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# Nalcor Project Impacts



# DRAFT

August 17, 2018

# Nalcor Project Impacts

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## Presentation Summary

- Summary
- Project Main Issues
- Schedule Analysis
- Cost
- Next Steps



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March 4, 2019

# Summary

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- Delay with the Telecom
- Excessive Snow on the Ground
- Software Delays
- Engineering Delays
- Construction Delays
- Commissioning Delays
- Procurement
- Change Requests



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March 4, 2019

# Summary of Claims

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- Since December 15, 2017, Nalcor has caused delays to the monopole implementation creating an economic detriment to GE. GE is claiming for EoT, acceleration and other claims indicated in this document.
- Nalcor did not comply with contractual requirements and failed to provide the Telecom network on time to support the project schedule.
- Nalcor/Growler introduced new requirements after the software was completed for the monopole and ready for the FAT.
- Nalcor caused delays by postponing some of the MC walkdowns and was late in approving MCC certifications and LUN. This delayed the start of commissioning.
- Nalcor caused delays to GE's Engineering due to late comments by new reviewers, specification inconsistencies and late termination drawings.
- Nalcor delayed the implementation of GE supplied EEC I/O list, had telecom issues, and had network restrictions.
- GE incurred additional expenditures due to logistics acceleration, warehousing and handling costs.
- Nalcor created issues with the routing of the 25kV cable.
- GE was negatively impacted by the MFA road conditions.
- GE's schedule and cost was negatively impacted by the total snow on the ground during the '17 to '18 winter which was the worst in the last fifty years.

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# 1. Project Main Issue

## Telecom

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- Nalcor did not comply with contractual requirements and failed to provide the Telecom network on time to support the project schedule.
- Nalcor was late in providing temporary 100Mbit telecom equipment and the specified 1Gbit equipment.
- At the request of Nalcor, Contractor supplied and installed 100Mbit equipment and performed commissioning work.
- All of these delays and changes requested by Nalcor negatively impacted the commissioning and completion dates.

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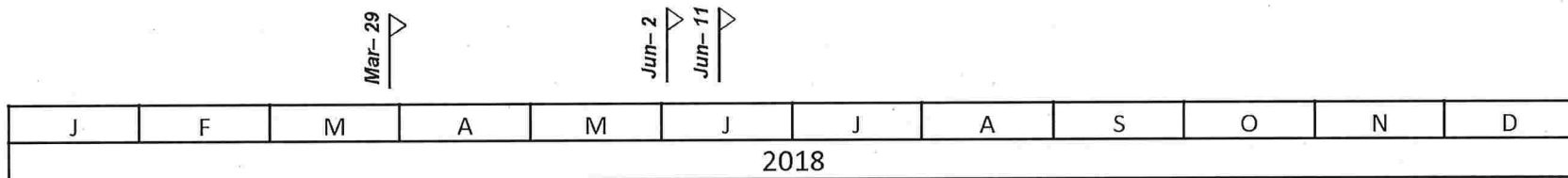
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# 1. Project Main Issue

## Telecom: Timeline

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- 01-Feb-18: Telecom required date for SOP
- 05-Feb-18: Telecom required date for MFA
- 29-Mar-18: Nalcor provided 100Mb instead of 1Gb Telecom equipment
- 26-Apr-18: Notice of Delay - Telecom Network for HVDC. GE did not agree that Telecom was ready to use. 1Gbit required.
- 16-May-18: Nalcor indicated that 100Mbit is enough. The 100Mbit did not work.
- 02-Jun-18: Nalcor provided the 1Gb network.
- 11-Jun-18: Nalcor performed partial retesting of the 1Gb telecom



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# Telecom Schedule Impact

CRITICAL PATH SCHEDULE DELAY																												
EVENT IMPACT ANALYSIS- TELECOM		ACTUAL L. DUR	ACTUAL START	ACTUAL FINISH	SL FINISH VARIATION	28-Jan	4-Feb	11-Feb	18-Feb	25-Feb	4-Mar	11-Mar	18-Mar	25-Mar	1-Apr	8-Apr	15-Apr	22-Apr	29-Apr	6-May	13-May	20-May	27-May	3-Jun	10-Jun	17-Jun	24-Jun	
MUSKRAT FALLS CONVERTER STATION																												
TELECOMMUNICATIONS BASELINE	91	7-Feb-10	30-Mar-10																									
TELECOMMUNICATIONS DELAY	126	8-Feb-10	11-Jun-10	73																								73 Day Delay
GOLDEN POND CONVERTER STATION																												
TELECOMMUNICATIONS BASELINE	98	21-Feb-10	26-Mar-10																									
TELECOMMUNICATIONS DELAY	130	1-Feb-10	11-Jun-10	73																								73 Day Delay
SNOAL CONVE																												
TELECOMMUNICATIONS BASELINE	11	17-Feb-10	30-Mar-10																									
TELECOMMUNICATIONS DELAY	122	9-Feb-10	11-Jun-10	73																								73 Day Delay
FOOTBALL POND TRANSITION COMPONENT																												
TELECOMMUNICATIONS DELAY BASELINE	31	15-Feb-10	29-Mar-10																									
TELECOMMUNICATIONS DELAY	47	24-Apr-10	11-Jun-10	73																								73 Day Delay

