



## **CANARIE ANNUAL REPORT**

for

Innovation, Science and Economic Development (ISED) Canada

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## 1. Overview

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### Context for CANARIE

CANARIE's role in Canada's innovation ecosystem was set out in its 1993 Articles of Incorporation, and reiterated in its 2013 Articles of Continuance: *to contribute to Canadian competitiveness in all sectors of the economy, to wealth and job creation and to the quality of life of Canadians.*

Throughout its history, CANARIE has evolved to support Canadian competitiveness through the development and deployment of digital technology for Canada's research, education and innovation communities. Over the course of its 28-year history, CANARIE has helped shape Canada's digital landscape by leading, among others, the following initiatives, many of which were incubated at CANARIE before being spun out into the community:

- laying the groundwork, with provincial partner networks, for the first commercial Internet in Canada;
- incubating the Internet Registration Authority in Canada, now known as CIRA;
- supporting hundreds of Canadian businesses, educational and health organizations in their transition to digital models and processes via the Technology Development, Technology Diffusion Program; Technology Applications Development Program; and E-business, E-learning and E-health Programs;
- working with global peers to align international research and education infrastructures to support globally collaborative research;
- developing the grid certificate authority in Canada that provides secure access to data generated from the Large Hadron Collider and other advanced digital technologies;
- identifying gaps in research software and championing the development of powerful research software tools to accelerate discovery; and
- supporting Research Data Canada to align research data activities within Canada and internationally.

CANARIE's activities serve to continually advance Canada's digital infrastructure for research, education and innovation so that Canadians are positioned to compete in the global knowledge economy. More detailed information on current activities may be found below.

### Executive Summary

CANARIE's Contribution Agreement for 2020-2024 with Innovation, Science and Economic Development (ISED) Canada requires the organization to "provide to the Minister, by July 31 of each Fiscal Year, beginning in 2021, an Annual Report approved by the Board, in both official languages relating to the previous Fiscal Year." This report addresses those requirements.

Over the past year, CANARIE has executed on all eligible activities outlined in its 2020-2021 Business Plan. These eligible activities align with CANARIE's core purpose: **the advancement of Canada's knowledge and innovation infrastructure**, and its mission: **to design and deliver digital infrastructure, and drive its adoption for research, education and innovation**. At a high level, through its programs, CANARIE works towards achieving these objectives by:

- overseeing the ongoing evolution of Canada's National Research and Education Network (NREN);
- supporting a collaborative approach to improving cybersecurity in the research and education ecosystem;
- championing the development of research software, research data management, and collaboration tools; and
- providing users in the private sector with access to advanced technologies to accelerate their time to market.

Together, these activities align to deliver more integrated and accessible digital research infrastructure, tools and services. Beyond these activities, CANARIE also champions the evolution of Canada's digital research infrastructure - such as supporting the developing of the New Digital Research Infrastructure Organization (NDRIO) - which is a critical lever driving social and economic gains that benefit all Canadians.

### **Network Evolution**

As the primary role of the CANARIE network is to provide interprovincial and international connectivity for Canada's National Research and Education Network (NREN), CANARIE works closely with provincial and territorial network partners that build and operate regional networks in their province or territory to co-deliver services to the Canadian research and education community. Through a governance structure which is led by the NREN Governance Committee, this successful federal/provincial partnership manages the evolution of the NREN as a whole to ensure that Canada's research, education and innovation communities can access nationally and globally distributed data, tools and colleagues.

CANARIE understands the impact of increasing amounts of digital data on research, education, and innovation, and has evolved the national backbone network to ensure Canada's research and education community can continue to access and leverage these data to support world-class research. Due to the COVID-19 pandemic, which saw most students studying off campuses, data traffic decreased approximately 18.5% from FY20 to FY21, though we expect traffic levels to recover in the near future.

Given the foundational nature of the network to a wide range of research, education, and innovation activities, CANARIE focuses on both its core network and the ongoing strategic evolution of Canada's NREN. Of particular note is the on-going execution of the 2020-2024 NREN Strategic Plan, which supports the federal-provincial partnership that is the cornerstone of Canada's NREN.

CANARIE continues to represent Canada in the international advanced networking community, participating actively in the NREN CEO Forum, including chairing the Financial Benchmarking Working Group, the Global Marketing Communications Group (SIG-Marcomms), and the Global R&E Network Advancement Group (GNA-G). CANARIE's CFO also sits on the Programme Committee for TNC, the global NREN conference run by the pan-European network GÉANT. CANARIE's participation in these and other communities ensures that Canada's digital research infrastructure evolves to enable Canada's research and education communities to participate and lead globally collaborative research.

