Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD2-138 Olive (AEP) – Reynolds (NIPSCO) 345 kV

December 2018

Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances, a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

For Local and Network Upgrades which are required due to overloads associated with the System Impact Studies of an individual New Services Queue, and have a cost less than $5,000,000, the cost of the Local and Network Upgrades will be shared by all proposed projects which have been assigned a Queue Position in the New Services Queue in which the need for the Local and Network Upgrades was identified. The Load Flow Cost Allocation methods discussed in this manual, including cutoffs, still apply to the individual projects.

For Local and Network Upgrades which are required due to the overloads associated with the System Impact Studies of an individual New Services Queue, and have a cost of $5,000,000 or greater, the cost of the Local and Network Upgrades will be allocated according to the order of the New Service Requests in the New Services Queue and the MW contribution of each individual Interconnection Request for those projects which cause or contribute to the need for the Local or Network Upgrades. The Load Flow Cost Allocation methods discussed in this manual, including cutoffs, still apply to the individual projects.

Cost allocation rules can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment G-2 of Manual 14A. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 2.2.2. of Manual

14A for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment G-1 of Manual 14A) in order to document the request for the study.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer (IC) proposes to install PJM Project #AD2-138, a 200.0 MW (35.2 MW Capacity) wind generating facility in Pulaski County, Indiana (see Figure 2). The primary point of interconnection will be to the Olive (AEP) – Reynolds (NIPSCO) 345 kV circuit #1 (see Figure 1).

The requested in service date is December 31, 2020

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 maintaining the reliability of the AEP transmission system. Stability analysis is not included as part of this study.

Attachment Facilities

Primary Point of Interconnection (Olive – Reynolds (NIPSCO) 345 kV Circuit #1)

To accommodate the interconnection on the Olive – Reynolds (NIPSCO) 345 kV circuit #1, the switching station will have to be expanded requiring the installation of three (3) new 345 kV circuit breakers at the proposed AC2-080 345 kV switching station (see Figure 1). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

<u>New Line Tap/Switching Station Work and Cost:</u>

- Expand the switching station requiring the installation of three (3) new 345 kV circuit breakers 345 at the proposed AC2-080 345 kV switching station. Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required (see Figure 1).
    - **Estimated Station Cost: $4,000,000**

Non-Direct Connection Cost Estimate

The total preliminary cost estimate for Non-Direct Connection work is given in the following table below:

For AEP building Non-Direct Connection cost estimates:

Description	Estimated Cost
345 kV Revenue Metering	$350,000
Upgrade line protection and controls at the Olive 345 kV substation.	$350,000
Upgrade line protection and control settings at the Reynolds (NIPSCO) 345 kV substation.	NIPSCO to provide scope and cost estimate
Total	**$700,000**

Table 1

Secondary Point of Interconnection (Starke (MISO) 138 kV Substation)

The secondary point of Interconnection is a direct connection to MISO's Starke 138 kV substation.

Interconnection Customer Requirements

It is understood that The IC is responsible for all costs associated with this interconnection. The cost of the generating plant and the costs for the line connecting the generating plant to the point of interconnection are not included in this report; these are assumed to be the IC's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power to provide power for consumption at the developer's facilities. A separate agreement may be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required

Requirement from the PJM Open Access Transmission Tariff:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

Revenue Metering and SCADA Requirements

PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

AEP Requirements

The Interconnection Customer will be required to comply with all AEP Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "Requirements for Connection of New Facilities or Changes to Existing Facilities Connected to the AEP Transmission System" document located at the following link:

http://www.pjm.com/~/media/planning/plan-standards/private-aep/aep-interconnection-requirements.ashx

Network Impacts – Option 1

The Queue Project AD2-138 was evaluated as a 200.0 MW (Capacity 35.2 MW) injection tapping the Olive – Reynolds 345 kV line in the AEP area. Project AD2-138 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-138 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Base Case Used

