



Energy and Environmental Analysis, Inc.
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NYSERDA Much Colder Than Normal Weather Combination Case Results

December 2009

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Sensitivity Assumptions for Combination Case

- Case assumes temperatures from the years 1976-1977, the coldest winter on record, occur in the forecast years 2017-2018.
- Average monthly and peak day power generation gas demand are based on GEMAPS results provided by NYSERDA.
 - In addition to the much colder than normal weather conditions, GEMAPS also assumes:
 - Indian Point Nuclear is retired and replaced with gas-fired units.
 - Residual oil burning units are re-powered to burn natural gas.
 - Electricity imports into New York from Canada are reduced due to weather conditions.
 - These additional assumptions increase power generation gas demand to roughly double the levels in the original Much Colder Than Normal Weather case.

Peak Day Power Generation Gas Consumption

Region	Much Colder Than Normal Weather				Combination Case			
	Firm	Interruptible	Total	Percent	Firm	Interruptible	Total	Percent
Upstate East	41	158	199	31%	13	75	89	7%
Upstate West	44	0	44	7%	28	0	29	2%
Downstate	<u>347</u>	<u>56</u>	<u>403</u>	<u>62%</u>	<u>855</u>	<u>345</u>	<u>1,200</u>	<u>91%</u>
Total New York	432	215	646	100%	897	421	1,317	100%

Caveats for the Much Colder Than Normal Weather Analysis

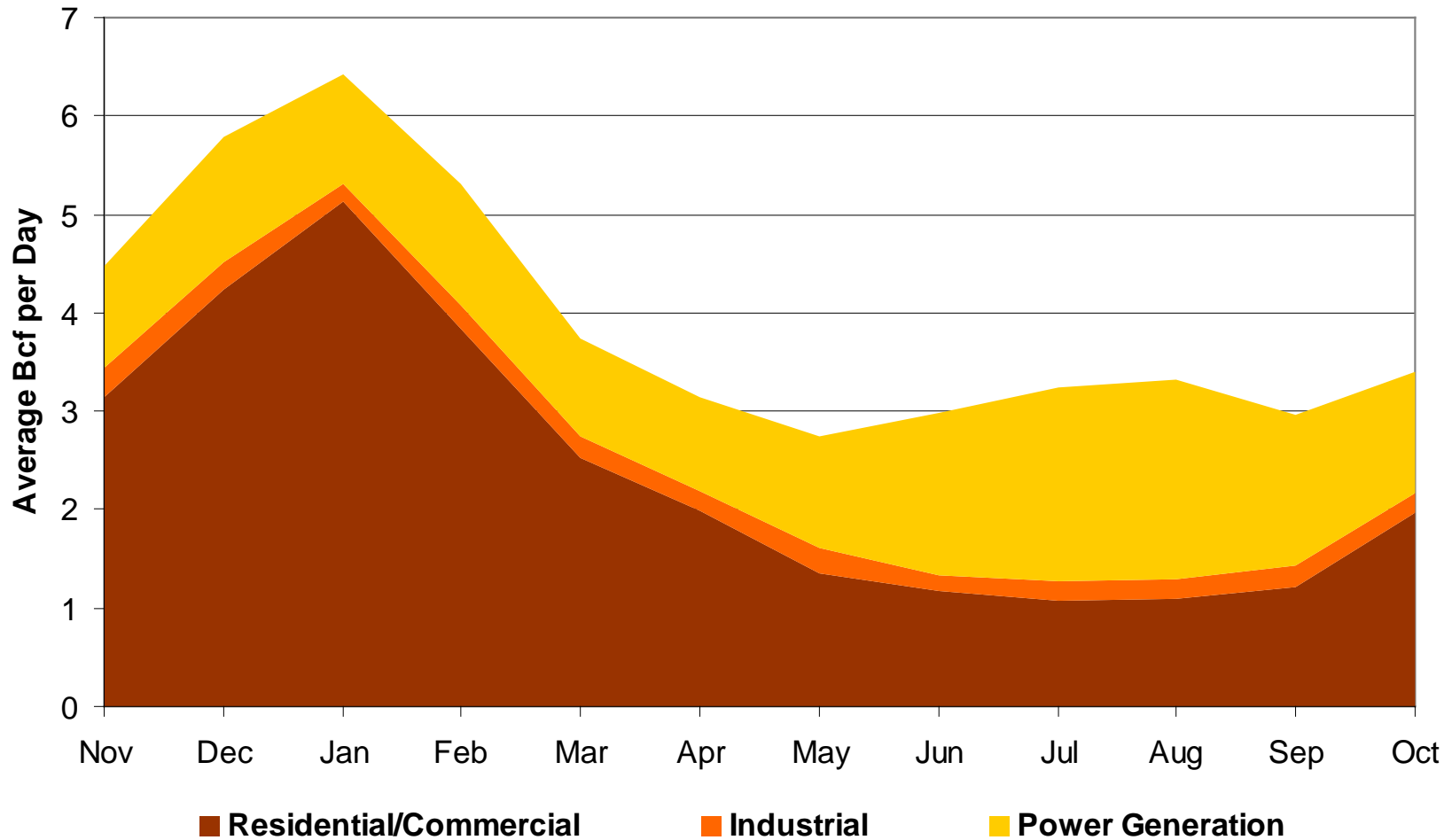
This analysis of the impacts of much colder than normal weather on the natural gas pipeline system is dependant on a number of assumptions that lessen the impacts on gas consumers in New York and New England.

