

Ottawa Light Rail Commission

Yang Liu
on Wednesday, May 4, 2022



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OTTAWA LIGHT RAIL COMMISSION
ALSTOM TRANSPORT CANADA INC. - YANG LIU
MAY 4, 2022

--- Held via Zoom Videoconferencing, with all
participants attending remotely, on the 4th day of
May, 2022, 2:00 p.m. to 5:01 p.m.

1 COMMISSION COUNSEL:

2
3 Kate McGrann, Co-Lead Counsel Member

4 Fraser Harland, Litigation Counsel Member

5
6 PARTICIPANTS:

7
8 Yang Liu, Alstom Transport Canada Inc.

9 Michael Valo & Charles Powell, Glaholt Bowles LLP

10
11 ALSO PRESENT:

12
13 Joanne Lawrence, Stenographer/Transcriptionist

14 Elizabeth Deasy, Virtual Technician

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1 -- Upon commencing at 2:00 p.m.

2 KATE MCGRANN: Good afternoon. My name
3 is Kate McGrann. I'm one of the co-lead counsel
4 for the Ottawa Light Rail Transit Public Inquiry,
5 joined by my colleague, Fraser Harland, who is a
6 member of the Commission's counsel team. The
7 purpose of today's interview is to obtain your
8 evidence under oath or solemn declaration for use
9 at the Commission's public hearings. This will be
10 a collaborative interview such that my cocounsel,
11 Mr. Harland, may intervene to ask certain
12 questions. If time permits, your counsel may also
13 ask follow-up questions at the end of this
14 interview.

15 This interview is being transcribed,
16 and the Commission intends to enter this transcript
17 into evidence at the Commission's public hearings,
18 either at the hearings or by way of procedural
19 order before the hearings commence. The transcript
20 will be posted to the Commission's public website,
21 along with any corrections made to it, after it is
22 entered into evidence. The transcript, along with
23 any corrections later made to it, will be shared
24 with the Commission's participants and their
25 counsel on a confidential basis before being

1 entered into evidence. You will be given the
2 opportunity to review your transcript and correct
3 any typos or other errors before the transcript is
4 shared with the participants or entered into
5 evidence. Any non-typographical corrections made
6 will be appended to the transcript.

7 Pursuant to Section 33(6) of the Public
8 Inquiries Act, 2009:

9 "A witness at an inquiry shall
10 be deemed to have objected to answer
11 any question asked of him or her
12 upon the ground that his or her
13 answer may tend to incriminate the
14 witness or may tend to establish his
15 or her liability to civil
16 proceedings at the instance of the
17 Crown or of any person, and no
18 answer given by a witness at an
19 inquiry shall be used or be
20 receivable in evidence against him
21 or her in any trial or other
22 proceedings against him or her
23 thereafter taking place, other than
24 a prosecution for perjury in giving
25 such evidence."

1 As required by Section 33(7) of that
2 Act, you are hereby advised that you have the right
3 to object to answer any question under Section 5 of
4 the Canada Evidence Act.

5 If at any point during our interview
6 you need to take a break, just let us know and
7 we'll pause the recording, and we will pause for a
8 short break about midway through.

9 Just to confirm, I understand that you
10 were the testing and commissioning manager on Stage
11 1 of Ottawa's light rail transit project for Alstom
12 from December 2015 to May 2019; is that right?

13 YANG LIU: Yes, that's correct.

14 KATE MCGRANN: And then you rejoined
15 the project in May 2020 as a maintenance engineer
16 working for Alstom; is that right?

17 YANG LIU: No. I joined as the project
18 engineering manager for the maintenance project.

19 KATE MCGRANN: And did you join in that
20 role in May of 2020?

21 YANG LIU: Yes, I joined in that role.

22 KATE MCGRANN: And do you remain in
23 that role today?

24 YANG LIU: Yes, I remain in that role.

25 KATE MCGRANN: Okay. Would you please

1 provide us with a brief description of your
2 professional background and experience as it
3 relates to your work on Stage 1 of Ottawa's LRT
4 project.

5 YANG LIU: Okay. I started as a -- in
6 the rolling stock -- well, in the train industry as
7 a rolling stock system engineer with Bombardier
8 Transportation in Switzerland in 2010. In that
9 role, I was working on the design and warranty
10 support for locomotive projects in Europe, North
11 America, and Africa.

12 In 2014, I came back to Canada, where I
13 actually -- I studied at university before going to
14 Europe. So I came back to Canada, where I further
15 worked for Bombardier Transportation as a
16 consultant contractor role for around one year,
17 until December of 2015, when I joined Alstom for
18 the Ottawa Light Rail Transit, OLRT, project.

19 For Alstom at that time, the scope was
20 to do the final assembly and supply of the vehicles
21 only for the Confederation Line. So I joined that
22 project as the testing and commissioning manager,
23 where I managed a department of technicians, BIEs
24 or interns, and even I had an assistant manager
25 under me. So we -- our group was responsible for

1 the serial - that means the factory acceptance
2 testing - for all the Stage 1 trains for the
3 Confederation Line.

4 In May 2019, I left to take a one-year
5 break, more or less. At that time, the project
6 was -- so we were going through the final
7 acceptance of the -- of the trains with the City,
8 and the project was about to go into revenue
9 service.

10 In May 2020, I came back to the project
11 in the role of maintenance engineering manager but
12 this time for the maintenance project, where we --
13 where my scope is to lead a group of engineers in
14 the maintenance activities for the LRV and the
15 infrastructure as -- so Alstom was a subcontractor
16 to RTM so that my involvement is purely with
17 Alstom.

18 KATE MCGRANN: In any of the projects
19 that you worked on prior to Stage 1, were you
20 involved in the launch of a new system or a new
21 extension to a system?

22 YANG LIU: No. In all the projects I
23 worked on, it has always been launching new trains
24 into existing systems.

25 KATE MCGRANN: And were any of the

1 projects that you worked on prior to Stage 1 of
2 Ottawa LRT delivered by way of a P3 model?

3 YANG LIU: No.

4 KATE MCGRANN: Would you please explain
5 Alstom's role in the testing and commissioning on
6 Stage 1 of Ottawa's LRT project.

7 YANG LIU: So Alstom, as the vehicle
8 supplier, the role of Alstom was to -- was to
9 manufacture these trains and have them delivered
10 to -- delivered to the City as the end customer.

11 Testing and commissioning is purely
12 responsible for the serial testing. That means
13 that we are actually not responsible for the
14 engineering -- validation of the engineering
15 design, but we are responsible for ensuring the
16 fleet is manufactured in accordance to the
17 validated engineering design. So what our
18 involvement was, so as the cars were manufactured,
19 we would do the -- so first, we would do the
20 electrical circuit testing to make sure that the
21 wiring of the trains is correct.

22 After that stage, the cars, individual
23 cars, are assembled together into a train, and our
24 job in the testing and commissioning was to power
25 up these trains, loaded with the right software,

1 and then ensure that all the functionalities are
2 tested in accordance to the validated design. And
3 that -- so actually, there's two parts in that:
4 First is a static test, where the train is tested
5 statically and powered on section by section to
6 ensure all the functions are working statically;
7 and afterwards, there is a dynamic testing portion
8 where every train is put onto the test track and
9 tested to ensure that the acceleration rates,
10 braking rates are meeting the validated values.
11 And after that, really, it's to get the provisional
12 acceptance from OLRT, which was the general
13 contractor, and then together with OLRT to get the
14 City's approval for acceptance of these trains.

15 KATE MCGRANN: So you've mentioned
16 serial testing and factory acceptance testing.
17 Starting with factory acceptance testing, would you
18 explain to me what that is.

19 YANG LIU: So these two are the same,
20 actually. Serial testing and factory acceptance
21 testing can be used interchangeably. That together
22 means that as -- if you consider the train as an
23 assembly line, with trains coming off of the
24 assembly line, that's the last step to ensure that
25 the trains are meeting the specifications.

1 I guess the differentiating thing is
2 that -- so we differentiate between serial testing
3 and validation testing. These are two separate
4 activities. Validation testing is used to validate
5 the design, whereas serial testing is to ensure
6 that the train is functional, functioning in
7 accordance to the validated design.

8 KATE MCGRANN: What was the status of
9 the validation testing when you joined the project?

10 YANG LIU: When I joined the project,
11 it was more or less an empty building. There
12 was -- so the -- the first train was being
13 manufactured in our -- in our assembly -- Alstom's
14 factory in Hornell, in the U.S., where in Ottawa,
15 when I joined, it was -- there was no trains
16 available. There was no cars available. It was a
17 roof and an underframe, and that was about it.
18 Validation testing really didn't start until much
19 later, when -- when -- when the first train got
20 assembled and tested to make -- to -- to be sure
21 that it's actually functional and can be used for
22 validation testing.

23 KATE MCGRANN: And when you say that it
24 started later, approximately when did it start?

25 YANG LIU: It had to be 2016, August,

1 maybe. August, September, somewhere around that
2 time frame. I don't recall the exact date, but
3 that's -- to the best of my memory, that's around
4 the time.

5 KATE MCGRANN: Now, I understand that
6 the original plan was to manufacture LRV 1 and
7 LRV 2 in Hornell, France; is that right?

8 YANG LIU: Yes. No, Hornell -- Hornell
9 in the U.S.

10 KATE MCGRANN: Sorry, my mistake. And
11 then LRV -- but -- sorry, was the original plan to
12 manufacture them, 1 and 2, in the States or in
13 France?

14 YANG LIU: I mean, I think the plan
15 changed repeatedly over time. As far as I'm aware,
16 my -- the first time when I got into the project,
17 the plan was to do the first two trains in Hornell,
18 in the States. If there was any changes before
19 that, I'm not aware. But that was the original
20 plan when I joined, yes.

21 KATE MCGRANN: And what changes were
22 made to that plan?

23 YANG LIU: I think -- so the whole
24 process was delayed, multiple changes to the -- to
25 the schedule. In the beginning, the plan was to

1 have the first two trains manufactured, used for
2 validation testing, and after everything is
3 validated and after the design is stable, then we
4 start serial production. There was a -- around a
5 year's gap in between train 2 and train 3 when I
6 first joined. That was the original plan. That
7 kept getting continuously compressed.

8 Eventually, train 2 was manufactured in
9 Ottawa, and train 1 was moved to Ottawa for serial
10 testing. So in fact train 1 was -- didn't get any
11 sort of factory acceptance testing in Hornell. And
12 train 3 started immediately after train 2 was
13 manufactured, so there was no gap.

14 KATE MCGRANN: And can you explain to
15 me what happened to the plan to complete validation
16 testing before manufacturer serial testing?

17 YANG LIU: It was just -- that didn't
18 happen. So we started -- we started serial
19 production right after the manufacture of train 2,
20 and why it was like that, I -- I'm not entirely
21 aware of all the reasons. I know that there were
22 delays in -- in the design phase, in every phase of
23 the project. The cumulation of all the delays
24 really impacted the schedule at the end, where I
25 became involved. So there was no break. And in

1 fact, we used the first four trains for validation
2 testing rather than just the first two, so -- so as
3 we started serial testing, validation was just
4 starting as well.

5 KATE MCGRANN: Sorry, when you -- I
6 just want to make sure that I heard what you said.
7 Did you say when you started serial testing,
8 validation testing was still ongoing?

9 YANG LIU: Oh, yes. It was still -- it
10 was -- so we started serial production, and with
11 serial production, we start serial testing, and
12 this took place pretty much in parallel with the
13 validation tests.

14 KATE MCGRANN: Were there any
15 implications for using four trains for validation
16 testing instead of two?

17 YANG LIU: Yes. The whole -- I mean,
18 it -- the implications of the whole validation, I
19 guess, can be summarized in the fact that -- sorry,
20 can be summarized as follows. So validation, it
21 required more resources to do the validation
22 testing, and to have four trains in validation
23 testing meant that we couldn't really bring any
24 trains to the customer for serial acceptance
25 because they were all used for validation testing.

1 And some validation tests required you to put the
2 train in a special configuration - for example, the
3 train that went into the climate chamber was
4 actually half a train. So we had to do special
5 tests and special -- I guess one-time tests to make
6 sure that the train -- that configuration was okay.
7 So it was different from the rest of the fleet.

8 KATE MCGRANN: When you say that the
9 train that went into the climate chamber -- first
10 of all, are you referring to the train that went
11 into the chamber at the National Research Centre?

12 YANG LIU: Yes.

13 KATE MCGRANN: And when you say it was
14 half a train, what do you mean by that?

15 YANG LIU: So -- so normally -- so a
16 train is considered four single -- four cars, so
17 four cars coupled together would be called a train.
18 That -- that train that was moved into the climate
19 chamber had two cars only, so basically we had to
20 decouple the train into two, into two pieces, and
21 basically do a configuration to one half of it so
22 that it still works because there are interfaces,
23 mechanical and electrical, at the top where you
24 need the full train to -- to allow the
25 communication process to work. So there was all

1 sorts of special jumpers everywhere to make sure
2 that it still functioned.

3 KATE MCGRANN: I've seen reference to
4 single car and double car configurations throughout
5 this project. I'm trying to understand how those
6 relate to the notion that a full train has four
7 cars. Can you help me with that?

8 YANG LIU: Yes. So a car is really
9 a -- it's a -- you can think of it as a carriage.
10 It's basically one -- one piece that is -- so one
11 roof, one underframe, that's assembled into a box.
12 That's a car. Four such cars will make up a train,
13 so a single unit, an LRV. So that's a single unit
14 that can be driven on its own, back and forth. If
15 you couple two of these trains together, that is
16 what we call a multiple unit, and that's how the
17 trains are operated in revenue service on the main
18 line. Essentially we have eight cars that's driven
19 at a time on the main line.

20 KATE MCGRANN: Okay. So two trains,
21 eight cars.

22 YANG LIU: Yes.

23 KATE MCGRANN: Okay. And what goes
24 into the climate chamber is a single train with
25 four cars.

1 YANG LIU: No. It's half --

2 KATE MCGRANN: Half a train with two
3 cars.

4 YANG LIU: Two cars, yes.

5 KATE MCGRANN: Was that half a train
6 with two cars an effective test of what an actual
7 train in practice would go through? Like, did the
8 modifications effectively reproduce the experience
9 of a full train?

10 YANG LIU: Yes, because all the
11 equipment was in its normal -- in the normal
12 operating mode. There was no -- no degradations
13 made to the actual performance of the train, simply
14 control signals that was -- that had to be -- so it
15 had to simulate a full train on the control signal
16 side.

17 KATE MCGRANN: Any concerns on your
18 part that the connections that would exist between
19 the trains and then -- well, the cars and then the
20 trains were not adequately tested through that
21 winter chamber?

22 YANG LIU: You mean in terms of the
23 half configuration, whether that was -- any of the
24 connections there was not working properly?

25 KATE MCGRANN: Well, the half car -- I

1 think you've spoken to whether the half car
2 configuration replicated the full car experience,
3 but Ottawa runs two trains, right? So the
4 connection as between -- as between those two, any
5 concerns that that was not captured in the climate
6 chamber testing?

7 YANG LIU: No, actually. So from my
8 side, I'm not actually -- I didn't execute the
9 climate testing program. That was a separate group
10 of people, the engineering team back then -- or the
11 validation team, they led that program. My role
12 was simply to give them the half a train that
13 actually worked, but my -- in my personal view, I
14 don't think it affected per se -- it degraded the
15 test in any way.

16 KATE MCGRANN: Now, we had been talking
17 about the implications of using four trains for
18 validation testing, and you said that that would
19 require more resources, and also it meant that
20 since you're using four cars, you can't provide any
21 of those vehicles to -- for serial testing; is that
22 right?

23 YANG LIU: Yes.

24 KATE MCGRANN: Any other implications
25 from using four cars for validation testing?

1 YANG LIU: Should -- technically it
2 should go faster if you use four cars because you
3 can do some tests in parallel, but I don't think it
4 ended up being faster. There were delays to the
5 test track, to -- there was a lot of external
6 factors that, in the end, didn't help the process.

7 KATE MCGRANN: Other than delays to the
8 test track, what else interfered with the
9 validation testing of four cars proceeding at a
10 pace that you would have expected?

11 YANG LIU: So I don't know the -- I
12 don't know the -- I can't -- probably cannot give a
13 responsive answer in that aspect because, again,
14 there was a validation manager who was leading that
15 whole exercise, but the impact on my side was
16 really the fact that we had to continuously give
17 cars to validation testing, and the fact that
18 validation -- every change or every modification
19 they find as part of -- as part of the validation
20 had -- had to mean that we had to do retrofits and
21 retest again and again because it was delayed.

