Q. **Reference: Life Extension Application, Schedule 1, page 6, lines 3-5.**

"In addition, Unit 7 also provides synchronous condensing capability to provide the necessary voltage support to the system during periods when power generation from the unit is not required."

a) Provide the number of times per year, for the last 10 years, that Unit 7 operated as a synchronous condenser. In the response include the duration for each synchronous condensing event.

b) Does Hydro have other hydroelectric generators that provide synchronous condensing capability? If yes, provide the location and designation for each generator with synchronous condensing capability.

c) Has Hydro undertaken a study into the synchronous condensing requirements of the Island Interconnected System? If yes, provide a copy of the study. If not, provide the reasons a study has not been completed.

A. **a)** In the last ten years, from January 1, 2014 to December 31, 2024, Bay d'Espoir Unit 7 has operated as a synchronous condenser on 822 separate occasions. Table 1 outlines the annual totals.

Table 1: Unit 7 Synchronous Condenser Operations 2015–2024

Year	Number of Synchronous Condenser Operations
2015	68
2016	67
2017	100
2018	59
2019	57
2020	85
2021	114
2022	113
2023	75
2024	84
Total	**822**

Please refer to PUB-NLH-001, Attachment 1, for detailed information on each of the above events.

Table 2 provides the total duration of synchronous condenser operation and the average duration for each of the last ten years.

Table 2: Unit 7 Synchronous Condenser Event Average Durations by Year

Year	Average Duration in Hours of Synchronous Condenser Event	Total Duration in Hours of Synchronous Condenser Events
2015	6.8	447.3
2016	7.4	498.5
2017	7.2	723.2
2018	6.9	406.4
2019	14.4	822.2
2020	9.4	802.6
2021	11.4	1,298.4
2022	13.0	1,473.9
2023	24.7	1,853.4
2024	20.0	1,682.5

b) Yes. Table 3 lists Newfoundland and Labrador Hydro's ("Hydro") other hydroelectric generators that provide synchronous condensing capability.

Table 3: Hydroelectric Generator Synchronous Condensing Capability

Unit	Reactive Power Capacity (at 0 MW)
Bay d'Espoir Unit 7	+107 MVAr / -138 MVAr
Cat Arm Unit 1	+39 MVAr / -60MVAr
Cat Arm Unit 2	+39 MVAr / -60MVAr

c) Reactive power and system strength considerations are prominent in the operation of the Island transmission system in particular for the Avalon Peninsula and West Coast regions. The requirement for synchronous condenser capability is location dependent. Hydro strongly recommends that existing synchronous condenser capability be maintained, and that new generation (i.e., the proposed Bay d'Espoir Unit 8 and the Avalon Combustion Turbine ("CT")) have the capability to operate as synchronous condensers. This will provide for the reactive power and increased system strength in a cost-effective and efficient

operating manner; otherwise, thermal units would have to operate at minimum or base load, or hydraulic units would have to be dispatched at inefficient setpoints to provide the required grid support.

The following are the technical benefits of having a synchronous condenser in terms of grid support:

a. **<u>System Strength (Short Circuit Levels):</u>** The operation of the Avalon units as synchronous condensers increases the three-phase short circuit levels ("SCL") of the system without the need to operate in generation mode and consume fuel. The latter would be the case if the Holyrood ("HRD") thermal units or HRD CT were to be dispatched to achieve the required SCLs. Higher SCLs increase system strength, which provides the following benefits:

i. **Labrador-Island Link ("LIL") Operation:** There are minimum SCL requirements at the Soldier's Pond ("SOP") 230 kV Bus in order to operate the LIL reliably at its rated capacity of 900 MW. In a scenario with only two large Avalon synchronous machines[1] online, the LIL must be derated. In the event of a loss of one of the remaining two machines, the LIL must be taken offline. Synchronous condenser capability at the proposed Avalon CT would provide for non-fuel-based redundancy in order to meet the minimum LIL SCL requirement.

ii. **Inverter-Based Resource ("IBR") Integration:** IBRs are sources of generation like wind, solar and battery energy storage systems that are asynchronously interconnected to the system via power electronics (Direct Current to Alternating Current inverters). The amount and/or size of IBRs that can be integrated to the system depends on SCLs at the point of interconnection. The higher the SCLs, the more IBRs can be integrated to the system. At low SCLs, there is more sensitivity to changes in voltage, which increases the risk of voltage collapse, given the increased active power variability of the IBR. Control instability with nearby control systems is currently an issue on the Island Interconnected System and limits our ability to integrate IBRs near the LIL. The increased system strength provided by more synchronous condensers would

[1] An Avalon synchronous machine would be a unit at HRD or SOP operating in generating or synchronous condenser mode.

help facilitate more renewable energy integration in the province. This would be critical when considering situations when active power generation from existing assets is minimized during periods of peak wind production.

