New York ISO
Independent System Operator

System & Resource Outlook Update Appendix: Contract Case Results

Economic Planning Department

Electric System Planning Working Group

March 24, 2022

Base Case Update

- The NYISO previously presented values for Production Cost savings when constrained path are relaxed with reference to Base Case; the values were not reported correctly.
- Below are the corrected values for Production Cost Savings for each relaxed case relative to the Base Case

Relaxed Case	02/09 ESPWG PCS (2021 $M)	Updated PCS (2021 $M)
Dunwoodie - Long Island	65	36
Dunwoodie - Motthaven	30	1
Volney - Scriba	123	94
New Scotland - Knickerbocker	25	3
Sugarloaf - Ramapo	23	1

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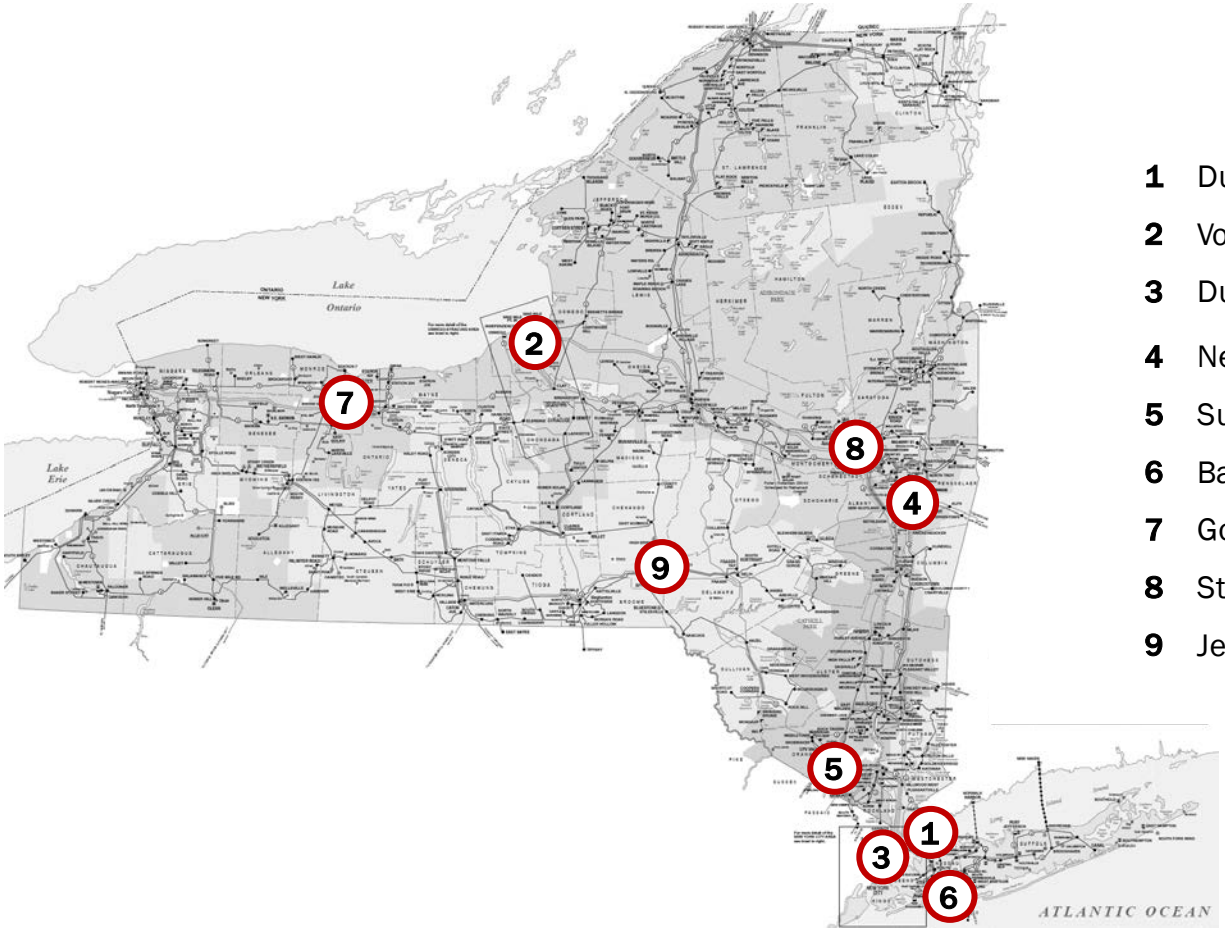

Constraints Evaluated

1. Dunwoodie – Long Island 345 kV
2. Volney – Scriba 345 kV
3. Dunwoodie – Motthaven 345 kV
4. New Scotland – Knickerbocker 345 kV
5. Sugarloaf – Ramapo 138 kV
6. Barrett – Valley Stream 138 kV
7. Golah – Mortimer 115 kV
8. Stoner – Rotterdam 115 kV
9. Jennison – Sidney 115 kV

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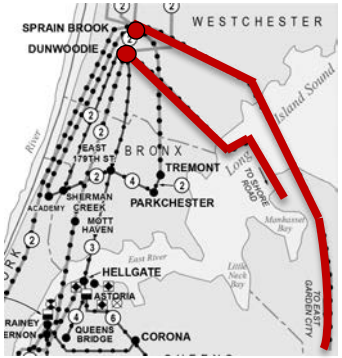
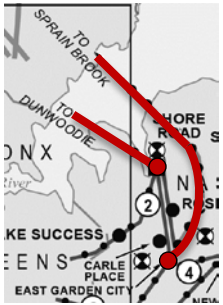
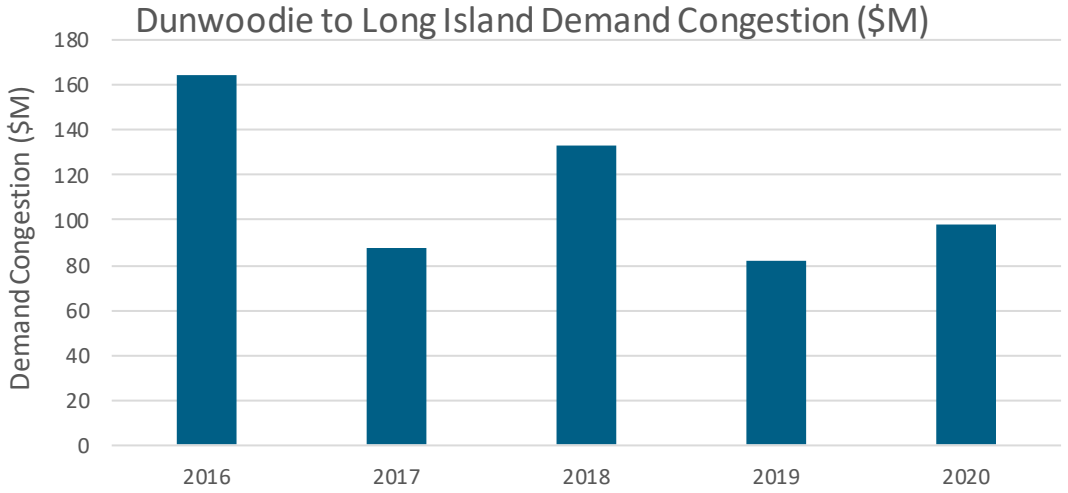
Dunwoodie – Long Island 345 kV

Transmission Information & Historic Congestion





	Y49	Y50
Type	Single Circuit 345kV	
Normal Op. Rating	637/693 MW	656/741 MW
Contingency Op. Rating	900/940 MW	916/977 MW
Length	~26 Miles	>10 Miles
Owner	NYPA	ConEd/LIPA



- **The congestion on this path is due to the outages of parallel lines.**

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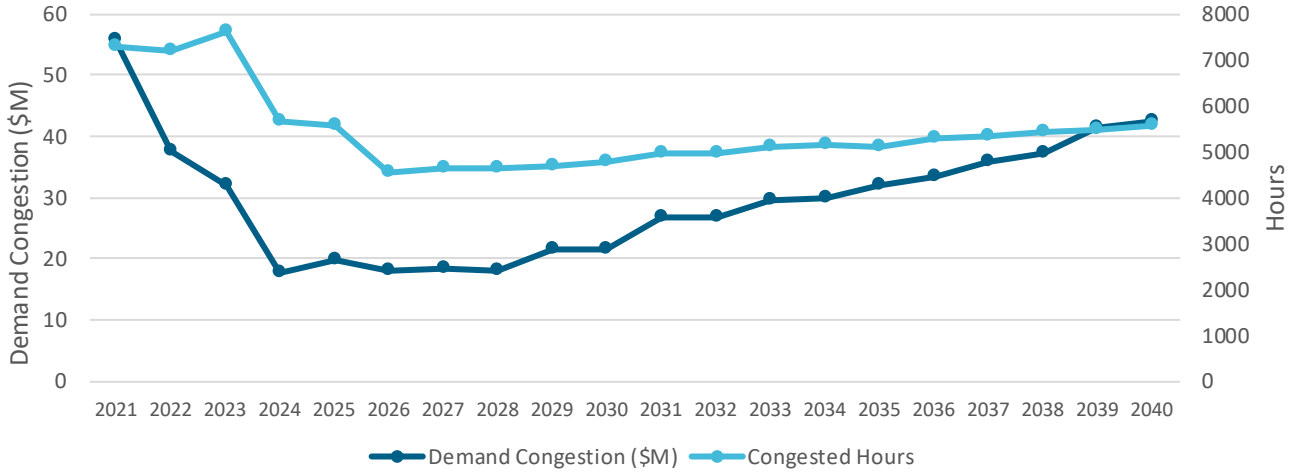
Dunwoodie – Long Island 345 kV

Transmission Information & Projected Congestion



- For 2021-2022, the series reactor on Y49 is in service all year-round, which causes heavy congestion on Y50.
- Starting 2023, the series reactor on Y49 is bypassed during summer, which reduces congestion on this path. Congestion is observed on both Y49 and Y50 instead of being concentrated on Y50 as in the first two years.

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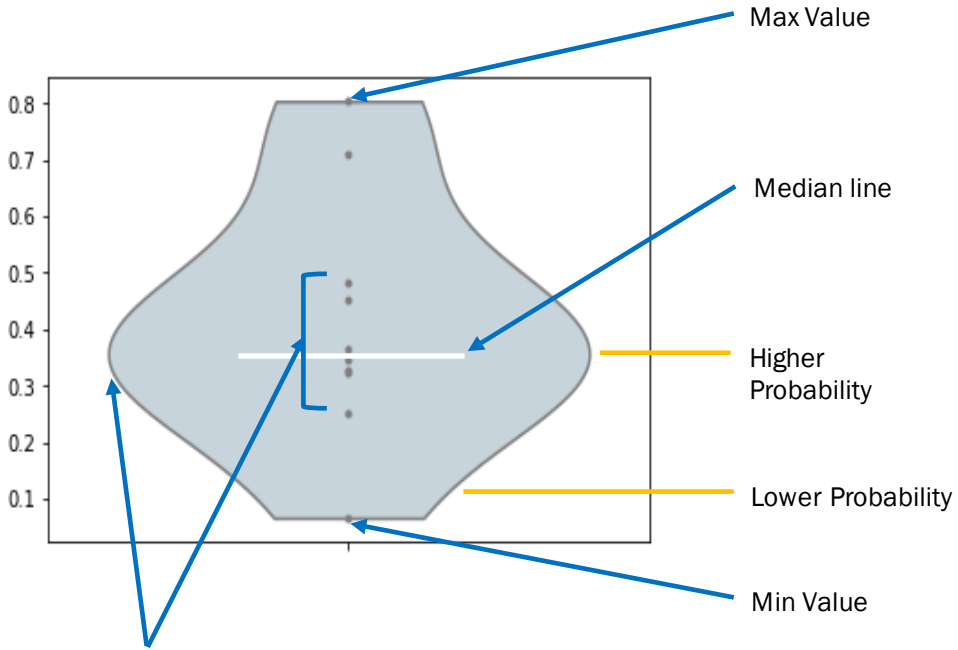
Violin Plot



Data Points that are closely grouped have larger kernel density estimate (KDE), which results in a bulge in the violin plot

- A violin plot is a hybrid of a box plot and a kernel density plot, which shows peaks in the data. It is used to visualize the distribution of numerical data. Unlike a box plot that can only show summary statistics, violin plots depict summary statistics and the density of each variable.
- The Kernel Density Estimate (KDE) shows the distribution shape of the underlying data.
- Wider sections of the violin plot represent a higher probability that members of the population will take on the given value; the skinnier sections represent a lower probability.
- Shaded area of the violin plot represents all the points in the population.

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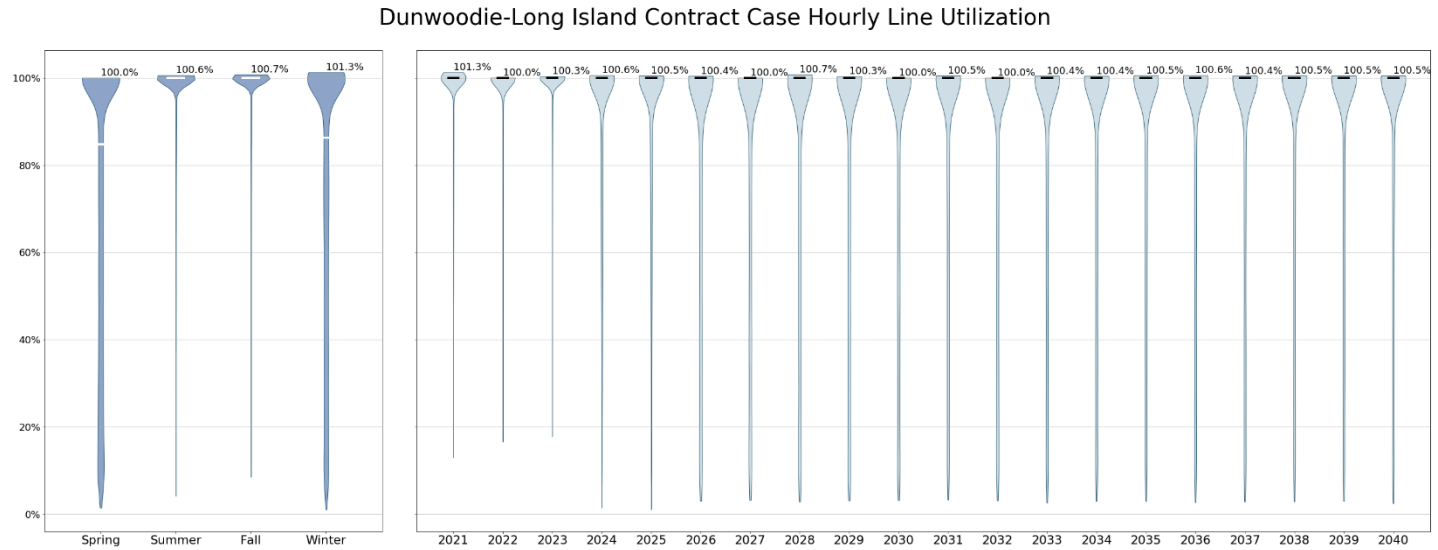
Dunwoodie – Long Island 345 kV



- The flow on this path is heavily utilized toward the facility limit throughout the year due to the price difference across this constraint.

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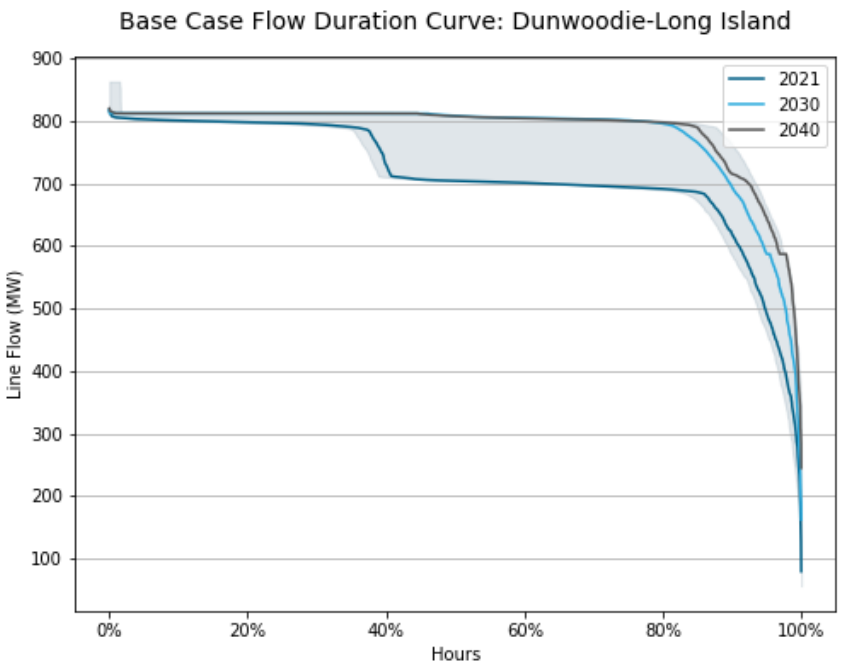
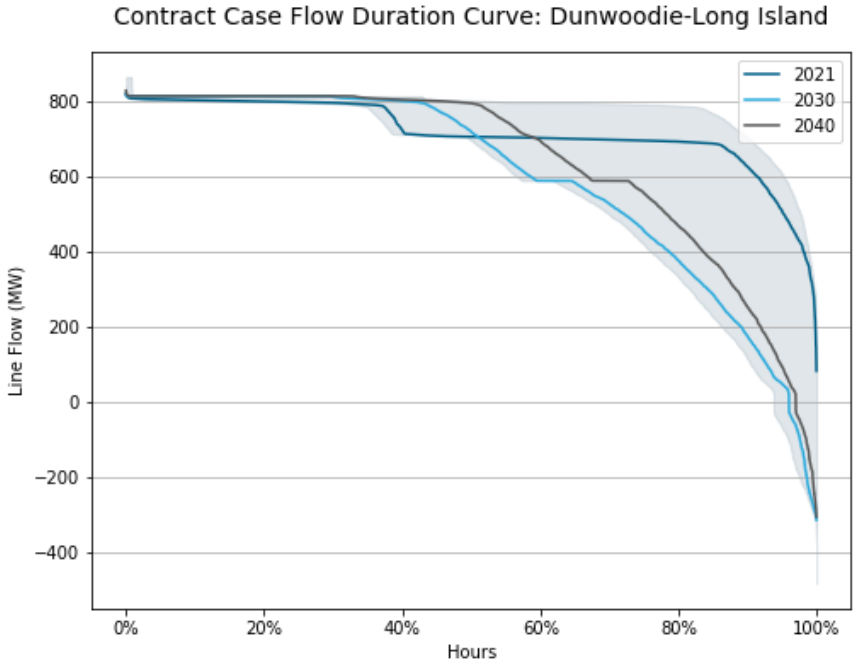
Dunwoodie – Long Island 345 kV





- Flows are lower in the Contract case as a result of Offshore wind injection into Long Island.

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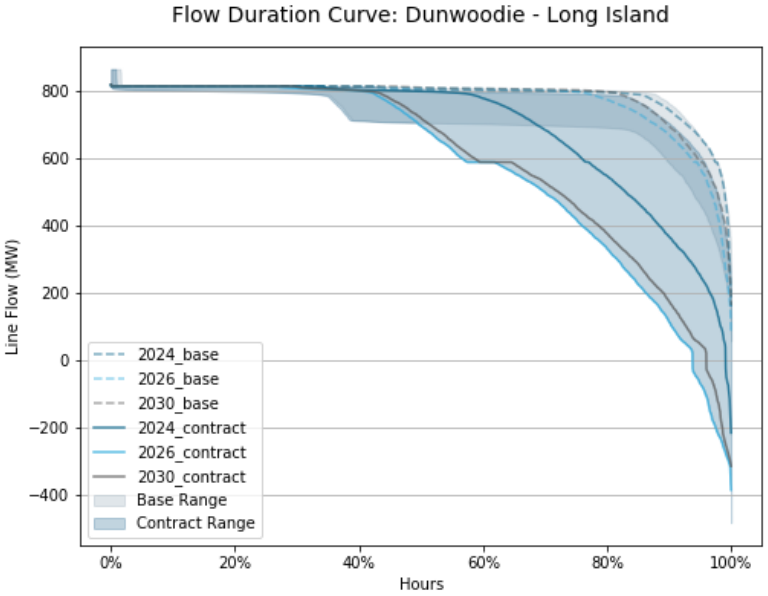
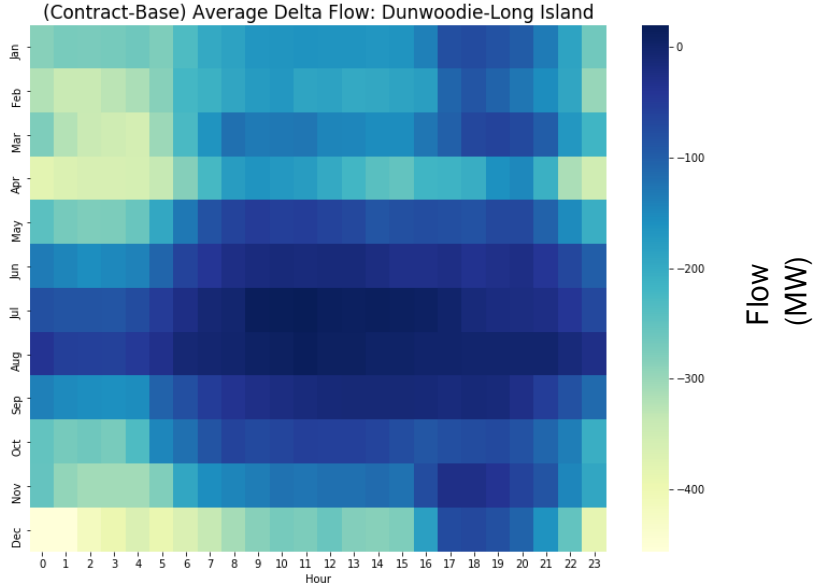
Dunwoodie – Long Island 345 kV

(Contract – Base) Flow Comparison





- Flows are lower in the Contract Case compared to the Base Case as a result of Offshore wind being modeled in Long Island in the Contract Case.

