

Transmission Expansion Advisory Committee
(TEAC)
Recommendations to the PJM Board

PJM Staff Whitepaper
November 03, 2011



EXECUTIVE SUMMARY

On October 18, 2011 the PJM Board of Managers approved changes to the Regional Transmission Expansion Plan (RTEP), totaling \$1,487.60 million, including baseline project changes and interconnection project changes.

Since the Board's prior approval of the 2010 RTEP, PJM has completed 246 System Impact Studies and 159 interconnection projects have withdrawn. More importantly the 2011 RTEP baseline analysis identified additional baseline reliability criteria violations in the 2012 - 2026 time-frame. Transmission system upgrades to resolve the reliability criteria violations were identified. The costs associated with a number of previously approved baseline upgrades were also updated.

With these changes, the RTEP will include over \$20.709 billion of transmission additions and upgrades since the first plan was approved by the Board in 2000.

The additional baseline upgrades for the 2011 RTEP are summarized below.

SUMMARY OF RESULTS

A. 2011 Baseline Transmission Upgrades Changes and Additions

One aspect of the development of the RTEP Process is an evaluation of the "baseline" system; i.e., the transmission system without any of the generation interconnection requests included in the current planning cycle. This baseline analysis determines the compliance of the existing system with reliability criteria and standards. Transmission upgrades required to maintain a reliable system are identified and reviewed with the Subregional RTEP Committees and the Transmission Expansion Advisory Committee (TEAC). The cost of transmission upgrades to mitigate such criteria violations are the responsibility of the PJM load.

For the 2011 RTEP, the baseline assessment resulted in the need for transmission upgrades in several transmission zones. A summary of the major baseline project additions that are \$5 million or greater are detailed below.

Mid-Atlantic Region System Upgrades

- PSE&G Transmission Zone
 - Re-conductor the Eagle Point - Gloucester 230 kV circuit #1 and #2 - \$25 M
 - Re-configure the Kearny 230 kV substation and loop the P-2216-1 (Essex - NJT Meadows) 230 kV circuit through the station - \$48 M
 - Upgrade the PSEG portion of the Camden - Richmond 230 kV circuit conductor and replace terminal equipment at Camden - \$40 M
 - Rebuild Camden 230 kV to 80 kA - \$18 M
 - Rebuild Athenia 230 kV substation to 80 kA - \$21 M



- Rebuild Burlington 230 kV to 80 kA - \$5 M
- JCP&L Transmission Zone
 - Install a new 230/34.5 kV transformer at the Rocktown Substation - \$7.83 M
 - Build a new Englishtown - Wyckoff Street 115 kV line and install 115/34.5 kV transformer at Wyckoff St - \$18.43 M
 - Build a third 230 kV line into the Red Bank 230 kV substation - \$22 M
- AE Transmission Zone
 - Reconnector Sherman Ave - Carl's Corner 69 kV circuit - \$5.6 M
 - Upgrade the Mill T2 138/69 kV transformer - \$5 M
- DPL Transmission Zone
 - Upgrade the conductor on the Wattsville - Signpost - Stockton - Kenney 69 kV circuit - \$15 M
- PECO Transmission Zone
 - Reconnector the underground portion of the Richmond - Waneeta 230 kV and replace terminal equipment - \$12 M
- PENELEC Transmission Zone
 - Reconnector the New Baltimore - Bedford North 115 kV - \$11 M
 - Construct a new 345/115 kV substation near Mansfield - \$13 M
 - Construct Four Mile Junction 230/115 kV substation by looping the Erie South - Erie East 230 kV line through the station and interconnect the Buffalo Road - Corry East and Buffalo Road - Erie South 115 kV lines - \$11M
- PEPCO Transmission Zone
 - Reconnector the Bowie - Burtonsville 230 kV "23045" circuit and upgrade terminal equipment at Bowie and Burtonsville 230 kV substations - \$8 M
 - Reconnector the Oak Grove – Bowie 230 kV "23042" circuit and upgrade terminal equipment at Oak Grove and Bowie 230 kV substations \$17 M
 - Reconnector the Bowie – Burtonsville 230 kV "23042" circuit and upgrade terminal equipment at Oak Grove and Burtonsville 230 kV substations \$8 M
 - Reconnector the Dickerson Station "H" – Quince Orchard 230 kV "23032" circuit and upgrade terminal equipment at Dickerson Station "H" and Quince Orchard 230 kV substations \$9.2 M
 - Reconnector the Oak Grove - Aquasco 230 kV "23062" circuit and upgrade terminal equipment at Oak Grove and Aquasco 230 kV substations - \$27 M
 - Reconnector the Oak Grove – Bowie 230 kV "23045" circuit and upgrade terminal equipments at Oak Grove and Bowie 230 kV substations - \$17 M
- PPL Transmission Zone
 - Install a new Honeybrook – Twin Valley 69/138 kV tie – \$7. 63 M
 - Replace Lock Haven 69kV ring bus with standard breaker and half design \$20.5 M
 - Build a new Pocono 230/69 kV substation – \$ 17.6 M
 - Build new South Pocono – North Pocono 230 kV line - \$28.6 M
 - Build new West Pocono 230/69 kV Substation - \$18.3 M
 - Build Jenkins-West Pocono 230 kV Line - \$28.5 M



