

Autonomous Vehicle Innovation Network (AVIN) Data and Information Sharing Protocol

1. Introduction

The Autonomous Vehicle Innovation Network (AVIN) Project, funded by the Province and delivered by the Ontario Centres of Excellence (OCE), seeks to capitalize on the economic potential of connected vehicles and autonomous vehicles (C/AVs) and to support the preparation and adaptation of the province's transportation systems and infrastructure to C/AV technology. Ontario's investment will support C/AV research and development (R&D) projects that foster partnerships among industry, academia, small- to medium-sized enterprises (SMEs), and governments; create sites across the province to develop, test and validate new technology; and attract and grow talent in the AV sector.

2. Objectives

A major component of the AVIN Project will be the generation and analysis of discrete and continuous data and information to support the operation of the Ontario C/AV ecosystem including governments, the public and public sector organizations, industry, academia, and transportation authorities.

The AVIN Project will not be collecting, analyzing or otherwise handling and disseminating data and information considered by industry Partners and Participants to be proprietary. OCE will work with industry Partners and Program Participants to ensure that the collection of information supports their interests and reflects their project design and business needs.

The analysis and reporting of the non-proprietary information collected by OCE is essential to advance the development and adoption of C/AV technologies across Ontario's transportation system and benefit all parts of the C/AV ecosystem. In particular, the sharing of information and analysis will:

- Advance knowledge and awareness to support the development and commercialization of leading-edge technologies.
- Provide Ontario's C/AV ecosystem with insights and information to improve products, technologies and processes.
- Inform changes to business models and operations throughout Ontario's economy.
- Help maintain Ontario's position as a leading global automotive parts and technology supply jurisdiction and centre for research.
- Allow Ontario and its municipalities to shape their infrastructure and transportation management systems to support and advance the deployment and adoption of C/AVs.

- Contribute to government decision-making around C/AV deployment, including regulation, policy, programs and investments.
- Contribute to building public education and awareness around C/AV technologies.

3. General Principles

The AVIN Data and Information Sharing Protocol (the “Protocol”) is intended to:

- Support assessment of the performance of the AVIN programs and related investments.
- Protect the commercial interests and intellectual property of Program Participants.
- Enable the collection of relevant data and information by OCE from projects funded through the AVIN programs and its own research.
- Outline the reporting requirements of the AVIN programs.
- Outline the analysis and public reporting to be undertaken by OCE for the benefit of the entire ecosystem.
- Foster openness and collaboration within Ontario’s C/AV ecosystem.

4. Protocol Scope

The protocol focuses on data and information elements that describe and assess the performance of Ontario’s C/AV ecosystem in general and the AVIN program in particular. A detailed list of these data and information elements is outlined in Appendix 1 of the Protocol. These elements can be classified into the following categories:

1. Technology, product, and service characteristics: data and information elements that describe the different products developed within the ecosystem, their capabilities, possible adoption scenarios, interoperability requirements, and contribution to the overall C/AV ecosystem. Examples of these data and information elements include level of automation, communication standards and protocols, safety and mobility impacts, vehicle and infrastructure types targeted, and potential applications.
2. Technology, product, and service performance and efficacy: data and information elements that describe the capabilities of developed products and technologies, their market readiness, associated risks, and performance characteristics under different environmental conditions. Examples of these data and information elements include stage of development, types of conditions tested, amount of testing, reliability, level of precision, margin of error, and factors affecting road safety for all transportation system users (e.g., human behaviour, design changes, and interactions with the infrastructure and other equipment).
3. External requirements for technology operation such as cellular and wifi connectivity, remote computing, preferred infrastructure design elements, preferred regulations and encryption protocols.
4. Program performance: data and information elements that characterize the overall performance of the program such as number of project proposals received, number of research projects funded, number of Participants, number and types of prototypes developed,

value of private investment leveraged, jobs created or retained, customer interactions, and events hosted.

Intellectual property and trade secrets information are outside the scope of the Protocol, and will be excluded from any reporting requirements. Information will be considered to be an intellectual property or a trade secret if

- i. it is required for, or contributes to, a pending patent or copyright publication;
- ii. it is a formula, pattern, program, device, or method which is unique to the business and cannot be shared without risking copy or theft by a competitor; or
- iii. the Participant has demonstrated, according to the amendment process described in section 7, that sharing the information or data with OCE and broader ecosystem would be detrimental to the Participant's business prospects.

