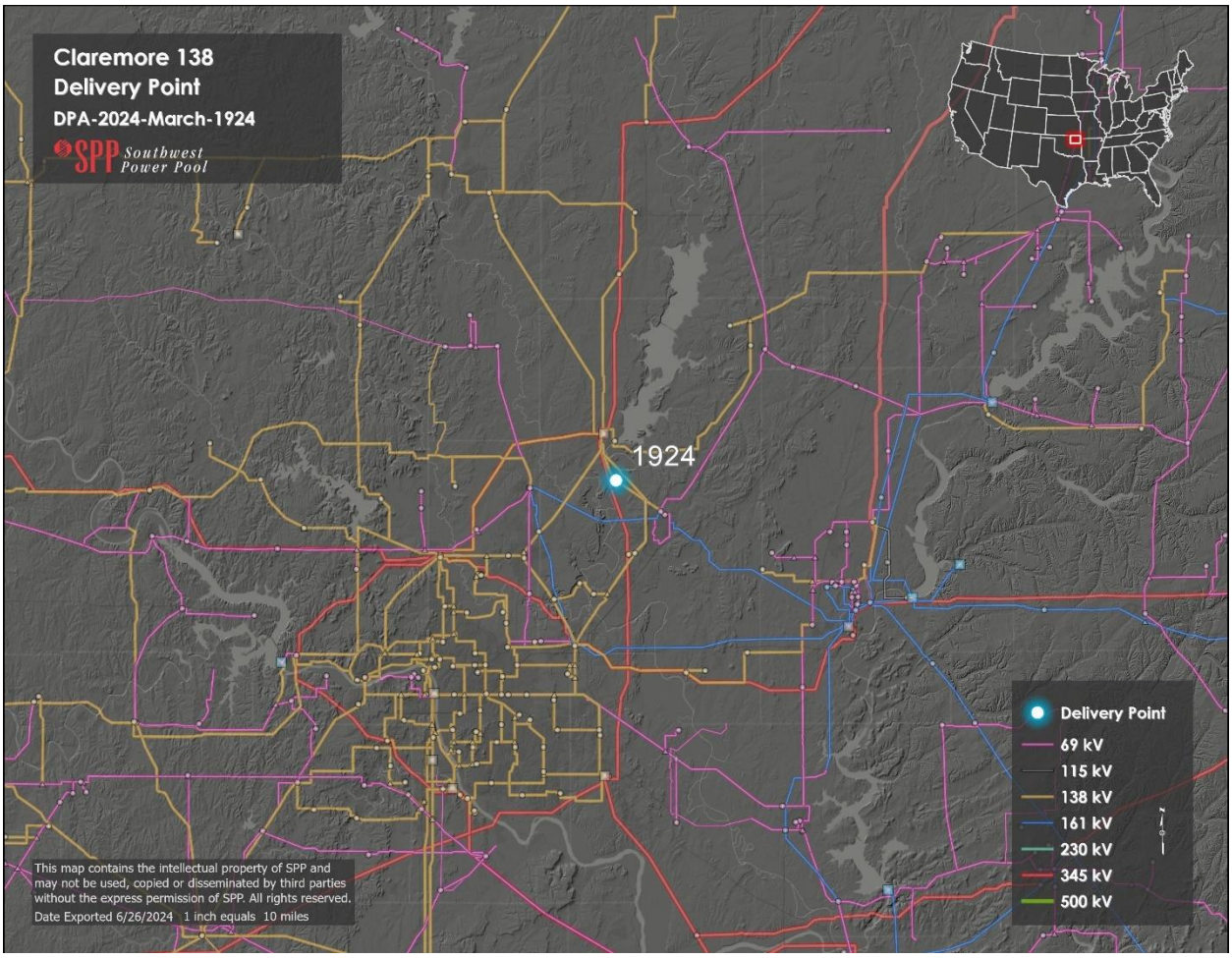
# CONTENTS

# SECTION 1: INTRODUCTION

This report outlines the results of an evaluation of regional transmission impacts from delivery point request DPA-2024-March-1924. The requesting entity plans to add a new delivery point called Claremore. The Claremore delivery point is in the Grand River Dam Authority (GRDA) transmission system.




The load flow models used for the evaluation were 2024 ITP models. SPP performed an AC contingency analysis on these models using PSS®E.

# SECTION 2: STUDY METHODOLOGY

## *OBJECTIVE*

The purpose of this study was to determine the regional transmission system impacts within the SPP footprint due to the new load served by GRDA. SPP performed a Delivery Point Network Study (DPNS) with the configurations shown in Table 2-1 below.