Other power utilities with relatively small systems are encountering the same barriers in terms of system strength and renewable energy integration. In Nova Scotia Power's 2023 Evergreen Integrated Resources Plan, "Powering a Green Nova Scotia, Together," it states the following as an action plan for Nova Scotia Power:

> Complete generator site-specific system impact studies for new variable renewable generation to assess the need for synchronous condenser support. Progress the development of 100 – 200 MVA of synchronous condensers by 2030 to support system reliability and strength with the increase in variable renewable generation on the system.[2]

Therefore, as new IBRs are integrated into the Island Interconnected System, it is anticipated that greater SCLs will be required to support system stability.

b. **Voltage Regulation:** The primary purpose of a synchronous condenser is to provide voltage regulation during steady state and transient events (i.e., electrical faults). In the event there are no or only one SOP synchronous condensers online, there is limited ability to regulate voltages on the Avalon Peninsula during light load conditions that could impact LIL operation, which is a critical source of supply to the Island Interconnected System. The additional voltage regulation is also beneficial during a LIL bipole outage at high load conditions when there is increased power flow from Bay d'Espoir to the Avalon, as it provides improved system stability following a fault.

Under certain operating scenarios, the Avalon CTs operating as synchronous condensers could marginally reduce the need to dispatch thermal generation to decrease Bay d'Espoir to SOP power flow. It would be preferable to operate as a synchronous condenser to provide voltage regulation without having to operate in generator mode

[2] "Powering A Green Nova Scotia, Together – 2023 Evergreen Integrated Resource Plan – Updated Action Plan and Roadmap," Nova Scotia Power, August 8, 2023, p. 16. https://www.nspower.ca/docs/default-source/irp/2023-action-plan-and-road-map.pdf?sfvrsn=bcd3c747_1.

and consume fuel. This is even more critical during outages of other synchronous machines (e.g., SOP Synchronous Condenser). Analysis was performed as part of the ongoing "Assessment of the BDE/SOP Transmission Constraints" study,[3] which demonstrated the value of additional reactive power support on the Avalon Peninsula with the LIL bipole in service. As shown in Table 4, the requirement for Avalon Generation decreases when more reactive power support is provided by additional SOP Units or HRD Unit 3. The Avalon CTs operating as synchronous condensers would also provide additional reactive power support and would reduce the Avalon generation requirements over peak to avoid voltage collapse following a LIL bipole trip. TransGrid Solutions Inc. is currently conducting a study that will result in an update of Table 4 and quantify the reduction of Avalon Generation associated with the proposed Avalon CTs operating as synchronous condensers. This study is expected to be completed by December 2025.[4]

Table 4: Avalon Generation Requirements to Avoid Voltage Collapse Following LIL Bipole Trip

	Avalon Generation[5] (MW)			
Island Interconnected System Demand (MW)	**0 SOP Syncs + HRD 3 SC**	**1 SOP Sync + HRD 3 SC**	**2 SOP Syncs + HRD 3 SC**	**3 SOP Syncs + HRD 3 SC**
2,100	400	300	200	150
2,000	370	260	175	123.5
1,950	350	230	150	90
1,925	335	215	123.5	75
1,850	300	120	70	40
1,750	120	70	30	None*
1,650	70	40	None*	None*
1,550	None*	None*	None*	None*

*Unless otherwise required to serve demand.

The need for more voltage regulation becomes more crucial as the load grows on the Avalon Peninsula. The addition of synchronous capability on the Avalon CT would be a

[3] "Assessment of the BDE/SOP Transmission Constraints TN1817.01.05," TransGrid Solutions Inc., October 25, 2023.
[4] Hydro will file this study as part of the *Reliability and Resource Adequacy Study Review* proceeding upon completion of its internal review within 45 days of the receipt of the final report.
[5] This assumes there is already 40 MW of NP Avalon Generation and 6 MW of Wind Generation at Fermeuse.

cost-effective provision of providing the reactive power necessary to support growth on the Avalon Peninsula.

c. **System Frequency Regulation:** The ability to operate a unit as a synchronous condenser provides more inertia to the system without having to operate in generator mode and consume fuel. The increased inertia provides better system frequency response during a system event, which could result in less customer impact in the form of under-frequency loading shedding.