- Construct a new 230/69 kV North Lancaster substation by tapping the South Akron to Berks 230kV Line - \$7.65 M
- Construct new 69/138 kV transmission from North Lancaster 230/69 kV sub to the Brecknock and Honeybrook areas - \$13.64 M
- Rebuild Lycoming-Lock Haven #1 and Lycoming-Lock Haven #2 69kV lines - \$17.74 M
- ODEC Transmission Zone
 - Replace existing Talsey - Kellam 69 kV line with a new double circuit line. Add a breaker to complete the ring bus at Kellam – \$12 M

Western Region System Upgrades

- American Electric Power
 - Build a new 765/345 kV station at Sorenson by tapping the Dumont to Marysville 765 kV line - \$85 M
 - Install a new 765/500 kV transformer at Cloverdale - \$65 M
 - Perform sag study on Altavista - Leesville 138 kV line - \$7.52 M
- ATSI Transmission Zone
 - Build a new Mansfield 69 kV Switching Station networking Leaside, Longview, and Galion Subs @ existing Alta 69 kV Sub Site - \$6.8 M
- Dayton Transmission Zone
 - Add a 345/69 kV transformer at AEP Marysville 345 kV bus - \$16 M
 - Construct a new 138 kV line from West Milton to Eldean - \$16 M

Southern Region System Upgrades

- Dominion Virginia Power Transmission Zone
 - Rebuild Loudoun - Brambleton 500kV - \$40 M
 - Reconductor line the Fredericksburg - Cranes Corner 230 kV line - \$5.5 M
 - Reconfigure the Idylwood 230 kV substation - \$12 M
 - Build a 2nd Clark - Idylwood 230 kV line - \$20 M
 - Install a 2nd 500/230 kV transformer at Brambleton - \$14 M

Changes to Previously Approved Baseline Projects

The costs associated with a number of previously approved RTEP baseline projects were also updated. This resulted in a net increase in cost of \$489.9 million. The difference in costs is mainly attributable to three projects in the Public Service Electric and Gas transmission.

Baseline project b-1099 to build a new 230 kV substation in Newark, NJ was put in the RTEP in 2009 to address NERC category C violations. The original estimate for the project was \$137 million. The new estimated cost is \$230 million. The reason for the increased cost is mainly due to increased real estate costs and the need to include an additional transmission source to the new substation.



Baseline project b-1154 to convert a number of lines and substations from 138 kV to 230 kV in the West Orange area was put in the RTEP to address NERC category C violations. The original estimate for the project was \$200 million. The revised estimated cost is \$336 million. The increased costs are due primarily to the need to do more extensive transmission structure work, permitting and siting costs and increased contract labor costs.

Baseline project b-1156 to convert Burlington – Camden – Cuthbert 138 kV loop to 230 kV was put in the RTEP to address NERC category C violations. The original estimate for the project was \$150 million. The revised cost is \$381 million. The increased costs are due primarily to the need for more extensive transmission structure and substation work, permitting and siting costs and increased contract labor costs.



Interconnection Projects

Since the PJM Board of Managers approval in December 2010, PJM has completed 246 System Impact Studies and 159 interconnection projects have withdrawn. Transmission upgrades have been identified to resolve reliability criteria violations associated with the new interconnection projects. The changes associated with the new and withdrawn projects resulted in a net increase in the RTEP of \$64.8 million for the network upgrades and attachment facilities.