5. Roles and Responsibilities: Partners and Program Participants¹

- It is the responsibility of AVIN Program Participants to identify, from the list of data and information elements provided in Appendix 1, the elements that they consider proprietary and include it as part of their funding agreements with OCE or AVIN Partners. AVIN Program Partners and Program Participants shall provide sufficient justification for removing any of these data and information elements from their reporting requirements as per the amendment process discussed in section 7.
- AVIN Program Partners and Program Participants shall gather, assemble and compile **all** corresponding, non-proprietary data and information elements from the list of elements described in Appendix 1, and report it to OCE over the duration outlined in the funding agreement of their AVIN funded projects and per the reporting requirements in section 7.
- It is the responsibility of the AVIN Program Partners and Program Participants to make sure that the reported data is true, accurate, complete and updated. The AVIN Program Partners and Program Participants acknowledge and agree that failing to provide the reporting requirements indicated in section 7 and Appendix 1 may result in the termination, suspension or revocation of OCE's obligations and payments described in the funding agreement.
- AVIN Program Partners must ensure that Program Participants, who receive support to research, develop, prototype, test and / or demonstrate technologies through, or as a result of, AVIN funding, are contractually obligated to provide the reporting requirements indicated in section 7 and Appendix 1. Reporting will take place biannually, at a minimum in accordance with the terms of the agreement between OCE and Program Partners.

¹ Program Partners are defined as organizations that are working with OCE to deliver the AVIN Demonstration Zone and Regional Technology Development Sites programs, while Program Participants are parties that utilize the programs, services and infrastructure funded through AVIN which includes the AV R&D Partnerships Fund, Demonstration Zone, Regional Technology Development Sites and Talent Development programs. OCE will sign Funding Agreements with Partners for the Demonstration Zone and Regional Technology Development Sites, and with Participants for the AV R&D Fund and Talent Development. Partners will sign agreements with Participants who use the Demonstration Zone and Regional Technology Development Sites.

- All AVIN Partners and Project Participants shall agree with OCE and AVIN Project Partners on data-sharing provisions (as part of the project funding agreement) that outline the reporting frequency and any proprietary data that will be excluded from the reporting process.

Note: Program Participants will retain full ownership of the data and information provided to OCE.

6. Role and Responsibilities: OCE

OCE will collect, manage, assess and provide insights from the data and information gathered from the AVIN programs and conduct additional research and scanning (e.g., literature reviews and surveys), over a period of five (5) years, ending December 31, 2023. The collection will take place through OCE's Partners that manage the Demonstration Zone and Regional Technology Development Sites, and through Program Participants that are part of the AV R&D Partnerships fund and the Talent Development programs. OCE will also ensure sufficient additional research and scanning is done to publish quarterly specialized reports and annual comprehensive reports on the C/AV sector.

Specific responsibilities of OCE regarding collection and use of the information include:

- Design methods and mechanisms through which the data, whether quantitative or qualitative, is collected from the AVIN Program Partners and Program Participants.
- Design data cleansing, data improvement, data inspection, and data monitoring mechanisms to improve the quality of the collected data and information.
- Manage the integrity of the data through collection, curation, storage, security, and access;
- Conduct analysis to generate insights, identify trends, and perform knowledge translation to help bridge technology and policy;
- Develop material and reports to present and share the information with the C/AV ecosystem; and,
- Provide all public-facing reports and material at no cost to the user.

Data Management and Security

- OCE will store all collected data and information on a secure server that is aligned with Shared Services Canada protocols.
- All collected data and information will be password protected.
- Access to collected data and information in its raw format, except for the program performance data listed in Appendix 1, will be limited to OCE staff directly involved in the AVIN project, unless otherwise specified by the data and information owner.
 - Program performance data will be shared with other organizations providing funding or co-funding to the program as per the contractual agreements with OCE and in accordance with the OCE's privacy policy².

² <http://www.oce-ontario.org/privacy-policy>

- OCE will take any further security and privacy precautions that are agreed upon and specified in agreements between OCE and Program Partners and Program Participants.

Note: Reported data and information is the sole responsibility of the entity that makes them available. OCE will not be liable for false data or misrepresentation of the data. Additionally, OCE will NOT be liable for any loss or damage that result from the reporting process.

7. Reporting of data and information by AVIN Partners and Participants

Reporting Requirements

Appendix 1 of this Protocol identifies the list of data and information elements required to be reported to OCE as a condition of funding or participation. AVIN Program Partners and Program Participants shall collect and prepare a complete list of non-proprietary information and data elements, and report it using the data collection methods and mechanisms which will be specified by OCE. The data owner is responsible for identifying any proprietary information and justifying requests for this proprietary information to be removed from the reporting requirements as per the amendment process described in this section. The frequency of the reporting and any proprietary data that will be excluded from the reporting process will be specified as part of the relevant funding agreements between Program Participants and OCE; Program Participants and Program Partners; and Program Partners and OCE.

As identified in Appendix 1, the list of required data and information elements will vary according to the level of maturity and the type of technology, product or service. The protocol differentiates between five different phases of AVIN projects: research phase, design phase, development phase, evaluation phase, and demonstration phase, where projects in the demonstration phase have the highest level of reporting requirements. AVIN Program Participants will declare the level of maturity and types of their technologies, products, and/or services as part of their reporting process. If there is disagreement between OCE and Program Participants, or Program Partners and Participants, OCE shall determine which elements apply to any particular project. Appendix 1 also highlights the expected analytical outcomes to be produced by OCE, as an output of the data collection processes. These outcomes are defined to support the objectives outlined in section 2 of this protocol.

