APPENDIX Q. FORCE FUEL TYPE SENSITIVITIES – S30 AND S34

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1 S30: FORCE OIL BURN FOR DUAL FUEL RESOURCES

1.1 RGDS S30 WINTER 2018

Figure Q1 summarizes the affected generation during the Winter 2018 peak hour by PPA.

Figure Q1. RGDS S30 Winter 2018: Peak Hour Affected Generation

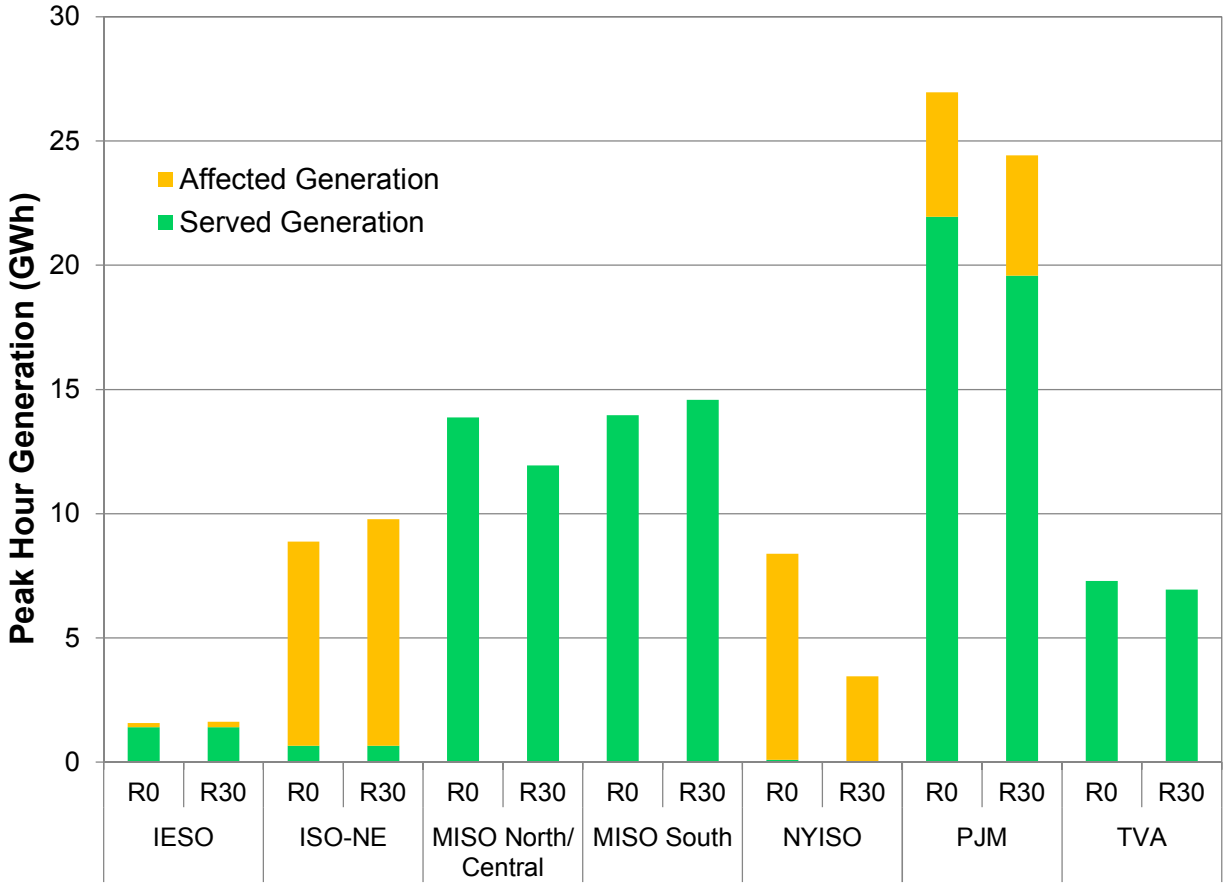


Figure Q2 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q1.

Figure Q2. RGDS S30 Winter 2018: Locations with Peak Hour Affected Generation

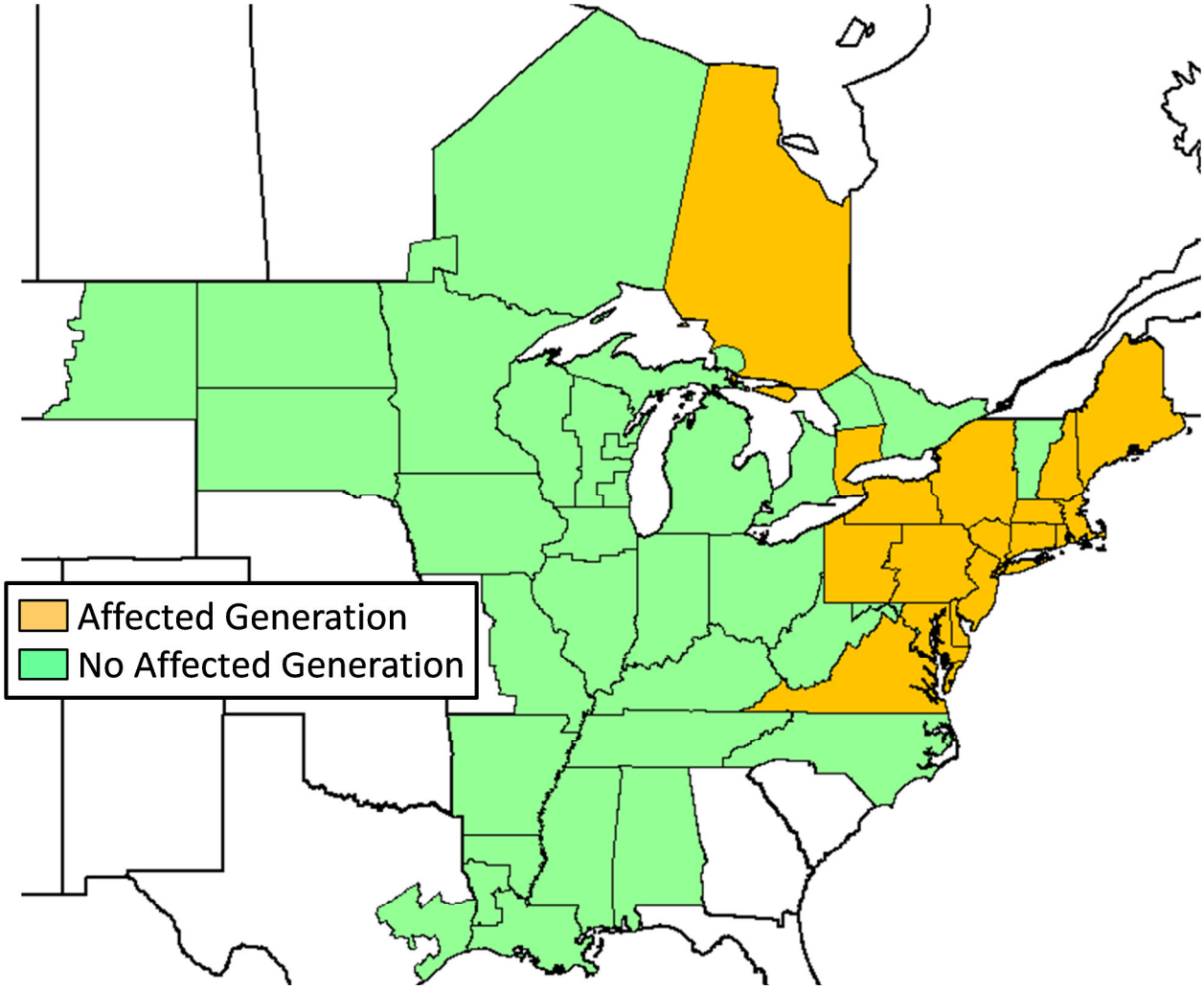


Table Q1. RGDS S30 Winter 2018: Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Connecticut	15.4	2,052
Delaware	1.7	207
Maine	9.5	1,292
Maryland Eastern	7.0	682
Massachusetts Eastern	17.9	2,458
Massachusetts Western	5.3	717
New Hampshire	5.4	717
New Jersey	7.1	855
New York Central Northern	9.6	1,256
New York City	7.3	863
New York Long Island	4.0	430
New York Southern	5.4	767
New York Western	1.2	136
Ontario (CDA)	0.5	55
Ontario (NDA)	1.2	155
Pennsylvania Eastern	8.0	1,140
Rhode Island	14.8	1,889
Virginia	15.0	1,965

Figure Q3 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q1 during the Winter 2018 peak hour.

Figure Q3. RGDS S30 Winter 2018: Peak Hour Constraints

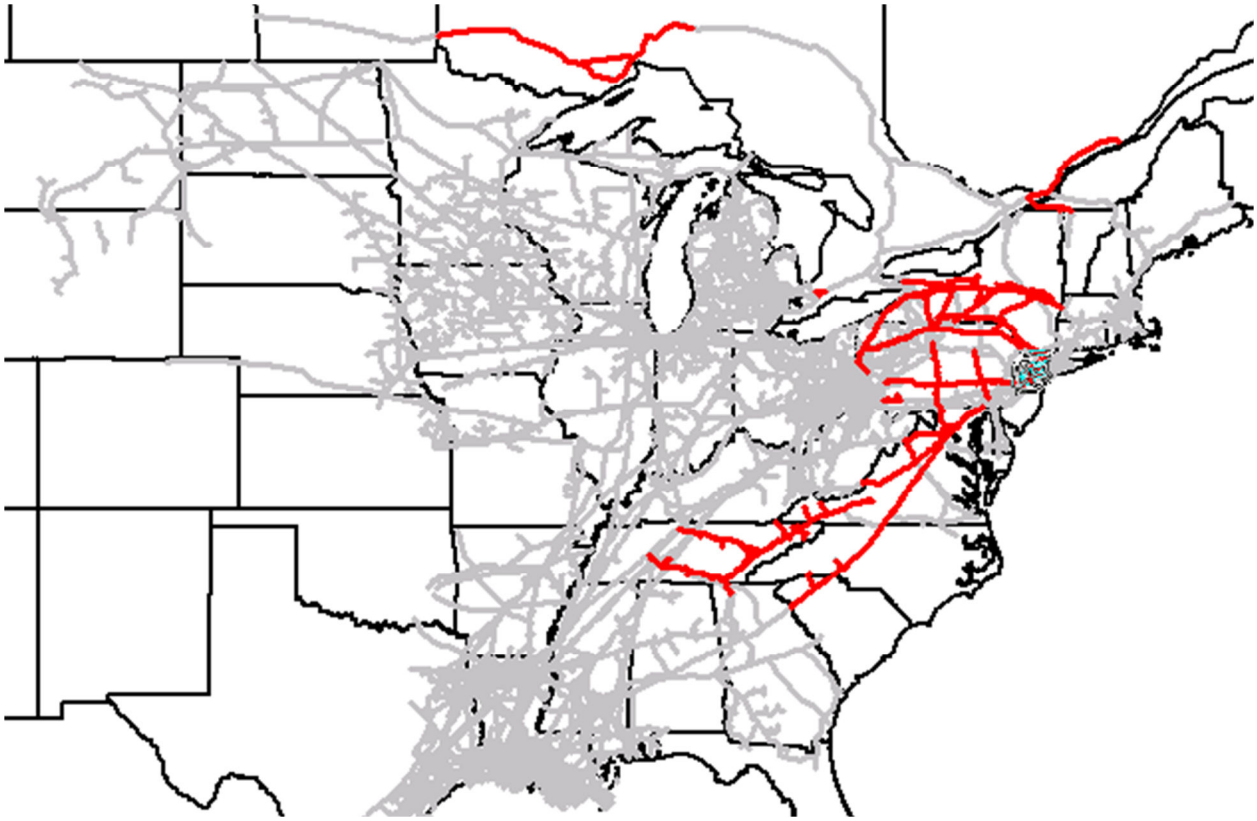


Table Q2 summarizes the results of the frequency and duration analysis.

Table Q2. RGDS S30 Winter 2018: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
Columbia Gas VA/MD	9	1	5	14
Constitution	5	1	57	81
Dominion Eastern NY	1	4	4	4
Dominion Western NY	2	1	1	2
Dominion Southeast	5	1	11	20
East Tennessee Mainline	5	1	2	7
Eastern Shore	11	1	15	55
Empire Mainline	1	3	3	3
Millennium	11	1	8	32
NB/NS Supply	8	1	19	45
Tennessee Z4 PA	7	1	15	30
Tennessee Z5 NY	4	2	59	86
Texas Eastern M2 PA South	10	1	9	32
Texas Eastern M3 North	11	1	10	38
TransCanada Ontario West	5	1	5	11
TransCanada Quebec	8	1	14	31
Transco Leidy Atlantic	7	1	29	63
Transco Z5	3	1	1	3
Transco Z6 Leidy to 210	1	2	2	2
Union Gas Dawn	2	1	2	3

1.1.1 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment, which is modeled with a capacity of 2,477 MDth/d, potentially affects generators directly connected to Columbia in Maryland and Virginia; generators behind LDCs served by Columbia Gas in Maryland and Virginia; and generators served by Dominion Cove Point and PPL Interstate downstream of interconnections with Columbia Gas. The locations of these generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R1 and Figure R2 relative to the capacity of the segment.

1.1.2 Constitution Pipeline

Constitution's proposed delivery capacity is 650 MDth/d. The 100% peak hour utilization on Constitution potentially affects generators served by Iroquois both directly and behind LDCs in New York and Connecticut. The locations of these generators are shown in Figure 82 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R3 and Figure R4 relative to the capacity of the segment.

1.1.3 Dominion Eastern New York

Dominion's Eastern New York segment is modeled with a capacity of 907 MDth/d. The 100% peak hour utilization on Dominion's Eastern New York segment potentially affects generators directly connected to Dominion and behind LDCs served by Dominion. The locations of these generators are shown in Figure 83 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R5 and Figure R6 relative to the capacity of the segment.

1.1.4 Dominion Western New York

Dominion Western New York is modeled with a capacity of 557 MDth/d. The 100% utilization on Dominion's Western New York segment potentially affects generators directly served by Dominion and behind LDCs served by Dominion. The locations of the plants in each category are shown in Figure 84 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R7 and Figure R8 relative to the capacity of the segment.

1.1.5 Dominion Southeast

Dominion Southeast is modeled with a capacity of 540 MDth/d. The 100% peak hour utilization on Dominion's Southeast segment serving Virginia and Maryland potentially affects generators directly served by Dominion, generators behind LDCs served by Dominion, and generators served by Dominion Cove Point via interconnect. The locations of these generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R9 and Figure R10 relative to the capacity of the segment.

1.1.6 East Tennessee Mainline

The East Tennessee mainline is modeled with a capacity of 800 MDth/d. The 100% peak hour utilization on East Tennessee's mainline potentially affects generators directly connected to East Tennessee and generators behind LDCs served by East Tennessee. The locations of these generators are shown in Figure 86 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R11 and Figure R12 relative to the capacity of the segment.

1.1.7 Eastern Shore

Eastern Shore is modeled with a capacity of 203 MDth/d. The 100% peak hour utilization rate on Eastern Shore's Receipt Zone 1 and Delivery Zone 2 potentially affects generators on the Delmarva Peninsula that are served by Eastern Shore. The locations of these generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R13 and Figure R14 relative to the capacity of the segments.

1.1.8 Empire Mainline

The Empire mainline is modeled with a capacity of 525 MDth/d. The 100% peak hour utilization on the Empire mainline across upstate New York potentially affects generators on the Niagara Mohawk LDC system. The locations of these generators are shown in Figure 88 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R15 and Figure R16 relative to the capacity of the segment. Total demand on Empire exceeds pipeline capacity on 16 days.

1.1.9 Millennium

Millennium is modeled with a capacity of 784 MDth/d. The 100% peak hour utilization on Millennium's mainline potentially affects generators directly connected to Millennium, generators behind LDCs served by Millennium, and generators served by Algonquin, particularly in southern New England. The locations of these generators are shown in Figure 89 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R17 and Figure R18 relative to the capacity of the segment.

1.1.10 New Brunswick Supply / Nova Scotia Offshore Supply

Production from Atlantic Canada is capped at approximately 24 MDth/d in New Brunswick and approximately 599 MDth/d for Nova Scotia Offshore. This supply limitation potentially affects generators directly connected to M&N in Maine and New Hampshire as well as generators located behind LDCs served by M&N in Maine. The locations of these generators are shown in Figure 90 of the report. Generators located in the Canadian Maritimes could also be affected by this supply constraint, but have not been included in the summary results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the supply limitation are shown in Figure R19 and Figure R20 relative to the total production capacity. The generator gas demand in these figures only reflects generators located in the Study Region.

1.1.11 Tennessee Zone 4 Pennsylvania

Tennessee Zone 4 Pennsylvania is modeled with a capacity of 1,887 MDth/d. The 100% peak hour utilization on Tennessee's Zone 4 segment in Pennsylvania potentially affects generators directly connected to Tennessee in Pennsylvania and New Jersey; generators behind LDCs served by Tennessee in Pennsylvania, New Jersey, downstate New York and Connecticut; and generators served by Algonquin either directly or via LDC in New England. The locations of these generators are shown in Figure 91 of the report.

The peak hour demand forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R21 and Figure R22 relative to the capacity of the segment.

1.1.12 Tennessee Zone 5 New York

Tennessee Zone 5 New York is modeled with a capacity of 1,189 MDth/d. The 100% peak hour utilization on Tennessee's Z5 New York segment potentially affects generators directly connected to Tennessee in upstate New York, Massachusetts, Rhode Island and New Hampshire; generators behind LDCs served by Tennessee in upstate New York, Massachusetts, Connecticut and Rhode Island; and generators served by Iroquois, Granite State and PNGTS either directly or behind an LDC. The locations of these generators are shown in Figure 92 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R23 and Figure R24 relative to the capacity of the segment.

1.1.13 Texas Eastern M2 PA – Southern Branch

The Texas Eastern M2 PA – Southern Branch is modeled with a capacity of 2,068 MDth/d. The 100% peak hour utilization on the southern branch of Texas Eastern's Zone M2 segment through Pennsylvania potentially affects generators directly connected to Texas Eastern in Pennsylvania, generators behind LDCs in Pennsylvania, Delaware and downstate New York. Generators that are served by Algonquin and Eastern Shore either directly or behind an LDC would also potentially be affected. The locations of these generators are shown in Figure 93 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R25 and Figure R26 relative to the capacity of the segment.

1.1.14 Texas Eastern M3 – Northern Line

The Texas Eastern M3 Northern Line is modeled with a capacity of 2,987 MDth/d. The 100% peak hour utilization on the Northern line through Pennsylvania potentially affects generators directly connected to Texas Eastern in New Jersey and Pennsylvania, generators behind LDCs served by Texas Eastern in New Jersey, Pennsylvania and downstate New York, as well as generators served by Algonquin both directly and behind LDCs. The locations of these generators are shown in Figure 94 of the report.

The seasonal daily forecasts of RCI and generator peak hour gas demand downstream of the constrained segment are shown in Figure R27 and Figure R28 relative to the capacity of the segment.

1.1.15 TransCanada Ontario West

TransCanada's Western Ontario segment is modeled with a capacity of 3,148 MDth/d. The 100% peak hour utilization on TransCanada's Western Ontario segment potentially affects generators directly connected to TransCanada and generators behind the Enbridge and Union local distribution systems. The locations of these generators are shown in Figure 95 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R29 and Figure R30 relative to the capacity of the segment.

1.1.16 TransCanada Quebec

TransCanada Quebec is modeled with a capacity of 1,320 MDth/d. The 100% peak hour utilization on TransCanada's Quebec segment potentially affects generators served by PNGTS, North Country and Vermont Gas. The locations of these generators are shown in Figure 96 of the report. Limitations for customers in Quebec could arise from this constraint, but such limitations have not been included in the results reported below.

The seasonal daily forecasts of RCI and generator peak hour demand downstream of the constrained segment are shown in Figure R31 and Figure R32 relative to the capacity of the segment. The generator gas demand in these figures includes only gas demand at generators in the Study Region. Gas demand from non-Study Region generators is not included in the tabulation of results.

1.1.17 Transco Leidy Atlantic

The Transco Leidy Atlantic segment is modeled with a capacity of 1,700 MDth/d. The 100% peak hour utilization on Transco's Leidy Atlantic segment potentially affects generators directly connected to Transco in New Jersey, Maryland, Pennsylvania and Virginia and generators behind LDCs served by Transco in Delaware, New Jersey, Pennsylvania, Maryland, Virginia and North Carolina. The locations of these generators are shown in Figure 97 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R33 and Figure R34 relative to the capacity of the segment.

1.1.18 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 3,967 MDth/d. The 100% peak hour utilization on Transco's Zone 5 segment potentially affects Study Region generators directly connected to Transco in Virginia and generators behind LDCs served by Transco in North Carolina and Virginia. The locations of these generators are shown in Figure 98 of the report. Non-Study Region generators in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R35 and Figure R36 relative to the capacity of the segment.

1.1.19 Transco Zone 6 Leidy Line to Station 210

The Transco Zone 6 Leidy to Station 210 segment is modeled with a capacity of 3,310 MDth/d. The 100% peak hour utilization on this segment potentially affects generators directly connected to Transco in New Jersey and Pennsylvania and generators behind LDCs served by Transco in New Jersey, Pennsylvania, New York City and Long Island. The locations of generators served along this Transco segment are shown in Figure 99 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R37 and Figure R38 relative to the capacity of the segment.