## 2. Project Main Issue

### Snow on the Ground

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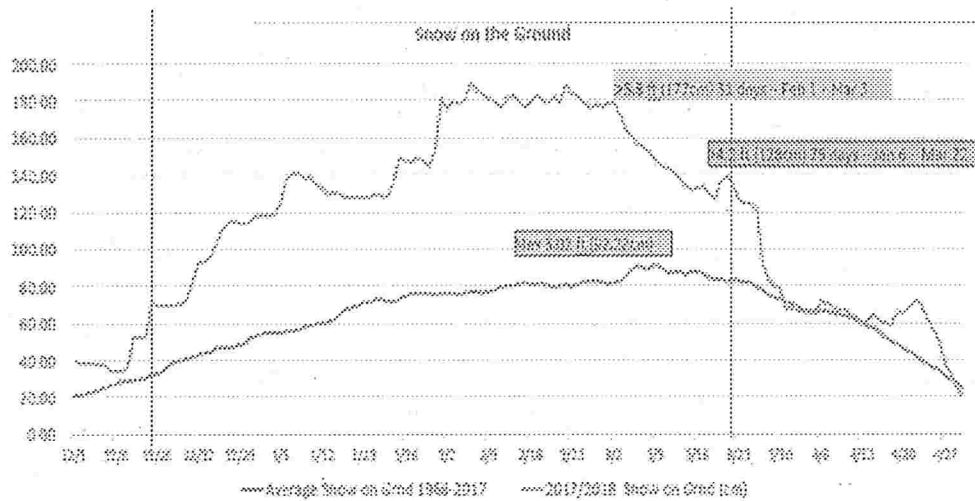
- Contractor experienced significant delays and costs due to the severe snow falls, resulting accumulations at the MFA site.
- Snow on the ground from Oct 2017 to May 2018 was the worst during the last 50 years.
- Over a 31-day period between February 1 and March 3, 2018, snow on the ground exceeded 177 cm (5.8 ft).
- Contractor is requesting that Company grant an Extension of Time (EoT) of forty-two (42) days and cost reimbursement.

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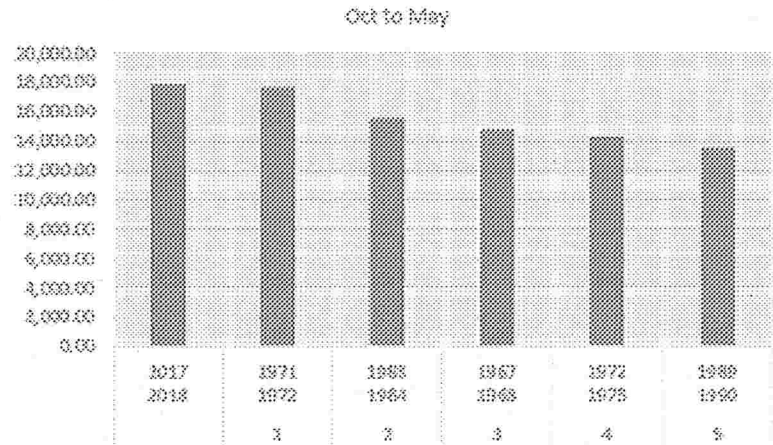
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## 2. Project Main Issue Snow on the Ground: Charts



