T123 Mickleton 230kV
Generation Interconnection

General

The Interconnection Customer (IC) has proposed a 1010 MW generating facility to be located in Gloucester County, New Jersey. T123 will connect to the Atlantic City Electric's (ACE) transmission system at the Mickleton 230kV substation. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2012. The IC has proposed a June 2102 in service date.

Point of Interconnection: T123 will connect with the ACE transmission system at the Mickleton 230kV substation.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owner's, (ACE), responsibility includes design and construction of all facilities associated with the Mickleton 230kV substation on the Interconnected Transmission Owner's side of the Point of Interconnection (POI). ACE's direct connection work at the Mickleton substation consists of creating one (1) 230kV terminal position and underground cabling to an estimated location at the fence line of the Mickleton substation for the Interconnection Customer's 230kV line to the T123 site. Revenue metering will be located on the feed to the generator.

The estimated cost to perform this work is **$4,000,000** and can be completed in **24 to 36 months** from the time "Notice to Proceed" is given after the ISA and CSA are executed. Note: the cost does not include the Contribution in Aid of Construction (CIAC) tax.

Interconnection Customer Scope of Direct Connection Work

The IC has assumed full responsibility for design and construction of all facilities associated with the T123 generating station and the 230 kV direct connection line on the Interconnection Customer side of the POI. Site preparation including grading, right off way, and access roads is assumed to be by the developer.

The Interconnection Customer will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with Atlantic City Electric's Applicable Standards.

Network Impacts

Potential network impacts are as follows:

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Generator Deliverability

*(Single or N-1 contingencies for the **Capacity portion** only of the interconnection request)*

1. The CHICH2-SAVILLE 138kV (PECO) line loads from 96.0% to 101.3% (DC power flow) of its emergency rating (323 MVA) for the single line contingency outage (PE303). This project contributes approximately 17.1 MW to cause this thermal violation.

2. The THOROFAR-DEPTFORD 230kV (PSEG) line loads from 96.5% to 131.9% (DC power flow) of its normal rating (653 MVA) for non-contingency condition. This project contributes approximately 231.4 MW to cause this thermal violation.

3. The DEPTFORD-EAGLE PT 230kV (PSEG) line loads from 94.4% to 137.6% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (PS4A). This project contributes approximately 325.4 MW to cause this thermal violation.

4. The LENOX-TIFFANY 115kV (PENELEC) line loads from 98.8% to 103.3% (DC power flow) of its emergency rating (151 MVA) for the single line contingency outage (PN20). This project contributes approximately 6.9 MW to cause this thermal violation.

5. The DEPTFORD-EAGLE PT 230kV (PSEG) line loads from 83.0% to 118.4% (DC power flow) of its normal rating (653 MVA) for non-contingency condition. This project contributes approximately 231.4 MW to cause this thermal violation.

6. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 93.0% to 140.8% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS6A). This project contributes approximately 346.4 MW to cause this thermal violation.

7. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 91.1% to 133.3% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PS6A). This project contributes approximately 346.0 MW to cause this thermal violation.

8. The TRAINER-CHIREACT 230kV (PECO) line loads from 84.4% to 126.7% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PS6A). This project contributes approximately 346.0 MW to cause this thermal violation.

9. The CHIREACT-CHICHST2 230kV (PECO) line loads from 84.4% to 126.6% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PS6A). This project contributes approximately 346.0 MW to cause this thermal violation.

10. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 79.8% to 127.2% (DC power flow) of its normal rating (605 MVA) for non-contingency condition. This project contributes approximately 286.9 MW to cause this thermal violation.

11. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 63.9% to 105.9% (DC power flow) of its normal rating (650 MVA) for non-contingency condition. This project contributes approximately 272.9 MW to cause this thermal violation.

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12. The NEW FREE-WINDSOR 500kV (PSEG) line loads from 94.9% to 101.7% (DC power flow) of its normal rating (2650 MVA) for non-contingency condition. This project contributes approximately 180.2 MW to cause this thermal violation.

13. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 67.4% to 102.4% (DC power flow) of its normal rating (819 MVA) for non-contingency condition. This project contributes approximately 286.5 MW to cause this thermal violation.

