

NextGen Train Control Conference

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2018 NEXTGEN TRAIN CONTROL CONFERENCE

OCTOBER 18, 2018



1 MR. GARCIA: The FCC defines ultra wideband as  
2 a radio signal translated between 3.1 and 10.6  
3 gigahertz, right. Okay. The computer on this slide  
4 looks funny. So the FCC defines ultra wideband as a  
5 radio signal translated between 3.1 and 10.6 gigahertz  
6 over a bandwidth of over 500 megahertz. Ultra  
7 wideband was initially developed for use by the  
8 military to provide secure communication and radar.

9 The benefit of this technology include that it  
10 is accurate with peer-to-peer ranging accuracy of two  
11 centimeters. The technology is secure, and that low  
12 power levels are virtually undetectable allowing for a  
13 low probability of interception. Ultra wideband is  
14 resistant to multipath distortion so that in highly  
15 reflective environments, such as subways, the  
16 technology uses better distance gains without  
17 degrading accuracy.

18 The Metrom ultra wideband solution utilizes  
19 coherent signal processing which negates the effect of  
20 noise on the signal as shown on these diagrams. So  
21 I'm going to peek here to my computer. Let me see if  
22 I can find it. Okay. So if you look at the diagram  
23 on the left, that shows a transmitted and received  
24 signal with the (indiscernible phrase). In the  
25 middle, you'll see the received signal with no

1 coherent processing.

2 Then on the right, you'll see the Metrom rail  
3 signal which is transmitted 256 times in integrative  
4 or coherent processing. This allows for distance  
5 gain -- distance gains and allows them to maintain  
6 ranging -- ranging accuracy. So why ultra wideband?  
7 So ultra wideband has been in service for over six  
8 years in the harsh, freight outdoor environments in  
9 Canada. So ultra wideband also works well outdoors in  
10 dense urban environments, and in underground tunnel  
11 environments.

12 So ultra wideband allows for time and  
13 speed-based warnings which can easily be tailored to  
14 agency requirements. And they also use current  
15 sensing technology for monitoring of the existing  
16 signaling infrastructure. The design of the system is  
17 rugged, and it's tested against Erema (phonetic) and  
18 military standards for EMC, shock and vibe, it -- and  
19 all the other requirements that are usually tested in  
20 train control systems.

21 So by using ultra wideband, Metrom Rail has  
22 taken a trained centric approach which greatly  
23 simplifies the installation time. And with the  
24 reduced architecture, you also get a cost savings by  
25 eliminating a lot of the wayside wiring and the need



1 for control centers. So there's a very high-level  
2 table put together here showing the AURA system, which  
3 is the UWB-based train control system, comparing it to  
4 CBTC. Now, it doesn't go over every single function  
5 because that would be a massive list. But just at a  
6 high level, the AURA system gives you the headway  
7 improvements by utilizing moving block -- moving block  
8 concept, same as CBTC will.

9           However, the differences are that with ultra  
10 wideband, you can maintain real-time positioning. So  
11 one of the biggest issues that people are always  
12 trying to solve, the -- the most basic of issues is  
13 just understanding where the train is. So with fixed  
14 block, you'll generally know it's in this fixed block.  
15 With CBTC, you -- you have a better understanding of  
16 where that train is. But with ultra wideband, you'll  
17 know down to an inch of where that train is on that  
18 territory.

19           So not only is there real-time position  
20 reports or position monitoring, but the -- with the  
21 use of ultra wideband, you can also localize the train  
22 right at initialization. So with CBTC, you often have  
23 to move the train until you pass a number of  
24 transponders, or to where it's able to calibrate its  
25 direction of travel, orientation, and where it's at.

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1 With ultra wideband, that issue -- that kind of  
2 disappears.

3 Moving to the next slide. So the AURA system.  
4 The AURA system is Metrom Rail's ultra  
5 wideband-based train control system. So the  
6 generation one is comprised of a system that -- signal  
7 compliance, speed limit control, collision avoidance,  
8 while the gen two solution builds on those functions  
9 to include roadway worker protection, moving block,  
10 platform burling (phonetic), and complete propulsion  
11 control. The ultra wideband-based AURA train control  
12 system has been designed to be modular and expandable  
13 such that the unique requirements of each agency can  
14 be addressed without having to invest in additional  
15 technology or features that the agency may not  
16 require.

17 Additional features such as worker protection  
18 when desired can be seamlessly integrated. The  
19 control rack is 15 inches by six inches by six inches,  
20 which allows for reduced installation time in almost  
21 any cab. The ultra wideband technology can be  
22 implemented into maintenance-of-way vehicles, signals,  
23 or the worker protection vests as shown. The vests  
24 include dual antennas for worker coverage at any  
25 angle.



1           The system provides customizable operator  
2 interface to meet agency requirements. UWB hangers  
3 can be placed along the site to achieve train  
4 position, remote configuration, and system health  
5 monitoring. The generation two AURA hardware is  
6 compatible with the generation one, allowing for an  
7 agency to grow and expand with minimal service  
8 interruptions.

9           So what we're showing here is a diagram. And  
10 the way the generation one system works is the signals  
11 will actually have a radio that will do current  
12 sensing to understand what aspect is being displayed.  
13 It will communicate that through peer-to-peer  
14 communications back to the train, and that way the  
15 train will understand what the rules are that the  
16 signal's trying to compare to it.

17           Additionally, the trains can communicate to  
18 themselves hence giving you collision avoidance, and  
19 it can also communicate with the maintenance-of-way  
20 vehicles as well. And as noted before, that is  
21 something that the CBTC suppliers are also looking for  
22 a way to achieve. The attractive thing here is the  
23 maintenance-of-way to train communication is not a  
24 concept. This is something -- again, the -- the  
25 maintenance-of-way utility was actually the first use

1 for ultra wideband, so this is something that exists  
2 today.

3 The generation two product distributes UWB  
4 anchors spaced out evenly on the guideway to give you  
5 a mesh-type network of ultra wideband. So that way at  
6 any given time, every train will know where every --  
7 every train is around it. It doesn't have to rely on  
8 peer-to-peer ranging with that asset. That mesh  
9 network will relay the position of all the trains at  
10 all times to every train, and the condition of the --  
11 the infrastructure.