CANARIE supports mission-critical research at a range of government laboratories. As well, a CANARIE representative sits on Shared Services Canada (SSC)'s IT Infrastructure Roundtable to provide unbiased information and expertise to assist SSC in network and network-based services planning and execution. CANARIE is increasingly called upon to provide objective advice to government partners regarding new technology initiatives and opportunities for Canada.

### **Collaboration Tools**

Under the Canadian Access Federation (CAF) service umbrella, CANARIE enables Canadian students, faculty and staff to securely access remote resources using digital identities from their home institutions. This service enables seamless access to protected online content, and to campus Wi-Fi networks through *eduroam*. CANARIE continues to see significant growth in the use of these services and to evolve the technical and administrative infrastructures that support Canada's increasingly mobile cohort of students, faculty and staff.

At the onset of the COVID-19 pandemic, the *eduroam* service experienced a reduction in use between March and April of 2020. Since then, the use of *eduroam* continues to increase, given the need for secure access to online resources close to home and as attendance on campuses gradually recover.

### **Cybersecurity**

Cybersecurity is a growing concern for all sectors, but institutions in the research and education sector operate in a uniquely complex environment: large and mobile user bases; policies that support "bring-your-own device" to campus; and significant amounts of IT infrastructure outside the purview of central IT. These organizations also hold a large amount of data of value to cybercriminals, including personal data of staff, faculty and students, and research data.

Not only has CANARIE undertaken significant work itself and with our NREN Partners to ensure the security of the foundational digital research infrastructure supporting these institutions, but it is also working with the community to strengthen the whole sector with advanced technologies, improved processes, and broadened expertise. This work started in CANARIE's previous mandate with the launch of the Intrusion Detection System pilot and Call 1 (then called the Joint Security Project Pilot and Call) , and has evolved with the launch of the Cybersecurity Initiatives Program (CIP) in FY21 all under the Joint Security Project.

CANARIE is working to engage the broad community to drive all elements of the CIP, most importantly, its governance, in order to drive the evolution of cybersecurity related services for the sector. The Cybersecurity Advisory Committee (CAC) and its standing committees represent Canada's research and education institutions and supporting organizations, and advocate for the priorities, realities, and challenges of the sector.

### **Research Software**

Recognizing that software is essential infrastructure to support access to data and its computation, CANARIE has invested in research software tools since 2007. CANARIE's long-term vision is to enable software reuse and software development best practices within Canada's research community. Through its Research Software Program, CANARIE has spearheaded the development of 146 reusable software

tools and is now supporting the onboarding of new researchers onto existing research software tools. In order to maximize the impact of these investments, these software tools are available to all researchers.

CANARIE's most recent funding calls have added support for the modification and maintenance of existing research software platforms to meet the needs of research teams, and funded local software expertise on campuses to enable and support the use of research software tools.

### **Research Data Management**

Since 2014, CANARIE has been providing funding for Research Data Canada (RDC) and its programs, enabling opportunities for greater integration of the elements of digital research infrastructure. RDC's Executive Director works with stakeholders to develop the policy frameworks that enable reuse of research data resources. This initiative not only represents an opportunity to address a gap in Canada's digital research infrastructure, but also leverages and informs CANARIE's Research Software, Canadian Access Federation, and DAIR programs.

Most recently, CANARIE launched a Research Data Management program to fund the development of national data management tools and software. The program has funded 14 research teams over two calls to develop software components and tools to enable Canadian researchers to adopt best practices in managing data resulting from scientific research.

### **Private Sector Innovation**

CANARIE enables users in the private sector to leverage digital infrastructure to accelerate the commercialization process. The Digital Accelerator for Innovation and Research (DAIR) Program has supported over 1,600 small and medium-sized enterprises (SMEs) to test and develop a range of novel Information and Communications Technology (ICT) products and services. The DAIR Program provides SMEs with an opportunity to benefit from the scale and agility of cloud resources (computing and storage resources that are located in distributed data centres). Deploying these advanced technologies provides businesses with an opportunity to test and develop innovative products at no cost, which both speeds time to market and reduces development costs. Further, the opportunity to deploy cloud technologies in early product development is a powerful demonstration of how these technologies can transform traditional business models and serves to further incent businesses in adopting cloud technologies as part of their long-term business strategy.