Status of Generation Interconnection Queues

<u>Queue</u>	<u>Queue Open Date</u>	<u>Queue Close Date</u>	<u>Active</u>	<u>Under Construction</u>	<u>In-Service*</u>	<u>Withdrawn</u>	<u>Suspended</u>	<u>Total MW Request**</u>
A	04/01/1994	01/31/1999	0	0	8,103	17,252	0	25,355
B	02/01/1999	11/30/1999	0	0	4,646	15,833	0	20,479
C	12/01/1999	03/31/2000	0	0	531	4,151	0	4,682
D	04/01/2000	07/31/2000	0	0	851	7,770	0	8,621
E	08/01/2000	11/30/2000	0	0	795	16,887	0	17,682
F	12/01/2000	01/31/2001	0	0	52	3,093	0	3,145
G	02/01/2001	07/31/2001	0	555	1,086	21,460	0	23,101
H	08/01/2001	01/31/2002	0	0	703	8,422	0	9,124
I	02/01/2002	07/31/2002	0	0	103	3,738	0	3,841
J	08/01/2002	01/31/2003	0	0	40	846	0	886
K	02/01/2003	07/31/2003	0	230	29	291	0	550
L	08/01/2003	01/31/2004	20	0	257	3,849	165	4,290
M	02/01/2004	07/31/2004	0	150	505	3,406	272	4,332
N	08/01/2004	01/31/2005	1,377	173	2,143	6,603	110	10,407
O	02/01/2005	07/31/2005	1,466	574	1,470	3,918	164	7,592
P	08/01/2005	01/31/2006	513	655	2,625	4,823	85	8,701
Q	02/01/2006	07/31/2006	1,759	2,778	1,384	8,293	400	14,614
R	08/01/2006	01/31/2007	4,687	1,183	691	16,174	20	22,755
S	02/01/2007	07/31/2007	2,357	932	2,612	10,431	512	16,843
T	08/01/2007	01/31/2008	11,375	471	927	14,105	740	27,617
U1	02/01/2008	04/30/2008	1,021	82	112	6,944	0	8,158
U2	05/01/2008	07/31/2008	2,482	420	50	14,088	140	17,180
U3	08/01/2008	10/31/2008	221	313	1	2,433	0	2,968
U4	11/01/2008	01/31/2009	2,571	0	39	2,401	110	5,121
V1	02/01/2009	04/30/2009	1,983	156	74	608	0	2,821
V2	05/01/2009	07/31/2009	3,653	57	9	920	0	4,639
V3	08/01/2009	10/31/2009	2,841	73	16	2,017	10	4,956
V4	11/01/2009	01/31/2010	3,840	132	13	1,104	0	5,088
W1	02/01/2010	04/30/2010	1,775	198	1	3,722	13	5,710
W2	05/01/2010	07/31/2010	2,716	219	2	473	0	3,410
W3	08/01/2010	10/31/2010	6,573	164	6	2,635	0	9,379
W4	11/01/2010	01/31/2011	5,502	35	0	444	0	5,981
X1	02/01/2011	04/30/2011	7,295	60	0	164	0	7,519
X2	05/01/2011	07/31/2011	10,658	0	0	33	0	10,690
X3	08/01/2011	10/31/2011	1,321	0	0	0	0	1,321
TOTAL			78,006	9,610	29,876	209,331	2,741	329,557



Cost Allocation

Cost allocations for the baseline upgrades described in this report are summarized in the attached sheets.