22 KATE MCGRANN: In terms of the
23 retrofits that are required, can you speak to the
24 number of those?

25 YANG LIU: So in -- I believe it's

1 still ongoing. Right now, there are still
2 retrofits planned on this fleet, but as of May
3 2019, we -- we were in the hundreds of changes
4 because every change, we would actually have a
5 field modification package that's released, whether
6 it's mechanical, electrical, wiring, parts. Every
7 change would have its own number, and we were in
8 the hundreds of -- we call it FAPs, Fix a Problem.
9 It was a French acronym, but we had English --
10 English, we called it Fix a Problem. So we were in
11 the FAP -- 500, 600 at a time. It was just
12 hundreds of wiring modifications and mechanical
13 modifications.

14 KATE MCGRANN: In your experience, for
15 the stage that the project was at in May of 2019,
16 is that a usual number of FAPs?

17 YANG LIU: No, no. There were -- there
18 was -- the changes, the extent of the changes, was
19 really significant. It was not minor changes such
20 as a minor touchup here and there, but we were
21 modifying entire circuits after the train finished
22 assembly because all of a sudden, with Thales, with
23 the ATC interfacing, we found that, okay,
24 there's -- that circuit didn't work, and we needed
25 to add switches and relays to make that

1 functionality work. And at that time, basically
2 there was a lot of wiring changes ongoing, which
3 was not normal for that stage of the project.

4 KATE MCGRANN: When did validation
5 testing complete?

6 YANG LIU: Pretty much -- I believe it
7 was in 2019.

8 KATE MCGRANN: Are you able to be any
9 more specific than that?

10 YANG LIU: It was -- before I left, I
11 think it was almost finishing.

12 KATE MCGRANN: So was it finished when
13 you left?

14 YANG LIU: There may have been small
15 lingering changes here and there, but for the most
16 part, I think it was finished.

17 KATE MCGRANN: And were issues being
18 identified in the validation testing right up until
19 its completion?

20 YANG LIU: Yes.

21 KATE MCGRANN: And to the extent you
22 can answer this question, were significant issues
23 being identified right up until the completion of
24 validation testing?

25 YANG LIU: As far as I remember, there

1 were still changes on -- especially the ATC
2 interface, the UTO mode, unmanned train operation
3 mode, was still not functional when I -- when I
4 left. There was still wiring changes being done.
5 But it -- they were getting there, I believe.
6 There was not anything major left, but it was
7 still -- there were still modifications ongoing.

8 KATE MCGRANN: By the time you left, I
9 understand that issues were still being identified
10 through validation testing. Were the solutions to
11 those issues sorted out, or were there still some
12 outstanding questions that needed to be answered?

13 YANG LIU: I think the most significant
14 questions have been -- or issues have solutions
15 identified. We're in the process of retrofitting
16 the trains to have those solutions implemented and
17 to have the serial tests done again to make sure
18 that the train still works. So we call that
19 nonregression testing. So we don't -- we don't do
20 the entire serial testing program again, but we
21 define test packages that focus on what could have
22 been touched by the modification. Most of it was
23 done. So it was different waves at the end, Wave
24 1, Wave 2, Wave 3 of changes. When I was leaving,
25 we were in the -- the trains were really in the --

1 in quite solid shape. There was still open points
2 that we have to put on the deficiency list of
3 acceptance, mostly related to the CCTV and, you
4 know, the passenger information system. That was
5 one system where it still had some open issues, but
6 the bulk of it have had solutions identified and
7 was in the phase of implementing those solutions.

8 KATE MCGRANN: And so you said
9 following the retrofits, you have to redo the
10 serial testing, but you don't completely redo the
11 tests. You redo portions of the tests; is that
12 right?

13 YANG LIU: Yes, that's correct.

14 KATE MCGRANN: And who determines what
15 portions of the tests need to be redone?

16 YANG LIU: It would be myself, as the
17 testing and commissioning manager, with the serial
18 test manager, with confirmation from the train
19 safety assessor.

20 KATE MCGRANN: And who was the train
21 safety assessor?

22 YANG LIU: That would be Lowell, Lowell
23 Goudge.

24 KATE MCGRANN: And when the serial
25 tests are first run, are they run on all of the

1 trains, or are they run on a sampling of the
2 trains?

3 YANG LIU: When the -- the first
4 execution of the serial tests?

5 KATE MCGRANN: Yes.

6 YANG LIU: It was run on the first
7 train.

8 KATE MCGRANN: And then does every
9 train that's manufactured pass through the same set
10 of serial tests?

11 YANG LIU: Yes, the same set of serial
12 tests. The details may change based on the
13 evolution of the validation.

14 KATE MCGRANN: And then with respect to
15 the retrofits and the focussed serial retesting
16 that's done, are all of the trains also run through
17 that process?

18 YANG LIU: Yes. Every single train
19 that had the retrofit done goes through the
20 sequence of nonregression tests.

21 KATE MCGRANN: And you're saying
22 nonregression tests? Am I saying that right?

23 YANG LIU: Yes, so to make sure that
24 the function didn't regress, so nonregression
25 testing.

1 KATE MCGRANN: At the time that you
2 left, what was the status of the serial testing?
3 And then I'm going to ask you about the
4 nonregression testing. I'm trying to split those
5 two apart.

6 YANG LIU: Serial testing had been
7 completed at that time. We had the provisional
8 acceptance from the customer on all of the trains,
9 and we were going through -- and the -- when I
10 left, the nonregression test was pretty much
11 finished for the -- so the trains were pretty much
12 in line with the validated design, excluding the
13 new changes that are coming up. Those needed new
14 tests but was not -- not a lot. The bulk of it had
15 been finished.

16 KATE MCGRANN: Then serial testing and
17 nonregression testing, but if the validation
18 testing isn't quite done when you leave, how is the
19 serial testing done? Like, how can serial testing
20 beat validation testing to the finish line?

21 YANG LIU: Well, it -- okay. So serial
22 testing can only be to -- can only bring the trains
23 as far as the validated design. So when I say the
24 serial testing was done, that means that more or
25 less we're at the same place as the validated

1 design. Because there are still changes going on
2 right now. There are new changes being put into
3 the trains. The software is still being updated.
4 It's just that after every update, we have to redo
5 the nonregression test to make sure that it's in
6 line with the validated design.

7 KATE MCGRANN: Once Alstom has
8 completed its validation testing, serial testing,
9 nonregression testing, do the trains then become
10 subject to further testing and commissioning as
11 part of the overall system?

12 YANG LIU: Yes. So first, after we're
13 done, we give the trains to Thales, so --
14 because -- so the ATC system has its own suite of
15 tests. We do the static portion of these tests,
16 and then after acceptance, we give these trains to
17 Thales to do the dynamic portion of these tests.
18 After all the trains are tested, then there are
19 system integration tests that -- basically, trains
20 need to run on the system to test the interfaces
21 with the system at that point.

22 KATE MCGRANN: And at the point in time
23 that you left, what was the status of the static
24 ATC testing?

25 YANG LIU: Yeah, static ATC testing is

1 done. Static ATC testing is part of the serial
2 tests, and it was mandatory to have those complete
3 for the acceptance of these trains.

4 KATE MCGRANN: And what about the
5 Thales dynamic testing?

6 YANG LIU: I think it was just
7 beginning. It was only just starting at that time.

8 KATE MCGRANN: And do you have a sense
9 of how long that testing was expected to take?

10 YANG LIU: The dynamic testing or
11 static testing?

12 KATE MCGRANN: The dynamic testing.

13 YANG LIU: No. It was completely a
14 black box to us. We didn't know.

15 KATE MCGRANN: And would that be
16 normal, based on your experience on prior projects?

17 YANG LIU: I wasn't -- I had never been
18 so intimately involved in the actual manufacturing
19 process of the train in previous projects, so I
20 cannot really answer that question, but I -- I
21 think it's normal for the serial test team to not
22 know about that, but for the project, it must have
23 been communicated on the engineering/project
24 management side.

25 KATE MCGRANN: And then -- so following

1 the Thales dynamic testing, the next stage is?

2 YANG LIU: System -- so the system
3 integration testing needed to be finished, but
4 these were validation tests - so the ride comfort,
5 all of those tests needed to be done - and then I
6 believe it was the trial run, trial running
7 afterwards.

8 KATE MCGRANN: So systems integration
9 testing, is that different than systems acceptance
10 testing?

11 YANG LIU: So I don't think there's a
12 system acceptance test. We had a vehicle
13 acceptance test, and then --

14 KATE MCGRANN: Vehicle acceptance test.

15 YANG LIU: Yeah. Vehicle acceptance
16 test is simply to make sure each vehicle is
17 functioning properly and have -- have all the tests
18 completed, whereas the system acceptance -- or,
19 sorry, the system integration test is to test the
20 interface between the system, the rail, the power,
21 and -- and -- and the train.

22 KATE MCGRANN: And what role would
23 Alstom have, if any, in the system integration
24 testing?

25 YANG LIU: So OLRT as the integrator

1 should be leading these system integration tests.
2 Alstom would be supporting these tests to make sure
3 that it's executed properly.

4 KATE MCGRANN: And did you have any
5 involvement in that work?

6 YANG LIU: No, I did not.

7 KATE MCGRANN: Who did that work for
8 Alstom?

9 YANG LIU: It was the -- the
10 warranty/engineering organizations.

11 KATE MCGRANN: And who was heading up
12 that organization?

13 YANG LIU: So warranty was headed up
14 by -- by our old project operation manager at that
15 time, Thomas Demachy, and the engineering was --
16 engineering management changed, but probably most
17 of the time it was -- it was -- it was Loic and
18 Frederic, so Loic Monteyne and Frederic Lamagnere.

19 KATE MCGRANN: Could you spell Loic's
20 first name, please?

21 YANG LIU: L-O-I-C.

22 KATE MCGRANN: Okay. And the other
23 person was Frederic?

24 YANG LIU: Lamagnere.

25 KATE MCGRANN: And did you have any

1 insight into the work that they were doing on that
2 front?

3 YANG LIU: On the system acceptance
4 side? Or on the --

5 KATE MCGRANN: Yes.

6 YANG LIU: -- integration part? I know
7 that there was -- there were experts coming from
8 France to really do the complicated testing such as
9 the instrumented bogie test, the ride comfort test.
10 These were not things that we could do locally.

11 KATE MCGRANN: And those were both
12 systems integration tests?

13 YANG LIU: Yes, they were part of the
14 system -- they were validation tests/systems
15 integration tests.

16 KATE MCGRANN: So could you just
17 explain to me -- because now I'm thinking
18 validation tests happens on the trains and system
19 integration testing happens on the entire system,
20 so how could they be both?

21 YANG LIU: So because -- because some
22 validation tests needs the infrastructure, such as
23 ride quality is highly dependent on the rail as
24 well, so -- so these tests had to be done at the
25 end, when -- you have to instrument the bogie to

1 run on that rail and -- and -- and get the
2 parameters of running exactly on that rail.

3 KATE MCGRANN: When you stepped into
4 the role of testing and commissioning manager, did
5 you replace someone?

6 YANG LIU: No. I was the first testing
7 and commissioning manager.

8 KATE MCGRANN: And did somebody replace
9 you when you left in May of 2019?

10 YANG LIU: Yes.

11 KATE MCGRANN: And who was that?

12 YANG LIU: It was my serial test
13 manager who was working with me through the whole
14 testing phase. His name is Rodrigo Chicarolli.

15 KATE MCGRANN: Still with the project
16 now?

17 YANG LIU: He has left as well. Or he
18 is leaving, shall I say, but very soon.

19 KATE MCGRANN: In terms of the
20 integration testing that OLRTC performed, to your
21 knowledge, did Alstom have the ability to review
22 the testing plans for that integration testing and
23 provide feedback?

24 YANG LIU: I cannot answer that
25 question. I wasn't involved in -- in that process

1 that much.

2 KATE MCGRANN: Would you have expected
3 to have the opportunity to give feedback on --

4 YANG LIU: Absolutely. Like, we --
5 we -- whoever was supporting that needed to have
6 all the test plans in advance to make sure that
7 it's -- it was in line with -- what's expected is,
8 first of all, feasible; and second, to give our
9 expert input on the testing plan and to have our --
10 the tests can only proceed after we agree that it's
11 feasible, I guess.

12 KATE MCGRANN: Those plans -- didn't
13 those plans have any impact on the work that you
14 were doing?

15 YANG LIU: No.

16 KATE MCGRANN: For the work that you
17 were doing, did you have the number of staff that
18 you needed?

19 YANG LIU: Well, my team kept ramping
20 up. At the beginning, it was not enough. The --
21 at the beginning, it was -- we were -- we were
22 sized to test two trains in parallel at the -- at
23 any given -- at any given time, but because of the
24 delays and because of all the rework, all the
25 retrofits, well, I had to more or less double that

1 team, so we're testing four trains, or we're
2 testing five trains in parallel, so it was -- so it
3 kept ramping up and up.

4 KATE MCGRANN: And did you have trouble
5 finding the number of people that you required in
6 order to do the work you had to do?

7 YANG LIU: We had a good system set in
8 place where we -- we -- we -- because Ottawa is not
9 an industrialized city, it's not -- there's no rail
10 history in the city, so we had a good system set up
11 where we would take technicians coming out of
12 Algonquin College, their -- the electrical
13 technician program, and we would put them in
14 training in -- and have them gradually train up to
15 be able to teach them about the train, for them to
16 be qualified test technicians. So because we had
17 this system, we were able to find -- to have
18 constantly new talent fed in and have them trained
19 up to be the properly skilled test technicians. So
20 we were able to find the people, just -- yeah. I
21 don't think the resource was a critical point for
22 us, but the team of -- the size of the team had to
23 increase over time.

24 KATE MCGRANN: And how long would the
25 training of these new graduates take?

1 YANG LIU: So they would -- they would
2 normally start as a production technician, and then
3 they would enter into -- into our electrical test,
4 so -- which is very basic. They don't actually do
5 any energized testing. They're dealing with a dead
6 train. They're just testing continuity of wires at
7 that time. And then after they graduate there,
8 they would go into serial tests but work underneath
9 a test -- an advanced technician and a test leader.
10 It normally took around 6 months to -- 6 months
11 to -- to 9 months to get someone new to become,
12 shall we say -- to be able to operate independently
13 to execute the test program.

14 KATE MCGRANN: And just thinking about
15 your resources and what you were able to do with
16 them, did you have sufficient experienced people
17 who could do the kind of training that you're
18 speaking about?

19 YANG LIU: Yes, yes. So first of all,
20 my serial test manager is a train expert. He has
21 spent his career testing -- in the engineering
22 department and testing -- and testing department in
23 Brazil and other -- and he came to Canada before
24 and worked for Bombardier in Kingston, so he was
25 very experienced.

1 The first two technicians we hired as
2 our test leader, we sent them to Hornell to train,
3 and then once they come back, our test -- my serial
4 test manager worked closely with them on the first
5 two trains to really get them up to speed, and then
6 the -- I would say we always had enough people. We
7 had different ranks of top technicians in
8 accordance with their skill level. We always had
9 enough seniors, so we never actually had a case
10 where we had a bunch of new people working on
11 trains. That didn't happen.

12 KATE MCGRANN: And that was going to be
13 my next question. So you've got enough people. Do
14 you have the right mix of skills and experience in
15 order to efficiently complete the testing that you
16 have to?

17 YANG LIU: Yes. I would say yes. From
18 my view, it's -- the testing program was conducted
19 in accordance with the requirements. There was
20 no -- the -- I have full confidence that every test
21 was performed properly.

22 KATE MCGRANN: And with respect to the
23 speed at which you were able to perform those
24 tests, did the human resource factor have any
25 impact on the speed at which you could conduct

1 those tests or slow you down at all?

2 YANG LIU: The -- sometimes yes, there
3 are complex problems that cannot be -- so if
4 everything goes smoothly, the tests can be done
5 very fast. It's when the things don't go smoothly,
6 you have to troubleshoot it. That's where the time
7 is spent, actually. So definitely we had a lot of
8 problems on these trains in the testing that we had
9 to fix, missed wires or components that didn't
10 work, so that's -- for sure slowed us down.

11 KATE MCGRANN: And with respect to the
12 problems that were identified on the trains, were
13 either the number of them or the severity of them
14 unusual, in your experience?

15 YANG LIU: Yes.

16 KATE MCGRANN: And would you explain
17 what you saw there.

18 YANG LIU: So -- so there were two
19 factors. One was the fact that the validation was
20 delayed, and we kept having changes to these trains
21 so that the -- we had to adapt constantly. So we
22 received new schematics very frequently that we --
23 we had to adapt our testing program to. That
24 increased the complexity of troubleshooting. And
25 second is that the minor deficiencies from the

1 entire production process would end up in test. So
2 the train cannot leave testing without everything
3 solved, whereas it could leave all the stations
4 before with minor deficiencies. So all the
5 problems basically had to be solved in -- when the
6 train was in testing.