1.1.20 Union Gas Dawn

The 100% peak hour utilization on Union Gas's Dawn segment, which is modeled with a capacity of 5,000 MDth/d, potentially affects generators directly connected to Union, generators directly connected to TransCanada, and generators served by the Union Gas and Enbridge distribution systems. The locations of these generators are shown in Figure 100 of the report.

The seasonal daily forecasts of RCI and generator peak hour gas demand downstream of the constrained segment are shown in Figure R39 and Figure R40 relative to the capacity of the segment.

1.2 RGDS S30 SUMMER 2018

Figure Q4 summarizes the affected generation during the Summer 2018 peak hour by PPA.

Figure Q4. RGDS S30 Summer 2018: Peak Hour Affected Generation

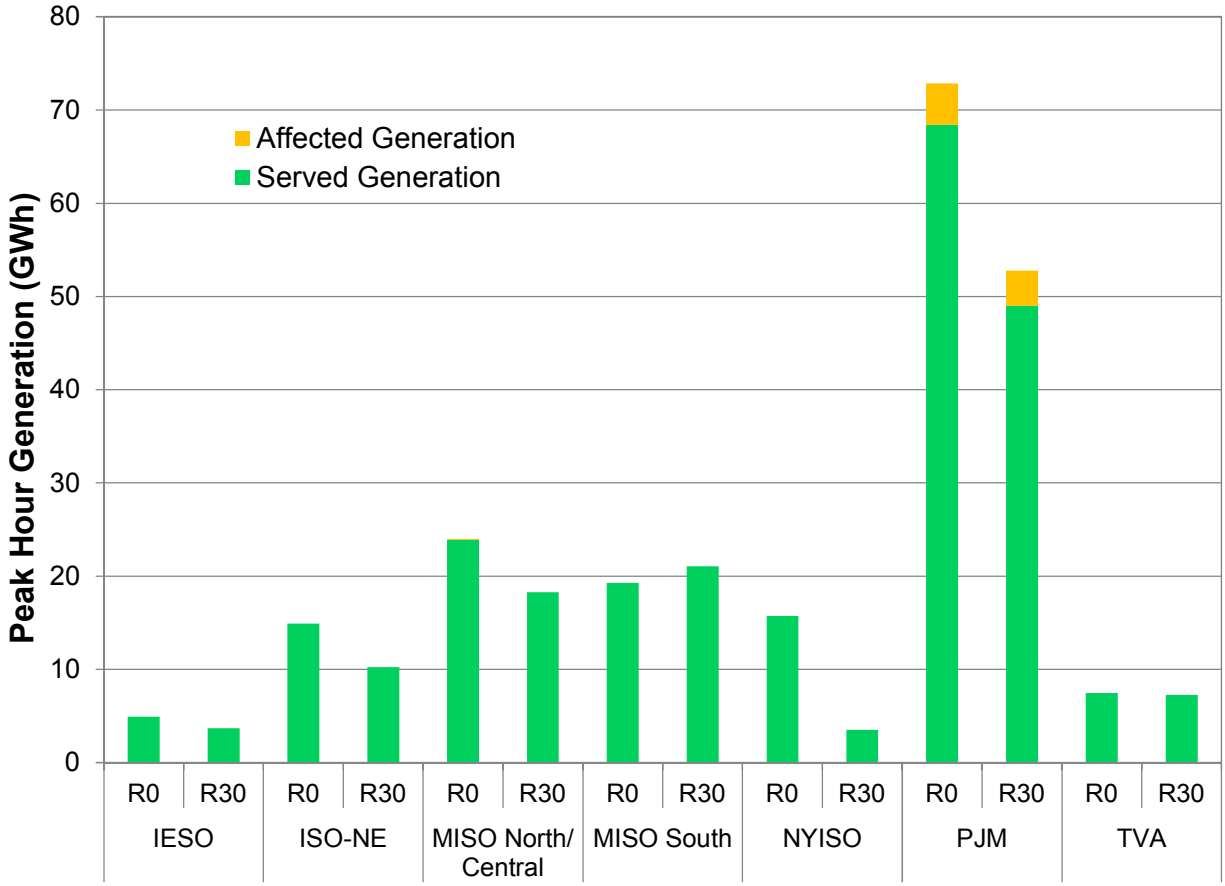


Figure Q5 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q3.

Figure Q5. RGDS S30 Summer 2018: Locations with Peak Hour Affected Generation

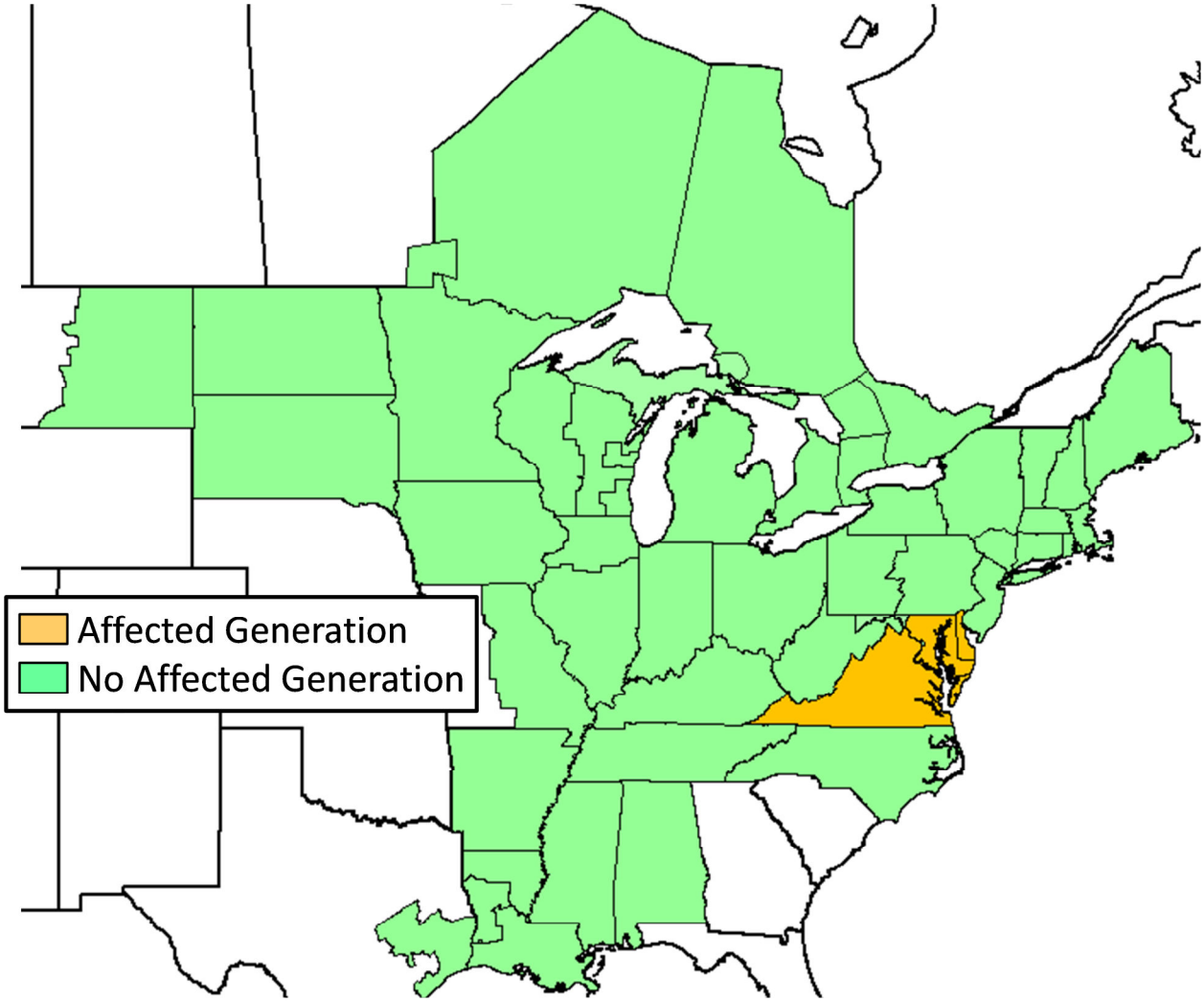


Table Q3. RGDS S30 Summer 2018 Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Delaware	8.4	1,155
Maryland Eastern	16.3	2,326
Virginia	2.7	297

Figure Q6 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q4 during the Summer 2018 peak hour.

Figure Q6. RGDS S30 Summer 2018: Peak Hour Constraints

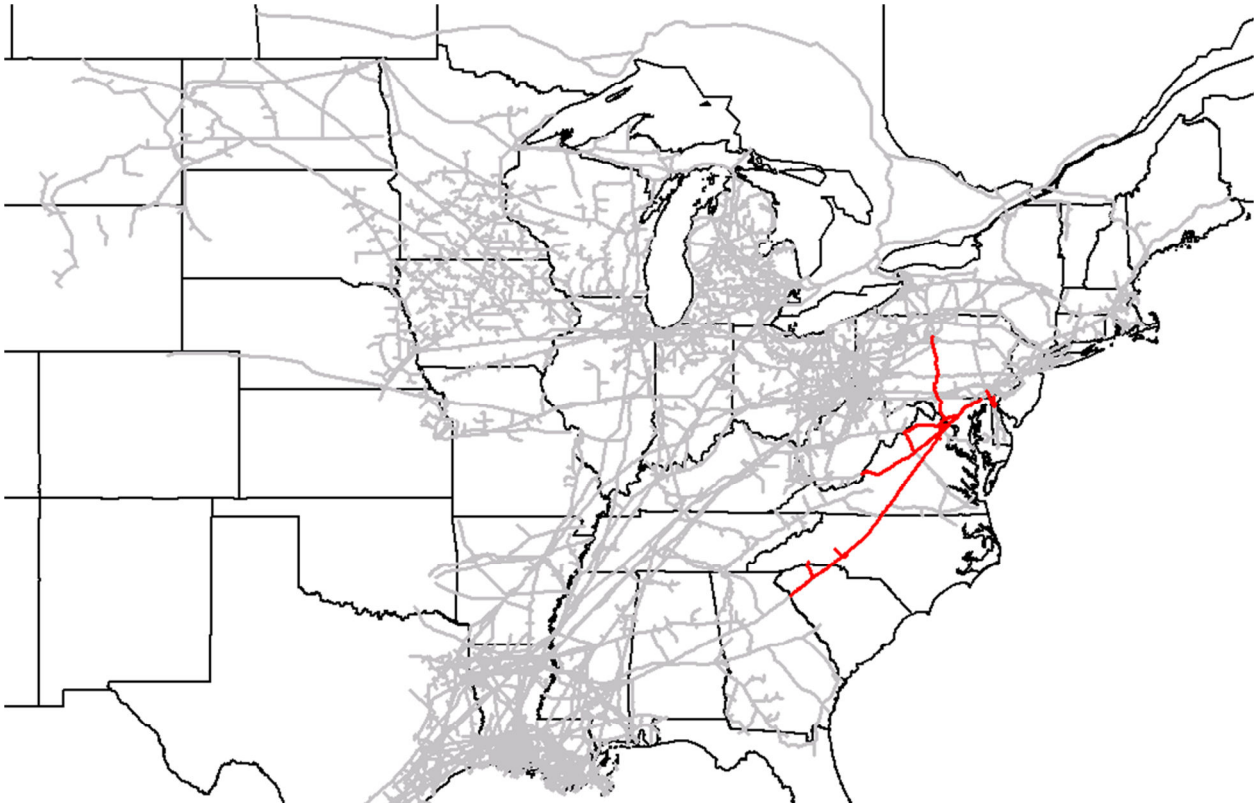


Table Q4 summarizes the results of the frequency and duration analysis.

Table Q4. RGDS S30 Summer 2018: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
Columbia Gas VA/MD	3	1	1	3
Dominion Southeast	3	1	1	3
Eastern Shore	8	1	16	47
Transco Z5	6	1	7	18

1.2.1 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment, which is modeled with a capacity of 2,477 MDth/d, potentially affects generators directly connected to Columbia in Maryland and Virginia, generators behind LDCs served by Columbia Gas in Maryland and Virginia, and generators served by Dominion Cove Point and PPL Interstate downstream of interconnections with Columbia Gas. The locations of these generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R41 and Figure R42 relative to the capacity of the segment.

1.2.2 Dominion Southeast

Dominion Southeast is modeled with a capacity of 540 MDth/d. The 100% peak hour utilization on Dominion's Southeast segment serving Virginia and Maryland potentially affects generators directly served by Dominion, generators behind LDCs served by Dominion, and generators served by Dominion Cove Point via interconnect. The locations of these generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R43 and Figure R44 relative to the capacity of the segment.

1.2.3 Eastern Shore

Eastern Shore is modeled with a capacity of 203 MDth/d. The 100% peak hour utilization rate on Eastern Shore's Receipt Zone 1 and Delivery Zone 2 potentially affects generators on the Delmarva Peninsula that are served by Eastern Shore. The locations of these generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R45 and Figure R46 relative to the capacity of the segments.

1.2.4 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 3,967 MDth/d. The 100% peak hour utilization on Transco's Zone 5 segment potentially affects Study Region generators directly connected to Transco in Virginia and generators behind LDCs served by Transco in North Carolina and Virginia. The locations of these generators are shown in Figure 98 of the report. Non-Study Region generators in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R47 and Figure R48 relative to the capacity of the segment.

1.3 HGDS S30 WINTER 2018

Figure Q7 summarizes the affected generation during the Winter 2018 peak hour by PPA.

Figure Q7. HGDS S30 Winter 2018: Peak Hour Affected Generation

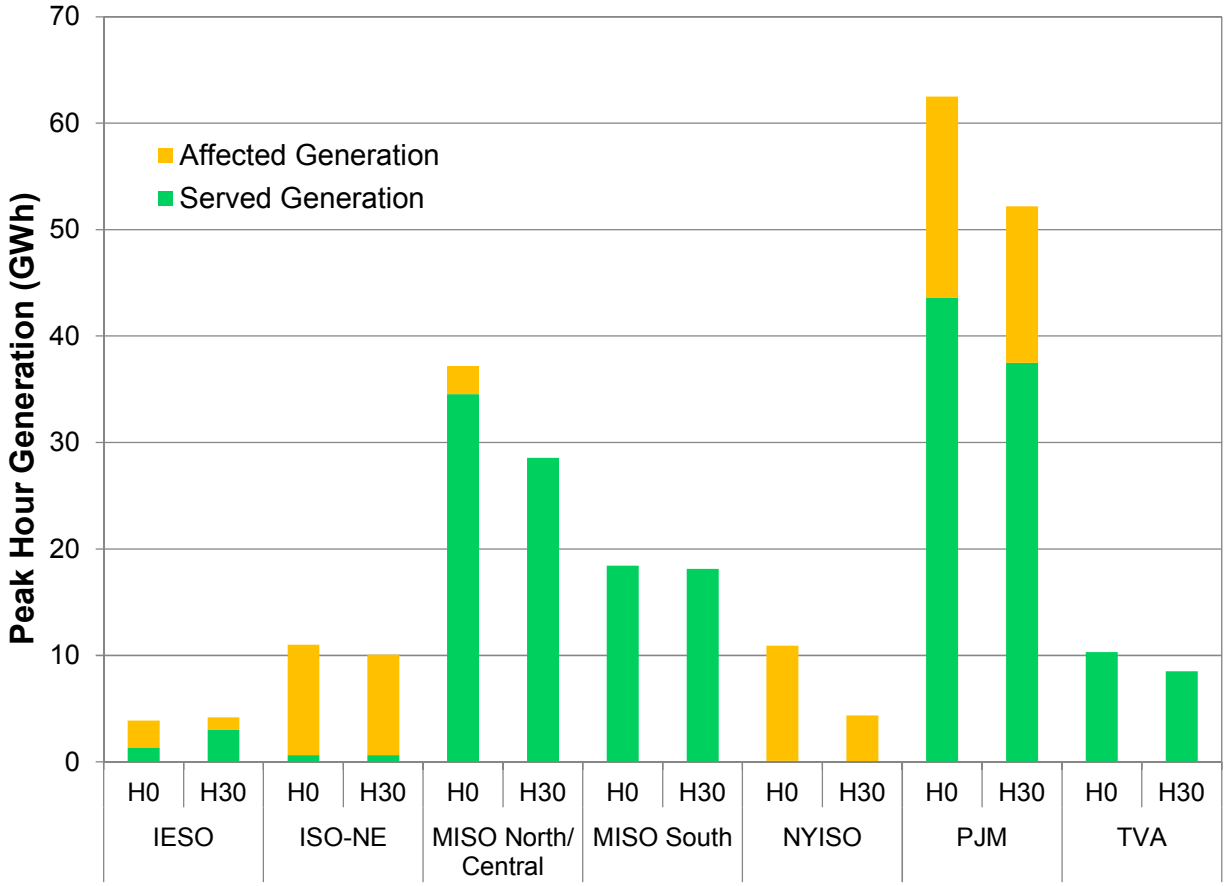


Figure Q8 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q5.

Figure Q8. HGDS S30 Winter 2018: Locations with Peak Hour Affected Generation

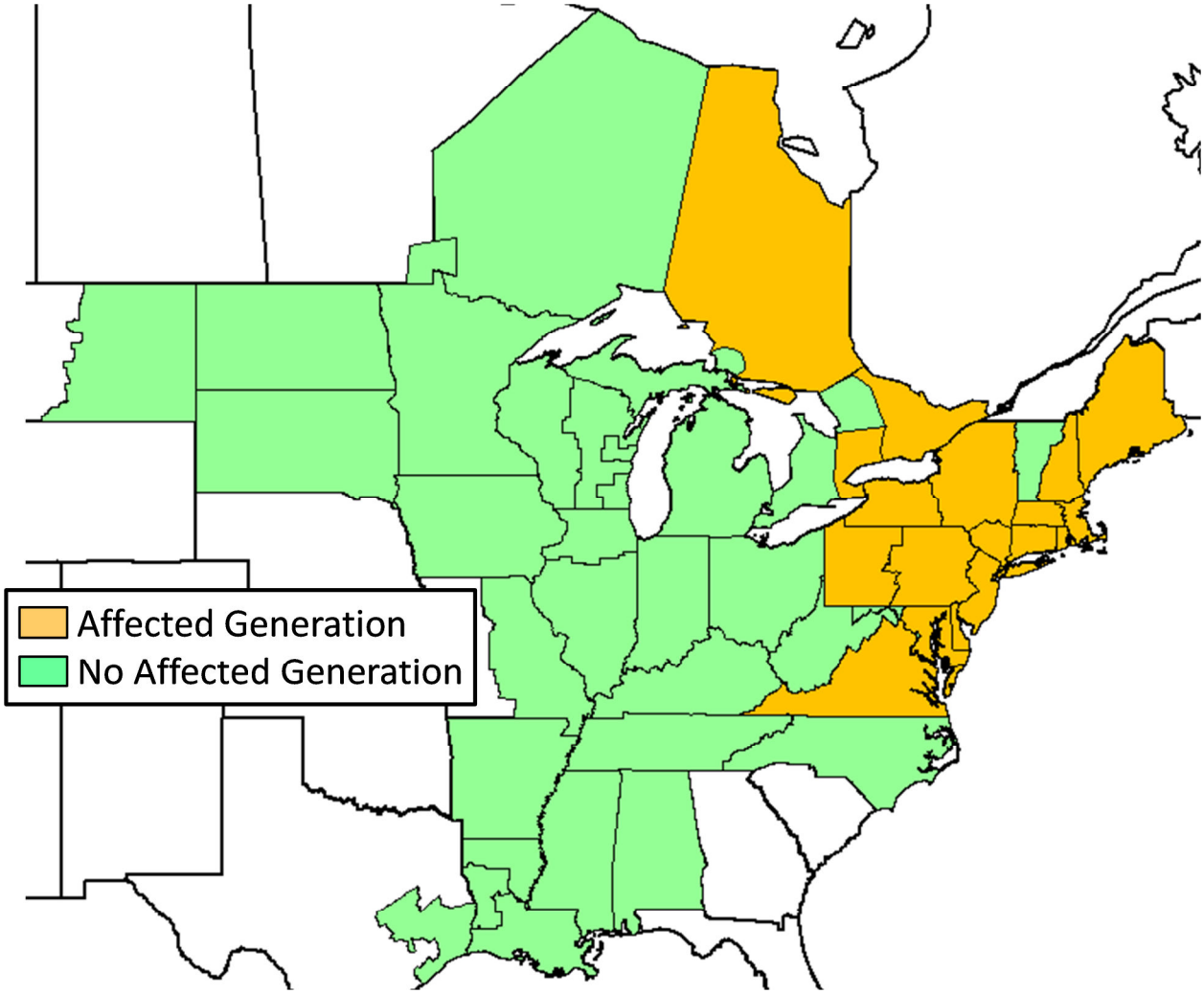


Table Q5. HGDS S30 Winter 2018: Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Connecticut	16.8	2,342
Delaware	1.7	207
Maine	9.5	1,292
Maryland Eastern	12.4	1,213
Massachusetts Eastern	16.4	2,284
Massachusetts Western	5.1	698
New Hampshire	9.0	1,237
New Jersey	14.3	1,684
New York Central Northern	11.2	1,444
New York City	8.7	998
New York Long Island	4.0	430
New York Southern	5.4	767
New York Western	5.4	721
Ontario (CDA)	1.6	181
Ontario (EDA)	5.7	769
Ontario (NDA)	1.5	186
Pennsylvania Eastern	57.1	7,759
Pennsylvania Western	11.0	1,574
Rhode Island	12.4	1,569
Virginia	17.2	2,213

Figure Q9 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q7 during the Winter 2018 peak hour.