## *STUDY PROCESS*

- Model Assumptions
  - 2024 ITP models
    - Model years 2025, 2028, and 2033
    - Summer Peak (2025S, 2028S and 2033S), Winter Peak (2025W 2028W, and 2033W), and Light Load (2028L and 2033L)
  - 2024 ITP Short Circuit model set
    - 2028 Summer Max Fault
  - 2024 TPL Dynamic model set
    - 2033 Summer Peak Base and Change Case

| Case Name | Study Year | Season | Scenario | Load (250.0/35.6) |
|---|---|---|---|---|
| 2024ITPPF-25S.sav | 2025 | Summer Peak | Base Reliability | Base Case |
| 2024ITPPF-25W.sav | 2025 | Winter Peak | Base Reliability | Base Case |
| 2024ITPPF-28L.sav | 2028 | Light Load | Base Reliability | Base Case |
| 2024ITPPF-28S.sav | 2028 | Summer Peak | Base Reliability | Base Case |
| 2024ITPPF-28W.sav | 2028 | Winter Peak | Base Reliability | Base Case |
| 2024ITPPF-33L.sav | 2033 | Light Load | Base Reliability | Base Case |
| 2024ITPPF-33S.sav | 2033 | Summer Peak | Base Reliability | Base Case |
| 2024ITPPF-33W.sav | 2032 | Winter Peak | Base Reliability | Base Case |
| 2024ITPPF-25S_1924.sav | 2025 | Summer Peak | Base Reliability | Claremore = 250.0/35.6 |
| 2024ITPPF-25W_1924.sav | 2025 | Winter Peak | Base Reliability | Claremore = 250.0/35.6 |
| 2024ITPPF-28L_1924.sav | 2028 | Light Load | Base Reliability | Claremore = 250.0/35.6 |
| 2024ITPPF-28S_1924.sav | 2028 | Summer Peak | Base Reliability | Claremore = 250.0/35.6 |
| 2024ITPPF-28W_1924.sav | 2028 | Winter Peak | Base Reliability | Claremore = 250.0/35.6 |
| 2024ITPPF-33L_1924.sav | 2033 | Light Load | Base Reliability | Claremore = 250.0/35.6 |
| 2024ITPPF-33S_1924.sav | 2033 | Summer Peak | Base Reliability | Claremore = 250.0/35.6 |
| 2024ITPPF-33W_1924.sav | 2033 | Winter Peak | Base Reliability | Claremore = 250.0/35.6 |

**Table 2-1: Study Cases**

- Steady State Analysis
    - Assumptions (consistent with the ITP analysis)
        - AC contingency analysis on all load flow models using PSS®E
        - Monitored Elements
            - SPP facilities 69 kV and above
            - First-tier companies 100 kV and above
        - Contingencies (consistent with the ITP analysis)
            - Provided for the ITP by SPP members and first-tier companies
        - Apply SPP Criteria and NERC reliability standards
    - Compare thermal overloads and voltage violations that occur with and without the Claremore delivery point change to determine thermal overloads and voltage violations resulting from the load addition to the transmission system.
- Dynamics Analysis
    - Assumptions
        - 2024 TPL Dynamics Model Set
            - 2033 Summer Peak Base and Change Case
    - Analyses
        - Fast Fault Screening using POM Studio
- Short Circuit Analysis
    - Assumptions
        - Used 2024 Final ITP Short Circuit models (Max Fault)
            - Placed all available facilities in service
                - Generation
                - Transmission lines
                - Transformers
                - Buses
            - Short Circuit Output
                - Physical
            - Short Circuit Coordinates
                - Polar
            - Short Circuit Parameters
                - 3 Phase
            - FLAT – classical fault analysis conditions
    - Analyses
        - Three-phase fault

# SECTION 3: RESULTS OF ANALYSIS

## *POTENTIAL THERMAL OVERLOADS AND VOLTAGE VIOLATIONS*

The analysis identified potential thermal overloads and no voltage violations resulting from the new Claremore delivery point. Table 3-1 details the potential thermal violations.