Additionally, to support the use of other emerging technologies that can leverage cloud resources, CANARIE launched the DAIR "BoosterPacks" initiative. Boosterpacks are curated packages of resources on specific emerging technology, available for free, built by experienced Canadian businesses. CANARIE enlists experienced Canadian businesses – "BoosterPack Builders" – to curate their knowledge and expertise with specific emerging technologies. The goal of each BoosterPack is to help SMEs get to market faster by benefiting from some of the tips and resources that helped the Builders, while avoiding some of their pitfalls.

CANARIE continues to promote the use of DAIR and the transformative power of cloud technologies through a range of media, and a range of case studies, published on the CANARIE website, which highlight these businesses' use of DAIR and the tangible competitive value delivered through the use of cloud infrastructures to the SME community.

To advance Canada's leadership in networking technology, CANARIE is a founding partner in the Centre of Excellence in Next Generation Networks (CENGN). CENGN is a consortium of industry, academic, and research leaders who are pooling their expertise and equipment to enable SMEs to test new products at scale, with the goal of accelerating the commercialization of Canadian networking technologies in the global marketplace. CANARIE continues to provide connections and support to stakeholders in the private and public sectors that underpin CENGN.

### **Partnerships and Community Engagement**

CANARIE continues to engage with a broad range of stakeholders to ensure its activities align with changing community needs, including NDRIO, the CFI, Compute Canada, Universities Canada, the U15, CUCCIO, CAUBO, Colleges and Institutes Canada, Polytechnics Canada, Genome Canada, and the granting councils. CANARIE is working extensively with NDRIO and the broader community to ensure the smooth transition of Research Software and Research Data Management Activities to NDRIO by the end of FY22. Additionally, CANARIE is working closely with NDRIO to ensure the DRI ecosystem functions seamlessly for users. A new Joint DRI Ecosystem Plan developed by the two organizations was submitted for the first time in January 2021, and the results will be reported on in the inaugural Joint DRI Ecosystem Report in July 2022.

CANARIE's role in the digital research infrastructure landscape continues to solidify through premier events such as the CANARIE National Summit, which will return in 2022, speaking opportunities for CANARIE staff at provincial, national, and international events and conferences, through ongoing updates to its corporate website (which was recently refreshed) and social media platforms, and with outreach/educational materials.

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On behalf of the Board of Directors, CANARIE would like to thank the Minister and officials at Innovation, Science and Economic Development Canada, for their continued support and confidence in CANARIE. CANARIE looks forward to providing Canada's research, education, and innovation communities in the public and private sectors with world-class digital research infrastructure, so that Canada can grow its innovation capacity and compete and win in the global digital economy.

## 2. Statement of Eligible Activities for 2020-21 and Report on the Extent to Which CANARIE Met the Expected Results

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Throughout its 2020-2024 mandate period, CANARIE will support the Government of Canada's DRI Strategy. CANARIE's activities in the first year of this mandate were aligned with "ensure that Canadian researchers have the digital tools they need to support scientific excellence."<sup>1</sup>

CANARIE's three eligible activities in the 2020-2021 Business Plan are detailed below. A report on the extent to which each eligible activity was achieved is contained in the paragraphs following.

### 2.1 Network Operations

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#### **Evolve/extend Canada's world-leading collaboration network**

In order to address the evolving needs of users in research, education and innovation communities, CANARIE will enable a pan-Canadian collaboration capability through a world-leading high performance network and network-based services.

#### ***CANARIE Network:***

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To evolve and expand the CANARIE network in a flexible and cost-effective manner over the long-term, CANARIE's vision is to deploy fibre, where economical, from coast-to-coast across Canada. In high-use, high-growth network corridors, CANARIE has purchased long term use of fibre and therefore has the flexibility to add capacity and deploy transformative technologies at a considerably lower incremental cost. To further build out the network, CANARIE uses leased services from suppliers where the traffic demand does not warrant dedicated fibre, for service resiliency, or when fibre acquisition is cost prohibitive.

#### ***Deployment of additional network capacity to support traffic growth***

CANARIE completed the work with ORION for a 100Gbps circuit from Winnipeg to Sudbury. This new circuit was being interconnected with the existing circuit between Toronto and Ottawa to establish a redundant service supporting CANARIE network nodes in Winnipeg, Toronto and Ottawa. This integrated service will strengthen the network connectivity east of Winnipeg. In the Atlantic region, CANARIE added two 100Gbps circuits from Montreal into Halifax. These two 100Gbps circuits serve two sites in Montreal, providing network redundancy from Montreal into the router in Halifax.