12 So proving that it works. As noted before,  
13 this product has been in service for over six years on  
14 over 4,000 assets for collision avoidance. But beyond  
15 that, Metrom Rail has done a number of demonstrations.  
16 So they have done a demonstration of their safety  
17 overlay system for the MBTA, and they were able to  
18 show that you don't need a control center. You can  
19 safely operate the rail with trains talking  
20 peer-to-peer to each other.

21 It was an easy installation, and they were  
22 able to enforce the red signals, speed control,  
23 roadway worker protection, double burdening, and  
24 showed some of the redundancies of the system as well  
25 to prove that it's highly available. Beyond that,



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1 Metrom Rail has also done demonstrations in New York  
2 City, starting with showing the accuracy of ultra  
3 wideband in a tunneled environment. Then moving onto  
4 doing a full demo of their next generation train  
5 control system, of the AURA system, which included  
6 interfacing to a commercially-available interlocking,  
7 which acted as it's own controller, and doing complete  
8 propulsion control of a -- of a vehicle.

9 The last demonstration that they're going to  
10 be doing is an integrated solution with ultra wideband  
11 to a traditional CBTC system using UWB for  
12 localization, which we believe will allow for a  
13 reduced architecture, and help increase the -- or  
14 improve upon the schedule for CBTC deployments.

15 So now I'm going to hand this off to Sara  
16 Wytell (phonetic).

17 (End of audio recording.)  
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## 1 CERTIFICATION

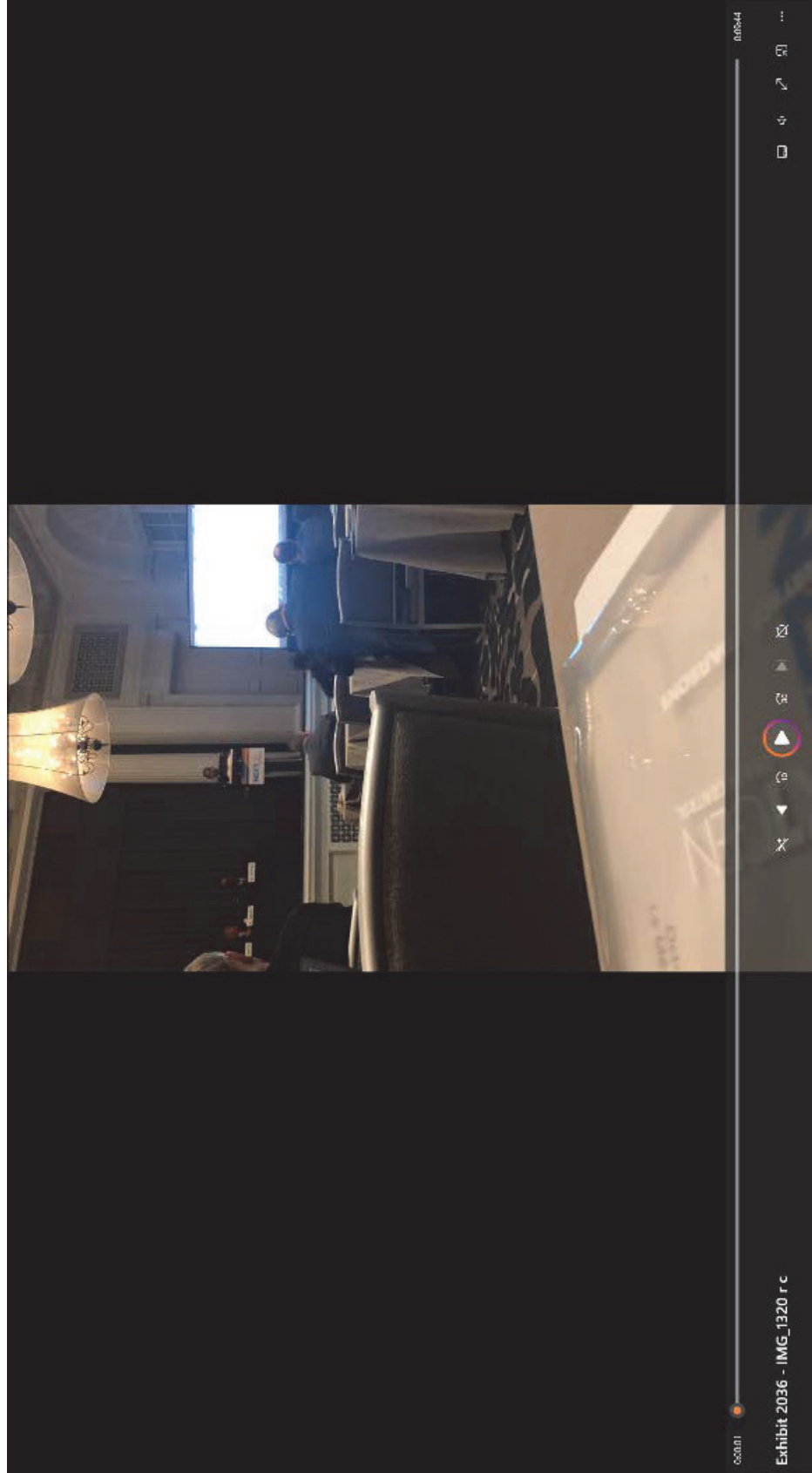
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3 I, DENISE MOORE, do certify that I was  
4 authorized to and did listen to and transcribe the  
5 foregoing recorded proceedings and that the transcript  
6 is a true record to the best of my ability.  
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11 Dated this 30th day of November, 2023.  
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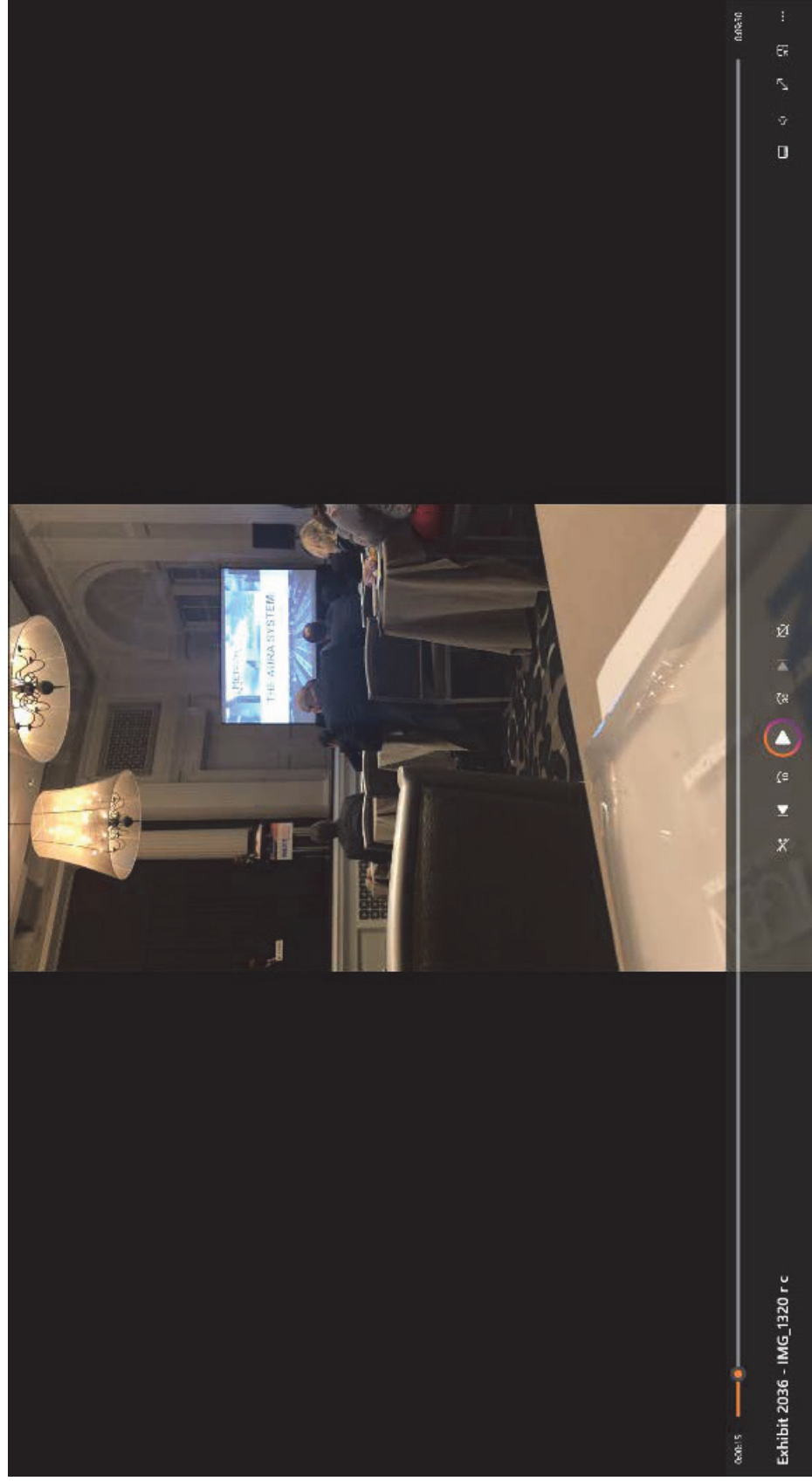
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17 DENISE MOORE