| Year | Season | Facility Name | Contingency Name | Rate A, Rate B (MVA) | Max Flow (MVA) | Change Case Max Loading (%) |
|---|---|---|---|---|---|---|
| 2028 | Light | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 264.7 | 103.4 |
| 2028 | Light | CLARMR 5 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 264.7 | 103.4 |
| 2028 | Light | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 264.7 | 103.4 |
| 2028 | Light | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 264.7 | 103.4 |
| 2028 | Light | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 199/239 | 258.8 | 108.3 |
| 2028 | Light | CLARMR 4 - CLARMORE 4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 199/239 | 258.8 | 108.3 |
| 2028 | Light | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 199/239 | 258.8 | 108.3 |
| 2028 | Light | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 199/239 | 258.8 | 108.3 |
| 2028 | Light | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 258.8 | 101.1 |
| 2028 | Light | CLARMR 4 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 258.8 | 101.1 |
| 2028 | Light | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 258.8 | 101.1 |
| 2028 | Light | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 258.8 | 101.1 |
| 2028 | Light | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 199/239 | 257.2 | 107.6 |
| 2028 | Light | CLARMR 4 - CLARMORE 4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 199/239 | 257.2 | 107.6 |
| 2028 | Light | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.0 | 100.4 |
| 2028 | Light | CLARMR 4 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.0 | 100.4 |
| 2028 | Light | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 262.9 | 102.7 |
| 2028 | Light | CLARMR 5 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 262.9 | 102.7 |
| 2028 | Light | N.E.S.-4 - OOLOGAH 4 - 1 | CLARMR 4 - CLARMORE 4 - 1 | 199/239 | 258.1 | 108 |
| 2028 | Light | N.E.S.-4 - OOLOGAH 4 - 1 | CLARMR 5 - CLARMR 4 - 1 | 199/239 | 258.1 | 108 |
| 2028 | Light | CLARMORE4-4OOLOGAHKAMO-1 | CLARMR 4 - CLARMORE 4 - 1 | 199/239 | 253.8 | 106.2 |
| 2028 | Light | CLARMORE4-4OOLOGAHKAMO-1 | CLARMR 5 - CLARMR 4 - 1 | 199/239 | 253.8 | 106.2 |
| 2028 | Summer | N.E.S.-4 - OOLOGAH 4 - 1 | GRDA_MSOLAR - CLARMR 5 - 1 | 199/239 | 296.8 | 124.2 |
| 2028 | Summer | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 270.1 | 105.5 |
| 2028 | Summer | CLARMR 5 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 270.1 | 105.5 |
| 2028 | Summer | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 270.1 | 105.5 |
| 2028 | Summer | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 270.1 | 105.5 |

| Year | Season | Facility Name | Contingency Name | Rate A, Rate B (MVA) | Max Flow (MVA) | Change Case Max Loading (%) |
|---|---|---|---|---|---|---|
| 2028 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GRDA_MSOLAR - CLARMR 5 - 1 | 286/286 | 293.4 | 102.6 |
| 2028 | Summer | CLARMORE4-4OOLOGAHKAMO-1 | GRDA_MSOLAR - CLARMR 5 - 1 | 199/239 | 287.3 | 120.2 |
| 2028 | Summer | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 199/239 | 263.6 | 110.3 |
| 2028 | Summer | CLARMR 4 - CLARMORE 4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 199/239 | 263.6 | 110.3 |
| 2028 | Summer | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 199/239 | 263.6 | 110.3 |
| 2028 | Summer | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 199/239 | 263.6 | 110.3 |
| 2028 | Summer | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 263.7 | 103 |
| 2028 | Summer | CLARMR 4 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 263.7 | 103 |
| 2028 | Summer | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 263.7 | 103 |
| 2028 | Summer | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 263.7 | 103 |
| 2028 | Summer | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 199/239 | 257.4 | 107.7 |
| 2028 | Summer | CLARMR 4 - CLARMORE 4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 199/239 | 257.4 | 107.7 |
| 2028 | Summer | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.3 | 100.5 |
| 2028 | Summer | CLARMR 4 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.3 | 100.5 |
| 2028 | Summer | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 263.2 | 102.8 |
| 2028 | Summer | CLARMR 5 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 263.2 | 102.8 |
| 2028 | Summer | N.E.S.-4 - OOLOGAH 4 - 1 | BASE CASE | 199/239 | 269.4 | 135.4 |
| 2028 | Summer | CLARMORE4-4OOLOGAHKAMO-1 | BASE CASE | 199/239 | 260.7 | 131 |
| 2028 | Winter | N.E.S.-4 - OOLOGAH 4 - 1 | CLARTOK4 - N.E.S.-4 - 1 | 238/271 | 315.7 | 116.5 |
| 2028 | Winter | CLARMORE4-4OOLOGAHKAMO-1 | CLARTOK4 - N.E.S.-4 - 1 | 205/256 | 306.4 | 119.7 |
| 2028 | Winter | N.E.S.-4 - OOLOGAH 4 - 1 | BASE CASE | 238/271 | 295.1 | 124 |
| 2028 | Winter | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 269.8 | 105.4 |
| 2028 | Winter | CLARMR 5 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 269.8 | 105.4 |
| 2028 | Winter | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 269.8 | 105.4 |
| 2028 | Winter | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 269.8 | 105.4 |
| 2028 | Winter | CLARMORE4-4OOLOGAHKAMO-1 | BASE CASE | 205/256 | 286.0 | 139.5 |
| 2028 | Winter | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 263.7 | 103 |
| 2028 | Winter | CLARMR 4 - CLARMORE 4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 263.7 | 103 |
| 2028 | Winter | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 263.7 | 103 |
| 2028 | Winter | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 263.7 | 103 |
| 2028 | Winter | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 263.7 | 103 |
| 2028 | Winter | CLARMR 4 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 263.7 | 103 |