Summer Peak Analysis – 2021 Case

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
'AEP_P4_#6189_05HANG R 765'	CONTINGENCY 'AEP_P4_#6189_05HANG R 765' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
'AEP_P4_#2978_05DUMONT 765'	CONTINGENCY 'AEP_P4_#2978_05DUMONT 765' OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON; 765 1 END
'COMED_P4_112-65-BT4-5__'	CONTINGENCY 'COMED_P4_112-65-BT4-5__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33 END
'COMED_P4_112-65-BT3-4__'	CONTINGENCY 'COMED_P4_112-65-BT3-4__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO; 3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO; 3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO; 3M 345 WILTO;3C 33 END
'AEP_P1-2_#709'	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
'COMED_P1-2_695_B2'	CONTINGENCY 'COMED_P1-2_695_B2' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1 END

Contingency Name	Description
'AEP_P1-2_#360A'	CONTINGENCY 'AEP_P1-2_#360A' OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 243207 X1-020 765 1 END

Table 2

Generator Deliverability

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

None

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None

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)

AD2-138 Contribution to Previously Identified Overloads												
Contingency					Bus		Loading		Rating			
#	Type	Name	Affected Area	Facility Description	From	To	Initial	Final	Type	MVA	MW Con.	FG App.
1	LFFB	'AEP_P4_#6189_05HANG R 765'	AEP - OVEC	The 05JEFRSO-06CLIFTY 345 kV line	242865	248000	102.47	102.57	ER	2045	23.98	
2	LFFB	'AEP_P4_#2978_05DUMONT 765'	AEP - AEP	X2-052 TAP-05DUMONT 345 kV line	247610	243219	124.11	124.84	ER	1409	28.63	
3	LFFB	'COMED_P4_112-65-BT4-5__'	AEP - AEP	X2-052 TAP-05DUMONT 345 kV line	247610	243219	114.78	115.16	ER	1409	25.54	
4	LFFB	'COMED_P4_112-65-BT3-4__'	AEP - AEP	X2-052 TAP-05DUMONT 345 kV line	247610	243219	114.78	115.16	ER	1409	25.54	

Table 3

Steady-State Voltage Requirements

None

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

None

Affected System Analysis & Mitigation

LGEE Impacts:

LGEE Impacts to be determined during later study phases (as applicable).

MISO Impacts:

MISO Impacts to be determined during later study phases (as applicable).

Duke, Progress & TVA Impacts:

Duke Carolina, Progress, & TVA Impacts to be determined during later study phases (as applicable).

OVEC Impacts:

OVEC Impacts to be determined during later study phases (as applicable).

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.
Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

AD2-138 Delivery of Energy Portion of Interconnection Request

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Loading Initial	Loading Final	Rating Type	Rating MVA	MW Con.	FG App.
1	N-1	'AEP_P1-2_#709'	AEP - OVEC	05JEFRSO-06CLIFTY 345 kV line	242865	248000	117.32	117.43	NR	1756	24.03	
2	N-1	'COMED_P1-2_695_B2'	AEP - AEP	X2-052 TAP-05DUMONT 345 kV line	247610	243219	114.78	115.15	NR	1409	25.54	

AD2-138 Delivery of Energy Portion of Interconnection Request													
		Contingency			Bus		Loading		Rating				FG
#	Type	Name	Affected Area	Facility Description	From	To	Initial	Final	Type	MVA	MW Con.	App.
3	N-1	'AEP_P1-2_#360A'	AEP - AEP	AC2-080 TAP-05OLIVE 345 kV line	932600	243229	100.78	106.09	NR	971	51.6	

Table 4

Note: FERC form 715 part 4 was updated this year to eliminate the normal rating requirement for single contingencies on EHV facilities.

New System Reinforcements

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

None

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)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. PJM Network Upgrade Project #N5034 will relieve the Jefferson – Clifty Creek 345 kV line constraints identified in this report. The constraint is driven by the X3-028 MTX project. The X3-028 upgrade is to build a new Sullivan – Reynolds 765 kV line. Cost is $464 Million. AD2-132 could receive cost allocation.

2. PJM Network Upgrade Project #N4512 will relieve the X2-052 Tap – Dumont 345 kV constraint identified in this report. This line has been upgraded and New SE Rating expected to be 1868 MVA.

Schedule

It is anticipated that the time between receipt of executed agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would be between 24 to 36 months after signing an interconnection agreement.

Note: The time provided between anticipated normal completion of System Impact, Facilities Studies, subsequent execution of ISA and ICSA documents, and the proposed Backfeed Date is shorter than usual and may be difficult to achieve.