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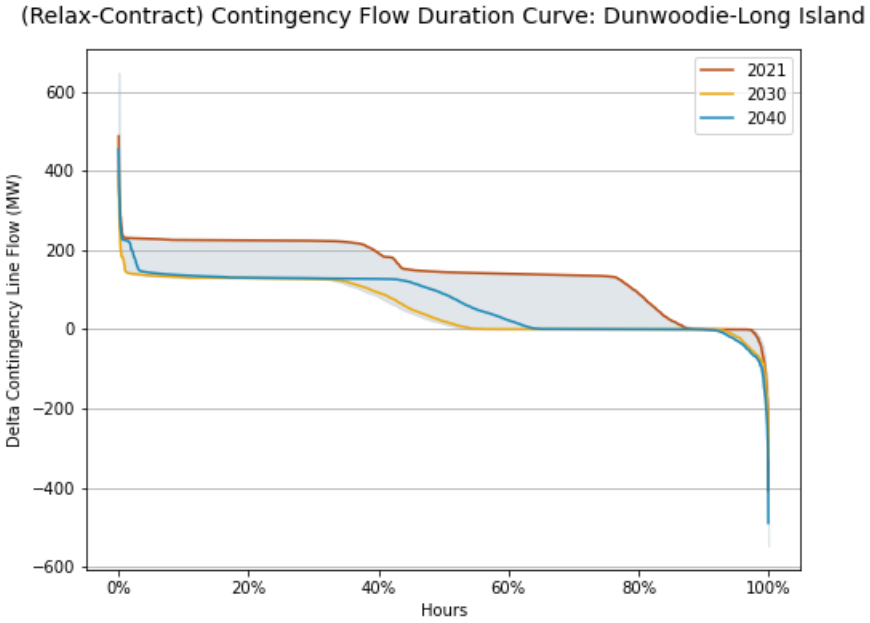
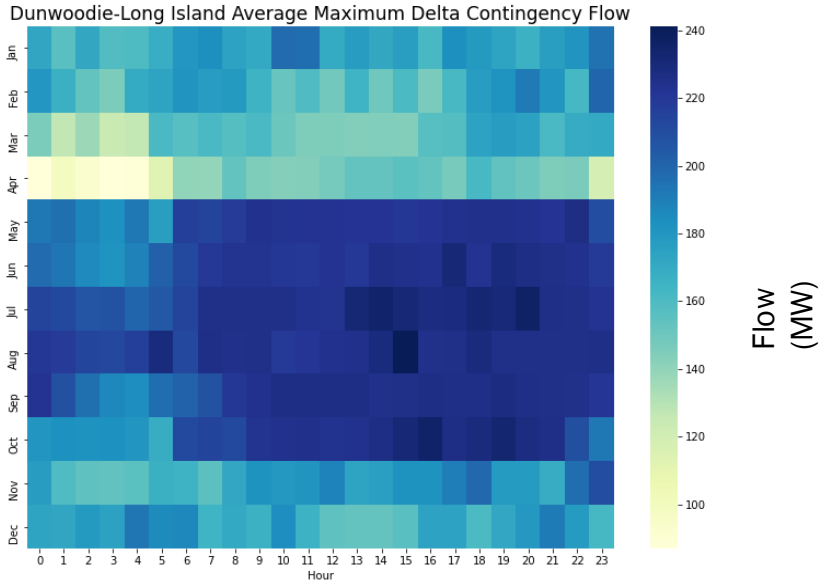
Dunwoodie – Long Island 345 kV

(Relax – Contract) Flow Comparison





- Interface flow increases especially during high peak hours.

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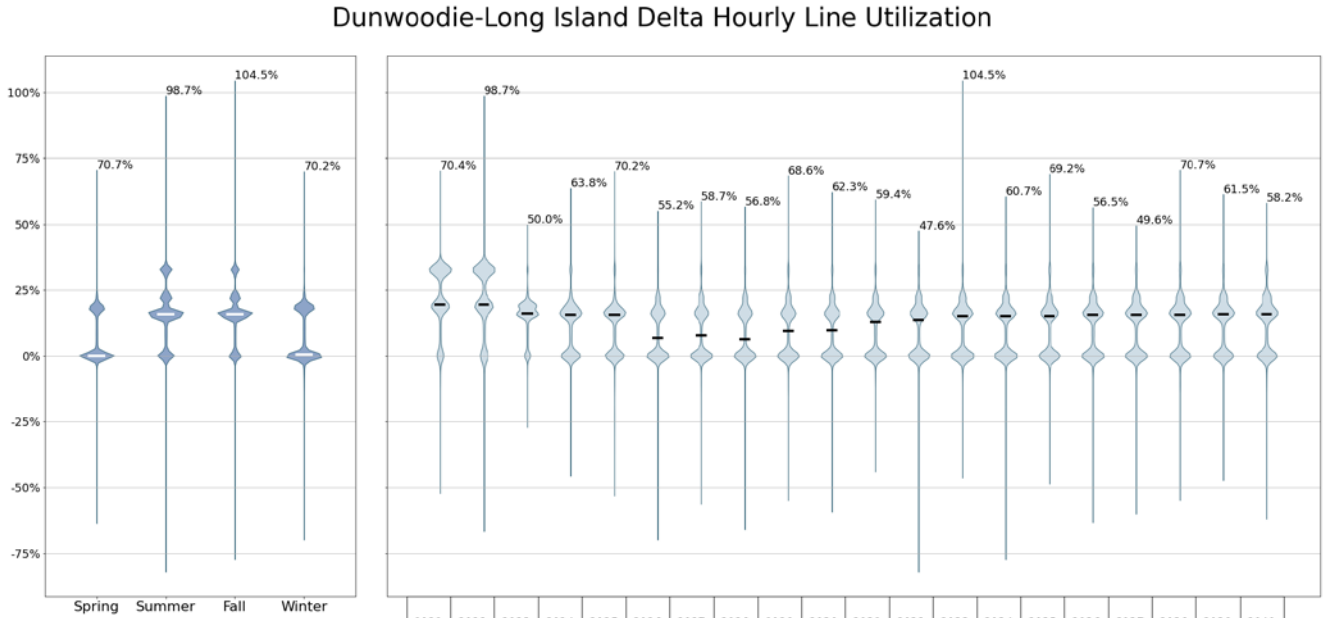
Dunwoodie – Long Island 345 kV



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	1294	1222	930	648	617	462	467	450	478	473	509	496	523	533	538	539	562	575	584	596

- Production Cost savings for relaxing this constraint is $21 million over 20 years.
- Relaxed case has on average approx. 20% increased flow.

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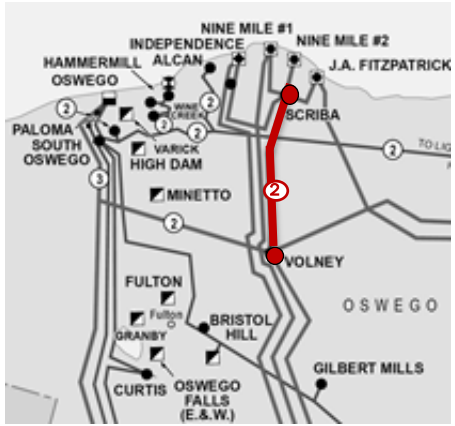
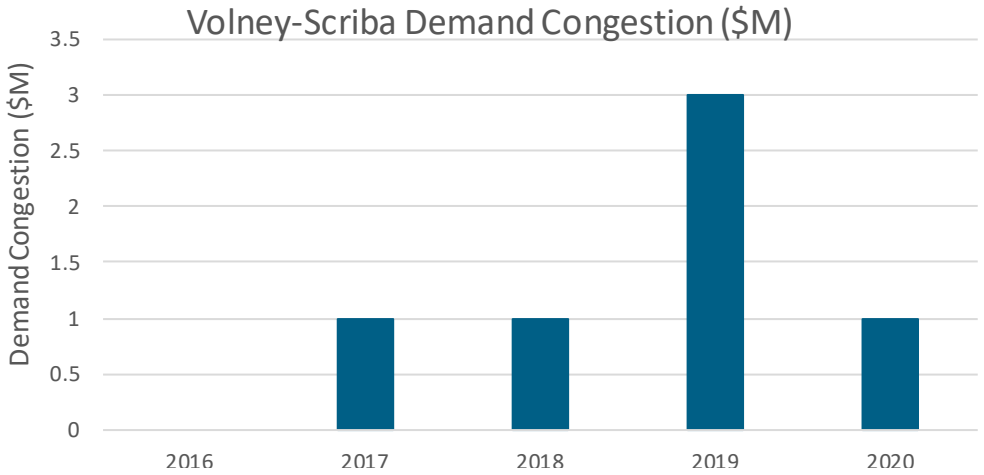
Volney - Scriba 345 kV

Transmission Information & Historic Congestion





Type	Single Circuit 345kV
Normal Op. Rating	1200/1474 MW
Contingency Op. Rating	1396/1626 MW
Length	~9 Miles
Owner	National Grid

- The two parallel 345kV lines have different ratings. Limiting constraints occur securing the line with the lower rating for loss of the other.

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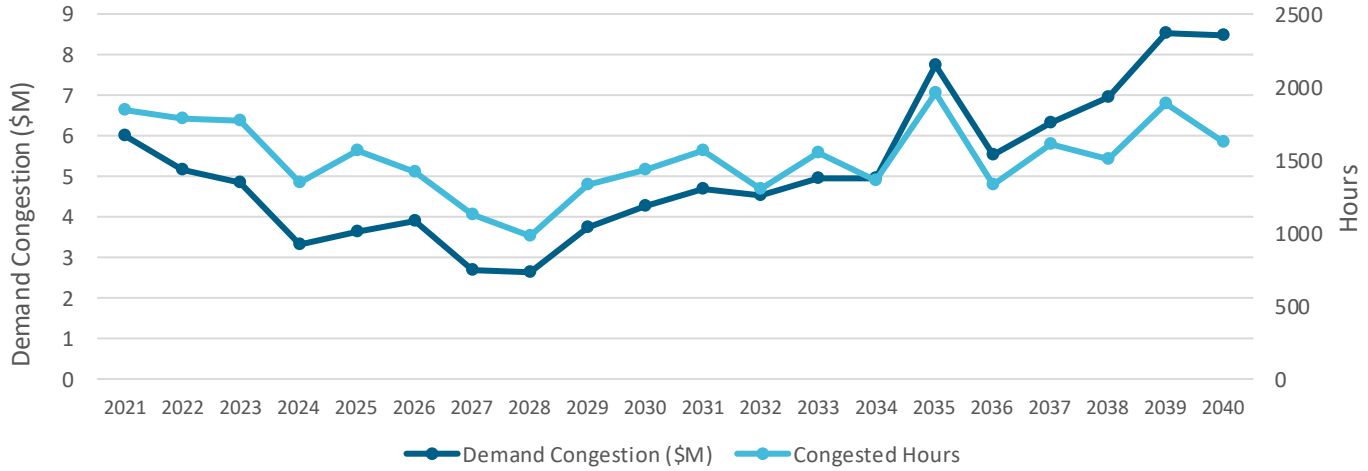
Volney - Scriba 345 kV

Transmission Information & Projected Congestion



- The driver for projected congestion is the same as historical congestion
- Resources in Oswego county located upstream of Volney-Scriba constraints are the primary driver of the congestion

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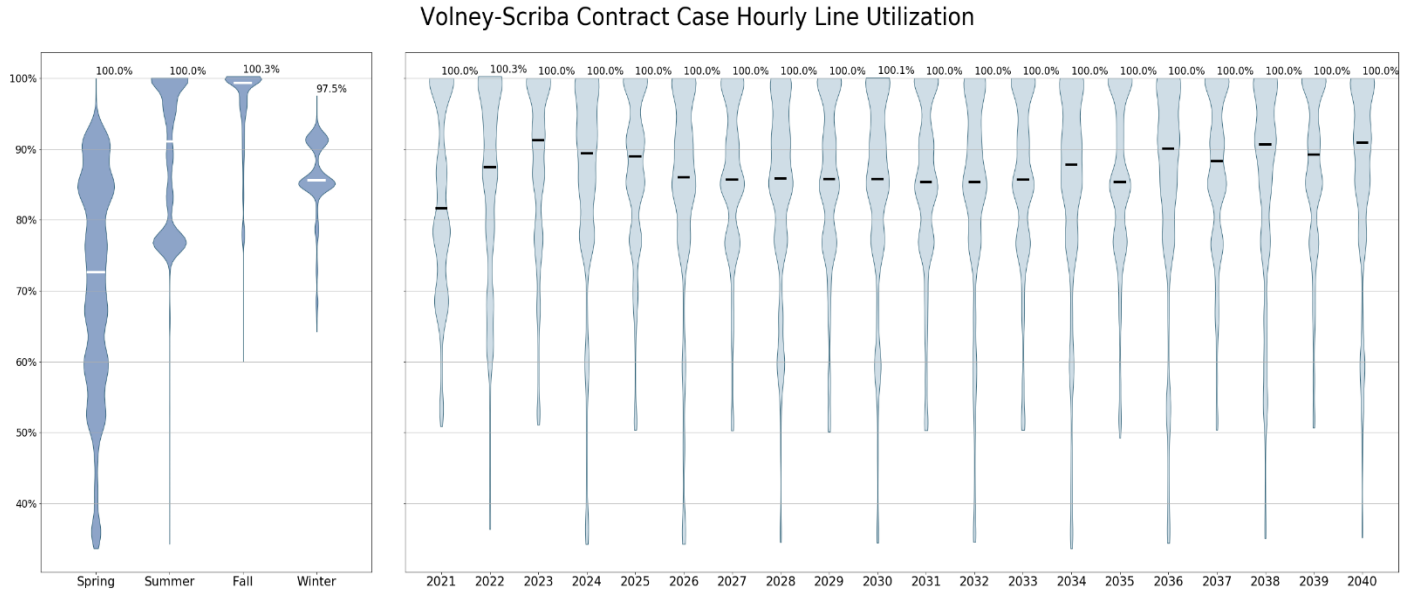
Volney - Scriba 345 kV



- Congestion primary occurs during the summer period when the seasonal rating is lower.
- This path is mostly congested during the summer and fall periods.

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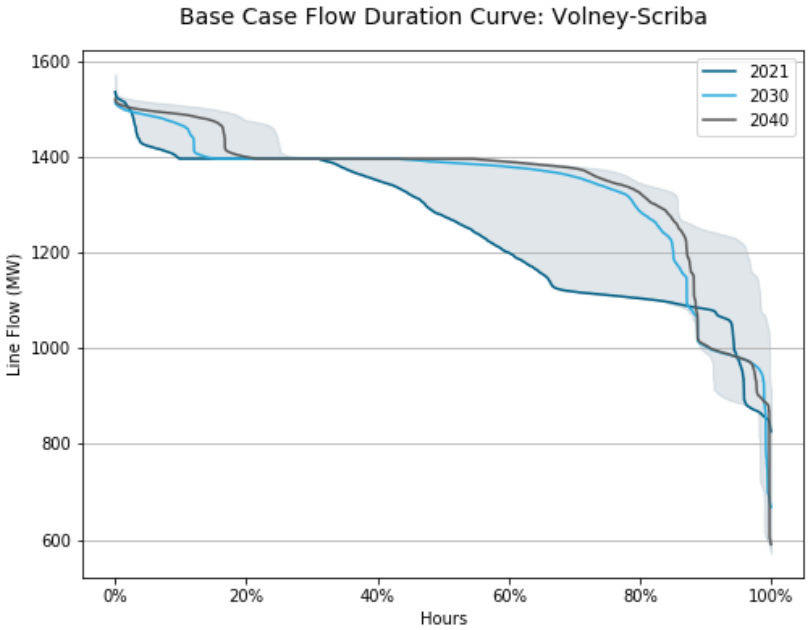
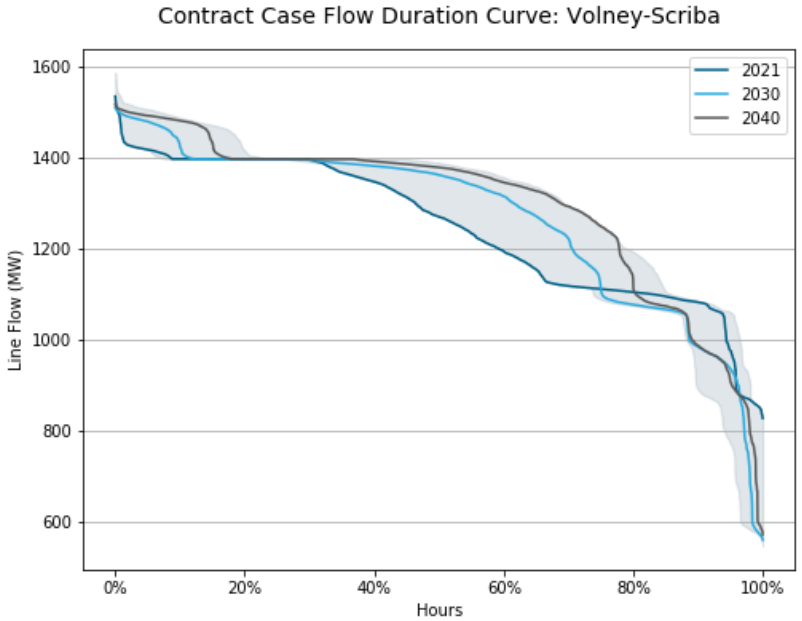
Volney - Scriba 345 kV





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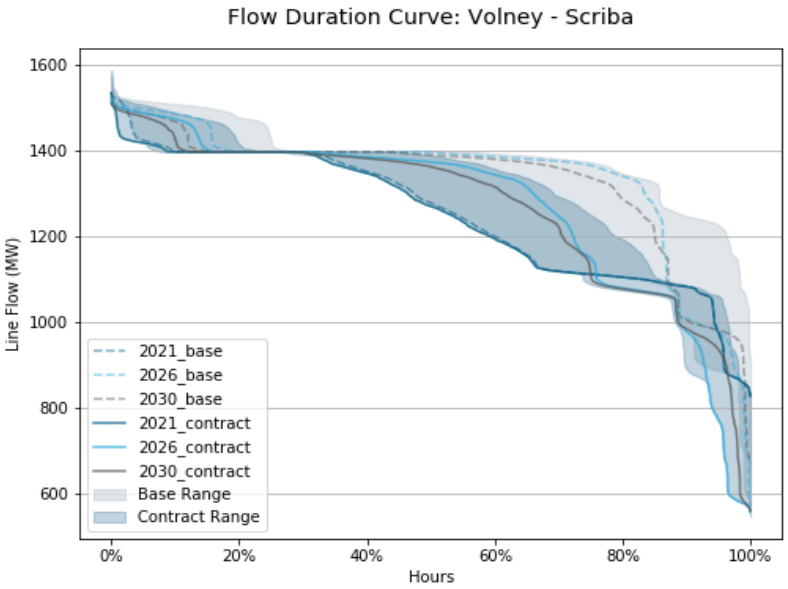
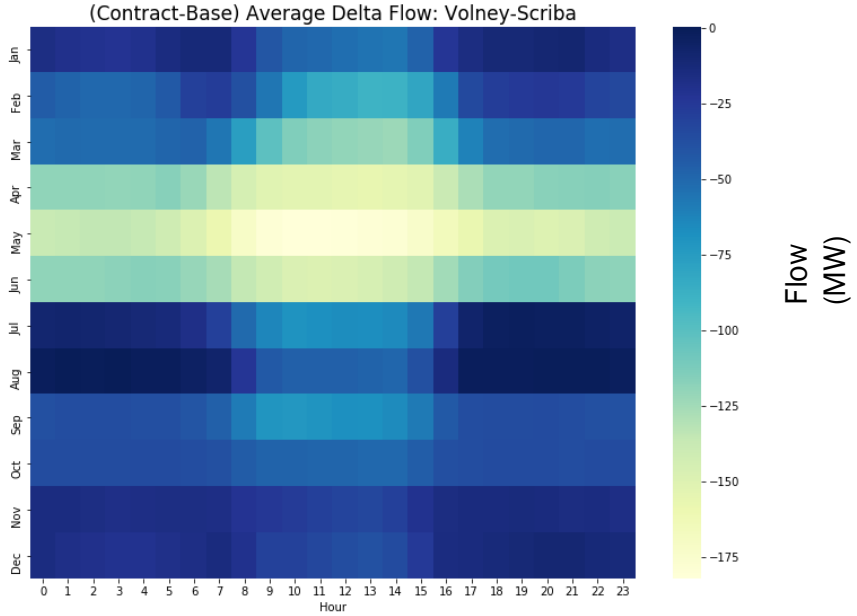
Volney – Scriba 345 kV

(Contract – Base) Flow Comparison





- Flow along this path is lower in the Contract Case compared to the Base Case as a result of thermal units upstream of the line running less in the Contract Case.