| Year | Season | Facility Name | Contingency Name | Rate A, Rate B (MVA) | Max Flow (MVA) | Change Case Max Loading (%) |
|---|---|---|---|---|---|---|
| 2028 | Winter | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 263.7 | 103 |
| 2028 | Winter | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 263.7 | 103 |
| 2028 | Winter | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.3 | 100.5 |
| 2028 | Winter | CLARMR 4 - CLARMORE 4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.3 | 100.5 |
| 2028 | Winter | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.3 | 100.5 |
| 2028 | Winter | CLARMR 4 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.3 | 100.5 |
| 2028 | Winter | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 262.9 | 102.7 |
| 2028 | Winter | CLARMR 5 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 262.9 | 102.7 |
| 2033 | Light | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 265.0 | 103.5 |
| 2033 | Light | CLARMR 5 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 265.0 | 103.5 |
| 2033 | Light | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 265.0 | 103.5 |
| 2033 | Light | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 265.0 | 103.5 |
| 2033 | Light | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 263.2 | 102.8 |
| 2033 | Light | CLARMR 5 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 263.2 | 102.8 |
| 2033 | Light | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 199/239 | 258.8 | 108.3 |
| 2033 | Light | CLARMR 4 - CLARMORE 4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 199/239 | 258.8 | 108.3 |
| 2033 | Light | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 199/239 | 258.8 | 108.3 |
| 2033 | Light | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 199/239 | 258.8 | 108.3 |
| 2033 | Light | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 258.8 | 101.1 |
| 2033 | Light | CLARMR 4 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 258.8 | 101.1 |
| 2033 | Light | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 258.8 | 101.1 |
| 2033 | Light | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 258.8 | 101.1 |
| 2033 | Light | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.3 | 100.5 |
| 2033 | Light | CLARMR 4 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.3 | 100.5 |
| 2033 | Light | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 199/239 | 257.2 | 107.6 |
| 2033 | Light | CLARMR 4 - CLARMORE 4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 199/239 | 257.2 | 107.6 |
| 2033 | Light | N.E.S.-4 - OOLOGAH 4 - 1 | CLARMR 4 - CLARMORE 4 - 1 | 199/239 | 258.1 | 108 |
| 2033 | Light | N.E.S.-4 - OOLOGAH 4 - 1 | CLARMR 5 - CLARMR 4 - 1 | 199/239 | 258.1 | 108 |
| 2033 | Light | CLARMORE4-4OOLOGAHKAMO-1 | CLARMR 4 - CLARMORE 4 - 1 | 199/239 | 253.8 | 106.2 |
| 2033 | Light | CLARMORE4-4OOLOGAHKAMO-1 | CLARMR 5 - CLARMR 4 - 1 | 199/239 | 253.8 | 106.2 |
| 2033 | Summer | N.E.S.-4 - OOLOGAH 4 - 1 | GRDA_MSOLAR - CLARMR 5 - 1 | 199/239 | 306.2 | 128.1 |
| 2033 | Summer | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 270.3 | 105.6 |
| 2033 | Summer | CLARMR 5 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 270.3 | 105.6 |
| 2033 | Summer | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 270.3 | 105.6 |