14. The NEW FREE-WINDSOR 500kV (PSEG) line loads from 94.7% to 104.4% (DC power flow) of its emergency rating (3040 MVA) for the single line contingency outage (PJM27B). This project contributes approximately 294.8 MW to cause this thermal violation.

15. The CHICHST1-FOULK8 230kV (PECO) line loads from 98.8% to 108.3% (DC power flow) of its normal rating (1036 MVA) for non-contingency condition. This project contributes approximately 98.6 MW to cause this thermal violation.

16. The FOULK-CONCORD6 230kV (PECO) line loads from 95.2% to 104.7% (DC power flow) of its normal rating (1036 MVA) for non-contingency condition. This project contributes approximately 98.6 MW to cause this thermal violation.

Multiple Facility Contingency

*(Double Circuit Tower Line contingencies only for the **full energy** output. Stuck breaker and bus fault contingencies will be performed for the System Impact Study)*

17. The GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer loads from 98.41% (DC power flow) to 117.33% of its emergency rating (341 MVA) for the tower line outage (39PS). This project contributes approximately 64.5 MW to cause this thermal violation.

18. The GLOUCSTR-CUTHBERT 138kV (PSEG) line loads from 98.17% to 117.09% (DC power flow) of its emergency rating (341 MVA) for the tower line outage (39PS). This project contributes approximately 64.5 MW to cause this thermal violation.

19. The GLCSTR1-BEAVR BK 230kV (PSEG) line loads from 77.79% to 109.70% (DC power flow) of its emergency rating (752 MVA) for the tower line outage (4AE_A19). This project contributes approximately 240.0 MW to cause this thermal violation.

20. The CHIREACT-CHICHST2 230kV (PECO) line loads from 97.63% to 143.09% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 372.4 MW to cause this thermal violation.

21. The PEDRKTWN-CHAMBERS 230kV (AE) line loads from 66.62% to 102.77% (DC power flow) of its emergency rating (552 MVA) for the tower line outage (4AE_A19). This project contributes approximately 199.5 MW to cause this thermal violation.

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22. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 71.94% to 110.07% (DC power flow) of its emergency rating (725 MVA) for the tower line outage (14AE). This project contributes approximately 276.4 MW to cause this thermal violation.

23. The ROCKSPGS-PEACHBTM 500kV (PECO) line loads from 96.22% to 105.66% (DC power flow) of its emergency rating (3112 MVA) for the tower line outage (1PS). This project contributes approximately 294.0 MW to cause this thermal violation.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

24. The PRINTZ-RIDLEY 230kV (PECO) line loads from 129.23% to 134.77% (DC power flow) of its emergency rating (1432 MVA) for the single line contingency outage (PE23). This project contributes approximately 79.2 MW to the thermal violation.

25. The EDDYSTN3-ISLANDR6 230kV (PECO) line loads from 122.88% to 127.46% (DC power flow) of its emergency rating (1410 MVA) for the single line contingency outage (PE46). This project contributes approximately 64.6 MW to the thermal violation.

26. The RIDLEY-MACDADE 230kV (PECO) line loads from 116.39% to 120.72% (DC power flow) of its emergency rating (1432 MVA) for the single line contingency outage (PE23). This project contributes approximately 62.0 MW to the thermal violation.

27. The MACDADE3-ELMWOOD 230kV (PECO) line loads from 115.61% to 120.24% (DC power flow) of its emergency rating (1339 MVA) for the single line contingency outage (PE23). This project contributes approximately 62.0 MW to the thermal violation.

28. The LAUREL L-GOUDY115 115kV (PENELEC) line loads from 109.60% to 115.17% (DC power flow) of its emergency rating (129 MVA) for the single line contingency outage (PN20). This project contributes approximately 7.2 MW to the thermal violation.

29. The ELMWOOD8-GRAYSF93 230kV (PECO) line loads from 110.82% to 115.44% (DC power flow) of its emergency rating (1339 MVA) for the single line contingency outage (PE23). This project contributes approximately 62.0 MW to the thermal violation.