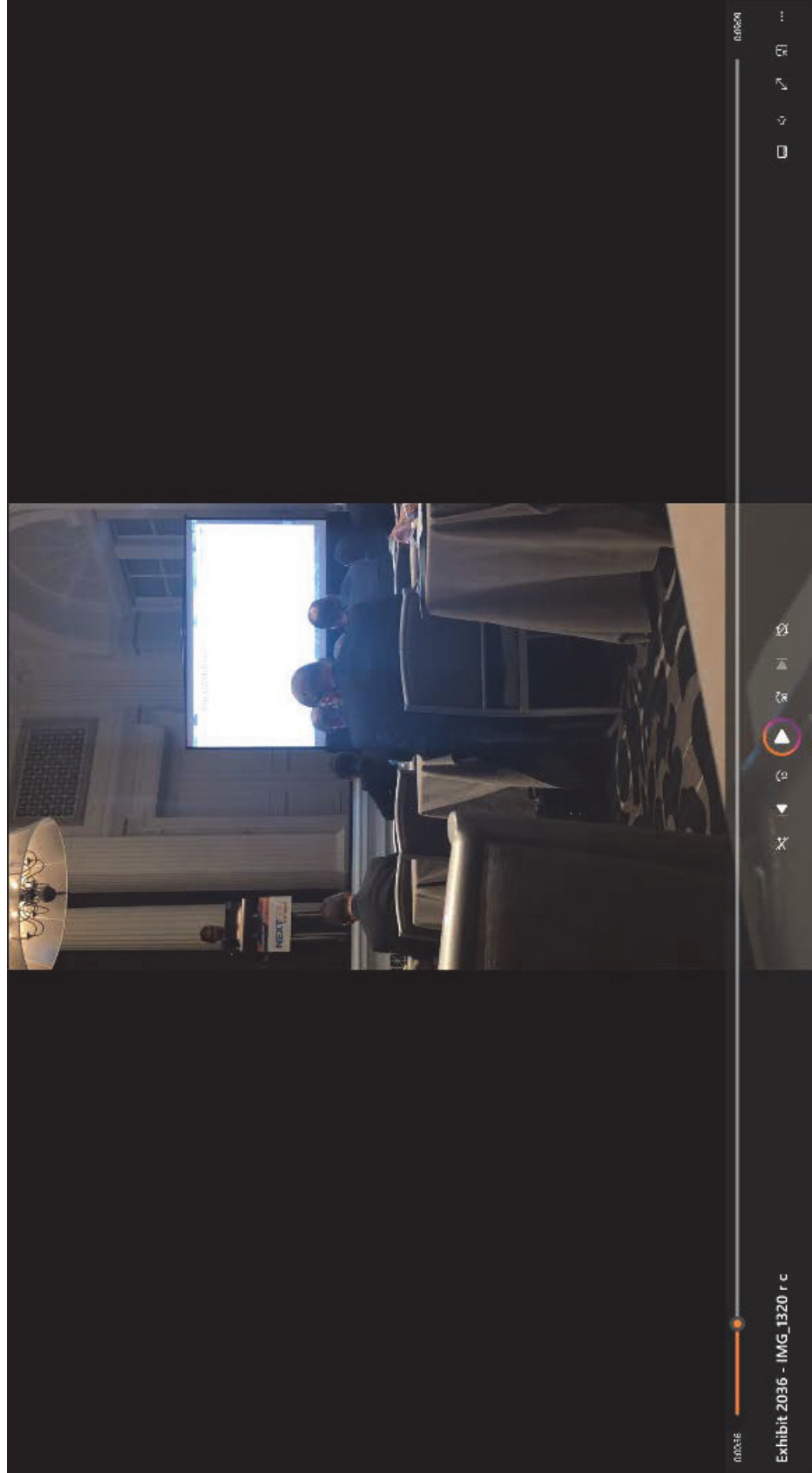
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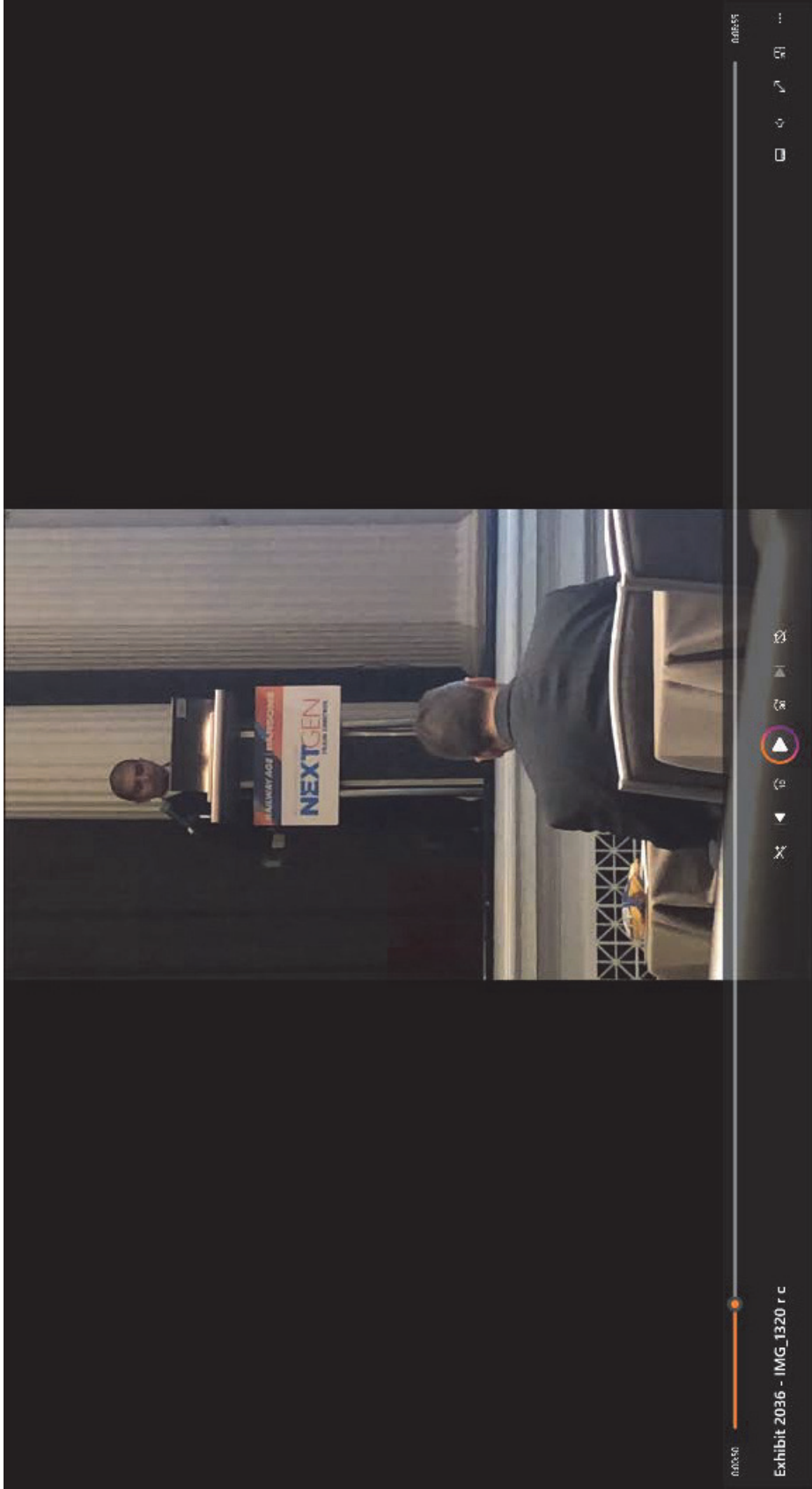