Conclusion

Based upon the results of this Feasibility Study, the construction of the IC's 200.0 MW (35.2 MW Capacity) wind generating facility (PJM Project #AD2-138) will require the following

additional interconnection charges. This plan of service will interconnect the proposed wind generating facility in a manner that will provide operational reliability and flexibility to both the AEP system and the IC's generating facility.

Cost Breakdown for Primary Point of Interconnection (Olive (AEP) – Reynolds (NIPSCO) 345 kV)		
Attachment Cost	Install three (3) 345 kV Circuit Breakers at the proposed AC2-080 345 kV switching station including installation of protection and controls equipment.	$4,000,000
Non-Direct Connection Cost Estimate	345 kV Revenue Metering	$350,000
	Upgrade line protection and controls at the Olive 345 kV substation.	$350,000
	Upgrade line protection and control settings at the Reynolds (NIPSCO) 345 kV substation.	NIPSCO to provide scope and cost estimate
	Total Estimated Cost for Project AD2-138	**$4,700,000**

Table 5

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.

Figure 1: Primary Point of Interconnection (Olive (AEP) – Reynolds (NIPSCO) 345 kV Circuit #1)

Single-Line Diagram

Appendices – Primary POI

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. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the Appendices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the Appendices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators.

It should be noted the project/generator MW contributions presented in the body of the report and appendices sections are full contributions, whereas the loading percentages reported in the body of the report, take into consideration the commercial probability of each project as well as the ramping impact of "Adder" contributions.

Appendix 1

(AEP - OVEC) The 05JEFRSO-06CLIFTY 345 kV line (from bus 242865 to bus 248000 ckt Z1) loads from 102.47% to 102.57% (**DC power flow**) of its emergency rating (2045 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#6189_05HANG R 765'. This project contributes approximately 23.98 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#6189_05HANG R 765'
OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765 242924 05HANG R 765 1
OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
243859	*05FR-11G C*	*0.43*
247900	*05FR-11G E*	*9.3*
243862	*05FR-12G C*	*0.43*
247901	*05FR-12G E*	*9.15*
243864	*05FR-21G C*	*0.45*
247902	*05FR-21G E*	*9.78*
243866	*05FR-22G C*	*0.44*
247903	*05FR-22G E*	*9.36*
243870	*05FR-3G C*	*0.88*
247904	*05FR-3G E*	*18.96*
243873	*05FR-4G C*	*0.68*
247905	*05FR-4G E*	*14.26*
246909	*05MDL-1G C*	*0.91*
247906	*05MDL-1G E*	*19.64*
246910	*05MDL-2G C*	*0.46*
247907	*05MDL-2G E*	*9.74*
246976	*05MDL-3G C*	*0.46*
247912	*05MDL-3G E*	*10.18*
246979	*05MDL-4G C*	*0.91*
247913	*05MDL-4G E*	*9.72*
243442	*05RKG1*	*51.25*
243443	*05RKG2*	*50.47*
932601	*AC2-080 C*	*3.12*
932602	*AC2-080 E*	*20.86*
932931	*AC2-117*	*4.29*
933281	*AC2-140 C*	*3.75*
933441	*AC2-157 C*	*9.81*