Figure Q9. HGDS S30 Winter 2018: Peak Hour Constraints

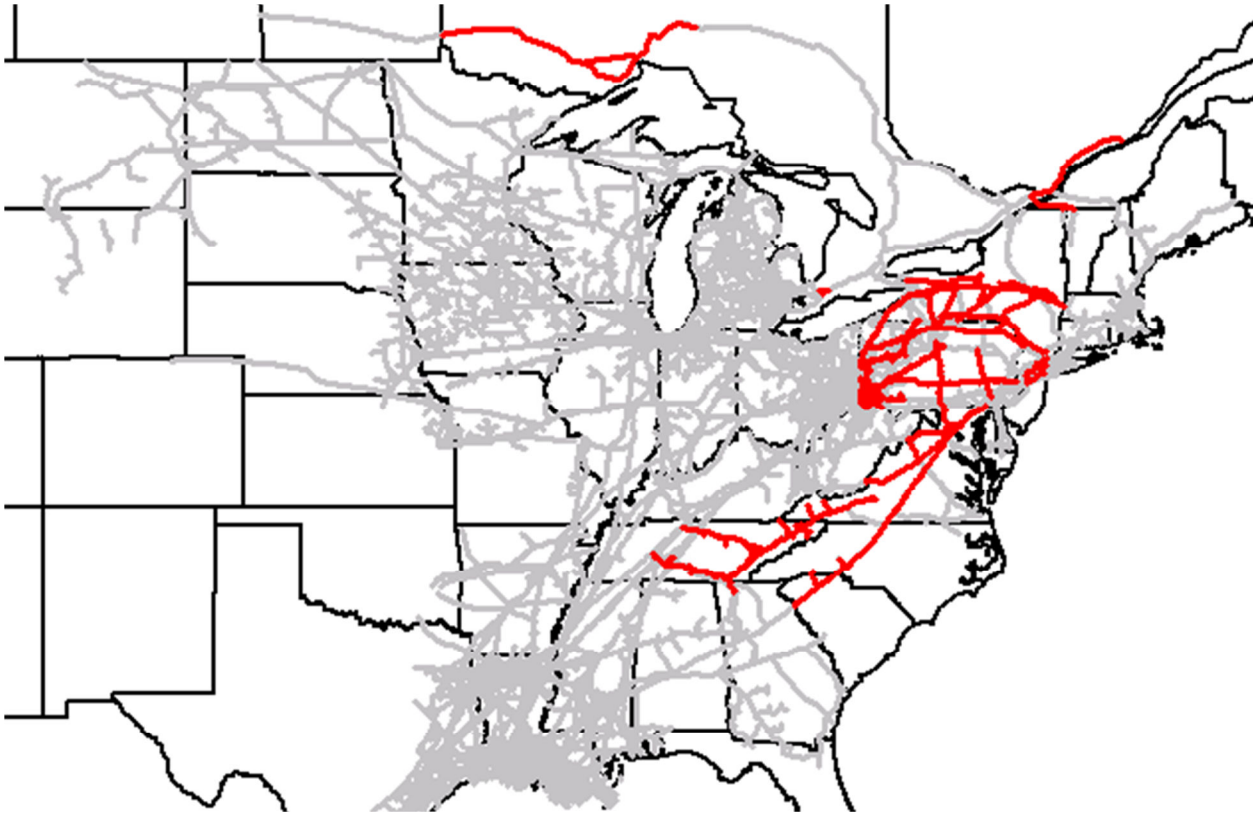


Table Q6 summarizes the results of the frequency and duration analysis.

Table Q6. HGDS S30 Winter 2018: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
Columbia Gas VA/MD	11	1	5	18
Columbia Gas W PA/NY	3	1	2	4
Constitution	3	3	29	89
Dominion Eastern NY	1	4	4	4
Dominion Western NY	5	1	14	29
Dominion Southeast	6	1	14	30
East Tennessee Mainline	6	1	8	26
Eastern Shore	8	2	31	73
Empire Mainline	1	3	3	3
Millennium	7	1	38	70
NB/NS Supply	14	1	20	51
Tennessee Z4 PA	6	2	47	73
Tennessee Z5 NY	9	1	41	71
Texas Eastern M2 PA South	2	31	59	90
Texas Eastern M3 North	4	3	48	88
TransCanada Ontario West	5	1	5	10
TransCanada Quebec	6	3	23	39
Transco Leidy Atlantic	5	1	48	86
Transco Z5	2	1	1	2
Transco Z6 Leidy to 210	3	1	59	86
Union Gas Dawn	4	1	3	6

1.3.1 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment, which is modeled with a capacity of 2,679 MDth/d, an increase of 202 MDth/d over the 2018 capacity. The locations of the potentially affected generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R49 and Figure R50 relative to the capacity of the segment.

1.3.2 Columbia Gas Western Pennsylvania / New York

The 100% peak hour utilization on Columbia Gas's Western Pennsylvania / New York segment, which is modeled with a capacity of 1,131 MDth/d, potentially affects generators directly connected to Columbia in Pennsylvania, New Jersey, Virginia and Maryland, and generators behind LDCs served by Columbia Gas in Pennsylvania, New Jersey, Delaware, Maryland and Virginia. The locations of these generators are shown in Figure 81 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R51 and Figure R52 relative to the capacity of the segment

1.3.3 Constitution Pipeline

Constitution's proposed delivery capacity is 650 MDth/d. The 100% peak hour utilization on Constitution potentially affects generators served by Iroquois both directly and behind LDCs in New York and Connecticut. The locations of these generators are shown in Figure 82 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R53 and Figure R54 relative to the capacity of the segment.

1.3.4 Dominion Eastern New York

Dominion's Eastern New York segment is modeled with a capacity of 907 MDth/d. The 100% peak hour utilization on Dominion's Eastern New York segment potentially affects generators directly connected to Dominion and behind LDCs served by Dominion. The locations of these generators are shown in Figure 83 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R55 and Figure R56 relative to the capacity of the segment.

1.3.5 Dominion Western New York

Dominion Western New York is modeled with a capacity of 557 MDth/d. The 100% utilization on Dominion's Western New York segment potentially affects generators directly served by Dominion and behind LDCs served by Dominion. The locations of the plants in each category are shown in Figure 84 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R57 and Figure R58 relative to the capacity of the segment.

1.3.6 Dominion Southeast

Dominion Southeast is modeled with a capacity of 555 MDth/d, an increase of 15 MDth/d over 2018. The 100% peak hour utilization on Dominion's Southeast segment serving Virginia and Maryland potentially affects generators directly served by Dominion, generators behind LDCs served by Dominion, and generators served by Dominion Cove Point via interconnect. The locations of these generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R59 and Figure R60 relative to the capacity of the segment.

1.3.7 East Tennessee Mainline

The East Tennessee mainline is modeled with a capacity of 800 MDth/d. The 100% peak hour utilization on East Tennessee's mainline potentially affects generators directly connected to East Tennessee and generators behind LDCs served by East Tennessee. The locations of these generators are shown in Figure 86 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R61 and Figure R62 relative to the capacity of the segment.

1.3.8 Eastern Shore

Eastern Shore is modeled with a capacity of 203 MDth/d. The 100% peak hour utilization rate on Eastern Shore's Receipt Zone 1 and Delivery Zone 2 potentially affects generators on the Delmarva Peninsula that are served by Eastern Shore. The locations of these generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R63 and Figure R64 relative to the capacity of the segments.

1.3.9 Empire Mainline

The Empire mainline is modeled with a capacity of 525 MDth/d. The 100% peak hour utilization on the Empire mainline across upstate New York potentially affects generators on the Niagara Mohawk LDC system. The locations of these generators are shown in Figure 88 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R65 and Figure R66 relative to the capacity of the segment.

1.3.10 Millennium

Millennium is modeled with a capacity of 784 MDth/d. The 100% peak hour utilization on Millennium's mainline potentially affects generators directly connected to Millennium, generators behind LDCs served by Millennium, and generators served by Algonquin, particularly in southern New England. The locations of these generators are shown in Figure 89 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R67 and Figure R68 relative to the capacity of the segment.

1.3.11 New Brunswick Supply / Nova Scotia Offshore Supply

Production from Atlantic Canada is capped at approximately 40 MDth/d in New Brunswick and approximately 243 MDth/d for Nova Scotia Offshore. This supply limitation potentially affects generators directly connected to M&N in Maine and New Hampshire as well as generators located behind LDCs served by M&N in Maine. The locations of these generators are shown in Figure 90 of the report. Generators located in the Canadian Maritimes could also be affected by this supply constraint, but have not been included in the summary results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the supply limitation are shown in Figure R69 and Figure R70 relative to the total production capacity. The generator gas demand in these figures only reflects generators located in the Study Region.

1.3.12 Tennessee Zone 4 Pennsylvania

Tennessee Zone 4 Pennsylvania is modeled with a capacity of 1,887 MDth/d. The 100% peak hour utilization on Tennessee's Zone 4 segment in Pennsylvania potentially affects generators directly connected to Tennessee in Pennsylvania and New Jersey; generators behind LDCs served by Tennessee in Pennsylvania, New Jersey, downstate New York and Connecticut; and generators served by Algonquin either directly or via LDC in New England. The locations of these generators are shown in Figure 91 of the report.

The peak hour demand forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R71 and Figure R72 relative to the capacity of the segment.

1.3.13 Tennessee Zone 5 New York

Tennessee Zone 5 New York is modeled with a capacity of 1,189 MDth/d. The 100% peak hour utilization on Tennessee's Z5 New York segment potentially affects generators directly connected to Tennessee in upstate New York, Massachusetts, Rhode Island and New Hampshire; generators behind LDCs served by Tennessee in upstate New York, Massachusetts, Connecticut and Rhode Island; and generators served by Iroquois, Granite State and PNGTS either directly or behind an LDC. The locations of these generators are shown in Figure 92 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R73 and Figure R74 relative to the capacity of the segment.

1.3.14 Texas Eastern M2 PA – Southern Branch

The Texas Eastern M2 PA – Southern Branch is modeled with a capacity of 2,068 MDth/d. The 100% peak hour utilization on the southern branch of Texas Eastern's Zone M2 segment through Pennsylvania potentially affects generators directly connected to Texas Eastern in Pennsylvania, generators behind LDCs in Pennsylvania, Delaware and downstate New York. Generators that are served by Algonquin and Eastern Shore either directly or behind an LDC would also potentially be affected. The locations of these generators are shown in Figure 93 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R75 and Figure R76 relative to the capacity of the segment.

1.3.15 Texas Eastern M3 – Northern Line

The Texas Eastern M3 Northern Line is modeled with a capacity of 2,987 MDth/d. The 100% peak hour utilization on the Northern line through Pennsylvania potentially affects generators directly connected to Texas Eastern in New Jersey and Pennsylvania, generators behind LDCs served by Texas Eastern in New Jersey, Pennsylvania and downstate New York, as well as generators served by Algonquin both directly and behind LDCs. The locations of these generators are shown in Figure 94 of the report.

The seasonal daily forecasts of RCI and generator peak hour gas demand downstream of the constrained segment are shown in Figure R77 and Figure R78 relative to the capacity of the segment.

1.3.16 TransCanada Ontario West

TransCanada's Western Ontario segment is modeled with a capacity of 3,148 MDth/d. The 100% peak hour utilization on TransCanada's Western Ontario segment potentially affects generators directly connected to TransCanada and generators behind the Enbridge and Union local distribution systems. The locations of these generators are shown in Figure 95 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R79 and Figure R80 relative to the capacity of the segment.

1.3.17 TransCanada Quebec

TransCanada Quebec is modeled with a capacity of 1,320 MDth/d. The 100% peak hour utilization on TransCanada's Quebec segment potentially affects generators served by PNGTS, North Country and Vermont Gas. The locations of these generators are shown in Figure 96 of the report. Limitations for customers in Quebec could arise from this constraint, but such limitations have not been included in the results reported below.

The seasonal daily forecasts of RCI and generator peak hour demand downstream of the constrained segment are shown in Figure R81 and Figure R82 relative to the capacity of the segment. The generator gas demand in these figures includes only gas demand at generators in the Study Region. Gas demand from non-Study Region generators is not included in the tabulation of results.

1.3.18 Transco Leidy Atlantic

The Transco Leidy Atlantic segment is modeled with a capacity of 1,700 MDth/d. The 100% peak hour utilization on Transco's Leidy Atlantic segment potentially affects generators directly connected to Transco in New Jersey, Maryland, Pennsylvania and Virginia and generators behind LDCs served by Transco in Delaware, New Jersey, Pennsylvania, Maryland, Virginia and North Carolina. The locations of these generators are shown in Figure 97 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R83 and Figure R84 relative to the capacity of the segment.

1.3.19 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 3,967 MDth/d. The 100% peak hour utilization on Transco's Zone 5 segment potentially affects Study Region generators directly connected to Transco in Virginia and generators behind LDCs served by Transco in North Carolina and Virginia. The locations of these generators are shown in Figure 98 of the report. Non-Study Region generators in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R85 and Figure R86 relative to the capacity of the segment.

1.3.20 Transco Zone 6 Leidy Line to Station 210

The Transco Zone 6 Leidy to Station 210 segment is modeled with a capacity of 3,310 MDth/d. The 100% peak hour utilization on this segment potentially affects generators directly connected to Transco in New Jersey and Pennsylvania and generators behind LDCs served by Transco in New Jersey, Pennsylvania, New York City and Long Island. The locations of generators served along this Transco segment are shown in Figure 99 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R87 and Figure R88 relative to the capacity of the segment.

1.3.21 Union Gas Dawn

The 100% peak hour utilization on Union Gas's Dawn segment, which is modeled with a capacity of 5,000 MDth/d, potentially affects generators directly connected to Union, generators directly connected to TransCanada, and generators served by the Union Gas and Enbridge distribution systems. The locations of these generators are shown in Figure 100 of the report.

The seasonal daily forecasts of RCI and generator peak hour gas demand downstream of the constrained segment are shown in Figure R89 and Figure R90 relative to the capacity of the segment.

1.4 HGDS S30 SUMMER 2018

Figure Q10 summarizes the affected generation during the Winter 2018 peak hour by PPA.

Figure Q10. HGDS S30 Summer 2018: Peak Hour Affected Generation

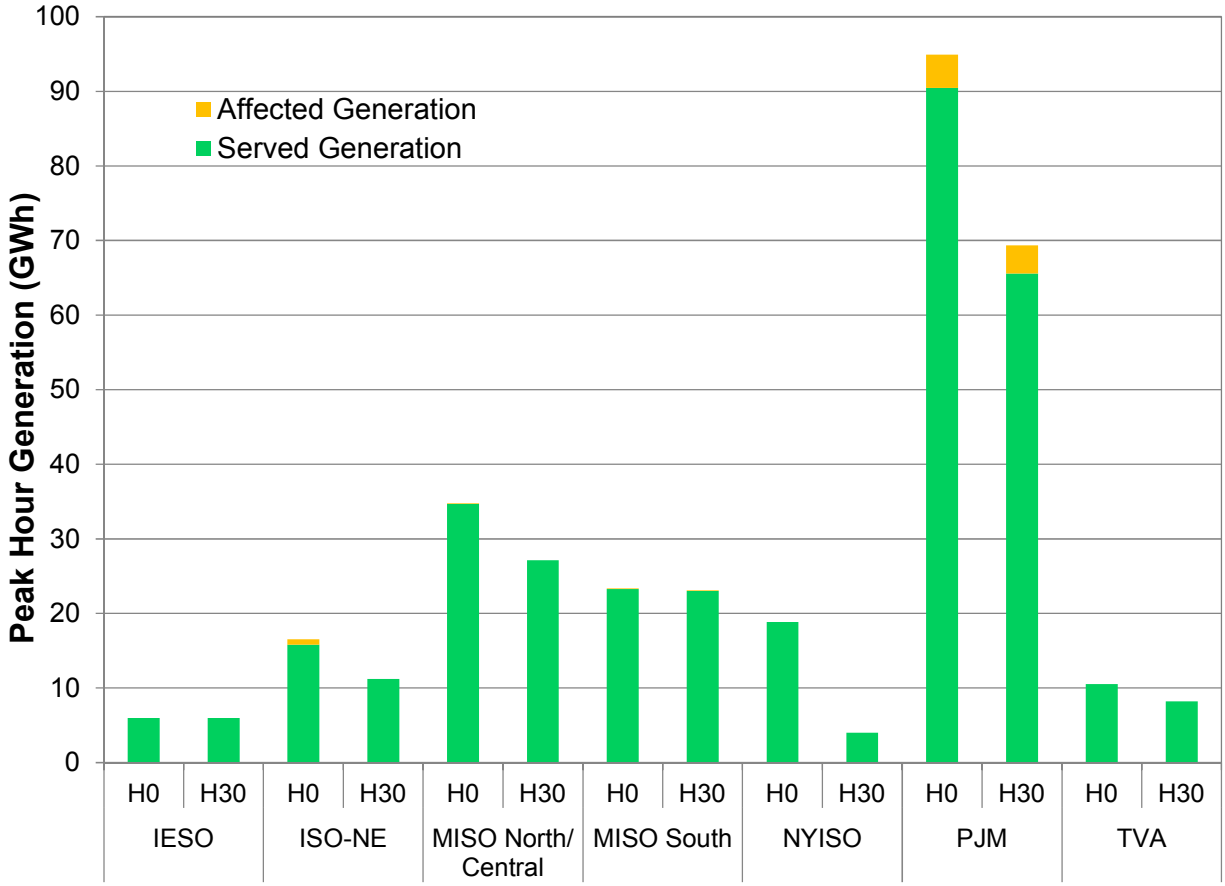


Figure Q11 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q7.

Figure Q11. HGDS S30 Summer 2018: Locations with Peak Hour Affected Generation

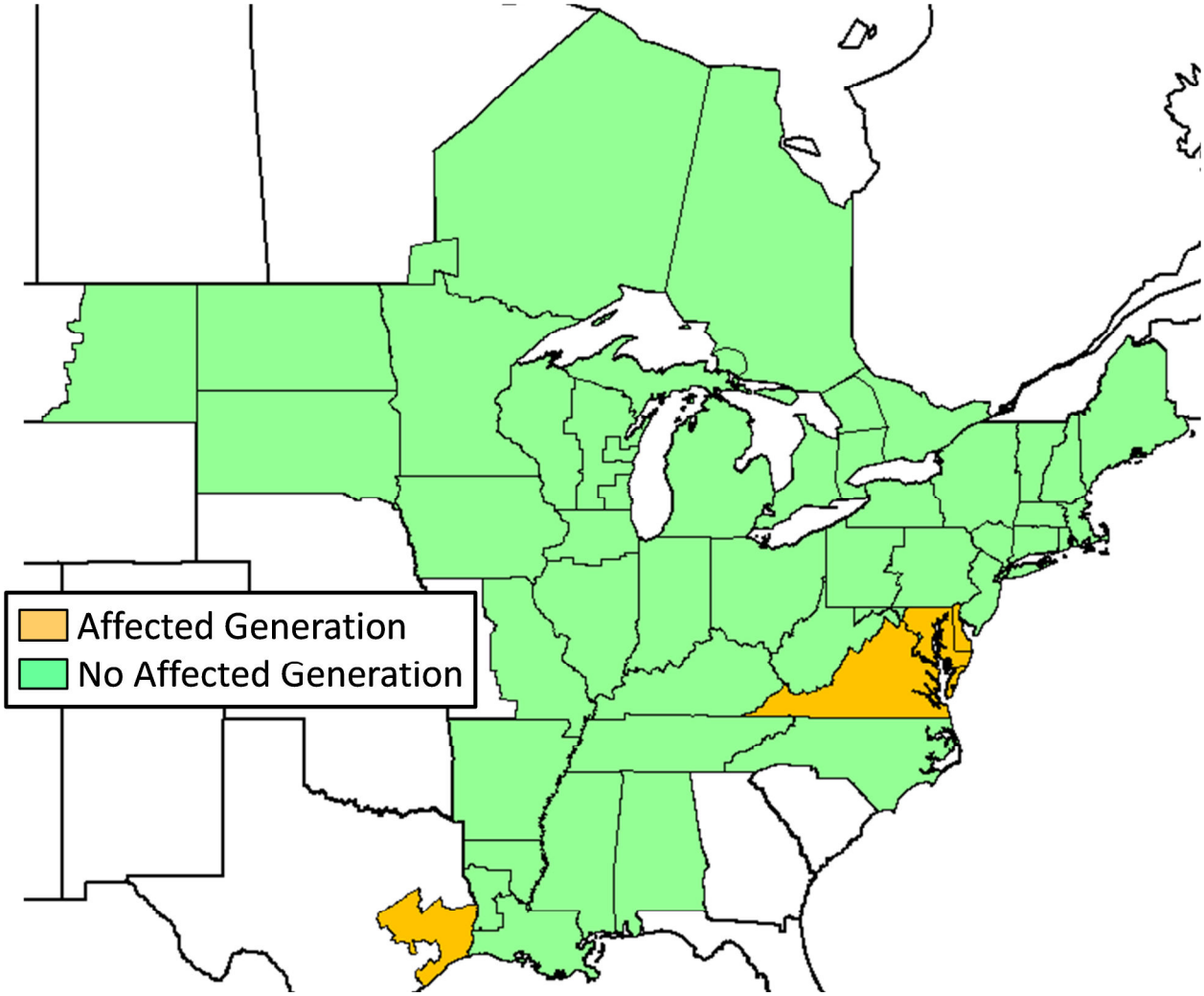


Table Q7. HGDS S30 Summer 2018: Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Delaware	8.4	1,155
Maryland Eastern	16.3	2,326
Texas East (SERC)	0.5	70
Virginia	2.7	297

Figure Q12 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q10 during the Summer 2018 peak hour.