#### ***Deployment of additional network capacity to support Northern connectivity***

CANARIE completed a service upgrade to Yukon to a 300Mbps service. CANARIE continues working with Northwest Territories to assess the connectivity needs supporting network evolution in the territory.

*The top five CANARIE network users in 2020-21 were:*

*Simon Fraser University, SHARCNET, TRIUMF, the University of Victoria, and the University of British Columbia*

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<sup>1</sup> <https://www.ic.gc.ca/eic/site/136.nsf/eng/home>  
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### ***Improved core node reliability to provide network continuity under certain failure conditions***

CANARIE added two network nodes, one in Vancouver and the other in Montreal, in FY20. In early FY21, CANARIE added 100Gbps circuits into these nodes to interconnect them to existing network nodes in metro Vancouver and Montreal, to improve network redundancy. These additional services enhanced inter-site connectivity and backbone resiliency.

### ***Improvement of network security monitoring and measurement system***

CANARIE has been working with our NREN partners in defining best practices and mitigation processes to handle Distributed Denial of Service (DDoS) attacks. This collaborative work aims to define a common model for reporting DDoS events, as well best practices to mitigate DDoS attacks. An NREN DDoS Working Group has been struck; they have drafted a DDoS support and communications document.

### ***Deployment of the Software Networking Applications***

CANARIE continues to collaborate with its Advanced North Atlantic (ANA) partners to expand the software networking experiment to include other international NRENs and advanced networking research groups. In FY21, CANARIE collaborated with SURFnet, CERN, and TRIUMF to test a new way of triggering network capacity increase through software application. This new approach will improve Large Hadron Collider (LHC) data distribution more effectively from CERN into Tier 1 data centres such as the one at TRIUMF. The CERN team will schedule further tests in the coming year.

### ***Deployment of support tools accessible through the user portal***

CANARIE continues to enhance its network support toolset to manage the network more effectively. In FY21, CANARIE deployed an enhanced notification tool to inform users of outages and maintenance. CANARIE will further the deployment of this tool, integrating it with other systems in the coming year. In addition, improvements were made to the data collection of network traffic stats and the method of report generation.

### ***Development of commercial cloud support strategy***

CANARIE has concluded that establishing direct connections with large content providers at strategic locations, such as Vancouver, Toronto, and Montreal, provides greater flexibility to increase capacity as needed. In FY21, CANARIE implemented direct connections with Amazon (all three locations) and Microsoft (Vancouver and Toronto).

### ***Launch of the Global Research and Education Network (GREN) Map***

CANARIE is leading a distributed team of software developers to realize a real-time map of the reach of the global research and education network (GREN). This network of research and education networks allows Canadian researchers to work with peers and data in nearly every country in the world. Data from Canada's NREN is serving to validate the mapping software, and a full demonstration is expected to be ready in June 2021.

***Continue to support connections to government research facilities that meet the performance needs of the government science community***

CANARIE continues to work with Shared Services Canada (SSC) on building the Government of Canada Science Network (GCSN), migrating other department connections as needed, and activating new connections if necessary.

***Provide sustainable cybersecurity monitoring service by efficiently managing and integrating the SIEM (Security Information and Event Management) systems deployed on CANARIE infrastructure and network, and at each NREN Partner location***

Following a joint RFP, the Fortinet SIEM was deployed both on CANARIE infrastructure and at ten NREN Partners. Each SIEM system is operated by at least one local Security Analyst, and these Analysts have formed a community which has been engaged in developing in-house expertise and capabilities to sustain incident response mechanisms for each organization. The community continues to evolve and is working on knowledge sharing related to SIEM Metrics, Use Cases, and Common Operating Procedures, including Incident Response.

***Operate the Distributed Denial of Service (DDoS) detection system dedicated to the CANARIE network and actively collaborate with NREN Partners on validation of incident data and delivery of mitigation options***

In FY21, CANARIE finalized the deployment of ARBOR – NETSCOUT Distributed Denial of Service (DDoS) Sightline detection platform. This system has traffic remote monitoring capabilities and is able to investigate data flows collected from across the CANARIE network. Detection of DDoS attacks can be manually or automated mitigated by CANARIE, and incident escalation procedures were developed to enhance CANARIE collaboration with our NREN Partners when a DDoS attack requires a consolidated mitigation effort.

