PJM Generator Interconnection Request
Queue #Y3-040
Feasibility Study

784268v2
March 2014

General

Interconnection Customer (IC) proposes to increase an existing by 20 MW (20 MW Capacity). PJM project Y3-040 was studied as a 20 MW (20 MW Capacity) injection at the generating unit.

The requested in service date is May 1, 2016

The objective of this Feasibility study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the AEP transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required to maintain the reliability of the AEP transmission system. Stability analysis is not included as part of this study.

Attachment Facilities

Not Applicable

Local and Network Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet performance parameters prescribed in the AEP FERC Form 715[1] and Connection Requirements for AEP Transmission System[2]. Therefore, these criteria were used to assess the impact of the proposed facility on the AEP System. Y3-040 was studied as a 20 MW (20 MW capacity) increase at the generating unit consistent with the interconnection application. Project #Y3-040 was evaluated for compliance with reliability criteria for summer peak conditions in 2017.

1 https://www.aep.com/about/codeofconduct/oasis/transmissionstudies/GuideLines/2013%20AEP%20PJM%20FERC%20715_Final_Part%204.pdf

2 http://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_Rev1.pdf

Potential network impacts were as follows:

Generator Deliverability
(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Light Load Analysis

Light Load Studies to be conducted during later study phases (applicable to wind, coal, nuclear, and pumped storage projects).

To be determined

Multiple Facility Contingency
(Double Circuit Tower Line, Failed Breaker and Bus Fault contingencies for the full energy output)

None

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

Not Required

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)

Table 1a - Contribution to Previously Identified Overloads

	Contingency			Bus		Loading		Rating		MW	FG
#	Type	Name	Facility Description	From	To	Initial	Final	Type	MVA	Contrib.	App.
1	LFFB	1528_C2	05ELKGAZ-05SALTV1 138 kV line	246766	242788	102.14	102.37	ER	398	5.53	1
2	Non	Non	05LEBANO-05ELKGAZ 138 kV line	242700	246766	100.69	102.51	NR	296	5.4	2
3	Non	Non	05CLNCHR-05LEBANO 138 kV line	242605	242700	105.11	106.94	NR	296	5.4	3
4	LFFB	1528_C2	05LEBANO-05ELKGAZ 138 kV line	242700	246766	106.87	107.09	ER	398	5.53	4
5	LFFB	1528_C2	05CLNCHR-05LEBANO 138 kV line	242605	242700	110.16	110.38	ER	398	5.53	5

Note: The last column in Table 1a denotes the flow gate appendix which can be found at the end of this report.

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

To be determined

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined

New System Reinforcements

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

None required

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 Impact Study)

Table 1b - Contribution to Previously Identified System Reinforcements

#	Contingency Name	Facility Description	Description	Mitigation	Cost
1	'1528_C2'	05ELKGAZ-05SALTV1 138 kV line	The Sub cond 750 MCM CU 61 Str SALTVILLE Bus is a limiting element.	Replace the Sub cond 750 MCM CU 61 Str Bus and Risers.	$150,000
			The Sub cond 750 MCM CU 61 Str SALTVILLE Risers are a limiting element.		
			The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 3 is a limiting element	Reconductor 0.09 mile section of 005ELKGAZ-05SALTV1 138 kV line.	$108,000
			The SALTVILLE Switch (1200A) is a limiting element.	Replace the SALTVILLE Switch (1200A).	$100,000
			The ELK GARDEN Switch (1200A) is a limiting element.	Replace the ELK GARDEN Switch (1200A).	Same as #1
2	NORMAL	05CLNCHR-05LEBANO 138 kV line	The Sub cond 1033.5 ACSR 45/7 CLINCH RIVER Riser is a limiting element.	Replace Sub cond 1033.5 ACSR 45/7 Riser.	$50,000
			The LEBANON Switch (1200A) is a limiting element.	Replace the LEBANON Switch (1200A).	$100,000
			The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 1 is a limiting element.	Reconductor 0.16 mile section of 05CLNCHR-05LEBANO 138 kV line.	$192,000
			The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 3 is a limiting element.	Reconductor 0.16 mile section of 05CLNCHR-05LEBANO 138 kV line.	$192,000
3	NORMAL	05LEBANO-05ELKGAZ 138 kV line	The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 1 is a limiting element.	Reconductor 0.09 mile section of 05LEBANO-05ELKGAZ 138 kV line.	$108,000
			The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 3 is a limiting element.	Reconductor 0.09 mile section of 05LEBANO-05ELKGAZ 138 kV line.	$108,000
			The LEBANON Moab "Y" Switch (1200A) is a limiting element.	Replace the LEBANON Moab "Y" Switch	$100,000