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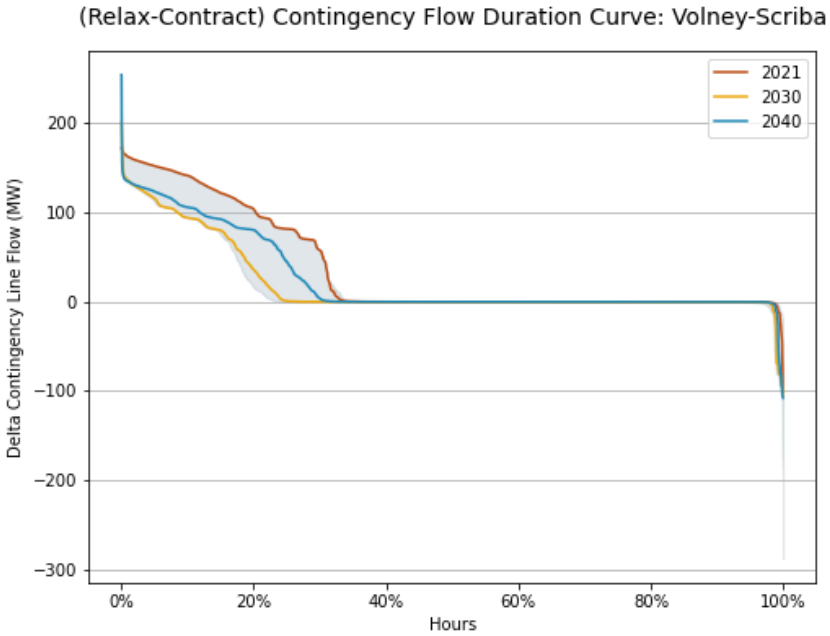
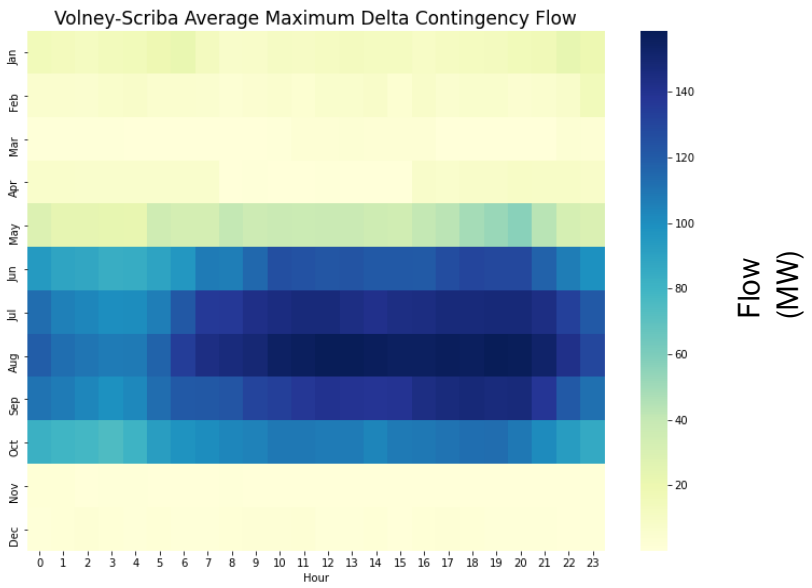
Volney-Scriba 345 kV

(Relax – Contract) Flow Comparison





- Largest flow delta (Relaxed – Base) occurs during Summer peak load period.

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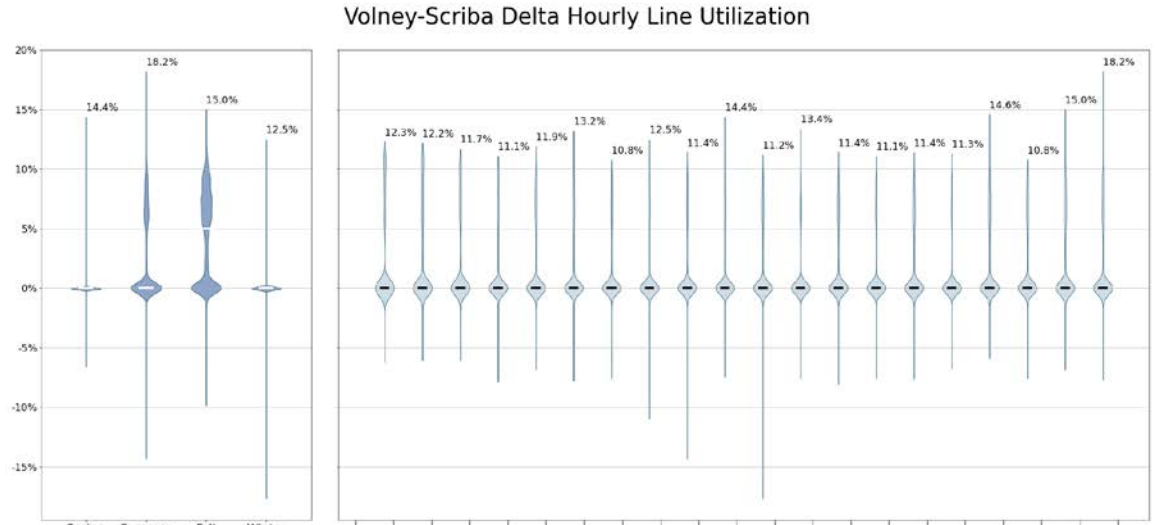
Volney-Scriba 345 kV



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	316	287	259	193	220	184	157	153	152	164	199	182	205	190	224	178	226	207	255	220

- Production Cost savings for relaxing this constraint is $59 million over 20 years.
- Relieving congestion on this path results in higher flows in the summer and fall seasons

Freed Energy = $\sum_{h=1}^{8760}[Max(Relax\ Case\ Flow)_h - Max(Base\ Case\ Flow)_h]$

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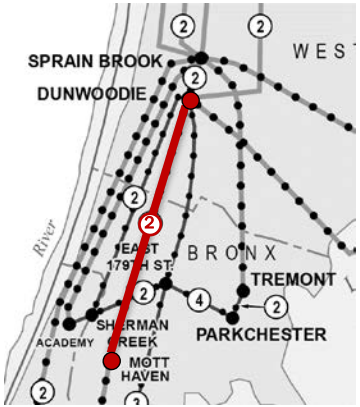
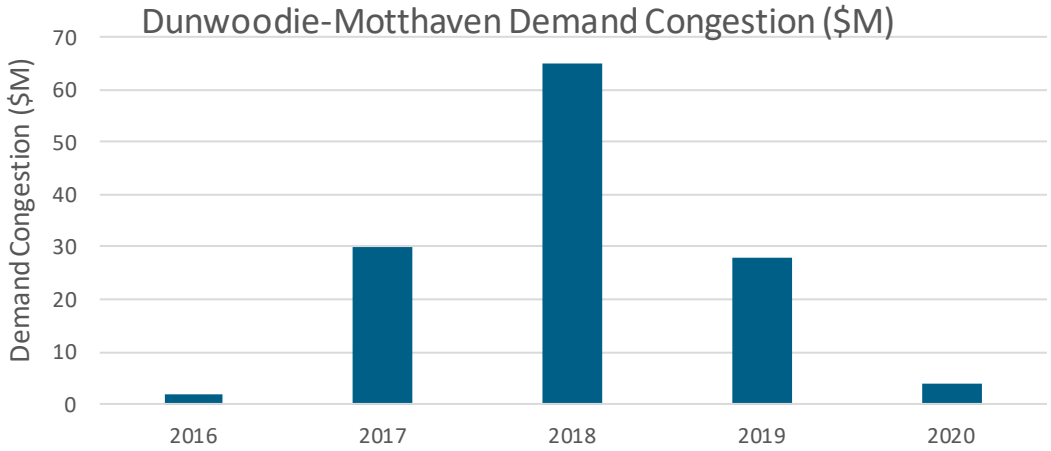
Dunwoodie – Motthaven 345 kV

Transmission Information & Historic Congestion



Type	Double Circuit 345kV
Normal Op. Rating	707/741 MW
Contingency Op. Rating	1066/1083 MW
Length	~12 Miles
Owner	ConEd



- **The congestion on this path is due to the expiration of the ConEd/PSEG Wheeling Agreement in May 2017 and outages of parallel lines.**

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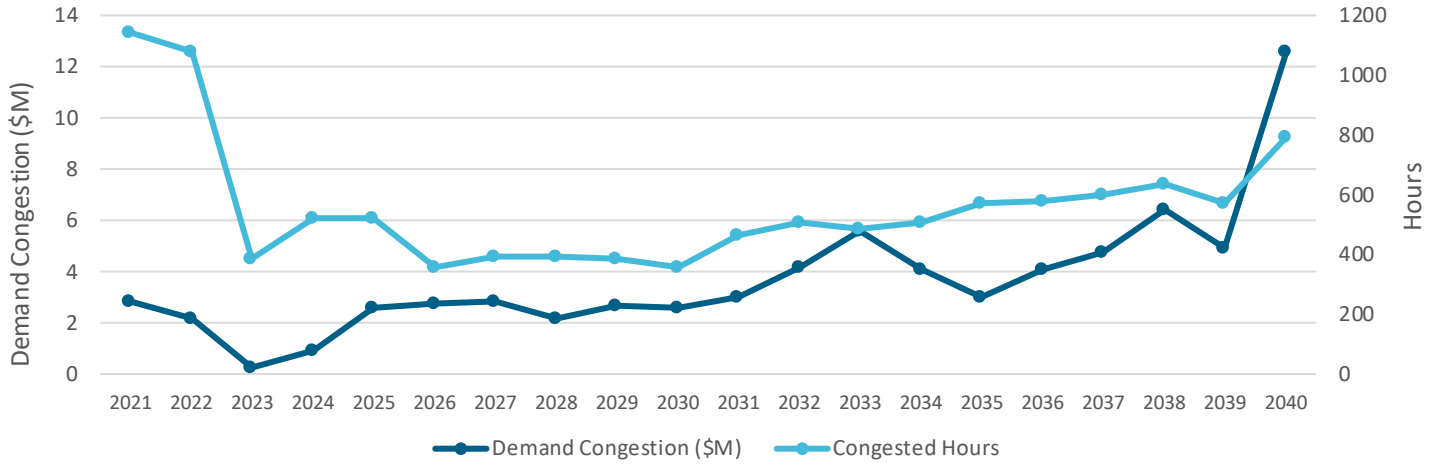
Dunwoodie – Motthaven 345 kV

Transmission Information & Projected Congestion



- The congestion on this path is mainly due to the contingency for loss of the parallel 345kV lines

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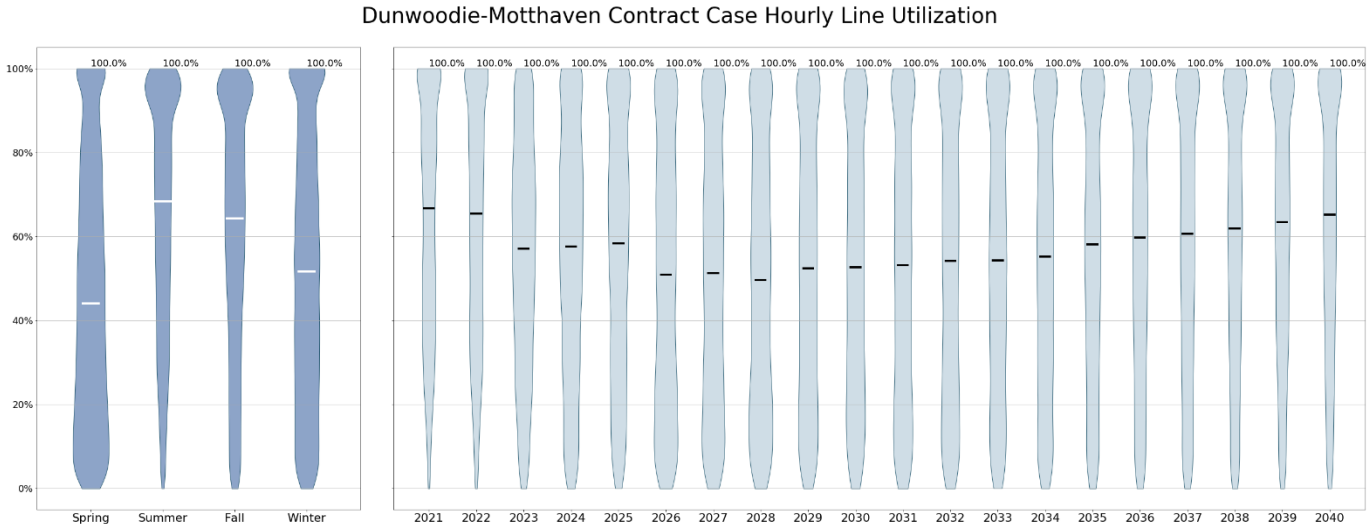
Dunwoodie – Motthaven 345 kV



- The average flow tends to increase in the outer years with the load growth.
- Higher line utilization in summer and fall is driven by lower seasonal ratings than in spring and winter

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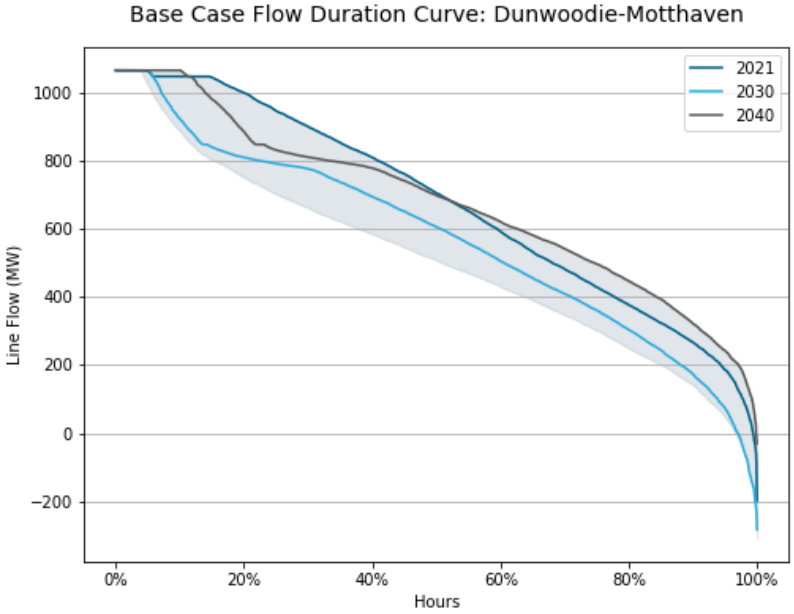
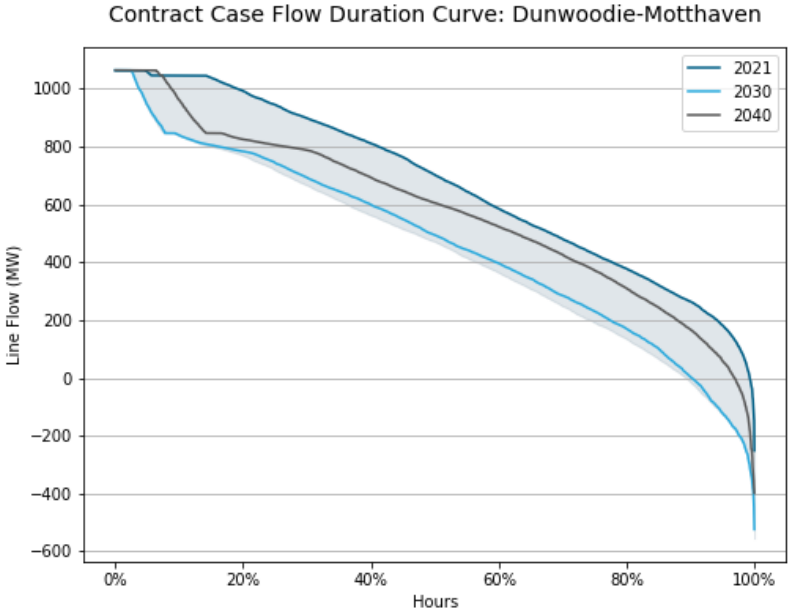
Dunwoodie – Motthaven 345 kV





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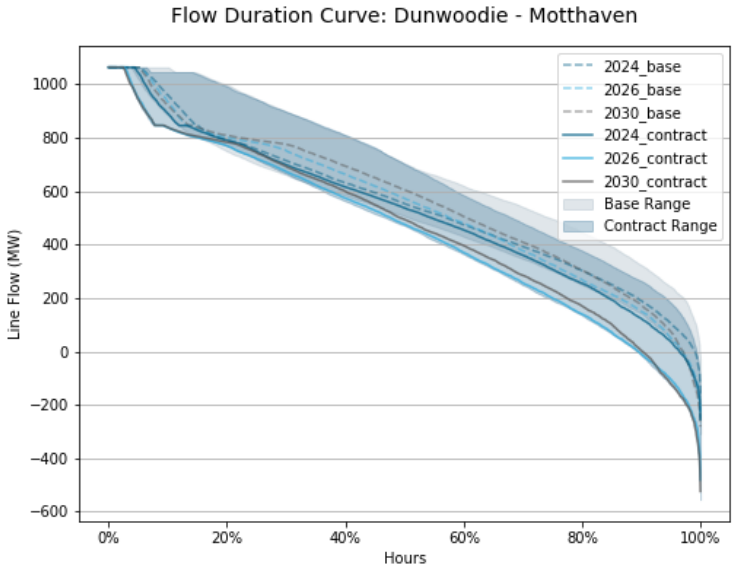
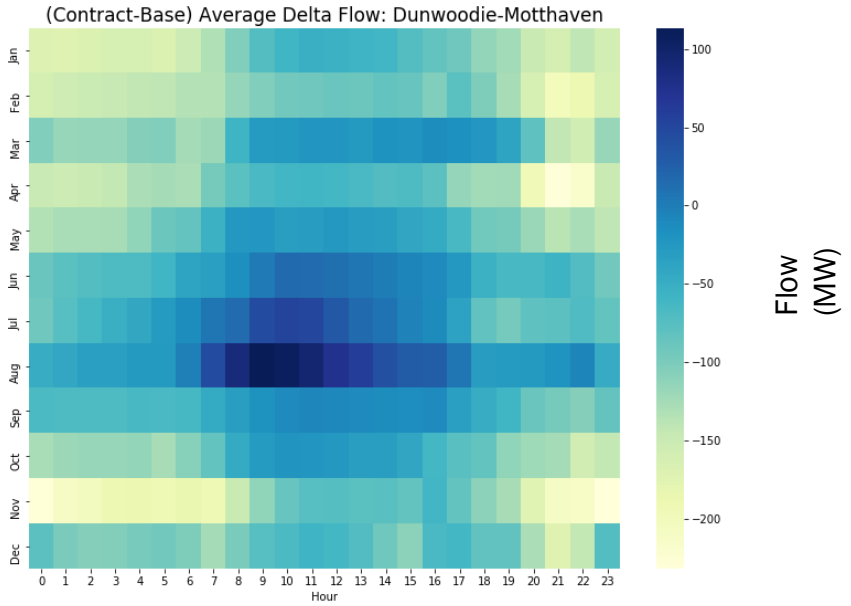
Dunwoodie – Motthaven 345 kV

(Contract – Base) Flow Comparison

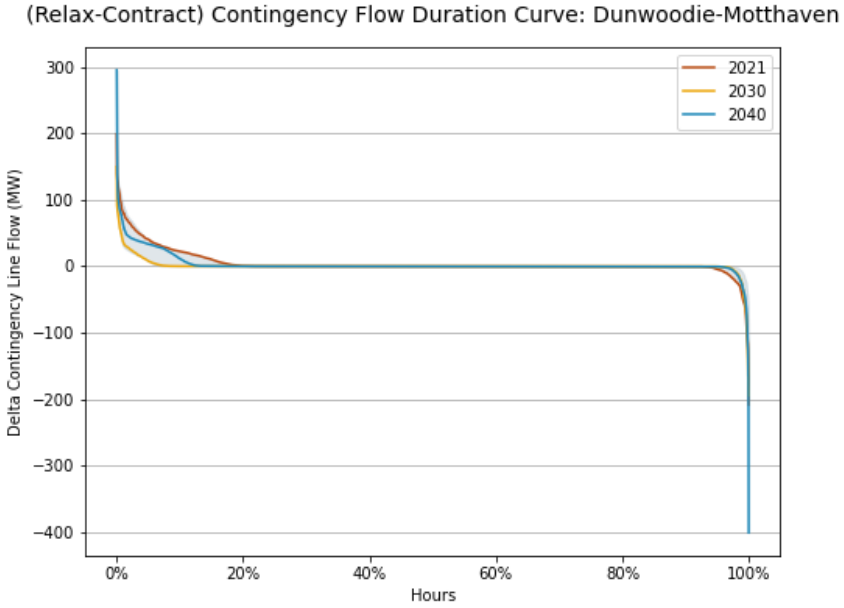


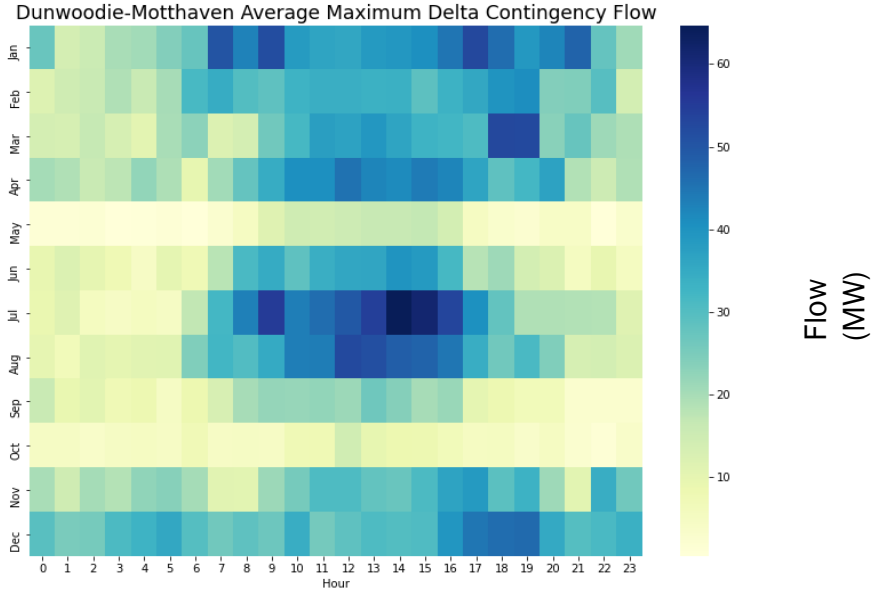


- The flows across this interface is similar to the Base Case.
- Flows are slightly lower in the later years as a result of renewable resources coming online downstate.