Snow on the Ground versus Fifty Year average



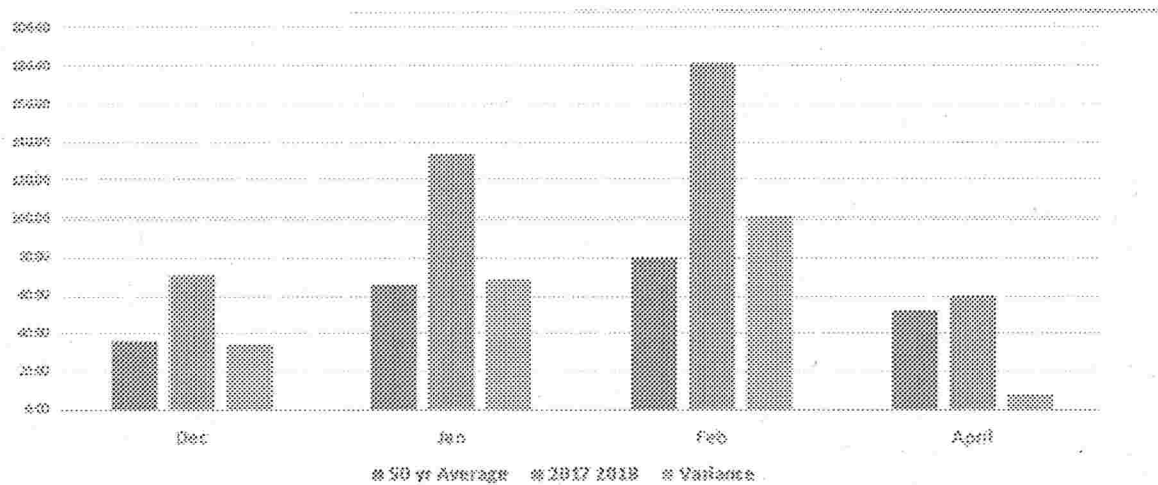
Comparison '17 '18 winter to last fifty years



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## 2. Project Main Issue Snow on the Ground: Timeline

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variance between this past snow season and the fifty-year monthly average



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### 3. Project Main Issue Software

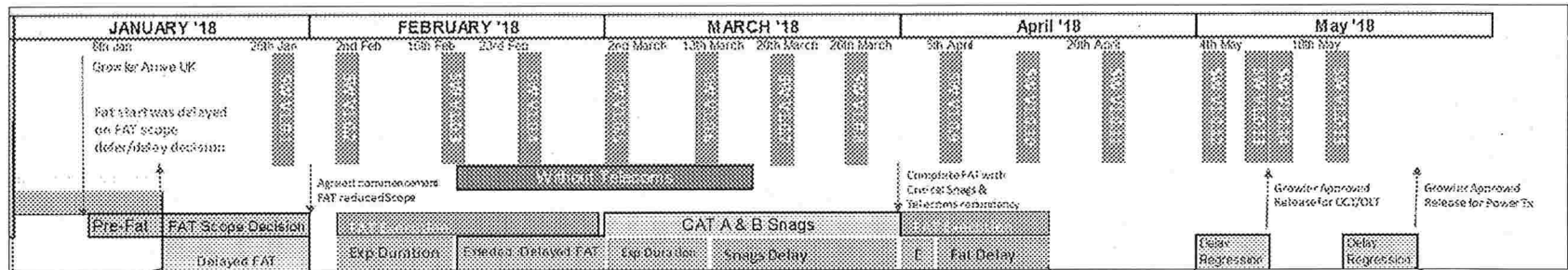
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- The start of the FAT was delayed by Growler/Nalcor by adding additional functionality to what was agreed on in March 2017, and by delaying the authorization to start the FAT.
- The FAT was planned for 2 weeks; however, it took 4 weeks due to Nalcor/Growler raising issues over and above the functionality planned for the FAT.
- The Part 2 FAT was extended from 4 days to 17 days due to Nalcor/Growler's request for additional FAT cases.
- Nalcor/Growler caused delays to the completion of the software due to raising issues over a 4-month period. Insistence of CAT A defects resolved prior to completion of OCT/OLT & Power Transfer Releases.
- Nalcor delayed the completion of the regression testing because they insisted in participating in every regression test.

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### 3. Project Main Issue Software: Timeline



**FAT with or without Telecoms**  
 In March 2017 a Monopole Release document was agreed. This document listed the features necessary for an early release for SW to commence power transfer with one Pole in operation. The full and final FAT would come at the end of all the BiPole features delivery.

December 2017 it was agreed for Growler to return on January 8<sup>th</sup> to pre-FAT the SW so they were confident the SW was ready for FAT. By Jan 15<sup>th</sup> 2018 the FAT start was delayed whilst we waited for authorisation to begin FAT from Nalcor.

Discussions about restrictions of features that Growler now stated must be delivered with Monopole for Power Tx.

