

# *Generation Interconnection Feasibility Study Report Queue Position AC2-155*

## **General**

Interconnection Customer has proposed a 100 MW wind generating facility located approximately 17.25 miles south of North Franklin substation located in Pendleton County, West Virginia. The installed facilities will have a total capability of 100 MW with 13 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 12/31/2019. **This study does not imply a Monongahela Power (“Mon Power”) commitment to this in-service date.**

## **Point of Interconnection**

AC2-155 will interconnect with the Mon Power transmission system by direct injection into North Franklin Substation 138 kV bus. Latitude: 38.4913420, Longitude: -79.4561500. There is no secondary POI selected; please refer to the single-line diagram in Appendix 2.

## Network Impacts

The Queue Project AC2-155 was evaluated as a 100.0 MW (Capacity 13.0 MW) injection at the North Franklin 138 kV substation in the APS area. Project AC2-155 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC2-155 was studied with a commercial probability of 53%. Potential network impacts were as follows:

### Summer Peak Analysis - 2020

#### 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)*

1. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 92.81% to 115.05% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-153'. This project contributes approximately 39.8 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-153'                /* OAK PARK-KELSO GAP STK BKR AT ALBRIGHT
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1    /* 01ALBRIG 138 01METTIK 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1    /* 01ALBRIG 138 01MTZION 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1    /* 01ALBRIG 138 01 106 J 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1    /* 01ALBRIG 138 01DENVER 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1    /* 01ALBRIG 138 01GARRET 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1    /* 01ALBRIG 138 01SNOW T 138
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1    /* 01SNOW T 138 01SNWYCK 138
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1    /* 01SNOW T 138 01OAKPRK 138
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1    /* 01SNWYCK 138 01SNOW C 66
DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1    /* 01OAKPRK 138 01KELSOG 138
END
```

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

2. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 91.95% to 114.08% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-160'. This project contributes approximately 39.63 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-160'                /* ALBRIGHT-SNOWY CREEK
STK BKR AT ALBRIGHT
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1    /* 01ALBRIG 138 01METTIK 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1    /* 01ALBRIG 138 01MTZION 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1    /* 01ALBRIG 138 01 106 J 138
```

DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /\* 01ALBRIG 138 01SNOW T 138  
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1 /\* 01SNOW T 138 01SNWYCK 138  
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1 /\* 01SNOW T 138 01OAKPRK 138  
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1 /\* 01SNWYCK 138 01SNOW C 66  
END

3. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 91.83% to 113.79% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'C1-MP-138-101'. This project contributes approximately 39.3 MW to the thermal violation.

CONTINGENCY 'C1-MP-138-101' /\* ALBRIGHT-138-SOUTH  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /\* 01ALBRIG 138 01SNOW T 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1 /\* 01ALBRIG 138 01GARRET 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /\* 01ALBRIG 138 01 106 J 138  
END

4. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 96.66% to 118.9% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-153'. This project contributes approximately 39.8 MW to the thermal violation.

CONTINGENCY 'C2-MP-138-153' /\* OAK PARK-KELSO GAP STK BKR AT ALBRIGHT  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /\* 01ALBRIG 138 01MTZION 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /\* 01ALBRIG 138 01 106 J 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1 /\* 01ALBRIG 138 01GARRET 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /\* 01ALBRIG 138 01SNOW T 138  
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1 /\* 01SNOW T 138 01SNWYCK 138  
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1 /\* 01SNOW T 138 01OAKPRK 138  
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1 /\* 01SNWYCK 138 01SNOW C 66  
DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1 /\* 01OAKPRK 138 01KELSOG 138  
END

Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

5. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 95.86% to 117.99% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-160'. This project contributes approximately 39.63 MW to the thermal violation.