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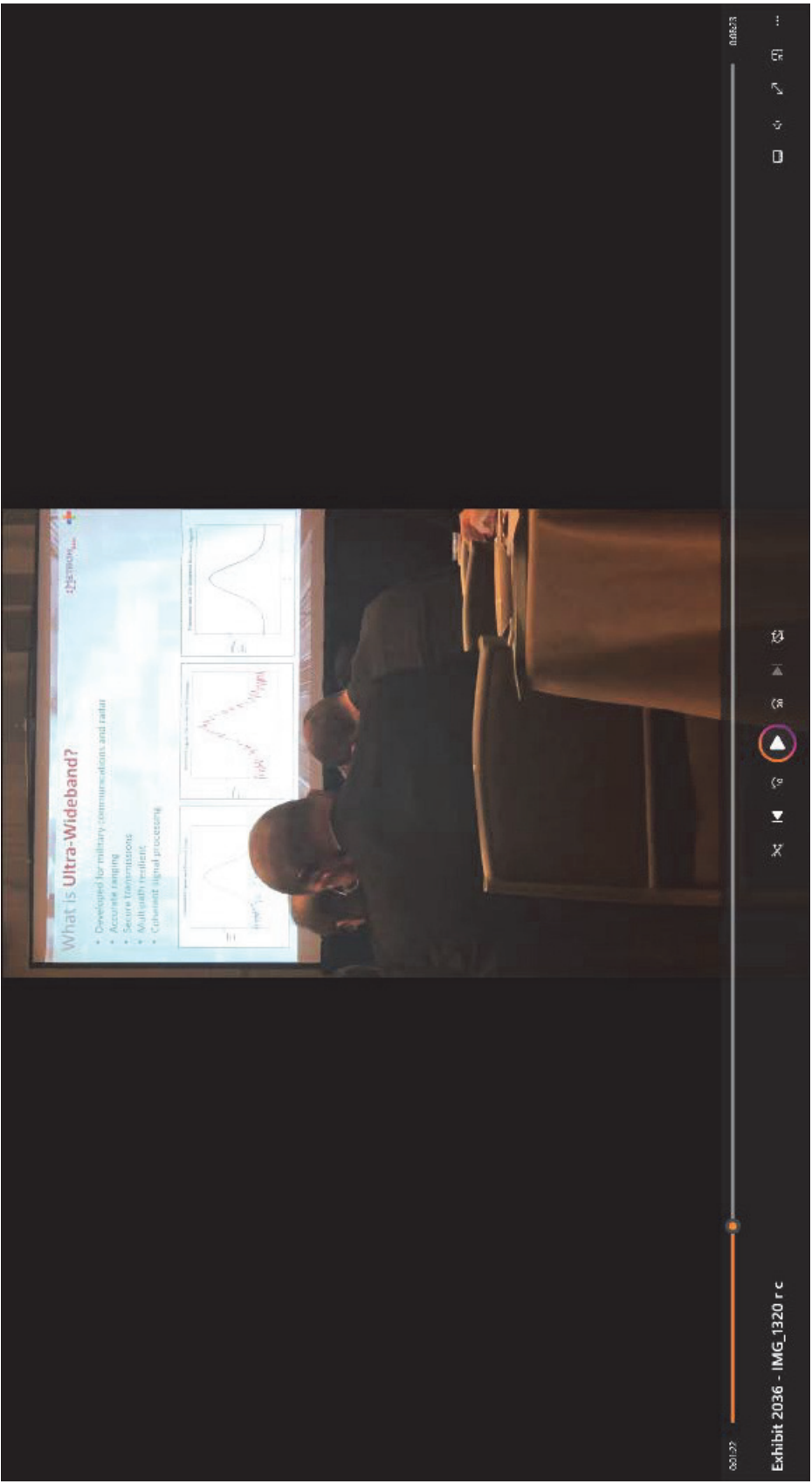
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