7 KATE MCGRANN: Okay. So the trains can
8 proceed through every step in the manufacturing
9 piece, et cetera, up until they hit serial testing,
10 and at that point, everything has got to be fixed?

11 YANG LIU: Yes.

12 KATE MCGRANN: And when the trains did
13 land in serial testing, were the number and
14 severity of the issues that had to be fixed
15 abnormal, in your experience?

16 YANG LIU: Yes. I -- I think -- I
17 think it was. It was... It is normal to have
18 issues when the trains enter tests or otherwise
19 they wouldn't need tests - you could just flip on
20 the switch and everything will power on perfectly.
21 But in this case, we were really into the later
22 trains. So normally you would expect to see, you
23 know, the -- maybe the first five trains had a lot
24 of issues, and afterwards everything gets stable.
25 In our case, because we're constantly changing the

1 design. We're making modifications, so the
2 likelihood of human error increased as well. So
3 you never really had a stable design that basically
4 you can -- you can just expect to be working.
5 There was a lot of issues that had to be resolved
6 throughout the whole testing process, the whole
7 testing program.

8 KATE MCGRANN: Were any steps taken to
9 account for the increase in the potential risk of
10 human error in the process that you've described?

11 YANG LIU: You mean any mitigations
12 that we did?

13 KATE MCGRANN: Yes.

14 YANG LIU: Yes. So we had basically --
15 we had additional test steps to be done on the
16 subcomponents. What I mean -- I can give an
17 example. As part of the wiring change, for
18 example, we had to take out an entire panel to be
19 reworked, to have maybe an ATC function updated.
20 Rather than doing the change and then putting the
21 whole panel back into the train and then redoing
22 the test, we developed procedures to test that
23 panel by itself before putting it back into the
24 train, which actually greatly helped to reduce the
25 issues. We had production members, production team

1 members on standby, so okay, if we identified --
2 say a door needs adjustment, they would come
3 directly into test and start adjusting right away,
4 so there was no delay in waiting for the team --
5 waiting for the technician to be available. And we
6 had, of course, internal experience. All the
7 issues that we found was shared with all the team
8 members. Everybody was aware of what are the
9 common issues that were occurring. All of these
10 steps were implemented to make it go more smoothly.

11 FRASER HARLAND: Can I just ask a quick
12 point of clarification? You mentioned that minor
13 deficiencies had to be resolved in the testing
14 process in order to move forward, but I thought
15 that you had mentioned earlier that a minor
16 deficiencies list stayed with the trains I think
17 even after revenue service, so can you just
18 explain --

19 YANG LIU: Yes.

20 FRASER HARLAND: -- what you mean.

21 YANG LIU: So the minor deficiency list
22 at the end, when the train is given to the
23 customer, is much shorter than the list that
24 accompanied the train when it came in. And so
25 you -- for example, you could have an entire panel

1 missing when the train entered testing because it
2 doesn't affect the ability to do work downstream,
3 whereas you can never deliver that to the client
4 because we -- we needed to be sure that the train
5 is in the proper shape. What the minor deficiency
6 in the -- in the end, it's mainly we know there are
7 issues with certain systems because engineering has
8 not identified the solution for it. These are
9 typically the items that will stay with the minor
10 deficiency list at the end, when the trains are
11 accepted.

12 KATE MCGRANN: Did you or Alstom more
13 generally have any concerns that by virtue of the
14 number of retrofits and the degree of regression
15 testing that had to be done, there may be issues
16 and bugs in the trains that had not been identified
17 by the time that you left?

18 YANG LIU: Yes, and that was the
19 purpose of the nonregression test program, really
20 to catch as much as possible, but the sheer -- so I
21 guess we were -- we were trying to devise these
22 testing programs to be sure that -- that -- that
23 all the functions are continuously verified to be
24 working, but you will never catch -- so you will
25 never catch everything, I guess, because really the

1 sheer number of retrofits was concerning. It was
2 not the fact that we didn't test anything, but it's
3 just the number of changes that was being done to
4 these trains was concerning.

5 KATE MCGRANN: And with respect to the
6 readiness of these trains for trial running and
7 then revenue service, were there concerns at the
8 time that you left, on Alstom's behalf, that the
9 trains were not ready for either of those things?

10 YANG LIU: When -- so when I left, we
11 were really finishing up the retrofits and the
12 testing, and the plan was to, okay, to make these
13 trains ready for trial run. For me, we -- so I --
14 okay, I had laid out these are the testing programs
15 that we have to do and -- to make these trains --
16 shall we say to make these trains perform in
17 accordance to the latest validated design. But
18 yes, there were still functions that were not fully
19 hashed out, like the passenger information display
20 system. That had -- we know that had some issues
21 that needed to be solved in the future by software
22 updates. Yeah. So I -- I guess there were some
23 concerns, but the trains were getting ready. I
24 wouldn't say they were completely not ready for
25 trial running.

1 KATE MCGRANN: And was there a schedule
2 put in place for completing the outstanding items
3 when you left?

4 YANG LIU: There was one, but I wasn't
5 too aware of it. I wasn't part of the -- the
6 engineering had the details. When I left, it was
7 not fully clear to me at that time.

8 KATE MCGRANN: Did you have a sense of
9 when all of the work that remained to be done on
10 the trains was to be completed?

11 YANG LIU: I would say -- I would have
12 expected it to be finished before start of revenue
13 service, but -- but now, looking back, I don't
14 think it was -- it was feasible.

15 KATE MCGRANN: And why do you say that?

16 YANG LIU: Well, because now I'm seeing
17 we're still having changes and retrofits done to
18 the trains, so there was more issues that was found
19 after revenue service.

20 KATE MCGRANN: Had the integration
21 testing started by the time that you left?

22 YANG LIU: Yes. We were driving the
23 trains around the stations to -- I believe, at a
24 certain point, the media was even on the trains,
25 and so the trains were running in the system when I

1 left.

2 KATE MCGRANN: The whole system?

3 YANG LIU: The east for sure. I'm not
4 sure about the west.

5 KATE MCGRANN: And would you expect
6 potential problems to be identified as the train
7 ran through various parts of the system? So for
8 example, if it works between Station 1 and 2, is
9 there a possibility that an issue may be identified
10 as between 3 and 4 no matter how many times it's
11 run between Station 1 and 2?

12 YANG LIU: Yes. So now with the
13 understanding that I have now, definitely, the
14 train -- the geography of the -- or the topology of
15 the rail and of the -- of the OCS has great
16 influence on the train behaviour.

17 KATE MCGRANN: And you've spoken some
18 about the -- I'll call it the compression or the
19 shortening of the schedule based on changes to the
20 location of the validation testing. Anything else
21 put pressure on the testing schedule, from your
22 perspective?

23 YANG LIU: Lack of availability of the
24 infrastructure as well. We -- so at the beginning,
25 we didn't have the infrastructure needed to test

1 these trains. There was no power anywhere in the
2 building, so you can only do low voltage testing,
3 which is very limited. The test track was not
4 ready -- was not that available at the beginning as
5 well, so we -- after we were ready for the dynamic
6 tests, we couldn't run it out there in the -- in
7 the main line. Yes, modifications to the train,
8 compressed validation, so the extent of the
9 validation program, all of these had impacts on the
10 testing program.

11 KATE MCGRANN: And when you say there
12 was no power in the building, are you referring to
13 the maintenance and storage facility?

14 YANG LIU: Yes.

15 KATE MCGRANN: When was power made
16 available in the maintenance and storage facility?

17 YANG LIU: It was Q3 2016, so somewhere
18 in August, in around that time frame.

19 KATE MCGRANN: And when was it supposed
20 to be made available?

21 YANG LIU: I think the moment we took
22 over the building it should have been available.

23 KATE MCGRANN: So was it your
24 expectation that it would be available when you
25 arrived?

1 YANG LIU: Yes. I would have expected
2 a fully functional building when I arrived, yes.

3 KATE MCGRANN: Other than the power
4 issue, any other issues with the maintenance and
5 storage facility that interfered with the work that
6 you were doing?

7 YANG LIU: Yes. So -- well, they're
8 all related to the power because in -- for testing,
9 it's one that -- without power, it's extra storage
10 space. It doesn't work. We need power. Whether
11 it's the OCS, whether it's the shop supply, there's
12 different sources where we can get this power. If
13 any of them fail, then it degrades the -- it delays
14 the serial testing program, and we have
15 continuously struggled with fuses being blown on
16 the infrastructure side to -- that hindered our
17 capability to progress.

18 KATE MCGRANN: Were you able to isolate
19 the cause or causes of the blown fuses?

20 YANG LIU: Yes. The input power was
21 designed incorrectly, and the part -- so the
22 feed-in system to the connection point that plugged
23 into the train was undersized. The contactor was
24 not properly rated to be able to handle the
25 voltage, and the current was not properly rated to

1 handle the current. In fact, we had a -- we had a
2 near -- near miss, we had almost a fire happen on
3 the -- on the power supply's cabinet, and that
4 was -- we were very lucky that it was an enclosed
5 area, and it burned out on its own, and the whole
6 thing was destroyed, but -- like, as an electrical
7 engineer, I can say it's -- it's purely -- it's
8 undersized.

9 KATE MCGRANN: What was done to fix
10 that problem?

11 YANG LIU: So now the whole system has
12 been changed out to a much -- to a contactor that
13 had a higher voltage rating, higher current rating.
14 The fuses were changed to a higher rating fuse.
15 The system had been redesigned, I would say.

16 KATE MCGRANN: And who took charge of
17 the redesign?

18 YANG LIU: Either OLRTC or RTM. One of
19 those two entities, basically.

20 KATE MCGRANN: Either RTG or RTM, did
21 you say?

22 YANG LIU: Yeah -- RTM. RTM or OLRT,
23 yes.

24 KATE MCGRANN: Or OLRTC.

25 YANG LIU: Or OLRT, yes, exactly.

1 KATE MCGRANN: When was it fixed?

2 YANG LIU: After I left, actually.

3 KATE MCGRANN: So this issue with the
4 fuses persisted through the entire time that you
5 are in --

6 YANG LIU: Yes.

7 KATE MCGRANN: -- the role of testing
8 and commissioning manager?

9 YANG LIU: Yes.

10 KATE MCGRANN: And how did you work
11 within those constraints?

12 YANG LIU: Changed the fuse. We
13 have -- we have to -- every time it -- it -- and
14 the train was fine. The train didn't see anything
15 wrong, yet the infrastructure that's supplying the
16 train had tripped. So we would go to OLRT to say,
17 okay, the fuse blew again, can you put in a new
18 one, and they would change the new one. But then
19 they said, Don't blow the fuse, but I said, Okay,
20 the train is fine. It can -- like, nothing even
21 tripped on the train, so it's just -- it's
22 undersized. Yeah. So it's -- we didn't really
23 have a redesign done at that time. It was simply
24 replace when it fails.

25 KATE MCGRANN: Two questions on that.

1 One, how much delay did that introduce into your
2 process?

3 YANG LIU: Okay. So on that, we had to
4 wait a significant amount of time after we first
5 took over the testing bay -- or after we started
6 testing to have OCS - a few months, I would say, at
7 least delayed us for a few months at that time -
8 and then when the (indiscernible) blew, we lost
9 half a year, I think, somewhere in there. After
10 the fire, we lost half a year. It was not fixed
11 for half a year. So all of -- there was a number
12 of trains where we had to develop workarounds,
13 temporary measures to -- to bypass the tests that
14 are needed for -- that are needed with the -- with
15 the shop supply, for example.

16 KATE MCGRANN: When was the fire?

17 YANG LIU: I'd have to check the dates.
18 It was 2017. It was I think 2017.

19 KATE MCGRANN: I would guess that the
20 workarounds were not as efficient as the original
21 process that was planned? Is that fair?

22 YANG LIU: I don't know what was
23 planned. It was -- it was -- it wasn't planned for
24 this to -- oh, sorry, you mean on the testing side?

25 KATE MCGRANN: Yes.

1 YANG LIU: Okay. So yes, the
2 workarounds were not as efficient. We had to
3 modify the testing program to see how can we get to
4 the circuits that we needed to test without that
5 supply.

6 KATE MCGRANN: And did the
7 modifications that were implemented create
8 additional risks that had to be tested through the
9 nonregression testing?

10 YANG LIU: Yes, there were some
11 circuits that had to be tested again.

12 KATE MCGRANN: I think I've asked you
13 this question, but I just want to make sure I've
14 asked it explicitly and clearly. The amount of
15 testing and -- am I describing nonregression
16 testing properly?

17 YANG LIU: Yes. Yes, you are.

18 KATE MCGRANN: The amount of serial
19 testing and nonregression testing as part of that
20 and the timing of it, did it present a risk that
21 issues would present themselves, you know, months
22 from when the testing was completed?

23 YANG LIU: Yes, it did increase the
24 risk, definitely.

25 KATE MCGRANN: And was Alstom aware of

1 that?

2 YANG LIU: Yes, Alstom was fully aware
3 of that. Like, ideally we don't have any
4 nonregression tests. All the trains come in with
5 the validated design, we do it once, and that's it.
6 Every time you touch the train, you are introducing
7 new potential points for failure, and nonregression
8 tests is really developed to catch as much as
9 possible, but there's -- the more retrofits you do,
10 the more likelihood there will be issues. That's
11 the case.

12 KATE MCGRANN: To your knowledge, were
13 these increased risks shared by Alstom with RTG or
14 OLRTC?

15 YANG LIU: I don't know. I mean, they
16 are fully aware of the retrofit program,
17 absolutely, and -- but I don't know to what extent,
18 what has been shared at what point, or whether that
19 sentence has been said, I don't know.

20 KATE MCGRANN: Other than what we've
21 already discussed, were there any other factors
22 that had interfered with the testing work that you
23 were doing?

24 YANG LIU: Test track, power
25 availability, the -- all the nonregression tests.

1 No, I think we -- that could cover the -- the main
2 factors.

3 KATE MCGRANN: At the time that you
4 left, did you have any concerns about the adequacy
5 of testing that had been completed other than what
6 we've already discussed?

7 YANG LIU: No. At the time that I
8 left, I was confident in the quality of the testing
9 done, and -- I mean, looking back it now, I think
10 it was done properly. We don't have issues with
11 wiring on these trains, generally speaking.
12 It's -- most of the issues are really design
13 issues - okay, that piece was not designed
14 adequately, we've changed to a new design - but we
15 rarely have the trains behaving in a mysterious
16 way. So at the time, I felt pretty -- I felt
17 confident, and now I'm still confident that the
18 testing program was done properly.

19 KATE MCGRANN: And when you say "design
20 issues," what are you talking about?

21 YANG LIU: Oh, I'm talking about all of
22 the issues that -- that caused the -- us headache
23 after revenue service, whether it's -- I don't
24 know, line inductors, line contactors, all of these
25 issues that actually are making the headlines, all

1 of these -- all of these things.

2 KATE MCGRANN: And when would you
3 expect those design issues to have been identified
4 normally?

5 YANG LIU: Some -- some could have been
6 identified in validation. Some couldn't. Some --
7 in my experience, no matter how mature the design
8 and the platform and the operating environment --
9 normally we put a new train into a -- a system, the
10 first 6 months to a year is really the most
11 problematic time. You have -- always have issues
12 that pop up. It's just normal, I would say. But
13 maybe in Ottawa, the amount of issues and the time
14 that is stretching is a little bit abnormal, but --
15 but with every new fleet, you do expect some new
16 issues, so -- so some could have been caught in the
17 validation phase, some not, I don't think so.

18 KATE MCGRANN: To the extent that you
19 can speak to it, what do you think contributed to
20 the abnormal number of issues and the time period
21 over which they have been presenting themselves?

22 YANG LIU: So first of all, it's -- so
23 the local content requirement of this project for
24 Canada, for Ottawa, I think we would -- some
25 suppliers were -- were new. They haven't --

1 they -- we had to use some new suppliers or some
2 subsidiary of a known supplier in Europe - for
3 example, a very -- could be a very experienced
4 supplier in Europe, but they have their partner in
5 Canada or in North America who's designing that
6 part, manufacturing that part, but it's not the
7 same thing, so -- so they could have some issues
8 that -- that are -- that are not seen before.
9 While it's a -- it's an existing platform, the
10 Citadis platform, there was, like, a lot of changes
11 to the train, and it's the first -- really the
12 first -- first project of Alstom in Canada. So a
13 lot of new things, I would say.

14 And as well, the infrastructure, it's a
15 new -- you know, it's a -- it's a brand-new
16 infrastructure. The city didn't have such
17 electrified light rail before, so. You know,
18 basically, we're taking a new train and the new
19 track and the new infrastructure, and we're trying
20 to merge it together. So there are -- I guess that
21 led to a lot of the issues that we're seeing.