The operation of Bay d'Espoir Unit 7 and the proposed Bay d'Espoir Unit 8 as a synchronous condenser provide for similar benefits as outlined above. In terms of voltages and regulation, during light load conditions, there is a risk of over-voltages (> 1.05 p.u.) on the Western section of the Island Interconnected System due to transmission line charging. This becomes particularly impactful during outages to the Maritime Link, which provides significant voltage regulation when in operation. Hydro currently has an operating practice to de-energize a 230 kV line to reduce voltages to acceptable levels when all other resources have been exhausted. This consequently has an adverse impact on system reliability.

Without synchronous condenser capability on Bay d'Espoir Unit 7, the requirement to de-energize a 230 kV line to reduce voltages would become more probable. Furthermore, the addition of Bay d'Espoir Unit 8 as a synchronous condenser will provide this necessary voltage regulation without de-energizing a line and operating Bay d'Espoir Unit 7 and/or Bay d'ESpoir Unit 8 in generator mode and use water resources. This would also ensure adequate voltage regulation in the event of an extended outage to Unit 7 or Unit 8 due to an overhaul or penstock replacement.

Table 5 provides a summary of load flow analysis during an outage of the Maritime Link during light load conditions for various scenarios involving Bay d'Espoir Unit 8 and a 230 kV line outage. As indicated in Table 5, the load flow analysis demonstrates that over-voltages occur in a scenario without voltage regulation provided by Bay d'Espoir Unit 8. The removal of a 230 kV line reduces the voltage to an acceptable 1.038 p.u., but this would negatively impact system reliability, as the next contingency would result in loss of customers. The operation of Bay d'Espoir Unit 8 as a synchronous condenser, assuming synchronous

condenser capability on Unit 7 is maintained, reduces the voltage to an acceptable of 1.047 p.u. without requiring a planned outage of a 230 kV line.

Following the eventual retirement of the Stephenville Gas Turbine, which can operate in synchronous condenser mode, the overvoltage conditions mentioned are worsened. This further justifies the requirement for synchronous condenser capability at Bay d'Espoir.

Table 5: Maritime Link Outage – Light Load Conditions[6]

Status of Bay d'Espoir Unit 8	Planned 230 kV Line Outage	Maximum Voltage at BBK[7] 230 kV Terminal Station (p.u.)
Offline	No	1.056
Offline	Yes	1.038
Synchronous Condenser	No	1.047

[6] Assumes Stephenville Combustion Turbine is online operating as a synchronous condenser.
[7] Bottom Brook ("BBK").

Unit 7 Synchronous Condenser Operations 2015–2024

Synch Event Date	Duration of Event (hours)
5/3/2015	6.18
5/3/2015	6.43
5/4/2015	7.12
5/5/2015	6.25
5/24/2015	5.72
5/25/2015	15.07
5/26/2015	26.55
5/28/2015	6.30
5/29/2015	6.12
5/31/2015	6.90
6/18/2015	5.13
6/29/2015	5.18
6/30/2015	5.63
7/1/2015	10.30
7/2/2015	6.97
7/3/2015	6.92
7/3/2015	9.63
7/4/2015	10.93
7/5/2015	6.87
7/9/2015	4.50
7/10/2015	6.45
7/10/2015	7.92
7/12/2015	7.35
7/13/2015	0.18
7/17/2015	6.28
7/18/2015	6.97
7/19/2015	6.95
7/22/2015	6.42
7/23/2015	6.70
7/24/2015	6.03
7/25/2015	5.48
7/26/2015	5.52
7/27/2015	5.63
7/28/2015	6.00
7/29/2015	5.97
7/30/2015	5.73
7/31/2015	5.73
8/1/2015	6.95
8/5/2015	0.28
8/15/2015	7.47
8/15/2015	9.40
9/7/2015	0.27
9/7/2015	7.78
9/13/2015	6.85