We wasted many days in this duration as we could not reconfigure the lab kit to use on other feature development either as every day we did not know if we could commence. Finally we were given the Go Ahead

In December 2017 and prior to this date the expectation was for a 2 weeks FAT execution, this quickly changed when the FAT began with Growler using the opportunity to look for issues relating to specification that went far beyond the approval for Power transfer. After 4 weeks the FAT was stopped as it was also indicated that we would have to rerun in any case again after the delivery of other features. So it was necessary to complete the without telecoms feature before finally a Power Tx release may be accepted. This was far beyond the scope from our initial agreements and discussions

The delay arising from the Snags will be discussed on another sheet.

At the end of march the team had a 3-4 day Fat expected and this had been previously discussed with Growler. This became a Growler plan of 17 days requested for a detailed execution of further FAT cases and negative testing of the system. This required expertise with James Winton as the negative tests have to break the system in many ways to evaluate the system under duress.

CAT A & B Snags released by SW Growler requested to participate in every regression test. Sometimes this would need alignment with flights and schedules, this would execute slower than our own team and resulted in many further evaluations of new FAT snags not related to changes introduced.

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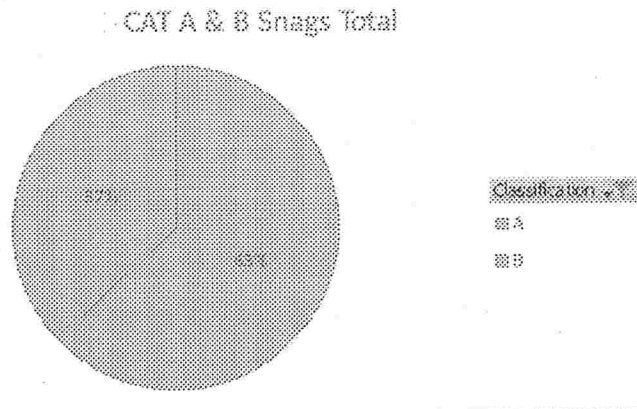
### 3. Project Main Issue Software : Snags

JANUARY '18		FEBRUARY '18			MARCH '18				April '18		May '18	
18th Jan	28th Jan	2nd Feb	16th Feb	23rd Feb	2nd March	13th March	20th March	28th March	5th April	20th April	4th May	18th May
Pre-Fat	FAT Scope Decision	CAT A & B Snags			CAT A & B Snags				CAT A & B Snags		CAT A & B Snags	
Delayed FAT	Delayed FAT	Exp Duration	Entered Delayed FAT	Exp Duration	Snags Delay	C	Fat Delay			Delay Regression	Delay Regression	

Detail of the Snag issues

There were 699 CAT A & B Snags raised during FAT & Post FAT execution

Count of Snag Categories



Many of the 699 Issues were closed as no fault found and documentation requests to explain functionality. During this time we had many daily meetings to review the issues raised, these discussions were lengthy for Growler and GE to debate each issue and remedy. One of the main issues was that issues would be reported a long time after the test platform had been used for other Snag verification and it may take considerable time to setup and evaluate an issue. Many of the issues were not explanatory so it took a long time to reproduce issues before they could be evaluated. Issues may still close as No product change as a result of investigation and some did result in product changes. This process was lengthy and delayed the completion of FAT and Power Tx.

Row Labels	Feb									Feb Total	Mar				Mar Total	Apr				Apr Total	May			May Total	Grand Total
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25				
A	12	41	41	41	27	162	21	5	35	7	68	31	66	61	12	1	171	13	12	10	35	436			
B	13	33	22	23	10	101	33	5	21	4	64	13	23	16	8	7	67	3	8	3	14	246			
Grand Total	25	74	63	64	37	263	54	11	56	11	132	44	89	77	20	8	231	16	20	13	49	682			
Running Total																									



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## 4. Project Main Issue Engineering – Summary since Dec 15, 2017

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- Excessive comments/questions on document review – [REDACTED]
- RCVT excessive requirement – [REDACTED]
- Inconsistencies in Nalcor's specifications – [REDACTED]
- Site events causing additional investigations – [REDACTED]
- OPS redundant signal missing – [REDACTED]

Overall cost impact since Dec. 15 2017: [REDACTED]



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[REDACTED]

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## 4.1 Project Main Issue

### Engineering – Drawings and Document Review

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- Many iterations of drawings due to new comments received from Nalcor and new reviewers assigned to the same document.
- Impact: Additional engineering hours to review drawings, respond in CRS and rework on already approved drawings.
- 19 actual case examples have been detailed as part of our current investigation.
- Estimated extra cost associated with this issue is [REDACTED]