22 KATE MCGRANN: When you mentioned the
23 fact that it's the first project for Alstom in
24 Canada, how could that potentially contribute to
25 the issues that are seen on the train after it goes

1 into revenue service?

2 YANG LIU: I think it's just that we
3 don't have a reference here in Canada to say, okay,
4 like, this is the type of issues -- like, freezing
5 rain, would see, like, X centimetres of freezing
6 rain come down, whereas -- or, for example, this
7 is -- where we're operating this train on a new
8 rail profile that it has not run on before, so
9 there's no experience running with this particular
10 rail profile. So I guess it's -- it's a lot of new
11 factors that are being introduced, being a new
12 project.

13 KATE MCGRANN: Do you think
14 manufacturing in a new facility may have had an
15 impact?

16 YANG LIU: Oh, yes, yes, absolutely. I
17 wouldn't recommend it after this -- this endeavour.
18 I would say it's -- to have a local staff trained
19 up and to manufacture trains was -- I think would
20 be challenging. Yeah.

21 KATE MCGRANN: And any challenges
22 presented by the maintenance and storage facility
23 as a manufacturing site, other than the power
24 issues that you've already identified?

25 YANG LIU: It's not so much the

1 facility as in it's a brand-new site. As I say,
2 you have to have -- get new people; you have -- I
3 guess -- you know, there's no routine. You have to
4 build up the routine because everything's new.
5 It's more that aspect that has an impact.

6 The MSF itself, I mean, the -- it was
7 very tight. There was -- basically you had to keep
8 the line moving. There was not -- if it stops,
9 there's not many places to park -- park, for
10 example. There's no queue. In testing, there's
11 only so much space. You know, there -- it's
12 very -- like, it had to -- it had to work as
13 intended. It cannot have any -- there's not much
14 tolerance for -- for faults or for unexpected
15 situations.

16 KATE MCGRANN: So a fault or an
17 unexpected situation that occurred in the
18 maintenance and storage facility would have a
19 larger impact on the overall project than it might
20 have if it was done in a larger established
21 facility?

22 YANG LIU: Yes. Yes.

23 KATE MCGRANN: Was there a competition
24 for space in the manufacturing and storage facility
25 with respect to the number of different activities

1 that were required to take place, given the
2 schedule for the project?

3 YANG LIU: Yes, absolutely. There
4 was --

5 KATE MCGRANN: Could you --

6 YANG LIU: -- competition for space in
7 the light maintenance bay because, first of all,
8 validation needed the same space, so it was always
9 a fight between validation and serial tests, who
10 gets which spots. And as well, if one -- so
11 there's four spots in the light maintenance bay.
12 We can fit four trains in there. But if one train
13 is powered, then the train adjacent to it, you --
14 there's no roof access for safety reasons, so there
15 was competition in that sense as well, so who gets
16 to power it at what time. Retrofits, there was --
17 we had to find a place to do these retrofits. That
18 was not -- that was not easily identifiable.

19 KATE MCGRANN: And did one of the three
20 activities - validation testing, serial testing, or
21 retrofits - take precedence over the other?

22 YANG LIU: Validation always took --
23 always took priority, so everybody else has to make
24 way for validation.

25 KATE MCGRANN: And then was there -- of

1 the other two, serial testing and retrofits, did
2 one of them generally take priority over the other?

3 YANG LIU: Well, they go --

4 KATE MCGRANN: Go hand in hand.

5 YANG LIU: -- hand in hand, yes.

6 You -- you need retrofit to do serial tests, and
7 you need to -- to continue with serial tests to do
8 retrofits, so it's -- those two were very
9 intimately related.

10 KATE MCGRANN: Did you have insight at
11 all into the Thales CBTC testing?

12 YANG LIU: Yes. The static -- so
13 the -- sorry, the view -- so there's two portions
14 to the CBTC system. There's an onboard component,
15 which is the VOBC, and then there's the CBTC, which
16 is the wayside. Are you referring to the onboard
17 or the wayside?

18 KATE MCGRANN: Both. So --

19 YANG LIU: Okay. So the onboard, yes,
20 because we were responsible for the onboard static
21 testing. Actually, it was a Thales procedure that
22 Alstom was supposed to execute, so that part I'm
23 quite familiar with. The other parts, I'm not --
24 I'm not -- I'm not -- I wasn't involved in that,
25 no.

1 KATE MCGRANN: Okay. With respect to
2 the VOBC testing and the Thales procedure, how did
3 that go?

4 YANG LIU: It took much longer than
5 expected, actually. Because -- because the system
6 doesn't really -- the interface was not -- was not
7 finalized at the beginning, so there was retrofits
8 on that system for -- first and foremost. And then
9 the -- it was -- I remember it took a lot longer
10 than what Thales told us it should be taking,
11 especially at the beginning. It took us almost a
12 week, I think, to do it. Eventually it got faster.

13 KATE MCGRANN: And when you say it took
14 almost a week, would that be one week per train?

15 YANG LIU: Yes, one week per train.

16 KATE MCGRANN: Okay. And how long was
17 it anticipated to take?

18 YANG LIU: If I -- I would say two or
19 three days, if I -- maybe two days. It was -- it
20 was -- it was very long, yes.

21 KATE MCGRANN: It was taking somewhere
22 between two and three times as long as --

23 YANG LIU: Yes.

24 KATE MCGRANN: -- you had thought.

25 YANG LIU: More importantly is that the

1 interface changes meant all the nonregression tests
2 was immense because of the VOBC modifications.

3 KATE MCGRANN: So do you know why the
4 interface wasn't finalized when you guys started on
5 this?

6 YANG LIU: I don't know. It was one of
7 the big mysteries. I have no clue. But it
8 wasn't -- it should have been finalized.

9 KATE MCGRANN: Was it known at the time
10 that it hadn't been finalized?

11 YANG LIU: Yes.

12 KATE MCGRANN: With respect to the
13 nonregression testing that came out of the VOBC
14 testing, did Thales assist in the design of that
15 nonregression testing?

16 YANG LIU: No, they did not. They --
17 so the way it works is that -- so we only need --
18 for example, for the Thales -- for the design
19 modification, it could be a very simple we need to
20 add a switch in this circuit, but we need --
21 because of that, we need to take out the electrical
22 panel, which actually has interface to every single
23 function on the train, and the -- add in that small
24 change and then put the whole panel back, but as a
25 result of that activity, we are not just testing

1 that switch. We're testing the train again because
2 every -- if you touch a connector, you need to test
3 all the functions that go through that connector,
4 so it's exponential, the amount of retesting that's
5 needed.

6 KATE MCGRANN: When was the interface
7 finalized?

8 YANG LIU: I think -- like, towards the
9 end of 2018, 2019, around -- around that time
10 frame.

11 KATE MCGRANN: Was it finalized before
12 you left?

13 YANG LIU: Most of it, yes, the vast
14 majority of it. There may -- I think UTO was still
15 not working, unmanned train operation. Other
16 things should have been finalized.

17 KATE MCGRANN: And what was the issue
18 with UTO?

19 YANG LIU: Just -- it was -- it
20 involved significant -- well, I'm not actually that
21 sure. I just know it was very complicated. Maybe
22 there was a lot of software changes that were
23 needed or maybe wiring changes. I'm not too
24 familiar with that modification.

25 KATE MCGRANN: When you rejoined the

1 project, what was the status of the UTO testing?

2 YANG LIU: It still wasn't -- I don't
3 know. I think it still wasn't working. I think
4 even -- even now, it's getting -- the modification
5 is getting done right now, on the fleet.

6 KATE MCGRANN: What implications would
7 that have for revenue service?

8 YANG LIU: Not that much because it's
9 always foreseen to have a driver, so you wouldn't
10 actually ever use UTO in the main line. It's
11 mainly in the yard, where the trains are shunting
12 around by themselves. But we have to compensate
13 with -- so we had to have additional hustlers or
14 train -- train shunters hired to move the trains
15 around. So it wasn't a -- I wouldn't say there was
16 no impact, but it was just resource-wise, there was
17 more resources required.

18 KATE MCGRANN: Other than -- other than
19 the more resources required, any implications for
20 your work flowing from the fact that the yard
21 wasn't fully automated as it was supposed to be?

22 YANG LIU: On the -- as the maintenance
23 engineering manager, on the maintenance side, it
24 was really processes. We had to set up processes
25 in place for, for example, coupling of the trains

1 and basically what checks to do before moving the
2 trains. It's more -- more setting up the processes
3 to make sure that the hustling worked.

4 KATE MCGRANN: Was the MSF supposed to
5 be fully automated when the testing was taking
6 place?

7 YANG LIU: Testing and commissioning?
8 No, it was not supposed to be fully automated.

9 KATE MCGRANN: Just while I'm looking
10 at my notes, Mr. Harland, do you have any follow-up
11 questions on anything that we've discussed so far?

12 FRASER HARLAND: Just a couple things.
13 One thing -- and I think you've answered this, but
14 if I could just put maybe a bit of a finer point on
15 it. Is it fair to say that it's ideal for
16 validation testing in its entirety to take place
17 before serial testing?

18 YANG LIU: Yes, it would be ideal.

19 FRASER HARLAND: And that was the
20 original plan on this project; is that right?

21 YANG LIU: Yes, that was the plan
22 originally, yeah.

23 FRASER HARLAND: And a major reason for
24 that is to work out as many problems as possible
25 before serial testing, which allows avoiding

1 retrofits; right?

2 YANG LIU: Yes, exactly.

3 FRASER HARLAND: Okay. And what
4 actually happened on this project was the overlap
5 between validation and serial testing, and that led
6 to significant retrofits.

7 YANG LIU: Yeah, exactly.

8 FRASER HARLAND: Okay. I just wanted
9 to clarify that. One other question in terms of
10 the MSF. It's my understanding that at some
11 point -- and this might have been for Phase 2, but
12 construction moved to Toronto or somewhere in
13 Toronto; is that right?

14 YANG LIU: Yes, Brampton. So Phase
15 2 -- I would say most of the Phase 2 fleet is being
16 manufactured in Brampton.

17 FRASER HARLAND: And do you know why
18 that happened?

19 YANG LIU: I think -- well, first of
20 all, there's no space here anymore because as soon
21 as revenue service started, we needed the building
22 to do maintenance on the Phase 1 fleet, and then
23 strategic reasons by the company, I guess, to --
24 because there was other projects in Canada that
25 could use, you know, a proper permanent plant.

1 Whereas Ottawa was always planned that, okay, we
2 would build the trains and decommission the staff.
3 Whereas now, there's more projects in Canada, so it
4 makes sense to have a permanent facility to
5 supply -- to build trains for various Canadian
6 projects.

7 FRASER HARLAND: I think those are my
8 only questions at this point. Thank you.

9 KATE MCGRANN: Perhaps we'll take the
10 afternoon break now. It's 3:20. Let's come back
11 at 3:30, if that works for everybody.

12 YANG LIU: Yes, thank you.

13 -- RECESS AT 3:20 --

14 -- UPON RESUMING AT 3:30 --

15 KATE MCGRANN: Okay. So turning now to
16 when you returned to the project in May of 2020,
17 would you please describe your role and
18 responsibilities upon your return.

19 YANG LIU: Okay. So I returned to
20 Alstom in the role of project engineering manager
21 for the maintenance project. My responsibility was
22 to lead the engineering department, which has a
23 team of engineers for overseeing the infrastructure
24 and vehicle maintenance of the -- of the Stage 1
25 Confederation Line. As well, I was overseeing the

1 fleet support team, which is a team that sits in
2 the control centre to support main line operation.

3 KATE MCGRANN: And who do you report to
4 in that role?

5 YANG LIU: I report to the -- so I have
6 two managers: So one is the Canada engineering
7 manager and then the other is the project manager.

8 KATE MCGRANN: And who are those
9 people?

10 YANG LIU: So the Canada engineering
11 manager is Jerome Copin. He has now -- but he has
12 since left. He's in France, and the role has not
13 been filled yet. Project manager is Richard
14 France.

15 KATE MCGRANN: And have there been any
16 changes to who you report to since you returned in
17 May of 2020?

18 YANG LIU: Yes, yes. So Richard -- so
19 now I'm reporting -- sorry. I would -- I should
20 say the project engineering manager should be
21 reporting to the site GM right now, site general
22 manager, who is Peter Keighron.

23 KATE MCGRANN: So describe that
24 reporting role or that line of reporting, if you
25 don't mind, from yourself up.

1 YANG LIU: Okay. So there has been
2 some changes in the last month. So Ottawa site
3 instated now a general manager for Alstom which
4 manages all the functions of maintenance, and now
5 the engineering manager is a part of his team, so
6 now the direct -- direct report would be Pete --
7 would be Peter as the site general manager.

8 KATE MCGRANN: Okay. And when you
9 first returned, you were reporting to --

10 YANG LIU: To Richard.

11 KATE MCGRANN: -- Jerome and Richard?

12 YANG LIU: Jerome and Richard, yes.

13 KATE MCGRANN: And what was Jerome's
14 area of responsibility?

15 YANG LIU: Jerome oversaw all of the
16 maintenance projects in Canada for Alstom,
17 including Ottawa, and at that time it was Montreal,
18 R-E-M, REM, in Montreal.

19 KATE MCGRANN: Okay. And what was
20 Mr. France's area of focus?

21 YANG LIU: So Richard is -- he was the
22 project manager, so he was overseeing all of the
23 different aspects of the project. His team
24 included, for example, the project engineering
25 manager, project operations manager, project

1 contract manager. So all of the different heads of
2 the departments was reporting to -- to Richard at
3 the beginning.

4 KATE MCGRANN: So the three departments
5 that exist when you return are engineering,
6 operations, and contract?

7 YANG LIU: No, more: engineering,
8 operations, contract, quality, performance,
9 procurement, supply chain. So... I think that's
10 pretty much it, I think. Yeah.

11 KATE MCGRANN: How many of those
12 departments were engaged in Stage 1 of the project
13 when you returned?

14 YANG LIU: It's a different project.
15 So Stage 1 is -- so the maintenance project and the
16 construction project are two separate groups in
17 Alstom. It was the rolling stock group who did the
18 Phase 1, whereas in Phase 2, it's the services
19 group.

20 KATE MCGRANN: Okay. And so you are
21 part of the services group?

22 YANG LIU: Now I am part of the
23 services group, yes.

24 KATE MCGRANN: And you have been since
25 you returned in May of 2020?

1 YANG LIU: Yes, that's right.

2 KATE MCGRANN: Are there members of the
3 rolling stock group that are still working to this
4 date?

5 YANG LIU: Yes, there are. So the
6 retrofit department right now is part of the
7 rolling stock group.

8 KATE MCGRANN: And how much interaction
9 is there between your group and the rolling stock
10 group?

11 YANG LIU: So it is two separate
12 organizations, I should say, but we meet regularly.
13 We meet in -- every day for the -- for the morning
14 meeting and afternoon meeting, so -- and in
15 addition, there is an open line of communication.

16 KATE MCGRANN: And what's the purpose
17 of keeping an open line of communication between
18 the two groups, through the meetings and otherwise?

19 YANG LIU: Well, it is one Alstom in
20 the end, so we -- whether we -- we -- we retrofit
21 trains or we do the maintenance, it's closely
22 related.

23 KATE MCGRANN: Is it a benefit to the
24 maintenance group to be kept apprised of the work
25 of the retrofit group?

1 YANG LIU: It is of the benefit,
2 because at the end, what they do affects -- like,
3 the trains will go into service, so we need to
4 be -- we need to know what they're doing. But we
5 don't necessarily control on the maintenance side
6 the processes that are followed by the retrofit
7 side.

8 KATE MCGRANN: Would you normally
9 expect to control those processes or have some
10 control over them?

11 YANG LIU: Well, if it was, for
12 example, another company that did the trains,
13 whether it was Siemens or something, then I think
14 the control would be much stronger. We would have
15 procedures -- I mean, I think it would be more --
16 probably -- yeah. It would be more -- much more --
17 shall we say much more stringent as well.

18 KATE MCGRANN: And why is that?

19 YANG LIU: Because the -- first of all,
20 it would be Siemens trains that we're maintaining,
21 so we wouldn't know as much about those trains as
22 we do now, so where -- so every -- all the
23 questions would have to be asked, and they would
24 be, I would say, a lot more scrutinized, whereas
25 now, it's all -- we use the same design

1 information, so the information is much more
2 transparent.

3 KATE MCGRANN: Any complications
4 flowing from the fact that the maintenance group
5 does not have as much control over the rolling
6 stock group as it would have if it was two separate
7 organizations at work?

8 YANG LIU: You are asking if -- any
9 concerns or --

10 KATE MCGRANN: Yes.

11 YANG LIU: -- in that -- I mean, has
12 been much better now, I guess, because after the
13 events that happened since the start of service,
14 after the derailments especially, so now we know --
15 it's really the service director -- sorry, the
16 quality director, he is overseeing both groups, so
17 he's able to instill the same -- implement the same
18 quality processes on both sides, so I think -- at
19 the beginning, it was not -- yes, it was -- we
20 didn't know too much what exactly was the
21 checkpoints, what was being done over there. Now
22 it's much more -- much more open, I guess.