The following allocations are single-zone allocations

Upgrade ID	Description	Cost Estimate	Trans Owner
b1061.1	Replace the Yorkana 115 kV breaker '97282'	\$0.21	ME
b1061.2	Replace the Yorkana 115 kV breaker 'B282'	\$0.15	ME
b1082.1	Replace Bergen 138 kV breaker '30P' with 80 kA	\$1.50	PSEG
b1082.2	Replace Bergen 138 kV breaker '80P' with 80 kA	\$1.50	PSEG
b1082.3	Replace Bergen 138 kV breaker '70P' with 80 kA	\$1.50	PSEG
b1082.4	Replace Bergen 138 kV breaker '90P' with 63 kA	\$0.60	PSEG
b1082.5	Replace Bergen 138 kV breaker '50P' with 63 kA	\$0.60	PSEG
b1082.6	Replace Bergen 230 kV breaker '12H' with 80 kA	\$1.50	PSEG
b1082.7	Replace Bergen 230 kV breaker '21H' with 80 kA	\$1.50	PSEG
b1082.8	Replace Bergen 230 kV breaker '11H' with 80 kA	\$1.50	PSEG
b1082.9	Replace Bergen 230 kV breaker '20H' with 80 kA	\$1.50	PSEG
b1153.1	Revise the reclosing on the Shelocta 115 kV breaker 'Lucerne'	\$0.00	PENELEC
b1154.1	Upgrade the Whippany 230 kV breaker 'JB'	\$0.26	JCPL
b1155.1	Upgrade the Red Oak 230 kV breaker 'G1047'	\$0.16	JCPL
b1155.2	Upgrade the Red Oak 230 kV breaker 'T1034'	\$0.10	JCPL
b1155.3	Replace Branchburg 230 kV breaker '81H' with 63 kA	\$0.60	PSEG
b1155.4	Replace Branchburg 230 kV breaker '72H' with 63 kA	\$0.60	PSEG
b1155.5	Replace Branchburg 230 kV breaker '61H' with 63 kA	\$0.60	PSEG
b1155.6	Replace Branchburg 230 kV breaker '41H' with 63 kA	\$0.60	PSEG
b1156.12	Replace Emilie 138 kV breaker '190'	\$0.50	PECO
b1156.13	Replace Camden 230 kV breaker '22H' with 80 kA	\$1.50	PSEG
b1156.14	Replace Camden 230 kV breaker '32H' with 80 kA	\$1.50	PSEG
b1156.15	Replace Camden 230 kV breaker '21H' with 80 kA	\$1.50	PSEG
b1156.16	Replace New Freedom 230 kV breaker '50H' with 63 kA	\$0.60	PSEG
b1156.17	Replace New Freedom 230 kV breaker '41H' with 63 kA	\$0.60	PSEG
b1156.18	Replace New Freedom 230 kV breaker '51H' with 63 kA	\$0.60	PSEG
b1156.19	Rebuild Camden 230 kV to 80 kA	\$18.00	PSEG
b1156.20	Rebuild Burlington 230 kV to 80 kA	\$5.00	PSEG
b1253.1	Replace the Northeast 230 kV breaker '2317/315'	\$0.55	BGE
b1253.2	Revise reclosing on Windy Edge 115 kV breaker '110515'	\$0.00	BGE
b1253.3	Revise reclosing on Windy Edge 115 kV breaker '110516'	\$0.00	BGE
b1253.4	Revise reclosing on Windy Edge 115 kV breaker '110517'	\$0.00	BGE
b1266.1	Revise reclosing on DesPlaines 138 kV breaker '46 4610'	\$0.10	ComEd
b1267.2	Replace Mays Chapel 115 kV breaker '110515A'	\$0.33	BGE
b1267.3	Replace Mays Chapel 115 kV breaker '110579C'	\$0.33	BGE



The following allocations are single-zone allocations

Upgrade ID	Description	Cost Estimate	Trans Owner
b1304.10	Replace South Waterfront 230 kV breaker '52H' with 80 kA	\$1.50	PSEG
b1304.11	Replace South Waterfront 230 kV breaker '62H' with 80 kA	\$1.50	PSEG
b1304.12	Replace South Waterfront 230 kV breaker '72H' with 80 kA	\$1.50	PSEG
b1304.13	Replace South Waterfront 230 kV breaker '82H' with 80 kA	\$1.50	PSEG
b1304.14	Replace Essex 230 kV breaker '20H' with 80 kA	\$1.50	PSEG
b1304.15	Replace Essex 230 kV breaker '21H' with 80 kA	\$1.50	PSEG
b1304.16	Replace Essex 230 kV breaker '10H' with 80 kA	\$1.50	PSEG
b1304.17	Replace Essex 230 kV breaker '11H' with 80 kA	\$1.50	PSEG
b1304.18	Replace Essex 230 kV breaker '11HL' with 80 kA	\$1.50	PSEG
b1304.19	Replace Newport R 230 kV breaker '23H' with 63 kA	\$0.60	PSEG
b1304.20	Rebuild Athenia 230 kV substation to 80 kA	\$21.00	PSEG
b1304.21	Rebuild Bergen 230 kV substation to 80 kA	\$39.00	PSEG
b1304.5	Replace Athenia 230 kV breaker '21H' with 80 kA	\$1.50	PSEG
b1304.6	Replace Athenia 230 kV breaker '41H' with 80 kA	\$1.50	PSEG
b1304.7	Replace South Waterfront 230 kV breaker '12H' with 80 kA	\$1.50	PSEG
b1304.8	Replace South Waterfront 230 kV breaker '22H' with 80 kA	\$1.50	PSEG
b1304.9	Replace South Waterfront 230 kV breaker '32H' with 80 kA	\$1.50	PSEG
b1398.12	Replace Graysferry 230 kV breaker '115'	\$0.50	PECO
b1398.14	Replace Whitpain 230 kV breaker '105'	\$0.50	PECO
b1398.15	Replace Gloucester 230 kV breaker '21H' with 63 kA	\$0.60	PSEG
b1398.16	Replace Gloucester 230 kV breaker '51H' with 63 kA	\$0.60	PSEG
b1398.17	Replace Gloucester 230 kV breaker '56H' with 63 kA	\$0.60	PSEG
b1398.18	Replace Gloucester 230 kV breaker '26H' with 63 kA	\$0.60	PSEG
b1398.19	Replace Gloucester 230 kV breaker '71H' with 63 kA	\$0.60	PSEG
b1399.1	Upgrade the Whippany 230 kV breaker 'QJ'	\$0.26	JCPL
b1524	Build a new Pocono 230/69 kV substation	\$17.60	PPL
b1524.1	Build approximately 14 miles new 230 kV South Pocono – North Pocono line	\$28.60	PPL
b1524.2	Install MOLSABs at Mt. Pocono substation	\$0.38	PPL
b1525	Build new West Pocono 230/69 kV Substation	\$18.30	PPL
b1525.1	Build approximately 14 miles new 230 kV Jenkins-West Pocono 230 kV Line	\$28.50	PPL
b1525.2	Install Jenkins 3E 230 kV circuit breaker	\$0.97	PPL
b1526	Install a new Honeybrook – Twin Valley 69/138 kV tie	\$7.63	PPL
b1527	Construct a new 230/69 kV North Lancaster substation. The sub will be supplied from the SAKR-BERK 230kV Line	\$7.65	PPL
b1527.1	Construct new 69/138 kV transmission from North Lancaster 230/69 kV sub to Brecknock and Honeybrook areas	\$13.64	PPL
b1528	Install Motor-Operated switches on the Wescosville-Trexlerstown #1 & #2 69 kV lines at East Texas Substation	\$0.22	PPL
b1529	Add a double breaker 230 kV bay 3 at Hosensack	\$1.37	PPL
b1530	Replace Lock Haven 69kV ring bus with standard breaker and half design	\$20.50	PPL
b1532	Install new 32.4 MVAR capacitor bank at Sunbury	\$0.84	PPL