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[REDACTED]

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## 4.2 Project Main Issue

### Engineering: Interfaces to CCTV, SACS, Voice/PA Systems

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- Nalcor did not provide the cable schedule and termination on time for their telecom equipment.
- Site was ready to install and connect cables by Sept 21<sup>st</sup> but did not receive the information until Feb, 2018.
- Late submission of termination drawings led to changes on site and extra work to Contractor.
- Estimated extra cost associated with this issue is [REDACTED]



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[REDACTED]

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## 4.3 Project Main Issue Engineering – RCVT

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- Original contract/offer was using CVTs with harm. monitoring device
- Detailed design led to a change to use these with additional bushing tap boxes that was required to achieve the phase-angle accuracy required by the Series V.
- A series of concession requests were debated to get this final design accepted by Nalcor – Nalcor still asked for an RCVT.
- Estimated extra cost associated with this issue is [REDACTED]

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[REDACTED]

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## 4.4 Project Main Issue

### Engineering – Inconsistency of Nalcor Specs

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- Inconsistency in specification requirements between 501, 502 standards and codes as well as between sections of the specs led to excessive acceptance delays.
- Six project examples investigated.
- Estimated extra cost associated with this issue is [REDACTED]



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[REDACTED]

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## 4.5 Project Main Issue

### Engineering – Site Events Affecting Engineering

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- Site events generating extra engineering work to answer Nalcor's concerns.
- Voltage fluctuation, Cable pressure monitoring, DC yard interlocking and wetting voltage are the major contributors to these costs.
- Estimated extra cost associated with this issue is [REDACTED]

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[REDACTED]

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## 4.6 Project Main Issue

### Engineering – PES – Cable Oil Pressure Switch

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- Nalcor provided a non redundant cable monitoring system but requested GE to adapt to it.
- Hardware and software modifications were required to accommodate this request.
- Estimated extra cost associated with this issue is [REDACTED]



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## 5.1 Project Main Issue Construction. SOP

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- 102 days delay in MC walkdown dates and MCC certification issued by Nalcor.
- 83 days delay in MCC certification and LUN approval by Nalcor
- Walk downs being cancelled by Nalcor caused delays in MCC completion;
  - Battery systems- Walk down was cancelled causing 46 days delay
  - Filter bank system was cancelled causing 39 days delay



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## 5.1 Project Main Issue Construction – SOP

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- 25kV Cable routing was not done as per the monopole requirement:
  - 25KV cable pulled by Nalcor was routed to SST2 instead of SST1.
  - Consequently, GE faced delays to Startup commissioning activity and energization of the 501 equipment.
- Prior to the energization of SST, Nalcor requested that GE perform the soak tests of the 25kv cables. Despite it being out of scope, GE performed the Soak Testing to avoid further delay.
- The delay of the energization of SST1 had a direct impact on the switchgear and subsequently other equipment (Eg. cooling system, Battery system and Battery chargers)
- Delays regarding permits to work due to Nalcor



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## 5.2 Project Main Issue Construction – MF-TC

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- 94 days delay in walk down and MCC certification issued by Nalcor
- Road conditions in MFA on March 28 caused damage to Surge Arrestors being shipped to SOP
- Voltage Fluctuations caused damaged equipment and delays in BAS commissioning
- Excessive snow falls blocked access to equipment in the yards- Subsystems were delayed in MCC walk downs.
- Rental, operation and fueling of generators were needed due to unavailable power supply from Nalcor (for installation and commissioning activities at transition compounds)

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## 6.1 Project Main Issue

### Commissioning – SOP & MFA – Interface tests with ECC

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- ECC Data base:
  - Nalcor delays in implementation of GE supplied EEC I/O list.
  - More testing time due to groupings done at D20 level. Grouping came from Nalcor due to their limitation of 3599 signals.
  - Concept of priority signals testing was not followed at ECC level, resulting into re-testing of signals.
- Telecom failure on several instances.
- Additional resources mobilized days and nights 7 days a week in order to minimize the impact on the dynamic commissioning progress.



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## 6.2 Project Main Issue

### Commissioning – SOP – Interface with AC Substation (502)

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- Due to Nalcor network restrictions:
  - Starting date of the works delayed
  - Complexity of the works accrue
- Working time per day reduced due to:
  - Switching operations
  - Network restriction
- Additional resources and test equipment mobilized in order to execute the works within the period of times allowed by Nalcor.