Table 1b - Contribution to Previously Identified System Reinforcements					
#	Contingency Name	Facility Description	Description	Mitigation	Cost
				(1200A).	
			The ELK GARDEN Switch (1200A) is a limiting element.	Replace the ELK GARDEN Switch (1200A).	$100,000
4	'1528_C2'	05LEBANO-05ELKGAZ 138 kV line	The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 1 is a limiting element.	Reconductor 0.09 mile section of 05LEBANO-05ELKGAZ 138 kV line.	Same as #1
			The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 3 is a limiting element.	Reconductor 0.09 mile section of 05LEBANO-05ELKGAZ 138 kV line.	Same as #1
			The LEBANON Moab "Y" Switch (1200A) is a limiting element.	Replace the LEBANON Moab "Y" Switch (1200A).	Same as #1
			The ELK GARDEN Switch (1200A) is a limiting element	Replace the ELK GARDEN Switch (1200A).	Same as #1
			The Sub cond 1590 AAC 61 Str LEBANON Bus is a limiting element.	Replace Sub cond 1590 AAC 61 Str Bus.	$50,000
5	'1528_C2'	05CLNCHR-05LEBANO 138 kV line	The Sub cond 1033.5 ACSR 45/7 CLINCH RIVER Riser is a limiting element.	Replace Sub cond 1033.5 ACSR 45/7 Riser.	Same as #3
			The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 1 is a limiting element	Reconductor 0.16 mile section of 05CLNCHR-05LEBANO 138 kV line.	Same as #3
			The ACSR ~ 1033.5 ~ 45/7 ~ ORTOLAN Conductor Section 3 is a limiting element.	Reconductor 0.16 mile section of 05CLNCHR-05LEBANO 138 kV line.	Same as #3
			The LEBANON Switch (1200A) is a limiting element.	Replace the LEBANON Switch (1200A).	Same as #3

Conclusion

Based upon the results of this Feasibility Study, the injection of an additional 20 MW at the generating unit (PJM Project #Y3-040) will require additional interconnection charges.

Total estimated cost for project Y3-040: $1,358,000

The estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements.

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(AEP - AEP) The 05ELKGAZ-05SALTV1 138 kV line (from bus 246766 to bus 242788 ckt 1) loads from 102.14% to 102.37% (**DC power flow**) of its emergency rating (398 MVA) for the line fault with failed breaker contingency outage of '1528_C2'. This project contributes approximately 5.53 MW to the thermal violation.

CONTINGENCY '1528_C2'
OPEN BRANCH FROM BUS 242510 TO BUS 242511 CKT 1 / 242510 05BAKER 765 242511 05BROADF 765 1
OPEN BRANCH FROM BUS 242511 TO BUS 242518 CKT 4 / 242511 05BROADF 765 242518 05BROADF 500 4
OPEN BRANCH FROM BUS 242518 TO BUS 360106 CKT 1 / 242518 05BROADF 500 360106 8SULLIVAN TN 500 1
END

Bus Number	Bus Name	Full Contribution
242900	05CRG1L	2.85
242902	05CRG2L	2.85
242903	05CRG3H	34.85
242904	05CRG3L	28.77
246895	05VACITY	7.61
244159	BUCK	-0.46
884780	S-058 C	5.13
884781	S-058 E	16.92
900404	X3-028 C	14.31
900405	X3-028 E	19.08
Y1-004	Y1-004	25.31
914192	Y2-067 E	3.32
Y2-068	Y2-068	48.82
914311	Y2-086	5.74
915161	Y3-039	5.53
915171	Y3-040	5.53