Synch Event Date	Duration of Event (hours)
9/14/2015	5.23
9/15/2015	4.82
9/16/2015	5.90
9/18/2015	5.73
9/20/2015	7.85
9/20/2015	7.95
9/21/2015	6.78
9/22/2015	6.42
9/23/2015	7.17
9/24/2015	6.52
9/26/2015	5.62
9/27/2015	7.02
9/28/2015	7.02
9/29/2015	7.33
10/1/2015	6.78
10/2/2015	6.33
10/6/2015	6.10
10/6/2015	6.43
10/9/2015	4.73
10/13/2015	5.25
10/13/2015	7.63
10/14/2015	7.10
10/15/2015	7.18
10/17/2015	6.93
1/18/2016	5.43
1/28/2016	1.68
2/1/2016	6.78
2/4/2016	7.98
2/6/2016	8.85
2/17/2016	6.85
2/26/2016	9.93
2/26/2016	2.78
2/26/2016	8.77
2/29/2016	8.80
3/2/2016	4.38
3/3/2016	4.20
3/5/2016	8.15
4/1/2016	11.13
4/2/2016	40.15
4/8/2016	8.25
4/9/2016	3.93
4/9/2016	7.37
4/10/2016	9.12
5/7/2016	8.78
5/8/2016	15.90
5/22/2016	4.23

Synch Event Date	Duration of Event (hours)
5/24/2016	6.13
5/24/2016	7.45
5/25/2016	8.00
5/30/2016	6.23
5/31/2016	6.63
6/7/2016	5.08
6/7/2016	6.93
6/13/2016	5.70
6/20/2016	8.30
6/21/2016	8.72
6/23/2016	6.57
6/23/2016	6.38
6/25/2016	6.13
6/25/2016	7.58
6/27/2016	6.30
6/28/2016	6.48
6/29/2016	6.30
8/26/2016	14.50
8/28/2016	7.90
8/29/2016	5.95
8/30/2016	6.47
9/16/2016	8.97
9/18/2016	6.40
9/18/2016	7.12
10/3/2016	3.82
10/5/2016	5.58
10/5/2016	6.82
10/6/2016	8.23
10/7/2016	8.75
10/9/2016	6.68
10/9/2016	9.52
10/17/2016	0.88
10/23/2016	6.33
10/25/2016	3.43
10/30/2016	6.77
11/2/2016	7.73
11/3/2016	6.80
11/4/2016	7.93
11/11/2016	6.87
11/14/2016	4.55
11/17/2016	7.27
11/20/2016	7.32
11/21/2016	5.98
11/22/2016	6.17
11/28/2016	5.40
4/28/2017	8.07

Synch Event Date	Duration of Event (hours)
4/29/2017	7.70
5/5/2017	3.45
5/6/2017	0.52
5/14/2017	5.45
5/15/2017	5.48
5/16/2017	7.23
5/17/2017	7.40
5/18/2017	10.97
5/19/2017	9.07
5/23/2017	7.20
5/30/2017	6.47
5/31/2017	6.65
6/1/2017	6.08
6/4/2017	6.38
6/5/2017	6.12
6/7/2017	3.20
6/7/2017	5.62
6/8/2017	6.90
6/9/2017	9.08
6/10/2017	8.50
6/11/2017	16.08
6/11/2017	7.55
6/12/2017	19.28
6/14/2017	4.97
6/18/2017	8.08
6/19/2017	6.27
6/20/2017	6.85
6/21/2017	9.28
6/23/2017	5.40
6/24/2017	5.50
6/25/2017	8.62
6/25/2017	17.08
6/27/2017	6.92
6/28/2017	5.80
6/28/2017	7.62
7/1/2017	8.67
7/3/2017	8.42
7/12/2017	5.60
7/13/2017	6.27
7/14/2017	5.57
7/20/2017	4.77
7/21/2017	5.98
7/22/2017	6.98
7/23/2017	6.87
7/25/2017	7.08
7/26/2017	5.92

Synch Event Date	Duration of Event (hours)
7/26/2017	7.40
7/27/2017	8.05
7/28/2017	10.00
8/22/2017	5.75
8/24/2017	6.25
8/25/2017	5.02
8/25/2017	9.82
8/26/2017	9.33
9/17/2017	8.07
9/18/2017	7.12
9/19/2017	7.87
9/20/2017	10.10
9/21/2017	1.08
9/21/2017	12.18
9/22/2017	9.17
9/23/2017	7.90
9/25/2017	4.73
9/25/2017	6.78
9/27/2017	5.17
9/28/2017	7.10
9/30/2017	4.30
10/5/2017	0.35
10/8/2017	8.88
10/9/2017	6.20
10/10/2017	7.68
10/12/2017	5.12
10/15/2017	8.08
10/16/2017	6.33
10/17/2017	5.23
10/25/2017	4.83
10/25/2017	6.28
10/26/2017	6.80
10/27/2017	8.05
10/29/2017	5.93
10/30/2017	4.52
11/1/2017	5.43
11/3/2017	5.02
11/3/2017	2.92
11/3/2017	11.33
11/6/2017	13.17
11/7/2017	5.57
11/11/2017	6.97
11/19/2017	5.95
11/20/2017	4.50
11/25/2017	4.40
11/25/2017	10.13