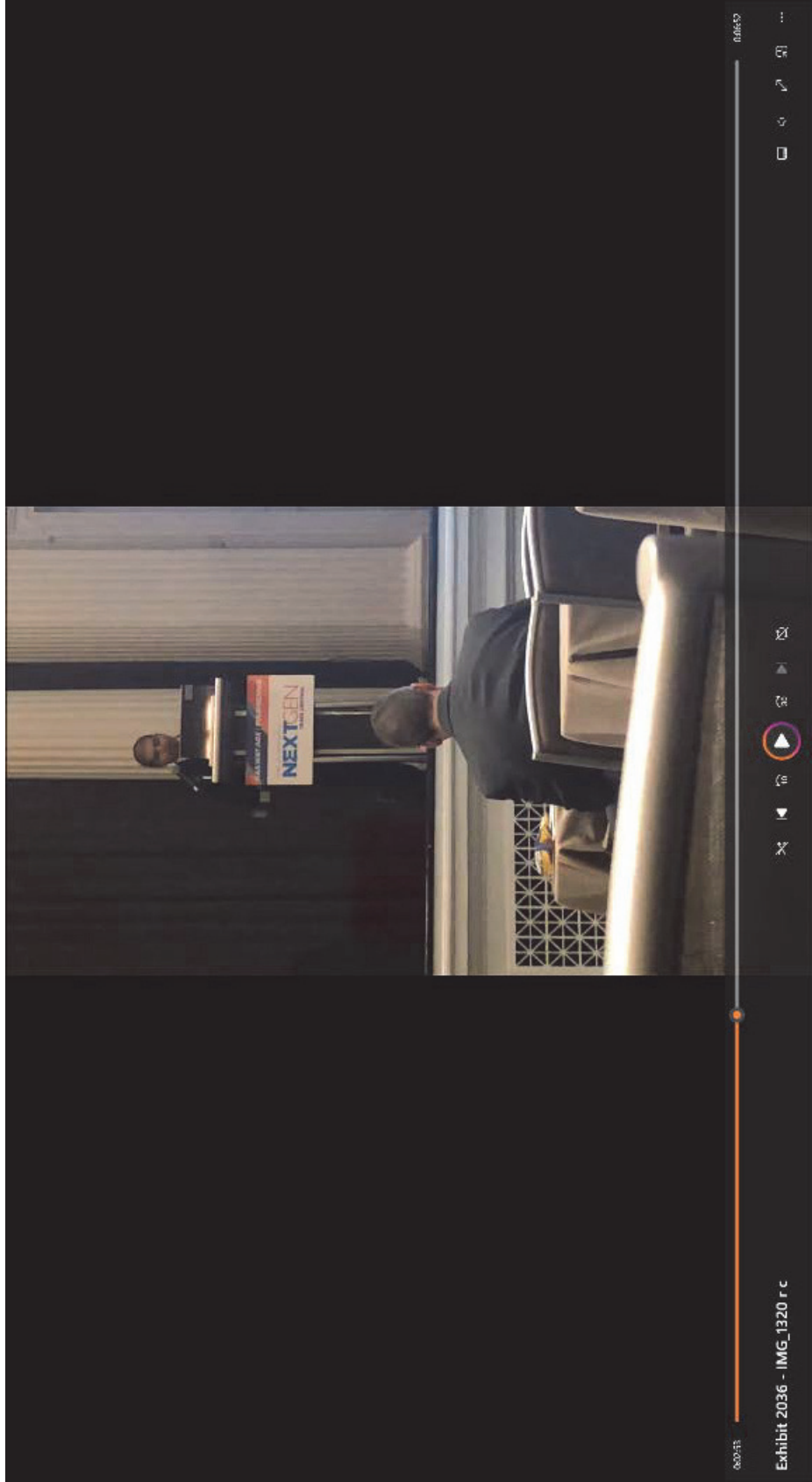
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