23 KATE MCGRANN: And what are the
24 benefits that flow from the way things are now?

25 YANG LIU: Well, first, we have more

1 clarity. It's really -- we have -- at a certain
2 level, now we have one -- like, one reporting, one
3 person where everybody would report to. The
4 quality gates are clear, where is where, what's
5 being set up where. I think there's more clarity
6 and more confidence.

7 KATE MCGRANN: The focus of the
8 Commission in its work is on the commercial and
9 technical circumstances that led to the breakdowns
10 and derailments. To your knowledge, the areas that
11 have been improved on, did they have any
12 involvement in the issues that were seen on the
13 system when it went into revenue service?

14 YANG LIU: I don't -- can you repeat
15 the question, please?

16 KATE MCGRANN: Let me see if I can
17 clarify. You say that things are much better now,
18 so it sounds like things have been improved.

19 YANG LIU: Yes.

20 KATE MCGRANN: So the areas that were
21 improved --

22 YANG LIU: Yes.

23 KATE MCGRANN: -- before they were
24 improved --

25 YANG LIU: Yes.

1 KATE MCGRANN: -- do you think they
2 contributed at all to the reliability issues, the
3 breakdowns, the derailments that were seen on the
4 line?

5 YANG LIU: The breakdowns -- so since
6 revenue service, there has been a lot of issues
7 with this train, and most of it is related to the
8 design, has been rooted in the engineering design.
9 There were unexpected failures that we didn't know
10 about, and only probably the early '21 derailment
11 was related to -- well, it was the main one that
12 was ultimately related to quality, or let's say --
13 or human factors. So I think we couldn't have
14 avoided all of the design issues if we were -- if
15 we were really one organization. They still would
16 have happened.

17 KATE MCGRANN: Just while we're on
18 this, what do you think it would have taken to
19 avoid more of the design factors? And I accept
20 that you can't avoid them all, but what do you
21 think it would have taken to avoid more of them?

22 YANG LIU: So first, we -- so if we
23 were to use all mature suppliers, and so if there
24 was not as much requirement for new suppliers, or
25 maybe -- which could have been related to the local

1 content requirements, if that was -- we don't test
2 things out, if we just keep using the established
3 methods and established vendors, it would have been
4 better. If we -- if we were running in probably --
5 if it was not a new infrastructure, if the
6 infrastructure is mature and we have a lot of
7 experience or can get a lot of (indiscernible) from
8 the infrastructure that would have resolved, that
9 would have helped it. Yeah. I mean, it was -- if
10 it was a mature plant, that would have helped it as
11 well, I guess.

12 KATE MCGRANN: A mature what, sorry?

13 YANG LIU: Plant, a mature
14 manufacturing plant, yeah. Yes, I think -- yeah.
15 Or if validation -- you know, if we did validation
16 before, like a -- you know, maybe if validation was
17 done according to the plan originally, if it was
18 not in a rush, maybe they could have found more
19 problems in the validation phase. These are I
20 think probably the main factors.

21 KATE MCGRANN: Okay. So you are --
22 when you return in May of 2020, you're leading the
23 engineering department, and you're also overseeing
24 the fleet support team; is that right?

25 YANG LIU: That's correct.

1 KATE MCGRANN: Okay. And with respect
2 to the engineering department, they are -- is it
3 that they're maintaining the infrastructure and the
4 vehicles?

5 YANG LIU: Yes.

6 KATE MCGRANN: What components of the
7 system is Alstom responsible for maintaining?

8 YANG LIU: So on the vehicle side -- on
9 the vehicle side is the LRVs, the entire fleet of
10 the LRVs. Infrastructure side, we are responsible
11 for the track and the guideway, actually, so
12 everything that's within the -- within the fences
13 of -- that's on the track or around the track.
14 We're responsible for the OCS system, the -- all
15 the traction power substations, the tunnel
16 ventilation system, the fire detection system, the
17 sump pumps, all the communication equipment - so
18 the displays, the guideway intrusion detection, the
19 communication network - the intrusion access
20 control system, so the door access control system,
21 and also we are partly responsible for the
22 maintenance of the CBTC system.

23 KATE MCGRANN: And who is responsible
24 for the other part?

25 YANG LIU: That would be -- so it's

1 split. So we -- so Alstom is responsible for doing
2 the primary -- the first line diagnosis for
3 corrective maintenance and executing the preventive
4 maintenance for the Thales CBTC system. Thales is
5 responsible for deeper corrective activities. Both
6 Alstom and Thales are -- I guess we're partners.
7 We -- Alstom doesn't hold a contractual
8 relationship with Thales. It's RTM who holds the
9 contractual relationship with both of us.

10 KATE MCGRANN: With respect to the
11 divided responsibilities over the CBTC, has the
12 division of responsibilities created challenges for
13 the work that Alstom is doing?

14 YANG LIU: Yes, absolutely. It's --
15 it's -- I would say it's not set up in a way that's
16 beneficial for the system, for the actual -- for
17 the performance of the system, and why I say that
18 is -- so Alstom doesn't have any contractual
19 relationship with Thales, yet this whole system was
20 built by Thales. There are a lot of proprietary
21 knowledge in there that's not shared with Alstom.
22 In fact, we can't even get them to answer a
23 question that we -- that we have on their system.
24 And RTM, having the contractual relationship, does
25 not -- is not -- they're not accountable or they're

1 not liable for any of the issues. All of the
2 penalties, performance penalties associated with
3 nonfunctioning of the Thales system is taken by
4 Alstom, so there's no incentive for RTM to really
5 get Thales to support. And we have a lot of
6 issues. We can't even read the logs of the Thales
7 equipment because Thales will not give us the tools
8 to read these logs. Yeah. So it's one of the
9 most -- I would say the most -- the most visible
10 gaps right now.

11 KATE MCGRANN: From a practical
12 perspective, where would you see -- from -- like,
13 where do you see the fallout of this? Does it take
14 longer to identify problems? Does it take longer
15 to solve them? How does it play out?

16 YANG LIU: It takes longer to solve --
17 everywhere. So some trains cannot enter into
18 service because the VOBC is not functioning, but
19 we're not able to see what's wrong with it. So it
20 may have had a fault on the main line one day, and
21 Alstom -- you know, when we power it on, it works,
22 there's not much we can do, yet -- it limits
23 Alstom's ability to do the proper investigation
24 needed into issues. It prevents Alstom to do the
25 preventive maintenance, so it could lead to

1 increased failures on the -- on the -- in revenue
2 service for the asset because there are certain
3 questions that needed -- that needs to be answered
4 and needs to be clarified.

5 KATE MCGRANN: To the extent that
6 you're able to answer this, do you know why Thales
7 will not answer Alstom's questions?

8 YANG LIU: They -- actually, they come
9 back -- so the first reason, the response from
10 Thales is I need a P.O., I need a purchase order,
11 before they are willing to do anything. So --
12 which is -- actually, which is normal because
13 Alstom -- Alstom has no contractual relationship
14 with them, so they're not obliged to provide any
15 support to Alstom. I would say -- and they made it
16 quite clear in their response to us that we will
17 not be supporting you without a purchase agreement
18 or a support contract in place.

19 KATE MCGRANN: And what is Alstom's
20 response to that or what has it been?

21 YANG LIU: We are always trying to go
22 through RTM. So the strategy of Alstom is really
23 to push -- or to engage RTM to engage Thales, to
24 have RTM engage Thales to get the proper support.

25 KATE MCGRANN: And how successful has

1 that been?

2 YANG LIU: Not very successful because
3 RTM -- from RTM's perspective, a training has been
4 provided prior to revenue service by Thales on
5 their system, and this -- for them, the contractual
6 requirement has been met, but pragmatically
7 speaking, it's not enough. We -- this is a gap in
8 the way that the contract is set up, but it's --
9 but regardless of how the contract is set up, I
10 think we need to -- we need to fix it so that the
11 system will work going forward.

12 KATE MCGRANN: You mentioned that you
13 don't have the tools required to read aspects of
14 the system? Have I got that right?

15 YANG LIU: Logs.

16 KATE MCGRANN: Logs?

17 YANG LIU: Equipment logs, yes.

18 KATE MCGRANN: And what tools do you
19 need?

20 YANG LIU: So they're all Thales
21 proprietary tools. It's -- it's the log decoder.
22 Thales has given us a manual that's very good and
23 says, okay, if you have this code, do this; if you
24 have that code, do that. But we can't get the --
25 we can't get to those codes because you need a

1 proprietary software to be able to read these logs.
2 It's the same thing with the train. You can't
3 simply touch some screens and get the logs of the
4 train. You need to use the Alstom-specific
5 software that interfaces with the train control.
6 So it's normal for this design. It's just that the
7 tool needs to be provided. Yeah.

8 KATE MCGRANN: And who was supposed to
9 be -- were you expecting this proprietary software
10 from Thales to be available to Alstom maintenance
11 from the get-go?

12 YANG LIU: I was -- I personally -- I'm
13 expecting it, but it's not written anywhere in the
14 contract.

15 KATE MCGRANN: And what would it take,
16 in your understanding, to obtain this software?

17 YANG LIU: So Thales has to just simply
18 release it to Alstom, or -- or they have to -- we
19 can set up an agreement where Alstom would -- where
20 Thales would commit to a turnaround time for
21 decoding of these logs. Either/or is fine. Yeah.

22 KATE MCGRANN: And what's the obstacle
23 to achieving either/or of those?

24 YANG LIU: Contractual difficulties.

25 KATE MCGRANN: Can you be more

1 specific?

2 YANG LIU: So there is, I think,
3 commercial arrangements. Somebody needs to -- so
4 it's not -- it's not -- there's nothing technical
5 that's blocking this. It's simply the parties need
6 to come to a commercial agreement.

7 KATE MCGRANN: Is it that Thales wants
8 to -- wants Alstom to purchase the software?

9 YANG LIU: No, that -- Thales wants
10 Alstom to set up a support contract with them to
11 pay them for doing the service.

12 KATE MCGRANN: And how long has that
13 issue been outstanding?

14 YANG LIU: Since the beginning of
15 revenue service.

16 KATE MCGRANN: Any of the issues seen
17 on the line connected directly or indirectly to
18 this impasse between Alstom and Thales?

19 YANG LIU: No, no, there's nothing in
20 the line that's -- that's due to this because
21 the -- if there's any issues, we -- we are
22 conservative. We -- the train is not launched.
23 The asset is not launched. It's more the
24 availability that's -- that could be affected by
25 this issue.

1 KATE MCGRANN: So vehicle availability.

2 YANG LIU: Vehicle availability, yes.

3 KATE MCGRANN: And have there been
4 vehicle availability issues due to this issue?

5 YANG LIU: Yes, there have been.

6 KATE MCGRANN: Have those vehicle
7 availability issues trickled down to service
8 reliability due to lack of spare parts or spare
9 vehicles, anything like that?

10 YANG LIU: It's mainly -- no. I would
11 say it's -- it's mainly the (indiscernible). So I
12 would say the issue is that an issue happened, but
13 Alstom is not able to diagnose the fault, and the
14 fault may be -- may be repeating again on the -- in
15 the future, and Alstom is again limited by the
16 ability to find what the fault is, and so the train
17 is not launched, is not available for service.

18 KATE MCGRANN: This has actually
19 happened, that there have been faults that Alstom
20 can't identify, and the train is therefore not
21 available?

22 YANG LIU: Yes.

23 KATE MCGRANN: Has it been the case
24 that a fault has presented itself during revenue
25 service such that the train is no longer available

1 for service, but it's in the middle of the line?

2 YANG LIU: Yes. It's not a single
3 point of failure, though, because there's two VOBC
4 systems. You can do a switchover, and the train
5 can continue to run until the end of the day.

6 KATE MCGRANN: Can you give me a sense
7 of the magnitude of this issue? Like, how many
8 trains are taken out of service as a result? For
9 how long?

10 YANG LIU: It's a recurring issue.
11 It's not fleet-wide. We don't have the fleet
12 stopped, but it's more, I would say, one in a week,
13 maybe, or something like that.

14 KATE MCGRANN: And then how long does
15 it take to get the train back into service?

16 YANG LIU: Several days.

17 KATE MCGRANN: Pausing to clarify an
18 acronym that I think we've used several times but
19 hasn't explained yet, OCS, can you just tell me
20 what that is?

21 YANG LIU: OCS is the overhead catenary
22 system.

23 KATE MCGRANN: You've described the
24 areas that Alstom is responsible for maintaining.
25 Is RTM responsible for maintaining any aspects of

1 the system?

2 YANG LIU: RTM is responsible for
3 maintaining the tunnel infrastructure and the
4 stations themselves.

5 KATE MCGRANN: Who's responsible for
6 maintaining the maintenance and storage facility?

7 YANG LIU: The -- that would be RTM,
8 the facility for maintenance.

9 KATE MCGRANN: And what about the
10 equipment within the facility?

11 YANG LIU: That is also RTM's scope to
12 maintain.

13 KATE MCGRANN: Have there been any
14 issues experienced with the maintenance and storage
15 facility or the equipment therein that have created
16 challenges for Alstom from a maintenance
17 perspective?

18 YANG LIU: Oh, yes, yes. I think the
19 famous wheel lathe is a good example, that --
20 there's a single point of failure, the wheel lathe,
21 because if the wheels are out of tolerance, the
22 train cannot leave, cannot -- cannot be -- cannot
23 be released for service. So there was a point -- a
24 point in time where all the trains were queued up,
25 waiting for the wheel lathe, yet the wheel lathe

1 broke down and there's -- cannot be -- cannot be
2 rectified in time.

3 KATE MCGRANN: And do you know what the
4 problem was, why it couldn't be rectified in time?

5 YANG LIU: There is a multitude of
6 problems with this wheel lathe. It --
7 unfortunately, I don't know the details because RTM
8 wouldn't -- you know, normally they wouldn't share
9 these details with Alstom about what exactly was
10 wrong with it, but simply they would say, okay,
11 it's fixed; be careful when you use it or don't
12 abuse it. But from Alstom's side, the technicians
13 are trained by the -- by the RTM -- sorry, by the
14 wheel lathe vendor. I don't know what exactly is
15 the issue, but there's -- but it just breaks down
16 very frequently.

17 KATE MCGRANN: And is that still the
18 case even today?

19 YANG LIU: I think it's better now, but
20 we still have cases, times where even -- I think
21 last week where we had, like, a downtime of a few
22 hours because the wheel lathe was down.

23 KATE MCGRANN: And for people who
24 aren't familiar with this kind of machinery, how
25 complicated would it be to bring in a backup?

1 YANG LIU: It's actually quite
2 complicated. It's a mechanical -- it's a
3 mechanical tool that -- basically, there's rollers
4 on it. It needs to cut the wheel precisely, to the
5 millimetre or to the point of a millimetre, 0.1 of
6 a millimetre. This is not -- it's -- only licenced
7 people, licenced technicians, can actually work on
8 this equipment. It's not very simple to bring back
9 online.

10 KATE MCGRANN: And other than the wheel
11 lathe, any other issues with the maintenance and
12 storage facility and equipment in that facility
13 that have caused challenges for Alstom on the
14 maintenance front?

15 YANG LIU: So the operations management
16 would be able to give you a much more detailed
17 explanation of all the -- all of the deficiencies
18 that -- or -- yes, all of the deficiencies that
19 affect them. My understanding is the wheel lathe,
20 the rail car mover -- the rail car movers are
21 breaking down frequently as well, so these are the
22 equipment used to shunt the trains around because
23 UTO is not activated. Hot -- there is no hot water
24 in the shed that can be used to clean the trains.
25 These kind of operation issues are affecting us.

1 KATE MCGRANN: And the hot water to
2 clean the trains is important because?

3 YANG LIU: I -- they're needed to clean
4 the trains. I don't know the specifics, but it
5 is -- it is -- it is a -- I would say a piece of
6 tooling that's -- that's mandatory for the -- for
7 the system.

8 KATE MCGRANN: When you joined in May
9 of 2020, were you stepping into somebody else's
10 role?

11 YANG LIU: So when I joined in 2020,
12 there was no project engineering manager on the
13 site. So Jerome, my boss, was working remotely
14 from Montreal supporting the project and managing
15 the team here.

16 KATE MCGRANN: And do you know what led
17 to the decision to bring in a project engineer
18 on -- sorry, a project engineering manager onsite?

19 YANG LIU: That was always the plan.
20 They just were not able to hire anyone before I
21 joined on.

22 KATE MCGRANN: Okay. So your role
23 existed but was not filled --

24 YANG LIU: Yes.

25 KATE MCGRANN: -- between revenue

1 service and when you joined?