Amendments

AVIN Program Partners and Program Participants may request to amend the list of required data and information specified in Appendix 1 to reflect their specific project design and business needs. When requesting an amendment, AVIN Program Partners and Program Participants must identify information they cannot report due to the project not generating that specific data or concerns around the proprietary nature of the data, and provide a sufficient justification of why the identified information cannot be reported. OCE will review the amendment requests on a case-by-case basis, and, if applicable, modify the requirements to minimize the effect of the missing information on the overall quality of the collected data. Approved changes have to be included in the relevant funding agreements between Program Participants and OCE; Program Participants and Program Partners; or Program Partners and OCE.

OCE may change the reporting requirements, specified in Appendix 1, based on its internal data monitoring / inspection processes and according to the consultation and review process described in

section 9. Changes may include adding, editing, or removing data information elements; adding, editing or removing product / technology types; and adding, editing, or removing analytical outcomes.

8. Public Reporting of Information and Analysis by OCE

Reporting structure

OCE will produce at a minimum, three types of public reports, using the data and information provided by AVIN Program Partners and Participants pursuant to this Protocol, and from any additional research and analysis they conduct. Reporting will take place over a five (5) year period, ending December 31, 2023.

1. Annual Comprehensive Reports

Each annual report will include:

- A description of the state of the C/AV sector and related technologies and trends;
- A summary of latest research and results (funded through the AVIN Project); and
- Any relevant developments and findings from other jurisdictions and research or technology entities.

2. Quarterly updates and / or specialized reports focused on a particular topic. An overview of potential topics is highlighted under the OCE research and analysis section of Appendix 2.

3. Monthly bulletins highlighting recent announcements, news, and decisions impacting the C/AV sector.

All products for public reporting will be made available on the AVIN Project website, managed by OCE, and may also be distributed in soft and hard copies, as necessary. OCE may also share information and analysis related to the AVIN Project through additional publications or reports, as it sees fit.

Report content

- OCE will report, as part of the annual comprehensive reports and / or the quarterly reports described above, on its analysis of the data and information collected from the AVIN programs, and its own research. The report content will include the expected analytical outputs identified in the tables in Appendix 1.
 - The analytical outputs will be focused on information that is considered to be of use to the entire C/AV ecosystem in Ontario, as determined through OCE's consultation and ongoing engagement with members of the ecosystem.
 - OCE will determine which information and analytical products should be featured in its reports based on:
 - Its understanding of the sector, including areas of knowledge or awareness that require further development;
 - Program Partner, Participant, and other requests from the C/AV ecosystem received by the AVIN; and,
 - Pertinence to recent developments in the global and Ontario C/AV sector.

- Any information that is shared or used to produce the public reports will be anonymized and, if possible, aggregated across projects and Program Partners and Participants to provide summary-level information.
- No person or organization will be singled out or identified in any public reporting, unless approval is obtained from this person or organization and in accordance with the OCE's privacy policy (<http://www.oce-ontario.org/privacy-policy>).

NOTE: We advise that Ontario Centres of Excellence Inc. ("OCE") is not an institution for the purposes of the Freedom of Information and Protection Of Privacy Act (Ontario) ("FIPPA"). As a result, OCE is not subject to the provisions of FIPPA, including its freedom of information provisions.

OCE is a not-for-profit corporation with a mandate to support the commercialization of technology for the benefit of Ontario. OCE works closely with its funders, including the Government of Ontario, to ensure its mandate is carried out in an efficient, effective and fair manner.

OCE also carries out its mandate with openness and transparency. OCE-supported projects are listed in the "Our projects" section of the OCE website at <http://www.oce-ontario.org/projects>, along with comprehensive information about each project. This information may be accessed by the public in a manner that is searchable by category, program, company name, academic institution and sector.

At the same time, OCE respects the privacy of individuals and the personal information OCE collects about them. For information on our privacy practices, please visit <http://www.oce-ontario.org/privacy-policy>

9. Protocol Updates:

On an annual basis OCE will review and consult with Partners and the C/AV ecosystem to ensure that the Protocol is up to date and captures all relevant data and information that is of interest to members of the C/AV ecosystem. Any changes proposed as a result of the review and consultation will be subject to approval.