Synch Event Date	Duration of Event (hours)
11/26/2017	10.35
11/27/2017	6.70
11/29/2017	29.60
12/5/2017	4.38
12/7/2017	2.33
12/11/2017	7.43
12/13/2017	4.58
1/12/2018	11.40
1/13/2018	13.23
2/3/2018	5.40
4/25/2018	6.85
4/26/2018	6.40
4/28/2018	4.72
4/28/2018	10.15
4/29/2018	7.12
5/2/2018	3.70
5/7/2018	4.77
5/9/2018	7.27
5/12/2018	2.67
5/15/2018	5.32
5/15/2018	7.82
5/21/2018	0.55
5/21/2018	5.78
5/28/2018	5.90
6/1/2018	6.55
6/6/2018	3.70
6/8/2018	3.75
6/8/2018	6.17
6/11/2018	4.70
6/14/2018	3.45
6/15/2018	4.23
6/21/2018	4.75
6/21/2018	6.75
6/23/2018	6.58
6/23/2018	22.30
6/24/2018	6.27
7/8/2018	4.52
7/9/2018	5.60
9/18/2018	6.17
9/23/2018	4.65
9/23/2018	5.93
9/27/2018	4.78
9/27/2018	6.67
9/28/2018	10.93
9/29/2018	10.97
9/30/2018	6.10

Synch Event Date	Duration of Event (hours)
10/2/2018	5.65
10/4/2018	14.43
10/4/2018	7.00
10/6/2018	5.18
10/20/2018	8.95
10/21/2018	12.97
10/26/2018	4.00
10/29/2018	6.33
10/30/2018	6.25
11/7/2018	9.02
11/8/2018	9.37
11/10/2018	1.98
12/18/2018	3.88
12/18/2018	6.92
12/19/2018	5.97
12/21/2018	4.60
12/21/2018	8.25
12/22/2018	19.08
12/23/2018	8.52
12/25/2018	3.52
1/5/2019	7.52
1/6/2019	6.60
1/10/2019	7.80
1/11/2019	8.83
1/21/2019	7.00
1/22/2019	5.77
1/24/2019	8.08
1/25/2019	8.73
1/25/2019	5.90
2/25/2019	6.12
3/17/2019	5.17
3/24/2019	5.30
3/31/2019	5.13
4/21/2019	10.15
5/14/2019	5.77
5/19/2019	5.38
5/25/2019	4.07
5/25/2019	4.75
9/20/2019	12.13
9/21/2019	0.18
9/21/2019	0.50
9/23/2019	9.02
9/24/2019	8.07
9/25/2019	7.92
9/26/2019	82.08
9/30/2019	7.62

Synch Event Date	Duration of Event (hours)
10/1/2019	7.55
10/3/2019	5.68
10/3/2019	15.78
10/5/2019	6.77
10/5/2019	6.13
10/6/2019	2.95
10/6/2019	6.85
10/7/2019	9.50
10/8/2019	7.70
10/10/2019	5.55
10/10/2019	7.45
10/11/2019	68.17
10/14/2019	7.77
10/15/2019	9.53
10/16/2019	7.55
10/17/2019	9.92
10/18/2019	125.27
10/23/2019	0.48
10/24/2019	113.38
10/29/2019	9.37
10/30/2019	9.18
10/31/2019	93.90
11/4/2019	3.15
11/4/2019	7.03
11/13/2019	6.63
11/14/2019	0.35
11/21/2019	4.58
11/22/2019	5.40
11/27/2019	0.60
12/11/2019	5.75
12/15/2019	6.63
1/27/2020	6.25
1/27/2020	6.27
1/28/2020	6.72
2/2/2020	7.47
2/4/2020	4.95
2/4/2020	5.72
2/11/2020	0.05
2/11/2020	2.50
2/17/2020	0.00
2/17/2020	4.95
2/17/2020	5.23
2/24/2020	3.65
2/24/2020	3.03
2/24/2020	6.12
2/25/2020	7.93