CONTINGENCY 'C2-MP-138-160' /\* ALBRIGHT-SNOWY CREEK STK BKR AT ALBRIGHT  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /\* 01ALBRIG 138 01MTZION 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /\* 01ALBRIG 138 01 106 J 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /\* 01ALBRIG 138 01SNOW T 138

DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1 /\* 01SNOW T 138 01SNWYCK 138  
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1 /\* 01SNOW T 138 01OAKPRK 138  
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1 /\* 01SNWYCK 138 01SNOW C 66  
END

6. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 95.74% to 117.7% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'C1-MP-138-101'. This project contributes approximately 39.3 MW to the thermal violation.

CONTINGENCY 'C1-MP-138-101' /\* ALBRIGHT-138-SOUTH  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /\* 01ALBRIG 138 01SNOW T 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1 /\* 01ALBRIG 138 01GARRET 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /\* 01ALBRIG 138 01 106 J 138  
END

### **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)*

1. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 152.03% to 174.69% (**DC power flow**) of its emergency rating (45 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-161\_A'. This project contributes approximately 10.2 MW to the thermal violation.

CONTINGENCY 'C2-MP-138-161\_A' /\* ALBRIGHT-MT ZION STK BKR AT ALBRIGHT  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /\* 01ALBRIG 138 01 106 J 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /\* 01ALBRIG 138 01MTZION 138  
DISCONNECT BRANCH FROM BUS 235492 TO BUS 931140 CKT 1 /\* 01MTZION 138 01WESTVA 138  
END

Please refer to Appendix 6 for a table containing the generators having contribution to this flowgate.

2. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 156.37% to 163.85% (**DC power flow**) of its emergency rating (45 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-200'. This project contributes approximately 7.47 MW to the thermal violation.

CONTINGENCY 'C2-MP-138-200' /\* ALBRIGHT BREAKER FAILURE - TIE BREAKER  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1 /\* 01ALBRIG 138 01BRANDN 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /\* 01ALBRIG 138 01 106 J 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1 /\* 01ALBRIG 138 01KINGWD 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1 /\* 01ALBRIG 138 01RUTHBL 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /\* 01ALBRIG 138 01SNOW T 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1 /\* 01ALBRIG 138 01GARRET 138

DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /\* 01ALBRIG 138 01MTZION 138  
END

3. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 139.11% to 161.73% (**DC power flow**) of its emergency rating (45 MVA) for the tower line contingency outage of 'C5-MP-138-055'. This project contributes approximately 10.18 MW to the thermal violation.

CONTINGENCY 'C5-MP-138-055' /\* AT-GFT-AT-WM  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235320 TO BUS 235810 CKT 1 /\* 01DENVER 138 01INT COAL 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235427 TO BUS 235485 CKT 1 /\* 01WILLIM 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235485 TO BUS 237513 CKT 1 /\* 01METTIK 138 01ROTHROCK 138  
DISCONNECT BRANCH FROM BUS 235338 TO BUS 235810 CKT 1 /\* 01GRAFTN 138 01INT COAL 138  
END

4. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 153.7% to 161.23% (**DC power flow**) of its emergency rating (45 MVA) for the bus fault outage of 'C1-MP-138-101'. This project contributes approximately 7.52 MW to the thermal violation.

CONTINGENCY 'C1-MP-138-101' /\* ALBRIGHT-138-SOUTH  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /\* 01ALBRIG 138 01DENVER 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /\* 01ALBRIG 138 01SNOW T 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1 /\* 01ALBRIG 138 01GARRET 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /\* 01ALBRIG 138 01 106 J 138  
END

### **Steady-State Voltage Requirements**

*(Results of the steady-state voltage studies should be inserted here)*

To be determined at later study stages

### **Short Circuit**

None.

### **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.

1. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 134.97% to 157.9% (**DC power flow**) of its emergency rating (45 MVA) for the single line contingency outage of 'B2-MP-138-151'. This project contributes approximately 10.32 MW to the thermal violation.

