**EXHIBIT C**

**Engineering Specifications for Underground Bipolar HVDC Transmission Line**

**Circuit \_\_ of \_\_**

**Part A – General Information**

1. Name of circuit number or name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Length of line: \_\_\_\_\_\_ miles
3. The line [ ] will be constructed, [ ] was constructed, [ ] was rebuilt, [ ] will be rebuilt in \_\_\_\_\_\_\_.
4. The line will be maintained in accordance with the Iowa Electrical Safety Code and the   
   \_\_\_\_\_\_ edition of the National Electrical Safety Code.
5. Maximum capable of operating voltage: \_\_\_\_\_\_ kVDC
6. Nominal operating voltage: \_\_\_\_\_\_\_ kVDC
7. Circuit capacity (MW): \_\_\_\_\_\_
8. The purpose of the circuit is: (check all that apply)
   * 1. [\_] To serve new or existing load at \_\_\_\_\_\_\_\_
     2. [\_] To connect new or existing generation to the transmission grid
        1. Type: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
        2. Owner: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
        3. Location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
        4. Total MW: \_\_\_\_\_\_\_\_\_
        5. Status: Proposed / Under Construction / Constructed
     3. [\_] Mitigate transmission congestion
     4. [\_] Remove NERC violations
     5. [\_] Required by RTO (name of RTO)
     6. [\_] Resolve thermal loading issue
     7. Other: *please specify*

**Part B – Conductor Specifications**

1. Direct burial or in duct: \_\_\_\_\_\_\_
2. Separation between cable and RC: Vertically: \_\_\_\_\_\_\_ Horizontally: \_\_\_\_\_\_\_\_\_
3. Minimum burial depth: \_\_\_\_\_\_\_\_\_\_
4. Primary and return cable(s) are identical: [ ] Yes [ ] No
5. Primary cable
   1. Cable size (kcmil): \_\_\_\_\_\_\_\_ Cable material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Insulation thickness: \_\_\_\_\_\_\_ Insulation material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Outer shield material(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Is cable jacketed? [ ] Yes [ ] No Jacket material:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Return cable(s)
   1. Number of return cables (RC): \_\_\_\_\_\_
   2. RC maximum operating voltage: \_\_\_\_\_\_ RC typical operating voltage: \_\_\_\_\_
   3. RC catalog number: \_\_\_\_\_\_\_
   4. RC size: \_\_\_\_\_\_\_ RC material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. RC insulation thickness: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ RC insulation material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   6. RC outer shield material(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   7. Is RC jacketed? [ ] Yes [ ] No RC jacket material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part C – Structures**

1. Aboveground enclosure or underground vault are used along the route: [ ] Yes [ ] No
   1. Locations: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Construction material: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Equipment within vault: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part D – Convert Stations**

1. AC to DC conversion station location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. AC voltage: \_\_\_\_\_\_
   2. DC voltage: \_\_\_\_\_\_
   3. Status: Proposed [ ] Under Construction [ ] (expected completion date \_\_\_\_\_\_\_\_\_\_\_) Constructed [ ]
2. DC to AC conversion station location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. AC voltage: \_\_\_\_\_\_
   2. DC voltage: \_\_\_\_\_\_
   3. Status: Proposed [ ] Under Construction [ ] (expected completion date \_\_\_\_\_\_\_\_\_\_\_) Constructed [ ]

**Part E – Additional Utilities in Common Trench**

If other utility facilities are to be buried in the same trench with the proposed line, complete the following:

1. Type of utility: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Name of utility: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. If electrical facilities, voltage: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Vertical separation between utilities: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Horizontal separation between utilities: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Locations of shared trench: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Maximum distance between shared trench: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Appendix 1 – Structure Drawing and Other Information**

Please Provide:

1. Typical cross-section of the trench
2. Typical cross-section at each location of a shared trench
3. Typical drawings for each type crossing of another underground facility
4. Typical drawing for the crossing of a waterway
5. Typical drawings of aboveground enclosure and underground vaults
6. Cut sheet for primary and return cables
7. Cut sheet for fiber optics cable, if used
8. Cut sheet for circuit breakers

**Appendix 2 – Circuit Location Map**

1. Map of circuit is attached: [ ] Yes [ ] No

**Appendix 3: Required Easements and Permits**

1. Number of easements required: \_\_\_\_\_\_\_\_\_ Number of easements obtained: \_\_\_\_\_\_\_\_\_
2. Construction start date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Construction end date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Line in-service date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. List any permits or approvals required by local, state, federal, or other agencies or entities to construct the transmission line, other than the Iowa Utilities Board, in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Permit/Approval Agency | Description | Status |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |

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