30. The ISLANDRD-GRAYSFR8 230kV (PECO) line loads from 110.08% to 114.54% (DC power flow) of its emergency rating (1374 MVA) for the single line contingency outage (PE46). This project contributes approximately 61.3 MW to the thermal violation.

31. The GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer loads from 124.61% to 148.47% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 81.4 MW to the thermal violation.

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32. The GLOUCSTR-CUTHBERT 138kV (PSEG) line loads from 126.01% to 155.49% (DC power flow) of its normal rating (239 MVA) for non-contingency condition. This project contributes approximately 70.5 MW to the thermal violation.

33. The EDDYSTN4-PRINTZ 230kV (PECO) line loads from 115.59% to 122.49% (DC power flow) of its emergency rating (1193 MVA) for the single line contingency outage (PE23). This project contributes approximately 82.3 MW to the thermal violation.

34. The MCKLTON-THOROFAR 230kV (AE/PSEG) line loads from 152.37% to 203.68% (DC power flow) of its normal rating (451 MVA) for non-contingency condition. This project contributes approximately 231.4 MW to the thermal violation.

35. The MCKLTON-MONROE 230kV (AE) line (circuit #2) loads from 142.43% to 195.28% (DC power flow) of its emergency rating (446 MVA) for the single line contingency outage (AE12). This project contributes approximately 235.7 MW to the thermal violation.

36. The MCKLTON-MONROE 230kV (AE) line (circuit #1) loads from 142.43% to 195.28% (DC power flow) of its emergency rating (446 MVA) for the single line contingency outage (AE2_A19). This project contributes approximately 235.7 MW to the thermal violation.

37. The GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer loads from 113.95% to 140.55% (DC power flow) of its normal rating (265 MVA) for non-contingency condition. This project contributes approximately 70.5 MW to the thermal violation.

38. The MCKLTON-MONROE 230kV (AE) line loads from 119.66% to 164.06% (DC power flow) of its normal rating (365 MVA) for non-contingency condition. This project contributes approximately 162.1 MW to the thermal violation.

39. The MCKLTON-MONROE 230kV (AE) line loads from 119.66% to 164.06% (DC power flow) of its normal rating (365 MVA) for non-contingency condition. This project contributes approximately 162.1 MW to the thermal violation.

40. The EAGLE PT-GLOUCSTR 230kV (PSEG) line loads from 111.37% to 146.64% (DC power flow) of its normal rating (653 MVA) for non-contingency condition. This project contributes approximately 230.3 MW to the thermal violation.

41. The EAGLE PT-GLOUCSTR 230kV (PSEG) line loads from 117.57% to 160.69% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (PS4A). This project contributes approximately 324.3 MW to the thermal violation.

42. The CHICHST1-EDDYSTN4 230kV (PECO) line loads from 128.79% to 141.91% (DC power flow) of its emergency rating (1235 MVA) for the single line contingency outage (PE4). This project contributes approximately 162.1 MW to the thermal violation.

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43. The MASTER-N PHILA8 230kV (PECO) line loads from 100.93% to 106.52% (DC power flow) of its emergency rating (882 MVA) for the single line contingency outage (PE69). This project contributes approximately 49.3 MW to the thermal violation.

44. The THOROFAR-DEPTFORD 230kV (PSEG) line loads from 118.02% to 166.16% (DC power flow) of its emergency rating (676 MVA) for the single line contingency outage (PS4A). This project contributes approximately 325.4 MW to the thermal violation.

45. The GRAYSF71-TUNNEL2 230kV (PECO) line loads from 110.68% to 118.21% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE69). This project contributes approximately 105.0 MW to the thermal violation.

46. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 108.65% to 162.51% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 390.4 MW to the thermal violation.

47. The RIDLEY-MORTON2 230kV (PECO) line loads from 118.23% to 128.64% (DC power flow) of its emergency rating (613 MVA) for the single line contingency outage (PE4). This project contributes approximately 63.8 MW to the thermal violation.

48. The CHICHST1-FOULK8 230kV (PECO) line loads from 117.79% to 129.52% (DC power flow) of its emergency rating (1335 MVA) for the single line contingency outage (PE36). This project contributes approximately 156.5 MW to the thermal violation.