933442	*AC2-157 E*	*16.*
LTF	*AD1-092*	*9.21*
LTF	*AD1-093*	*15.78*
LTF	*AD1-094*	*3.02*
935271	*AD1-137 C*	*7.72*
935272	*AD1-137 E*	*51.68*
936781	*AD2-101 C*	*3.28*
936782	*AD2-101 E*	*15.35*
936981	*AD2-132 C*	*4.22*
936982	*AD2-132 E*	*19.76*
937031	*AD2-137 C O1*	*2.48*
937032	*AD2-137 E O1*	*11.62*
937041	*AD2-138 C*	*4.22*
937042	*AD2-138 E*	*19.76*
937051	*AD2-140 C O1*	*2.49*
937052	*AD2-140 E O1*	*11.65*
937061	*AD2-141 C O1*	*2.47*
937062	*AD2-141 E O1*	*11.67*
937071	*AD2-142 C O1*	*4.98*
937072	*AD2-142 E O1*	*23.3*
937121	*AD2-148 C O1*	*2.46*
937122	*AD2-148 E O1*	*11.5*
937131	*AD2-149 C O1*	*2.46*
937132	*AD2-149 E O1*	*11.5*
937141	*AD2-150 C O1*	*2.46*
937142	*AD2-150 E O1*	*11.5*
937181	*AD2-155 C O1*	*2.46*
937182	*AD2-155 E O1*	*11.5*
937321	*AD2-175 C*	*11.45*
937322	*AD2-175 E*	*7.63*
LTF	*BLUEG*	*33.04*
LTF	*CALDERWOOD*	*0.47*
LTF	*CARR*	*0.55*
LTF	*CATAWBA*	*0.47*
LTF	*CBM-W1*	*70.12*
LTF	*CBM-W2*	*73.71*
LTF	*CELEVELAND*	*1.35*
LTF	*CHEOAH*	*0.44*
LTF	*CHILHOWEE*	*0.15*
LTF	*CIN*	*10.3*
LTF	*CLIFTY*	*138.11*
LTF	*G-007*	*1.77*
LTF	*HAMLET*	*1.63*
LTF	*IPL*	*6.13*

LTF	*MEC*	*33.94*
LTF	*MECS*	*16.85*
LTF	*O-066*	*11.35*
LTF	*RENSSELAER*	*0.44*
LTF	*ROSETON*	*3.15*
LTF	*ROWAN*	*1.04*
LTF	*SANTEETLA*	*0.13*
247556	*T-127 C*	*0.46*
247943	*T-127 E*	*9.97*
LTF	*TRIMBLE*	*7.13*
299993	*U3-031C*	*3.77*
LTF	*WEC*	*5.89*
907041	*X1-020 C*	*27.72*
907042	*X1-020 E*	*185.53*
910542	*X3-005 E*	*0.52*
900404	*X3-028 C*	*193.58*
900405	*X3-028 E*	*258.1*
913222	*Y1-054 E*	*-2.27*
LTF	*Y3-032*	*8.57*
915662	*Y3-099 E*	*0.24*
915672	*Y3-100 E*	*0.24*
LTF	*Z1-043*	*23.07*
916182	*Z1-065 E*	*0.64*
919591	*AA2-035*	*76.62*
930041	*AB1-006 C*	*3.2*
930042	*AB1-006 E*	*21.4*
930461	*AB1-087*	*70.98*
930471	*AB1-088*	*70.98*
930501	*AB1-091*	*51.2*
LTF	*AB2-013*	*13.15*
925242	*AB2-178 E*	*2.4*
927331	*AC1-040 C*	*9.2*
927332	*AC1-040 E*	*15.*
925881	*AC1-067*	*101.99*

Appendix 2

(AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 124.11% to 124.84% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 28.63 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
247900	*05FR-11G E*	*6.83*
247901	*05FR-12G E*	*6.72*
247902	*05FR-21G E*	*7.18*
247903	*05FR-22G E*	*6.87*
247904	*05FR-3G E*	*13.92*
247905	*05FR-4G E*	*10.47*
247906	*05MDL-1G E*	*15.6*
247907	*05MDL-2G E*	*7.74*
247912	*05MDL-3G E*	*8.09*
247913	*05MDL-4G E*	*7.72*
932011	*AC2-007 C*	*0.5*
932012	*AC2-007 E*	*0.92*
932601	*AC2-080 C*	*3.72*
932602	*AC2-080 E*	*24.91*
932881	*AC2-115 1*	*1.41*
932891	*AC2-115 2*	*1.41*
932921	*AC2-116*	*0.49*
932931	*AC2-117*	*5.19*
933361	*AC2-149 C*	*0.54*
933362	*AC2-149 E*	*0.89*
933381	*AC2-151 C*	*0.57*
933382	*AC2-151 E*	*0.92*
933411	*AC2-154 C*	*1.41*
933412	*AC2-154 E*	*2.29*
933431	*AC2-156 C*	*0.55*
933432	*AC2-156 E*	*0.9*
933511	*AC2-166 C*	*1.36*