The following allocations are single-zone allocations

Upgrade ID	Description	Cost Estimate	Trans Owner
b1533	Rebuild Lycoming-Lock Haven #1 and Lycoming-Lock Haven #2 69kV lines	\$17.74	PPL
b1534	Rebuild 1.4 miles of the Sunbury-Milton 69kV	\$1.80	PPL
b1535	Reconductor 0.8 miles of the Gore Junction – ESG Tap 115 kV line with 795 ACSS	\$0.16	PENELEC
b1536	Advance n1752 (Replace OX 230 breaker 24342 with an 63kA breaker)	\$0.03	DOM
b1537	Advance n1753 (Replace OX 230 breaker 243T2097 with an 63kA breaker)	\$0.03	DOM
b1538	Replace Loudoun 230 kV breaker '29552'	\$0.21	DOM
b1539	Replace Tosco 230 kV breaker 'CB1' with 63 kA	\$0.60	PSEG
b1540	Replace Tosco 230 kV breaker 'CB2' with 63 kA	\$0.60	PSEG
b1541	Open the Hudson 230 kV bus tie	\$0.00	PSEG
b1544	Advance the baseline upgrade B1252 to upgrade terminal equipment removing terminal limitation at Pumphrey Tap on BGE 230 kV circuit 2332-A.	\$0.03	BGE
b1545	Upgrade terminal equipment at both Brandon Shores and Waugh Chapel removing terminal limitation on BGE 230 kV circuit 2343	\$0.02	BGE
b1546	Upgrade terminal equipment at Graceton removing terminal limitation on BGE portion of the 230 kV Graceton – Cooper circuit 2343	\$0.01	BGE
b1571	Replace Acca 115 kV breaker '6072' with 40 kA	\$0.15	DOM
b1572	Construct a new 138 kV line from West Milton to Eldean	\$16.00	Dayton
b1579	Revise reclosing and upgrade relays at State Line 138 kV breaker '7 L0707'	\$0.10	ComEd
b1580	Revise reclosing and upgrade relays at State Line 138 kV breaker '7 L0761'	\$0.10	ComEd
b1581	Revise reclosing and upgrade relays at Cherry Valley 138 kV breaker '156 15622'	\$0.10	ComEd
b1582	Replace Lombard 138 kV breaker '120 12008'	\$0.90	ComEd
b1583	Replace Hazelwood 115 kV breaker '110602'	\$0.13	BGE
b1584	Replace Hazelwood 115 kV breaker '110604'	\$0.13	BGE
b1585	Galion-GM Mansfield-Longview 138 kV line: Bypass GM Mansfield substation	\$0.05	ATSI
b1586	Change the relay setting limit	\$0.00	ATSI
b1598	Reconductor Sherman Av - Carl's Corner 69 kV circuit	\$5.60	AE
b1599	Replace terminal equipments at Central North 69 kV substation	\$0.48	AE
b1602	Re-configure the Elimsport 230 kV substation to breaker and half scheme and install 80 MVAR capacitor	\$3.70	PPL
b1603	Upgrade 19 miles conductor of the Wattsville - Signepost - Stockton - Kenney 69 kV circuit	\$15.00	DPL
b1604	Replact CT at Reybold 138 kV substation	\$0.08	DPL
b1606.1	Install 115kV tie breakers at Melvale	\$0.15	BGE