Appendix 1

The tables below specify the data and information types and elements required to be reported to OCE by AVIN Program Participants and Partners. Reporting requirements are designed to adapt to the different types of the technologies developed within the ecosystem and the maturity level of each technology / product. Separate data and information reporting requirements are outlined for each of the four AVIN programs. Within each program, data and information elements will differ according to the category of the technology, product, or service under development and its implementation phase. The four programs are:

- **AV R&D Partnerships Fund** - The fund supports collaborative development, prototyping, and validation projects, including technologies in vehicles or innovations in transportation systems- and infrastructure-related R&D.
- **Regional Technology Development Sites** - Entrepreneurs, startups and SMEs can leverage Regional Technology Development Sites to develop, prototype, and validate new C/AV products and technologies; use specialized equipment, hardware, and software; and access business advisory services.
- **Demonstration Zone** - The Demonstration Zone, located in Stratford, Ontario, is a site where SMEs can validate and test technologies in live scenarios and weather conditions using vehicle platforms such as city buses, fleet vehicles, and OEM vehicles.
- **Talent Development Program** - Interns and fellows will have an opportunity to apply their expertise, leading-edge knowledge, and tools to solve industry problems related to C/AV technologies.

Reporting requirements, based on the following tables, will be agreed upon between OCE and AVIN funding recipients, and do not replace or modify any regulatory reporting requirements to the Government of Ontario that may apply to the testing of products or technologies funded through the AVIN. In particular, Program Partners and Participants will be required to comply with Ontario Regulation 306/15 made under the Highway Traffic Act³, and all related reporting requirements, as applicable.

AV R&D Partnership Fund:

Program Performance Data	
Expected Analytical Outcome:	
<ul style="list-style-type: none"> • Measure economic benefits to the Province 	
Reporting requirements for all projects	<ul style="list-style-type: none"> • Partnership proposals received • Partnership proposals funded (breakdown by firm size and in-vehicle or out-of-vehicle) • Number of project proposals received

³ <https://www.ontario.ca/laws/regulation/r15306>

	<ul style="list-style-type: none"> • Number of research projects funded • Total value of partnerships funded (the Program Partner recipients and industry matching) • Number and types of prototypes developed • Number of patents developed or filed resulting from program • Licensing of technologies resulting from program • Jobs created or retained • International exports • Follow-on investment received • Incremental sales (in Canada and internationally) • Value of private investment leveraged • Areas of expertise, certifications and qualifications of the product development team. Companies involved in Partnerships
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Technology / Product / Service Characteristics and Performance data

Expected Analytical Outcomes:

- **Provide information about products / services developed within the AVIN Project, the capabilities of these products / services, and potential uses / applications.**
- **Identify potential risks associated with technology / product deployment to support making informed decisions about how to manage or avoid these risks.**
- **Identify possible adoption scenarios, and highlight the potential applications of the new technologies developed within the C/AV ecosystem.**
- **Identify policies, regulations and programs that could be changed to accelerate the adoption of the C/AV technologies and hence, maintain Ontario’s position as a global leader in the space.**
- **Identify barriers and enablers to C/AV technologies and products, and potential improvements to processes and business models adopted within the C/AV ecosystem.**
- **Inform transportation authorities of infrastructural changes and design features that could be considered to support the adoption of C/AV technologies.**

Reporting requirements for all projects

Research / Requirements Specification Phase

- Type of technology, product, or service being researched or developed (e.g., collision avoidance system, obstacle detection system, positioning and navigation system.)
- Stage of technology, product, or service development and its market readiness (e.g., prototype, testing, demonstration, and market-ready)

Design Phase

- Updated version of all data elements outlined in the research / requirements specification phase.
- Main components of the system and their category (an in-vehicle component, a smart infrastructure component, or a C/AV service).
- Core functionalities of each identified component.
- If applicable, certifications and standards being sought.
- Expected impacts of using the designed technology, product, or service including: 1) Safety impacts (e.g., reduced number of accidents); 2) Mobility Impacts (e.g., reduced travel time and increased accessibility); and 3) Environmental Impacts (e.g., reduced CO2 emissions).
- Any additional design-related information that could be beneficial to the AVIN ecosystem.

Development Phase

- Updated version of all data elements outlined in research and design phases.
- Tools accelerating the development of C/AV technologies, products, and services.
- Perceived technological / cost / social / regulatory enablers or barriers to research, development, testing, and commercialization of the technology / product.
- Pace of development and anticipated release dates.
- Any additional development-related information that could be beneficial to the AVIN ecosystem.

Testing / Evaluation Phase

- Updated version of all data elements outlined in research, design, and development phases.
- Experimental procedure for the testing phase. For example, identify simulation tools, specification of actual / virtual test tracks, and environmental conditions.
- Types of tests performed (component tests, system tests, integration tests, and acceptance tests)
- Amount of testing completed (measured in testing time, number of runs and / or distance).
- Types of conditions that are tested or simulated during the evaluation process including 1) Environmental conditions: lighting and weather conditions; 2)Traffic conditions: traffic conditions and level of service; 3)Road Characteristics: design speed / speed