Dunwoodie – Motthaven 345 kV

(Relax – Contract) Flow Comparison





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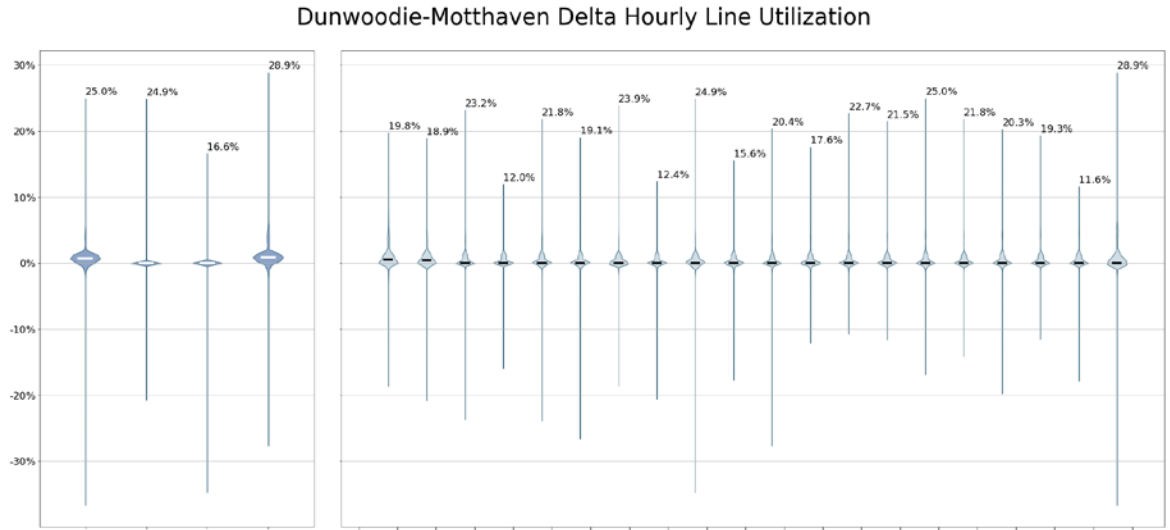
Dunwoodie – Motthaven 345 kV



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	37	40	8	11	10	7	9	8	6	4	12	13	14	13	16	17	17	20	15	26

- Production Cost savings for relaxing this constraint is $1 million over 20 years
- There are still constraints downstream of Motthaven once this constraint is relaxed.
- Flow increases slightly in the winter when limits are relaxed.

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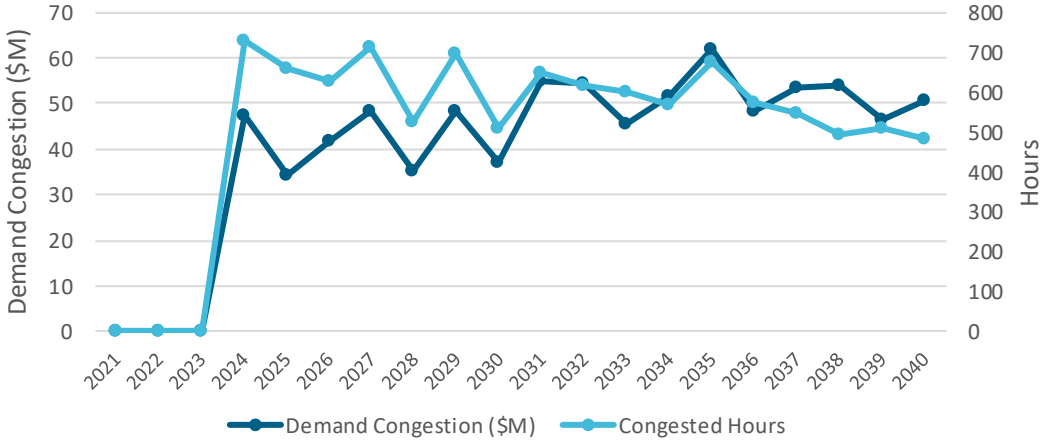
New Scotland – Knickerbocker 345 kV

Transmission Information & Projected Congestion

Type	Single Circuit 345kV
Normal Op. Rating	1423/1852 MVA
Contingency Op. Rating	
Length	~12 Miles
Owner	National Grid



- The congestion on this path is due to the AC Transmission public policy projects being placed into service, which diverts more flow to this path.

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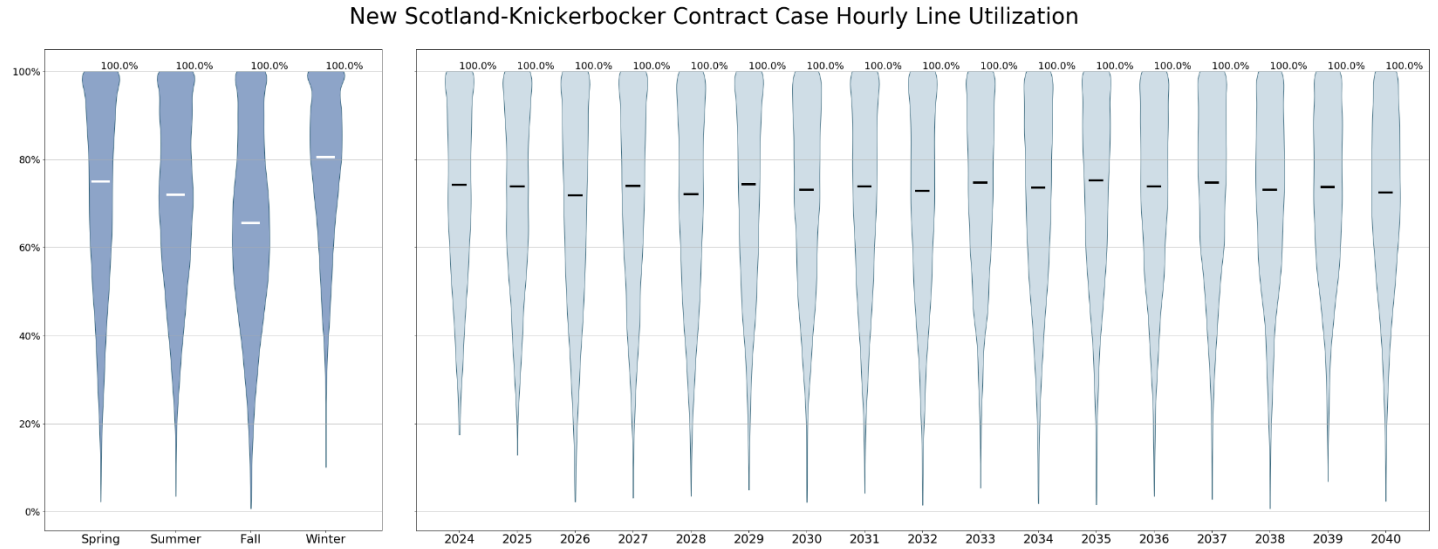
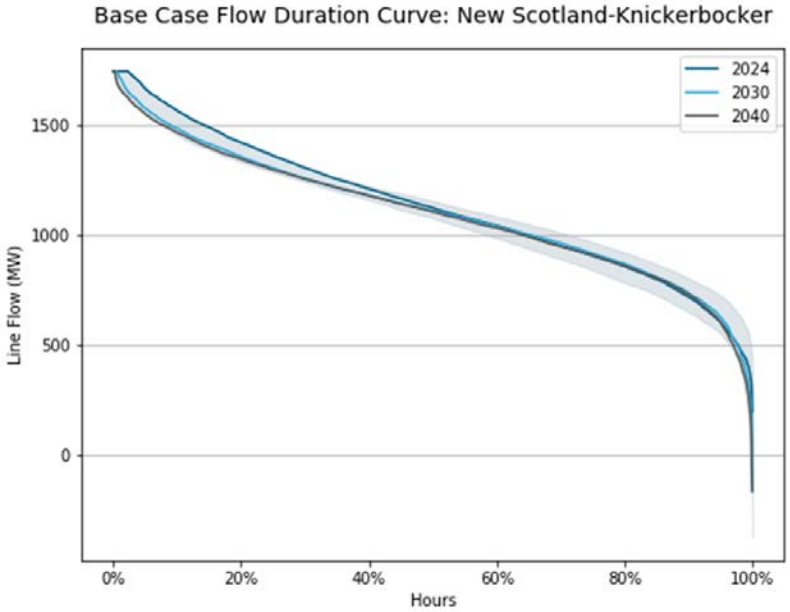
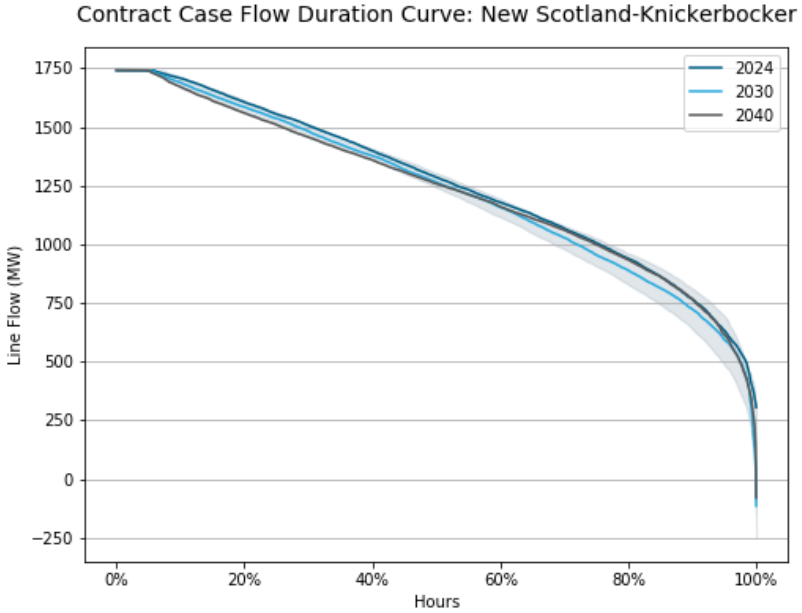
New Scotland – Knickerbocker 345 kV



- The flow utilization is higher in winter than in the summer mainly due to the Marcy South Series Compensation (MSSC) bypass in winter, while it is in service during summer period.

New Scotland – Knickerbocker 345 kV





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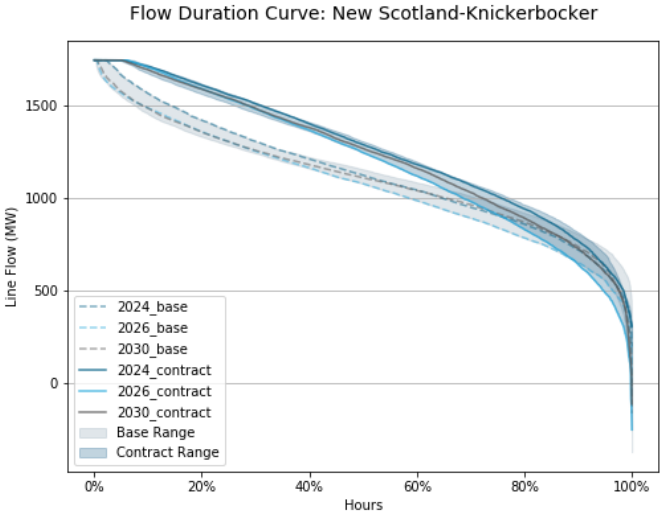
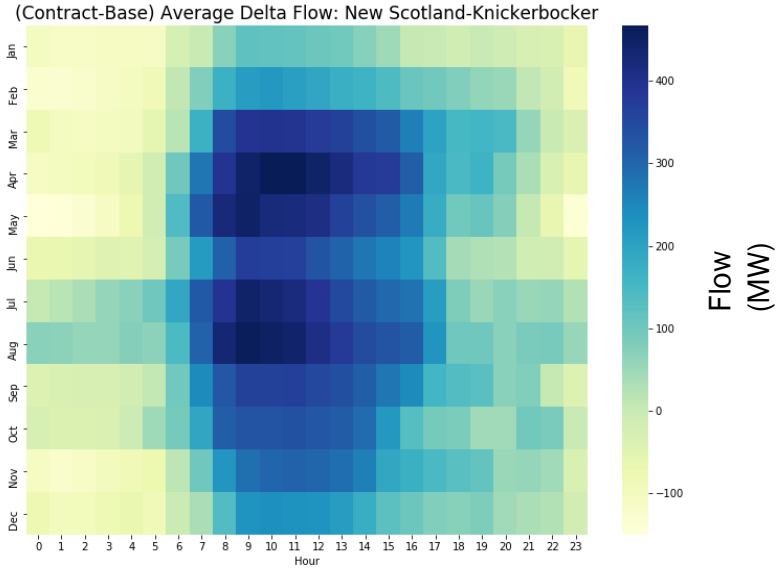
New Scotland – Knickerbocker 345 kV

(Contract – Base) Flow Comparison





- The flow on New Scotland – Knickerbocker is higher in the Contract case compared to the Base case.
- Flow increase is mostly due to increased renewable penetration upstate of Central East.

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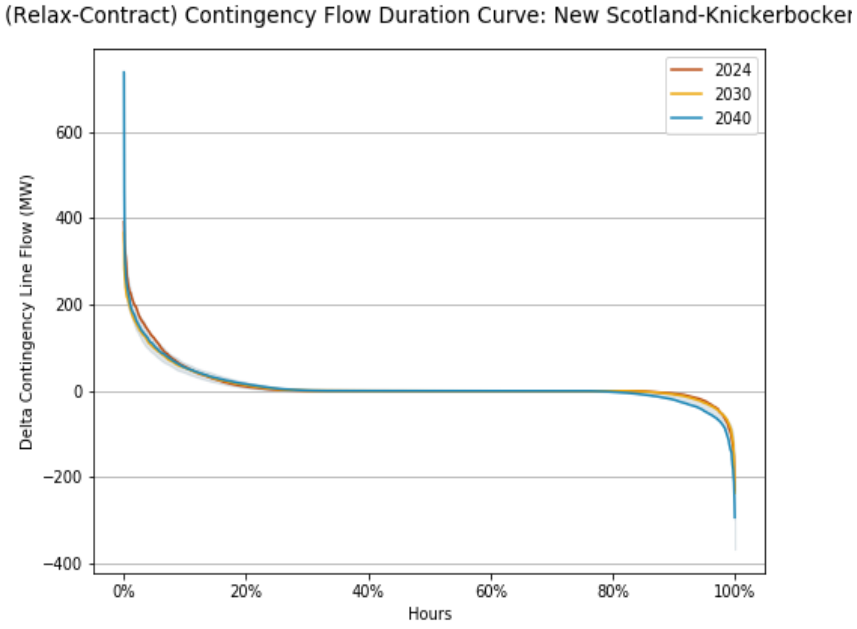
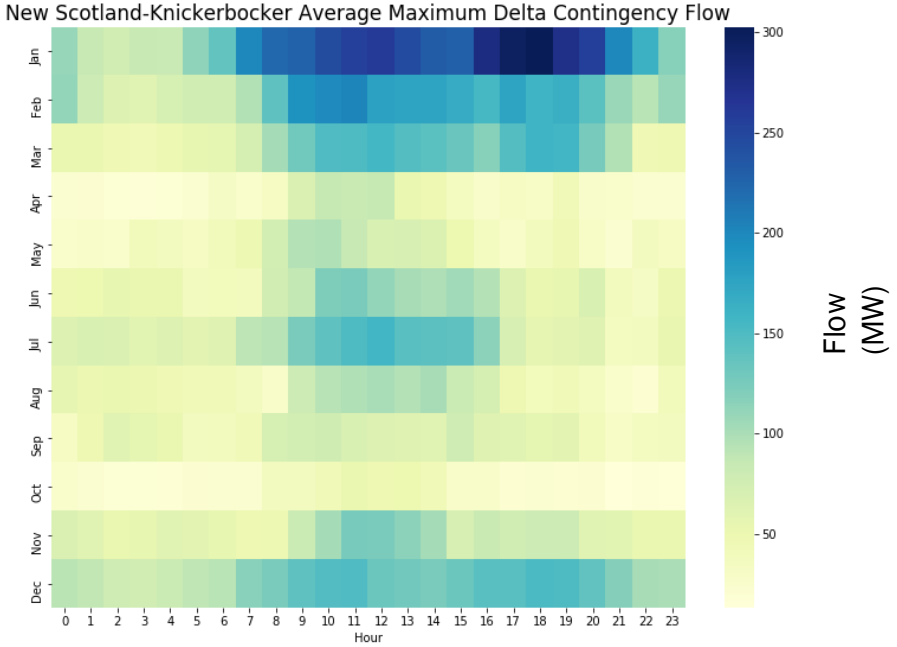
New Scotland – Knickerbocker 345 kV

(Relax - Contract) Flow Comparison

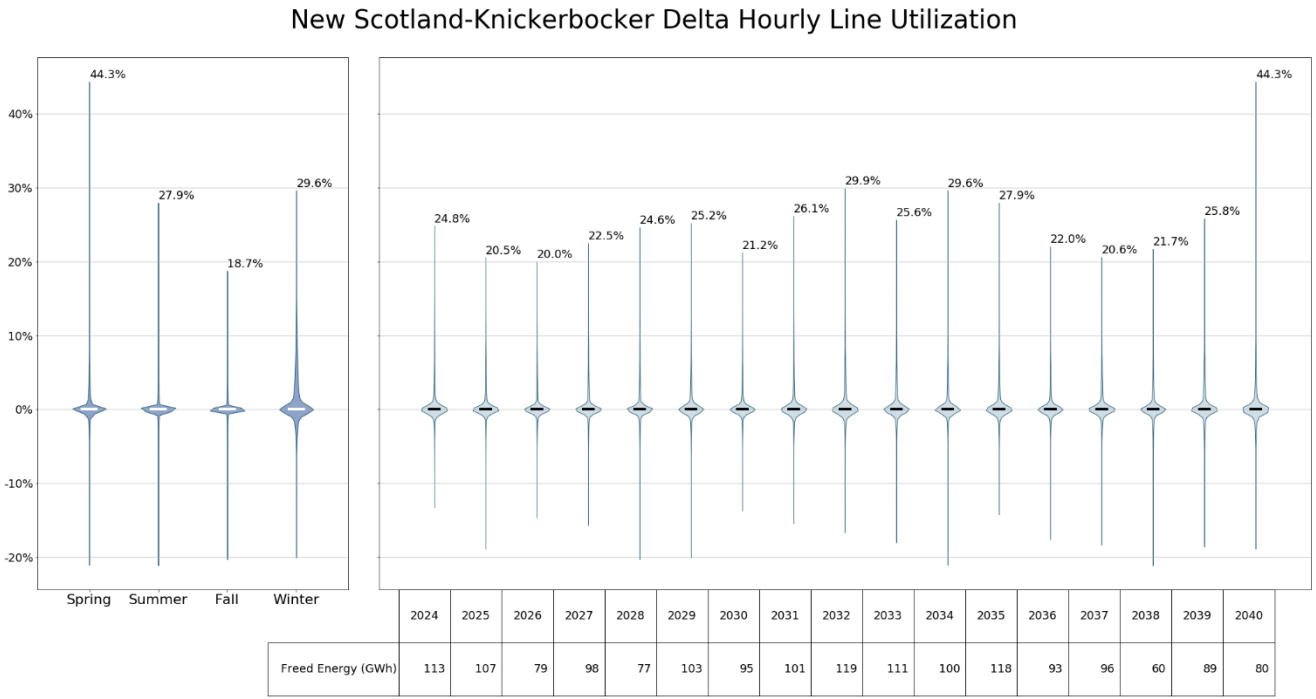




- Relaxing this constraint increases flows during the winter peak period when flow on Central East is high.

New York ISO

New Scotland – Knickerbocker 345 kV



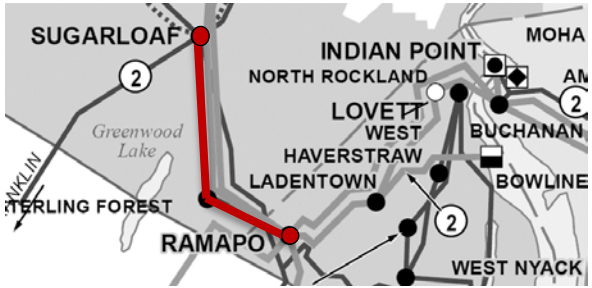
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	113	107	79	98	77	103	95	101	119	111	100	118	93	96	60	89	80

- Production Cost savings for relaxing this constraint is $11 million over 17 years.
- Relaxing this constraint will put more pressure back on the Central East interface and downstream constraints.