***Promote and implement in-house cybersecurity expertise development for CANARIE's dedicated security staff and the NREN security analyst community***

CANARIE continues to grow its cybersecurity expertise in relation to deployed tools (SIEM; Sightlight; Intrusion Detection System), and as such CANARIE was able to successfully resolve all support cases and provide remote assistance to institutions using the Intrusion Detection System.

**Other Achievements – Network:**

***Ottawa Point of Presence (PoP) Relocation***

In June 2020, our co-location provider in Ottawa informed CANARIE that they were planning to shut down the co-location site at the end of March 2021 and required CANARIE to vacate the space by then. Immediately, CANARIE searched for new potential sites in Ottawa for our Point of Presence (PoP), with the University of Ottawa identified as the most appropriate location. CANARIE worked diligently with the University of Ottawa and our partners, including ORION and RISQ, throughout the migration, which was executed smoothly despite challenges related to COVID-19 health and safety protocols.

### ***International Partnerships – NREN CEO Forum***

CANARIE continues to participate as a member of the Global NREN CEO Forum. This forum brings together the CEOs of 17 national research and education networks to collaborate on the global evolution of critical digital infrastructures and associated services. In spite of a lack of face to face meetings due to the COVID-19 pandemic, the forum continued to meet regularly on a virtual basis. The forum provides an opportunity for Canadian representation on a broad range of global research and education initiatives that include networking evolution, shared marketing collateral, and identity management.

### ***International Partnerships – Global Network Advancement Group (GNA-G)***

CANARIE was actively involved in the Global Network Architecture (GNA) initiative with the goal of defining a reference architecture and creating a roadmap for both national and regional research and education networks to more seamlessly support research. This group has evolved into the Global Network Advancement Group (GNA-G), to provide a broader effort that will establish more capable, predictable, cost-effective, and resilient next-generation global connectivity for research and education. CANARIE's CEO serves as the Executive Liaison between the GNA-G leads and CEOs of R&E networks globally.

### ***Canadian Access Federation:***

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CANARIE works with stakeholder groups to identify demand for network services and collaborates with national and global partners to deliver them. Currently, CANARIE is the national operator of the Canadian Access Federation (CAF), which enables Canadian students, faculty, and staff to access protected online content using their home institution digital identities through its Federated Identity Management (FIM) service. Institutions participating in CAF also benefit from the *eduroam* service, which provides students, faculty, and staff with secure access to Wi-Fi at the participating site they are visiting, by using their home institution's credentials.

### ***Increased adoption of CAF services***

In 2020-21, participation in the Canadian Access Federation increased from 188 to 204 organizations. Participants continue to benefit from the *eduroam* service as the need for secure access to online resources close to home has increased. In 2020-21, CANARIE supported 89.9 million *eduroam* inter-institutional logins.

### ***NREN Program:***

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Canada's National Research and Education Network (NREN) operates on a co-delivery model, as a partnership between CANARIE and provincial/territorial NREN Partners. CANARIE provides interprovincial and international connectivity, while the NREN Partners provide connections to institutions and organizations within their jurisdictions. NREN Partners' data that travels out of a province or territory traverses CANARIE network links to NREN Partners in other provinces or territories, or internationally via CANARIE links connecting Canada to the rest of the world.

A coherent technical and strategic evolution of the NREN as a whole is driven by a vision to ensure that Canadians from coast to coast to coast have a comparable user experience within Canada, and to users

of NRENs in other countries. CANARIE's NREN Program provides funding for NREN Partners to increase the capacity and reliability of existing equipment and infrastructure; to enable network management (tools and training); and to extend the reach of NREN Partner networks to more institutions.

#### ***Interconnection Agreements executed with all CANARIE-approved NREN Partners***

Interconnection Agreements were executed with 13 NREN Partners for the course of CANARIE's 2020-2024 Mandate.

#### ***Completion of first competitive funding call issued to meet NREN Partner networks' requirements***

The first of two calls of the Competitive funding component of the NREN Program was launched via a ranked Expression of Interest which closed on May 7, 2020. Eligible projects were then invited to submit full proposals by August 31, 2020. Six projects from across the NREN were selected for funding in this first round of competitive funding.

#### ***Technical audits of funded projects***

No technical audits of NREN Projects were required in FY21.

#### ***Increased reliability, capacity, and security on network segments shared by NREN Partners***

CANARIE completed the work with ORION for a 100Gbps circuit from Winnipeg to Sudbury. This new circuit interconnected with the existing circuit between Toronto and Ottawa to establish a backup service to increase network availability of CANARIE network nodes in Winnipeg, Toronto, and Ottawa.