933512	*AC2-166 E*	*1.51*
933911	*AD1-013 C O1*	*1.08*
933912	*AD1-013 E O1*	*1.73*
933931	*AD1-016 C*	*0.54*
933932	*AD1-016 E*	*0.89*
934101	*AD1-039 1*	*4.54*
934111	*AD1-039 2*	*4.64*
934401	*AD1-064 C O1*	*1.88*
934402	*AD1-064 E O1*	*8.8*
934431	*AD1-067 C*	*0.08*
934432	*AD1-067 E*	*0.33*
LTF	*AD1-092*	*6.98*
LTF	*AD1-093*	*12.01*
LTF	*AD1-094*	*2.31*
934651	*AD1-096 C*	*0.53*
934652	*AD1-096 E*	*0.86*
934701	*AD1-098 C O1*	*4.06*
934702	*AD1-098 E O1*	*2.96*
934721	*AD1-100 C*	*12.86*
934722	*AD1-100 E*	*60.19*
934871	*AD1-116 C*	*0.57*
934872	*AD1-116 E*	*0.93*
934941	*AD1-126 C*	*3.42*
934942	*AD1-126 E*	*2.28*
934971	*AD1-129 C*	*0.53*
934972	*AD1-129 E*	*0.35*
935001	*AD1-133 C O1*	*12.6*
935002	*AD1-133 E O1*	*8.4*
935271	*AD1-137 C*	*5.67*
935272	*AD1-137 E*	*37.95*
936181	*AD2-024 C O1*	*0.54*
936182	*AD2-024 E O1*	*0.89*
936291	*AD2-038 C O1*	*1.41*
936292	*AD2-038 E O1*	*9.45*
936371	*AD2-047 C O1*	*1.26*
936372	*AD2-047 E O1*	*13.54*
936461	*AD2-060*	*1.48*
936511	*AD2-066 C O1*	*4.99*
936512	*AD2-066 E O1*	*3.33*
936781	*AD2-101 C*	*2.46*
936782	*AD2-101 E*	*11.52*
936791	*AD2-102 C*	*7.12*
936792	*AD2-102 E*	*6.84*
936961	*AD2-130 C*	*0.9*

936962	*AD2-130 E*	*0.12*
936981	*AD2-132 C*	*5.04*
936982	*AD2-132 E*	*23.59*
937001	*AD2-134 C*	*1.61*
937002	*AD2-134 E*	*6.66*
937031	*AD2-137 C O1*	*1.91*
937032	*AD2-137 E O1*	*8.94*
937041	*AD2-138 C*	*5.04*
937042	*AD2-138 E*	*23.59*
937051	*AD2-140 C O1*	*1.91*
937052	*AD2-140 E O1*	*8.94*
937061	*AD2-141 C O1*	*1.9*
937062	*AD2-141 E O1*	*8.96*
937071	*AD2-142 C O1*	*3.82*
937072	*AD2-142 E O1*	*17.89*
937121	*AD2-148 C O1*	*1.91*
937122	*AD2-148 E O1*	*8.95*
937131	*AD2-149 C O1*	*1.91*
937132	*AD2-149 E O1*	*8.95*
937141	*AD2-150 C O1*	*1.91*
937142	*AD2-150 E O1*	*8.95*
937181	*AD2-155 C O1*	*1.91*
937182	*AD2-155 E O1*	*8.95*
937311	*AD2-172 C*	*1.46*
937312	*AD2-172 E*	*2.02*
937321	*AD2-175 C*	*8.91*
937322	*AD2-175 E*	*5.94*
937331	*AD2-176 C O1*	*4.29*
937332	*AD2-176 E O1*	*2.86*
937401	*AD2-194 C1*	*2.25*
937411	*AD2-194 C2*	*2.25*
937402	*AD2-194 E1*	*2.25*
937412	*AD2-194 E2*	*2.25*
LTF	*CARR*	*0.63*
LTF	*CATAWBA*	*0.04*
LTF	*CBM-S1*	*4.46*
LTF	*CBM-W1*	*39.35*
LTF	*CBM-W2*	*51.5*
LTF	*CELEVELAND*	*0.09*
LTF	*CIN*	*6.59*
LTF	*DEARBORN*	*1.74*
LTF	*G-007*	*1.64*
290051	*GSG-6; E*	*6.16*
LTF	*HAMLET*	*0.32*