2 YANG LIU: Yes.

3 KATE MCGRANN: And if you could just
4 briefly describe for me the benefits of having
5 somebody in your role for the project.

6 YANG LIU: Because the engineering
7 department is responsible for many -- well, it's
8 actually a core member of the maintenance group
9 because the responsibilities include, for example,
10 defining the maintenance schedule, defining the
11 maintenance instructions, being involved in the
12 safety -- safety management of the trains, defining
13 the stock levels, responsible for the life cycle
14 costs. So it's actually intimate -- it's a core
15 part of the project, and with a team of engineers,
16 it's imperative to have an engineering manager to
17 be able to coordinate the team and to manage the
18 activities.

19 KATE MCGRANN: I think there were --
20 any direct or indirect links between the fact that
21 there was nobody in your role and the issues
22 experienced on the line, particularly before you
23 joined?

24 YANG LIU: So there was -- so there was
25 nobody here, but Jerome was managing. He was

1 stepping in -- he was taking the management role,
2 so he was managing the team of engineers here. He
3 just -- so he's -- I wouldn't say there was no
4 project engineering manager. It's just the Canada
5 engineering manager was acting as the project
6 engineering manager.

7 KATE MCGRANN: Okay. So do you think
8 there are any direct or indirect links between the
9 issues experienced on the line and the fact that
10 there wasn't a dedicated onsite project engineering
11 manager before you joined?

12 YANG LIU: No, I don't think so.

13 KATE MCGRANN: What was the status of
14 the maintenance operations when you joined, in
15 terms of outstanding work orders, retrofits, things
16 like that?

17 YANG LIU: When I joined, the project
18 was -- had just finished executing the
19 100,000-kilometre maintenance on the fleet. On the
20 vehicle side, it was -- there was -- I was aware
21 there was a backlog of work orders, but I would say
22 lower priority work orders, not related to
23 equipment -- the equipment degradation -- or,
24 sorry, any nonfunctional equipment or any
25 service-affecting issues but more on the minor --

1 minor issues that could have been addressed -- that
2 could have been deferred, such as chips, cracks,
3 paint issues, or -- we would consider them defects
4 that don't degrade the equipment, the functionality
5 of the equipment.

6 There was -- the processes were set up,
7 but I -- I further fine-tuned all of the
8 engineering processes over the last couple of
9 years. But overall, the team was staffed, and it
10 basically was -- it was running. There was -- it
11 was -- there was no breakdowns or let's -- shall we
12 say there was no visible gaps in the organization
13 that caused -- that caused -- that limited Alstom's
14 ability to perform the maintenance.

15 KATE MCGRANN: So you had, when you
16 joined, the number of staff you required in order
17 to perform all of the demands on Alstom
18 maintenance?

19 YANG LIU: Yes. I would -- I had one
20 engineer for every system - so one for the vehicle,
21 one for the -- one for each of the infrastructure
22 assets.

23 KATE MCGRANN: And was that sufficient?

24 YANG LIU: The team grew a little bit.
25 I hired -- well, it was -- it was sufficient for

1 the core activities but not ideal, so I -- I
2 expanded the team to hire one more vehicle engineer
3 and several infra engineers.

4 KATE MCGRANN: Several -- what was
5 that?

6 YANG LIU: Infrastructure engineers.

7 KATE MCGRANN: Okay. I'm just thinking
8 if you've got one engineer for every system, and
9 the train -- the system is running 7 days a week,
10 and any system could have an issue at any time, it
11 sounds like either those people are working a heck
12 of a lot, or maybe they could have used some help.
13 I mean --

14 YANG LIU: So normally it's the
15 operations team that actually -- they are the first
16 line of contact, so if any issue happens, they are
17 the first responders. On the -- on the vehicle
18 side, also at that time -- so we are in the
19 warranty phase, so rolling stock, that
20 organization, it was their responsibility to fix
21 all the deficiencies and on the design side and
22 make sure that everything was -- all the
23 engineering issues were sorted out.

24 KATE MCGRANN: Was the operations team
25 sufficiently staffed and resourced when you joined?

1 YANG LIU: From my view, they could
2 have used a little bit more, shall we say, a little
3 bit more people, supervisors especially, on the --
4 who needed to be the first point of contact for any
5 issues, as you say, during 24/7 operation.

6 KATE MCGRANN: And then with respect to
7 the rolling stock team who were dealing with the
8 warranty component of this, were they sufficiently
9 resourced?

10 YANG LIU: There was -- all the -- I
11 would say there was a proper failure tracking
12 system, and there was a proper follow-up on all the
13 engineering issues. The speed at which -- by which
14 everything was solved could have been a little bit
15 faster, yes, but rolling stock is also a global
16 organization. We have -- rolling stock has
17 design -- put simply, all the critical components,
18 such as the bogie, the traction -- traction
19 converters, these are supplied by Alstom, so Alstom
20 has the -- has design support from all of the
21 design centres around the world.

22 KATE MCGRANN: And what do you think
23 was required to speed up the work done by the
24 rolling stock group?

25 YANG LIU: More -- probably more

1 people, more staff, better involvement by the
2 suppliers, some of the suppliers.

3 KATE MCGRANN: Anything else?

4 YANG LIU: I mean, I think it could
5 have been -- it's not so much the speed as -- by
6 which some things were solved rather than it's the
7 number of issues. It's really the sheer magnitude
8 of the issues that popped up after revenue service
9 made it hard to manage. So definitely, like, if
10 you double the team, we could have managed it
11 faster.

12 KATE MCGRANN: Thinking about the
13 maintenance and storage facility, was there the
14 physical capacity to allow for the doubling of the
15 team? Like, could you have done it with the space
16 you had?

17 YANG LIU: No, no. The -- we have --
18 so with the team of staff to do the preventive
19 maintenance and some corrective maintenance on
20 these trains, but all these issues that happened
21 requires additional inspections, so while the root
22 cause, fixing the root cause, was the
23 responsibility of the rolling stock group, the
24 containment and the inspections on these trains was
25 the maintenance group. We were -- we were

1 responsible for doing that. And we had over
2 150-something fleet checks that was -- around that
3 ballpark number that was -- that was launched
4 within the first year and a half to 2 years of
5 operation. All of that created a huge amount of
6 work for the team, extra work that was not planned.

7 KATE MCGRANN: How did these three --
8 how did these three groups work together as -- when
9 you joined? So the operations team, the rolling
10 stock team, and the maintenance team, how were they
11 working together? Is it --

12 YANG LIU: So the rolling stock team
13 and the maintenance team, they were located -- I
14 would say the -- here. Both the project manager
15 for the rolling stock team and the project manager
16 of the maintenance sitting in the same floor,
17 just -- offices were right by each other. The
18 teams were working closely together. They were
19 talking with each other.

20 On the engineering side, because it was
21 all -- maintenance was in a support role because
22 rolling stock was taking the lead to really solve
23 these engineering issues. Maintenance engineering
24 was more there to support, to implement the
25 inspections that's needed in response to new issues

1 that are found in the -- during service.

2 KATE MCGRANN: You mentioned that you
3 staffed up, you hired some additional people. The
4 operations team and the rolling stock team both
5 could have benefitted from additional staff; that
6 is right?

7 YANG LIU: Yes.

8 KATE MCGRANN: Any impediments to
9 hiring the additional staff that were needed?

10 YANG LIU: So engineers is not so
11 simple to hire, to staff up on engineers. There is
12 a certain amount of technical background that's
13 needed for this role, especially in the trains --
14 experience in the train industry, which was not
15 that easy to come by here. We -- it was a lot of
16 internal promotions. We -- we promoted quite a few
17 engineers internally. Yeah. So we had to do that.

18 KATE MCGRANN: And so is it just the --
19 it just took time to find the talent and --

20 YANG LIU: Yes, it took time. Yes,
21 exactly. It took time to find these people and
22 make sure that -- and to bring them up to speed.

23 KATE MCGRANN: You've talked about the
24 information that Alstom needs from Thales in order
25 to perform the maintenance and other work on that

1 system. Is there any other information that Alstom
2 required to maintain the system by any of the
3 groups that you've named that it didn't have access
4 to?

5 YANG LIU: Yes. So -- so if we
6 consider that the -- like, when we started on the
7 rolling stock project, if -- we were not very happy
8 with that. When we started the maintenance
9 project, it was much worse. Basically, it was --
10 there was no proper hand-over done between RTM and
11 Alstom. I believe we -- Alstom never formally
12 accepted to maintain this system even. There was
13 no hand-over, there was no structured hand-over
14 where you would expect to go over all the -- all
15 the documentation, all the spare parts, all the --
16 you know, to go over all the maintenance manuals.
17 This process wasn't done. It was simply -- my
18 understanding -- I wasn't here for revenue service,
19 but from speaking with my team and also the
20 management team, we were just notified that we're
21 entering revenue service, that -- in the upcoming
22 days, and we should prepare for revenue service,
23 which was not normal.

24 So since start of revenue service, we
25 have identified all the gaps in terms of

1 documentation, and we have communicated to RTM but
2 have not received -- still have not received some
3 of the documentation.

4 KATE MCGRANN: What in particular is
5 outstanding?

6 YANG LIU: Okay. We didn't receive the
7 maintenance manuals for some of the systems. For
8 all the communication systems, we didn't receive
9 the maintenance manual. And even in the
10 maintenance plan that was released by RTM, it's
11 written we have not received the construction
12 contractor maintenance manuals for systems such as
13 CCTV -- the communication systems, basically, and
14 Alstom's maintenance plan simply says -- sorry,
15 RTM's maintenance plan simply says Alstom should
16 use their expertise and maintain these systems
17 without giving any requirements of what exactly
18 should be done for the maintenance, which is
19 actually very strange.

20 We have not received, for the SCADA
21 system, for example, the alarm definitions. What
22 do each of these alarms mean for the SCADA? We
23 have repeatedly asked for this information. I have
24 not received it. I would say the hand-over was
25 done extremely poorly. It was -- could have been a

1 lot better.

2 KATE MCGRANN: When you were in your
3 previous role, so in the spring of 2019, was any
4 work being done to prepare for the hand-over?

5 YANG LIU: No.

6 KATE MCGRANN: By Alstom or by RTM?

7 YANG LIU: You mean for the hand-over
8 of the trains, or --

9 KATE MCGRANN: No, for the hand-over
10 of -- like, for the hand-over of the maintenance
11 responsibilities to the --

12 YANG LIU: Oh, because at that time, I
13 wasn't part of the maintenance group, so I don't
14 know. It's all -- all of this is -- so after I
15 joined in 2020 into the maintenance project, I
16 checked the state of the documentation, and it was
17 really lacking. At that point, digging into the
18 history, I found out that's what actually happened,
19 why Alstom's missing all of these documents.

20 KATE MCGRANN: I've seen reference to
21 an OEM. Do you know what that is?

22 YANG LIU: Original equipment
23 manufacturer. Right?

24 KATE MCGRANN: Original equipment
25 manufacturer.

1 YANG LIU: Yes.

2 KATE MCGRANN: Okay. Have you seen
3 reference to that -- and what is that? What does
4 that relate to?

5 YANG LIU: That is the -- the -- the
6 company or the entity who manufactured that piece
7 of equipment. So for example, for the CCTV system,
8 the OEM is the company who manufactured the -- the
9 soft -- who built the software to oversee all of
10 the cameras, and then the construction contractor
11 is the -- is the company which would set up these
12 cameras and install the software so that everything
13 works together, sort of the builder.

14 KATE MCGRANN: What maintenance plans
15 were provided to Alstom by RTM?

16 YANG LIU: We had the track. The track
17 maintenance plan was in good quality. We had the
18 OCS maintenance plan, but it was, like, a very poor
19 document. It was -- I think it was not that
20 professional. It was probably drawn -- some
21 sketches seemed to be drawn on the back of a
22 napkin. It was really in poor shape, the OCS
23 maintenance manual. We had it for the TVS --
24 sorry, for the tunnel ventilation system, we had a
25 proper manual. For the signalling, for Thales, we

1 had all the Thales manuals. Communications was
2 completely missing.

3 KATE MCGRANN: Okay.

4 YANG LIU: And traction power
5 substations we had the maintenance manuals.

6 KATE MCGRANN: What has RTM's response
7 been to the issues that have been raised about the
8 missing information?

9 YANG LIU: So it's mainly that -- so
10 their response mostly is that they are also waiting
11 for the maintenance manuals. That's their
12 response, so...

13 KATE MCGRANN: And they're waiting to
14 receive those from?

15 YANG LIU: From OLRT, the construction
16 contractor.

17 KATE MCGRANN: OLRTC. And do you have
18 any sense of what the holdup is?

19 YANG LIU: I think it's just that the
20 manuals haven't been written, and the people who
21 were responsible in the construction phase have
22 left, and there's nobody writing it right now.

23 KATE MCGRANN: I understood that Alstom
24 has a number of work method statements that it
25 uses; is that right?

1 YANG LIU: Yes.

2 KATE MCGRANN: What are those?

3 YANG LIU: Work method statements are
4 generated by the engineers in the maintenance side.
5 They are basically work instructions on how to
6 carry out certain activity, whether it's preventive
7 maintenance or corrective maintenance.

8 KATE MCGRANN: What are they derived
9 from? What are the inputs for those?

10 YANG LIU: So those are all based on
11 the -- the maintenance manuals and the maintenance
12 plans provided by the construction contractor,
13 where available. For the systems that we don't
14 have the maintenance manuals available, it was --
15 it's based on the engineer's own experience and
16 their own judgment.

17 KATE MCGRANN: Have there been any
18 issues with -- arising from mismatches between
19 what's in the work method statements and what was
20 in the maintenance manuals provided?

21 YANG LIU: There were some -- some
22 systems have had some gaps, yes, but most of the
23 cases, Alstom has been over-maintaining. We have
24 been doing more maintenance than what is actually
25 specified.

1 KATE MCGRANN: Any of those gaps
2 contribute in any way to the issues seen on the
3 system, in terms of breakdowns and things like
4 that?

5 YANG LIU: Not in terms of the
6 instructions, no.

7 KATE MCGRANN: In terms of anything
8 else?

9 YANG LIU: Maybe the execution could
10 have been strengthened a little bit to -- so, like,
11 the track instructions could have been a little bit
12 more detailed, so the execution by the operations
13 of these instructions.

14 KATE MCGRANN: And would you see the
15 implications of that in track cracking or buckling,
16 for example?

17 YANG LIU: No, that is a
18 construction -- construction defect.

19 KATE MCGRANN: Where would you see the
20 results of where this execution was not what it
21 should have been?

22 YANG LIU: So maybe, like, some of the
23 corrugation, for example, if it was spotted a
24 little bit earlier, we could have grinded it sooner
25 that preserved the asset life for a little bit

1 longer, more in that aspect.

2 KATE MCGRANN: Could you describe what
3 the relationship with RTM was like when you joined
4 and then, to the extent that it's changed, how it's
5 changed over time.

6 YANG LIU: So at the beginning, I --
7 the personal feeling was more RTM was siding with
8 the City on any of -- on all of the issues. It was
9 more of a joint front between RTM and the City
10 against Alstom, to challenge Alstom on the way --
11 on the defects, on the responses.

12 When I joined, there was not a very
13 friendly relationship between Alstom and RTM.
14 There has been a lot of issues and a lot of -- a
15 lot of -- yes, a lot of issues with the system, and
16 I -- you can see that it was not a cooperative
17 relationship. Since then, I think we have
18 progressed a lot until now, whereas -- we're more
19 working together now, I have to say. They're --
20 they are coming to Alstom for advice on -- and
21 before executing, taking action, they are coming to
22 Alstom to get confirmation. I would say it's --
23 it's -- and they are working with Alstom a little
24 bit more better now.

25 KATE MCGRANN: From a reliability of

1 service perspective, where did you see -- where
2 would we see any issues flowing from the lack of
3 collaboration and cooperation that you saw when you
4 first joined on?

5 YANG LIU: I think -- the reliability
6 of service... I'm not sure -- I mean, for sure if
7 more information -- for example, if we're able to
8 get Thales support back then, we could have had
9 less failures on the vehicle side. If RTM was more
10 open to the fact that the track had defects, we --
11 maybe we -- we could have avoided the buckles and
12 all of these temporary speed restrictions we have
13 put in place every summer. If they had
14 acknowledged a little bit more that the
15 construction had issues and took a different
16 approach, I think it would have been better.

17 KATE MCGRANN: What do you attribute
18 the improvements in the relationship to?

19 YANG LIU: I think time. We -- we
20 have -- we have worked through a lot of the issues,
21 a lot of defects. It's -- both parties are more
22 mature.