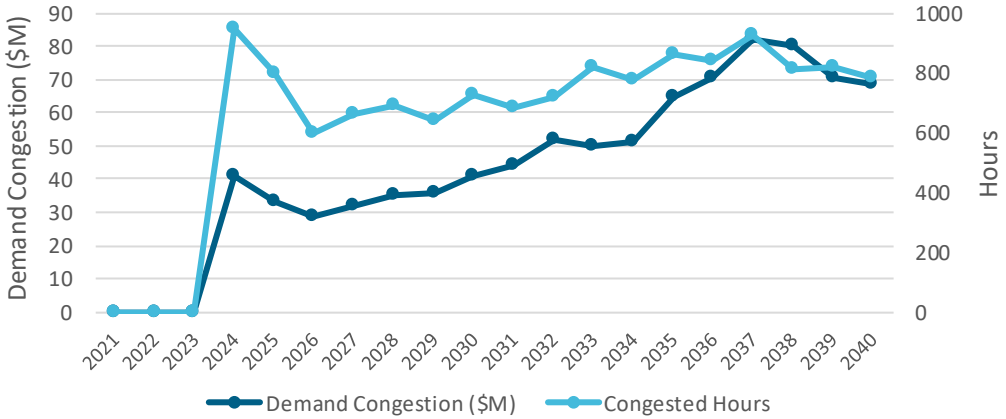
New York ISO

Sugarloaf – Ramapo 138 kV

Transmission Information & Projected Congestion



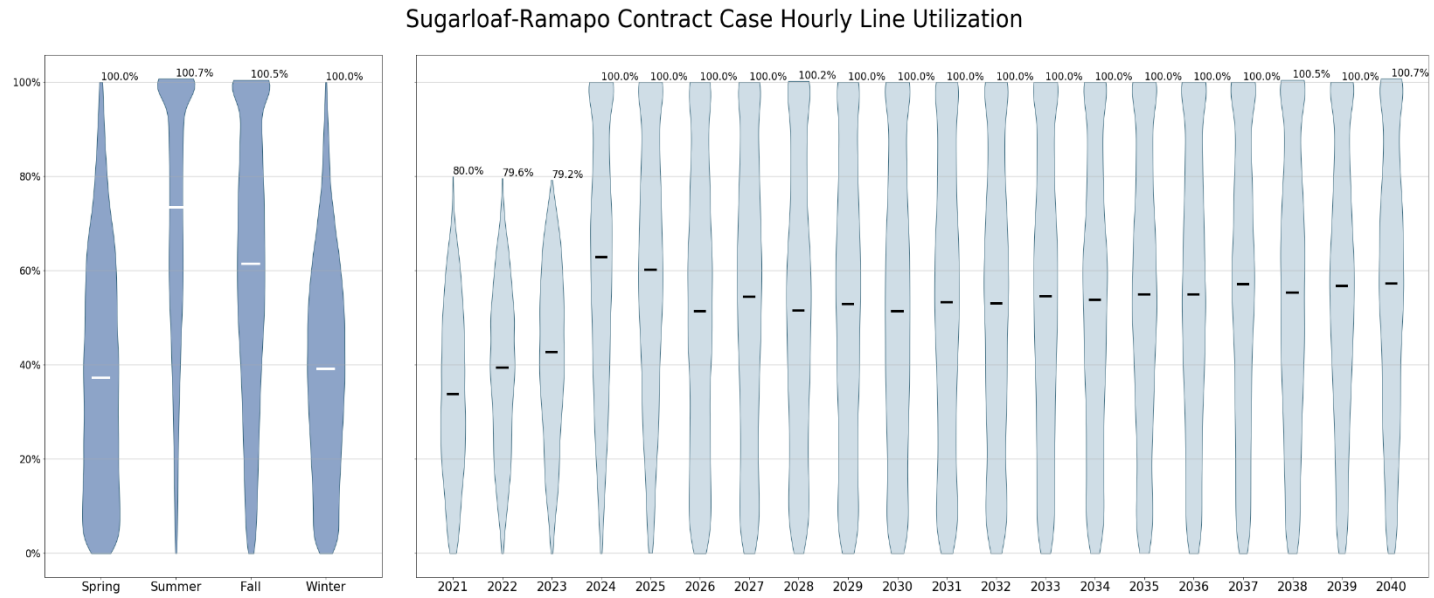
Type	Single Circuit 138kV
Normal Op. Rating	236/282 MW
Contingency Op. Rating	270/309 MW
Length	~ 17 miles
Owner	Orange & Rockland



- The congestion in the future years starting 2024 are primary driven by congestion shifted to local transmission downstream of the Segment B project of AC Transmission Public Policy projects placed into service (with the addition of Rock Tavern to Sugarloaf line).

New York ISO

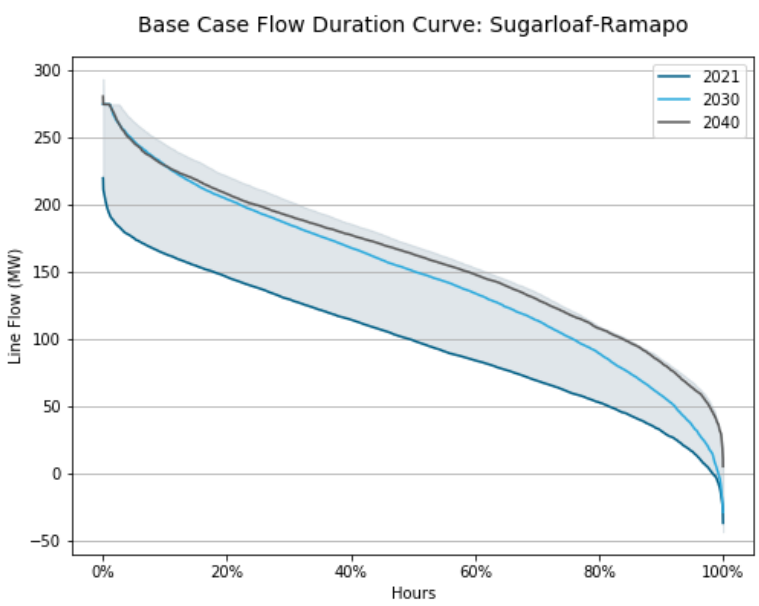
Sugarloaf – Ramapo 138 kV

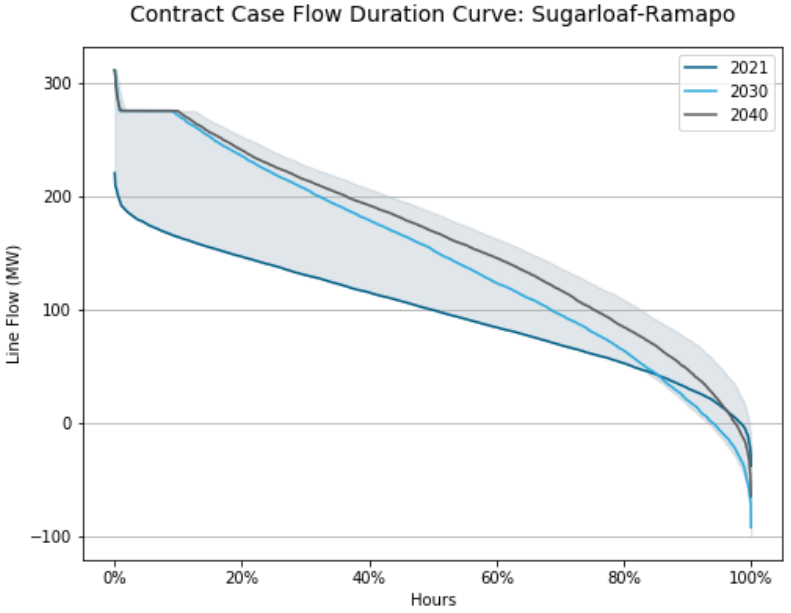


- The flow utilization in this path significantly increased with a portion of Segment B of the AC Transmission Public Policy project in-service.
- Higher flow utilization in summer and fall occurs because the seasonal rating is lower than in winter.

New York ISO

Sugarloaf – Ramapo 138 kV

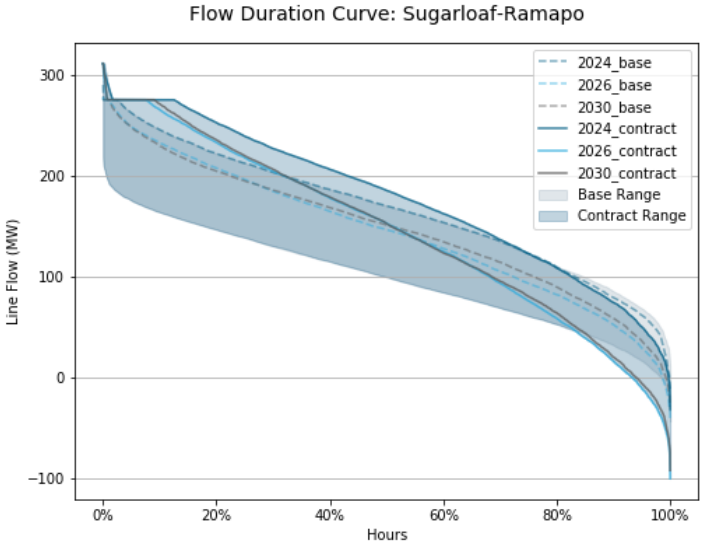


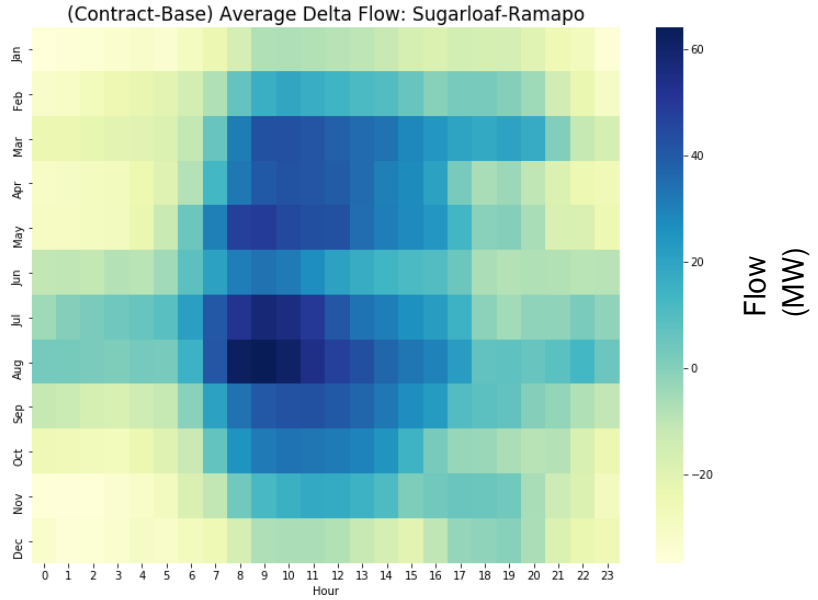


New York ISO

Sugarloaf – Ramapo 138 kV

(Contract – Base) Flow Comparison



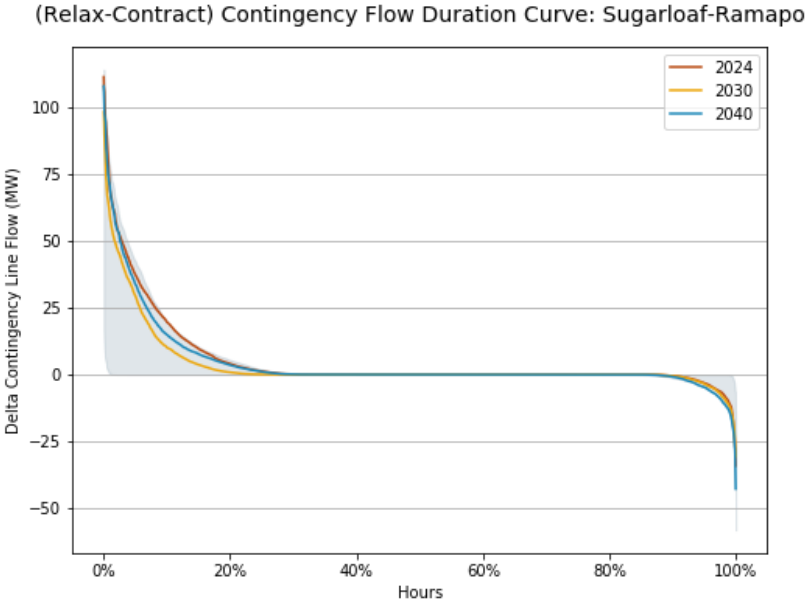


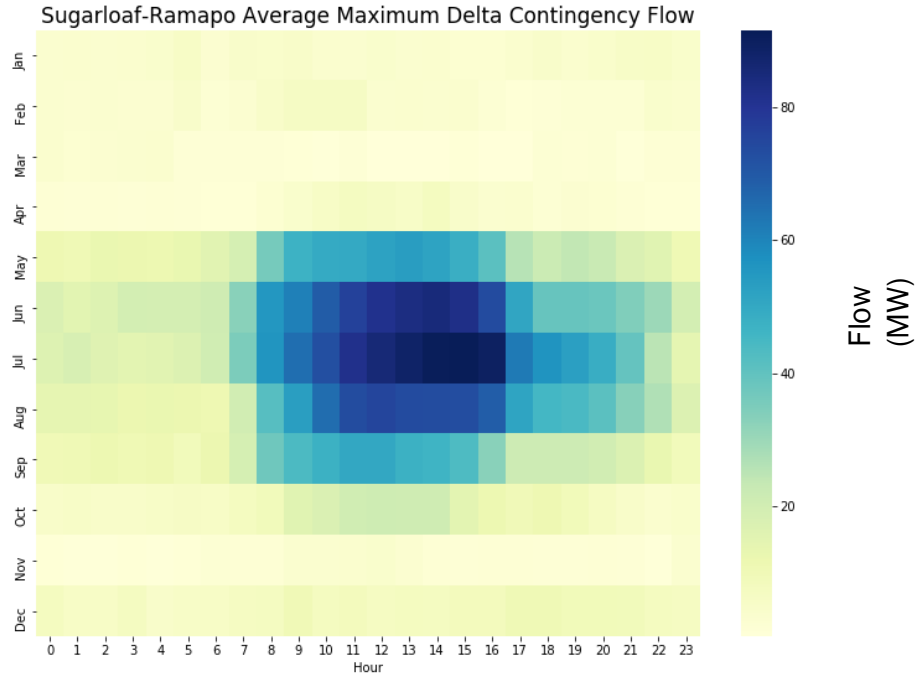
- Flow is slightly higher in the Contract Case compared to the Base Case.
- Higher flows are a result of upstate renewable resources flowing to serve downstate loads.

New York ISO

Sugarloaf – Ramapo 138 kV

(Relax - Contract) Flow Comparison

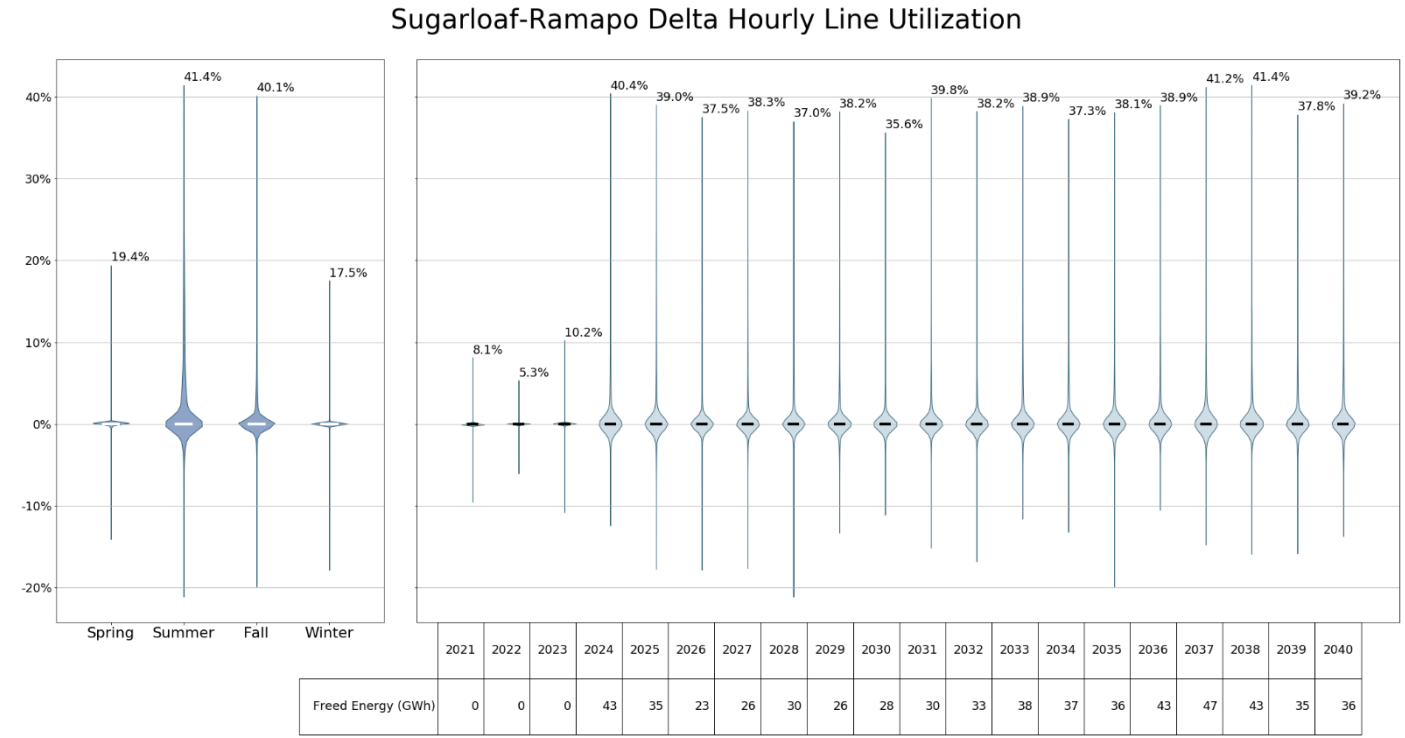




- Largest flow increase occurs during peak load hours in the summer season.

New York ISO

Sugarloaf – Ramapo 138 kV



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	0	0	0	43	35	23	26	30	26	28	30	33	38	37	36	43	47	43	35	36

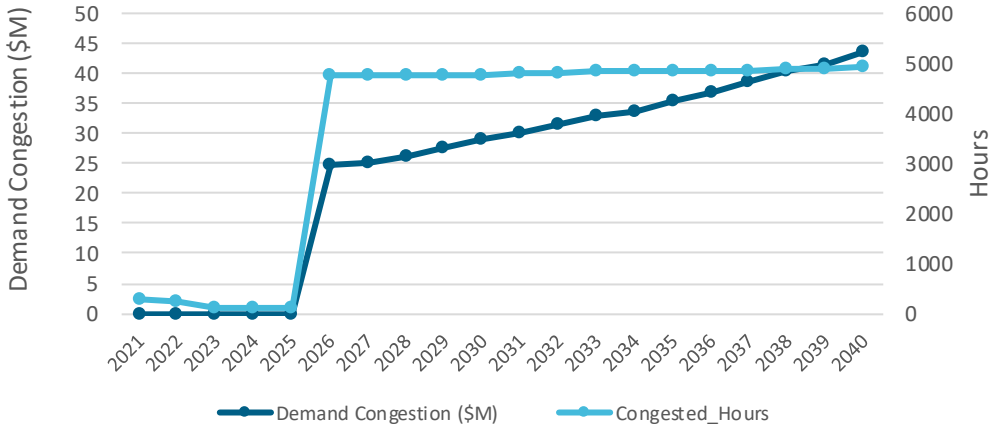
- Production Cost savings for relaxing this constraint is $16 million over 20 years.
- Line utilization increases mostly in the summer period.