#### ***Increased NREN security through continuation of the NREN SIEM Project***

Ten partners in the NREN participated in the NREN SIEM Project, which began with a national joint procurement of a Security Information and Event Management (SIEM) tool at NREN partners. The project also incorporated the hiring of dedicated Cybersecurity Analysts at NREN partners, thereby creating a community of security practitioners across the country. This dedicated group of Cybersecurity Analysts work together to protect the NREN community by efficiently leveraging resources and best practices; creating a national view with local implementation.

#### ***Development and launch of projects to enhance security***

The NREN launched a Working Group to implement MANRS (Mutually Agreed Norms for Routing Security) across the NREN.

#### ***Completion of an updated strategic plan to support the evolution of the NREN***

The 2020-2024 NREN Strategic Plan was developed by the NREN Governance Committee and approved in August 2020. The plan identifies four main areas of focus for the current mandate; NREN Evolution, Network, Cybersecurity, and Communications.

#### ***Nunavut NREN Partner***

In August 2020, CANARIE signed an agreement with Nunavut Arctic College for the college to become the NREN Partner in Nunavut, thereby completing the Canadian NREN. In the short term, CANARIE will

support the technical and administrative development of its newest NREN Partner to optimize and secure access to research and education resources for all Nunavummiut.

## **Other Achievements – NREN**

### ***NREN Assembly***

CANARIE facilitated the third NREN Assembly – the first held online – in October 2020, bringing together staff from across the NREN. The event provides an opportunity for NREN staff to learn more about what is taking place across the entirety of the Canadian NREN, and to develop operational priorities for the coming year.

### ***NREN Summit***

In December 2020, the Canadian NREN Partners, including CANARIE, hosted the first NREN Summit, which featured speakers looking at how Canadians leveraged our national, digital infrastructure ecosystem to support mission-critical activities such as education, research, and cybersecurity.

### ***Financial audits of the NREN SIEM Project***

All 10 projects have been scheduled for audits which are in progress.

### ***Cybersecurity Initiatives Program:***

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In response to the need identified by Canada’s research and education community for national coordination and alignment of cybersecurity efforts, CANARIE invests in initiatives that will strengthen the whole sector with advanced technologies, improved processes, and broadened expertise. These initiatives are delivered to eligible organizations through the provincial and territorial partners in Canada’s National Research and Education Network (NREN).

### ***Continue to evolve the Joint Security Project (JSP); and launch new cybersecurity funding program(s) based on the development of a national cybersecurity framework***

In line with CANARIE’s goal of strengthening the overall security of the NREN and the organizations connected to it, CANARIE launched its Cybersecurity Initiatives Program (CIP) in November 2020. The CIP funds initiatives that are recommended by the Cybersecurity Advisory Committee in order to support a community led evolution of the JSP.

Initiatives funded by the CIP will support the evolution of a complementary set of capabilities at all layers - from local to national - which collectively support the goal of enhancing the overall cybersecurity posture of the sector. Funding will support activities that address priorities or gaps with the greatest potential to advance cybersecurity posture across the broadest portion of the ecosystem. Additionally, funded initiatives must allow all NREN-connected eligible organizations to participate in and/or benefit from initiatives.

The first initiative launched under the CIP was the CIRA DNS Firewall, which provides protection against malware and phishing attacks by blocking access to malicious websites.

***Collaborate with over-the-network security offerings such as CanSSOC, and work to provide integrated security solutions***

CANARIE continues to work closely with a number of organizations, including the institutions supporting CanSSOC, with the goal of making the integration of security services more seamless to eligible organizations. To this end, CANARIE will be funding the Threat Feed developed by CanSSOC institutional partners via the CIP to eligible organizations in FY22.

**Other Achievements – CIP**

***Cybersecurity Advisory Committee***

To support the development of ecosystem-wide approaches to cybersecurity, and to advise on the evolution of CANARIE's CIP, CANARIE has struck a Cybersecurity Advisory Committee (CAC), made up of representatives from academia, not for profit organizations, and the private sector. Additionally, there are three standing committees and a working group reporting into the CAC, in generate input from specialists in specific areas related to cybersecurity technology, implementation, identity management, and metrics.

**2.2 Technology Innovation:**

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***Research Software Program:***

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In order to address gaps in research infrastructure and leverage existing investments in research software, CANARIE supports the creation of technologies to bring new collaboration capabilities, not previously offered, to the research community. The Research Software program currently focuses on three principles: funding software re-use and adaptation, to minimise development efforts; promoting research software best practices; and supporting long-term software sustainability.