49. The TUNNEL-PARRISH9 230kV (PECO) line loads from 104.58% to 112.10% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE48). This project contributes approximately 105.0 MW to the thermal violation.

50. The FOULK-CONCORD6 230kV (PECO) line loads from 115.01% to 126.73% (DC power flow) of its emergency rating (1335 MVA) for the single line contingency outage (PE36). This project contributes approximately 156.5 MW to the thermal violation.

51. The MORTON-MIDDLTW8 230kV (PECO) line loads from 110.36% to 120.77% (DC power flow) of its emergency rating (613 MVA) for the single line contingency outage (PE4).

52. The N.MESHPN-MESH2REA 230/115kV (PENELEC) transformer loads from 151.44% to 157.73% (DC power flow) of its emergency rating (201 MVA) for the single line contingency outage (PN47B). This project contributes approximately 12.6 MW to the thermal violation.

53. The MESH2REA-NO MESHO 115kV (PENELEC) line loads from 151.38% to 157.67% (DC power flow) of its emergency rating (201 MVA) for the single line contingency outage (PN47B). This project contributes approximately 12.6 MW to the thermal violation.

54. The LACKAWNA-OXBOW 230kV (PL/PENELEC) line loads from 183.45% to 190.16% (DC power flow) of its normal rating (499 MVA) for non-contingency condition. This project contributes approximately 33.5 MW to the thermal violation.

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55. The OXBOW-N.MESHPN 230kV (PENELEC) line loads from 183.28% to 190.00% (DC power flow) of its normal rating (499 MVA) for non-contingency condition. This project contributes approximately 33.5 MW to the thermal violation.

56. The RL_230-KEEN_230 230kV (DP&L) line loads from 108.65% to 121.69% (DC power flow) of its emergency rating (932 MVA) for the single line contingency outage (PJM64). This project contributes approximately 121.6 MW to the thermal violation.

57. The MCKLTON-THOROFAR 230kV (AE/PSEG) line loads from 185.20% to 250.35% (DC power flow) of its emergency rating (566 MVA) for the tower line outage (4AE_A19). This project contributes approximately 368.7 MW to the thermal violation.

58. The NEAST317-N.EAST 230/115kV (BG&E) transformer loads from 140.66% to 146.23% (DC power flow) of its emergency rating (378 MVA) for the tower line outage (NORTHEAST_RIVERSIDE). This project contributes approximately 21.1 MW to the thermal violation.

59. The EAGLE PT-GLOUCSTR 230kV (PSEG) line loads from 144.69% to 193.57% (DC power flow) of its emergency rating (752 MVA) for the tower line outage (4AE_A19). This project contributes approximately 367.6 MW to the thermal violation.

60. The THOROFAR-DEPTFORD 230kV (PSEG) line loads from 146.60% to 201.14% (DC power flow) of its emergency rating (676 MVA) for the tower line outage (4AE_A19). This project contributes approximately 368.7 MW to the thermal violation.

61. The MCKLTON-MONROE 230kV (AE) line loads from 140.79% to 193.75% (DC power flow) of its emergency rating (446 MVA) for the tower line outage (5AE). This project contributes approximately 236.2 MW to the thermal violation.

62. The DEPTFORD-EAGLE PT 230kV (PSEG) line loads from 120.05% to 169.08% (DC power flow) of its emergency rating (752 MVA) for the tower line outage (4AE_A19). This project contributes approximately 368.7 MW to the thermal violation.

63. The MCKLTON-MONROE 230kV (AE) line loads from 101.25% to 137.52% (DC power flow) of its emergency rating (446 MVA) for the tower line outage (13AE). This project contributes approximately 161.8 MW to the thermal violation.

64. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 108.15% to 159.57% (DC power flow) of its emergency rating (725 MVA) for the tower line outage (4AE_A19). This project contributes approximately 372.8 MW to the thermal violation.

65. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 104.28% to 149.75% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 372.4 MW to the thermal violation.