CONTINGENCY 'B2-MP-138-151' /\* 7  
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1 /\* 01ALBRIG 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235427 TO BUS 235485 CKT 1 /\* 01WILLIM 138 01METTIK 138  
DISCONNECT BRANCH FROM BUS 235485 TO BUS 237513 CKT 1 /\* 01METTIK 138 01ROTHROCK 138  
END

## **Light Load Analysis - 2020**

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

## **System Reinforcements**

### **Short Circuit**

None.

### **Stability and Reactive Power Requirement**

To be determined at later study stages.

## **Summer Peak Load Flow Analysis Reinforcements**

### **New System Reinforcements**

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

### **Multiple Facility Contingency**

1. (AP - AP) The 01PARSNS-01LOUGHHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 92.81% to 115.05% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-153'. This project contributes approximately 39.8 MW to the thermal violation.

**Convert Albright 138 kV substation to a breaker-and-a-half scheme:**

**At the Albright 138 kV substation, construct a 138 kV breaker-and-a-half substation with 5 strings. Total Cost with Tax: \$12,203,300; Tax: \$1,462,100; Total Cost: \$10,741,200**

**Relocate (9) 138 kV transmission lines to a new breaker-and-a-half substation adjacent to the abandoned Albright PS. Total Cost: \$4,420,100**

**Adjust remote relay and metering settings at multiple substations. Total Cost: \$54,300**

**Estimated Time: 34 months**

2. (AP - AP) The 01PARSNS-01LOUGHHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 91.95% to 114.08% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-160'. This project contributes approximately 39.63 MW to the thermal violation.

**Same as Multiple Facility #1**

3. (AP - AP) The 01PARSNS-01LOUGHHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 91.83% to 113.79% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'C1-MP-138-101'. This project contributes approximately 39.3 MW to the thermal violation.

**Same as Multiple Facility #1**

4. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 96.66% to 118.9% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-153'. This project contributes approximately 39.8 MW to the thermal violation.

**Same as Multiple Facility #1**

5. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 95.86% to 117.99% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-160'. This project contributes approximately 39.63 MW to the thermal violation.

**Same as Multiple Facility #1**

6. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 95.74% to 117.7% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'C1-MP-138-101'. This project contributes approximately 39.3 MW to the thermal violation.

**Same as Multiple Facility #1**

## **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)*

1. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 152.03% to 174.69% (**DC power flow**) of its emergency rating (45 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-161\_A'. This project contributes approximately 10.2 MW to the thermal violation.

### **Same as Multiple Facility #1**

2. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 156.37% to 163.85% (**DC power flow**) of its emergency rating (45 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-200'. This project contributes approximately 7.47 MW to the thermal violation.

### **Same as Multiple Facility #1**

3. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 139.11% to 161.73% (**DC power flow**) of its emergency rating (45 MVA) for the tower line contingency outage of 'C5-MP-138-055'. This project contributes approximately 10.18 MW to the thermal violation.

### **Same as Multiple Facility #1**

4. (AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 153.7% to 161.23% (**DC power flow**) of its emergency rating (45 MVA) for the bus fault outage of 'C1-MP-138-101'. This project contributes approximately 7.52 MW to the thermal violation.

### **Same as Multiple Facility #1**

## **Light Load Load Flow Analysis Reinforcements**

### **New System Reinforcements**

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

None

## Appendix 3

### PJM Queue Position: AC2-155

### Overview Power Flow Analysis Results

Overloaded Facility	Contingency Description	Rating (MVA)	% Loading	Reinforcement
Loughs Lane-Parsons 138 kV Line	Oak Park-Kelso Gap 138 kV line fault with Failed Breaker at Albright	179 MVA	115.05%	Convert Albright 138 kV Substation to Breaker and a Half Scheme
Parsons-William 138 kV Line	Oak Park-Kelso Gap 138 kV line fault with Failed Breaker at Albright	179 MVA	118.9%	Convert Albright 138 kV Substation to Breaker and a Half Scheme
William 138-69 kV #2 Transformer	Albright-Mt. Zion 138 kV line fault with Failed Breaker at Albright	45 MVA	174.69%	Convert Albright 138 kV Substation to Breaker and a Half Scheme