Figure Q12. HGDS S30 Summer 2018: Peak Hour Constraints

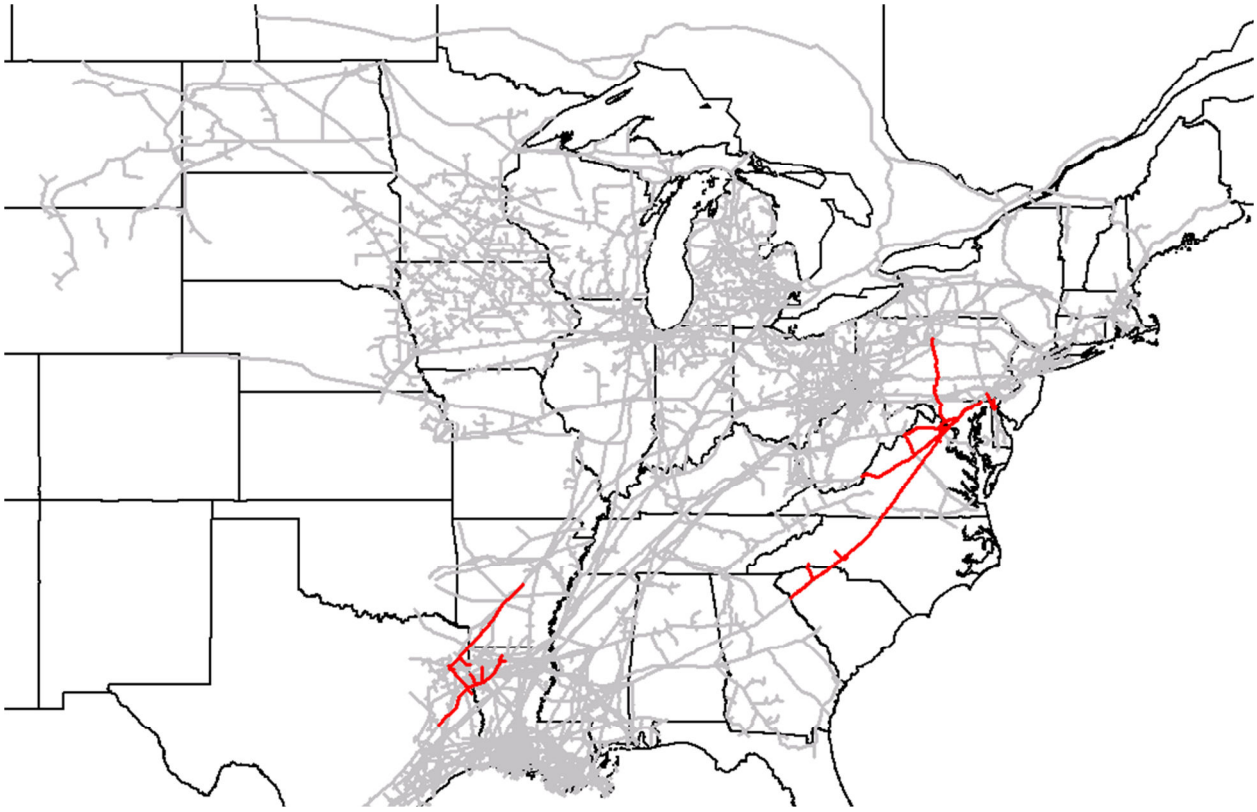


Table Q8 summarizes the results of the frequency and duration analysis.

Table Q8. HGDS S30 Summer 2018: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
Columbia Gas VA/MD	14	1	6	28
Dominion Southeast	12	1	18	50
Eastern Shore	6	3	24	70
Texas Eastern ETX	9	1	10	35
Transco Z5	9	1	32	75

1.4.1 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment is modeled with a capacity of 2,679 MDth/d, an increase of 202 MDth/d for 2023 as compared with 2018. The locations of the potentially affected generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R91 and Figure R92 relative to the capacity of the segment.

1.4.2 Dominion Southeast

Dominion Southeast is modeled with a capacity of 555 MDth/d, an increase over the capacity modeled for the summer 2018 of 15 MDth/d. The locations of the potentially affected generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R93 and Figure R94 relative to the capacity of the segment.

1.4.3 Eastern Shore

Eastern Shore is modeled with a capacity of 203 MDth/d, the same as the capacity modeled for the summer of 2018. The locations of the potentially affected generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R95 and Figure R96 relative to the capacity of the segments.

1.4.4 Texas Eastern Zone ETX

The 100% peak hour utilization on Texas Eastern's East Texas segment is modeled with a capacity of 623 MDth/d, the same capacity as modeled for 2018. The locations of the potentially affected generators are shown in Figure 104 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R97 and Figure R98 relative to the capacity of the segment.

1.4.5 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 3,967 MDth/d, the same capacity as modeled for 2018. The locations of the potentially affected generators are shown in Figure 98 of the report. Generators located in outside the Study Region in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R99 and Figure R100 relative to the capacity of the segment.

2 S34: MAXIMUM GAS DEMAND ON ELECTRIC SECTOR

2.1 RGDS S34 WINTER 2018

Figure Q13 summarizes the affected generation during the Winter 2018 peak hour by PPA.

Figure Q13. RGDS S34 Winter 2018: Peak Hour Affected Generation

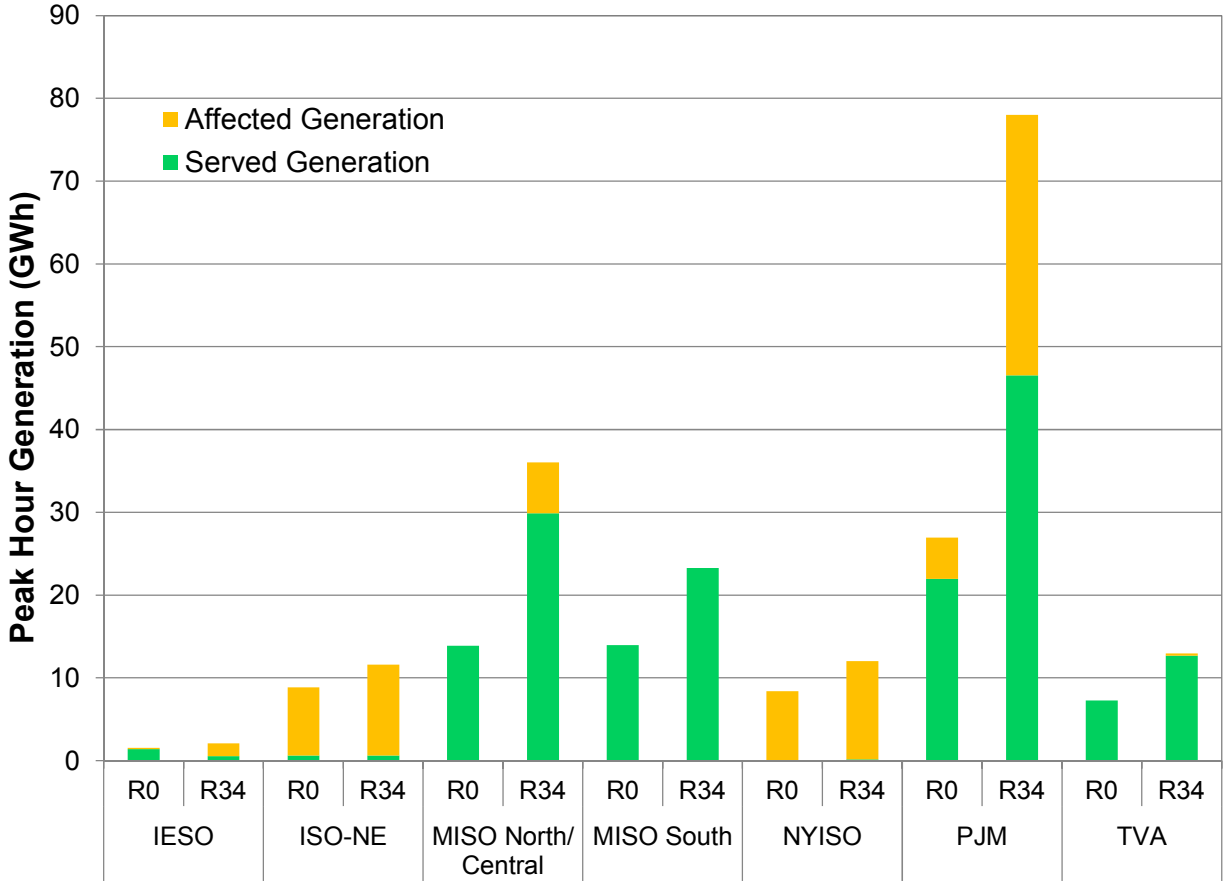


Figure Q14 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q9.

Figure Q14. RGDS S34 Winter 2018: Locations with Peak Hour Affected Generation

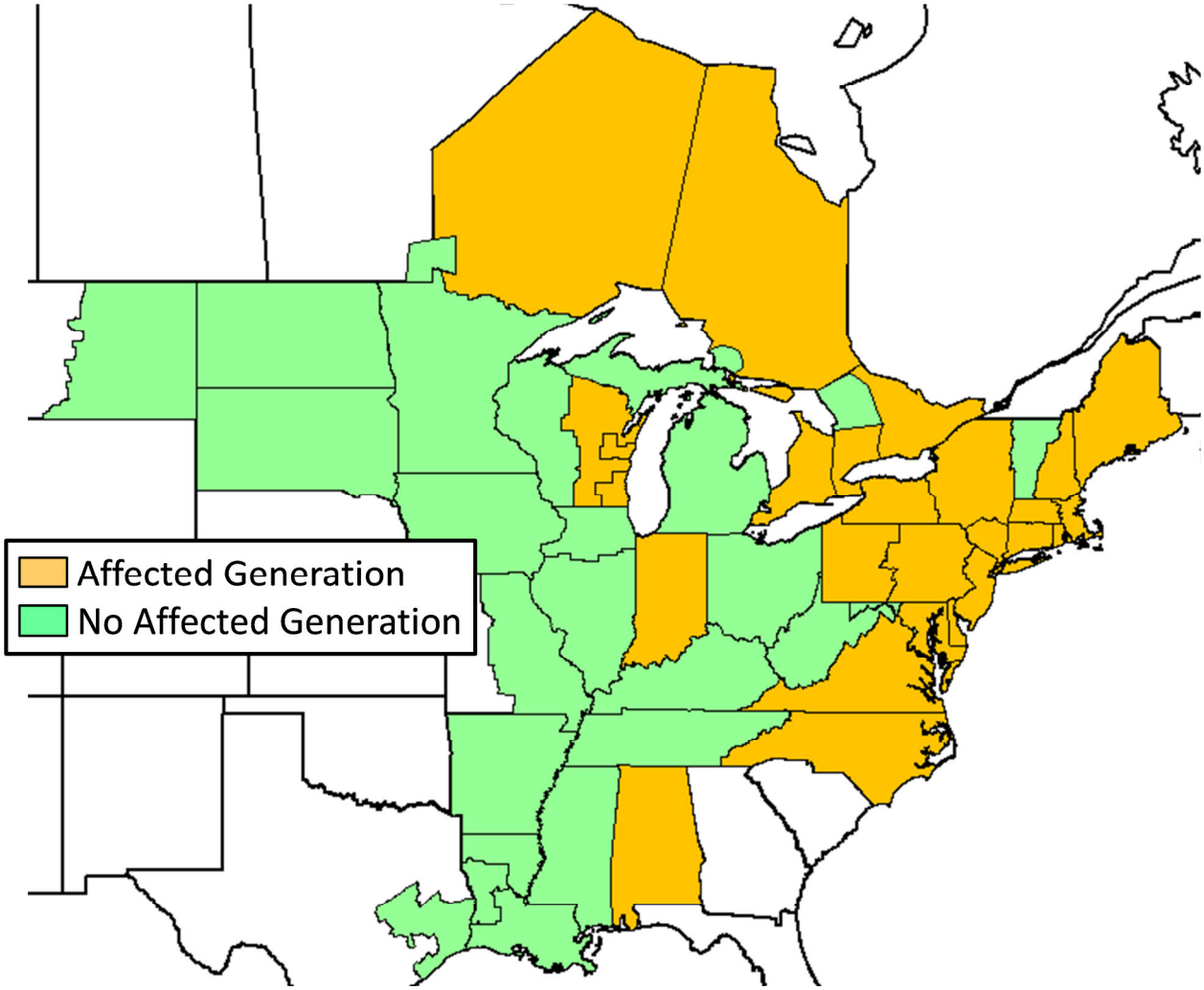


Table Q9. RGDS S34 Winter 2018: Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Alabama	3.2	238
Connecticut	25.4	3,173
Delaware	2.3	279
Indiana	1.3	131
Maine	7.5	969
Maryland Eastern	27.0	2,903
Massachusetts Eastern	17.4	2,135
Massachusetts Western	9.3	1,183
New Hampshire	13.3	1,621
New Jersey	74.3	9,474
New York Central Northern	48.2	5,813
New York City	25.3	2,622
New York Long Island	17.6	1,732
New York Southern	10.9	1,312
New York Western	3.6	400
North Carolina	1.2	169
Ontario (CDA)	1.6	181
Ontario (EDA)	1.6	175
Ontario (NDA)	1.5	186
Ontario (StClair)	7.0	950
Ontario (WDA)	0.4	38
Pennsylvania Eastern	64.1	8,272
Pennsylvania Western	11.0	1,574
Rhode Island	14.8	1,889
Virginia	71.8	8,772
Wisconsin Eastern (RFC)	21.6	2,671
Wisconsin Western (MROE)	31.4	3,317

Figure Q15 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q13 during the Winter 2018 peak hour.

Figure Q15. RGDS S34 Winter 2018: Peak Hour Constraints

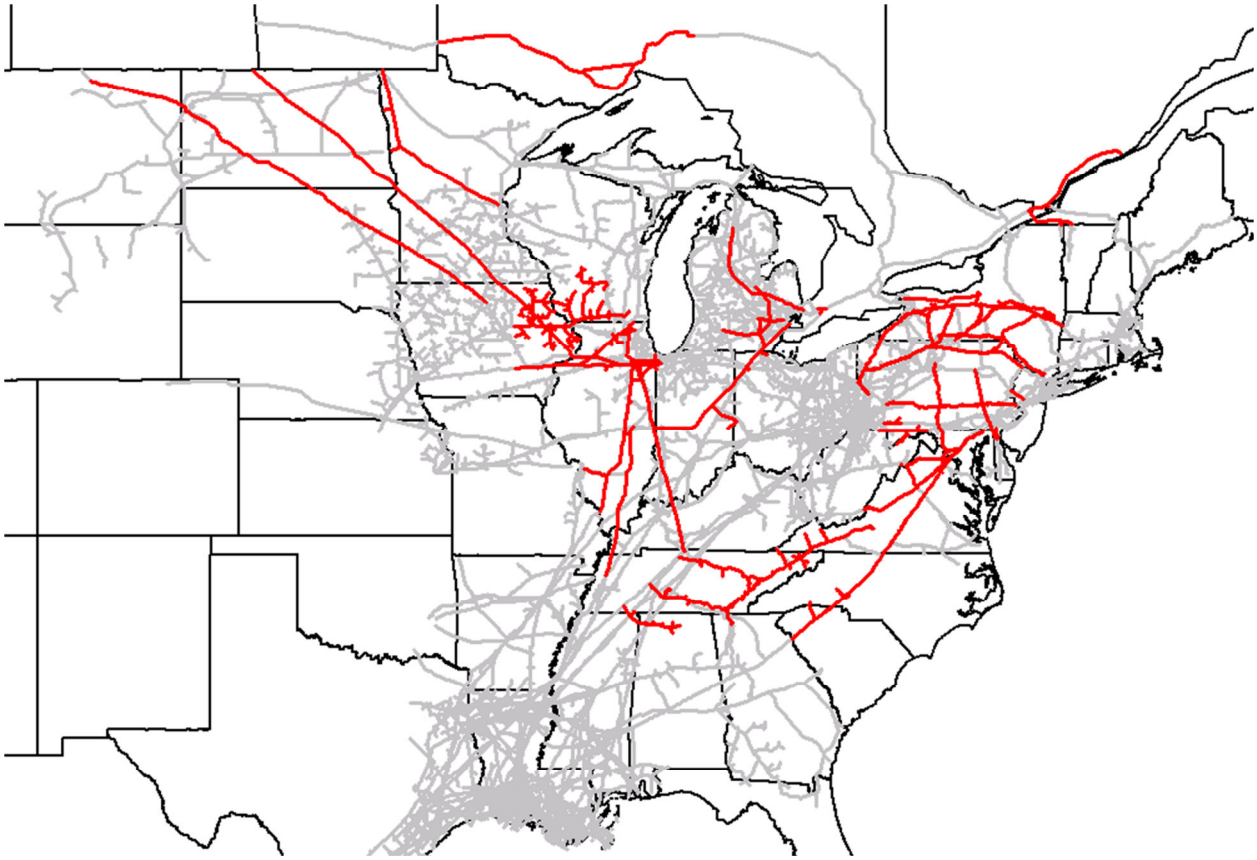


Table Q10 summarizes the results of the frequency and duration analysis.

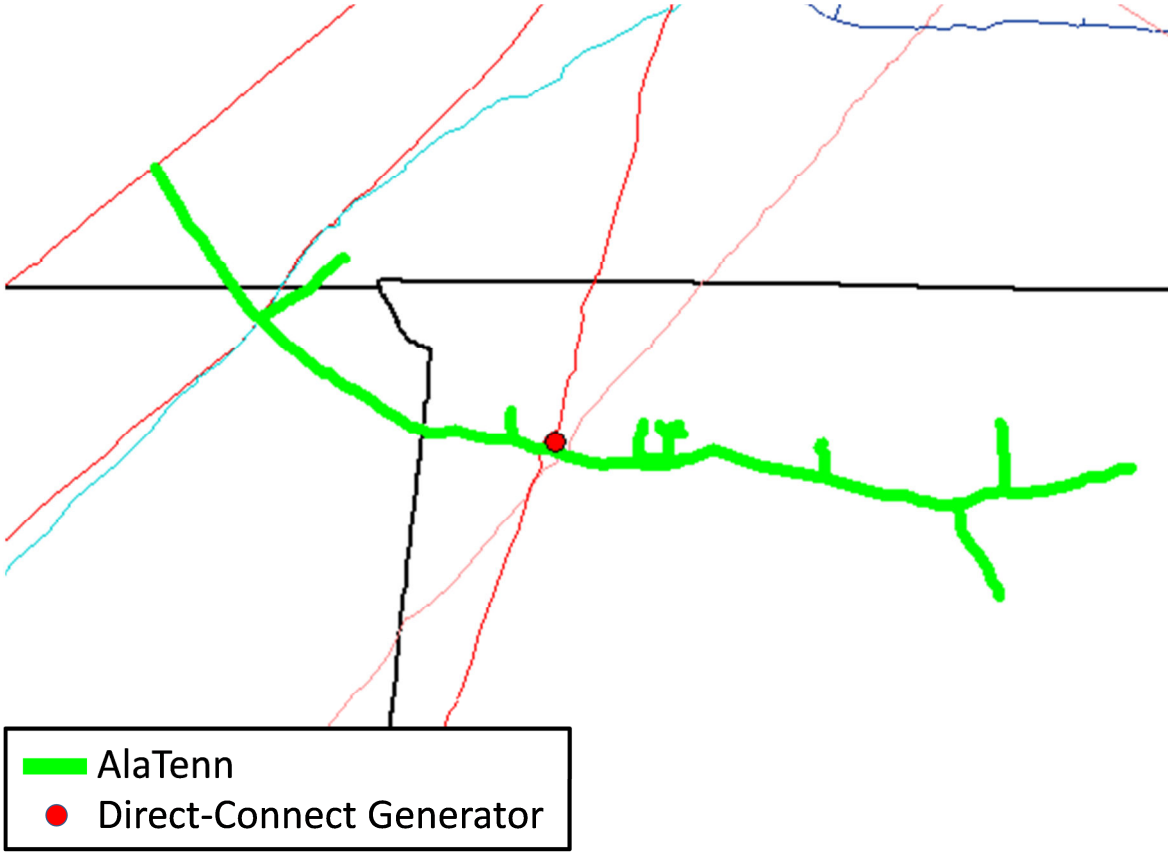
Table Q10. RGDS S34 Winter 2018: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
AlaTenn	5	2	52	86
Alliance	9	1	8	22
ANR Northern Illinois	2	29	59	88
Columbia Gas VA/MD	9	1	21	73
Columbia Gas W PA/NY	3	1	59	89
Constitution	2	31	59	90
Dominion Eastern NY	6	3	16	69
Dominion Western NY	1	4	4	4
Dominion Southeast	5	1	45	72
East Tennessee Mainline	7	1	5	21
Eastern Shore	4	5	44	87
Empire Mainline	4	1	59	71
Great Lakes East	10	1	12	44
Midwestern	5	1	3	8
Millennium	7	1	38	69
NB/NS Supply	2	31	59	90
NGPL IA/IL North	1	2	2	2
NGPL IA/IL South	3	1	8	10
Northern Border Mainline	6	2	10	29
Northern Natural D	8	1	13	27
Panhandle Eastern Z3	7	1	4	13
Tennessee Z4 PA	8	3	22	68
Tennessee Z5 NY	2	31	59	90
Texas Eastern M2 PA South	2	31	59	90
Texas Eastern M3 North	3	3	59	89
TransCanada Ontario West	4	1	9	18
TransCanada Quebec	11	1	18	59
Transco Leidy Atlantic	2	31	59	90
Transco Z5	7	1	22	53
Transco Z6 Leidy to 210	2	31	59	90
Trunkline 1B	7	3	14	41
Union Gas Dawn	2	1	3	4
Vector Z1	3	1	4	7
Viking Z1	13	1	15	41

2.1.1 AlaTenn

The 100% peak hour utilization on AlaTenn's mainline, which is modeled with a capacity of 197 MDth/d, potentially affects generators served by AlaTenn in Alabama. The locations of these generators are shown in Figure Q16.