Synch Event Date	Duration of Event (hours)
2/26/2020	1.33
2/26/2020	6.33
2/27/2020	0.63
2/29/2020	4.57
3/1/2020	4.47
3/3/2020	2.07
3/3/2020	7.92
3/5/2020	23.35
3/21/2020	1.13
4/13/2020	7.50
5/3/2020	7.70
5/9/2020	8.52
5/20/2020	15.70
5/21/2020	43.93
5/23/2020	1.20
5/23/2020	29.73
5/25/2020	10.63
5/26/2020	2.25
5/26/2020	12.15
5/27/2020	8.02
5/28/2020	84.63
6/2/2020	5.92
6/3/2020	8.82
6/4/2020	9.02
6/5/2020	21.33
6/7/2020	8.23
6/8/2020	5.90
6/15/2020	7.27
6/16/2020	8.75
6/17/2020	11.43
6/18/2020	13.65
6/19/2020	11.88
6/22/2020	7.45
6/23/2020	15.25
6/24/2020	7.05
6/25/2020	8.77
6/25/2020	7.33
6/26/2020	11.40
6/27/2020	16.77
6/28/2020	15.97
6/29/2020	14.13
6/30/2020	34.12
7/19/2020	7.48
7/20/2020	7.58
7/24/2020	7.40
8/4/2020	6.57

Synch Event Date	Duration of Event (hours)
9/13/2020	4.98
10/4/2020	0.28
10/9/2020	6.33
10/14/2020	7.53
10/15/2020	7.32
10/16/2020	9.97
10/17/2020	8.32
10/19/2020	5.15
10/20/2020	5.63
10/20/2020	12.10
10/22/2020	2.00
11/2/2020	5.28
11/6/2020	10.17
11/7/2020	5.62
11/11/2020	6.72
11/12/2020	5.37
11/28/2020	0.52
12/2/2020	4.80
12/2/2020	16.82
12/3/2020	7.20
12/6/2020	7.05
12/23/2020	5.20
12/26/2020	5.97
12/26/2020	18.25
1/1/2021	0.00
1/1/2021	3.28
1/7/2021	5.28
1/8/2021	5.45
1/8/2021	6.80
2/3/2021	9.27
2/4/2021	4.43
2/5/2021	4.95
2/6/2021	6.00
2/23/2021	4.80
2/25/2021	4.63
2/26/2021	4.60
3/2/2021	3.73
3/13/2021	2.03
3/19/2021	4.08
3/21/2021	3.65
3/21/2021	6.05
3/22/2021	17.62
3/23/2021	14.63
3/25/2021	4.68
3/26/2021	5.62
3/27/2021	3.95

Synch Event Date	Duration of Event (hours)
3/30/2021	2.93
4/2/2021	41.82
4/4/2021	17.58
4/7/2021	5.10
4/8/2021	6.22
4/9/2021	8.77
4/11/2021	5.20
4/11/2021	5.28
4/14/2021	4.98
4/22/2021	1.33
4/22/2021	7.93
4/23/2021	18.37
6/2/2021	5.57
6/2/2021	6.57
6/3/2021	12.17
6/4/2021	7.47
6/5/2021	7.27
6/7/2021	7.83
6/8/2021	7.43
6/9/2021	2.57
6/18/2021	4.43
6/19/2021	7.43
6/19/2021	5.55
6/22/2021	6.35
6/23/2021	6.10
6/27/2021	12.58
7/28/2021	109.08
8/2/2021	17.05
8/3/2021	25.53
8/18/2021	5.77
8/18/2021	7.73
8/19/2021	7.65
8/21/2021	18.73
8/22/2021	46.28
8/25/2021	5.53
8/26/2021	6.63
8/27/2021	6.45
8/28/2021	6.50
8/29/2021	7.40
8/29/2021	6.95
8/31/2021	5.93
9/1/2021	5.03
9/3/2021	108.00
9/8/2021	10.77
9/9/2021	11.57
9/10/2021	5.82