New York ISO

Barrett – Valley Stream 138 kV

Transmission Information & Projected Congestion

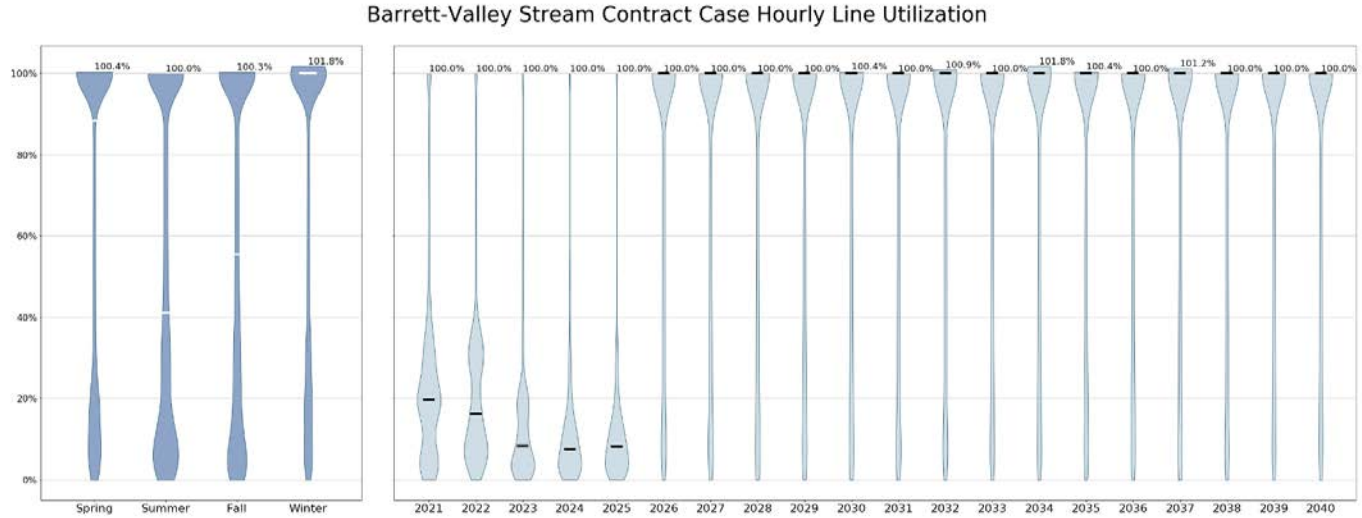
Type	Double Circuit 138 kV	
Normal Op. Rating	160/176 MW	168/184 MW
Contingency Op. Rating	261/271 MW	268/279 MW
Length	~4 Miles	
Owner	Long Island Power Authority	



- **Congestion increases when offshore wind is modeled in-service starting 2026.**

New York ISO

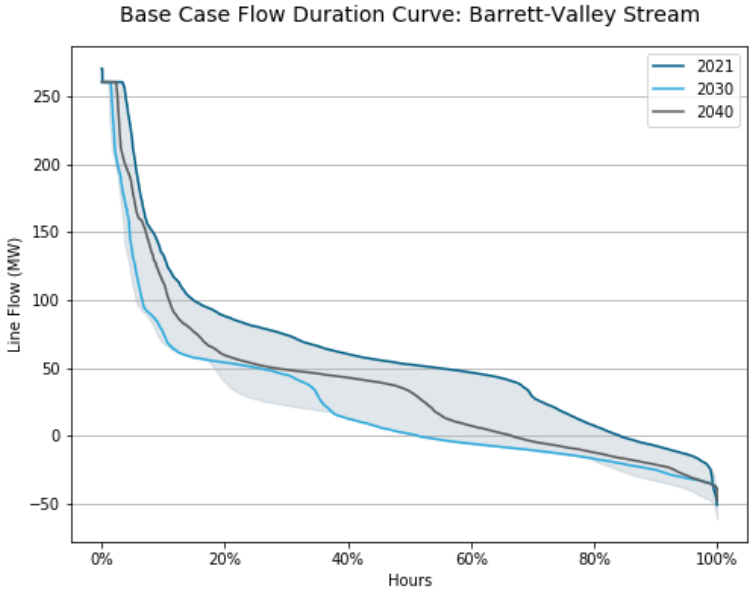
Barrett – Valley Stream 138 kV

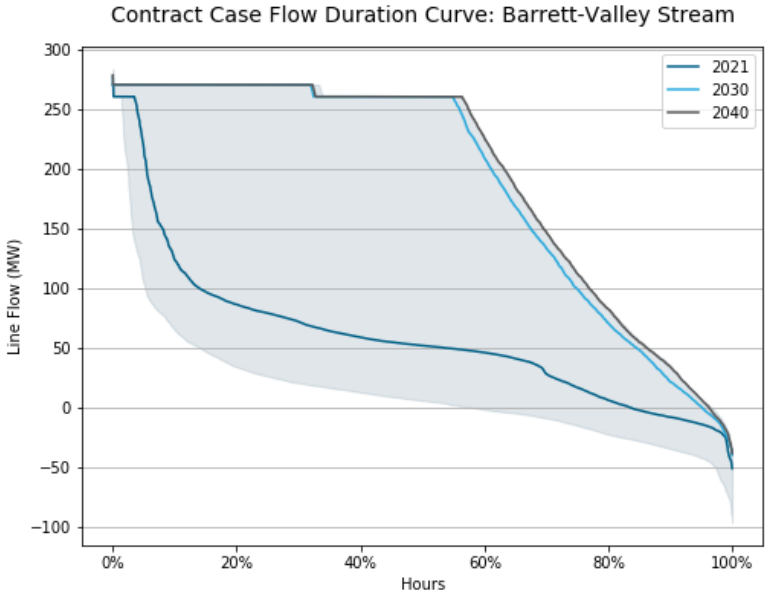


- This line is heavily congested when offshore wind units are placed in-service starting in 2026.
- Line utilization increases throughout the year after 2026.

New York ISO

Barrett – Valley Stream 138 kV

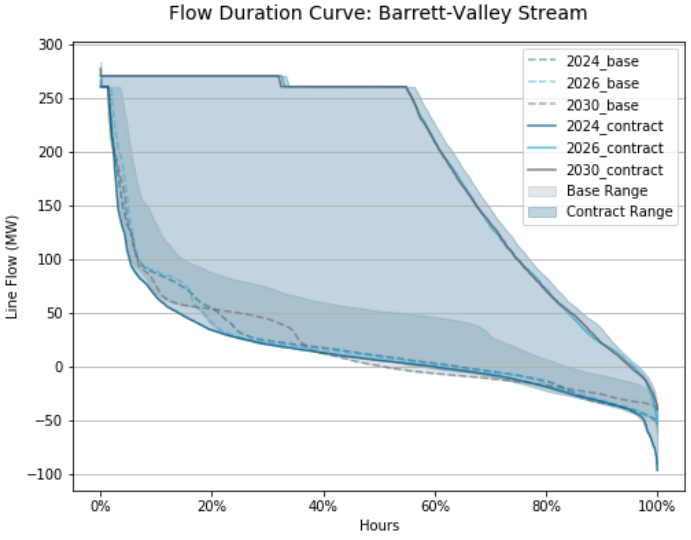


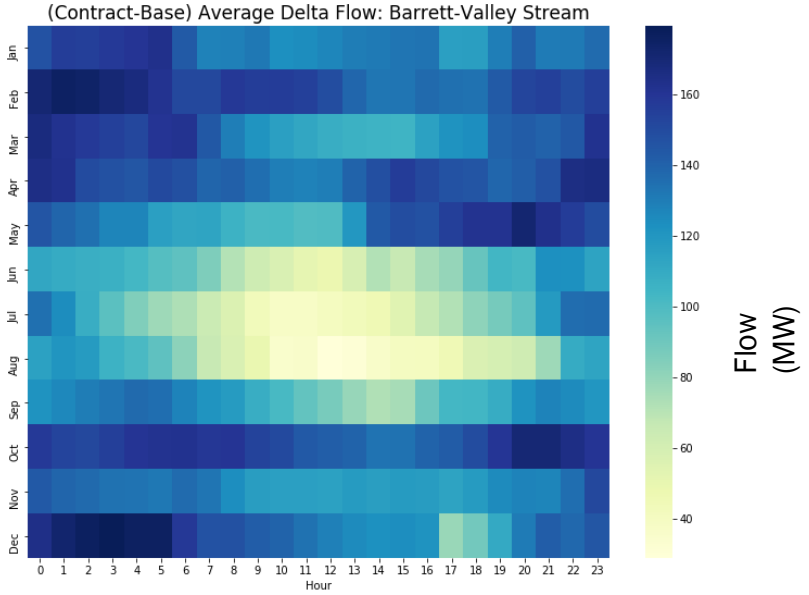


New York ISO

Barrett – Valley Stream 138 kV

(Contract – Base) Flow Comparison



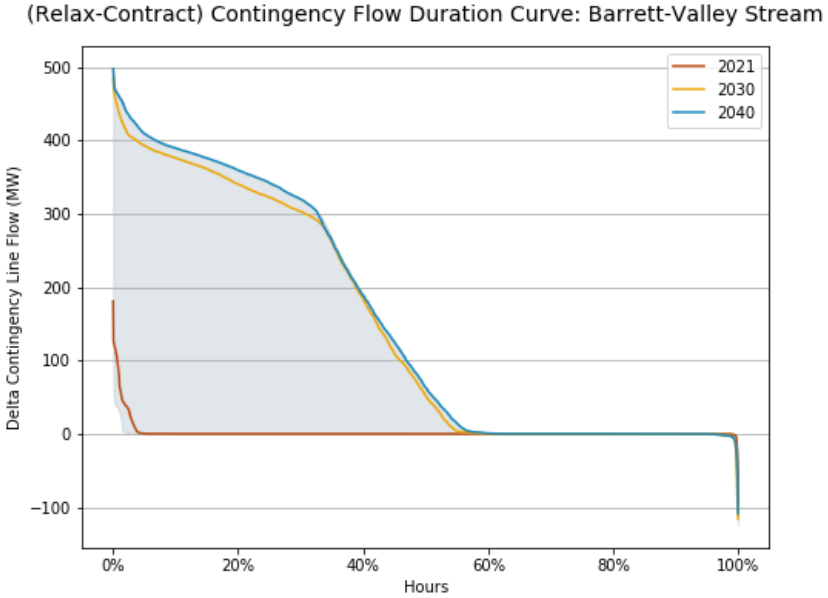


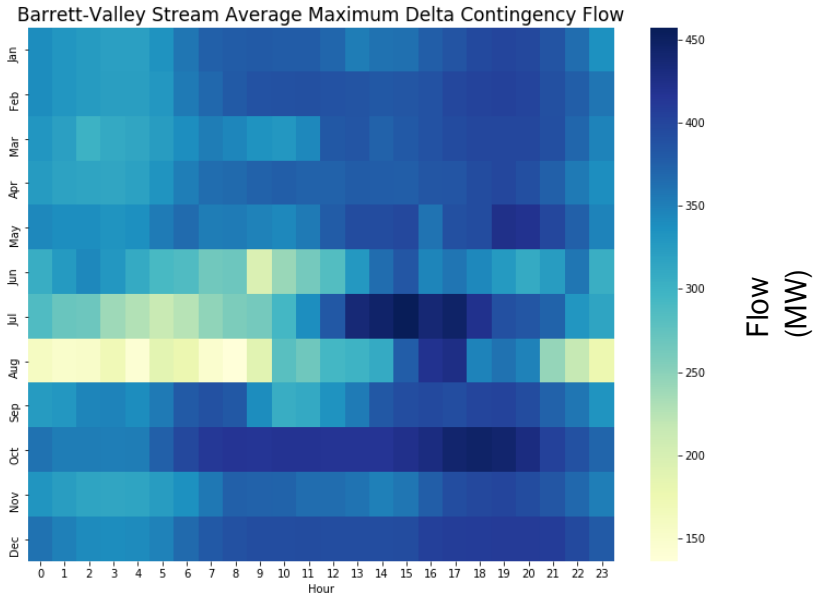
- Flows increase significantly on this line after Offshore wind projects are in-service in Long Island starting in 2026.

New York ISO

Barrett – Valley Stream 138 kV

(Relax - Contract) Flow Comparison

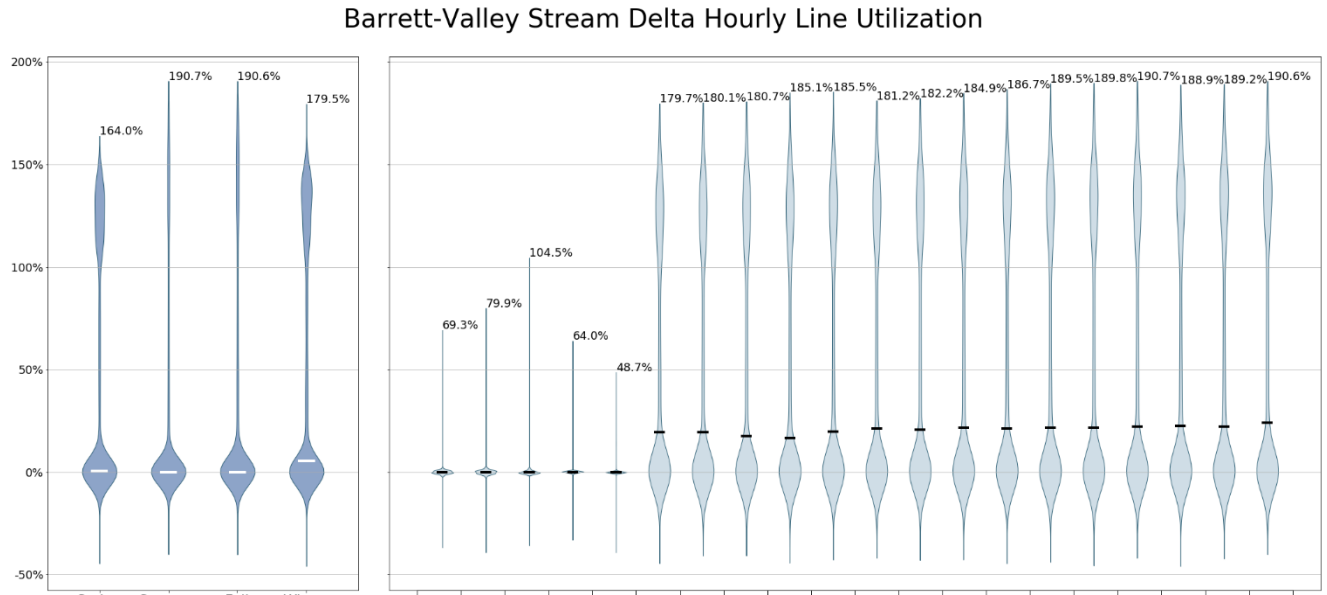




- There is significant increase in flow when the constraints on this line are relaxed.
- Increased flow is observed throughout the year.

New York ISO

Barrett – Valley Stream 138 kV



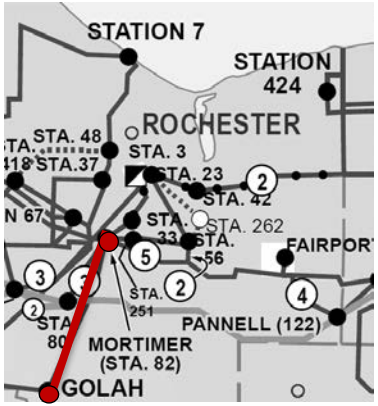
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	16	15	6	4	3	1274	1270	1266	1263	1279	1290	1292	1295	1298	1308	1316	1324	1333	1335	1348

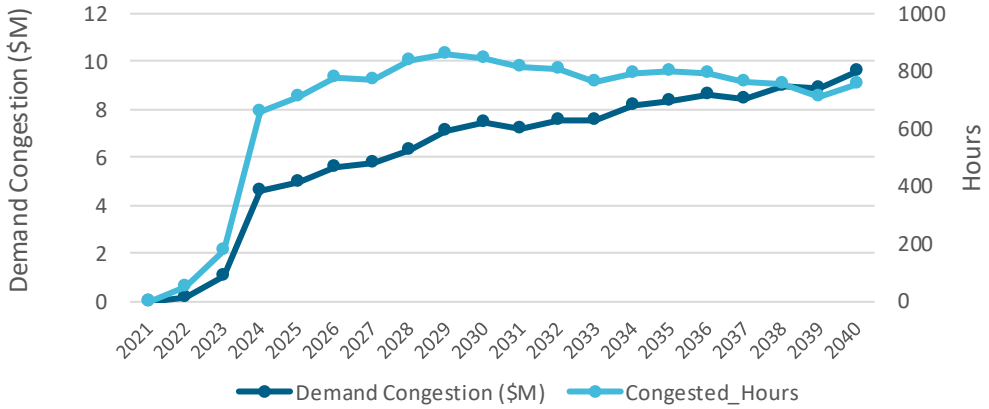
- Increased flow can be observed starting 2026 in the relaxed case when Offshore wind projects are modeled in-service.
- Production Cost savings for relaxing this constraint is $434 million over 20 years.
- Savings can be attributed to increased output from offshore wind which displaces internal NYCA generation and imports.

New York ISO

Golah – Mortimer 115 kV

Transmission Information & Projected Congestion



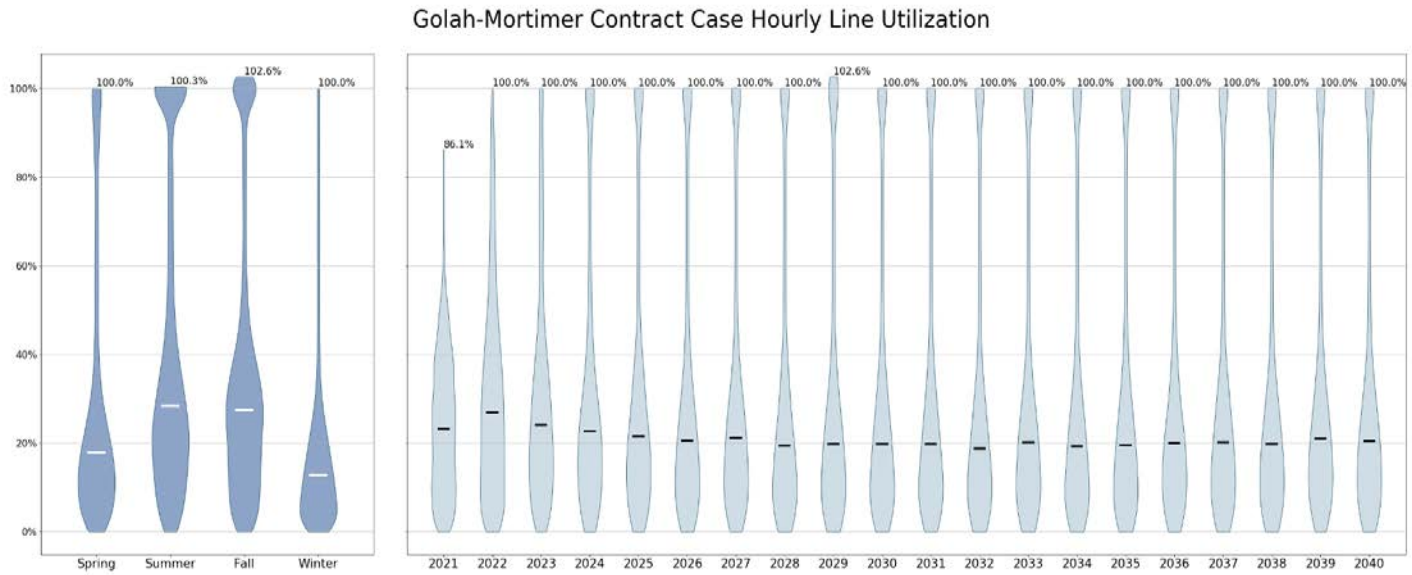


Type	Single Circuit 115 kV
Normal Op. Rating	120/148 MW
Contingency Op. Rating	
Length	~10 Miles
Owner	National Grid

- Congestion is primarily due to UPV resources sited upstream of constraint which flows into load center in zone B.

New York ISO

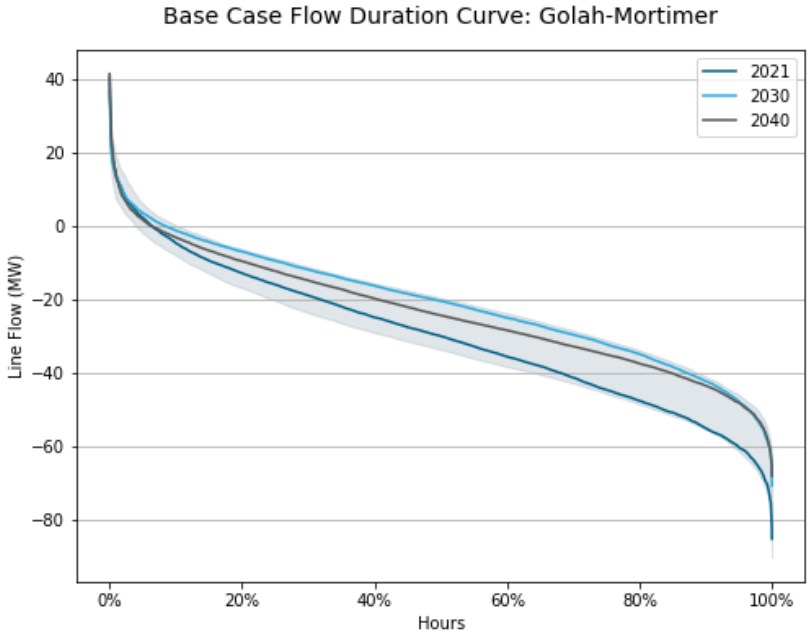
Golah – Mortimer 115 kV

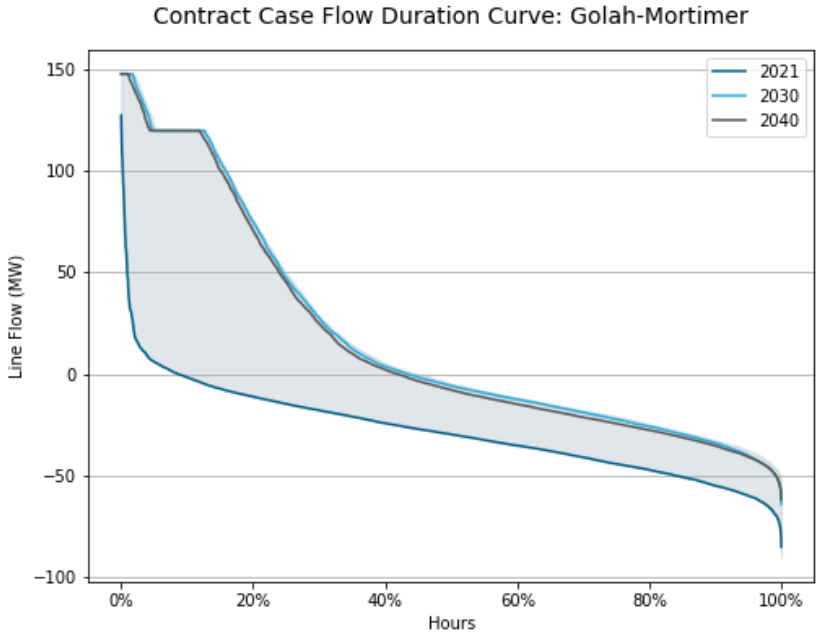


- Gradual increase in line flow and utilization as a result of upstate resources coming online.
- Mostly congested during summer period.