Figure Q16. Generators Affected by AlaTenn Constraint



The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R101 and Figure R102 relative to the capacity of the segment.

2.1.2 Alliance

The 100% peak hour utilization on Alliance's mainline, which is modeled with a capacity of 1,800 MDth/d, potentially affects generators behind LDCs served by Alliance and generators behind LDCs served by Guardian. The locations of these generators are shown in Figure D1.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R103 and Figure R104 relative to the capacity of the segment.

2.1.3 ANR Northern Illinois

The 100% peak hour utilization on ANR's Northern Illinois segment, which is modeled with a capacity of 1,337 MDth/d, potentially affects generators directly connected to ANR in Illinois and Wisconsin and generators behind LDCs served by ANR in Illinois and Wisconsin. The locations of these generators are shown in Figure D2.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R105 and Figure R106 relative to the capacity of the segment.

2.1.4 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment, which is modeled with a capacity of 2,477 MDth/d, potentially affects generators directly connected to Columbia in Maryland and Virginia; generators behind LDCs served by Columbia Gas in Maryland and Virginia; and generators served by Dominion Cove Point and PPL Interstate downstream of interconnections with Columbia Gas. The locations of these generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R107 and Figure R108 relative to the capacity of the segment.

2.1.5 Columbia Gas Western Pennsylvania / New York

The 100% peak hour utilization on Columbia Gas's Western Pennsylvania / New York segment, which is modeled with a capacity of 1,131 MDth/d, potentially affects generators directly connected to Columbia in Pennsylvania, New Jersey, Virginia and Maryland, and generators behind LDCs served by Columbia Gas in Pennsylvania, New Jersey, Delaware, Maryland and Virginia. The locations of these generators are shown in Figure 81 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R109 and Figure R110 relative to the capacity of the segment

2.1.6 Constitution Pipeline

Constitution's proposed delivery capacity is 650 MDth/d. The 100% peak hour utilization on Constitution potentially affects generators served by Iroquois both directly and behind LDCs in New York and Connecticut. The locations of these generators are shown in Figure 82 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R111 and Figure R112 relative to the capacity of the segment.

2.1.7 Dominion Eastern New York

Dominion's Eastern New York segment is modeled with a capacity of 907 MDth/d. The 100% peak hour utilization on Dominion's Eastern New York segment potentially affects generators directly connected to Dominion and behind LDCs served by Dominion. The locations of these generators are shown in Figure 83 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R113 and Figure R114 relative to the capacity of the segment.

2.1.8 Dominion Western New York

Dominion Western New York is modeled with a capacity of 557 MDth/d. The 100% utilization on Dominion's Western New York segment potentially affects generators directly served by

Dominion and behind LDCs served by Dominion. The locations of the plants in each category are shown in Figure 84 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R115 and Figure R116 relative to the capacity of the segment.

2.1.9 Dominion Southeast

Dominion Southeast is modeled with a capacity of 540 MDth/d. The 100% peak hour utilization on Dominion's Southeast segment serving Virginia and Maryland potentially affects generators directly served by Dominion, generators behind LDCs served by Dominion, and generators served by Dominion Cove Point via interconnect. The locations of these generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R117 and Figure R118 relative to the capacity of the segment.

2.1.10 East Tennessee Mainline

The East Tennessee mainline is modeled with a capacity of 800 MDth/d. The 100% peak hour utilization on East Tennessee's mainline potentially affects generators directly connected to East Tennessee and generators behind LDCs served by East Tennessee. The locations of these generators are shown in Figure 86 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R119 and Figure R120 relative to the capacity of the segment.

2.1.11 Eastern Shore

Eastern Shore is modeled with a capacity of 203 MDth/d. The 100% peak hour utilization rate on Eastern Shore's Receipt Zone 1 and Delivery Zone 2 potentially affects generators on the Delmarva Peninsula that are served by Eastern Shore. The locations of these generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R121 and Figure R122 relative to the capacity of the segments.

2.1.12 Empire Mainline

The Empire mainline is modeled with a capacity of 525 MDth/d. The 100% peak hour utilization on the Empire mainline across upstate New York potentially affects generators on the Niagara Mohawk LDC system. The locations of these generators are shown in Figure 88 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R123 and Figure R124 relative to the capacity of the segment.

2.1.13 Great Lakes East

The 100% peak hour utilization on Great Lakes Gas's East segment, which is modeled with a capacity of 1,164 MDth/d, potentially affects generators directly connected to Great Lakes in Michigan, generators behind LDCs served by Great Lakes in Michigan, generators directly connected to Vector, and generators behind Union Gas. The locations of these generators are shown in Figure D3.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R125 and Figure R126 relative to the capacity of the segment.

2.1.14 Midwestern

The 100% peak hour utilization on Midwestern's mainline segment, which is modeled with a capacity of 635 MDth/d, potentially affects generators that are directly connected to Midwestern in Indiana and Indiana, generators behind LDCs served by Midwestern in Indiana and Illinois, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D4.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R127 and Figure R128 relative to the capacity of the segment.

2.1.15 Millennium

Millennium is modeled with a capacity of 784 MDth/d. The 100% peak hour utilization on Millennium's mainline potentially affects generators directly connected to Millennium, generators behind LDCs served by Millennium, and generators served by Algonquin, particularly in southern New England. The locations of these generators are shown in Figure 89 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R129 and Figure R130 relative to the capacity of the segment.

2.1.16 New Brunswick Supply / Nova Scotia Offshore Supply

Production from Atlantic Canada is capped at approximately 24 MDth/d in New Brunswick and approximately 599 MDth/d for Nova Scotia Offshore. This supply limitation potentially affects generators directly connected to M&N in Maine and New Hampshire as well as generators located behind LDCs served by M&N in Maine. The locations of these generators are shown in Figure 90 of the report. Generators located in the Canadian Maritimes could also be affected by this supply constraint, but have not been included in the summary results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the supply limitation are shown in Figure R131 and Figure R132 relative to the total production capacity. The generator gas demand in these figures only reflects generators located in the Study Region.

2.1.17 NGPL Iowa/Illinois North

The 100% peak hour utilization on NGPL's Iowa/Illinois North segment, which is modeled with a capacity of 1,677 MDth/d, potentially affects generators directly connected to NGPL in Illinois, generators behind LDCs served by NGPL in Iowa, Illinois and Indiana, generators directly connected to Horizon in Illinois, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D5.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R133 and Figure R134 relative to the capacity of the segment.

2.1.18 NGPL Iowa/Illinois South

The 100% peak hour utilization on NGPL's Iowa/Illinois South segment, which is modeled with a capacity of 1,624 MDth/d, potentially affects generators directly connected to NGPL in Illinois, generators behind LDCs served by NGPL in Illinois and Indiana, generators directly connected to Horizon in Illinois, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D6.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R135 and Figure R136 relative to the capacity of the segment.

2.1.19 Northern Border Mainline

The 100% peak hour utilization on Northern Border's mainline, which is modeled with a capacity of 2,311 MDth/d, potentially affects generators directly connected to Northern Border in Minnesota and Illinois, generators behind LDCs served by Northern Border in Minnesota, Iowa, Illinois and Indiana, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D11.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R137 and Figure R138 relative to the capacity of the segment.

2.1.20 Northern Natural Zone D

The 100% peak hour utilization on Northern Natural's Zone D segment, which is modeled with a capacity of 800 MDth/d, potentially affects generators directly connected to Northern Natural in Wisconsin, generators behind LDCs served by Northern Natural in Illinois and Wisconsin, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D8.

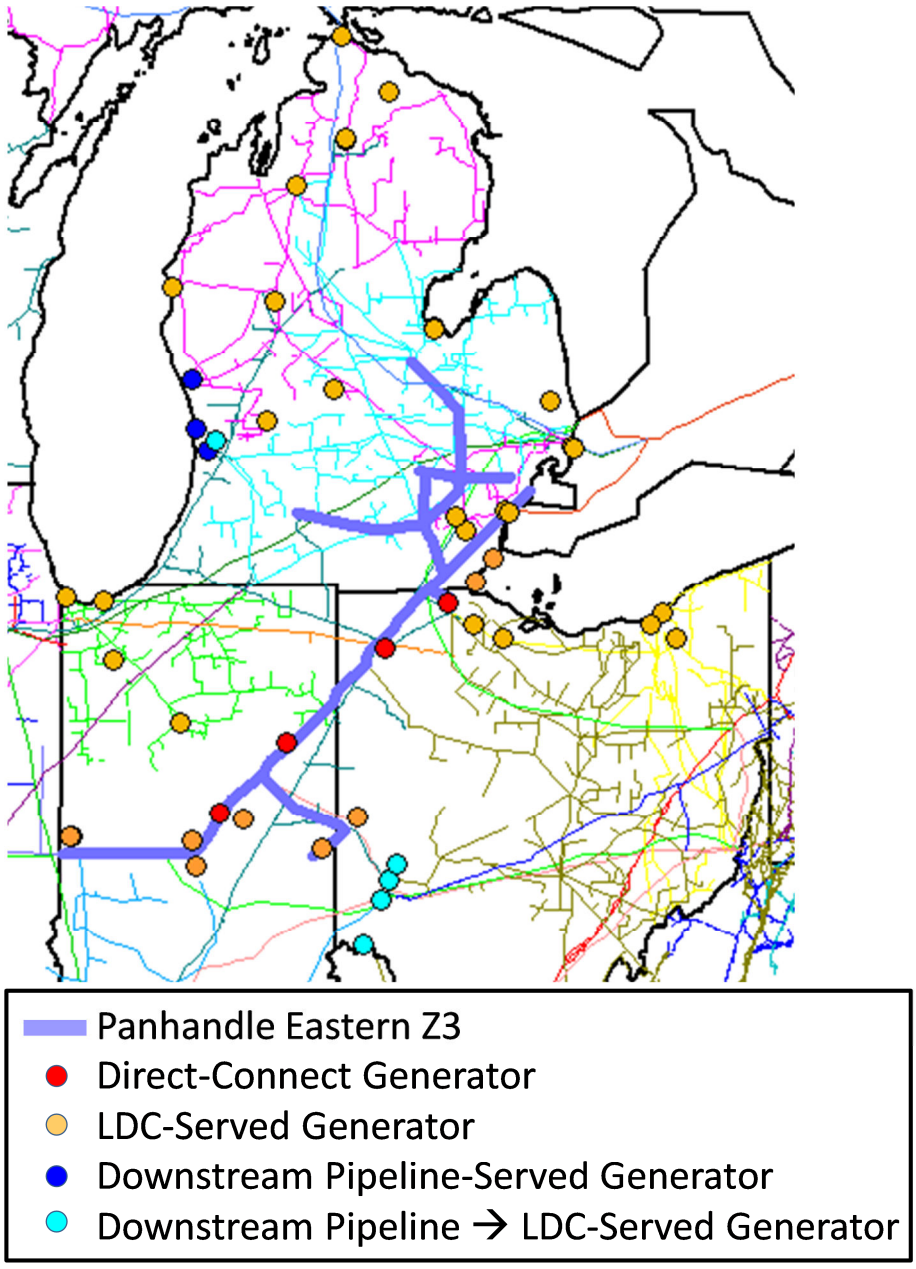
The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R139 and Figure R140 relative to the capacity of the segment.

2.1.21 Panhandle Eastern Z3

The 100% peak hour utilization on Panhandle Eastern's Z3 segment, which is modeled with a capacity of 1,593 MDth/d, potentially affects generators directly connected to Panhandle Eastern

in Indiana and Ohio, generators behind LDCs served by Panhandle Eastern in Indiana, Ohio and Michigan, and generators served by ANR or Texas Eastern in Michigan and Ohio, either directly or behind an LDC. The locations of these generators are shown in Figure Q17.

Figure Q17. Generators Affected by Panhandle Eastern Z3 Constraint



The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R141 and Figure R142 relative to the capacity of the segment.

2.1.22 Tennessee Zone 4 Pennsylvania

Tennessee Zone 4 Pennsylvania is modeled with a capacity of 1,887 MDth/d. The 100% peak hour utilization on Tennessee's Zone 4 segment in Pennsylvania potentially affects generators directly connected to Tennessee in Pennsylvania and New Jersey; generators behind LDCs served by Tennessee in Pennsylvania, New Jersey, downstate New York and Connecticut; and generators served by Algonquin either directly or via LDC in New England. The locations of these generators are shown in Figure 91 of the report.

The peak hour demand forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R143 and Figure R144 relative to the capacity of the segment.

2.1.23 Tennessee Zone 5 New York

Tennessee Zone 5 New York is modeled with a capacity of 1,189 MDth/d. The 100% peak hour utilization on Tennessee's Z5 New York segment potentially affects generators directly connected to Tennessee in upstate New York, Massachusetts, Rhode Island and New Hampshire; generators behind LDCs served by Tennessee in upstate New York, Massachusetts, Connecticut and Rhode Island; and generators served by Iroquois, Granite State and PNGTS either directly or behind an LDC. The locations of these generators are shown in Figure 92 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R145 and Figure R146 relative to the capacity of the segment.

2.1.24 Texas Eastern M2 PA – Southern Branch

The Texas Eastern M2 PA – Southern Branch is modeled with a capacity of 2,068 MDth/d. The 100% peak hour utilization on the southern branch of Texas Eastern's Zone M2 segment through Pennsylvania potentially affects generators directly connected to Texas Eastern in Pennsylvania, generators behind LDCs in Pennsylvania, Delaware and downstate New York. Generators that are served by Algonquin and Eastern Shore either directly or behind an LDC would also potentially be affected. The locations of these generators are shown in Figure 93 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R147 and Figure R148 relative to the capacity of the segment.

2.1.25 Texas Eastern M3 – Northern Line

The Texas Eastern M3 Northern Line is modeled with a capacity of 2,987 MDth/d. The 100% peak hour utilization on the Northern line through Pennsylvania potentially affects generators directly connected to Texas Eastern in New Jersey and Pennsylvania, generators behind LDCs served by Texas Eastern in New Jersey, Pennsylvania and downstate New York, as well as generators served by Algonquin both directly and behind LDCs. The locations of these generators are shown in Figure 94 of the report.

The seasonal daily forecasts of RCI and generator peak hour gas demand downstream of the constrained segment are shown in Figure R149 and Figure R150 relative to the capacity of the segment.

2.1.26 TransCanada Ontario West

TransCanada's Western Ontario segment is modeled with a capacity of 3,148 MDth/d. The 100% peak hour utilization on TransCanada's Western Ontario segment potentially affects generators directly connected to TransCanada and generators behind the Enbridge and Union local distribution systems. The locations of these generators are shown in Figure 95 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R151 and Figure R152 relative to the capacity of the segment.

2.1.27 TransCanada Quebec

TransCanada Quebec is modeled with a capacity of 1,320 MDth/d. The 100% peak hour utilization on TransCanada's Quebec segment potentially affects generators served by PNGTS, North Country and Vermont Gas. The locations of these generators are shown in Figure 96 of the report. Limitations for customers in Quebec could arise from this constraint, but such limitations have not been included in the results reported below.

The seasonal daily forecasts of RCI and generator peak hour demand downstream of the constrained segment are shown in Figure R153 and Figure R154 relative to the capacity of the segment. The generator gas demand in these figures includes only gas demand at generators in the Study Region. Gas demand from non-Study Region generators is not included in the tabulation of results.

2.1.28 Transco Leidy Atlantic

The Transco Leidy Atlantic segment is modeled with a capacity of 1,700 MDth/d. The 100% peak hour utilization on Transco's Leidy Atlantic segment potentially affects generators directly connected to Transco in New Jersey, Maryland, Pennsylvania and Virginia and generators behind LDCs served by Transco in Delaware, New Jersey, Pennsylvania, Maryland, Virginia and North Carolina. The locations of these generators are shown in Figure 97 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R155 and Figure R156 relative to the capacity of the segment.

2.1.29 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 3,967 MDth/d. The 100% peak hour utilization on Transco's Zone 5 segment potentially affects Study Region generators directly connected to Transco in Virginia and generators behind LDCs served by Transco in North Carolina and Virginia. The locations of these generators are shown in Figure 98 of the report. Non-Study Region generators in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R157 and Figure R158 relative to the capacity of the segment.

2.1.30 Transco Zone 6 Leidy Line to Station 210

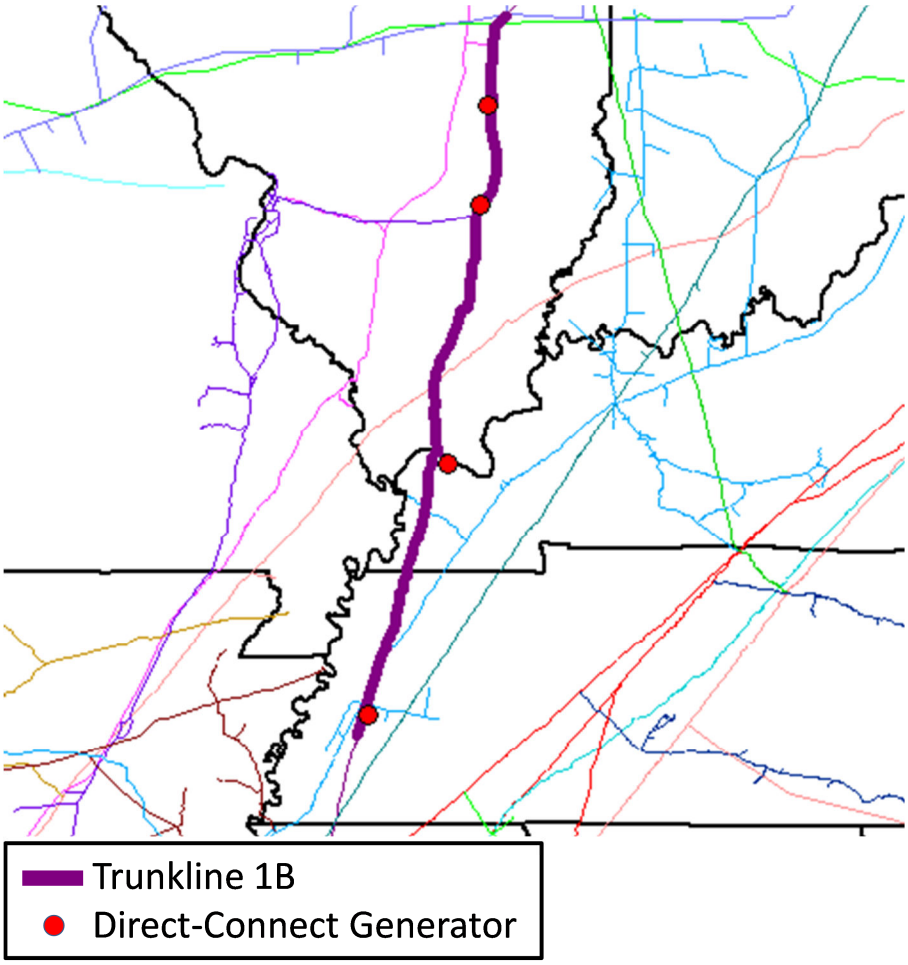
The Transco Zone 6 Leidy to Station 210 segment is modeled with a capacity of 3,310 MDth/d. The 100% peak hour utilization on this segment potentially affects generators directly connected to Transco in New Jersey and Pennsylvania and generators behind LDCs served by Transco in New Jersey, Pennsylvania, New York City and Long Island. The locations of generators served along this Transco segment are shown in Figure 99 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R159 and Figure R160 relative to the capacity of the segment.

2.1.31 Trunkline Zone 1B

The 100% peak hour utilization on Trunkline's Zone 1B segment, which is modeled with a capacity of 947 MDth/d, potentially affects generators that are directly connected to Trunkline in Tennessee, Kentucky and Illinois. The locations of these generators are shown in Figure Q18.

Figure Q18. Generators Affected by Trunkline 1B Constraint



The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R161 and Figure R162 relative to the capacity of the segment.