Appendix 2

(AEP - AEP) The 05LEBANO-05ELKGAZ 138 kV line (from bus 242700 to bus 246766 ckt 1) loads from 100.69% to 102.51% (**DC power flow**) of its normal rating (296 MVA) for non-contingency condition. This project contributes approximately 5.4 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
242570	05BUCHAN	0.37
242900	05CRG1L	2.78
242902	05CRG2L	2.78
242903	05CRG3H	34.01
242904	05CRG3L	28.07
246895	05VACITY	7.43
242851	05WOLFH2	0.47
244221	INDDRVL	0.13
Y2-068	Y2-068	20.95
914311	Y2-086	5.09
915161	Y3-039	5.4
915171	Y3-040	5.4

Appendix 3

(AEP - AEP) The 05CLNCHR-05LEBANO 138 kV line (from bus 242605 to bus 242700 ckt 1) loads from 105.11% to 106.94% (**DC power flow**) of its normal rating (296 MVA) for non-contingency condition. This project contributes approximately 5.4 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
242570	05BUCHAN	0.37
242900	05CRG1L	2.78
242902	05CRG2L	2.78
242903	05CRG3H	34.01
242904	05CRG3L	28.07
246895	05VACITY	7.43
242851	05WOLFH2	0.47
244221	INDDRVL	0.13
Y2-068	Y2-068	20.95
914311	Y2-086	5.09
915161	Y3-039	5.4
915171	Y3-040	5.4

Appendix 4

(AEP - AEP) The 05LEBANO-05ELKGAZ 138 kV line (from bus 242700 to bus 246766 ckt 1) loads from 106.87% to 107.09% (**DC power flow**) of its emergency rating (398 MVA) for the line fault with failed breaker contingency outage of '1528_C2'. This project contributes approximately 5.53 MW to the thermal violation.

CONTINGENCY '1528_C2'
OPEN BRANCH FROM BUS 242510 TO BUS 242511 CKT 1 / 242510 05BAKER 765 242511 05BROADF 765 1
OPEN BRANCH FROM BUS 242511 TO BUS 242518 CKT 4 / 242511 05BROADF 765 242518 05BROADF 500 4
OPEN BRANCH FROM BUS 242518 TO BUS 360106 CKT 1 / 242518 05BROADF 500 360106 8SULLIVAN TN 500 1
END

Bus Number	Bus Name	Full Contribution
242900	05CRG1L	2.85
242902	05CRG2L	2.85
242903	05CRG3H	34.85
242904	05CRG3L	28.77
246895	05VACITY	7.61
244159	BUCK	-0.46
884780	S-058 C	5.13
884781	S-058 E	16.92
900404	X3-028 C	14.31
900405	X3-028 E	19.08
Y1-004	Y1-004	25.31
914192	Y2-067 E	3.32
Y2-068	Y2-068	48.82
914311	Y2-086	5.74
915161	Y3-039	5.53
915171	Y3-040	5.53

Appendix 5

(AEP - AEP) The 05CLNCHR-05LEBANO 138 kV line (from bus 242605 to bus 242700 ckt 1) loads from 110.16% to 110.38% (**DC power flow**) of its emergency rating (398 MVA) for the line fault with failed breaker contingency outage of '1528_C2'. This project contributes approximately 5.53 MW to the thermal violation.

CONTINGENCY '1528_C2'
OPEN BRANCH FROM BUS 242510 TO BUS 242511 CKT 1 / 242510 05BAKER 765 242511 05BROADF 765 1
OPEN BRANCH FROM BUS 242511 TO BUS 242518 CKT 4 / 242511 05BROADF 765 242518 05BROADF 500 4
OPEN BRANCH FROM BUS 242518 TO BUS 360106 CKT 1 / 242518 05BROADF 500 360106 8SULLIVAN TN 500 1
END

Bus Number	Bus Name	Full Contribution
242900	05CRG1L	2.85
242902	05CRG2L	2.85
242903	05CRG3H	34.85
242904	05CRG3L	28.77
246895	05VACITY	7.61
244159	BUCK	-0.46
884780	S-058 C	5.13
884781	S-058 E	16.92
900404	X3-028 C	14.31
900405	X3-028 E	19.08
Y1-004	Y1-004	25.31
914192	Y2-067 E	3.32
Y2-068	Y2-068	48.82
914311	Y2-086	5.74
915161	Y3-039	5.53
915171	Y3-040	5.53