| Year | Season | Facility Name | Contingency Name | Rate A, Rate B (MVA) | Max Flow (MVA) | Change Case Max Loading (%) |
|---|---|---|---|---|---|---|
| 2033 | Summer | CLARMORE4-4OOLOGAHKAMO-1 | GRDA_MSOLAR - CLARMR 5 - 1 | 199/239 | 296.6 | 124.1 |
| 2033 | Summer | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 270.3 | 105.6 |
| 2033 | Summer | N.E.S.-4 - OOLOGAH 4 - 1 | BASE CASE | 199/239 | 282.6 | 142 |
| 2033 | Summer | CLARMORE4-4OOLOGAHKAMO-1 | BASE CASE | 199/239 | 273.6 | 137.5 |
| 2033 | Summer | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 263.4 | 102.9 |
| 2033 | Summer | CLARMR 5 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 263.4 | 102.9 |
| 2033 | Summer | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 199/239 | 263.9 | 110.4 |
| 2033 | Summer | CLARMR 4 - CLARMORE 4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 199/239 | 263.9 | 110.4 |
| 2033 | Summer | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 199/239 | 263.9 | 110.4 |
| 2033 | Summer | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 199/239 | 263.9 | 110.4 |
| 2033 | Summer | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 263.9 | 103.1 |
| 2033 | Summer | CLARMR 4 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 263.9 | 103.1 |
| 2033 | Summer | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 263.9 | 103.1 |
| 2033 | Summer | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 263.9 | 103.1 |
| 2033 | Summer | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 199/239 | 257.4 | 107.7 |
| 2033 | Summer | CLARMR 4 - CLARMORE 4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 199/239 | 257.4 | 107.7 |
| 2033 | Summer | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.3 | 100.5 |
| 2033 | Summer | CLARMR 4 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.3 | 100.5 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GRDA_MSOLAR - CLARMR 5 - 1 | 286/286 | 302.9 | 105.9 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | CHAMSPR7 - CLARKSV7 - 1 | 286/286 | 294.9 | 103.1 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | CLARTOK4 - N.E.S.-4 - 1 | 286/286 | 294.9 | 103.1 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | OWASO2_4 - N.E.S.-4 - 1 | 286/286 | 294.0 | 102.8 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | RICE CK4 - N.E.S.-4 - 1 | 286/286 | 294.0 | 102.8 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | 5ELMCRK - CATSAGR5 - 1 | 286/286 | 293.7 | 102.7 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | CATSAGR5 - 5ELMCRK - 1 | 286/286 | 293.7 | 102.7 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | VERDIGS4 - CLARTOK4 - 1 | 286/286 | 293.4 | 102.6 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | OWAS1094 - N.E.S.-4 - 1 | 286/286 | 293.2 | 102.5 |

| Year | Season | Facility Name | Contingency Name | Rate A, Rate B (MVA) | Max Flow (MVA) | Change Case Max Loading (%) |
|---|---|---|---|---|---|---|
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | RICE CK4 - BV-SE--4 - 1 | 286/286 | 292.9 | 102.4 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | N.E.S.-4 - HAWTHRN4 - 1 | 286/286 | 292.0 | 102.1 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | CHELSA4 - HAWTHRN4 - 1 | 286/286 | 291.4 | 101.9 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | NBVILLE4 - BV-SE--4 - 1 | 286/286 | 290.9 | 101.7 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | CLARMR 5 - MCSTAP 5 - 1 | 286/286 | 290.6 | 101.6 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GRDA1 5 - MCSTAP 5 - 1 | 286/286 | 290.6 | 101.6 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | 5ELMCRK - COLINS 5 - 1 | 286/286 | 290.3 | 101.5 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GEN512000 1 | 286/286 | 290.3 | 101.5 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | COLINS 5 - 5ELMCRK - 1 | 286/286 | 290.3 | 101.5 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | NBVILLE4 - COFFEYT4 - 1 | 286/286 | 290.0 | 101.4 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | 5CHOTEAU1 - MAID 5 - 1 | 286/286 | 289.7 | 101.3 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | CHELSA4 - ALWUETP4 - 1 | 286/286 | 289.7 | 101.3 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | MAID 5 - 5CHOTEAU1 - 1 | 286/286 | 289.7 | 101.3 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | TERNITP4 - VERDIGS4 - 1 | 286/286 | 289.4 | 101.2 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | PCATSAT4 - OWASO2_4 - 1 | 286/286 | 289.4 | 101.2 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GEN509394 1 | 286/286 | 289.4 | 101.2 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | VINTAJC4 - ALWUETP4 - 1 | 286/286 | 288.9 | 101 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | FLINTCR5 - FLINTCR1 - 1 | 286/286 | 288.9 | 101 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | WATOVA 4 - N.E.S.-4 - 1 | 286/286 | 288.6 | 100.9 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | DEARING4 - COFFEYT4 - 1 | 286/286 | 288.6 | 100.9 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GEN512614 1 | 286/286 | 288.3 | 100.8 |