Synch Event Date	Duration of Event (hours)
9/10/2021	30.90
9/12/2021	12.78
9/13/2021	12.87
9/14/2021	21.80
9/15/2021	38.90
9/17/2021	0.30
9/18/2021	53.62
9/20/2021	0.25
9/20/2021	11.55
9/21/2021	8.30
9/23/2021	4.38
9/23/2021	7.70
9/26/2021	54.78
9/30/2021	5.95
9/30/2021	7.17
10/2/2021	8.40
10/3/2021	6.40
10/6/2021	5.60
10/8/2021	4.87
10/20/2021	4.95
10/20/2021	7.85
10/21/2021	79.23
10/26/2021	5.10
11/2/2021	3.50
11/4/2021	5.32
11/14/2021	11.55
11/15/2021	4.45
11/15/2021	0.60
11/16/2021	5.45
11/19/2021	16.87
11/21/2021	6.88
11/23/2021	8.48
11/24/2021	8.77
11/25/2021	2.70
11/25/2021	8.78
11/27/2021	6.27
11/27/2021	1.00
11/27/2021	11.30
11/29/2021	5.05
12/3/2021	5.30
12/7/2021	1.03
12/17/2021	6.75
12/24/2021	0.50
12/28/2021	0.65
12/29/2021	4.78
12/30/2021	3.97

Synch Event Date	Duration of Event (hours)
1/3/2022	5.12
1/5/2022	6.33
1/6/2022	7.62
1/13/2022	8.03
1/14/2022	12.83
1/25/2022	5.03
1/25/2022	6.78
2/11/2022	5.82
2/12/2022	4.17
2/12/2022	11.13
2/23/2022	5.55
3/29/2022	4.43
4/26/2022	5.18
5/10/2022	5.42
5/11/2022	9.02
5/12/2022	15.98
5/13/2022	10.08
5/20/2022	19.73
5/21/2022	21.13
5/22/2022	39.72
5/25/2022	6.67
5/27/2022	5.12
5/27/2022	10.75
5/29/2022	7.33
5/30/2022	7.78
6/6/2022	15.30
6/10/2022	5.10
6/10/2022	55.53
6/13/2022	8.17
6/15/2022	4.72
6/15/2022	12.47
6/17/2022	7.25
6/18/2022	26.60
7/7/2022	34.17
7/9/2022	41.10
7/11/2022	9.67
7/14/2022	4.80
7/15/2022	5.72
7/16/2022	6.55
7/17/2022	6.42
7/18/2022	5.53
7/19/2022	5.85
7/20/2022	6.38
7/21/2022	6.65
7/21/2022	7.77
7/22/2022	7.53

Synch Event Date	Duration of Event (hours)
7/23/2022	8.27
7/24/2022	6.45
7/26/2022	5.95
7/27/2022	6.88
7/28/2022	6.40
7/29/2022	6.57
7/30/2022	9.58
7/31/2022	6.92
7/31/2022	9.77
8/1/2022	8.37
8/2/2022	9.35
8/4/2022	8.10
8/4/2022	7.37
8/5/2022	11.35
8/6/2022	10.77
8/8/2022	9.32
8/14/2022	53.15
8/25/2022	7.90
8/26/2022	56.10
8/29/2022	12.67
9/2/2022	8.70
9/3/2022	9.95
9/4/2022	9.35
9/9/2022	8.63
9/13/2022	5.95
9/14/2022	7.53
9/15/2022	6.52
9/15/2022	5.75
9/16/2022	8.07
9/17/2022	7.58
9/18/2022	6.30
9/19/2022	6.77
9/20/2022	5.33
9/22/2022	8.85
9/23/2022	34.73
9/25/2022	9.35
9/26/2022	11.02
9/27/2022	9.50
9/28/2022	9.63
9/29/2022	8.97
9/30/2022	9.27
10/1/2022	8.08
10/3/2022	5.07
10/6/2022	5.62
10/6/2022	7.17
10/9/2022	5.63

Synch Event Date	Duration of Event (hours)
10/10/2022	4.37
10/10/2022	6.88
10/11/2022	7.68
10/12/2022	7.92
10/13/2022	17.60
10/14/2022	68.17
10/17/2022	121.77
10/22/2022	34.13
10/24/2022	7.08
10/25/2022	9.02
10/26/2022	57.00
10/29/2022	30.65
11/5/2022	17.00
11/6/2022	9.30
11/7/2022	20.68
12/18/2022	6.67
12/20/2022	6.65
12/21/2022	2.17
12/24/2022	4.85
12/24/2022	6.97
12/25/2022	6.75
1/1/2023	5.68
1/1/2023	6.32
2/21/2023	5.78
2/21/2023	5.30
4/11/2023	3.28
4/12/2023	5.12
5/13/2023	40.97
5/16/2023	0.00
5/16/2023	6.62
5/16/2023	48.20
5/19/2023	76.80
5/22/2023	7.25
5/24/2023	10.45
5/28/2023	30.03
5/30/2023	8.88
6/7/2023	8.23
6/8/2023	18.75
6/9/2023	20.22
6/10/2023	22.83
6/11/2023	7.32
6/12/2023	11.98
6/13/2023	15.02
6/15/2023	8.53
6/15/2023	7.43
6/16/2023	9.20