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66. The TRAINER-CHIREACT 230kV (PECO) line loads from 103.03% to 136.10% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (10APECO_A57). This project contributes approximately 270.8 MW to the thermal violation.

67. The NEW FREE-WINDSOR 500kV (PSEG) line loads from 100.63% to 107.00% (DC power flow) of its emergency rating (3040 MVA) for the tower line outage (21JC). This project contributes approximately 193.8 MW to the thermal violation.

68. The BRUNNER-YORKANA 230kV (METED/PPL) line loads from 135.92% to 142.55% (DC power flow) of its emergency rating (617 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 40.9 MW to the thermal violation.

69. The 3 MILE I-TMI 500/230kV (METED) transformer loads from 171.52% to 180.74% (DC power flow) of its emergency rating (1077 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 99.3 MW to the thermal violation.

70. The NOTTNGHM-NOTTREAC 230kV (PECO) line loads from 227.44% to 240.82% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 83.9 MW to the thermal violation.

71. The NOTTREAC-PCHBTMTP 230kV (PECO) line loads from 227.41% to 240.79% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 83.9 MW to the thermal violation.

72. The PCHBTMTP-GRACETON 230kV (PECO/BGE) line loads from 227.41% to 240.79% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 83.9 MW to the thermal violation.

73. The PEACHBTM-3 MILE I 500kV (PECO/METED) line loads from 112.12% to 119.59% (DC power flow) of its emergency rating (2596 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 193.7 MW to the thermal violation.

74. The TMI-JACKSON1 230kV (METED) line loads from 115.65% to 122.49% (DC power flow) of its emergency rating (599 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 41.0 MW to the thermal violation.

75. The CNASTONE-N-NWEST 500kV (BGE) line loads from 191.50% to 200.30% (DC power flow) of its emergency rating (2901 MVA) for the tower line outage (CNSTN_NWEST_NNWEST_A). This project contributes approximately 255.2 MW to the thermal violation.

76. The HOSENSAK-N.BOYTWN 230kV (METED/PPL) line loads from 119.33% to 126.28% (DC power flow) of its emergency rating (525 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 36.5 MW to the thermal violation.

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Short Circuit

8 new breakers were found to be over-duty in the AEC transmission area. The new over-duty breakers are listed below:

Mickleton 230 kV – DT
Mickleton 230 kV – ES
Mickleton 230 kV – GQ
Mickleton 230 kV – HP
Mickleton 230 kV – JN
Mickleton 230 kV – R
Mickleton 230 kV – S
Mickleton 230 kV – BV

In addition, the analysis also showed a significant fault contribution to 2 breakers, which were already identified as over-duty. The breakers are listed below:

Mickleton 230 kV – U
Mickleton 230 kV – V

T123 had a significant enough fault contribution at all of these breakers to receive a cost allocation for their upgrade or replacement.

Stability and Reactive Power Requirements

Will be performed during the Queue T123 System Impact Study.

Steady State Voltage Requirements

Will be performed during the Queue T123 System Impact Study.

New System Reinforcements

*(Upgrades **required** to mitigate reliability criteria violations, i.e. "Network Impacts", initially caused by the addition of this project generation)*

1. To mitigate the CHICH2-SAVILLE 138kV (PECO) line overload would require re-rating the line to 338 MVA emergency. The estimated cost to perform this work is **$0.**

2. 44.and 60. To mitigate the THOROFAR-DEPTFORD 230kV (PSEG) line overload would require the reconductoring of approximately 4 miles of line and upgrading of terminal equipment. The estimated cost to perform this work is **$4,700,000.**

3. 5.and 62. To mitigate the DEPTFORD-EAGLE PT 230kV (PSEG) line overload would require the reconductoring of approximately 1 mile of line and upgrading of terminal equipment. The estimated cost to perform this work is **$1,200,000.**

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4. To mitigate the LENOX-TIFFANY 115kV (PENELEC) line overload would require opening of the TIFFANY-Goudey 115kV line, which is consistent with existing FirstEnergy procedures to control thermal limits that occur on the PENELEC/NY-ISO tie lines.