| Year | Season | Facility Name | Contingency Name | Rate A, Rate B (MVA) | Max Flow (MVA) | Change Case Max Loading (%) |
|---|---|---|---|---|---|---|
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GREC TAP7 - GRECCTG_1 - 1 | 286/286 | 288.3 | 100.8 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | WATOVA 4 - NOWATA-4 - 1 | 286/286 | 288.0 | 100.7 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | GRDA1 7 - GREC TAP7 - 1 | 286/286 | 288.0 | 100.7 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | T.NO.--4 - N.E.S.-4 - 1 | 286/286 | 287.7 | 100.6 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | OWASOTP4 - OWAS1094 - 1 | 286/286 | 287.4 | 100.5 |
| 2033 | Summer | OOLOGAH4-4OOLOGAHKAMO-Z1 | BV-SE--4 - NOWATA-4 - 1 | 286/286 | 286.9 | 100.3 |
| 2033 | Winter | N.E.S.-4 - OOLOGAH 4 - 1 | CLARTOK4 - N.E.S.-4 - 1 | 238/271 | 320.3 | 118.2 |
| 2033 | Winter | CLARMORE4-4OOLOGAHKAMO-1 | CLARTOK4 - N.E.S.-4 - 1 | 205/256 | 310.8 | 121.4 |
| 2033 | Winter | N.E.S.-4 - OOLOGAH 4 - 1 | BASE CASE | 238/271 | 300.6 | 126.3 |
| 2033 | Winter | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 270.1 | 105.5 |
| 2033 | Winter | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 270.1 | 105.5 |
| 2033 | Winter | CLARMR 5 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 269.8 | 105.4 |
| 2033 | Winter | CLARMR 5 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 269.8 | 105.4 |
| 2033 | Winter | CLARMORE4-4OOLOGAHKAMO-1 | BASE CASE | 205/256 | 291.5 | 142.2 |
| 2033 | Winter | CLARMR 5 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 262.9 | 102.7 |
| 2033 | Winter | CLARMR 5 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 262.9 | 102.7 |
| 2033 | Winter | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLARMORE 4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLARMORE 4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-OOLOGAH4-Z1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLRAUTO4 - 1 | N.E.S.-4 - OOLOGAH 4 - 1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH4-4OOLOGAHKAMO-Z1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLRAUTO4 - 1 | OOLOGAH 4 - N.E.S.-4 - 1 | 205/256 | 263.7 | 103 |
| 2033 | Winter | CLARMR 4 - CLARMORE 4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.3 | 100.5 |
| 2033 | Winter | CLARMR 4 - CLARMORE 4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.3 | 100.5 |
| 2033 | Winter | CLARMR 4 - CLRAUTO4 - 1 | 4OOLOGAHKAMO-CLARMORE4-1 | 205/256 | 257.3 | 100.5 |
| 2033 | Winter | CLARMR 4 - CLRAUTO4 - 1 | CLARMORE4-4OOLOGAHKAMO-1 | 205/256 | 257.3 | 100.5 |

**Table 3-1: Potential Thermal Overloads**

## *SHORT CIRCUIT*

SPP performed short circuit analysis for the 2028 Summer Peak with the new load addition. The analysis identified the currents as listed in Table 3-2.