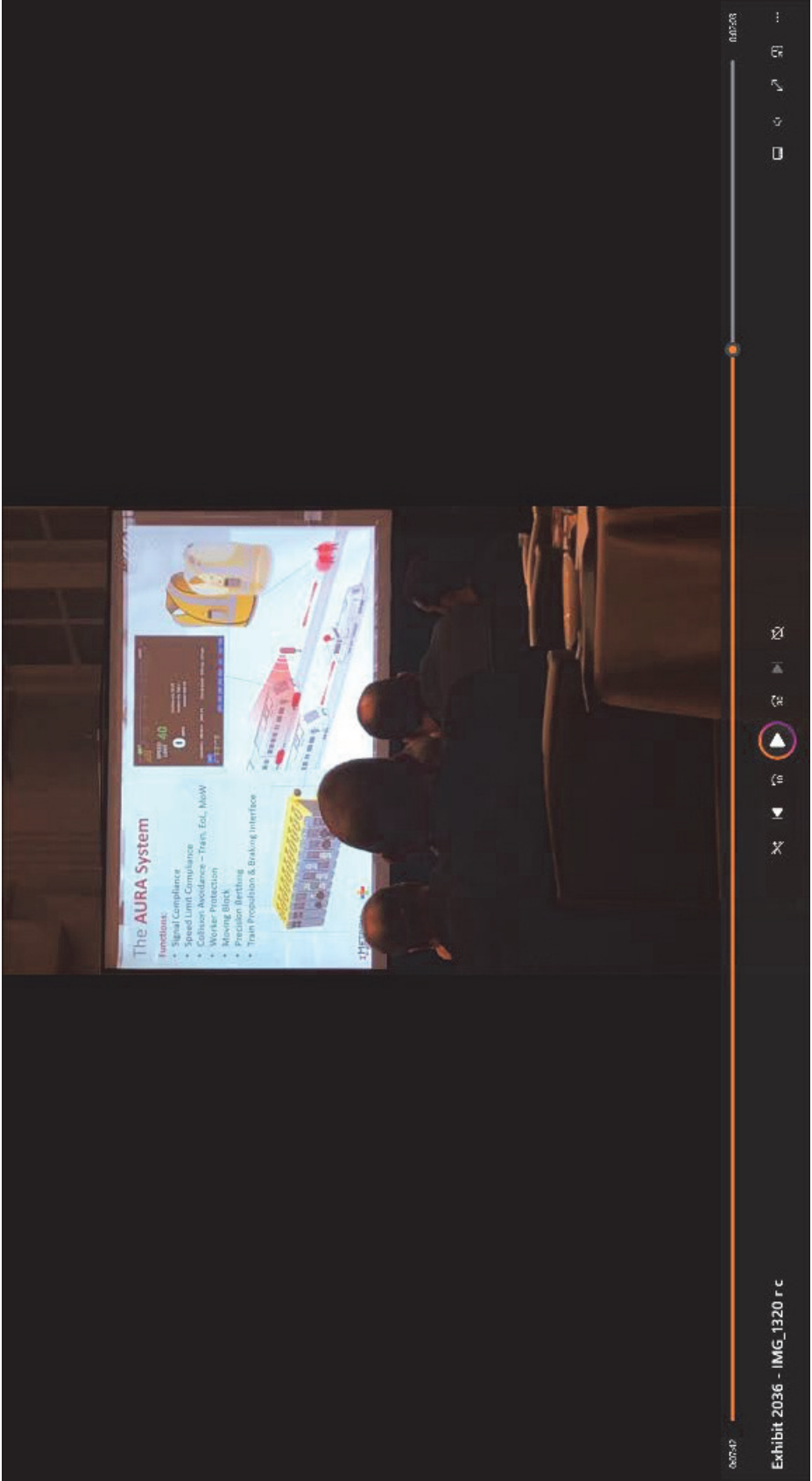
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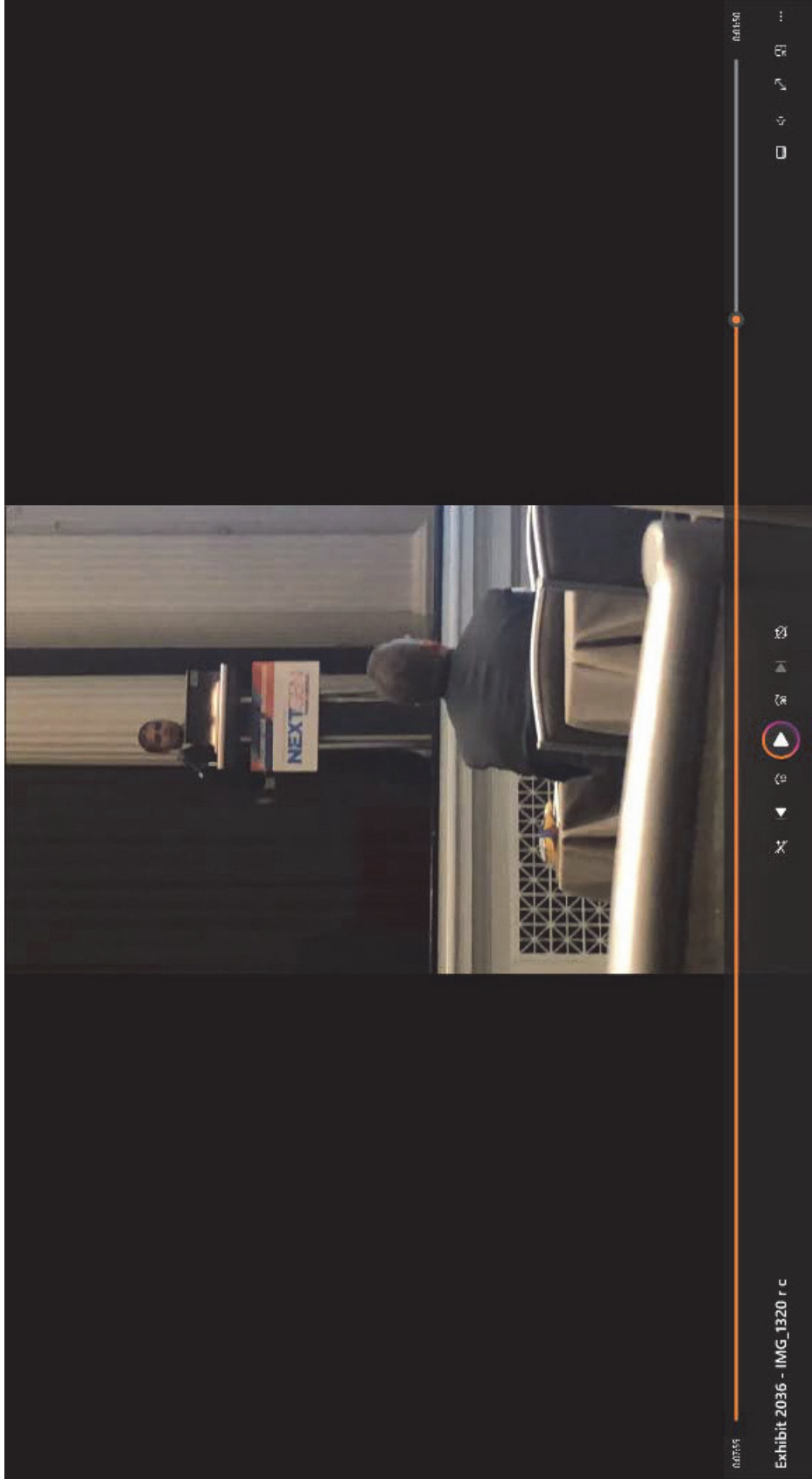