New York ISO

Golah – Mortimer 115 kV

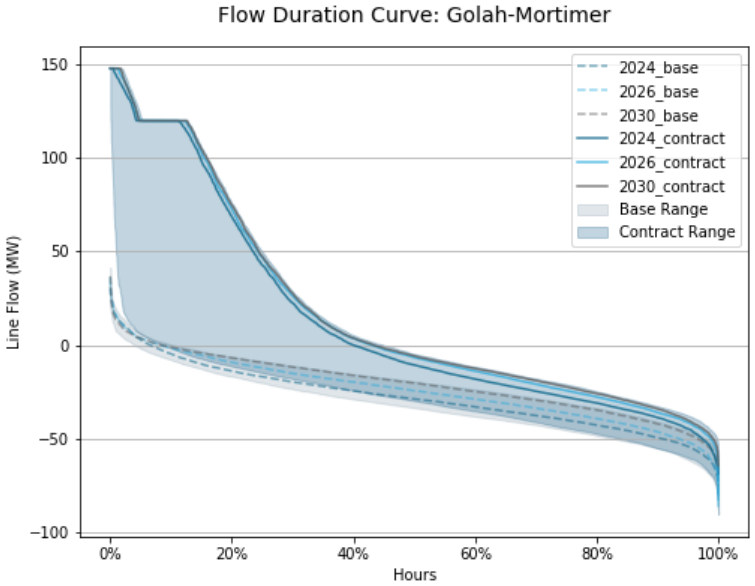


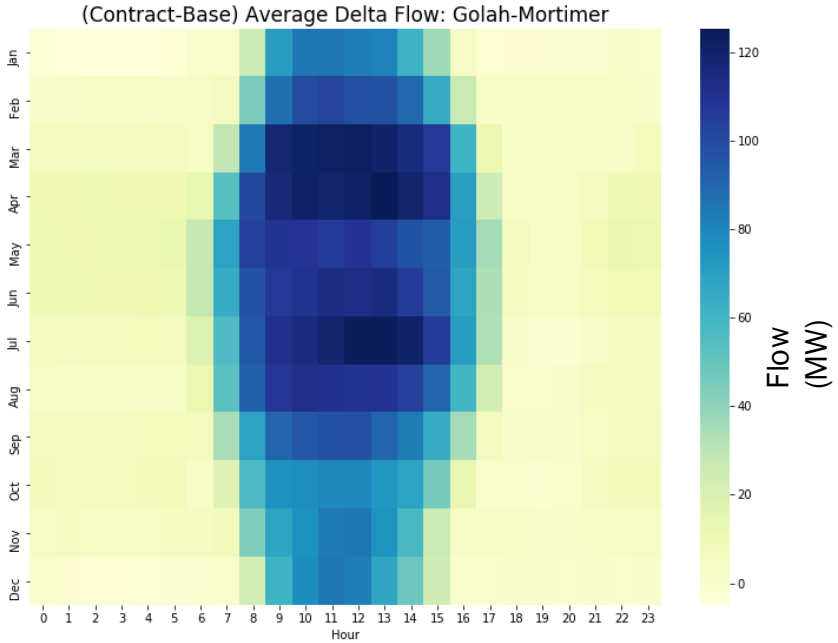


New York ISO

Golah – Mortimer 115 kV

(Contract – Base) Flow Comparison



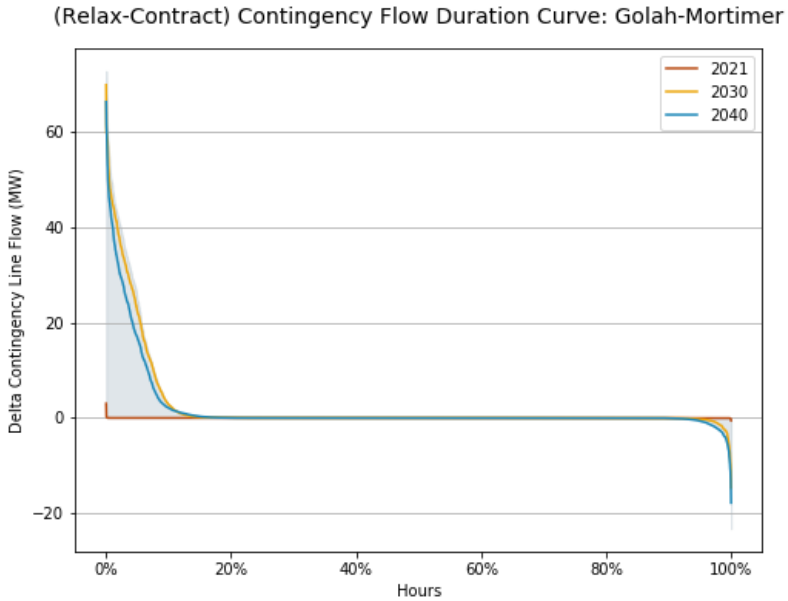


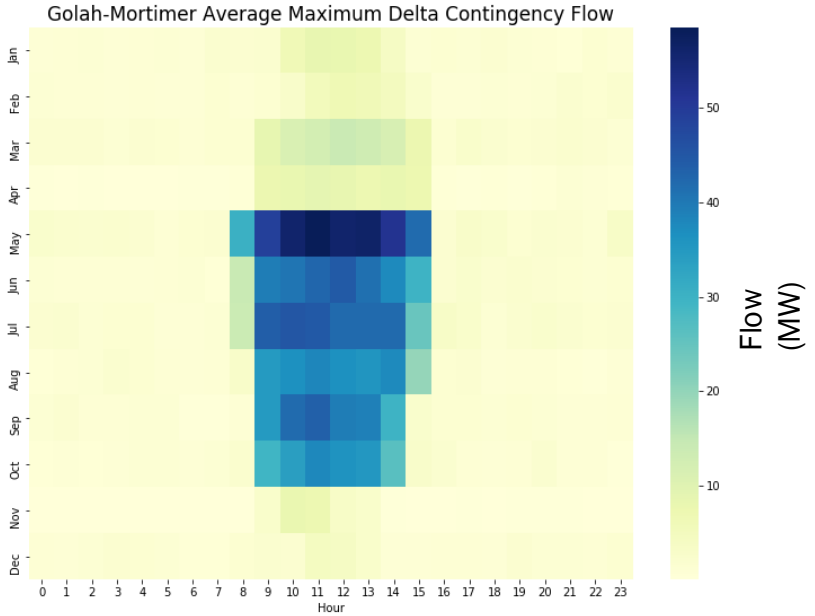
- Increase in flow can be attributed to UPV units directly upstream of constraint.

New York ISO

Golah – Mortimer 115 kV

(Relax - Contract) Flow Comparison

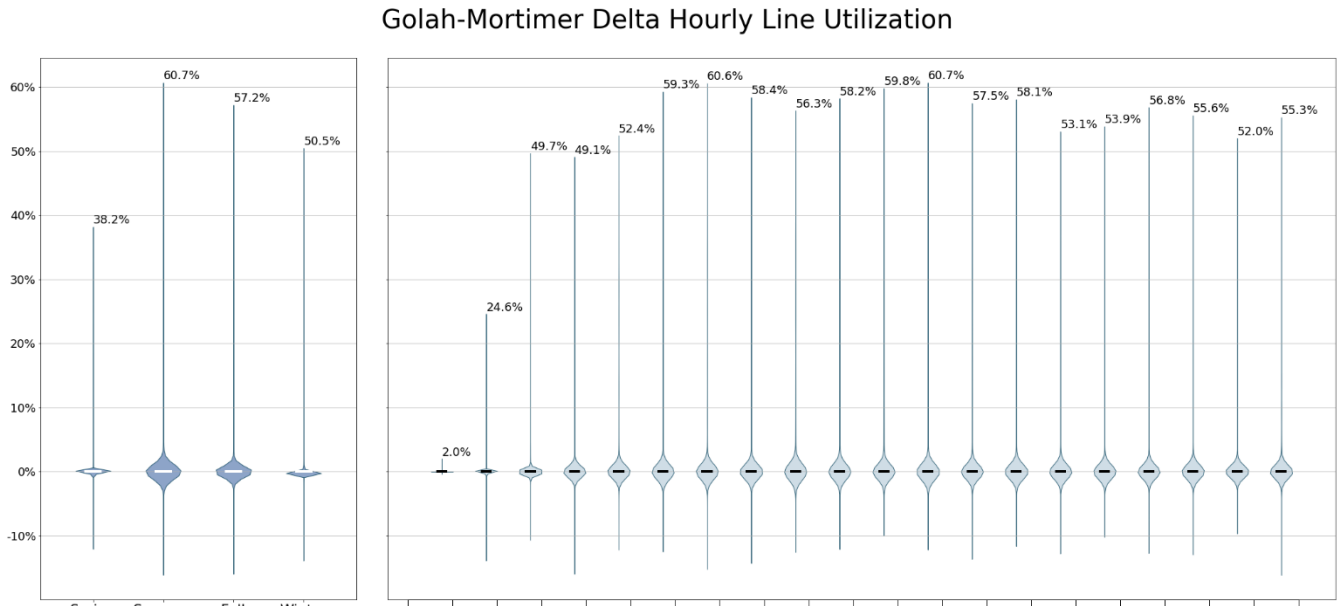




- Relaxing the constraint un-bottles UPV resources which are directly upstream of the constraint.

New York ISO

Golah – Mortimer 115 kV



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	0	0	2	13	15	18	19	19	22	20	19	20	17	18	18	18	16	17	15	16

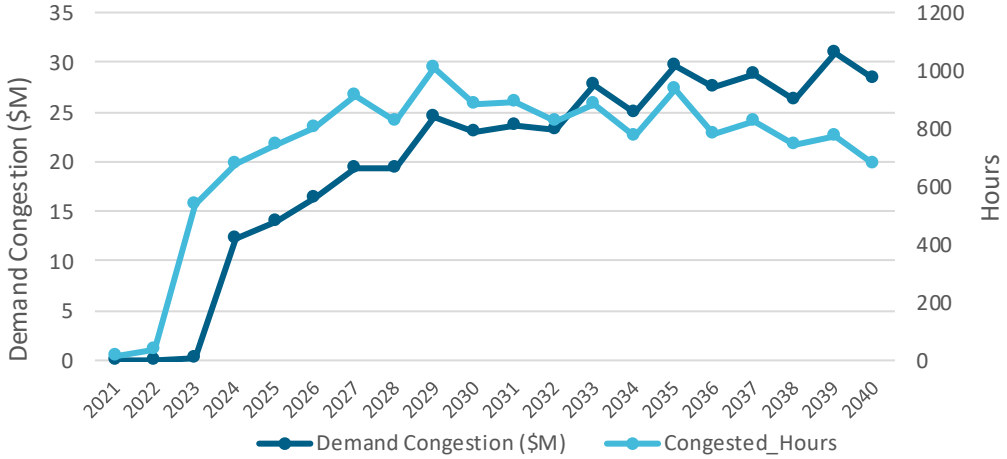
- Production Cost savings for relaxing this constraint is $5 million over 20 years.

New York ISO

Stoner – Rotterdam 115 kV

Transmission Information & Projected Congestion

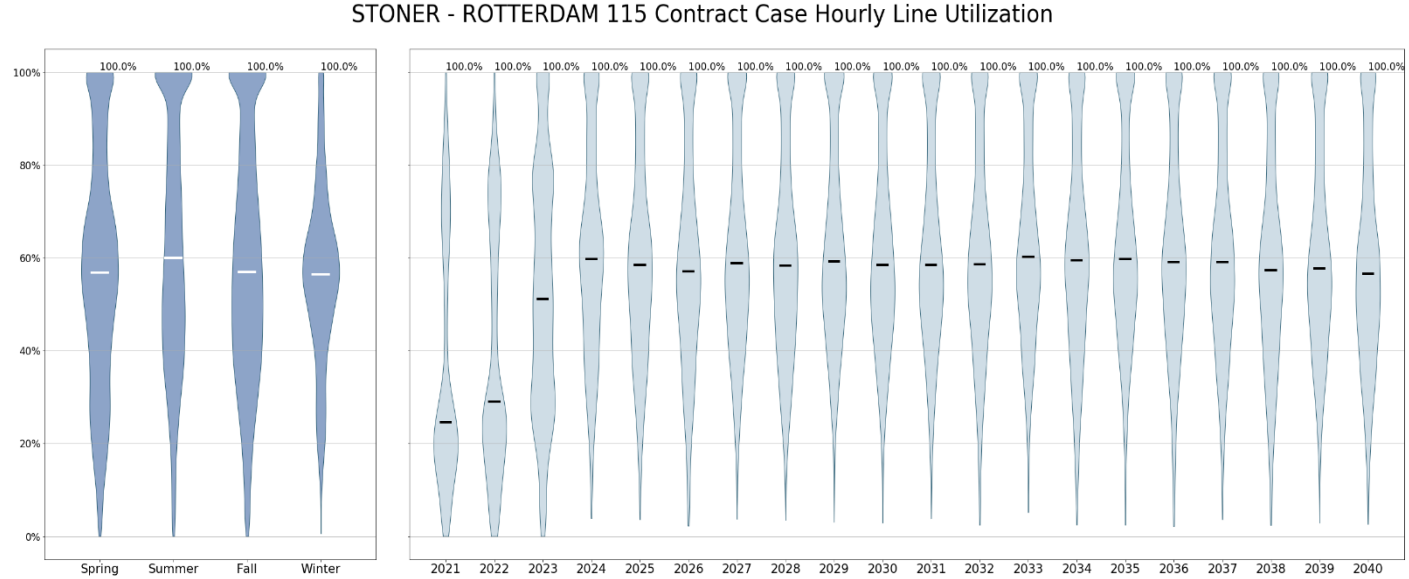
Type	Double Circuit 115 kV
Normal Op. Rating	74/74 MW
Contingency Op. Rating	74/ 111 MW
Length	~23 miles
Owner	National Grid



- Congestion increases due to increased amount of renewables modeled in-service upstream of this constraint.

New York ISO

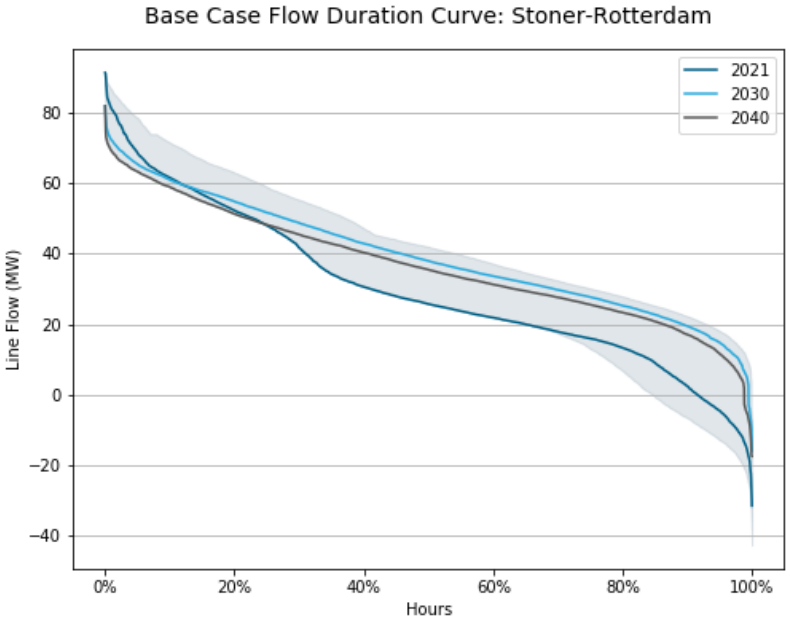
Stoner – Rotterdam 115 kV

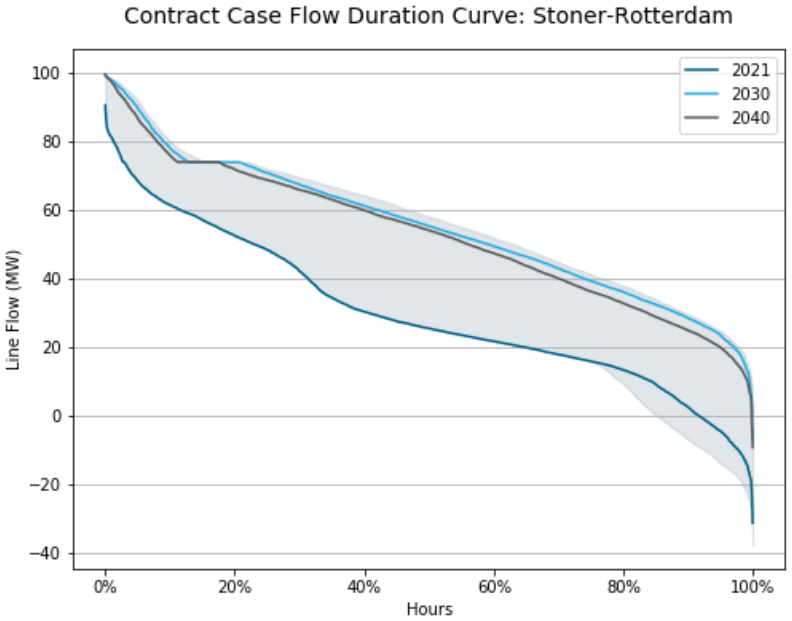


- Increased line utilization and congestion is observed in the contract case as a result of new renewable resources being modeled upstream of this path.

New York ISO

Stoner – Rotterdam 115 kV

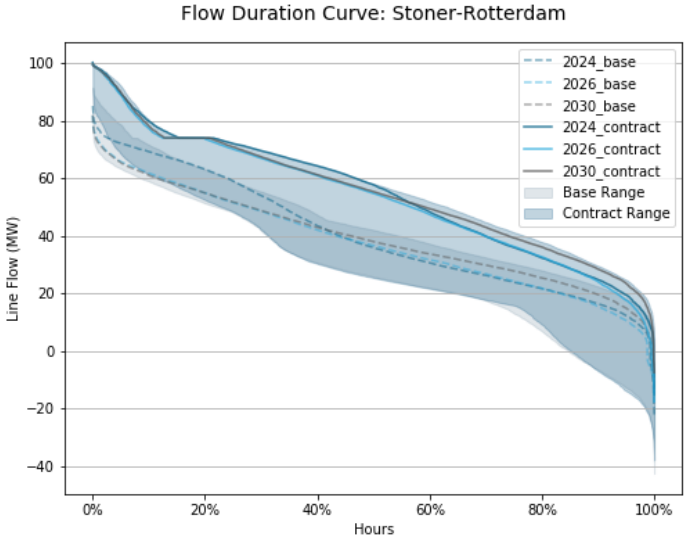


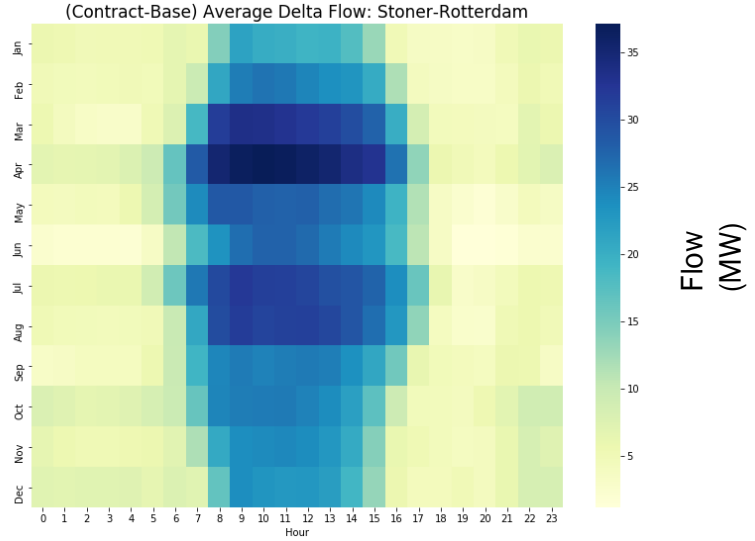


New York ISO

Stoner – Rotterdam 115 kV

(Contract – Base) Flow Comparison



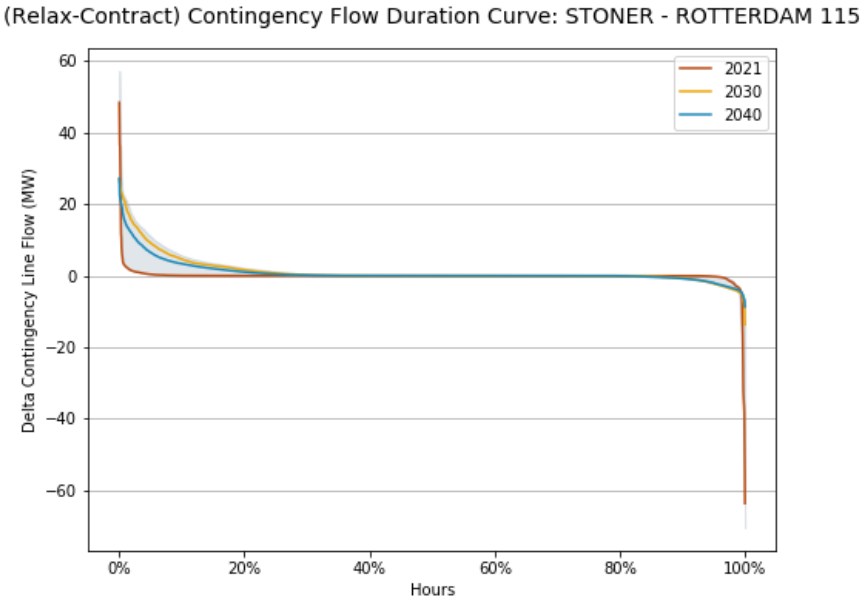


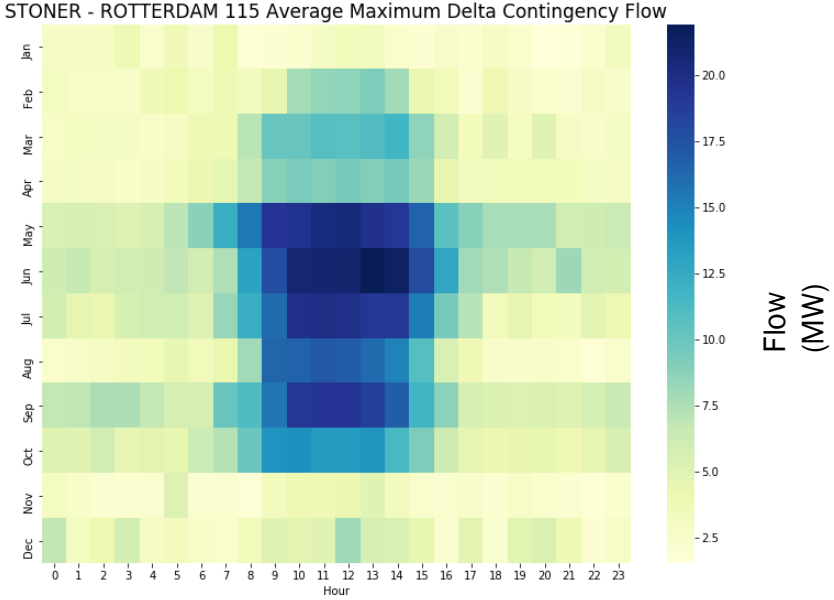
- Increase in flow in the contract case is primarily due to contracted solar resources that are sited upstream of this constraint