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## 7.1 Project Main Issue Procurement/Logistics –

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- Acceleration costs: airfreight ( [REDACTED] )
- Acceleration costs: dedicated fast-trucks ( [REDACTED] )
- Warehousing and handling costs ( [REDACTED] )



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[REDACTED]

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## 8.1 Change Requests

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- Look at Change Requests Submitted



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## 9.1 Schedule - EoT

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- Telecom – Nalcor failed to provide 1GB Equipment as per Schedule; Only provided One Path (Degraded Path B) – 900 Telecommunication Tests Affected for the HVDC System.
- Snow on Ground (Above Average on the ground Conditions)
- Software Development (Stafford) – 1122 Tests Affected on the HVDC System.
- Engr – Receiving new comments on approved MEP dwgs, and after 10 weeks of issuing it
- Engr MEP/BAS documents CD0501 returned from Nalcor 's reviewers with more comments following change in Nalcor's lead reviewer as below
- Air integrity tests in TC SOC/FP Telecom and Auxiliary rooms
- OPS redundant signal missing
- Voltage Fluctuation
- ECC Tests (Required by Nalcor)
- Interface Works (502<>501) Outage Works -SOP 502 – 85 Tests Affected on the AC System.
- SOP Delays in MCC and LUN Issuance by Nalcor
- MFA Delays in MCC Issuance by Nalcor
- Dynamic Commissioning Duration Increased form 14 Days to 29 Days

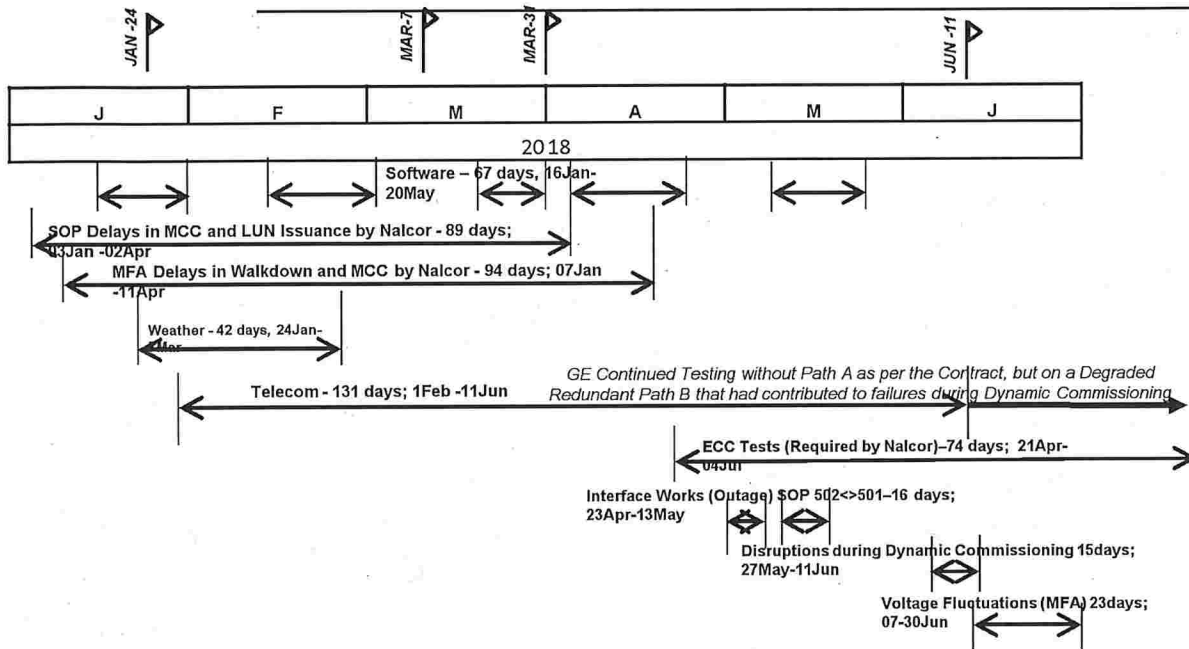
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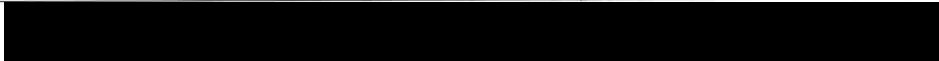


# Claim Timeframe -EOT

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- Nalcor/Growler delayed the start of the FAT and impacted the duration of the FAT, the regression testing and no fault issues.
- Nalcor caused delays by postponing some of the MC walkdowns and was late approving MCC certifications and LUN. This delayed the start of commissioning.
- The total snow on the ground during the '17 to '18 winter was the worst in the last fifty years.
- Nalcor failed to provide the required Telecom network on time to support the project schedule. Delay from Feb 1 to June 2, 2018
- The phased approach signal testing was not followed at ECC level. Nalcor delayed implementation of the GE IO list.
- Nalcor delayed approving outages.
- Nalcor caused delays to network restrictions by switching operations and work start dates.