The following allocations are single-zone allocations

Upgrade ID	Description	Cost Estimate	Trans Owner
b1607	Reconductor the New Baltimore - Bedford North 115 kV	\$11.00	PENELEC
b1610	Install a new 230 kV breaker at Yeagertown	\$0.70	PENELEC
b1651	Replace Loudoun 230kV breaker ' 295T2030 ' with 63kA breaker.	\$0.22	DOM
b1652	Replace Ox 230kV breaker '209742' with 63kA breaker.	\$0.22	DOM
b1653	Replace Clifton 230kV breaker '26582' with 63kA breaker.	\$0.22	DOM
b1654	Replace Clifton 230kV breaker '26682' with 63kA breaker.	\$0.22	DOM
b1655	Replace Clifton 230kV breaker '205182' with 63kA breaker.	\$0.22	DOM
b1656	Replace Clifton 230kV breaker '265T266' with 63kA breaker.	\$0.22	DOM
b1657	Replace Clifton 230kV breaker '2051T2063' with 63kA breaker.	\$0.22	DOM
b1672	Install a 230 kV breaker at Carbon Center	\$0.40	APS
b1673	Rocktown - Install a 230/34.5 kV transformer by looping the Pleasant Valley - E Flemington 230 kV Q-2243 line (0.4 miles) through the Rocktown Substation	\$7.83	JCPL
b1674	Build a new Englishtown - Wyckoff St 15 mile, 115 kV line and install 115/34.5 kV transformer at Wyckoff St	\$18.43	JCPL
b1675	Replace existing Talsey - Kellam 69 kV line with a new double circuit line. Add a breaker to complete the ring bus at Kellam.	\$12.00	ODEC
b1689	Atlantic Sub - 230 kV ring bus reconfiguration. Put a "source" between the Red Bank and Oceaview "loads"	\$0.56	JCPL
b1690	Build a new third 230 kV line into the Red Bank 230 kV substation	\$22.00	JCPL
b1699	Reconfigure Line #203 to feed Edwards Ferry sub radial from Pleasant View 230 kV and install new breaker bay at Pleasant View Sub	\$4.00	DOM
b1700	Install a 230/115 kV transformer at the new Liberty substation to relieve Gainesville Transformer #3	\$4.50	DOM
b1713	Install a 345 kV breaker at Erie West and relocate Ashtabula 345 kV line	\$0.65	PENELEC
b1724	Install a 2nd 138/115 kV transformer at Edinburg	\$4.50	DOM
b1728	Replace the 115/34.5 kV transformer #1 at Hickory with a 230/34.5 kV transformer	\$0.75	DOM
b1729	Add 4 breaker ring bus at Burton 115 kV substation. Construct a 115 kV line approximately 3.5 miles from Oakwood 115 kV substation to Burton 115 kV substation	\$0.75	DOM
b1730	Install a 230/115 kV transformer at a new Liberty substation	\$4.30	DOM
b1731	Upgrade or rebuild Line #47 or Install capacitors or Convert load from 115 kV system to 230 kV system	\$4.30	DOM