6. 10.and 64. To mitigate the MCKLTON-DELCOTAP 230kV (AE/PECO) line overloads would require the rebuild and reconductor of the line section with bundled conductor. The Delaware River crossing section of this line will also require a rebuild and reconductor. The estimated cost to perform this work is **$108,100,000** and will take **36 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

7. 13. and 65. To mitigate the DELCOTAP-TRAINER2 230kV (PECO) overload would require a teardown and rebuild to 1243/1410 MVA along with replacement of terminal equipment. The estimated cost to perform this work is **$7,100,000** and will take **42 months** to complete.

8. and 66. To mitigate the TRAINER-CHIREACT 230kV (PECO) overload would require a teardown and rebuild of the circuit to a new 1243/1410 MVA rating along with replacement of the terminal equipment. The estimated cost to perform this work is **$9,200,000** and will take **48 months** to complete.

9. and 20. To mitigate the CHIREACT-CHICHST2 230kV (PECO) line overload would require removal of the line reactor. The estimated cost to perform this work is **$100,000** and will take **6 months** to complete.

11. 22.and 46. To mitigate the MONROE-NEW FRDM 230kV (AE/PSEG) line overloads will require a rebuild and reconductor of the 6.91 mile Monroe-New Freedom 230 kV line with a bundled conductor. The estimated cost to perform this work is $**16,600,000** and will take **36 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

12. 14.and 67. The reinforcement necessary to mitigate the NEW FREE-WINDSOR 500kV (PSEG) line overload is currently under development and is expected to be available during the System Impact Study phase of the T123 project.

15. To mitigate the CHICHST1-FOULK8 230kV (PECO) line overload would require the line to be reconductored to an adequate rating along with replacement of terminal equipment. The estimated cost to perform this work is **$8,200,000** and will take **36 months** to complete.

16. To mitigate the FOULK-CONCORD6 230kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will require **30 months** to complete.

17. 31.and 37. To mitigate the GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer overloads would require the replacement of the transformer. The estimated cost to perform this work is **$3,975,000**.

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18. and 32. To mitigate the GLOUCSTR-CUTHBERT 138kV (PSEG) line overloads would require reconductoring approximately 5 miles of line and upgrading terminal equipment. The estimated cost to perform this work is **$20,800,000.**

19. The reinforcement necessary to mitigate the GLCSTR1-BEAVR BK 230kV (PSEG) line overload is currently under development and is expected to be available during the System Impact Study phase of the T123 project.

21. To mitigate the PEDRKTWN-CHAMBERS 230kV (AE) line overload would require the upgrade of the 230kV strand bus at Pedricktown. The estimated cost to perform this work is **$200,000** and will take **24 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

23. To mitigate the ROCKSPGS-PEACHBTM 500kV (PECO) line overload would require the replacement of circuit breakers and wave trap. The estimated cost to perform his work is **$3,000,000** and will take **30 months** to complete.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the System Impact Study)

24. To mitigate the PRINTZ-RIDLEY 230kV (PECO) line overload would require the reconductor the Printz to Ridley portion of the 220-46 line (3.15 miles on railroad right of way) with ACSS/TW conductor and replace terminal equipment at Printz and Ridley. The estimated cost is to perform this work is **$7,700,000** and it will take **36 months** to complete.

25. To mitigate the EDDYSTN3-ISLANDR6 230kV (PECO) line overload would require reconductor of the line along with terminal equipment replacement. The estimated cost to perform this work is **$9,100,000** and will take **36 months** to complete.

26. To mitigate the RIDLEY-MACDADE 230kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will take **30 months** to complete.

27. To mitigate the MACDADE3-ELMWOOD 230kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will take **30 months** to complete.

28. To mitigate the LAUREL L-GOUDY115 115kV (PENELEC) line overload, the Tiffany-Goudey 115kV line should be operated open, consistent with existing FirstEnergy procedures to control thermal limits that occur on the PENELEC/NY-ISO tie lines.

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29. To mitigate the ELMWOOD8-GRAYSF93 230kV (PECO) overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will take **30 months** to complete.

30. To mitigate the ISLANDRD-GRAYSFR8 230kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will take **30 months** to complete.