	<p>limits, number of lanes, road slope / gradient, curvature, lane width, etc. 4) Assumptions of certain infrastructure changes or modifications. 5) Required infrastructure systems or field equipment (e.g., roadside units, GPS availability).</p> <ul style="list-style-type: none"> • Identified barriers for testing of the product. • Performance indicators that highlight the added value of the proposed technology, product, or service on one or more the following areas: driving performance and safety; precision and the reliability of the automated driving mode; drivers' interaction with the system; transportation system performance, environmental aspects; interaction / communication with transportation infrastructure and broader systems (e.g., emergency response systems); and users' acceptance. • Any additional testing-related information that could be beneficial to the AVIN ecosystem. <p>Demonstration Phase</p> <ul style="list-style-type: none"> • Updated version of all data elements outlined in research, design, development, and testing phases. • Identified applications of the technology, product, or service. • Supported use cases of the technology, product, or service. • Other products, technologies, or services that could benefit from the demonstrated technology. • Anticipated cost. • Anticipated availability. • Types of interfaces with drivers/users and surrounding environment (including other vehicles, pedestrians and infrastructure). • Preferred infrastructure design elements or regulatory changes to enable the deployment or adoption of the technology. • If applicable, the interoperability requirements (e.g., communication standards) and required communication systems, information and infrastructure that support the operation or use of the technology, product, or service. • Collisions, property damage, or other potentially dangerous or unsafe situations arising from demonstrating the technology, if relevant. • Any additional demonstration-related information that could be beneficial to the AVIN ecosystem.
Additional reporting	Research / Requirements Specification Phase

requirements for projects involving an in-vehicle system.

- If applicable, targeted level of automation supported by the technology, product, or service.
- If applicable, targeted type of communication supported by the technology, product, or service.
- Types of vehicle (e.g., cars, trucks, buses, Recreational Vehicles (RV), trains, and two wheelers, etc.).

Design Phase

- Specific new vehicle capabilities resulting from the proposed technology, product, or service.
- If applicable, types of sensors used in automation (e.g., Lidar, Radar, and cameras), minimum capabilities of each sensing device (accuracy, sensitivity, etc.), and their limitations (range, power usage, coverage, weather conditions, etc.).
- If applicable, types of other sensors, actuators, and communication devices used for the product, technology or service.
- If applicable, types of communication devices, networks and protocols required to support the designed product / technology (e.g. DSRC, LTE, and 5G, Bluetooth).

Testing / Evaluation Phase

- If applicable, specification of the communication / network requirements to support the tested product, technology, or service (e.g. communication range, latency, bandwidth, and type of information transmitted).
- If applicable, infrastructure (e.g. Road side equipment, sensors or signals, signage, markings) required to support the tested product, technology, or service if deployed.

Demonstration Phase

- Safety considerations and requirements for the safe use of the proposed technology, product, or service including geographic and environment restrictions, handling malfunctions, response to unexpected events, infrastructure and communication requirements, and driver characteristics.
- External requirements for the technology, product, or service operation including mechanical, electrical, and data storage requirements, data acquisition tools, encryption and cybersecurity requirements, external computing support (e.g., cloud services), and external mapping / information.

	<ul style="list-style-type: none"> • If applicable, test track specifications to demonstrate the technology.
<p>Additional reporting requirements for projects involving a smart infrastructure component</p>	<p>Research / Requirements Specification Phase</p> <ul style="list-style-type: none"> • Targeted infrastructure types (highways, arterials, airports, railways, green infrastructure, etc.) <p>Design Phase</p> <ul style="list-style-type: none"> • Specific infrastructure capabilities resulting from the proposed technology / product. • If applicable, types of sensors, actuators, and communication devices used to enable the smart infrastructure functionality and their capabilities and limitations. <p>Demonstration Phase</p> <ul style="list-style-type: none"> • External requirements for the technology, product, or service operation including required infrastructure, field equipment, external data sources, mapping information, cellular / Wi-Fi connectivity, and remote / cloud computing.
<p>Additional reporting requirements for projects involving a connected vehicle component</p>	<p>Research / Requirements Specification Phase</p> <ul style="list-style-type: none"> • Type of communication supported by the technology, product, or service (e.g., V2V, V2I, V2P). <p>Design Phase</p> <ul style="list-style-type: none"> • Specific new vehicle or infrastructure capabilities resulting from the proposed connected vehicle technology, product, or service. • External cellular / Wi-Fi connectivity required and the characteristics of such communication (e.g., bandwidth, latency). • If applicable, types of sensors, actuators, and communication devices used to enable the vehicle communication. • Messaging and communication protocols. • Purpose of communication (e.g. safety, traffic management, security, infotainment, or fleet management, etc.) whether it is expected to contain personal information or pose other privacy concerns. <p>Testing Phase</p> <ul style="list-style-type: none"> • If applicable, specification of the communication / network requirements to support the tested product, technology, or service