| Season | Model | Fault | Bus | Current (Amps) |
|---|---|---|---|---|
| 28S | Max Fault | Three Phase | 4OOLOGAHKAMO138.00 | 21,604 |
| 28S | Max Fault | Three Phase | 5ELMCRK 161.00 | 13,668 |
| 28S | Max Fault | Three Phase | 5KETONVL 161.00 | 11,917 |
| 28S | Max Fault | Three Phase | DENVTAP4 138.00 | 9,338 |
| 28S | Max Fault | Three Phase | T.NO.--4 138.00 | 35,058 |
| 28S | Max Fault | Three Phase | CDC-ET 4 138.00 | 22,718 |
| 28S | Max Fault | Three Phase | PCATSAT4 138.00 | 21,030 |
| 28S | Max Fault | Three Phase | CDC-WT 4 138.00 | 23,764 |
| 28S | Max Fault | Three Phase | OWASO2_4 138.00 | 15,070 |
| 28S | Max Fault | Three Phase | OWASOTP4 138.00 | 14,625 |
| 28S | Max Fault | Three Phase | P&P WTP4 138.00 | 15,100 |
| 28S | Max Fault | Three Phase | VERDIGS4 138.00 | 15,130 |
| 28S | Max Fault | Three Phase | OWAS1094 138.00 | 14,226 |
| 28S | Max Fault | Three Phase | CLARTOK4 138.00 | 15,109 |
| 28S | Max Fault | Three Phase | T.NO.2-4 138.00 | 34,973 |
| 28S | Max Fault | Three Phase | 46ST-TP-4 138.00 | 17,978 |
| 28S | Max Fault | Three Phase | SKIATKTP4 138.00 | 10,777 |
| 28S | Max Fault | Three Phase | WATOVA 4 138.00 | 9,073 |
| 28S | Max Fault | Three Phase | RICE CK4 138.00 | 11,428 |
| 28S | Max Fault | Three Phase | BV-SE--4 138.00 | 12,329 |
| 28S | Max Fault | Three Phase | N.E.S.-4 138.00 | 36,220 |
| 28S | Max Fault | Three Phase | NOWATA-4 138.00 | 8,439 |
| 28S | Max Fault | Three Phase | CHELSA4 138.00 | 6,018 |
| 28S | Max Fault | Three Phase | HAWTHRN4 138.00 | 20,446 |
| 28S | Max Fault | Three Phase | NES1-1 14.400 | 87,541 |
| 28S | Max Fault | Three Phase | NES1-1A 18.000 | 86,139 |
| 28S | Max Fault | Three Phase | NES1-1B 18.000 | 85,332 |
| 28S | Max Fault | Three Phase | NES2-1 22.000 | 59,670 |
| 28S | Max Fault | Three Phase | CENTLFT2 69.000 | 11,521 |
| 28S | Max Fault | Three Phase | COLINS 5 161.00 | 12,717 |
| 28S | Max Fault | Three Phase | MAID 5 161.00 | 43,744 |
| 28S | Max Fault | Three Phase | GRDA1 7 345.00 | 26,478 |
| 28S | Max Fault | Three Phase | CLARMR 5 161.00 | 14,140 |
| 28S | Max Fault | Three Phase | GRDA1 5 161.00 | 43,272 |
| 28S | Max Fault | Three Phase | CLARMR 2 69.000 | 12,918 |
| 28S | Max Fault | Three Phase | GRDA15-1 22.800 | 17,352 |
| 28S | Max Fault | Three Phase | WAGNOR 5 161.00 | 9,552 |
| 28S | Max Fault | Three Phase | COLLINS4 138.00 | 7,923 |
| 28S | Max Fault | Three Phase | CLARMR 4 138.00 | 15,290 |
| 28S | Max Fault | Three Phase | CHELSGR2 69.000 | 4,460 |
| 28S | Max Fault | Three Phase | GRDA1 2 69.000 | 12,201 |
| 28S | Max Fault | Three Phase | WMAIN ST5 161.00 | 26,131 |
| 28S | Max Fault | Three Phase | CLARMR4 13.800 | 4,821 |

| Season | Model | Fault | Bus | Current (Amps) |
|---|---|---|---|---|
| 28S | Max Fault | Three Phase | CLARMR1 13.800 | 17,788 |
| 28S | Max Fault | Three Phase | CLARMR2 13.800 | 17,062 |
| 28S | Max Fault | Three Phase | GRDA1 1 13.800 | 14,211 |
| 28S | Max Fault | Three Phase | GRDA1 13.800 | 15,882 |
| 28S | Max Fault | Three Phase | GRDA2 1 13.800 | 16,729 |
| 28S | Max Fault | Three Phase | COLLIN1 1 13.800 | 990 |
| 28S | Max Fault | Three Phase | COLLIN2 1 13.800 | 13,923 |
| 28S | Max Fault | Three Phase | COLLIN3 1 13.800 | 9,579 |
| 28S | Max Fault | Three Phase | CLARMORE 4 138.00 | 18,485 |
| 28S | Max Fault | Three Phase | COLNSGR2 69.000 | 10,224 |
| 28S | Max Fault | Three Phase | CLARMTP 2 69.000 | 10,828 |
| 28S | Max Fault | Three Phase | CLARCTY1 2 69.000 | 9,995 |
| 28S | Max Fault | Three Phase | CLARCTY2 2 69.000 | 9,161 |
| 28S | Max Fault | Three Phase | CLARCTY4 2 69.000 | 9,132 |
| 28S | Max Fault | Three Phase | OOLOGAH 4 138.00 | 21,627 |
| 28S | Max Fault | Three Phase | SEQUOYA 2 69.000 | 6,895 |
| 28S | Max Fault | Three Phase | MCSTAP 5 161.00 | 20,052 |
| 28S | Max Fault | Three Phase | CLARMRDUP* 13.800 | 4,821 |

**Table 3-2: Short Circuit Results**

*CLARMRDUP is the tertiary bus of the solution's new transformer at existing Claremore substation

## *STABILITY*

SPP performed a Fast Fault Screening (FFS) for the base case and change case models. The change case models include the Claremore delivery point changes. The FFS was performed for 2033 Summer Peak. There were no significant differences in the critical clearing times between the base and change case. Therefore, a transient stability analysis is not required.