## 9.2 Schedule – Acceleration

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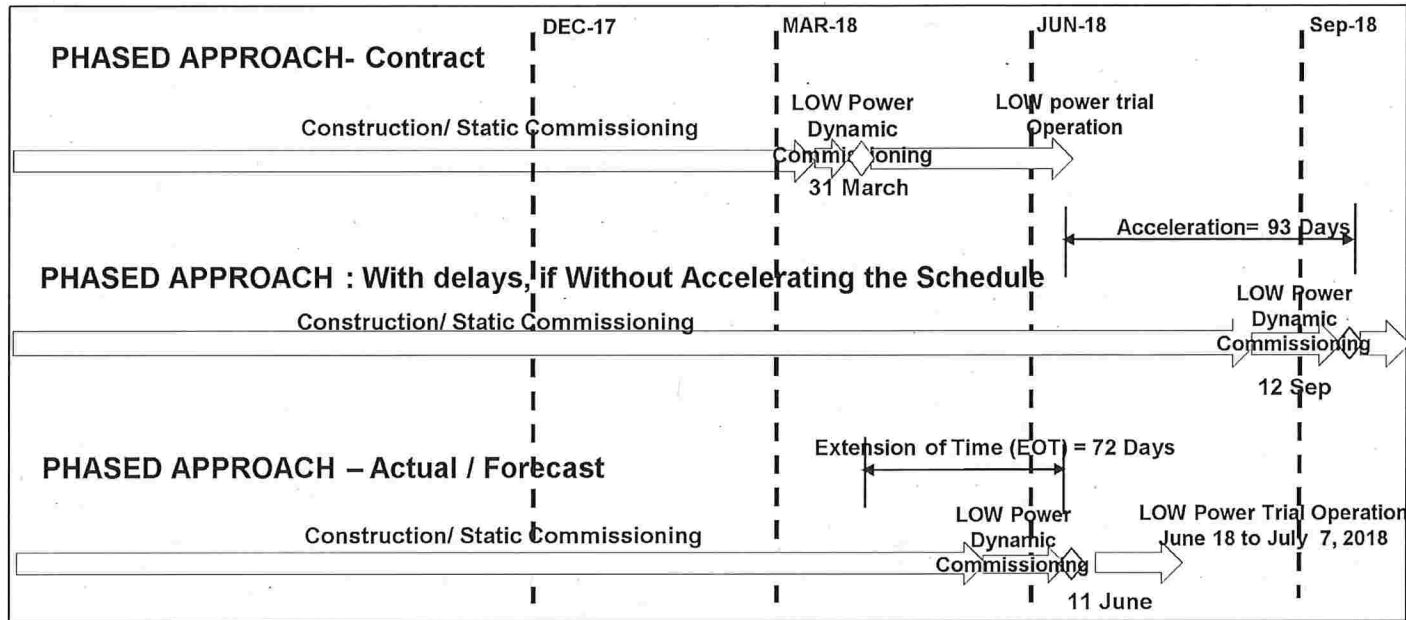
- **Telecommunications** – Affected Tests - Layer 3 Network Communication Checks and Tests; Digital Profibus I/O Tests-(Pole Control Profibus); Analog I/O Tests (DC Currents); Series V Communication Interface; Pole 1 Blocking/Tripping Tests; End to End Blocking Tests) TOTAL of 900 TESTS Affected. Nalcor only provided the correct 1GB equipment as per Specifications on 02 June 2018. GE was instructed to utilize the 100MB equipment for the Telecommunication Tests on 06 April 2018. On 06 May 2018, GE informed Nalcor that there were continuing Latency Issues with the Tests forcing Nalcor to revert and supply the 1GB as per Contract Specifications.
- **Duration** - Planned from Jan. 22 - Mar.12 , 2018 for a Period of 49 days, should only be done, in principle after 1 GB equipment is available (02 June); As per the baseline schedule. GE was actually able to do this for only 9 days for Re-Testing.
- **Dynamic Commissioning** - Should be done only AFTER Static Commissioning is completed and only for a period of 14 days. Because of disruptions, GE finished with 29 days duration or additional 15 days.