	<p>(e.g. communication range, latency, bandwidth, and type of information transmitted).</p> <ul style="list-style-type: none"> • If applicable, infrastructure (e.g. Road side equipment, sensors or signals, signage, markings) required to support the tested product, technology, or service if deployed. <p>Demonstration Phase</p> <ul style="list-style-type: none"> • If applicable, encryption methods used for communicating messages and the reason for choosing these methods. • External requirements for the technology, product, or service operation including required infrastructure, external data sources, mapping information, field equipment, cellular / Wi-Fi connectivity, and remote / cloud computing.
Reporting requirements for projects involving a C/AV service	<p>Research / Requirements Specification Phase</p> <ul style="list-style-type: none"> • If applicable, level of automation and / or type of communication supported. • Targeted vehicle types (e.g., cars, trucks, buses, recreational vehicles (RV), two wheelers, and trains). • Targeted infrastructure types (e.g. pavement, lighting, signage, bridges, etc.). <p>Design Phase</p> <ul style="list-style-type: none"> • Specific new vehicle or infrastructure capabilities resulting from the proposed service. • External cellular / Wi-Fi / GPS connectivity required and the characteristics of such communication (e.g., bandwidth and latency). • Types of sensors, actuators, and communication devices, if applicable, used to enable the proposed service and their capabilities and limitations.

Regional Technology Development Sites:

Program Performance Data	
Expected Analytical Outcome:	
<ul style="list-style-type: none"> • Measure economic benefits to the Province 	
Reporting requirements for all projects	<ul style="list-style-type: none"> • Number of Participants per site (breakdown by name of company, firm size and area of business) • Number of projects underway at site

	<ul style="list-style-type: none"> • Industry funds per site • Number and types of prototypes developed • Number of patents developed or filed resulting from program • Licensing of technologies resulting from program • Jobs created or retained • Incremental International exports • Follow-on investment received • Incremental sales (in Canada and internationally) • Value of private investment leveraged • Areas of expertise, certifications and qualifications of the product development team. • Customer interactions • Events hosted • New companies or business ventures generated
Technology / Product / service Characteristics and Performance data	
<p>Expected Analytical Outcomes:</p> <ul style="list-style-type: none"> • All the outcomes highlighted in the AV R&D Partnerships Fund program • Provide information / statistics about the strengths and abilities of Regional Technology Development Sites. 	
<p>Reporting requirements for all projects</p>	<ul style="list-style-type: none"> • All the data and information elements that are defined in the AV R&D Partnerships Fund program. The data shall be collected individually from all program Participants and reported to OCE as per the reporting requirements in section 7.
Regional Technology Development Sites' data	
<ul style="list-style-type: none"> • Identify future needs of Regional Technology Development Sites to improve their efficiency and competitiveness. • List of new tools / equipment that were ordered, purchased, and / or installed to support the AVIN program including a description of the tool, key functionalities, and the type of projects that are expected to benefit from this tool. • List of existing tools / equipment that are being used by AVIN Projects sites including the utilization rate, number of projects using the tools, and types of technologies / products produced by these projects. • List of new tools / equipment that are required to support AVIN projects including a description of the tool / technology, key functionalities, and number of projects requesting this tool. 	

Demonstration Zone

Program Performance Data	
<p>Expected Analytical Outcome:</p> <ul style="list-style-type: none"> • Measure economic benefits to the Province 	
<p>Reporting requirements for all projects</p>	<ul style="list-style-type: none"> • Number of requests to use the Demonstration Zone. • Number of companies using the Demonstration Zone to demonstrate technology. • Number of companies visiting the Demonstration Zone to view or purchase technology. • Prototypes developed or launched. • Number of customer interactions / meetings facilitated at Demonstration Zone Business Centre. • Number of visits by members of the public and / or media at the Demonstration Zone Business Centre. • Media tags. • Prototypes developed. • Patents filed resulting from program. • Licensing of technologies resulting from program. • Jobs created or retained. • International exports. • Follow-on investment received. • Incremental sales (in Canada and internationally). • Number and type of events hosted. • Value of private investment leveraged. • Names of companies using or visiting the demonstration zone.
Demonstration Zone characteristics	
<p>Expected Analytical outcomes:</p> <ul style="list-style-type: none"> • Identify future needs of the Demonstration Zone for displaying the effectiveness of developed AVIN technologies / products. • List of infrastructure changes / field equipment installations required to demonstrate the AVIN projects including a description of the equipment / infrastructure change, purpose, and number of projects requesting this change or equipment. • List of infrastructure / field equipment features and capabilities that have been valuable to the demonstration of AVIN projects including a description of the feature / capability and how it is utilized by the demonstrated technologies. 	
Technology / Product / service Characteristics and Performance data	

Expected Analytical outcomes:

- All the outcomes highlighted in the AV R&D Partnerships Fund program
- Provide information / statistics about demonstrated technologies, their uses, functionalities, and characteristics.
- Provide information / statistics about the strengths and abilities of the Demonstration Zone.
- Provide information / statistics about accidents and other potentially dangerous situations that were identified during any demonstration.
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Reporting requirements for all projects