- In the Much Colder Than Normal Weather cases, Iroquois flows nearly full from the Canadian border. However, there may not be that much gas available under Much Colder Than Normal weather conditions due to either pipeline constraints at Parkway or gas supply constraints in eastern Canada.
- The RIAMS model optimizes the use of storage to help meet peak day demands. In the real world, storage withdrawals and the use of peak-shaving plants would not necessarily be optimally timed throughout the month. The projection, therefore presents the greatest possible volume that can be available and there would likely be less storage withdrawals available on peak days.
- One of the ways the GMM responds to increased gas demand and gas prices is to increase the volume of LNG imports into New England and Eastern Canada. While LNG imports may increase in response to Much Colder Than Normal weather, there may be less additional LNG available, or additional supplies may not be delivered when they are most needed. A delay of days or weeks in obtaining shipments would result in a more constrained market.
- Much Colder Than Normal weather can also have an impact on the ability to deliver fuels to consumers. Much Colder Than Normal cold can disrupt oil deliveries and therefore limit the amount of gas-to-oil switching at power plants. Moreover, the analysis assumes that on-site fuel inventories are intact and available.

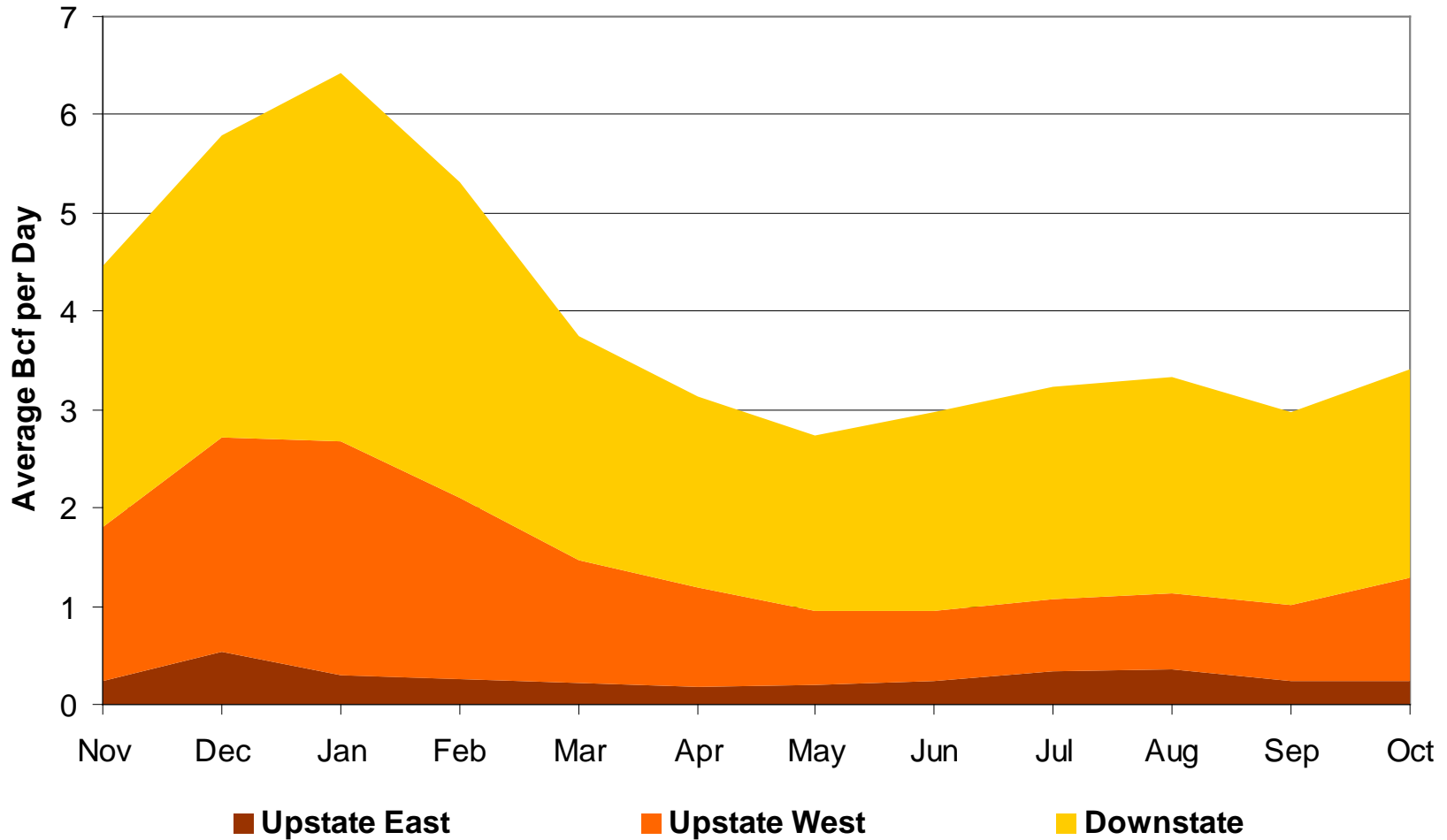
Due to these and other factors, the projections for unmet demands in this analysis should be viewed as the minimum levels of demand disruption.