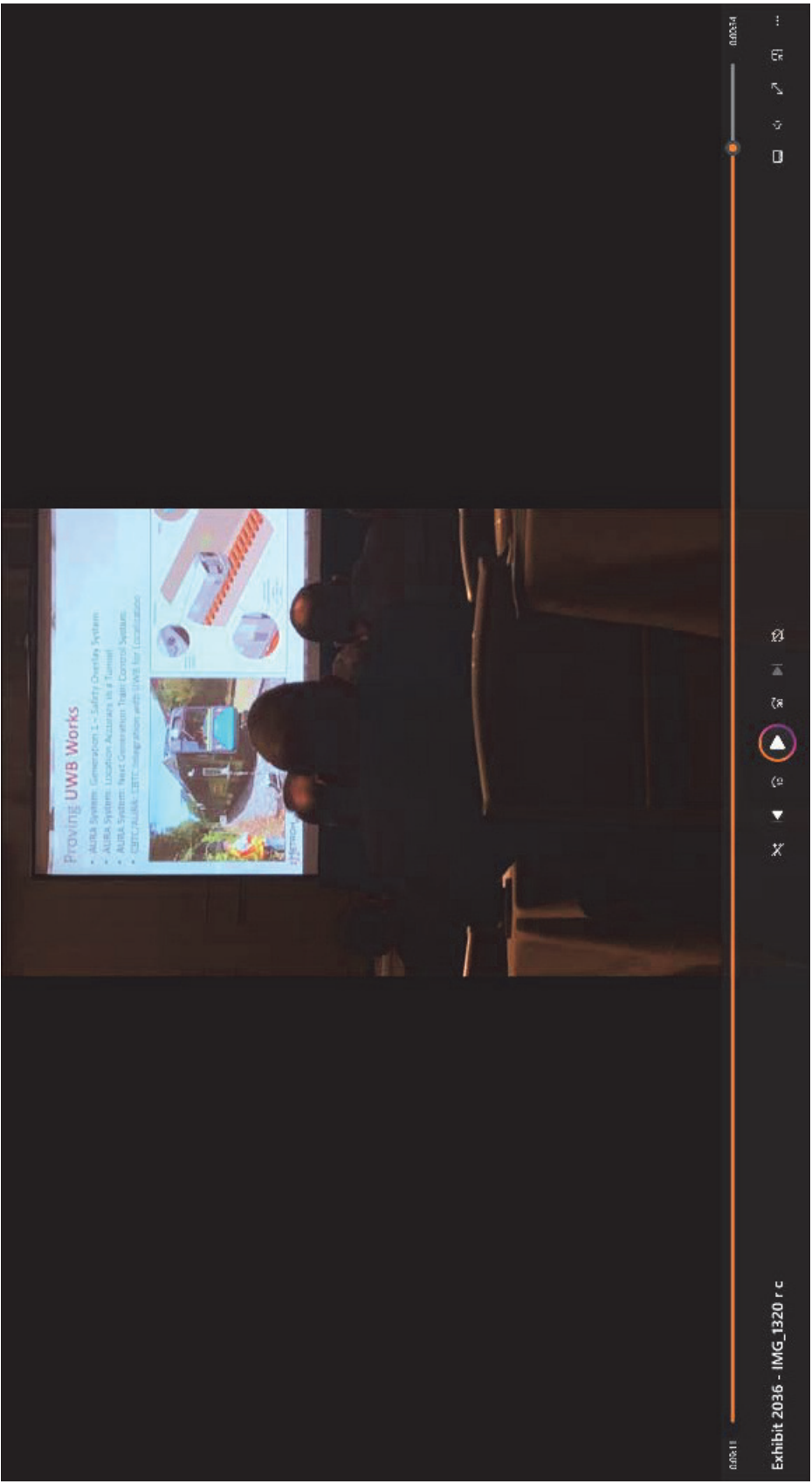
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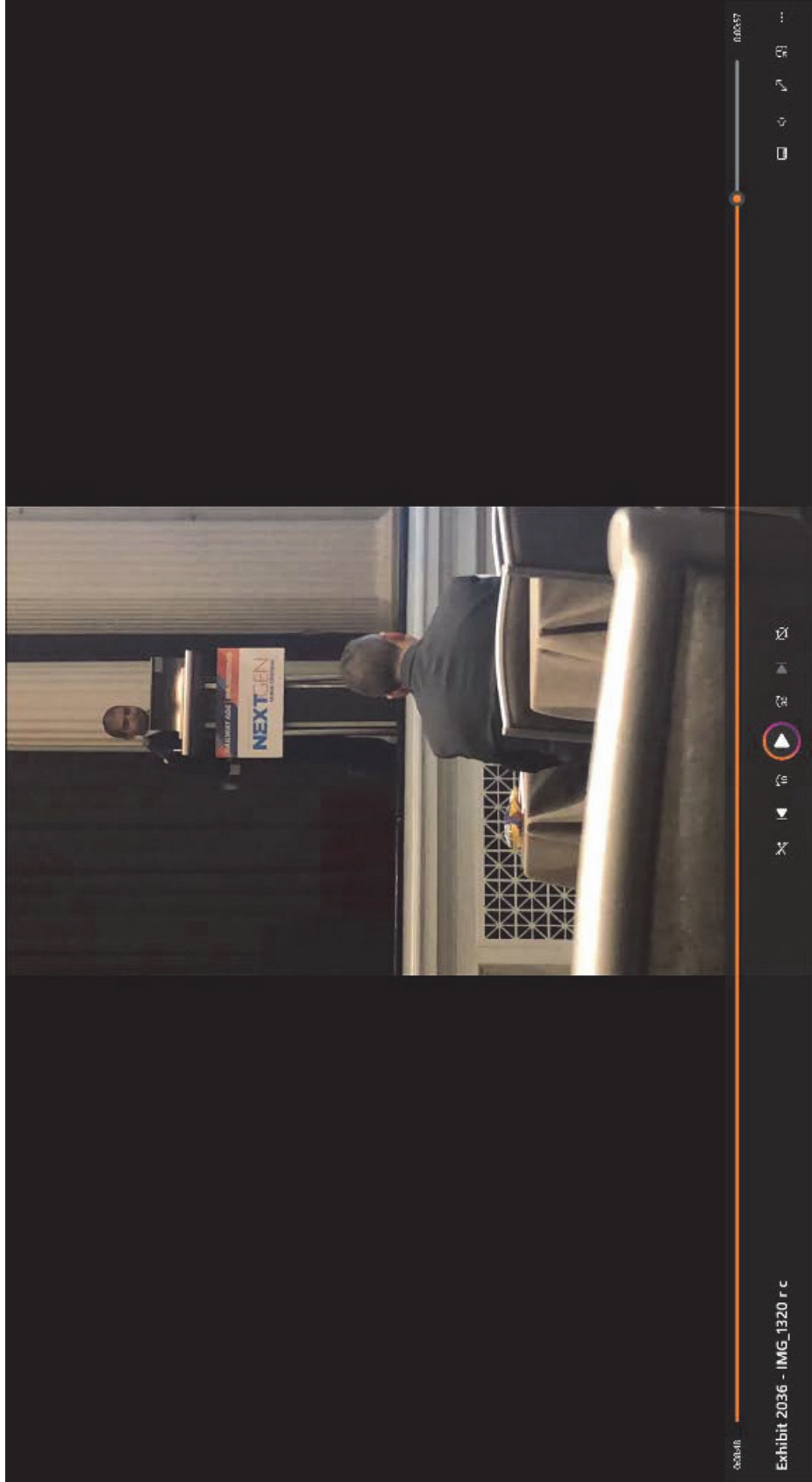