33. To mitigate the EDDYSTN4-PRINTZ 230kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will take **30 months** to complete.

34. and 57. To mitigate the MCKLTON-THOROFAR 230 kV (AE/PSEG) line overloads would require rebuilding and reconductoring the line with an ACSS/TW conductor and upgrading terminal equipment. The estimated cost to perform this work is **$1,500,000** and will take **30 months** to complete from the time "Notice to Proceed is given after the ISA and CSA are executed.

35. 36. 38. 39. 61. and 63. To mitigate the MCKLTON-MONROE 230 kV (AE) circuit #1 and #2 overloads would require reconductoring the lines with an ACSS/TW conductor. The estimated cost to perform this work is **$9,000,000** and will take **30 months** to complete from the time "Notice to Proceed is given after the ISA and CSA are executed.

40. 41. and 59. To mitigate the EAGLE PT-GLOUCSTR 230kV (PSEG) line overloads would require the reconductoring of approximately 3 miles of line and the upgrading of terminal equipment. The estimated cost to perform this work is **$3,800,000.**

42. To mitigate the CHICHST1- EDDYSTN4 230kV (PECO) line overload would require replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will take **30 months** to complete.

43. To mitigate the MASTER-N PHILA8 230kV (PECO) line overload would require rebuilding and reconductoring the circuit to a new rating of 1243/1410 MVA (AMTRAK ROW) along with the replacement of terminal equipment. The estimated cost to perform this work is **$13,000,000** and will take **42 months** to complete.

45. To mitigate the GRAYSF71-TUNNEL2 230kV (PECO) line overload would require rebuilding and reconductoring the circuit to a new rating of 1243/1410 MVA along with the replacement of terminal equipment. The estimated cost to perform this work is **$5,800,000** and will take **42 months** to complete.

47. To mitigate the RIDLEY-MORTON2 230kV (PECO) line overload would require upgrading the circuit by paralleling the existing 220-46 line (1.72 miles) 230kV pipe type underground cable with a second cable between Ridley and Morton substations and replacing relay equipment at Morton. The estimated cost to perform this work is **$8,300,000** and it will take **48 months** to complete.

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48. To mitigate the CHICHST1-FOULK8 230kV (PECO) line overload would require reconductoring the line along with replacement of terminal equipment. The estimated cost to perform this work is **$8,200,000** and will take **36 months** to complete.

49. To mitigate the TUNNEL-PARRISH9 230kV (PECO) line overload would require rebuilding and reconductoring the circuit (2.4 miles on railroad right of way) along with the replacement of terminal equipment at both ends of the line. The estimated cost to perform this work is **$11,500,000** and it will take **42 months** to complete.

50. To mitigate the FOULK-CONCORD6 230kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$5,000,000** and will take **30 months** to complete.

51. To mitigate the MORTON-MIDDLTW8 230kV (PECO) line overload would require upgrading the circuit by paralleling the existing 220-66 line (4.2 miles) 230kV pipe type underground cable with a second cable between Morton and Middletown substations. The estimated cost to perform this work is **$18,000,000** and will take **48 months** to complete.

52. and 53. To mitigate the N.MESHPN-MESH2REA 230/115kV (PENELEC) transformer and line overloads would require the addition of two (2) 230 kV circuit breakers at the North Meshoppen substation. The North Meshoppen 230 kV bus would also need to be reconfigured into a ring bus. The estimated cost to perform this work is **$4,000,000** and will take **24 months** to complete after an ISA and CSA is executed.

54. To mitigate the LACKAWNA-OXBOW 230kV (PENELEC/PPL) line overload would require the following: for PENELEC, the rebuild of approximately 16.33 miles of transmission line to support bundled conductor. The Oxbow substation would require replacement of substation conductor and replacement of a disconnect switch. The estimated cost to perform this work is **$19,771,000** and will take **48 to 60 months** to complete after an ISA and CSA are executed. For PPL: the rebuild of 0.18 miles of transmission line and the upgrade of the Lackawanna substation terminal equipment. The estimated cost to perform this work is **$550,000.**

55. To mitigate the OXBOW-N.MESHPN 230kV (PENELEC) line overload would require the rebuild of approximately 10.16 mile of transmission line to support bundled conductor. Oxbow substation would require the replacement of a disconnect switch and substation conductor. North Meshoppen substation would require the upgrade/replacement of two (2) CT circuits, replacement of substation conductor, and the replacement/upgrade of a line/wave trap. The estimated cost to perform this work is **$12,939,000** and will take **48 to 60 months** to complete after an ISA and CSA is executed.