2.1.32 Union Gas Dawn

The 100% peak hour utilization on Union Gas's Dawn segment, which is modeled with a capacity of 5,000 MDth/d, potentially affects generators directly connected to Union, generators directly connected to TransCanada, and generators served by the Union Gas and Enbridge distribution systems. The locations of these generators are shown in Figure 100 of the report.

The seasonal daily forecasts of RCI and generator peak hour gas demand downstream of the constrained segment are shown in Figure R163 and Figure R164 relative to the capacity of the segment.

2.1.33 Vector Zone 1

The 100% peak hour utilization on Vector's Zone 1 segment, which is modeled with a capacity of 1,600 MDth/d, potentially affects generators directly connected to Vector in Illinois, Indiana, Michigan and Ontario and generators behind LDCs served by Vector in Indiana and Michigan. The locations of these generators are shown in Figure D14.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R165 and Figure R166 relative to the capacity of the segment.

2.1.34 Viking Zone 1

The 100% peak hour utilization on Viking's Zone 1 segment, which is modeled with a capacity of 543 MDth/d, potentially affects generators directly connected to Viking, generators behind LDCs served by Viking, generators directly connected to ANR, and generators behind LDCs served by ANR. The locations of these generators are shown in Figure D9.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R167 and Figure R168 relative to the capacity of the segment.

2.2 RGDS S34 SUMMER 2018

Figure Q19 summarizes the affected generation during the Summer 2018 peak hour by PPA.

Figure Q19. RGDS S34 Summer 2018: Peak Hour Affected Generation

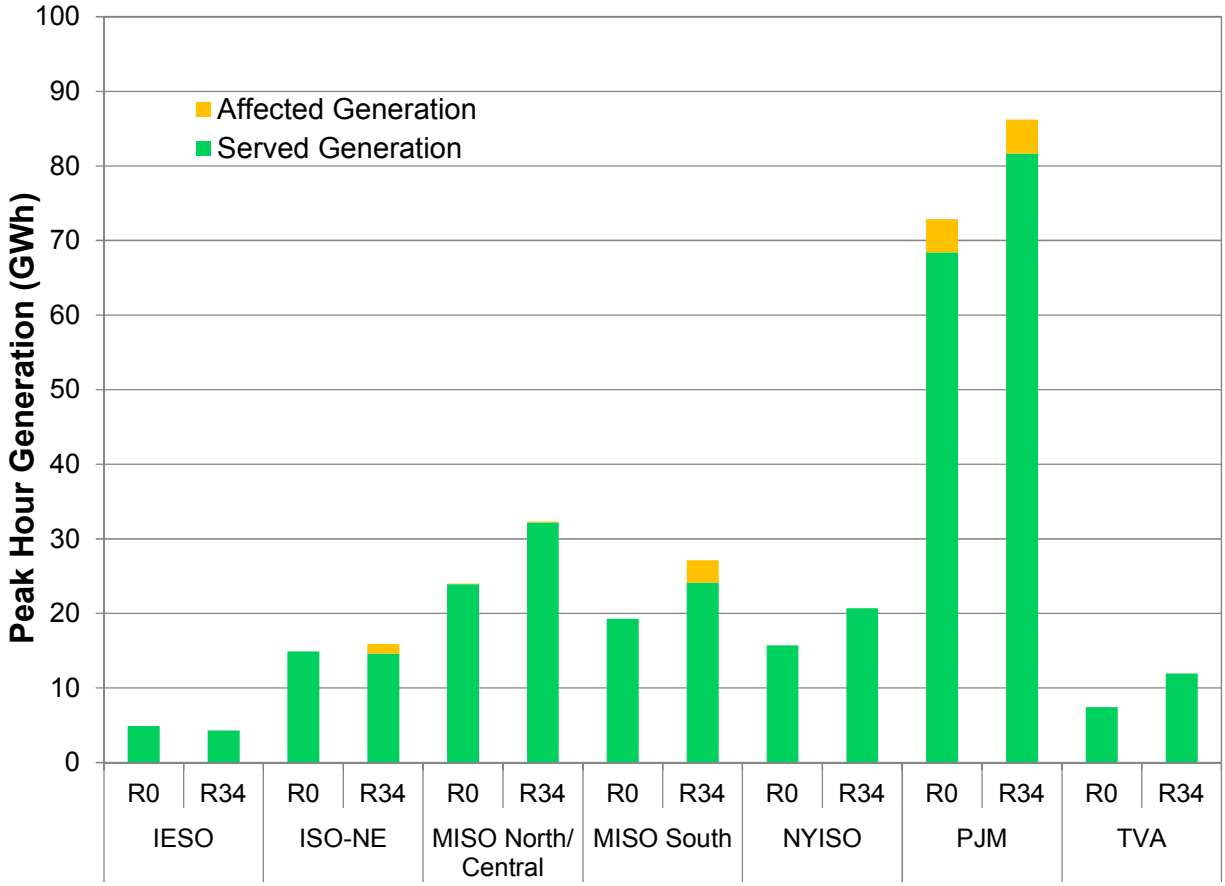


Figure Q20 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q11.

Figure Q20. RGDS S34 Summer 2018: Locations with Peak Hour Affected Generation

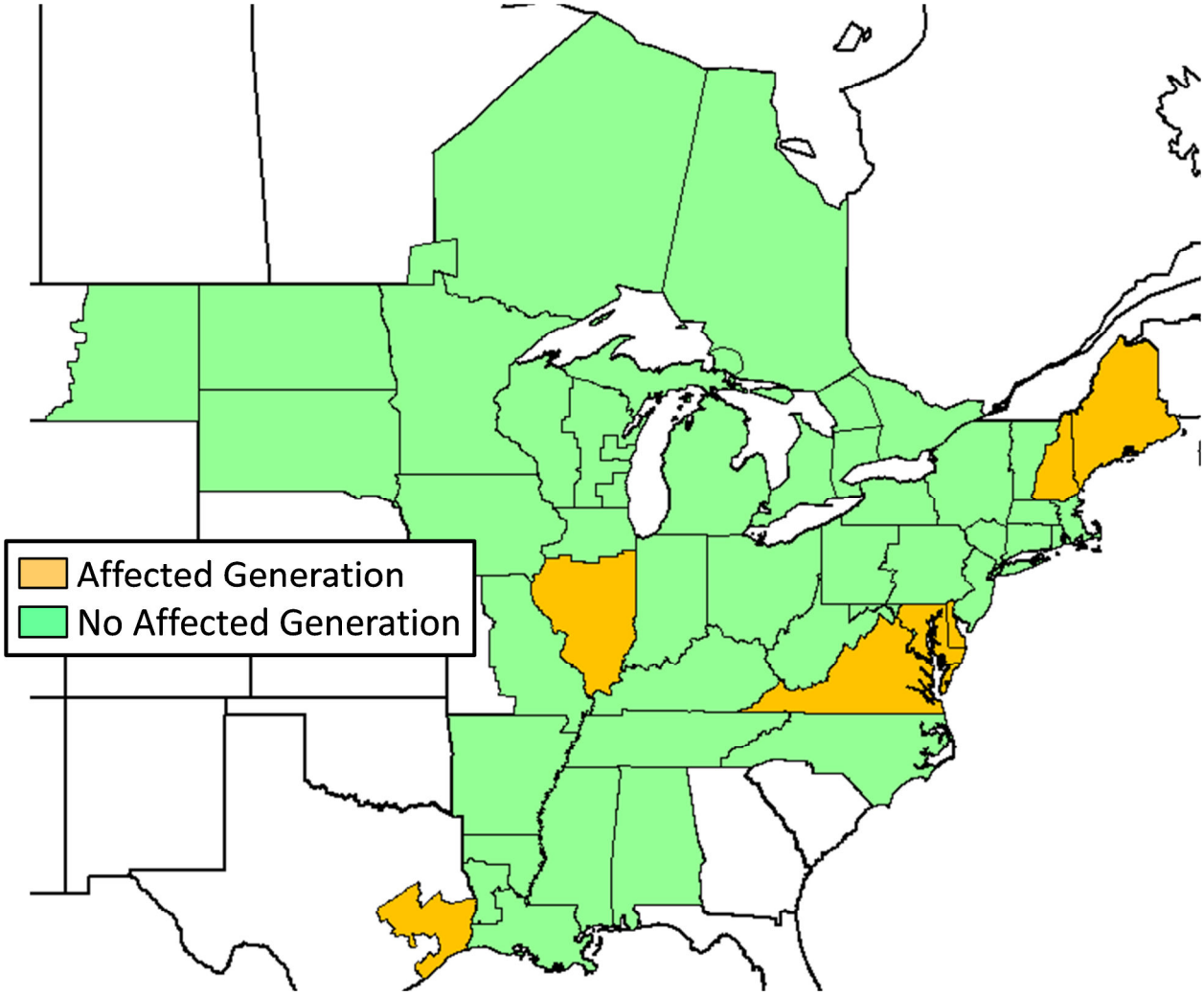


Table Q11. RGDS S34 Summer 2018 Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Delaware	9.3	1,241
Illinois Southern	1.0	112
Louisiana Southern	23.6	2,421
Maine	4.0	540
Maryland Eastern	16.7	2,361
New Hampshire	6.1	738
Texas East (SERC)	1.2	174
Virginia	8.4	936

Figure Q21 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q19 during the Summer 2018 peak hour.

Figure Q21. RGDS S34 Summer 2018: Peak Hour Constraints

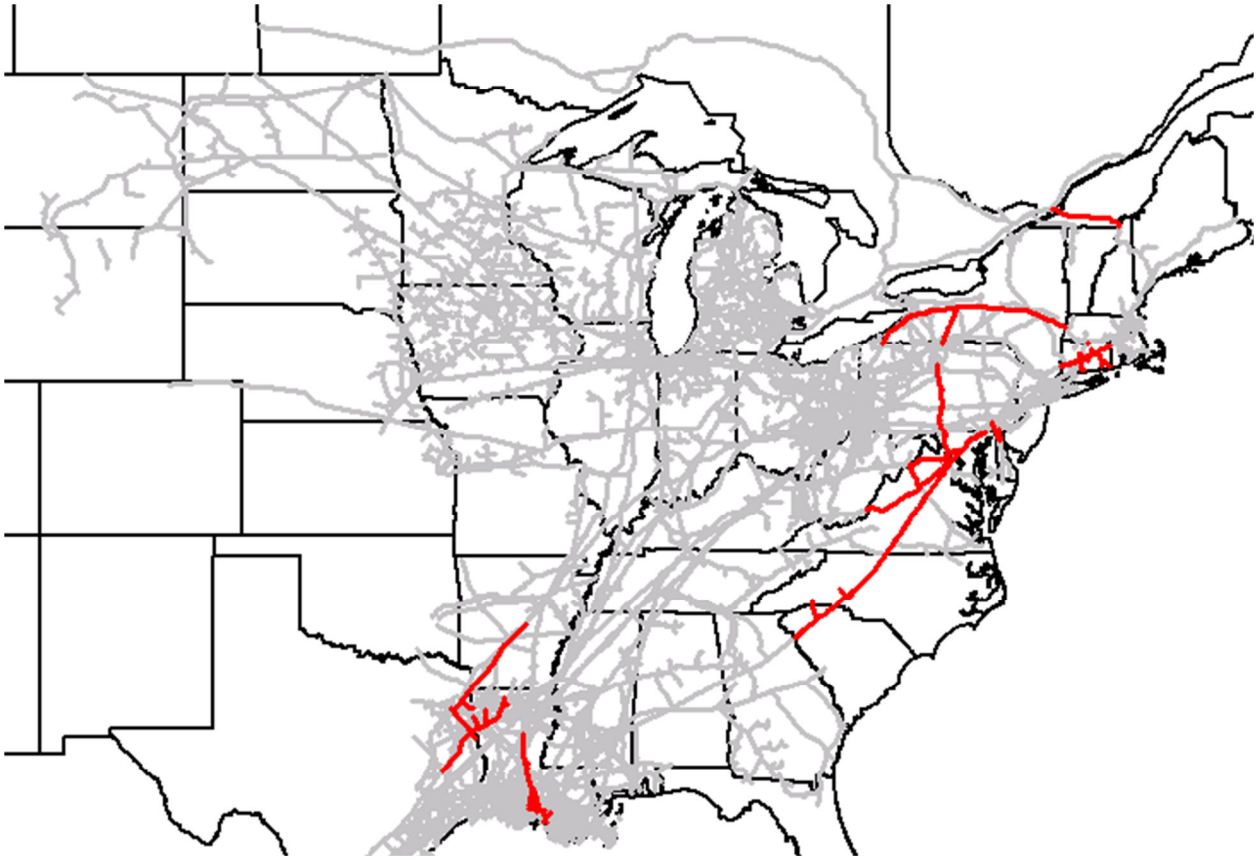


Table Q12 summarizes the results of the frequency and duration analysis.

Table Q12. RGDS S34 Summer 2018: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
Algonquin Connecticut	8	1	5	22
Columbia Gas VA/MD	13	1	15	55
Dominion Southeast	3	1	72	85
Eastern Shore	9	1	23	65
Gulf South Zone 2 HH	1	92	92	92
NB/NS Supply	8	1	5	18
Tennessee Z5 NY	9	1	5	22
Texas Eastern ETX	10	1	17	53
TransCanada Quebec to PNGTS	6	1	28	75
Transco Z5	10	1	19	60

2.2.1 Algonquin Connecticut

The 100% peak hour utilization on Algonquin's Connecticut segment, which is modeled with a capacity of 1,827 MDth/d, potentially affects generators directly connected to Algonquin in

Connecticut, Massachusetts and Rhode Island, generators directly connected to M&N in Maine and New Hampshire, and generators served by LDCs connected to Algonquin and M&N. The locations of these generators are shown in Figure 111 of the report..

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R169 and Figure R170 relative to the capacity of the segment.

2.2.2 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment, which is modeled with a capacity of 2,477 MDth/d, potentially affects generators directly connected to Columbia in Maryland and Virginia; generators behind LDCs served by Columbia Gas in Maryland and Virginia; and generators served by Dominion Cove Point and PPL Interstate downstream of interconnections with Columbia Gas. The locations of these generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R171 and Figure R172 relative to the capacity of the segment.

2.2.3 Dominion Southeast

Dominion Southeast is modeled with a capacity of 540 Mdth/d. The 100% peak hour utilization on Dominion's Southeast segment serving Virginia and Maryland potentially affects generators directly served by Dominion, generators behind LDCs served by Dominion, and generators served by Dominion Cove Point via interconnect. The locations of these generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R173 and Figure R174 relative to the capacity of the segment.

2.2.4 Eastern Shore

Eastern Shore is modeled with a capacity of 208 MDth/d. The 100% peak hour utilization rate on Eastern Shore's Receipt Zone 1 and Delivery Zone 2 potentially affects generators on the Delmarva Peninsula that are served by Eastern Shore. The locations of these generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R175 and Figure R176 relative to the capacity of the segments.

2.2.5 Gulf South Zone 2 Henry Hub

The 100% peak hour utilization on the Henry Hub segment of Gulf South Zone 2, which is modeled with a capacity of 700 MDth/d, potentially affects generators directly connected to Gulf South in Louisiana, and generators behind LDCs served by Gulf South in Louisiana. The locations of these generators are shown in Figure D15.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R177 and Figure R178 relative to the capacity of the segment.

2.2.6 New Brunswick Supply / Nova Scotia Offshore Supply

Total supplies from New Brunswick and Nova Scotia Offshore are capped at approximately 623 MDth/d in 2018. This limitation potentially affects generators directly connected to M&N in Maine and New Hampshire as well as generators located behind LDCs served by M&N in Maine. The locations of these generators are shown in Figure 90 of the report. Generators located in the Canadian Maritimes would also be affected by this supply constraint, but have not been included in the summary results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the supply limitation are shown in Figure R179 and Figure R180 relative to the total production capacity. The electric demand data set in these figures includes only gas demand at generators in the Study Region, demand from non-Study Region generators is not accounted for.

2.2.7 Tennessee Zone 5 New York

Tennessee Zone 5 New York is modeled with a capacity of 1,189 MDth/d. The 100% peak hour utilization on Tennessee's Z5 New York segment potentially affects generators directly connected to Tennessee in upstate New York, Massachusetts, Rhode Island and New Hampshire; generators behind LDCs served by Tennessee in upstate New York, Massachusetts, Connecticut and Rhode Island; and generators served by Iroquois, Granite State and PNGTS either directly or behind an LDC. The locations of these generators are shown in Figure 92 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R181 and Figure R182 relative to the capacity of the segment.

2.2.8 Texas Eastern Zone ETX

The 100% peak hour utilization on Texas Eastern's East Texas segment, which is modeled with a capacity of 623 MDth/d, potentially affects generators directly connected to Texas Eastern in Texas, Arkansas and Illinois. The locations of these generators are shown in Figure 104 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R183 and Figure R184 relative to the capacity of the segment.

2.2.9 TransCanada Quebec to PNGTS

TransCanada's Quebec to PNGTS segment is modeled with a capacity of 270 MDth/d. The 100% peak hour utilization on this segment potentially affects generators served by PNGTS, North Country and Vermont Gas. The locations of these generators are shown in Figure D13.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R185 and Figure R186 relative to the capacity of the segment.

2.2.10 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 3,967 MDth/d. The 100% peak hour utilization on Transco's Zone 5 segment potentially affects Study Region generators directly connected to Transco in Virginia and generators behind LDCs served by Transco in North Carolina and Virginia. The locations of these generators are shown in Figure 98 of the report. Non-Study Region generators in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R187 and Figure R188 relative to the capacity of the segment.

2.3 RGDS S34 WINTER 2023

Figure Q22 summarizes the affected generation during the Winter 2023 peak hour by PPA.

Figure Q22. RGDS S34 Winter 2023: Peak Hour Affected Generation

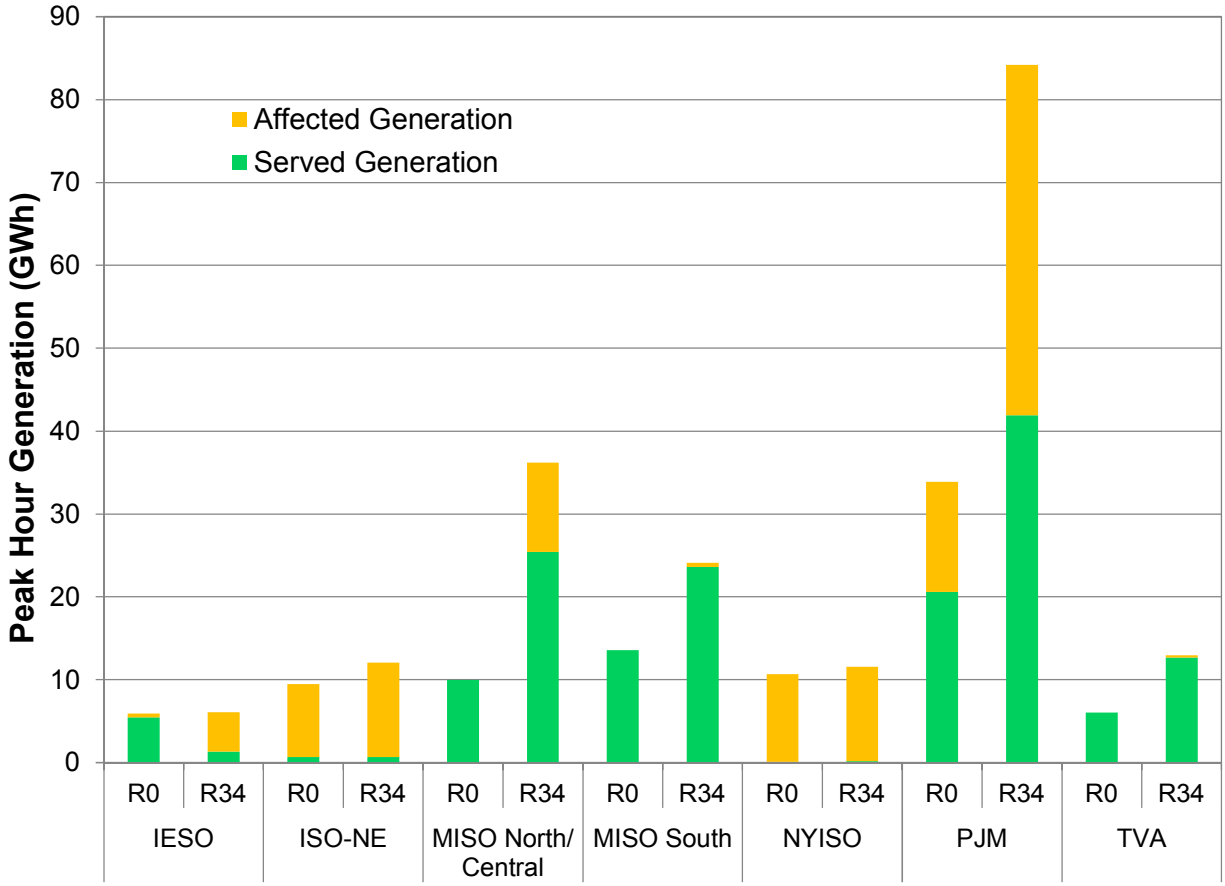


Figure Q23 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q13.