LTF	*IPL*	*3.35*
275149	*KEMPTON ;1E*	*10.35*
290108	*LEEDK;1U E*	*14.24*
LTF	*LGEE*	*0.55*
LTF	*MEC*	*25.36*
274850	*MENDOTA H;RU*	*3.18*
293061	*N-015 E*	*8.99*
LTF	*O-066*	*10.55*
293644	*O22 E1*	*5.92*
293645	*O22 E2*	*11.49*
290021	*O50 E*	*11.46*
294392	*P-010 E*	*11.42*
294763	*P-046 E*	*5.57*
274888	*PILOT HIL;1E*	*10.35*
274830	*PWR VTREC;1U*	*3.58*
274831	*PWR VTREC;2U*	*3.58*
LTF	*RENSSELAER*	*0.5*
LTF	*ROSETON*	*3.6*
LTF	*ROWAN*	*0.18*
295111	*SUBLETTE E*	*1.6*
247943	*T-127 E*	*7.92*
299993	*U3-031C*	*2.9*
291984	*U4-033*	*0.75*
274814	*UNIV PK N;0U*	*0.59*
274808	*UNIV PK N;4U*	*0.59*
274809	*UNIV PK N;5U*	*0.59*
274810	*UNIV PK N;6U*	*0.59*
274811	*UNIV PK N;7U*	*0.59*
274812	*UNIV PK N;8U*	*0.59*
274813	*UNIV PK N;9U*	*0.59*
274815	*UNIV PK N;XU*	*0.59*
274816	*UNIV PK N;YU*	*0.59*
903433	*W3-046*	*9.8*
LTF	*WEC*	*4.7*
295109	*WESTBROOK E*	*3.3*
274687	*WILL CNTY;4U*	*37.96*
247611	*X2-052*	*70.*
914641	*Y2-103*	*26.2*
915011	*Y3-013 1*	*2.18*
915021	*Y3-013 2*	*2.18*
915031	*Y3-013 3*	*2.18*
LTF	*Z1-043*	*17.65*
916502	*Z1-106 E1*	*0.73*
916504	*Z1-106 E2*	*0.73*

916512	*Z1-107 E*	*1.51*
916522	*Z1-108 E*	*1.45*
917711	*Z2-114 C*	*0.07*
917712	*Z2-114 E*	*0.39*
918051	*AA1-018 C*	*1.47*
918052	*AA1-018 E*	*9.82*
918972	*AA1-116 E*	*1.48*
918982	*AA1-117 E*	*1.48*
919591	*AA2-035*	*75.31*
920112	*AA2-107 E*	*1.43*
920272	*AA2-123 E*	*1.43*
930041	*AB1-006 C*	*2.54*
930042	*AB1-006 E*	*17.*
930391	*AB1-080*	*4.15*
930481	*AB1-089*	*38.77*
930491	*AB1-090*	*38.77*
930501	*AB1-091*	*40.47*
930761	*AB1-122 1*	*41.76*
930771	*AB1-122 2*	*42.65*
931221	*AB1-172*	*0.47*
LTF	*AB2-013*	*10.01*
924471	*AB2-096*	*24.88*
925301	*AB2-191 C*	*0.75*
925302	*AB2-191 E*	*0.66*
926311	*AC1-109 1*	*1.1*
926321	*AC1-109 2*	*1.1*
926331	*AC1-110 1*	*1.1*
926341	*AC1-110 2*	*1.1*
926351	*AC1-111 1*	*0.44*
926361	*AC1-111 2*	*0.44*
926371	*AC1-111 3*	*0.44*
926381	*AC1-111 4*	*0.44*
926391	*AC1-111 5*	*0.44*
926401	*AC1-111 6*	*0.44*
927511	*AC1-113 1*	*0.7*
927522	*AC1-113 2*	*0.7*
926431	*AC1-114*	*1.41*
927451	*AC1-142A 1*	*2.42*
927461	*AC1-142A 2*	*2.42*
926701	*AC1-153 C1*	*45.39*
926711	*AC1-153 C2*	*46.36*
926702	*AC1-153 E1*	*1.82*
926712	*AC1-153 E2*	*1.85*
927091	*AC1-204 1*	*41.9*

927101	*AC1-204 2*	*41.91*