RIAMS Results

Seasonal Consumption by Sector: 2017 -2018



Seasonal Consumption by Region: 2017 -2018

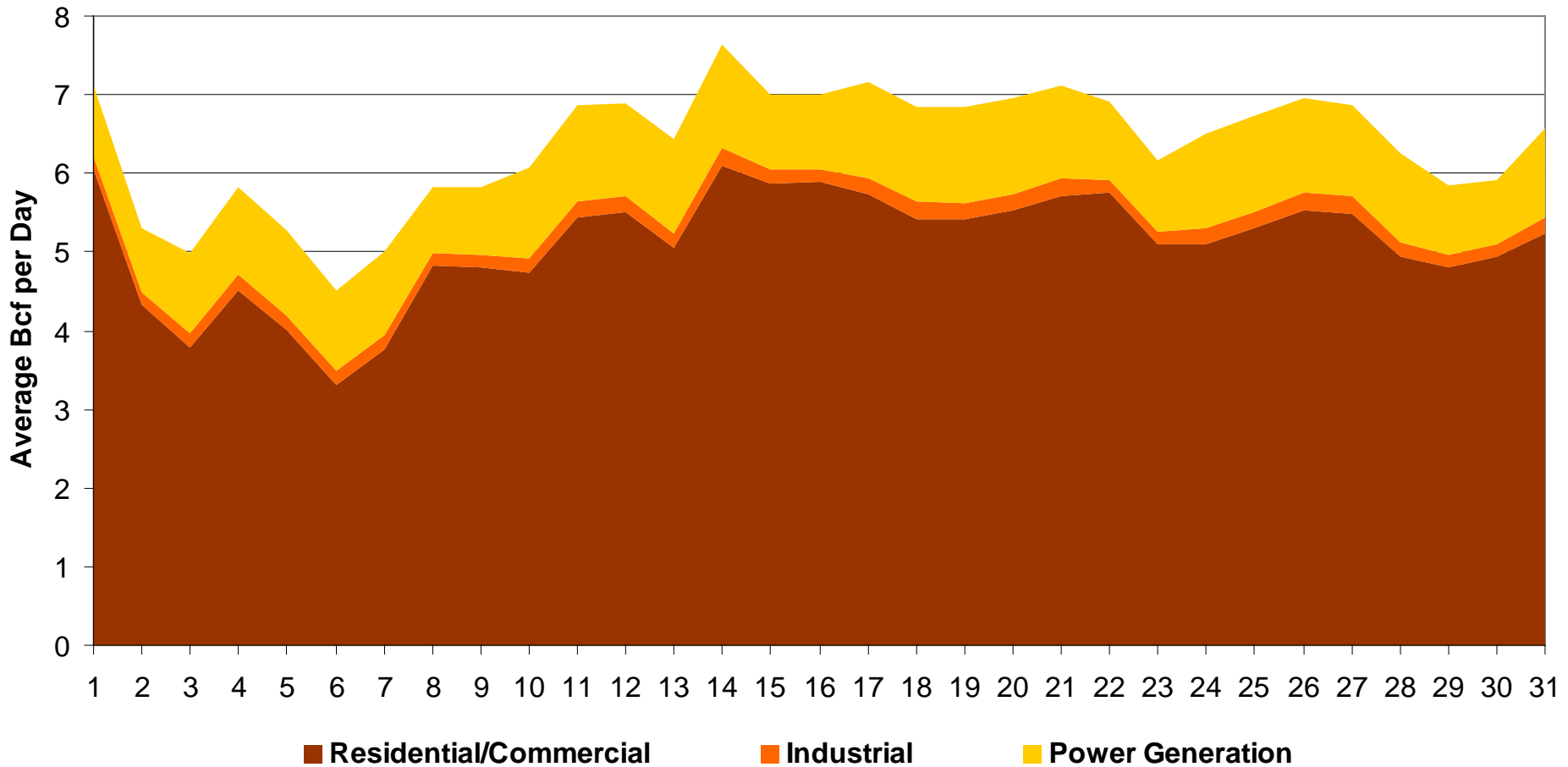