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# 9.2 Schedule - Timeline Pole 1 - Acceleration



- Telecommunications – Affected Tests - Layer 3 Network Communication Checks and Tests; Digital Profibus I/O Tests-(Pole Control Profibus); Analog I/O Tests (DC Currents); Series V Communication Interface; Pole 1 Blocking/Tripping Tests; End to End Blocking Tests) TOTAL of 900 TESTS Affected
- Late supply of the telecom equipment by Nalcor impacted the project schedule. Commissioning with the Telecom was delayed from Jan. 22 - Mar.12, 2018, until after Nalcor provided the 1 GB telecom equipment on June 2, 2018.
- Dynamic Commissioning should be done only AFTER Static Commissioning is completed and only for a period of 14 Days. Because of Disruptions we finished with 29 Days Duration or additional 15 Days..
- Construction- 95,086 Additional Hours, EOT- 76,068 Hours and Acceleration- 19,018 Hours

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# Project Main Issue

## Commissioning – SOP & MFA – Acceleration

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- Extended working hours:
  - Commissioning non stop; 7 days a week
  - Extended working hours for day shifts
  - Night shifts implemented



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## Project Main Issue

### Commissioning – SOP & MFA – Acceleration

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- Commissioning duration was significantly reduced in order to achieve an accelerated schedule. The following actions were implemented:
  - Daily progress under high daily monitoring:
    - Commissioning schedules updated every day
    - Commissioning progress checked and analyzed every day
    - Dedicated schedules established for specific sequences of works
  - Additional resources and equipment:
    - Additional commissioning subcontractors engaged
    - Additional commissioning engineers
    - Additional protection relay test equipment mobilized

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# Project Main Issue

## Commissioning – SOP & MFA – Dynamic Commissioning Duration

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- Dynamic commissioning tasks scheduled, frequently reduced due to:
  - Late start every day due to time required to coordinate the activities with Nalcor
  - Network restrictions in order to process with the tests.
- Durations of the inspections of the HV equipment during the commissioning were extended due to Nalcor isolation process.
- Progress disturbed due to telecommunication issues.

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## Summary Schedule – Page 1

GE Claims	Sites	Start Date of Delay	End Date of Delay	Days of Delay	Days Impacting Critical Path
1. Telecom	MFA	5-Feb-18	11-Jun-18	126	72
1. Telecom	SOP	1-Feb-18	11-Jun-18	130	72
1. Telecom	Shoal Cove	9-Feb-18	11-Jun-18	122	72
1. Telecom	Forteau	25-Apr-18	11-Jun-18	47	72
2. Snow on Ground	MFA	24-Jan-18	7-Mar-18	42	42
3. Software	ALL	16-Jan-18	20-May-18	67	67
4.1 Engr – Drawing and Document Review	ALL	15-Jun-18	15-Aug-18	60	
4.2 Interface to CCTV, SACS, Voice/PA	All	21-Dec-17	21-Feb-18	60	
4.3 Engr. RCVT	SOP&MF A	15-Dec-17	Ongoing	320	
4.4 Inconsistency of Nalcor Specs	SOC&FP	18-Jan-18	18-May-18	120	

## Summary Schedule – Page 2

GE Claims	Sites	Start Date of Delay	End Date of Delay	Days of Delay	Days Impacting Critical Path
4.6 PES – OPS Signal	ALL	18-Jan-18	18-May-18	120	
5.1 Construction – SOP – MCC and LUN	SOP	03-Jan-18	02-Apr-18	89	
5.2 Construction – MF – TC - MCC	SOP	07-Jan-18	11-Apr-18	94	
6.1 Commissioning – SOP & MFA - Accel					
6.2 Commissioning – SOP & MFA – Interface tests with ECC	ALL	21-Apr-18	04-Jul-18	74	
6.3 Commissioning – SOP & MFA – Dynamic Commissioning Duration	All Sites	27-May-18	11-Jun-18	15	15
6.4 Commissioning – SOP – Interface with AC Substation (502)	SOP	23-Apr-18	13-May-18	16	9
7.1 Procurement/Logistics		NA	NA		

# Cost Impacts

TOPIC	AMOUNT K CAD	COMMENTS
EoT	13,530	
Acceleration	15,610	
Telecom	1,115	
Software	1,075	
Engineering	1,100	
Commissioning	1316	
Procurement	620	
CHRs	2,631	
Construction/Permits	985	634 + Permits
Snow Removal	7,300	
Warranty Extension	780	
TOTAL	46,062	(back out CHO/Warranty -  )

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# Next Steps

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- Claims non negotiable
- Negotiable claims
- Timing



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