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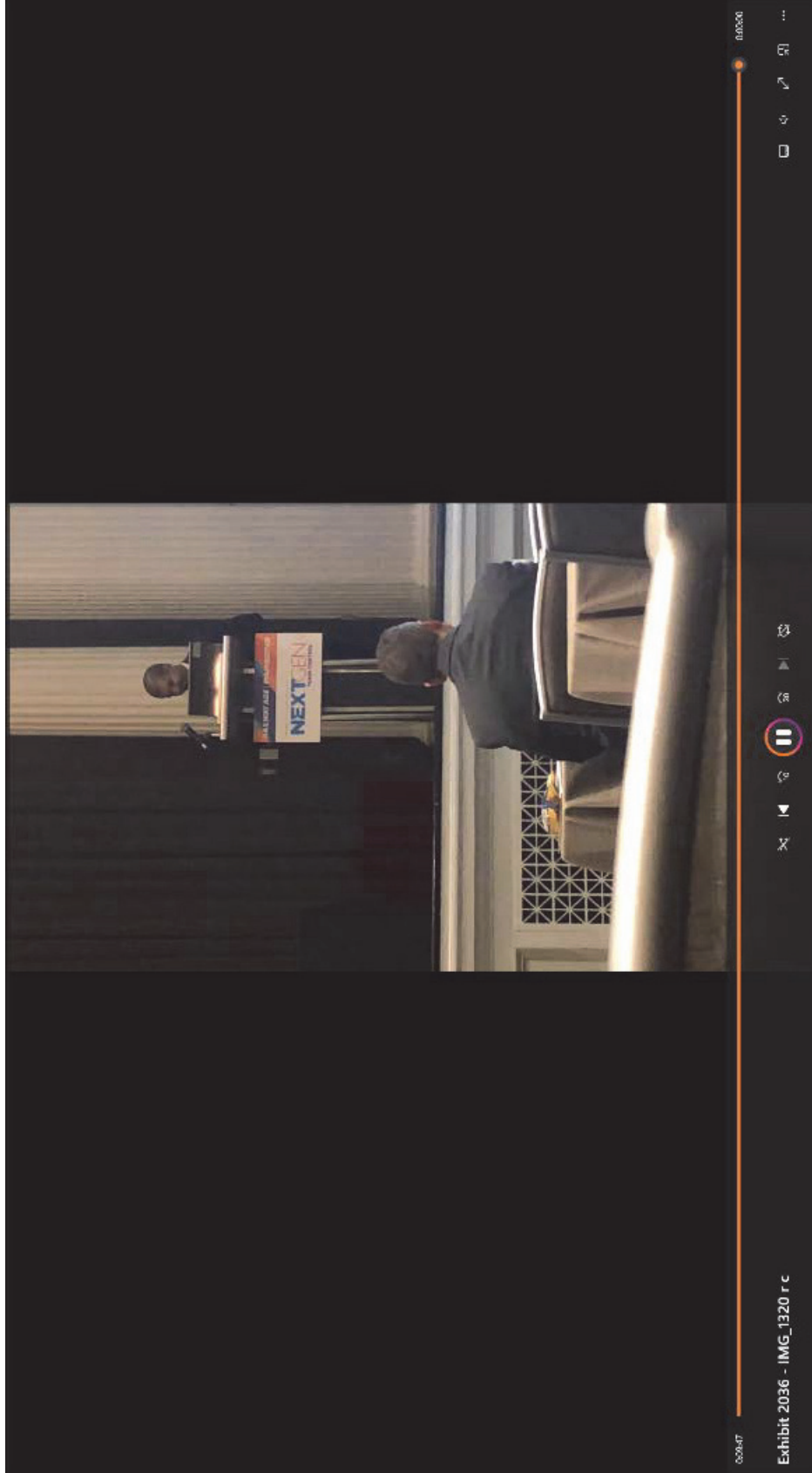


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