Daily RIAMS Conditions

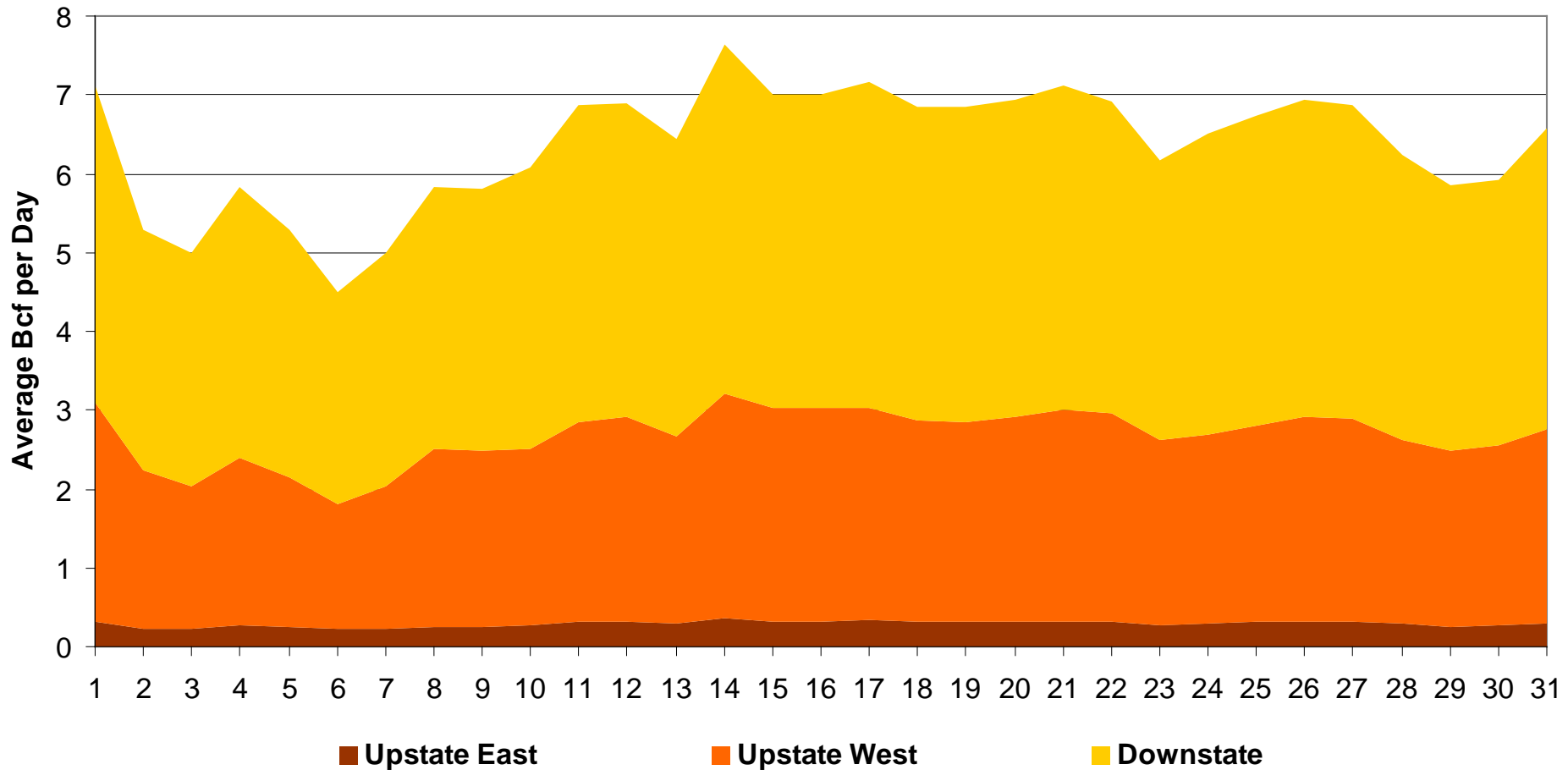
Assumed temperatures for the peak winter day are the same as in the Much Colder Than Normal Weather Case:

- New York City is 2 degrees Fahrenheit on the peak gas demand day, 3 degrees colder than the average peak day.
 - Average temperature for the month is 22 degrees, 11 degrees colder than an average January.
- Buffalo is -5 degrees Fahrenheit on the peak gas demand day, 2 degrees colder than the average peak day.
 - Average temperature in January is 14 degrees, 11 degrees colder than an average January.

Daily Consumption by Sector: Jan 2018



Daily Consumption by Region: Jan 2018



New York Gas Peak and Average Day Imports/Exports (MMcfd)



Location	Case	Capacity	Peak Day	Avg Day
Algonquin Exports to CT	MCTN	1,375	1,293	982
	Combo	1,375	901	808
Algonquin Imports from NJ	MCTN	1,069	1,069	907
	Combo	1,069	1,070	983
Columbia Imports from Western PA	MCTN	45	18	16
	Combo	45	18	20
Dominion Imports from Western PA	MCTN	1,600	868	700
	Combo	1,600	906	773
Empire State Receipts from Transcanada	MCTN	820	475	243
	Combo	820	475	247
Iroquois Net Exports to CT	MCTN	1,000	323	311
	Combo	1,000	208	274
Iroquois Deliveries to New York City	MCTN	778	622	375
	Combo	778	778	435
Iroquois Receipts from Transcanada	MCTN	1,195	1,182	789
	Combo	1,195	1,184	801
Millennium Deliveries to New York City	MCTN	167	157	31
	Combo	167	167	104
National Fuel Imports from PA	MCTN	385	222	151
	Combo	385	231	171
National Fuel Receipts from Transcanada	MCTN	426	101	52
	Combo	426	101	53
Tennessee Exports to MA	MCTN	1,318	980	446
	Combo	1,318	1,222	513
Tennessee Imports from NJ	MCTN	377	308	69
	Combo	377	377	91
Tennessee Imports from Western PA	MCTN	773	439	339
	Combo	773	464	362
Tennessee Receipts from Transcanada	MCTN	1,050	261	133
	Combo	1,050	261	135
Texas Eastern Downstate Deliveries	MCTN	705	705	247
	Combo	705	705	317
Transco NJ to Long Is & Staten Is	MCTN	689	578	248
	Combo	689	578	308
Transco NJ to Manhattan	MCTN	1,007	1,007	750
	Combo	1,007	1,007	852