The following allocations are multi-zone allocations

Upgrade ID	Description	Cost Estimate	Transmission Owner	Multi-Zone Cost Allocation
b1398.13	Upgrade Peach Bottom 500 kV breaker '225'	\$ 0.25	PECO	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1570	Add a 345/69 kV transformer at AEP Marysville 345 kV bus	\$ 16.00	Dayton	ATSI - 9.93%, Dayton - 90.07%
b1570.1	Add Marysville - Darby 69 kV line	\$ -	Dayton	ATSI - 9.93%, Dayton - 90.07%
b1570.2	Add Marysville - Union REA 69 kV line	\$ -	Dayton	ATSI - 9.93%, Dayton - 90.07%
b1570.3	Reconductor Union REA - Honda MT 69 kV line	\$ -	Dayton	ATSI - 9.93%, Dayton - 90.07%
b1587	Build a new Mansfield 69 kV Switching Station networking Leaside, Longview, and Galion Subs @ existing Alta 69 kV Sub Site	\$ 6.80	ATSI	APS - 0.56%, ATSI - 97.56%, DL - 0.75%, PENELEC - 1.13%
b1588	Reconductor the Eagle Point - Gloucester 230 kV circuit #1 and #2 with higher conductor rating	\$ 25.00	PSEG	ECP - 0.82%, HTP - 0.75%, JCPL - 10.31%, Neptune - 0.98%, PECO - 30.81%, PSEG - 54.17%, RE - 2.16%
b1589	Re-configure the Kearny 230 kV substation and loop the P-2216-1 (Essex - NJT Meadows) 230 kV circuit	\$ 48.00	PSEG	ATSI - 8%, HTP - 20.18%, PENELEC - 7.77%, PSEG - 61.59%, RE - 2.46%
b1590	Upgrade the PSEG portion of the Camden - Richmond 230 kV circuit to six wire conductor and replace terminal equipments at Camden	\$ 40.00	PSEG	BGE - 3.16%, ECP - 0.04%, HTP - 0.09%, ME - 0.81%, PECO - 91.43%, PEPCO - 1.89%, PPL - 2.58%
B1590.1	Replace terminal equipment at Richmond	\$ 0.80	PSEG	BGE - 3.16%, ECP - 0.04%, HTP - 0.09%, ME - 0.81%, PECO - 91.43%, PEPCO - 1.89%, PPL - 2.58%
b1591	Reconductor the underground portion of the Richmond - Waneeta 230 kV and replace terminal equipments	\$ 12.00	PECO	BGE - 4.54%, DL - 0.27%, HTP - 0.03%, ME - 1.04%, PECO - 88.08%, PEPCO - 2.79%, PPL - 3.25%
b1592	Reconductor the Oak Grove - Bowie 230 kV circuit and upgrade terminal equipments at Oak Grove and Bowie 230 kV substations	\$ 17.00	PEPCO	AEC - 2.39%, APS - 3.82%, BGE - 65.72%, DPL - 4.43%, ECP - 0.13%, HTP - 0.1%, JCPL - 3.93%, ME - 2.16%, Neptune - 0.39%, PECO - 8.35%, PPL - 2.83%, PSEG - 5.53%, RE - 0.22%
b1593	Reconductor the Bowie - Burtonsville 230 kV circuit and upgrade terminal equipments at Bowie and Burtonsville 230 kV substations	\$ 8.00	PEPCO	AEC - 2.39%, APS - 3.82%, BGE - 65.72%, DPL - 4.43%, ECP - 0.13%, HTP - 0.1%, JCPL - 3.93%, ME - 2.16%, Neptune - 0.39%, PECO - 8.35%, PPL - 2.83%, PSEG - 5.53%, RE - 0.22%
b1594	Reconductor the Oak Grove - Bowie 230 kV '23042' circuit and upgrade terminal equipments at Oak Grove and Bowie 230 kV substations	\$ 17.00	PEPCO	AEC - 2.38%, APS - 3.84%, BGE - 65.72%, DPL - 4.44%, ECP - 0.13%, HTP - 0.1%, JCPL - 3.93%, ME - 2.16%, Neptune - 0.39%, PECO - 8.33%, PPL - 2.83%, PSEG - 5.53%, RE - 0.22%
b1595	Reconductor the Bowie - Burtonsville 230 kV '23042' circuit and upgrade terminal equipments at Oak Grove and Burtonsville 230 kV substations	\$ 8.00	PEPCO	AEC - 2.38%, APS - 3.84%, BGE - 65.72%, DPL - 4.44%, ECP - 0.13%, HTP - 0.1%, JCPL - 3.93%, ME - 2.16%, Neptune - 0.39%, PECO - 8.33%, PPL - 2.83%, PSEG - 5.53%, RE - 0.22%
b1596	Reconductor the Dickerson station 'H' - Quince Orchard 230 kV '23032' circuit and upgrade terminal equipments at Dickerson station 'H' and Quince Orchard 230 kV substations	\$ 9.20	PEPCO	AEC - 0.8%, BGE - 33.68%, DPL - 2.09%, PECO - 3.07%, PEPCO - 60.36%
b1597	Reconductor the Oak Grove - Aquasco 230 kV '23062' circuit and upgrade terminal equipments at Oak Grove and Aquasco 230 kV substations	\$ 27.00	PEPCO	AEC - 1.44%, BGE - 48.6%, DPL - 2.52%, PECO - 5%, PEPCO - 42.44%
b1600	Upgrade the Mill T2 138/69 kV transformer	\$ 5.00	AE	AEC - 88.83%, ECP - 0.22%, HTP - 0.2%, JCPL - 4.74%, PSEG - 5.78%, RE - 0.23%