***Maintain visits to science.canarie.ca consistent with FY20 levels***

CANARIE continues to maintain and promote the software portal at science.canarie.ca to encourage the reuse of existing research software tools. There were 65,003 visits to the portal in 2020-21, compared to 59,034 in 2019-20.

***Enhanced documented metrics and best practices for the Local Research Software Support Initiative***

Best practices and metrics that demonstrate the value of Local Research Software Support to institutions were developed in conjunction with the 3 institutions that participated in the pilot. This information was made available to applicants under Local Research Software Support Call 1 to inform their project plans.

***Execution of the development and maintenance portions of projects funded under Call 2a, 2b and 3***

Research Software Calls 2a, 2b, and 3 were launched in 2016, 2018 and 2020 respectively, to support the adaptation of existing platforms to support new users. CANARIE continued to monitor the maintenance activities of the projects funded under Calls 2a and 2b until the completion of the Calls in September 2020.

### ***Selection and execution of the first year of projects under Local Research Software Support Call 1***

Eighteen (18) proposals were received under Local Research Software Support Call 1 and six (6) institutions were selected to participate. All 6 of these institutions added staff to their Local Research Software Support teams, engaged researchers and are currently working on software projects.

### ***Financial audits of funded projects for Calls 2a, 2b and the Local Research Software Support Call 1***

Audits have been completed for 9 projects, another 18 are in progress.

### ***Canadian Research Software Conference (CRSC) 2020 held and feedback from attendees documented***

Due to the COVID-19 pandemic, CRSC 2020 was cancelled. CRSC will return in 2021 as an online event.

### **Other Achievements – Research Software**

#### ***Execution of projects funded under the Local Research Software Support Pilot***

The Local Research Software Support Pilot was launched in 2018 at 3 pilot institutions. Teams of software developers dedicated to providing research software support across disciplines at the institution were funded. CANARIE continued to monitor the activities of the pilot teams until the completion of the Pilot in March 2021.

#### ***Research Data Management:***

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In response to consistent community feedback that identified the need to coordinate activities in research data management, CANARIE took action and provided funding to support Research Data Canada in 2014. RDC's overarching goal is to improve the management of research data in Canada so that it is broadly available to support knowledge creation and innovation. CANARIE was given the mandate to support RDC in its 2015 Contribution Agreement, and an Executive Director was hired in 2016.

Members of the community presented the need for the development of software tools to bridge gaps in the Research Data Management ecosystem. As a result, CANARIE launched a Research Data Management (RDM) program in 2017-18 to fund the development of RDM tools.

#### ***Execution underway for all approved projects in Research Data Management competitive calls***

Execution is underway for all the projects funded under Call 2.

#### ***Development of an action plan for RDC's outreach efforts, including Canada's National Data Services Framework***

RDC's Roadmap for 2020-22 was approved in 2019 and has 3 main areas of focus: Embedding the National Data Services Framework (focused on facilitating the adoption of best practices in RDM); Building International Linkages and Partnerships; and Strengthening the RDM Ecosystem During NDRIO Transition. As of May 2021, most of the actions in the Roadmap have been completed.

In March 2021, RDC hosted the 2021 National Data Services Framework Summit, with the theme of "Crafting the Canadian Open Research Commons". This theme led to a focus on developing a digital

research infrastructure ecosystem that is available to all Canadian researchers, and that is interoperable at a global level. The discussions and outputs of the Summit are being transformed into a document which will be open for community consultation, before being finalized and sent to participants and appropriate stakeholders.

### ***Financial audits of Call 1 funded projects completed***

Audits have been completed for 7 projects; another 2 are in progress.

### ***Development and use of RDM services, tools and platforms that enable Canadians to adopt RDM practices and comply with evolving funder policy***

RDC facilitated the adoption of RDM best practices in FY21, but some of these efforts were impacted by the delay in the launch of the Tri-Council data management policy.

### ***Development of end-of-project metrics that demonstrate the impact of targeted funding to the RDM community***

CANARIE's funding for CARL-Portage was completed, and relevant metrics will be submitted to the Government of Canada as part of CANARIE's Performance Report.

## **2.3 Private Sector Innovation**

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CANARIE seeks opportunities to leverage digital infrastructure and tools to maximize the use of transformative technologies and drive increased innovation and commercialization. CANARIE currently participates in two major initiatives to support ICT sector innovation and commercialization.