New York Monthly Average Gas Imports/Exports



Location	Case	Capacity	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Algonquin Exports to CT	MCTN	1,375	1,138	1,361	1,130	1,175	1,038	1,065	746	718	825	825	723	1,054
	Combo	1,375	967	1,318	876	894	907	887	631	563	591	591	600	876
Algonquin Imports from NJ	MCTN	1,069	1,069	1,069	928	1,069	1,069	1,067	758	726	671	670	731	1,069
	Combo	1,069	1,070	1,070	1,070	1,070	1,070	1,000	853	847	895	933	856	1,070
Columbia Imports from Western PA	MCTN	45	18	18	18	18	18	18	18	18	9	9	9	18
	Combo	45	25	18	18	18	27	26	18	18	9	18	18	27
Dominion Imports from Western PA	MCTN	1,600	840	840	825	840	843	657	640	640	537	520	563	669
	Combo	1,600	960	960	840	1,008	888	705	640	640	614	624	640	780
Empire State Receipts from Transcanada	MCTN	820	114	542	475	364	113	109	109	121	380	350	118	109
	Combo	820	114	542	475	364	113	113	113	125	396	365	123	113
Iroquois Net Exports to CT	MCTN	1,000	600	687	362	645	601	258	-	-	85	116	-	400
	Combo	1,000	548	404	448	457	609	264	-	-	123	104	-	336
Iroquois Deliveries to New York City	MCTN	778	381	225	602	311	311	311	428	245	617	489	399	165
	Combo	778	438	519	540	514	323	347	454	275	616	528	421	241
Iroquois Receipts from Transcanada	MCTN	1,195	1,177	1,065	1,188	1,150	957	605	456	299	784	718	467	623
	Combo	1,195	1,180	1,064	1,189	1,151	959	629	474	308	808	734	484	648
Millennium Deliveries to New York City	MCTN	167	56	102	99	89	25	-	-	-	-	-	-	-
	Combo	167	115	115	167	167	82	91	41	86	96	80	95	114
National Fuel Imports from PA	MCTN	385	154	154	154	154	200	154	154	154	154	77	154	154
	Combo	385	228	212	154	231	231	154	154	154	77	154	154	155
National Fuel Receipts from Transcanada	MCTN	426	25	119	101	78	24	23	23	26	82	76	25	23
	Combo	426	25	119	101	78	24	24	24	27	84	78	26	24
Tennessee Exports to MA	MCTN	1,318	565	821	935	788	453	398	201	118	239	234	235	379
	Combo	1,318	695	1,029	1,071	1,057	468	380	162	127	268	311	204	417
Tennessee Imports from NJ	MCTN	377	66	66	141	66	66	66	66	54	55	55	59	66
	Combo	377	66	141	289	66	66	66	66	66	66	66	66	66
Tennessee Imports from Western PA	MCTN	773	395	395	381	395	395	345	309	309	240	246	288	375
	Combo	773	395	448	395	464	424	395	309	309	240	240	309	419
Tennessee Receipts from Transcanada	MCTN	1,050	61	291	261	200	62	60	60	66	211	195	65	60
	Combo	1,050	61	291	261	200	62	62	62	69	218	201	67	62
Texas Eastern Downstate Deliveries	MCTN	705	282	564	565	477	282	141	88	147	-	141	-	282
	Combo	705	423	656	705	564	282	282	141	142	61	141	141	282
Transco NJ to Long Is & Staten Is	MCTN	689	409	517	551	413	275	255	-	138	33	46	131	222
	Combo	689	437	551	578	472	338	204	138	276	138	138	138	294
Transco NJ to Manhattan	MCTN	1,007	962	1,007	1,007	1,007	790	604	468	604	621	640	579	724
	Combo	1,007	1,007	1,007	1,007	1,007	918	765	619	806	775	785	734	806

RIAMS Model Projections for Peak Day Unmet Gas Demand (MMcfd)



Peak Day Jan 2018	FIRM				INTERRUPTIBLE				TOTAL UNMET DEMAND			
	Power	Industrial	Residential/ Commercial	Total	Power	Industrial	Residential/ Commercial	Total	Power	Industrial	Residential/ Commercial	Total
Upstate East	0	0	0	0	-21	-4	-3	-27	-21	-4	-3	-27
Upstate West	0	0	-3	-3	0	-8	-6	-15	0	-9	-9	-17
Downstate	-24	-3	-41	-68	-182	-15	-64	-262	-207	-18	-105	-330
Total New York	-24	-3	-44	-71	-203	-28	-73	-303	-227	-31	-117	-375
New England	Not Broken Out Firm and Int				-61	-44	-414	-518	-61	-44	-414	-518
Total New York and New England	-24	-3	-44	-71	-264	-72	-486	-821	-288	-75	-530	-893

- About 900 MMcfd of unmet demand on a peak day.
 - 58% of unmet demand is in New England.
 - Remaining 42% of unmet demand (375 MMcfd) is in New York State.
 - Nearly 90% of New York’s unmet demand (330 MMcfd) is Downstate.
 - About 19% of New York’s unmet demand (71 MMcfd) is associated with Firm load.

RIAMS Model Conclusions

Much Colder Than Normal Weather Combination Case

- Compared to the Much Colder Than Normal Weather Case, average daily pipeline flows on most systems within New York are somewhat higher.
 - Millennium Deliveries to NYC are much higher on an average daily basis.
- Peak day flow on Algonquin to New England are lower, but that reduction is partially offset by an increase in flow on Tennessee to New England.
- Peak day throughput to downstate New York on Iroquois is up by over 150 MMcfd.
- Unmet demand of about 900 MMcf per day in New York and New England due to pipeline constraints.
 - There is about 140 MMcfd more unmet demand in New England than in New York.



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