23 KATE MCGRANN: And to the extent that
24 you can speak to it, what's the relationship like
25 with the City?

1 YANG LIU: So the City is very
2 demanding in the -- what they -- what -- well, I
3 guess any customer would be, depending if the
4 performance was not according to -- according --
5 according to the contractual standards. But shall
6 we say -- I mean, as far as I'm concerned, from the
7 engineering side, is that the City's always
8 challenging us to bring solutions faster, to be
9 more -- to be more transparent on -- on the
10 progress, which we tried to do. They -- we are
11 supporting our performance team to really -- to --
12 with data to -- to dispute the -- the penalties.
13 That part gets a little bit difficult sometimes,
14 but on a technical front is I think people are
15 still reasonable. They are -- they are -- they
16 just want things faster, the City wants more
17 solutions faster.

18 KATE MCGRANN: Okay. Anything in the
19 City's approach that directly contributes to
20 Alstom's ability to maintain the system in
21 accordance with the PA, project agreement?

22 YANG LIU: Do you mean if they -- if
23 the way -- the relationship affects how Alstom does
24 the things, do the activities? I don't know.

25 KATE MCGRANN: Yeah, or demands from

1 the City, the nature -- or the way in which the
2 demands are communicated.

3 YANG LIU: I -- well, the demand is
4 always for more trains, whereas the reliability
5 status sometimes doesn't support it. That's the
6 key gap here. It's the City -- the -- let's say --
7 even after the first derailment, the expectation
8 was to have 15 trains, to have the normal service
9 restored as soon as possible, but with the
10 additional work of the inspections, of all the
11 clearance checks, it put a significant strain on
12 the team to say, okay, we need to do everything
13 faster; we need to maintain the same level of
14 service despite the significant additional
15 workload.

16 That, I would say -- but honestly, I
17 don't think -- maybe it wasn't needed to have. I
18 mean, especially in COVID, maybe it wasn't needed
19 to have so many trains, but I think the demand is
20 always, okay, Alstom, when are you going to provide
21 me all of these trains as you have promised in the
22 contract, and that translates into pressure for
23 the -- for the operations side to say, okay, we
24 need to work harder with the resources that we
25 have, faster. Yeah. Maybe that's not ideal.

1 KATE MCGRANN: Could you speak to some
2 of the specific issues that were seen on the
3 system -- and if these predate your time and were
4 resolved by the time you arrived, then you just let
5 me know, but issues with power supply on the
6 trains - line inductors, for example - can you
7 speak to what you know about the causes of those?

8 YANG LIU: Yes. The line inductors
9 were failing because of excessive pollution from
10 carbon dust or from all the debris that's
11 accumulating on these line inductors. This was not
12 something that was seen in testing or in trial run
13 phases. It happened gradually over time. The fix
14 for that was to change the covers to a -- to a --
15 to a different design that sort of barred pollution
16 ingress.

17 KATE MCGRANN: And is that issue --
18 from your perspective, is that issue resolved now?

19 YANG LIU: Yes, it should be resolved,
20 and all -- we have added additional inspections in
21 the preventive maintenance to -- to clean these
22 things as well, so it's -- it's being -- an
23 inspection point that has been added as well.

24 KATE MCGRANN: And are the additional
25 inspections and preventive maintenance combined

1 with the design solution effective in preventing
2 this problem?

3 YANG LIU: Yes. We have not had any
4 failures in the past winter.

5 KATE MCGRANN: Door faults.

6 YANG LIU: Yes, door faults -- even in
7 testing phase, there was a lot of door faults. The
8 doors are -- on any -- on any train, normally the
9 doors are one of the least reliable components. So
10 for Ottawa, I know there has been a lot of
11 adjustments done on the doors in the -- but mostly
12 in the first year, first winter, where I was not
13 here. After I joined, we were still having door
14 faults intermittently, but they're all related to
15 adjustment, doors coming out of adjustment.

16 KATE MCGRANN: Sorry, they're all
17 related to doors coming out of adjustment?

18 YANG LIU: Yeah. Normally it's -- yes.
19 The major --

20 KATE MCGRANN: What does that mean?

21 YANG LIU: Sorry?

22 KATE MCGRANN: What does that mean?

23 YANG LIU: Oh, what does that mean?

24 Okay. So basically as the door opens and closes,
25 there's mechanical wear and tear that sometimes

1 causes the door to come out of adjustment. I don't
2 believe there's a systematic fault at the moment.

3 KATE MCGRANN: Okay. Any other
4 repetitive train faults that you're aware of or
5 that you've seen since you rejoined that have
6 interfered with service?

7 YANG LIU: Yes. You mean -- are you
8 asking if there -- which are the repetitive train
9 faults?

10 KATE MCGRANN: Yes.

11 YANG LIU: The vibrations that's
12 causing equipment to fall from the bogie, that's
13 one of the repetitive issues we have -- have seen
14 that needed corrective action. Speed sensor
15 harnesses that are breaking when we are going
16 around tight curves, so there is a few of them.

17 KATE MCGRANN: And the vibration issue,
18 what's the cause of that, or what are the causes of
19 that, to your knowledge?

20 YANG LIU: The vibration issue?

21 KATE MCGRANN: Yeah.

22 YANG LIU: The vibration issue -- so we
23 had brackets. So all of the axle-borne equipment,
24 all of the brackets and the equipment that's
25 attached to the bogie before the suspension, that

1 is prone to -- we have seen quite a bit of that
2 fall off the train, and all -- and the vibration
3 experienced by our bogie on this track was very
4 high. We had our measurements done by our experts
5 when they came to Ottawa show that this bogie
6 experiences significantly higher vibrations in
7 Ottawa than on any other project, similar project
8 around the world. So to correct that, we -- a lot
9 of the brackets on the train were redesigned with
10 more robust brackets and then the track was
11 grinded -- the track -- the track profile was
12 regrinded in 2021. Actually, the entire line was
13 re -- regrinded back to the normal profile.

14 KATE MCGRANN: And then have subsequent
15 later steps been taken after the regrinding of the
16 line to maintain what the regrinding accomplished?

17 YANG LIU: Yes. The issue was that
18 when we started revenue service, I believe
19 someone -- I think -- I believe it's OLRT, they
20 shaved -- they did some milling on the rail, and
21 they -- and they shaved the top of the rail, so the
22 rail profile was no longer ideal. It was no longer
23 normal, was very flat, and that caused a lot of the
24 issues with the train -- like, was one of the
25 contributing factors to additional migrations

1 experienced by the train, and we found out about
2 that in 2021, January, and the grinding campaign in
3 June really now brought it back to the -- to the
4 original profile.

5 KATE MCGRANN: Do you know why the
6 shaving and milling work was done?

7 YANG LIU: I guess -- I don't know.
8 Probably to remove some surface defects on the
9 rail.

10 KATE MCGRANN: The wheel flats we've
11 spoken to a little bit, and you've talked about the
12 wheel lathe and its availability. What else can
13 you tell me about the causes of the wheel flats?

14 YANG LIU: The wheel flats are --
15 basically, it's quite -- almost all of them, or I
16 would say the majority of them, I believe, is
17 caused by the trains overspeeding when it hits a
18 new -- a section of track with a lower speed limit.
19 So imagine a train -- as it goes along a track,
20 there are different speed limits at different
21 sections of the track. If the train is about to
22 enter into a new zone with a lower speed limit, it
23 needs to brake in advance to meet the new maximum
24 speed as it hits the new area.

25 The issue is that the -- the ATC system

1 commands -- it assumes the train is always able to
2 maintain a certain brake rate, so it brakes at the
3 last minute, at the very last second, by a
4 theoretical brake -- by the theoretical achievable
5 brake rate. If the train is not able to achieve
6 this brake rate, it will enter the new zone with a
7 higher than allowed speed, and the train ATC system
8 will realize this and cause the train -- command
9 the train to do an emergency brake because it's
10 overspeeding, and that emergency brake is not
11 protected against slides, so then the wheels lock
12 together, and you have flats. I believe this is
13 the predominant cause of all the -- of all the flat
14 spots that we are seeing.

15 KATE MCGRANN: And what is the fix for
16 that or what are the fixes for that issue?

17 YANG LIU: The fixes is -- is to reduce
18 the brake rate, to reduce the -- so in adverse
19 conditions, if the weather is bad, if it's snowing
20 or if it's around zero degrees Celsius, then the
21 ATC system should use -- should assume the train
22 has a lower brake rate so that it starts braking
23 earlier, and it would be able to hit the speed.

24 KATE MCGRANN: And what does it take to
25 implement that solution?

1 YANG LIU: So we have done that since
2 last winter, and it was very effective. The number
3 of wheel flats decreased drastically. It's a
4 parameter that we can adjust on the train controls
5 in the operations centre.

6 KATE MCGRANN: Any challenges to
7 implementing that solution?

8 YANG LIU: No.

9 KATE MCGRANN: Any other solutions
10 being explored to the wheel flat issue beyond the
11 changes to the --

12 YANG LIU: Yes.

13 KATE MCGRANN: -- brake rate?

14 YANG LIU: We're looking into
15 various -- there are still a few problematic areas
16 on the main line. We need to adjust the speed
17 profiles, so the speed limits at these areas, so
18 that we don't have a transition -- too drastic of a
19 transition in speed.

20 KATE MCGRANN: And is that a change to
21 software that's required? How are the speed
22 profiles adjusted?

23 YANG LIU: It's by software.

24 KATE MCGRANN: By software? Okay.
25 Whose software?

1 YANG LIU: Thales's software. We are
2 looking at also -- like, we changed the sand, the
3 type of sand, for example. Before, it was not --
4 the sand that was put on these trains was not --
5 didn't have the right granularity. Now we're
6 switching to a more coarser sand that supposedly
7 have better additional characteristics, all of
8 these things, so...

9 KATE MCGRANN: On the sand question,
10 how was it that sand without the right granularity
11 was used at the outset?

12 YANG LIU: So the sand was provided by
13 OLRTC at the beginning. They filled their silo
14 with the sand. At the beginning, it was almost
15 like beach sand. I don't know why they purchased
16 that sand, whether Alstom gave the wrong spec or if
17 they didn't ask for the spec, but it was the wrong
18 type, and the fine sand has a tendency to cake
19 together, to -- so it doesn't flow anymore when
20 it's wet. Or when it becomes dry after it -- after
21 it was wet, it doesn't flow. So -- so we had to
22 correct that.

23 KATE MCGRANN: And were there any
24 follow-on changes to operating manuals or
25 documentation or specs or anything like that made

1 after the issue with the sand was discovered?

2 YANG LIU: The spec was always the
3 spec. We just simply bought the sand according to
4 the spec.

5 KATE MCGRANN: So the spec was wrong.
6 Has it been fixed since?

7 YANG LIU: No, no, the spec was right.
8 It was just at the beginning, they didn't buy the
9 sand according to the spec.

10 KATE MCGRANN: Oh, I see. I see.
11 There was a -- the spec was right. The wrong sand
12 was purchased. The spec was not followed.

13 YANG LIU: Yes.

14 KATE MCGRANN: And what about track
15 buckling? Do you know --

16 YANG LIU: Yes.

17 KATE MCGRANN: -- what the issue is
18 there?

19 YANG LIU: Yes. So track -- every
20 summer since I joined, we have had track buckling
21 or track -- yes, track buckling in the curves.
22 Normally, in the tight radius curves in the main
23 line, in the ballasted track, we have horizontal
24 deflections, and typically this would be indicating
25 either that there's too much steel that -- when the

1 temperature heats up, the steel was -- is expanding
2 and causing it to move out, or there's not enough
3 compaction in the -- in the ballast that holds the
4 ties together and prevents the track from buckling,
5 or it could mean that the track was laid at the
6 incorrect temperature, so... Which actually is
7 related to too much steel, yes. That's what --
8 those two are more or less the same, yeah. I think
9 from what we -- what we see and our activities in
10 the last year, I think it's both. There's -- the
11 track wasn't laid at the right temperature, and the
12 track wasn't compacted -- the ballast wasn't
13 compacted properly.

14 KATE MCGRANN: And so how were those
15 issues resolved?

16 YANG LIU: So last summer, we tamped --
17 we hired -- Alstom hired a contractor to tamp the
18 entire main line on the east side. So everything
19 from uOttawa to Blair was tamped, and after the
20 compaction, in the summer, we had much fewer track
21 buckling last summer, after June.

22 KATE MCGRANN: So the tamping would
23 address the issue with the ballast?

24 YANG LIU: Yes, it would compact the
25 ballast. There is still too much steel in the --

1 in the -- in the rails, and we need to do a
2 destressing campaign to -- to cut the proper amount
3 of steel that the rail would -- would not expand,
4 would not have significant forces in the heat.

5 KATE MCGRANN: How complicated a
6 project is that?

7 YANG LIU: It's very complicated. You
8 can't actually do the entire main line at once, so
9 you have to do a certain stretch, maybe 100 feet at
10 a time, and you have to unclip all of the rail,
11 wait for it to expand to its right -- to the right
12 length, and then cut it and then weld it. It's
13 pretty complicated.

14 KATE MCGRANN: Is there a -- are there
15 plans to do that work?

16 YANG LIU: In discussion right now, I
17 guess. It's -- it -- not finalized, no.

18 KATE MCGRANN: What are the obstacles
19 to finalizing that?

20 YANG LIU: Just coordination, time,
21 when to -- you can't do this overnight. You need
22 the proper downtime to be able to do it properly.

23 KATE MCGRANN: Would this require a
24 shutdown of the line?

25 YANG LIU: Partial shutdown, maybe.

1 Extended -- extended engineering hours.

2 KATE MCGRANN: And who's this solution
3 in discussion with?

4 YANG LIU: RTM.

5 KATE MCGRANN: With respect to the
6 derailments on the main line, you've spoken a
7 little bit to the derailment with LRV 21, I think.
8 That was the torquing of the bolts issue that was
9 encountered in September of 2021, I believe?

10 YANG LIU: Yep. M-hm.

11 KATE MCGRANN: Can you back up and
12 speak about the August 2021 derailment for a
13 moment.

14 YANG LIU: Okay. The LRV 19 derailment
15 that happened, I think, August 7th.

16 KATE MCGRANN: Yeah, I've got it down
17 as the 8th, but I think we're talking about the
18 same one, so --

19 YANG LIU: Yeah. So the train was --
20 developed a brake fault in the day and was parked
21 at Tunney's for most of the day, and at night,
22 after revenue service, they would bring the train
23 back, at which point they realized the wheel had
24 fallen off, and the train had derailed as it was
25 leaving Tunney's Station -- actually, after it left

1 Tunney's Station, shortly after it left Tunney's
2 Station. And the root cause is still -- you know,
3 is still ongoing. We haven't concluded that part.
4 But immediately, the immediate actions was to stop
5 the fleet and -- and do the proper -- to allow the
6 proper containment action to be -- to be -- to be
7 developed.

8 Upon examination, we found that it was
9 the bearing, the journal bearing - or axle hub,
10 these two are the same thing - that actually came
11 apart. So after, we got really all the design
12 authorities involved on this one, and the
13 engineering consensus was to implement an axle
14 clearance check as the containment action. So this
15 would -- basically, you take a pry bar, and you try
16 to pry the wheel out from the axle, and you see how
17 much movement there is. If there's -- if the
18 movement is below a certain threshold, 0.1
19 millimetres, then we consider the axle to be tight,
20 and the train can be released, and for any -- any
21 value above 0.1 millimetres would require the axle
22 and the axle hub to be changed.

23 KATE MCGRANN: Okay. Is that still the
24 fix that's in place today?

25 YANG LIU: Yes, still the fix.

1 KATE MCGRANN: And are there any other
2 explorations or plans for a solution to that issue
3 beyond the pry bar approach that you've just
4 described?

5 YANG LIU: Yes. So after the root
6 cause analysis has been done, we will need to plan
7 a proper retrofit campaign, whatever the
8 recommendation is. Until then, we need to maintain
9 this -- this very strictly, this containment
10 action.

11 KATE MCGRANN: Do you have any sense of
12 how long it will take before the root cause is
13 determined?

14 YANG LIU: I don't know. I'm not
15 actually -- as far as my involvement, I'm not
16 involved in that at the moment.

17 KATE MCGRANN: And could you speak to
18 the September 19th, 2021, derailment on LRV 21?

19 YANG LIU: Yeah. That was almost
20 exactly one month after -- well, a little bit more
21 than one month after the LRV 19 derailment, and I
22 think it is linked, these two are linked, in the
23 facts. So what happened on LRV 21 was an axle was
24 identified to be -- to be -- to be bad because it
25 had a clearance above the threshold from 21, so the

1 axle was -- the train was stopped, and axle was
2 changed out. As part of the axle change process,
3 it was required to dismount the gearbox to expose
4 the axle, axle hub. When the gearbox was
5 remounted, it seems that the -- the -- the hub on
6 which the gearbox rests on, that hub is bolted onto
7 the wheel by a series of bolts, and these bolts, it
8 seems, was not torqued properly. That led -- so
9 the train entered into service, it made a few loops
10 around on the line, and then as it was doing its
11 final run from Blair to Tunney's, it derailed
12 before it entered Tremblay Station. Unfortunately,
13 the train -- the driver didn't realize that, and he
14 kept driving it until he left the station, crossed
15 an overpass, and almost gone into a switch. Yeah,
16 unfortunately.