56. To mitigate the RL_230-KEEN_230 230kV (DP&L) line overload would require the replacement of the 2000A wave trap with one rated fro 3000A. The estimated cost to perform this work is **$400,000** and will take **12 to 18 months** to complete.

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58. To mitigate the NEAST317-N.EAST 230/115kV transformer (BGE) overload would require the replacement of the transformer with a 500kV unit. The estimated cost to perform this work is **$10,200,000.**

68. To mitigate the BRUNNER-YORKANA 230kV (METED/PPL) line overload would require the re-conductor of 0.64 miles of the existing single circuit 1033 Kcmil conductor which is limiting the line capacity of the Brunner Island – Yorkana 230kV line. The new line will be 1590 Kcmil equivalent ACCC (composite core) conductor. The 230 kV lines will be rated for summer normal/emergency of 653/793 MVA respectively or higher. This rebuild may require reinforcing the existing structures to accommodate the larger size of the new conductor. The rebuild will be 0.64 miles long and will travel the existing right of way. The estimated cost to perform this work including substation terminal equipment cost is **$600,000**.

69. To mitigate the 3 MILE I-TMI 500/230kV (METED) transformer would require the installation of a second 500/230kV transformer. The estimated cost to perform this work is **$11,800,000** and will take **20 months** to complete.

70. To mitigate the NOTTNGHM-NOTTREAC 230kV (PECO) line overload would require upgrading the circuit by replacing line reactors. The estimate to perform this work is **$200,000** and will take **18 months** to complete.

71. To mitigate the NOTTREAC-PCHBTMTP 230kV (PECO) line overload would require a teardown and rebuild of the circuit to a new 1700 MVA emergency rating. The estimate to perform this work is **$40,000,000** and will take **48 months** to complete.

72. To mitigate the PCHBTMTP-GRACETON 230kV (PECO/BG&E) line overload would require the replacement of existing lines with three (3) 230kV underground circuits. The estimate to perform this work is **$90,000,000** and will take **48 months** to complete. Note: a new right of way will be required if this line is to be replaced with an aerial transmission line. Assume 6 years to acquire land.

73. To mitigate the PEACHBTM-3 MILE I 500kV (PECO/METED) line overload would require the replacement of circuit breakers and wave trap. The estimated cost to perform this work is **$3,000,000** and will take **30 months** to complete.

74. To mitigate the TMI-JACKSON1 230kV (METED) line overload would require upgrading the circuit by reconductoring 18.05 miles of 230kV line and drop/loop bus with a bundled conductor. The estimated cost to perform this work is **$10,910,000**.

75. To mitigate the CNASTONE-N-NWEST 500kV (BG&E) overload would require:

<u>1 new single circuit line with the following assumptions:</u>

A new 200 ft. wide ROW paralleling the existing Conastone to Northwest ROW
Total ROW length = 19.6 miles
3 - bundle 1,590 kcm conductor

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North Northwest substation is located 4 miles north of Northwest substation

The estimated cost to perform this work, which includes breakers and terminations, is **$110,000,000** and will take **10 years** to complete.

Additional substation work to include:

At the Conastone 500kV substation – install a 1 breaker bay
At the NNW 500kV substation – install a 3 breaker bay.

The estimated cost to perform this work is **$9,200,000** with a **10 year** lead time to complete.

76. To mitigate the HOSENSAK-N.BOYTWN 230kV (METED/PPL) line overload would require the rebuilding and reconductoring of approximately 8 miles of 230kV transmission line with 1590 ACRS wire. The estimated cost to perform this work is **$11,760,000** and will take **36 months** to complete.

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