Figure Q23. RGDS S34 Winter 2023: Locations with Peak Hour Affected Generation

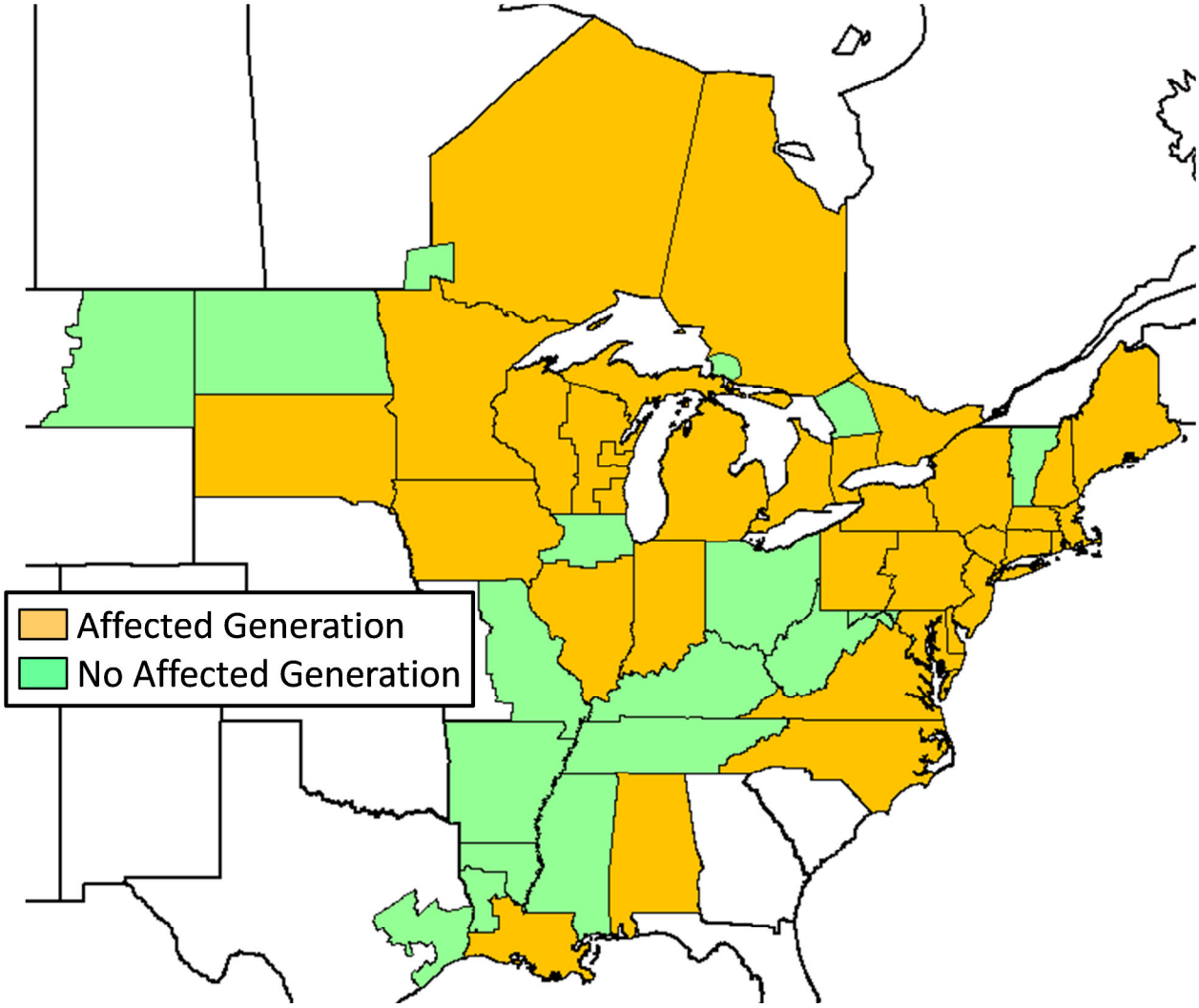


Table Q13. RGDS S34 Winter 2023: Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Alabama	3.2	243
Connecticut	25.6	3,189
Delaware	4.3	572
Illinois Southern	0.5	61
Indiana	14.9	1,603
Iowa	14.3	1,565
Louisiana Southern	4.8	501
Maine	11.6	1,502
Maryland Eastern	39.6	4,223
Massachusetts Eastern	14.0	1,774
Massachusetts Western	11.0	1,414
Michigan Lower Peninsula	4.7	599
Michigan Upper Peninsula	0.1	11
Minnesota	1.7	96
New Hampshire	13.4	1,627
New Jersey	93.8	12,115
New York Central Northern	45.8	5,667
New York City	23.1	2,421
New York Long Island	16.3	1,604
New York Southern	10.9	1,312
New York Western	3.3	367
North Carolina	1.2	169
Ontario (CDA)	10.5	1,068
Ontario (EDA)	16.0	1,635
Ontario (NDA)	1.5	186
Ontario (StClair)	15.8	1,838
Ontario (WDA)	0.4	38
Pennsylvania Eastern	101.6	13,281
Pennsylvania Western	11.0	1,574
Rhode Island	14.8	1,889
South Dakota	3.2	302
Virginia	82.2	9,882
Wisconsin Eastern (RFC)	23.4	2,909
Wisconsin Western (MROE)	33.7	3,548
Wisconsin Western (MROW)	7.4	499

Figure Q24 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q22 during the Winter 2023 peak hour.

Figure Q24. RGDS S34 Winter 2023: Peak Hour Constraints

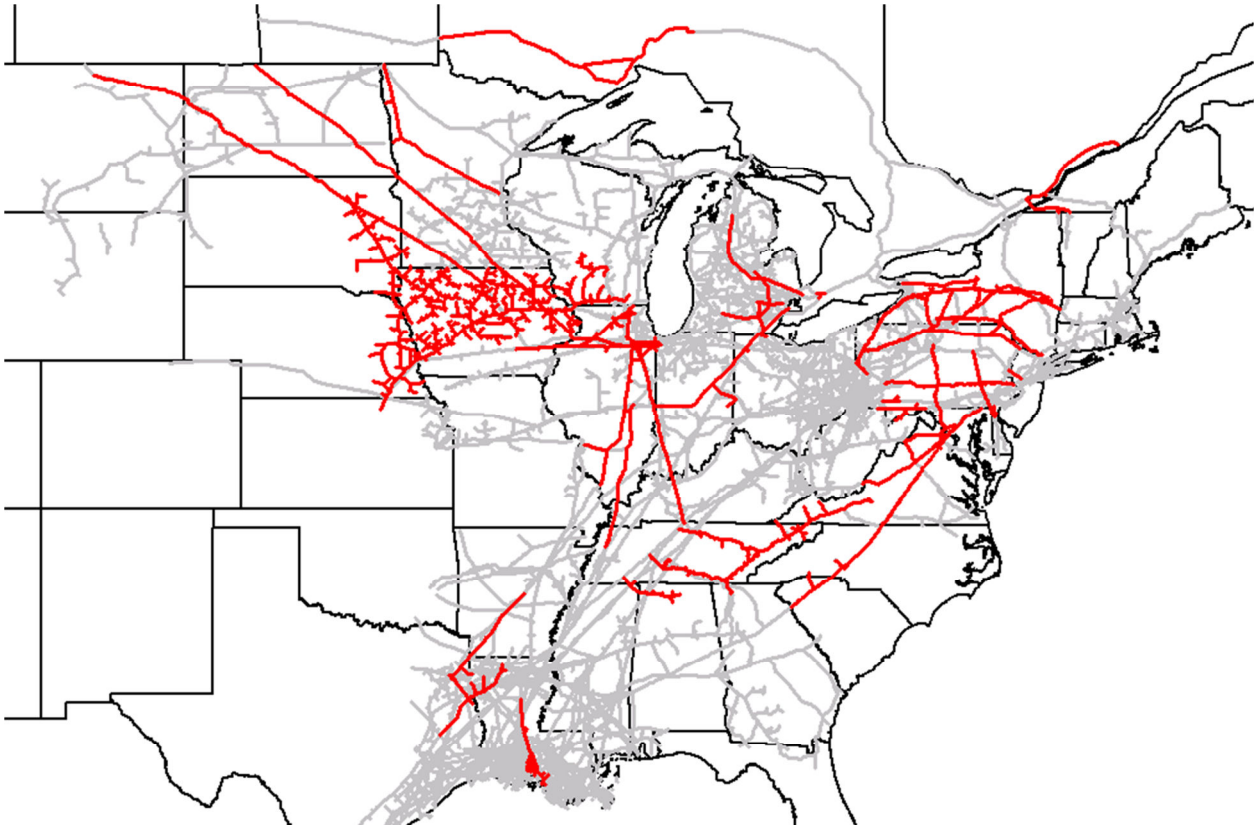


Table Q14 summarizes the results of the frequency and duration analysis.

Table Q14. RGDS S34 Winter 2023: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
AlaTenn	15	1	10	63
Alliance	5	1	8	17
ANR Northern Illinois	2	28	59	87
Columbia Gas VA/MD	5	2	52	84
Columbia Gas W PA/NY	2	31	59	90
Constitution	2	31	59	90
Dominion Eastern NY	9	3	15	60
Dominion Western NY	1	4	4	4
Dominion Southeast	5	1	45	82
East Tennessee Mainline	7	1	5	19
Eastern Shore	12	1	16	72
Empire Mainline	10	1	20	53
Great Lakes East	2	31	59	90
Gulf South Z2 HH	8	1	3	15
Midwestern	14	1	18	60
Millennium	7	1	38	69
NB/NS Supply	2	31	59	90
NGPL IA/IL North	1	2	2	2
NGPL IA/IL South	3	1	8	10
Northern Border Mainline	7	1	4	14
Northern Natural ABC	2	31	59	90
Northern Natural D	8	1	37	77
Panhandle Eastern Z3	5	2	59	80
Tennessee Z4 PA	6	2	48	79
Tennessee Z5 NY	2	31	59	90
Texas Eastern ETX	5	2	10	29
Texas Eastern M2 PA South	2	31	59	90
Texas Eastern M3 North	2	31	59	90
TransCanada Ontario West	10	1	17	44
TransCanada Quebec	7	1	41	61
Transco Leidy Atlantic	2	31	59	90
Transco Z5	9	1	27	61
Transco Z6 Leidy to 210	2	31	59	90
Trunkline 1B	8	1	14	40
Union Gas Dawn	5	1	5	13
Vector Z1	3	1	1	1
Viking Z1	9	1	24	66

2.3.1 AlaTenn

The 100% peak hour utilization on AlaTenn's mainline, which is modeled with a capacity of 197 MDth/d, potentially affects generators served by AlaTenn in Alabama. The locations of these generators are shown in Figure Q16.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R189 and Figure R190 relative to the capacity of the segment.

2.3.2 Alliance

The 100% peak hour utilization on Alliance's mainline, which is modeled with a capacity of 1,800 MDth/d, potentially affects generators behind LDCs served by Alliance and generators behind LDCs served by Guardian. The locations of these generators are shown in Figure D1.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R191 and Figure R192 relative to the capacity of the segment.

2.3.3 ANR Northern Illinois

The 100% peak hour utilization on ANR's Northern Illinois segment, which is modeled with a capacity of 1,337 MDth/d, potentially affects generators directly connected to ANR, generators behind LDCs served by ANR. The locations of these generators are shown in Figure D2.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R193 and Figure R194 relative to the capacity of the segment.

2.3.4 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment, which is modeled with a capacity of 2,867 MDth/d, potentially affects generators directly connected to Columbia in Maryland and Virginia; generators behind LDCs served by Columbia Gas in Maryland and Virginia; and generators served by Dominion Cove Point and PPL Interstate downstream of interconnections with Columbia Gas. The locations of these generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R195 and Figure R196 relative to the capacity of the segment.

2.3.5 Columbia Gas Western Pennsylvania / New York

The 100% peak hour utilization on Columbia Gas's Western Pennsylvania / New York segment, which is modeled with a capacity of 1,131 MDth/d, potentially affects generators directly connected to Columbia in Pennsylvania, New Jersey, Virginia and Maryland and generators behind LDCs served by Columbia Gas in Pennsylvania, New Jersey, Delaware, Maryland and Virginia. The locations of these generators are shown in Figure 81 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R197 and Figure R198 relative to the capacity of the segment.

2.3.6 Constitution Pipeline

Constitution's proposed delivery capacity is 650 MDth/d. The 100% peak hour utilization on Constitution potentially affects generators served by Iroquois both directly and behind LDCs. The locations of these generators are shown in Figure 82 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R199 and Figure R200 relative to the capacity of the segment.

2.3.7 Dominion Eastern New York

Dominion's Eastern New York segment is modeled with a capacity of 907 MDth/d. The 100% peak hour utilization on Dominion's Eastern New York segment potentially affects generators directly connected to Dominion and behind LDCs served by Dominion. The locations of these generators are shown in Figure 83 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R201 and Figure R202 relative to the capacity of the segment.

2.3.8 Dominion Western New York

Dominion Western New York is modeled with a capacity of 557 MDth/d. The 100% utilization on Dominion's Western New York segment potentially affects generators directly served by Dominion and behind LDCs served by Dominion. The locations of the plants in each category are shown in Figure 84 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R203 and Figure R204 relative to the capacity of the segment.

2.3.9 Dominion Southeast

Dominion Southeast is modeled with a capacity of 555 Mdth/d. The 100% peak hour utilization on Dominion's Southeast segment serving Virginia and Maryland potentially affects generators directly served by Dominion, generators behind LDCs served by Dominion, and generators served by Dominion Cove Point via interconnect. The locations of these generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R205 and Figure R206 relative to the capacity of the segment.

2.3.10 East Tennessee Mainline

The East Tennessee mainline is modeled with a capacity of 800 MDth/d. The 100% peak hour utilization on East Tennessee's mainline potentially affects generators directly connected to East

Tennessee and generators behind LDCs served by East Tennessee. The locations of these generators are shown in Figure 86 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R207 and Figure R208 relative to the capacity of the segment.

2.3.11 Eastern Shore

Eastern Shore is modeled with a capacity of 208 MDth/d. The 100% peak hour utilization rate on Eastern Shore's Receipt Zone 1 and Delivery Zone 2 potentially affects generators on the Delmarva Peninsula that are served by Eastern Shore. The locations of these generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R209 and Figure R210 relative to the capacity of the segments.

2.3.12 Empire Mainline

The Empire mainline is modeled with a capacity of 525 MDth/d. The 100% peak hour utilization on the Empire mainline across upstate New York potentially affects generators on the Niagara Mohawk LDC system. The locations of these generators are shown in Figure 88 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R211 and Figure R212 relative to the capacity of the segment.

2.3.13 Great Lakes East

The 100% peak hour utilization on Great Lakes Gas's East segment, which is modeled with a capacity of 1,164 MDth/d, potentially affects generators directly connected to Great Lakes in Michigan, generators behind LDCs served by Great Lakes in Michigan, generators directly connected to Vector, and generators behind Union Gas. The locations of these generators are shown in Figure D3.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R213 and Figure R214 relative to the capacity of the segment.

2.3.14 Gulf South Zone 2 Henry Hub

The 100% peak hour utilization on the Henry Hub segment of Gulf South Zone 2, which is modeled with a capacity of 700 MDth/d, potentially affects generators directly connected to Gulf South in Louisiana, and generators behind LDCs served by Gulf South in Louisiana. The locations of these generators are shown in Figure D15.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R215 and Figure R216 relative to the capacity of the segment.

2.3.15 Midwestern

The 100% peak hour utilization on Midwestern's mainline segment, which is modeled with a capacity of 635 MDth/d, potentially affects generators behind LDCs served by Midwestern and behind LDCs served by Guardian downstream of the Joliet Hub. The locations of these generators are shown in Figure D4.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R217 and Figure R218 relative to the capacity of the segment

2.3.16 Millennium

Millennium is modeled with a capacity of 784 MDth/d. The 100% peak hour utilization on Millennium's mainline potentially affects generators directly connected to Millennium, generators behind LDCs served by Millennium, and generators served by Algonquin, in particular, in southern New England. The locations of these generators are shown in Figure 89 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R219 and Figure R220 relative to the capacity of the segment.

2.3.17 New Brunswick Supply / Nova Scotia Offshore Supply

Total supplies from New Brunswick and Nova Scotia Offshore are capped at approximately 283 MDth/d in 2023. This limitation potentially affects generators directly connected to M&N in Maine and New Hampshire as well as generators located behind LDCs served by M&N in Maine. The locations of these generators are shown in Figure 90 of the report. Generators located in the Canadian Maritimes would also be affected by this supply constraint, but have not been included in the summary results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the supply limitation are shown in Figure R221 and Figure R222 relative to the total production capacity. The electric demand data set in these figures includes only gas demand at generators in the Study Region, demand from non-Study Region generators is not accounted for.

2.3.18 NGPL Iowa/Illinois North

The 100% peak hour utilization on NGPL's Iowa/Illinois North segment, which is modeled with a capacity of 1,677 MDth/d, potentially affects generators directly connected to NGPL in Illinois, generators behind LDCs served by NGPL in Iowa, Illinois and Indiana, generators directly connected to Horizon in Illinois, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D5.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R223 and Figure R224 relative to the capacity of the segment.

2.3.19 NGPL Iowa/Illinois South

The 100% peak hour utilization on NGPL's Iowa/Illinois South segment, which is modeled with a capacity of 1,624 MDth/d, potentially affects generators directly connected to NGPL in Illinois, generators behind LDCs served by NGPL in Illinois and Indiana, generators directly connected to Horizon in Illinois, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D6.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R225 and Figure R226 relative to the capacity of the segment.

2.3.20 Northern Border Mainline

The 100% peak hour utilization on Northern Border's mainline, which is modeled with a capacity of 2,311 MDth/d, potentially affects generators directly connected to Northern Border in Minnesota and Illinois, generators behind LDCs served by Northern Border in Minnesota, Iowa, Illinois and Indiana, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D11.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R227 and Figure R228 relative to the capacity of the segment.

2.3.21 Northern Natural Zone ABC

The 100% peak hour utilization on Northern Natural's Zone ABC segment, which is modeled with a capacity of 2,138 MDth/d, potentially affects generators directly connected to Northern Natural in Iowa, South Dakota, Wisconsin and Minnesota, generators behind LDCs served by Northern Natural in Iowa, Wisconsin and Minnesota, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D12.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R229 and Figure R230 relative to the capacity of the segment.

2.3.22 Northern Natural Zone D

The 100% peak hour utilization on Northern Natural's Zone D segment, which is modeled with a capacity of 800 MDth/d, potentially affects generators directly connected to Northern Natural in Wisconsin, generators behind LDCs served by Northern Natural in Illinois and Wisconsin, and generators behind LDCs served by Guardian in Wisconsin. The locations of these generators are shown in Figure D8.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R231 and Figure R232 relative to the capacity of the segment.

2.3.23 Panhandle Eastern Z3

The 100% peak hour utilization on Panhandle Eastern's Z3 segment, which is modeled with a capacity of 1,593 MDth/d, potentially affects generators directly connected to Panhandle Eastern

in Indiana and Ohio, generators behind LDCs served by Panhandle Eastern in Indiana, Ohio and Michigan, and generators served by ANR or Texas Eastern in Michigan and Ohio, either directly or behind an LDC. The locations of these generators are shown in Figure Q17.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R233 and Figure R234 relative to the capacity of the segment.

2.3.24 Tennessee Zone 4 Pennsylvania

Tennessee Zone 4 Pennsylvania is modeled with a capacity of 1,887 MDth/d. The 100% peak hour utilization on Tennessee's Zone 4 segment in Pennsylvania potentially affects generators directly connected to Tennessee in Pennsylvania and New Jersey; generators behind LDCs served by Tennessee in Pennsylvania, New Jersey, downstate New York and Connecticut; and generators served by Algonquin either directly or via LDC. The locations of these generators are shown in Figure 91 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R235 and Figure R236 relative to the capacity of the segment.

2.3.25 Tennessee Zone 5 New York

Tennessee Zone 5 New York is modeled with a capacity of 1,404 MDth/d. The 100% peak hour utilization on Tennessee's Z5 New York segment potentially affects generators directly connected to Tennessee in upstate New York, Massachusetts, Rhode Island and New Hampshire; generators behind LDCs served by Tennessee in upstate New York, Massachusetts, Connecticut and Rhode Island; and generators served by Iroquois, Granite State and PNGTS either directly or behind an LDC. The locations of these generators are shown in Figure 92 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R237 and Figure R238 relative to the capacity of the segment.

2.3.26 Texas Eastern Zone ETX

The 100% peak hour utilization on Texas Eastern's East Texas segment is modeled with a capacity of 623 MDth/d, the same capacity as modeled for 2023. The locations of the potentially affected generators are shown in Figure 104 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R239 and Figure R240 relative to the capacity of the segment.

2.3.27 Texas Eastern M2 Pennsylvania – Southern Branch

The Texas Eastern M2 Pennsylvania – Southern Branch is modeled with a capacity of 2,068 MDth/d. The 100% peak hour utilization on the southern branch of Texas Eastern's Zone M2 segment through Pennsylvania potentially affects generators directly connected to Texas Eastern in Pennsylvania, generators behind LDCs in Pennsylvania, Delaware and downstate New York that are served by Texas Eastern, and generators that are served by Algonquin and Eastern Shore,

either directly or behind an LDC. The locations of these generators are shown in Figure 93 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R241 and Figure R242 relative to the capacity of the segment.