## *TRANSMISSION SOLUTIONS*

The addition of the load at the new Claremore delivery point caused potential thermal overloads on the 138 kV system around Claremore and on a third-party transmission facility as indicated in Table 3-1. SPP solutions considered rebuilding the surrounding 138 kV system and bringing in nearby transmission sources. The solutions are listed below.

**Solution #1:** 138 kV Rebuild (Total cost $11,981,322)

- Rebuild N.E.S. to Oologah 138 kV circuit 1
- Rebuild Oologah to Claremore 138 kV circuit 1
- Rebuild Claremore to Claremore4 138 kV circuit 1
- New 161/138 kV transformer at Claremore4

**Solution #2** 345 kV Source (Total cost $28,125,155)

- New 345 kV substation at Claremore tapping N.E.S. to Oneta 345 kV circuit 1
- Build 1.54 miles of new 345 kV lines from tapped N.E.S. to Oneta line to new Claremore 345 kV substation
- New 345/138 kV transformer at new Claremore substation
- Rebuild N.E.S. to Oologah 138 kV circuit 1
- Rebuild Oologah to Claremore 138 kV circuit 1

SPP chose to move forward with Solution #1. This solution solves all issues identified in Table 3-1 in the most cost-effective manner.

| New Upgrade Description* | Mileage | MVA (Rate B) | Date Needed** | Host Transmission Owner | Estimated Cost*** |
|---|---|---|---|---|---|
| Rebuild N.E.S. to Oologah 138 kV circuit 1 | 2.98 | 325 | 6/1/2026 | GRDA | $2,918,314 |
| Rebuild Oologah to Claremore 138 kV circuit 1 | 1.7 | 325 | 6/1/2026 | GRDA | $1,659,913 |
| Rebuild Claremore to Claremore4 138 kV circuit 1 | 5.09 | 265 | 6/1/2026 | GRDA | $4,979,740 |
| New 161/138 kV transformer at Claremore4 | - | 256 | 6/1/2026 | GRDA | $2,423,355 |
| **TOTAL NEW UPGRADE COST** | | | | | **$11,981,322** |

**Table 3-3: Recommended Upgrade Solution 1**

*All requests with a Network Upgrade(s) identified in the DPNS will be subject to further evaluation in the soonest available Integrated Transmission Planning Assessment that is able to include the load changes, if it is determined that the Network Upgrade(s) will be able to meet the study timeframe requirements pursuant to the standardized project timelines in SPP Business Practices, based on the SPP determined Network Upgrade(s) need date. If it is determined that a Network Upgrade(s) identified from a DPNS is unable to be further evaluated pursuant to the Integrated Transmission Planning Assessment, the DPNS report will be posted on the SPP website once SPP is notified by the Transmission Customer to update the applicable Network Integration Transmission Service Agreement to reflect the changes in delivery points and the Network Upgrade(s).

Pursuant to Attachment AQ of the Tariff, the Transmission provider is responsible for assessing the impacts on the Transmission System caused by modifying an existing delivery point or establishing the new delivery point through the Delivery Point Network Study (DPNS). The DPNS may determine the need for a Network Upgrade(s) necessary for the modification of an existing delivery point or the establishment of a new delivery point. A Network Upgrade(s) that the Transmission Customer or Host Transmission Owner desires that exceeds the needed Network Upgrade(s) identified in the DPNS will need to be studied through the Transmission Provider's Sponsored Upgrade study process to evaluate the impacts of the desired changes on the Transmission System.

**If the project need date specified in this study cannot be met, the Transmission Owner will be required to submit mitigations pursuant to the SPP Project Tracking process. All upgrades or mitigations must be in place prior to the dates shown in Table 3-4.

***Note that the estimated new upgrade cost provided in this report is an SPP Conceptual Cost Estimate only; this is preliminary, and a more refined Study Cost Estimate will be developed after issuance of this report through a Standardized Cost Estimate Reporting Template (SCERT).

# SECTION 4: CONCLUSION

The AC analysis revealed potential thermal violations associated with the Claremore load addition on SPP facilities and a third-party transmission facility. The study shows that the following SPP upgrades are required to reliably serve the load addition:

- Rebuild N.E.S. to Oologah 138 kV circuit 1
- Rebuild Oologah to Claremore 138 kV circuit 1
- Rebuild Claremore to Claremore4 138 kV circuit 1
- New 161/138 kV transformer at Claremore4

The transmission upgrades in Table 3-3 are recommended to mitigate the potential thermal violations.