The following allocations are multi-zone allocations

Upgrade ID	Description	Cost Estimate	Transmission Owner	Multi-Zone Cost Allocation
b1601	Re-configure the Breinigsville 500 kV substation with addition two 500 kV circuit breakers	\$ 2.10	PPL	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECCO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1608	Construct a new 345/115 kV substation and loop the Mansfield-Everts 115 kV	\$ 13.00	PENELEC	APS - 8.59%, PECCO - 1.73%, PENELEC - 89.68%
b1609	Construct Four Mile Junction 230/115 kV substation. Loop the Erie South - Erie East 230 kV line, Buffalo Road - Corry East and Buffalo Road - Erie South 115 kV lines	\$ 11.10	PENELEC	APS - 4.86%, PENELEC - 95.14%
b1647	Upgrade Morrisville 500kV breaker 'HIT573' to 50 kA	\$ -	DOM	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECCO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1648	Upgrade Morrisville 500kV breaker 'H2T545' to 50 kA	\$ -	DOM	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECCO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1649	Replace Morrisville 500kV breaker 'HIT580' with 50kA breaker.	\$ 0.68	DOM	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECCO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1650	Replace Morrisville 500kV breaker 'H2T569 with 50kA breaker.	\$ 0.68	DOM	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECCO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1659	Establish Sorenson 345/138 kV station as a 765/345 kV station	\$ 85.00	AEP	AEP - 93.61%, ATSI - 2.99%, ComEd - 2.07%, ECP - 0.03%, HTP - 0.03%, PENELEC - 0.31%, PSEG - 0.92%, RE - 0.04%
b1660	Install a 765/500 kV transformer at Cloverdale	\$ 65.00	AEP	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECCO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%



The following allocations are multi-zone allocations

Upgrade ID	Description	Cost Estimate	Transmission Owner	Multi-Zone Cost Allocation
b1661	Install a 765 kV circuit breaker at Wyoming station	\$ 2.00	AEP	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1694	Rebuild Loudoun - Brambleton 500 kV	\$ 40.00	DOM	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1696	Install a breaker and a half scheme with a minimum of eight 230 kV breakers for five existing lines at Idylwood 230 kV	\$ 12.00	DOM	AEC - 0.46%, APS - 4.18%, BGE - 2.02%, DPL - 0.8%, Dominion - 88.45%, JCPL - 0.64%, ME - 0.5%, Neptune - 0.06%, PECO - 1.55%, PEPCO - 1.34%
b1697	Build a 2nd Clark - Idylwood 230 kV line and install 230 kV gas-hybrid breakers at Clark	\$ 20.00	DOM	AEC - 1.35%, APS - 15.65%, BGE - 10.53%, DPL - 2.59%, Dominion - 46.97%, JCPL - 2.36%, ME - 1.91%, Neptune - 0.23%, PECO - 4.48%, PEPCO - 11.23%, PSEG - 2.59%, RE - 0.11%
b1698	Install a 2nd 500/230 kV transformer	\$ 16.00	DOM	APS - 4.21%, BGE - 13.28%, DPL - 1.09%, Dominion - 59.38%, PEPCO - 22.04%
b1698.1	Install a 500 kV breaker at Brambleton	\$ -	DOM	AEC - 2.09%, AEP - 16.7%, APS - 6.03%, BGE - 4.92%, ComEd - 15.58%, Dayton - 2.41%, DL - 2.05%, DPL - 2.88%, Dominion - 13.61%, ECP - 0.22%, JCPL - 4.56%, ME - 2.09%, Neptune - 0.49%, PECO - 6.3%, PENELEC - 2.11%, PEPCO - 4.73%, PPL - 5.27%, PSEG - 7.65%, RE - 0.31%
b1701	Reconductor line #2104 (Fredericksburg - Cranes Corner 230 kV)	\$ 5.50	DOM	APS - 8.66%, BGE - 10.95%, Dominion - 63.3%, PEPCO - 17.09%
b1712.1	Perform sag study on Altavista - Leesville 138 kV line	\$ 7.52	AEP	Dominion - 75.3%, PEPCO - 24.7%
b1712.2	Rebuild the Altavista - Leesville 138 kV line	\$ -	AEP	Dominion - 75.3%, PEPCO - 24.7%