- Type of technology, product, or service being demonstrated (e.g., collision avoidance system, obstacle detection system, and positioning and navigation system)
- Stage of technology, product, or service development or market readiness (e.g., prototype, testing, demonstration, and market-ready)
- Main components of the system and their category (an in-vehicle component, a smart infrastructure component, or a C/AV service).
- Core functionalities of each identified component.
- If applicable, certifications and standards being sought.
- Expected impacts of using the demonstrated technology, product, or service including: *1) Safety impacts* (e.g., reduced number of accidents); *2) Mobility Impacts* (e.g., reduced travel time and increased accessibility); and *3) Environmental Impacts* (e.g., reduced CO2 emissions).
- Perceived technological / cost / social / regulatory enablers or barriers to deployment or commercialization of the demonstrated technology, product, or service.
- Collisions, property damage, or other potentially dangerous or unsafe situations arising from demonstrating the technology, if relevant.
- Public education and human behaviour considerations for technology adoption (e.g., observed level of comfort with technology, observed changes to behaviour of system users, and expressed concerns from the public)

Testing / Evaluation Phase

- Experimental procedure for the demonstration. For example, specification of test tracks, and environmental conditions.

- Types of tests performed (e.g., component tests, system tests, integration tests, and public awareness and acceptance tests)
- Amount of testing completed (measured in testing time, number of runs and / or distance).
- Types of conditions including 1) Environmental conditions: lighting and weather conditions; 2) Traffic conditions: traffic conditions and level of service; 3) Road Characteristics: speed limits, number of lanes, road slope / gradient, curvature, lane width, road condition, etc.
- Field equipment / infrastructure systems required for controlled testing of the product (e.g., roadside units and GPS availability).
- Perceived barriers for testing of the product.
- Performance indicators that highlight the added value of the proposed technology, product, or service on one or more the following areas: driving performance and safety; precision and the reliability of the automated driving mode; drivers' interaction with the system; transportation system performance, environmental aspects; interaction / communication with transportation infrastructure and broader systems (e.g., emergency response systems); and users' acceptance.
- Any additional demonstration-related information that could be beneficial to the AVIN ecosystem.

Demonstration Phase

- Updated version of all data elements outlined in the testing phase.
- Identified uses of the demonstrated technology, product, or service.
- Other products, technologies, or services that could benefit from the demonstrated technology.
- Anticipated cost.
- Anticipated availability.
- Types of interfaces with drivers/users and surrounding environment (including other vehicles, pedestrians and infrastructure).
- Preferred infrastructure design elements or regulatory changes to enable the deployment, commercialization and adoption of the technology.
- If applicable, the interoperability requirements (e.g., communication standards) and required communication systems, information and infrastructure that support the operation or use of the technology, product, or service.

	<ul style="list-style-type: none"> • Any additional demonstration-related information that could be beneficial to the AVIN ecosystem.
<p>Additional reporting requirements for projects involving an in-vehicle system.</p>	<ul style="list-style-type: none"> • Targeted level of automation supported by the technology, product, or service. • Types of vehicle (e.g., cars, trucks, buses, recreational vehicles (RV), two wheelers, and trains). • If applicable, targeted type of communication supported by the technology/ product. • Specific new vehicle capabilities resulting from the proposed technology, product, or service. • If applicable, types of sensors used in automation (e.g., Lidar, Radar, and cameras), minimum capabilities of each sensing device (accuracy, sensitivity, etc.), and their limitations (range, power usage, coverage, weather conditions, etc.). • If applicable, types of other sensors, actuators, and communication devices used for the product, technology or service. • If applicable, specification of the communication requirements to support the tested product, technology or service (e.g. communication range, latency, bandwidth, and type of information transmitted). <p>Testing / Evaluation Phase</p> <ul style="list-style-type: none"> • If applicable, types of communication devices and protocols required to support the demonstrated product, technology, or service (e.g. DSRC, LTE, and 5G). • If applicable, infrastructure (e.g. Road side equipment, sensors or signals, signage, markings) required to support the tested product, technology, or service if deployed. <p>Demonstration Phase</p> <ul style="list-style-type: none"> • Safety considerations and requirements for the safe use of the proposed technology, product, or service including geographic and environment restrictions, handling malfunctions, response to unexpected events, infrastructure and communication requirements, and driver characteristics. • External requirements for the technology, product, or service operation including mechanical, electrical, and data storage requirements, data acquisition tools, encryption and cybersecurity requirements, external computing support (e.g., cloud services), and external mapping / information.