2.3.28 Texas Eastern M3 – Northern Line

The Texas Eastern M3 Northern Line is modeled with a capacity of 3,357 MDth/d. The 100% peak hour utilization on Texas Eastern's Zone M3 northern line through Pennsylvania potentially affects generators directly connected to Texas Eastern in New Jersey and Pennsylvania, generators behind LDCs served by Texas Eastern in New Jersey, Pennsylvania and downstate New York, and generators served by Algonquin both directly and behind LDCs. The locations of these generators are shown in Figure 94 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R243 and Figure R244 relative to the capacity of the segment.

2.3.29 TransCanada Ontario West

TransCanada's Western Ontario segment is modeled with a capacity of 3,508 MDth/d. The 100% peak hour utilization on TransCanada's Western Ontario segment potentially affects generators directly connected to TransCanada and generators behind the Enbridge and Union local distribution systems. The locations of these generators are shown in Figure 95 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R245 and Figure R246 relative to the capacity of the segment.

2.3.30 TransCanada Quebec

TransCanada Quebec is modeled with a capacity of 1,320 MDth/d. The 100% peak hour utilization on TransCanada's Quebec segment potentially affects generators served by PNGTS, North Country and Vermont Gas. The locations of these generators are shown in Figure 96 of the report. Limitations for customers in Quebec could arise from this constraint, but such limitations have not been included in the results reported below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R247 and Figure R248 relative to the capacity of the segment.

2.3.31 Transco Leidy Atlantic

The Transco Leidy Atlantic segment is modeled with a capacity of 1,700 MDth/d. The 100% peak hour utilization on Transco's Leidy Atlantic segment potentially affects generators directly connected to Transco in New Jersey, Maryland, Pennsylvania and Virginia and generators behind LDCs served by Transco in Delaware, New Jersey, Pennsylvania, Maryland, Virginia and North Carolina. The locations of these generators are shown in Figure 97 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R249 and Figure R250 relative to the capacity of the segment.

2.3.32 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 4,117 MDth/d. The 100% peak hour utilization on Transco's Zone 5 segment potentially affects Study Region generators directly connected to Transco in Virginia and generators behind LDCs served by Transco in North Carolina and Virginia. The locations of these generators are shown in Figure 98 of the report. Non-Study Region generators in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R251 and Figure R252 relative to the capacity of the segment. The electric demand data set in these figures includes only gas demand at generators in the Study Region.

2.3.33 Transco Zone 6 Leidy Line to Station 210

The Transco Zone 6 Leidy to Station segment is modeled with a capacity of 3,430 MDth/d. The 100% peak hour utilization on Transco's Leidy Line to Station 210 segment potentially affects generators directly connected to Transco in New Jersey and Pennsylvania and generators behind LDCs served by Transco in New Jersey, Pennsylvania and both New York City and Long Island. Locations of these generators are shown in Figure 99 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R253 and Figure R254 relative to the capacity of the segment.

2.3.34 Trunkline Zone 1B

The 100% peak hour utilization on Trunkline's Zone 1B segment, which is modeled with a capacity of 947 MDth/d, potentially affects generators that are directly connected to Trunkline in Tennessee, Kentucky and Illinois. The locations of these generators are shown in Figure Q18.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R255 and Figure R256 relative to the capacity of the segment.

2.3.35 Union Gas Dawn

The 100% peak hour utilization on Union Gas's Dawn segment, which is modeled with a capacity of 5,000 MDth/d, potentially affects generators directly connected to Union, generators directly connected to TransCanada, and generators served by the Union Gas and Enbridge distribution systems. The locations of these generators are shown in Figure 100 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R257 and Figure R258 relative to the capacity of the segment.

2.3.36 Vector Zone 1

The 100% peak hour utilization on Vector's Zone 1 segment, which is modeled with a capacity of 1,600 MDth/d, potentially affects generators directly connected to Vector in Illinois, Indiana, Michigan and Ontario and generators behind LDCs served by Vector in Indiana and Michigan. The locations of these generators are shown in Figure D14.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R259 and Figure R260 relative to the capacity of the segment.

2.3.37 Viking Zone 1

The 100% peak hour utilization on Viking's Zone 1 segment, which is modeled with a capacity of 543 MDth/d, potentially affects generators directly connected to Viking, generators behind LDCs served by Viking, generators directly connected to ANR, and generators behind LDCs served by ANR. The locations of these generators are shown in Figure D9.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R261 and Figure R262 relative to the capacity of the segment.

2.4 RGDS S34 SUMMER 2023

Figure Q25 summarizes the affected generation during the Summer 2023 peak hour by PPA.

Figure Q25. RGDS S34 Summer 2023: Peak Hour Affected Generation

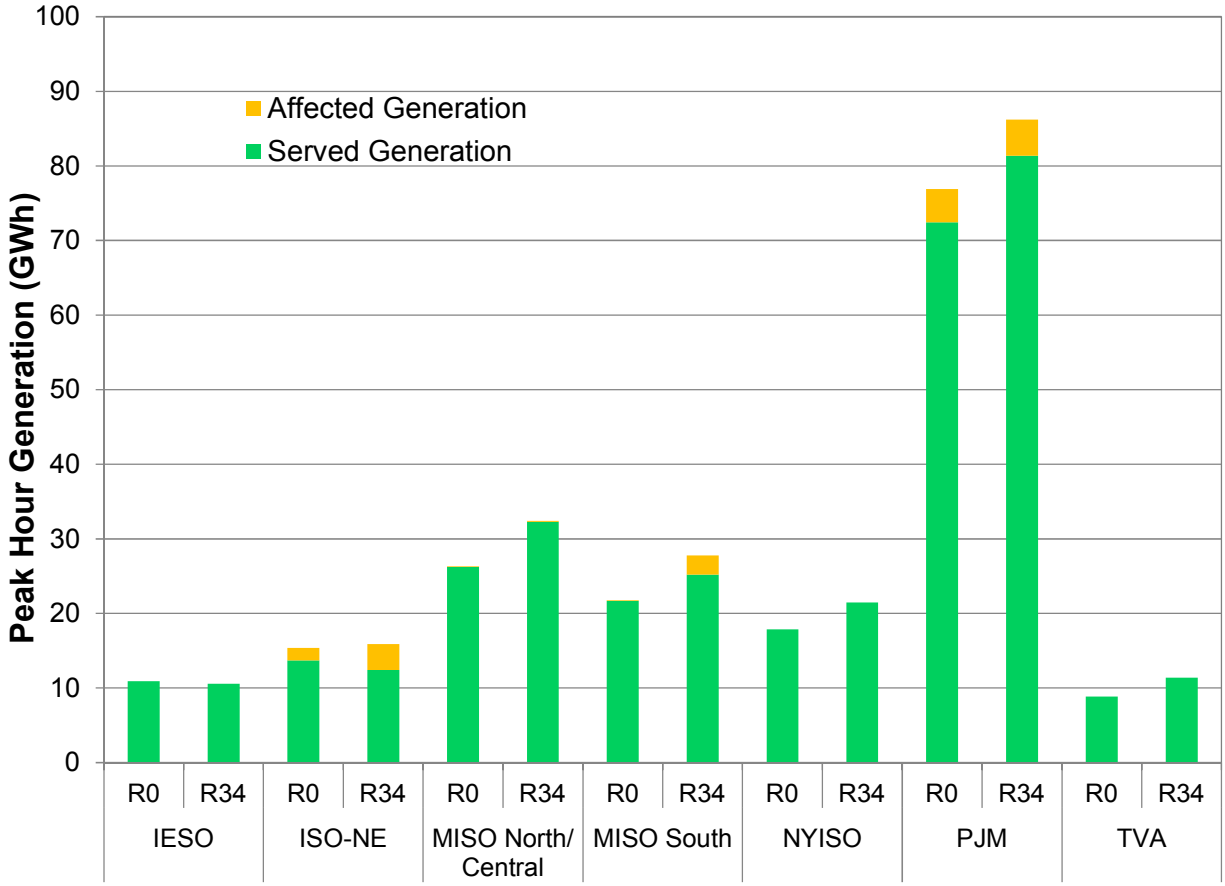


Figure Q26 summarizes the unserved demand by GPCM location. The unserved demand and affected generation by location are quantified in Table Q15.

Figure Q26. RGDS S34 Summer 2023: Locations with Peak Hour Affected Generation

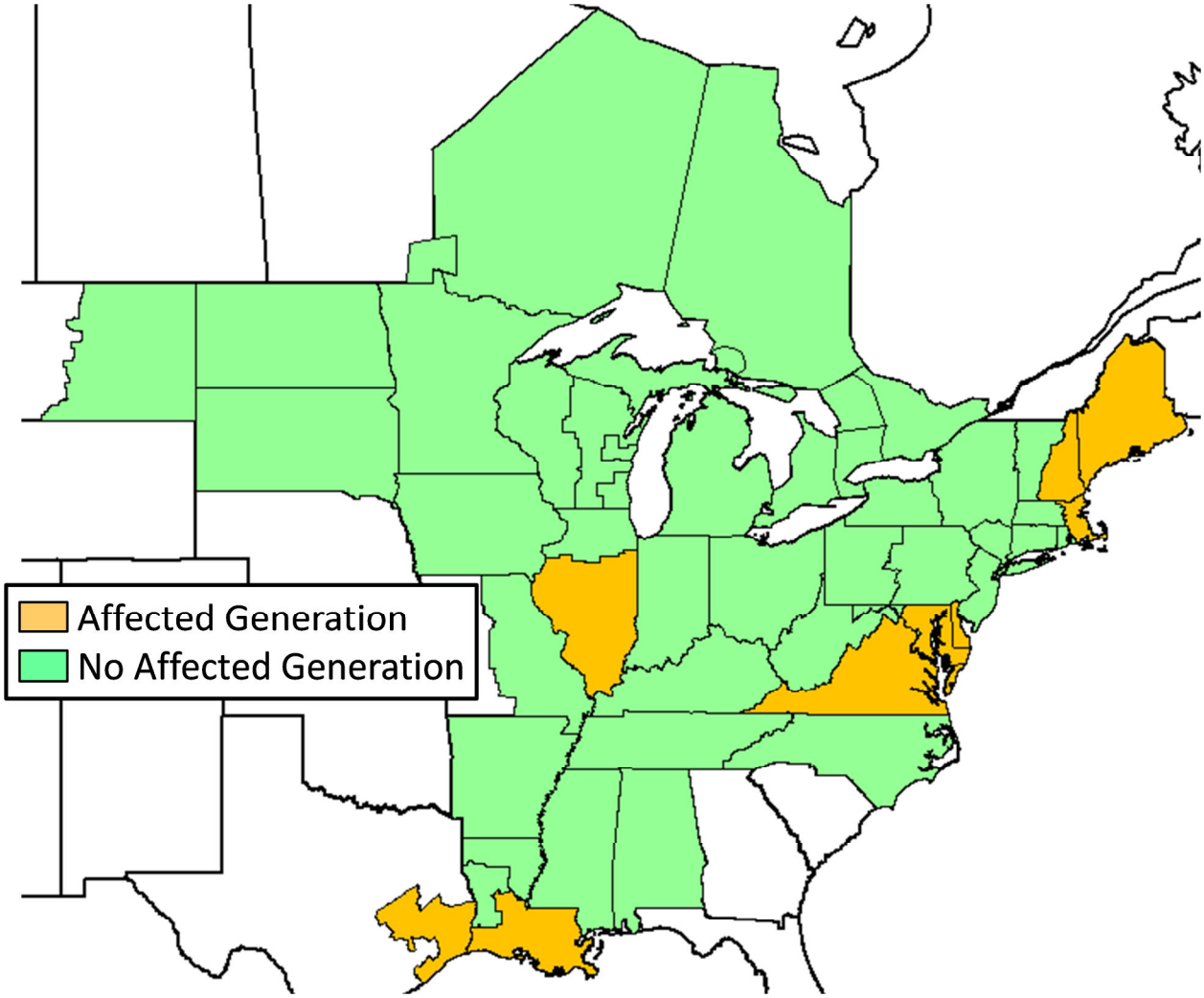


Table Q15. RGDS S34 Summer 2023: Peak Hour Unserved Generation Demand and Affected Generation

Location	Unserved Generation Gas Demand (MDth)	Affected Generation (MWh)
Delaware	9.4	1,255
Illinois Southern	1.0	112
Louisiana Southern	24.5	2,514
Maine	10.5	1,357
Maryland Eastern	16.7	2,361
Massachusetts Eastern	5.6	657
New Hampshire	12.3	1,480
Texas East (SERC)	0.6	81
Virginia	11.1	1,208

Figure Q27 shows the constrained pipeline segments, in red, that result in the affected generation shown in Figure Q25 during the Summer 2023 peak hour.

Figure Q27. RGDS S34 Summer 2023: Peak Hour Constraints

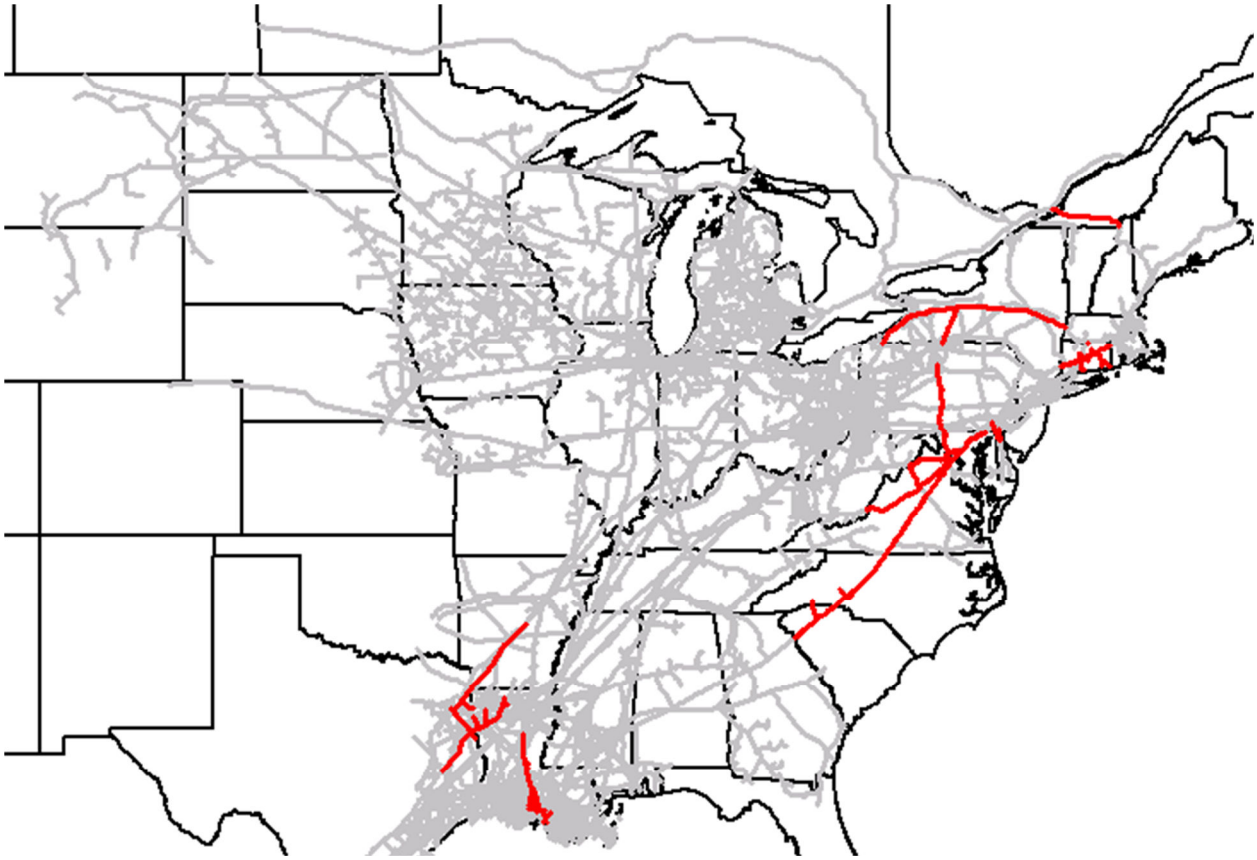


Table Q16 summarizes the results of the frequency and duration analysis.

Table Q16. RGDS S34 Summer 2023: Frequency and Duration of Constraints

Constraint	# of Events	Min. Duration (Days)	Max. Duration (Days)	Total # of Days
Algonquin Connecticut	7	1	22	54
Columbia Gas VA/MD	9	3	24	80
Dominion Southeast	2	18	73	91
Eastern Shore	8	1	24	80
Gulf South Zone 2 HH	1	92	92	92
NB/NS Supply	3	2	82	90
Tennessee Z5 NY	8	1	10	32
Texas Eastern ETX	9	1	18	58
TransCanada Quebec to PNGTS	3	2	81	89
Transco Z5	10	1	24	76

2.4.1 Algonquin Connecticut

The 100% peak hour utilization on Algonquin's Connecticut segment, which is modeled with a capacity of 1,827 MDth/d, potentially affects generators directly connected to Algonquin in

Connecticut, Massachusetts and Rhode Island, generators directly connected to M&N in Maine and New Hampshire, and generators served by LDCs connected to Algonquin and M&N. The locations of these generators are shown in Figure 111 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R263 and Figure R264 relative to the capacity of the segment.

2.4.2 Columbia Gas Virginia / Maryland

The 100% peak hour utilization on Columbia Gas's Virginia/Maryland segment, which is modeled with a capacity of 2,867 MDth/d, potentially affects generators directly connected to Columbia in Maryland and Virginia; generators behind LDCs served by Columbia Gas in Maryland and Virginia; and generators served by Dominion Cove Point downstream of interconnections with Columbia Gas. The locations of these generators are shown in Figure 80 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R265 and Figure R266 relative to the capacity of the segment.

2.4.3 Dominion Southeast

Dominion Southeast is modeled with a capacity of 540 Mdth/d. The 100% peak hour utilization on Dominion's Southeast segment serving Virginia and Maryland potentially affects generators directly served by Dominion, generators behind LDCs served by Dominion, and generators served by Dominion Cove Point via interconnect. The locations of these generators are shown in Figure 85 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R267 and Figure R268 relative to the capacity of the segment.

2.4.4 Eastern Shore

Eastern Shore is modeled with a capacity of 208 MDth/d. The 100% peak hour utilization rate on Eastern Shore's Receipt Zone 1 and Delivery Zone 2 potentially affects generators on the Delmarva Peninsula that are served by Eastern Shore. The locations of these generators are shown in Figure 87 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segments are shown in Figure R269 and Figure R270 relative to the capacity of the segments.

2.4.5 Gulf South Zone 2 Henry Hub

The 100% peak hour utilization on the Henry Hub segment of Gulf South Zone 2, which is modeled with a capacity of 700 MDth/d, potentially affects generators directly connected to Gulf South in Louisiana, and generators behind LDCs served by Gulf South in Louisiana. The locations of these generators are shown in Figure D15.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R271 and Figure R272 relative to the capacity of the segment.

2.4.6 New Brunswick Supply / Nova Scotia Offshore Supply

Total supplies from New Brunswick and Nova Scotia Offshore are capped at approximately 283 MDth/d in 2023. This limitation potentially affects generators directly connected to M&N in Maine and New Hampshire as well as generators located behind LDCs served by M&N in Maine. The locations of these generators are shown in Figure 90 of the report. Generators located in the Canadian Maritimes would also be affected by this supply constraint, but have not been included in the summary results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the supply limitation are shown in Figure R273 and Figure R274 relative to the total production capacity. The electric demand data set in these figures includes only gas demand at generators in the Study Region, demand from non-Study Region generators is not accounted for.

2.4.7 Tennessee Zone 5 New York

Tennessee Zone 5 New York is modeled with a capacity of 1,189 MDth/d. The 100% peak hour utilization on Tennessee's Z5 New York segment potentially affects generators directly connected to Tennessee in upstate New York, Massachusetts, Rhode Island and New Hampshire; generators behind LDCs served by Tennessee in upstate New York, Massachusetts, Connecticut and Rhode Island; and generators served by Iroquois, Granite State and PNGTS either directly or behind an LDC. The locations of these generators are shown in Figure 92 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R275 and Figure R276 relative to the capacity of the segment.

2.4.8 Texas Eastern Zone ETX

The 100% peak hour utilization on Texas Eastern's East Texas segment, which is modeled with a capacity of 623 MDth/d, potentially affects generators directly connected to Texas Eastern in Texas, Arkansas and Illinois. The locations of these generators are shown in Figure 104 of the report.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R277 and Figure R278 relative to the capacity of the segment.

2.4.9 TransCanada Quebec to PNGTS

TransCanada's Quebec to PNGTS segment is modeled with a capacity of 270 MDth/d. The 100% peak hour utilization on this segment potentially affects generators served by PNGTS, North Country and Vermont Gas. The locations of these generators are shown in Figure D13.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R279 and Figure R280 relative to the capacity of the segment.

2.4.10 Transco Zone 5

Transco Zone 5 is modeled with a capacity of 3,967 MDth/d. The 100% peak hour utilization on Transco's Zone 5 segment potentially affects Study Region generators directly connected to Transco in Virginia and generators behind LDCs served by Transco in North Carolina and Virginia. The locations of these generators are shown in Figure 98 of the report. Non-Study Region generators in North Carolina and South Carolina could also be affected, but are not included in the results shown below.

The seasonal daily forecasts of RCI and generator gas demand downstream of the constrained segment are shown in Figure R281 and Figure R282 relative to the capacity of the segment.