Synch Event Date	Duration of Event (hours)
6/17/2023	10.75
6/19/2023	5.80
6/21/2023	16.33
6/22/2023	83.87
6/26/2023	6.33
6/27/2023	8.60
6/28/2023	129.15
7/4/2023	70.75
7/7/2023	62.53
7/10/2023	7.83
7/11/2023	7.85
7/13/2023	6.27
7/13/2023	7.28
7/14/2023	37.57
7/17/2023	8.75
7/17/2023	7.47
7/19/2023	5.92
7/20/2023	5.82
7/21/2023	6.38
7/22/2023	9.70
7/22/2023	11.53
7/23/2023	10.27
7/25/2023	7.22
7/25/2023	17.12
7/26/2023	249.58
8/25/2023	10.12
8/26/2023	257.47
9/6/2023	85.80
9/10/2023	10.18
9/13/2023	8.38
9/14/2023	7.37
9/15/2023	33.53
9/18/2023	8.15
9/19/2023	8.38
9/20/2023	6.83
9/21/2023	6.05
10/2/2023	7.45
10/8/2023	7.67
10/8/2023	58.02
10/15/2023	67.08
10/19/2023	0.82
10/21/2023	9.35
10/21/2023	11.60
10/22/2023	7.43
10/28/2023	8.65
11/19/2023	6.78

Synch Event Date	Duration of Event (hours)
12/11/2023	12.70
12/19/2023	8.28
12/20/2023	9.33
12/22/2023	5.13
1/29/2024	5.47
2/23/2024	14.33
2/24/2024	9.65
2/25/2024	14.02
2/27/2024	4.48
2/27/2024	7.63
2/28/2024	44.72
3/3/2024	14.17
3/5/2024	4.52
3/5/2024	2.87
3/5/2024	6.70
3/6/2024	8.80
3/7/2024	6.13
3/12/2024	12.13
3/13/2024	37.88
3/28/2024	11.12
3/29/2024	9.18
3/30/2024	17.60
3/31/2024	9.82
4/1/2024	7.33
4/12/2024	127.62
4/20/2024	23.03
4/24/2024	6.47
4/25/2024	14.53
4/29/2024	7.97
5/1/2024	6.37
5/2/2024	1.17
5/4/2024	5.07
5/6/2024	6.23
5/7/2024	0.47
5/7/2024	8.35
5/8/2024	7.50
5/9/2024	7.67
5/12/2024	6.20
5/13/2024	2.07
5/13/2024	0.27
5/13/2024	0.03
5/15/2024	0.05
6/13/2024	2.73
6/20/2024	109.62
6/24/2024	25.45
6/27/2024	12.37

Synch Event Date	Duration of Event (hours)
7/2/2024	7.70
7/2/2024	8.47
7/4/2024	0.95
7/4/2024	0.18
8/15/2024	0.25
8/15/2024	0.23
8/21/2024	0.75
8/28/2024	2.17
8/28/2024	0.22
8/29/2024	0.53
9/3/2024	19.67
9/4/2024	6.42
9/5/2024	6.32
9/6/2024	63.05
9/9/2024	17.08
9/10/2024	37.68
9/12/2024	5.43
9/13/2024	4.07
9/14/2024	2.05
9/14/2024	14.75
9/15/2024	10.83
9/23/2024	6.18
10/4/2024	42.87
10/10/2024	0.83
10/11/2024	0.37
10/11/2024	281.00
10/23/2024	130.52
10/29/2024	9.02
10/30/2024	7.80
10/31/2024	22.45
11/1/2024	59.23
11/6/2024	6.12
11/6/2024	2.50
11/6/2024	35.72
11/8/2024	131.08
11/14/2024	67.43
11/21/2024	11.30
11/23/2024	9.57
12/16/2024	1.38
12/18/2024	6.80