New York ISO

Stoner – Rotterdam 115 kV

(Relax - Contract) Flow Comparison

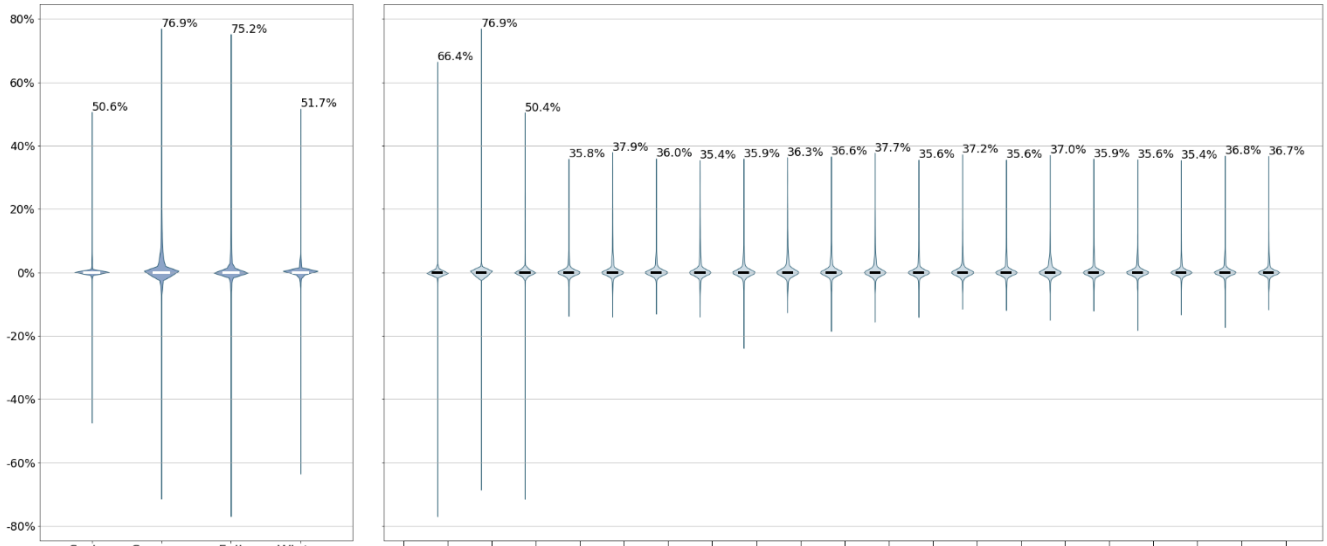




- Relaxing this constraint allows contracted UPV resources in Zone E and F to generate more and flow downstate

New York ISO

Stoner – Rotterdam 115 kV



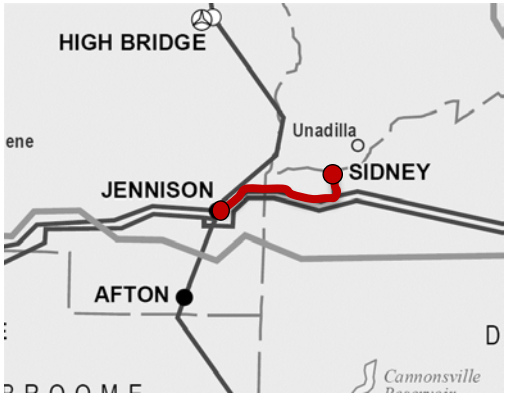
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	0	0	4	8	9	10	10	9	13	10	11	9	10	8	11	8	9	7	8	6

- Production Cost savings for relaxing this constraint is $19 million over 20 years.

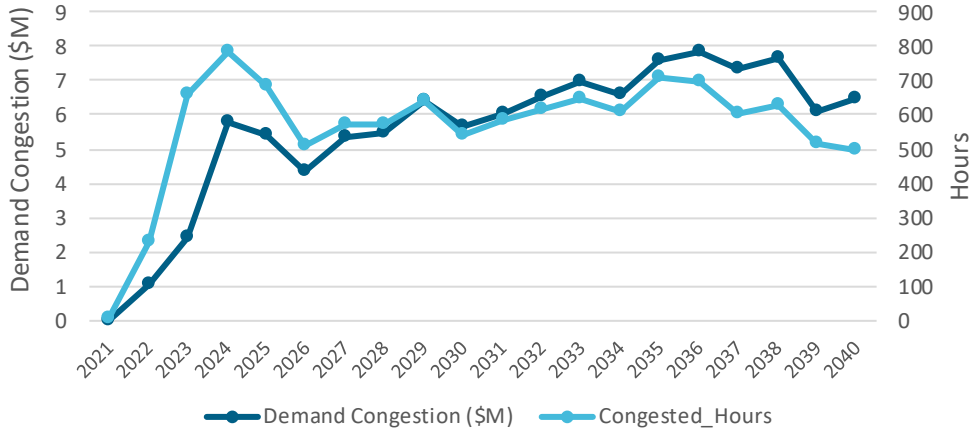
New York ISO

Jennison – Sidney 115 kV

Transmission Information & Projected Congestion



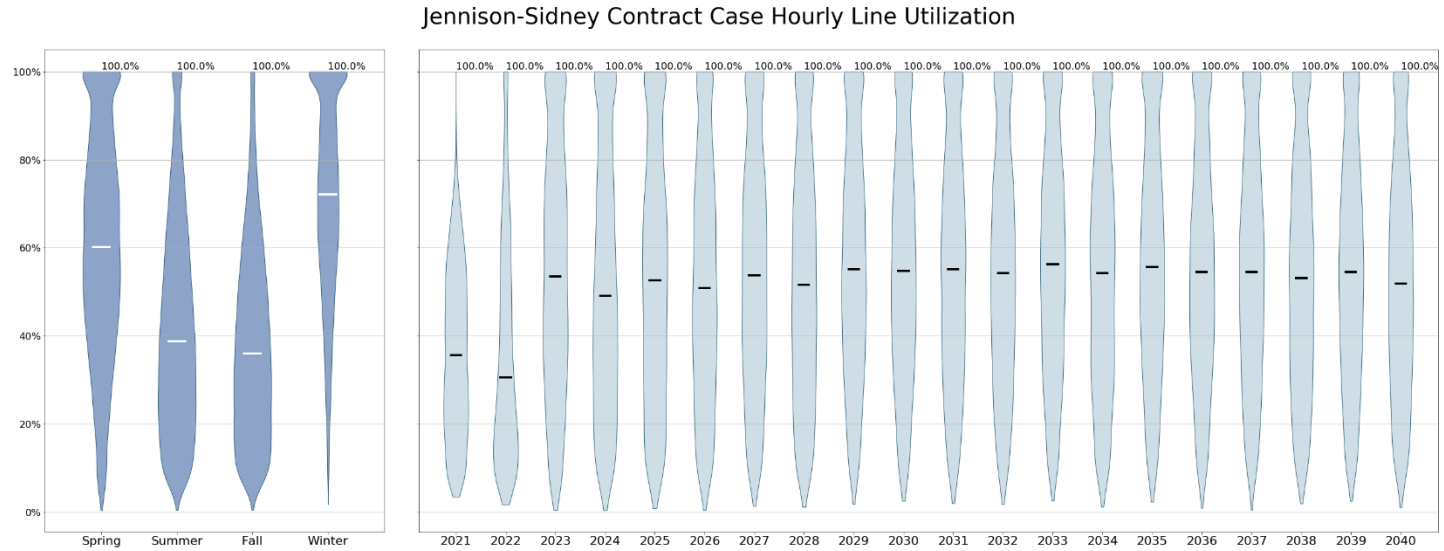
Type	Single Circuit 115kV
Normal Op. Rating	70/ 107 MW
Contingency Op. Rating	110/ 110 MW
Length	~10 Miles
Owner	NYSEG



- Congestion is likely caused by increased wind and solar resources in-service in the area.

New York ISO

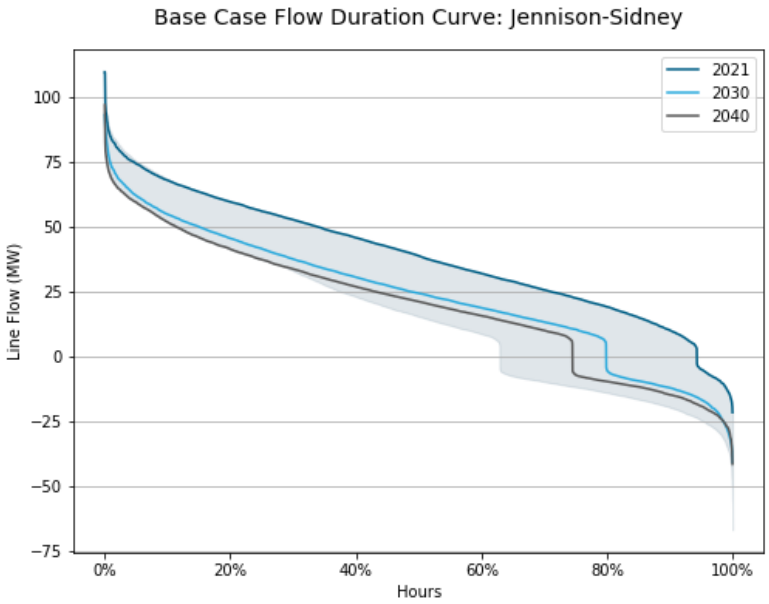
Jennison – Sidney 115 kV

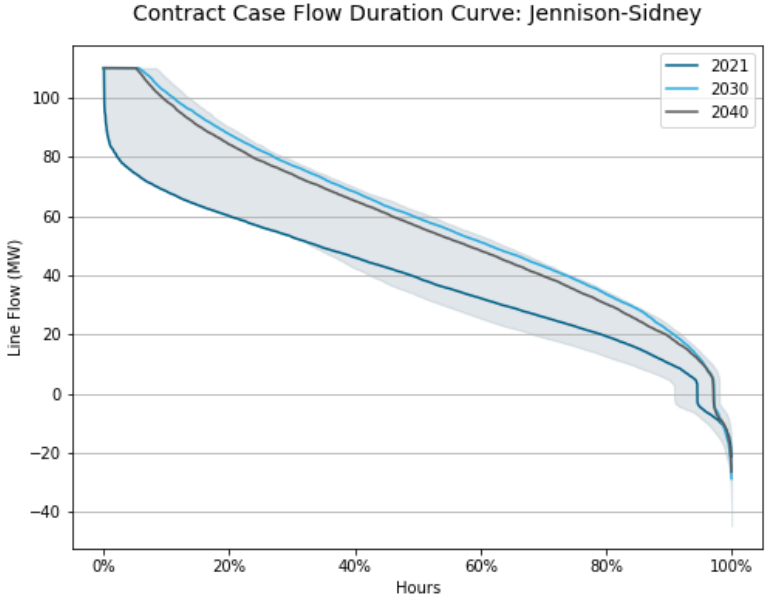


- Line utilization is spread out throughout the year.
- The line is more congested in the winter period compared to the summer.
- Flow on this line is highly affected by nearby contracted wind resources.

New York ISO

Jennison – Sidney 115 kV

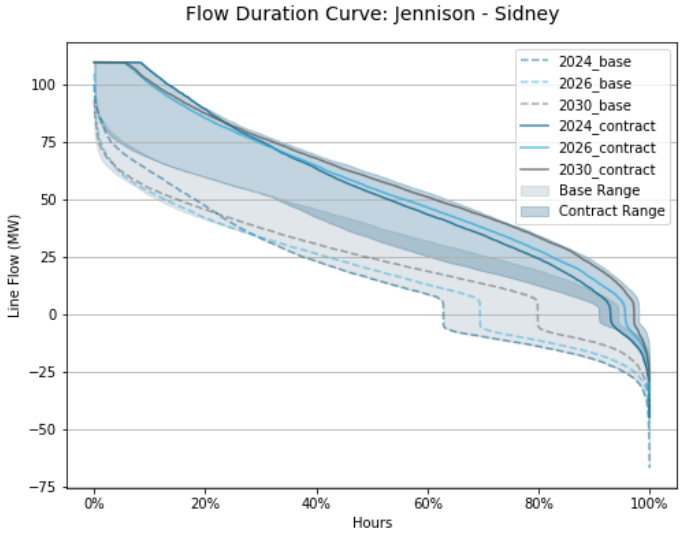


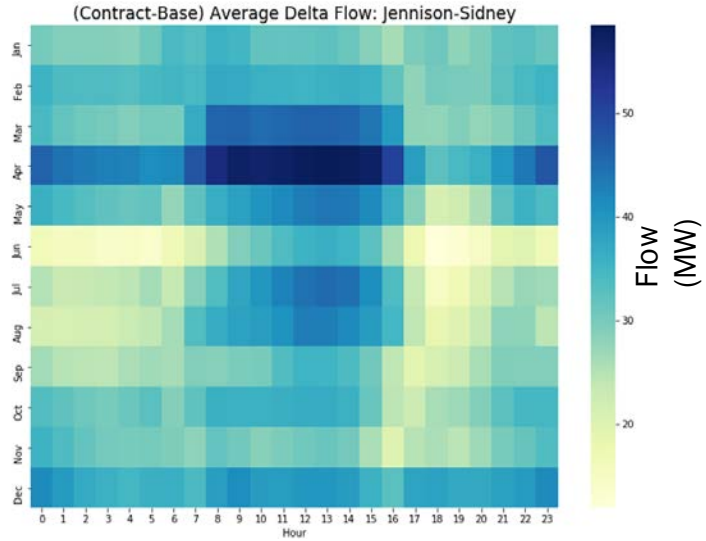


New York ISO

Jennison – Sidney 115 kV

(Contract – Base) Flow Comparison



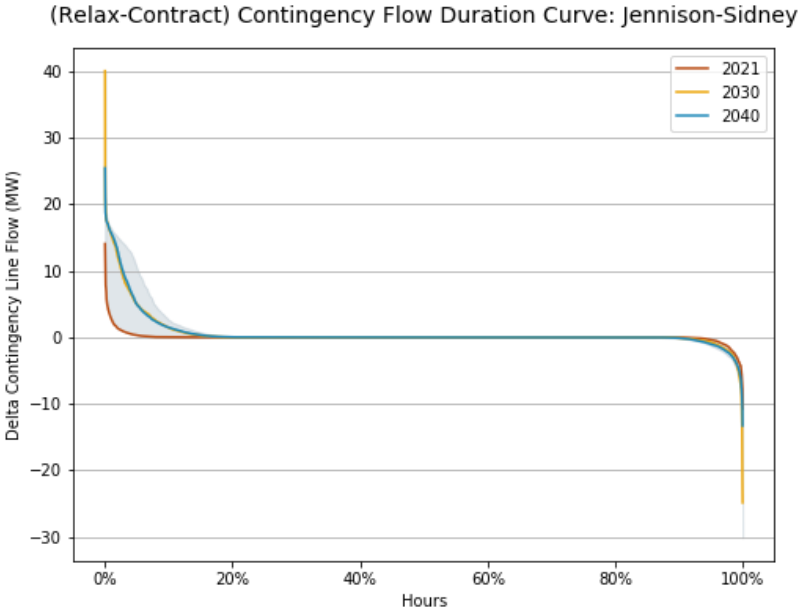


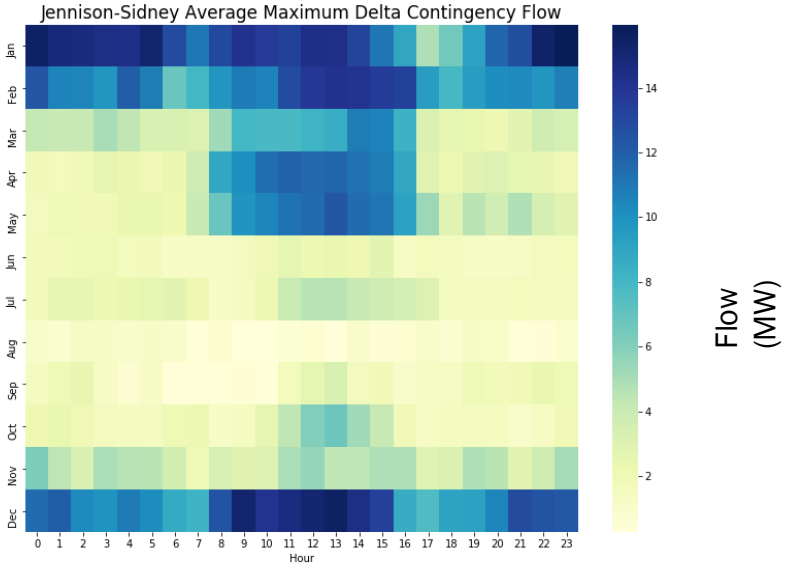
- Increased flow in Contract case as a result of nearby wind resources being modeled in the Contract Case.

New York ISO

Jennison – Sidney 115 kV

(Relax - Contract) Flow Comparison





- Relaxing this constraint allows nearby wind resources to generate more in the relaxed case compared to contract case.

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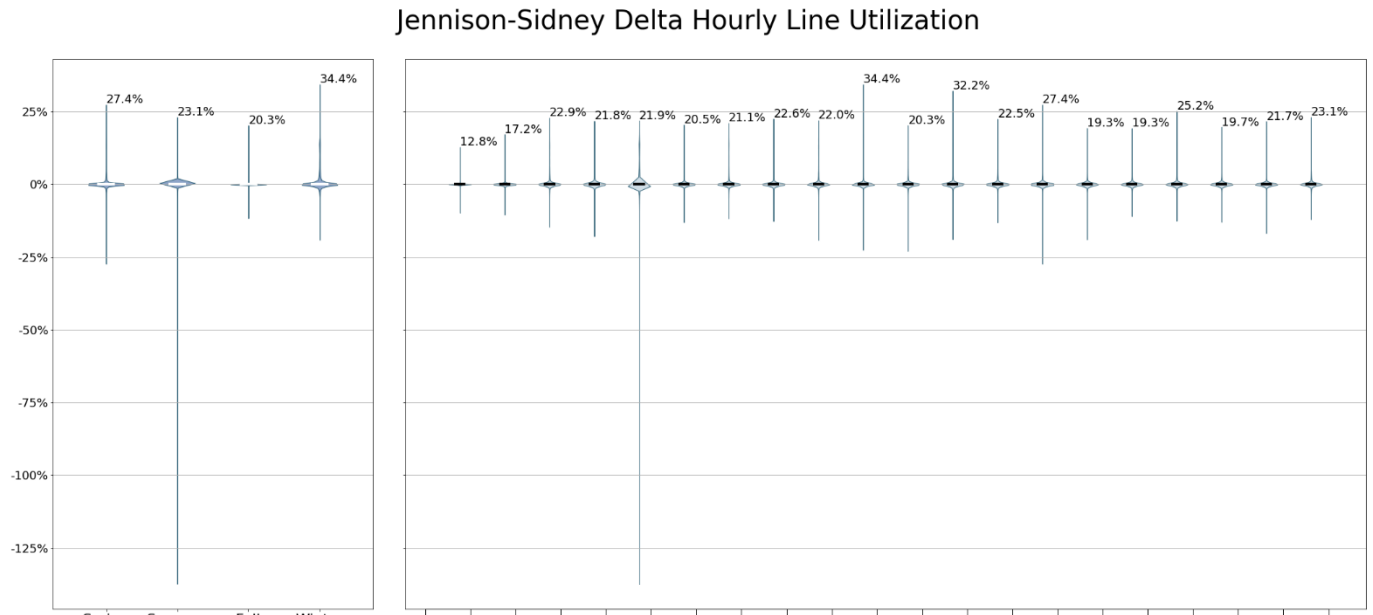

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Freed Energy (GWh)	0	2	6	8	7	5	5	5	5	5	5	6	6	6	6	6	6	5	5	5

- Production Cost savings for relaxing this constraint is $8 million over 20 years.

New York ISO

Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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Questions, Feedback, Comments?

- Email additional feedback to: JFrasier@nyiso.com