	<ul style="list-style-type: none"> • If applicable, test track specifications to demonstrate the technology.
<p>Additional reporting requirements for projects involving a smart infrastructure component</p>	<ul style="list-style-type: none"> • Targeted infrastructure types (highways, arterials, airports, railways, green infrastructure, etc.) • Specific infrastructure capabilities resulting from the proposed technology, product, or service. • If applicable, types of sensors, actuators, and communication devices used to enable the smart infrastructure functionality and its capabilities and limitations. <p>Demonstration Phase</p> <ul style="list-style-type: none"> • External requirements for the technology, product, or service operation including required infrastructure, field equipment, external data sources, mapping information, cellular / Wi-Fi connectivity, and remote / cloud computing.
<p>Additional reporting requirements for projects involving a connected vehicle component</p>	<ul style="list-style-type: none"> • Type of communication supported by the technology, product, or service (e.g., V2V, V2I, and V2P). • Specific new vehicle or infrastructure capabilities resulting from the proposed connected vehicle technology, product, or service. • External cellular / Wi-Fi connectivity required and the characteristics of such communication (e.g., bandwidth and latency). <p>Demonstration Phase</p> <ul style="list-style-type: none"> • Messaging and communication protocols • Purpose of communication (e.g. safety, traffic management, security, infotainment, and fleet management). • Encryption methods used for communicating messages. • If applicable, specification of the communication / network requirements to support the tested product, technology, or service (e.g. communication range, latency, bandwidth, and type of information transmitted). • If applicable, infrastructure (e.g. Road side equipment, sensors or signals, signage, markings) required to support the tested product, technology, or service if deployed. • External requirements for the technology, product, or service operation including required infrastructure, external data sources, mapping information, field equipment, cellular / Wi-Fi connectivity, and remote / cloud computing.

Reporting requirements for projects involving a C/AV service	<ul style="list-style-type: none"> • If applicable, level of automation and / or type of communication supported • Targeted vehicle types (e.g. cars, trucks, buses, Recreational Vehicles (RV), two wheelers, and trains). • Targeted infrastructure types (e.g. pavement, lighting, signage, bridges, etc.). • Specific new vehicle or infrastructure capabilities resulting from the proposed service. • External cellular / Wi-Fi / GPS connectivity required and the characteristics of such communication (e.g., bandwidth and latency). • Types of sensors, actuators, and communication devices, if applicable, used to enable the proposed service and their capabilities and limitations.
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Talent Development:

Program Performance Data	
Expected Analytical Outcome: <ul style="list-style-type: none"> • Measure economic benefits to the Province 	
<ul style="list-style-type: none"> • Number of applications received • Number of internships and fellowships granted or completed • Academic institution Participants • Jobs created or retained • International exports • Follow-on investment received • Incremental sales (in Canada and internationally) • Number and type of events hosted 	
Expected Analytical Outcome: <ul style="list-style-type: none"> • Identify talent needs and opportunity areas 	
Talent Characteristics	
All Applications	<ul style="list-style-type: none"> • Discipline • Level of education • Job title • Responsibilities

Appendix 2

OCE Research & Analysis

OCE will also conduct its own research, outside of data collected from the four AVIN programs, to support increased knowledge and awareness around C/AV technologies in Ontario and to support the C/AV ecosystem. Topics could include, but are not limited to, the following:

- Potential risks associated with the deployment of C/AV technologies.
- Potential adoption scenarios.
- Features of the infrastructure facilitating the operation of C/AVs.
- Obstacles or features that limit navigation of C/AVs.
- Potential technology upgrades to improve the performance of C/AVs.
- Information that can be collected from and disseminated to C/AVs and its associated operational opportunities.
- Infrastructure modifications required to enable C/AV operations (e.g. signage, markings, geometric standards, and lighting).
- Environmental and social impacts of C/AV technologies.
- Surface and structural impacts of C/AVs (e.g., road weight capacity requirements for truck platooning, wear and tear resulting from C/AV driving patterns, and recommended road configurations).
- Likelihood of various "end game" scenarios for private vs. shared AVs (e.g., ownership leads, on-demand leads, or split outcome.) and the drivers for each scenario including: likely owners and ownership structure, and vehicle / operation cost.
- Projected market penetration and rate of adoption of C/AV technologies.
- Timeframe for technology availability and anticipated early adopters.
- Consumer behaviour and the public awareness of available technologies and providers
- Consumer preferences and the perceived needs for government involvement, oversight, and control.
- Applicability of C/AV technologies to enable the first mile and last mile connections for transit trips.
- Potential transit applications of C/AV technologies.
- Applications of C/AV technologies in fleet management, traffic management, and transportation demand management.
- Applications of C/AV technologies in urban logistics.
- Applications of C/AV technologies in rural and remote transportation services.
- Potential benefits of C/AV technologies to support mobility-reduced and marginalized populations.
- Ride sharing and ride hailing applications of C/AVs.
- Accessory or back-up technologies external to the vehicle needed to support C/AV operation (e.g., remote computing, human operator, dispatch service).
- Regulations, requirements, programs, plans, and strategies related to C/AV.