17 KATE MCGRANN: Were there steps or
18 checks that were missed or bypassed that allowed
19 for that train to go back into service without the
20 bolts being torqued?

21 YANG LIU: Yes. So those bolts are
22 torqued with -- only with a specific tool. It's a
23 gun, it's a torquing gun. Because it's -- you --
24 torquing of this bolt, you need to torque it once
25 to a certain value - I believe it's 50

1 newton-metres - and then you need to go all around
2 the bolts again, torque it to a certain higher
3 torque range, and then go around again and turn
4 each one, each bolt 120 degrees. So there's a
5 specific sequence of actions needed to torque it.
6 And everything was done using this gun to make
7 it -- to make it human-error-free, but what
8 happened in that case was the second and third
9 sequence was not followed. They didn't -- the
10 operator did not torque it up to the right value
11 and did not do the final -- final torquing.

12 KATE MCGRANN: When you say the gun is
13 set up to make this process human-error-free, how
14 does the gun prevent human error in the torquing
15 process?

16 YANG LIU: Because it doesn't allow you
17 to -- to proceed further if you didn't do the
18 previous action. So you have to go around all the
19 bolts once and then it allows you to torque it to
20 the higher value at -- in one more pass and then it
21 does the 120 degrees. But --

22 KATE MCGRANN: Okay. Go ahead.

23 YANG LIU: I believe in this case it
24 wasn't -- the gun wasn't used -- wasn't used on one
25 bolt.

1 KATE MCGRANN: It wasn't used at all on
2 the one bolt?

3 YANG LIU: On all the bolts, yes, it
4 was -- I think, from what I -- my understanding is
5 that the bolts were torqued only to the initial
6 torque value, the very low torque value of 50
7 newton-metres, and after that, it wasn't used
8 again.

9 KATE MCGRANN: And do you know what
10 happened, like why the gun -- why the process
11 wasn't finished?

12 YANG LIU: I don't -- so this was a
13 retrofit process, so I -- as maintenance
14 engineering manager, I'm not actually fully clear
15 on that process. So just through my involvement in
16 the -- as one of the core members of the -- of the
17 AT group, which -- the AT problem-solving team, I
18 was made aware of these details. I believed there
19 was a shift change somewhere in there as a
20 contributing factor, but I'm not exactly familiar
21 with the exact root cause.

22 KATE MCGRANN: If you can't speak to
23 this, then just let me know, but other than the
24 safety measures built into the gun, any other
25 checks or safety measures built into this system

1 that would be intended to prevent this from
2 happening?

3 YANG LIU: So I know now there are --
4 there are more steps built into the system to
5 prevent this from re-happening; however, I don't
6 know what was the checks in place originally before
7 it happened. Now I know there are quality checks
8 for all of these because they're safety-critical
9 operations. So there needs to be a quality -- QC
10 checkoff, signoff, on all these steps, whereas I
11 don't think -- I don't think it existed before, but
12 I'm not -- I cannot say to that exactly.

13 KATE MCGRANN: Fraser, do you have --
14 Mr. Harland, do you have any follow-up questions
15 based on anything we've talked about since the
16 break?

17 FRASER HARLAND: Just a couple. One
18 thing I was wondering: Does Alstom, in other
19 projects, have experience maintaining systems like,
20 you know, track, OCS, that kind of thing? This is
21 a vehicle manufacturer, so does it have experience
22 with that?

23 YANG LIU: It does, in Europe.

24 FRASER HARLAND: Okay.

25 YANG LIU: And other projects around

1 the world, yes.

2 FRASER HARLAND: And on the RTM issue,
3 you had mentioned that the relationship was
4 difficult between RTM and Alstom at the beginning.
5 Do you have any sense as to why that was the case,
6 beyond what you've already told us?

7 YANG LIU: So the -- we -- so there was
8 a lot of construction contractor defects that
9 Alstom was trying to push onto RTM, to push to the
10 construction side, but I -- I believe RTM and OLRT,
11 in the end, they may have some -- you know, they're
12 the same company, and so I think there was -- that
13 was not really accept -- willing to accept that
14 these are construction contractor defects. I
15 believe if the construction was done by another
16 party, RTM would have been much more proactive
17 to -- may have been more proactive to -- to
18 pursuing these defects. I mean, the -- it was --
19 it was also -- we were taking a lot of penalties,
20 there was a lot of issues, so it wasn't really the
21 smoothest start we could have to a project.

22 FRASER HARLAND: So on that, do you
23 think the contractual structure posed challenges in
24 the sense that penalties rested on Alstom? Can you
25 speak to that?

1 YANG LIU: Yes. So the penalties
2 were -- flowed down to Alstom from the -- this
3 contract really has a very strict penalty scheme,
4 whereas -- first of all, there's no limit, so it
5 actually accumulates and rolls over month to month,
6 so it -- you know, you can hold more than -- you
7 can be penalized for more than the earnings even.
8 And second is that there's very -- it's very strict
9 in the sense of the response time and the
10 rectification time. They are written -- it's
11 written very clearly, and it's very challenging for
12 Alstom to -- or for anybody, for that matter, to do
13 the rectification actions within the specified
14 amount of time, which was actually sometimes in
15 hours or in days.

16 And if you add to that all of the
17 construction contractor issues, all of the
18 construction defects, you know, it's -- I would say
19 it's not really feasible to meet the performance
20 requirements of the contracts, especially at the
21 beginning of the project. So that caused also more
22 a lot of tension between Alstom and RTM and the
23 City.

24 FRASER HARLAND: Okay. And then one
25 other question: You mentioned that the change to

1 the -- the speeds used by the train was a very
2 effective solution in reducing wheel flats. Do you
3 have any sense as to why that solution wouldn't
4 have been implemented from the get-go of the
5 project or during trial running earlier?

6 YANG LIU: So in trial running -- in
7 trial running, they didn't experience the -- so
8 much wheel slips and wheel slides and flat spots.
9 Even in the first winter, it was -- like, I think
10 people didn't realize the magnitude of -- of this.
11 People -- like, it was only when we looked at the
12 data afterwards, after one year, after the first
13 winter, we -- okay -- and after JBA made their
14 report, we saw that it was very clearly stated the
15 brake rates were too high, and we need to -- like,
16 we need to reduce the braking demand from this --
17 from this train when the addition can --
18 addition -- conditions do not support it. Just
19 like you would drive slowly -- slower when it's icy
20 on the roads in the winter, it's the same thing for
21 the trains. It's not a binary function like brake
22 or -- or -- or accelerate. It -- you need to
23 adjust it based on the practical situation.

24 FRASER HARLAND: And what was the
25 report that you just mentioned? The --

1 YANG LIU: JBA, JBA report.

2 FRASER HARLAND: Okay. I think those
3 are all my questions, Ms. McGrann. Thank you.

4 KATE MCGRANN: I understand that
5 there's a system called IMIRS, the Integrated
6 Management Infrastructure Reporting System. Am I
7 right that that interfaces with an Alstom system
8 called SAP?

9 YANG LIU: Yes.

10 KATE MCGRANN: And what does SAP stand
11 for?

12 YANG LIU: I don't know. It's called
13 SAP. That's all we call it, but it's -- it's a --

14 KATE MCGRANN: Less important than --
15 what does SAP do?

16 YANG LIU: Okay. It is also a work
17 order management system, so -- actually, it does
18 even more than that. You can manage stock levels,
19 (indiscernible) flow. It's a very big system,
20 although we use it predominantly for work order
21 management, so it basically interfaces with IMIRS
22 to flow information from IMIRS to SAP for new work
23 orders created from IMIRS. It also flows
24 information back, so the completion of a certain
25 work order will be flowed back between SAP and

1 IMIRS.

2 KATE MCGRANN: Any challenges presented
3 from the interface between IMIRS and SAP?

4 YANG LIU: Yes. So IMIRS and SAP
5 communicate through interfaces, and it's -- has
6 been challenging because -- well, most obvious
7 reason is because the performance and the penalty
8 scheme is time-based, so Alstom needs to respond to
9 a certain work order within X hours and needs to
10 close it within X hours. If the interface is not
11 really working, or if there's any delay in the
12 interface, then basically what that translates to
13 is a delay in the -- in the -- in the
14 (indiscernible) time. I think it would -- it's
15 definitely not the most ideal -- ideal setup, to
16 have SAP and IMIRS.

17 KATE MCGRANN: From a reliability or
18 breakdowns/derailments perspective, has the
19 interface between IMIRS and SAP caused any
20 complications?

21 YANG LIU: No. I'm -- I can't think of
22 it on -- off the top of my head, no.

23 KATE MCGRANN: Would it affect at all
24 in a detrimental way the response time to discovery
25 of an issue on the line?

1 YANG LIU: No because we have our fleet
2 support, so their duty is to monitor for work
3 orders in IMIRS and then to make sure that the work
4 order is flowed back to the actual people who is
5 responsible to solve it.

6 KATE MCGRANN: The last specific area I
7 want to talk to you about is derailments and other
8 issues within the MSF. I understand that there
9 were I think three derailments in the maintenance
10 and storage facility, if I've got that right, two
11 in the fall of 2020 and -- oh, maybe four -- and
12 one in the spring of 2021?

13 YANG LIU: That's right. There were
14 three.

15 KATE MCGRANN: And can you -- did they
16 share similar causes, or can you speak to what led
17 to those?

18 YANG LIU: Yes. The root cause of all
19 three have been identified to be -- to be the same,
20 actually. The root cause is that the wheel --
21 wheel unloaded and wheel climbed -- wheel flange
22 climbed over the rails in tight curves. So in the
23 yard, we have curves that have radiuses down to
24 35 metres, and you can -- so when these trains pass
25 these curves, you can hear that there is -- they're

1 grinding, there's a lot of friction between these
2 two -- between the interface. The normal solution
3 to deal with wheel -- wheel flange climb is to have
4 greasing, to grease the track and the rail to lower
5 the coefficient of friction.

6 So when we -- before the derailments,
7 we did not have any greasing, and so the train has
8 an onboard greasing system, but it was not active
9 in the yard. RTM did not put any wayside greasers,
10 so what happened was that when the train's newly
11 finished, their wheel we're providing, when they
12 come out with brand-new wheels, it's very rough.
13 And then when they pass through these curves, they
14 will -- they would -- the coefficient of friction
15 would cause the wheel flange to rise and climb out.
16 We actually have similar cases in other yards that
17 have tight curves as well, so it's not only limited
18 to Ottawa. It seems to be a common problem these
19 days. So the solution there was to grease the
20 tracks.

21 So since the derailments, we have
22 started -- so since -- after the first derailment,
23 we started a greasing program where the guideway
24 technicians would manually apply grease on the top
25 of the -- on the wheel flange -- sorry, on the

1 rail, on the -- on the gauge side, but nonetheless,
2 the second derailment happened, and we -- we -- and
3 we realized that the first -- the frequency of the
4 greasing from the first derailment, after the first
5 derailment was not enough, so we increased it from
6 a monthly activity to a twice-weekly activity, so
7 it was every two days the technician would go out
8 and grease the rails, and that seemed to have
9 solved it. But we also transposed the rails
10 because -- I mean, with -- with a lot of friction,
11 you have a lot of wear, so -- and eventually the
12 rail will no longer be a straight face but it will
13 be a slant on the -- on the -- on the gauge side,
14 and that further makes it easier to climb out. But
15 the ultimate solution was to grease.

16 KATE MCGRANN: Okay. So you've got --
17 you have one derailment, you begin greasing once a
18 month. You have a second derailment, you begin
19 greasing twice a week?

20 YANG LIU: Yes.

21 KATE MCGRANN: And then did you have a
22 third derailment after that?

23 YANG LIU: The third derailment was in
24 the connector tunnel. It was also due to -- the
25 root cause was also due to a greasing issue. I

1 think the second one happened -- so -- so the first
2 one and the third one happened on the exact same
3 track, and -- and that's -- after the third one is
4 when we -- when we actually started the
5 twice-weekly greasing.

6 The second one happened at a different
7 area. It was in the -- in the -- in the transition
8 between the main line and the MSF. After the
9 second one, we activated greasing on the train, so
10 it started to grease that area as well, so -- in
11 the end, it's all related to the grease. We needed
12 grease to lower the coefficient of friction.

13 KATE MCGRANN: And can you help me
14 understand the consequences of those three
15 derailments. Did they have any sort of lasting
16 impact on the vehicles, their availability for
17 service?

18 YANG LIU: Yes. So the first one was
19 not too bad. The first one, the train derailed and
20 immediately was spotted, and the train stopped.
21 The second one was also not too bad because the
22 driver realized he derailed, and he stopped the
23 train, and it was not -- we had to fix some
24 components on the bogie, but that was about it.

25 The third one was quite bad because the

1 driver didn't realize he had derailed, and so he
2 dragged the train for 100 metres or more and caused
3 extensive damage to the infrastructure on the -- in
4 the yard and the train. That one, I think, is
5 still being recovered.

6 KATE MCGRANN: Okay. But no issues
7 since you instituted the greasing program that
8 you've described?

9 YANG LIU: Yes. And other cities are
10 doing the same now. In Edmonton, they are also
11 installing wayside greasers to -- because they also
12 had a derailment in a very tight curve. This
13 should be something that I think we need to --
14 like, for Canadian projects, for all depots in
15 Canada, to gradually -- to add this requirement to
16 have gauge face lubrication whenever we have tight
17 curves.

18 KATE MCGRANN: The Commission has been
19 asked to look at the commercial and technical
20 circumstances that led to the breakdowns and
21 derailments. Based on your experience with the
22 system, were there any areas that we haven't
23 discussed today that you think the Commission
24 should be looking at as part of its investigation?

25 YANG LIU: I think we touched upon

1 the -- all the aspects. I think it's -- it's just
2 a -- like, combination of everything has caused the
3 project to be in the current shape. But I think if
4 we are able to get the engineering issues solved,
5 then the performance should gradually increase. I
6 think it's -- it's on its good way, I can say.

7 KATE MCGRANN: And part of the
8 Commissioner's mandate is to make recommendations
9 to prevent issues like this from happening. Any
10 specific recommendations or areas of recommendation
11 that you would suggest be looked at as part of that
12 work?

13 YANG LIU: Yes. So what I would say
14 first is we should maybe rethink the local content
15 requirement and whether we -- we -- we sacrifice
16 experience for local content. I think it's for --
17 because the train is a complicated system. It's --
18 I think the experience with steady -- we need to
19 use experienced suppliers, just do it the way it
20 has always been done, try not to reinvent the
21 wheel, for example, to try many new things at once.
22 And also maybe the operating model -- to have a new
23 site built up in the depot for the construction of
24 a train and then to decommission it afterwards,
25 this doesn't really work. Trains should be built

1 from established sites with permanent, stable
2 staff, I would say. Maybe the -- and the
3 maintenance -- the construction -- the way the
4 organization -- the relationship is working between
5 City, maintenance contractor and maintenance
6 subcontractor, this needs to be simplified. It
7 doesn't benefit the actual operation of the system
8 to have such a complicated contractual
9 relationship. Yeah. Those are probably the main
10 takeaways.

11 KATE MCGRANN: Mr. Harland, any
12 follow-up questions?

13 FRASER HARLAND: No, not from me, I
14 don't think. Thank you.

15 KATE MCGRANN: And we promised your
16 counsel that they would have the opportunity to ask
17 any follow-up questions they've got.

18 MICHAEL VALO: Just give me one moment,
19 Kate. Nothing from our team. Thanks.

20 KATE MCGRANN: So that brings our
21 questioning of you to an end, and we can go off the
22 record.

23 -- Concluded at 5:01 p.m.

24

25

1 REPORTER'S CERTIFICATE

2
3 I, JOANNE A. LAWRENCE, Registered
4 Professional Reporter, certify;

5 That the foregoing proceedings were
6 taken before me at the time and place therein set
7 forth, at which time the witness was put under oath
8 by me;

9 That the testimony of the witness
10 and all objections made at the time of the
11 examination were recorded stenographically by me
12 and were thereafter transcribed;

13 That the foregoing is a true and
14 correct transcript of my shorthand notes so taken.

15
16 Dated this 4th day of May, 2022.

17
18 

19 _____
20 NEESONS, A VERITEXT COMPANY

21 PER: JOANNE LAWRENCE, RPR, CSR

22 COURT REPORTER
23
24
25

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