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 4

### PJM Queue Position: AC2-155 Loughs Lane-Parsons 138 kV Line

(AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 92.81% to 115.05% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-153'. This project contributes approximately 39.8 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-153'                /* OAK PARK-KELSO GAP STK BKR AT ALBRIGHT
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1    /* 01ALBRIG 138 01METTIK 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1    /* 01ALBRIG 138 01MTZION 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1    /* 01ALBRIG 138 01 106 J 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1    /* 01ALBRIG 138 01DENVER 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1    /* 01ALBRIG 138 01GARRET 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1    /* 01ALBRIG 138 01SNOW T 138
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1    /* 01SNOW T 138 01SNWYCK 138
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1    /* 01SNOW T 138 01OAKPRK 138
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1    /* 01SNWYCK 138 01SNOW C 66
DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1    /* 01OAKPRK 138 01KELSOG 138
END
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
235625	01BACKB	32.77
235854	01KL_K28_T16	0.5
237512	01ROTHROCK	0.66
932421	AC2-155 C	5.17
932422	AC2-155 E	34.63
292310	K-019	1.34
292401	K-028 E	9.44
885642	T-016 E	2.82
235091	U2-061_E	26.99
921152	AA1-062 C	18.
921153	AA1-062 E	121.01
922013	AA2-103 E	12.41

## Appendix 5

### PJM Queue Position: AC2-155 Parsons-William 138 kV Line

(AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 96.66% to 118.9% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-153'. This project contributes approximately 39.8 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-153'                /* OAK PARK-KELSO GAP STK BKR AT ALBRIGHT
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1    /* 01ALBRIG 138 01METTIK 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1    /* 01ALBRIG 138 01MTZION 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1    /* 01ALBRIG 138 01 106 J 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1    /* 01ALBRIG 138 01DENVER 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235469 CKT 1    /* 01ALBRIG 138 01GARRET 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1    /* 01ALBRIG 138 01SNOW T 138
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1    /* 01SNOW T 138 01SNWYCK 138
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1    /* 01SNOW T 138 01OAKPRK 138
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1    /* 01SNWYCK 138 01SNOW C 66
DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1    /* 01OAKPRK 138 01KELSOG 138
END
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
235625	01BACKB	32.77
235854	01KL_K28_T16	0.5
237512	01ROTHROCK	0.66
932421	AC2-155 C	5.17
932422	AC2-155 E	34.63
292310	K-019	1.34
292401	K-028 E	9.44
885642	T-016 E	2.82
235091	U2-061_E	26.99
921152	AA1-062 C	18.
921153	AA1-062 E	121.01
922013	AA2-103 E	12.41

## Appendix 6

### PJM Queue Position: AC2-155 William 138-69 kV #2 Transformer

(AP - AP) The 01WILLIM 138/66 kV transformer (from bus 235427 to bus 237276 ckt 2) loads from 152.03% to 174.69% (**DC power flow**) of its emergency rating (45 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-161\_A'. This project contributes approximately 10.2 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-161_A'                /* ALBRIGHT-MT ZION STK BKR AT ALBRIGHT
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1    /* 01ALBRIG 138 01DENVER 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1    /* 01ALBRIG 138 01 106 J 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1    /* 01ALBRIG 138 01METTIK 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1    /* 01ALBRIG 138 01MTZION 138
DISCONNECT BRANCH FROM BUS 235492 TO BUS 931140 CKT 1    /* 01MTZION 138 01WESTVA 138
END
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
235625	01BACKB	9.33
237512	01ROTHROCK	0.19
932421	AC2-155 C	1.33
932422	AC2-155 E	8.87
292310	K-019	0.38
235091	U2-061_E	7.69
921152	AA1-062 C	5.13
921153	AA1-062 E	34.46
922013	AA2-103 E	3.53