### ***DAIR Program:***

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In order to leverage CANARIE resources to stimulate commercialization, CANARIE delivers a cloud-based program, the Digital Accelerator for Innovation and Research (DAIR), that enables advanced ICT research and development, providing an opportunity for entrepreneurs to accelerate time-to-market. DAIR offers powerful cloud computing resources to small and medium-sized enterprises (SMEs) to accelerate their product development timelines. DAIR exposes users to the power of cloud technologies to transform traditional business models and provides these businesses with an opportunity to adopt these technologies as part of their long-term growth strategy.

### ***Continued increase in the total number of DAIR users to beyond 1500 by the end of FY21***

The aggregate number of DAIR users as of April 1, 2021 was 1,622 which is up from 1,390 in the prior year.

*Hubert Sugeng,*

*Director of Engineering, BluWave-ai:*

*"As a start-up, careful allocation of funds is critical to success and using the DAIR Cloud allowed us to direct more funds into product development instead of worrying about cloud infrastructure."*



### ***New features added to the DAIR cloud platform***

Several cloud technology enhancements were added to the DAIR cloud platform to support participant needs including the high demand request to manage Docker clusters and containers and deploy custom automations.

Additionally, upgrades were made to the cloud broker tools to support enhanced notification and reporting services for participants and CANARIE's use.

### ***Content released to educate SMEs on cloud independence and security in the cloud***

DAIR continues to develop educational tools and fora for the start-up and SME community. This year saw the publication of two additional technical tutorials to support adopting cloud technologies, along with quarterly technical webinars that were made available on demand as part of the growing resource library for DAIR participants. The communication channel among DAIR participants continued to evolve and saw the added benefit of participants increasingly relying on each other to provide support and knowledge.

### ***Report initial findings and outcomes of the BoosterPack pilot based on user consultation or questionnaire***

A questionnaire was distributed to DAIR participants in support of the final evaluation report of the DAIR BoosterPack Pilot Project. Key findings included: overall SMEs polled agreed that the DAIR pilot provided high value, public awareness of the BoosterPack catalogue continues to grow with an increasing number of Canadian SMEs viewing these documents, and pilot users reporting the ability to re-use sample code to speed development of their own product. The quality of the code was rated as "above average to excellent." Users claimed that using BoosterPacks led them to consider incorporating newer technologies into their product.

### ***Monitor ongoing cloud usage patterns of SMEs as they develop and test cloud-based applications and services***

DAIR updated the participant model and upgraded the DAIR cloud broker tool to support developing enhanced data collection related to participant usage patterns and services in use by cloud provider on the DAIR cloud platform. This will allow for detailed reporting of services in use to support program planning and prioritization for future enhancements to the DAIR cloud platform.

### ***Provide additional BoosterPack Tutorials, in order to reduce the time and cost for SMEs to develop new technology skills***

CANARIE launched the fifth DAIR BoosterPack in Winter 2021, built by DAIR graduate BigBitBus. The new "Automate Cloud Orchestration with Kubernetes" BoosterPack supports SMEs adopting cloud containerization technology and helps Canadian SMEs to "kick-the-tires" on Kubernetes and leverage their inherent vendor agnostic approach. CANARIE remains on pace to launch 16 BoosterPacks during the 2020-2024 Mandate.

***Further advance the partnership between DAIR and CENGN, making participant transitions between programs more apparent and seamless***

DAIR continued to work directly with CENGN on joint referral opportunities for the SME community through targeted communications of each program's benefits to current and potential participants, sponsorship of community events, including the CENGN Summit, and an event at Invest Ottawa. Discussions are ongoing to support test bed infrastructure development for SMEs in Canada.

**Other Achievements – DAIR**

***Innovation and Commercialization Committee***

To ensure that CANARIE initiatives evolve to remain effective and relevant to Canada's private sector, CANARIE has struck a new Innovation and Commercialization Committee (ICC). The ICC includes a range of participants from across the innovation ecosystem, including DAIR graduates, and participants from business incubators/accelerators, higher education knowledge transfer offices, and other private sector enterprises, to provide CANARIE with guidance on initiatives that support Canadian businesses' adoption of transformative technologies. The Committee met for the first time in March 2021.

***Centre of Excellence in Next Generation Networks (CENGN):***

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**Overview of CENGN**

CANARIE is a founding partner in the Centre of Excellence in Next Generation Networks (CENGN). CENGN is a consortium of industry (including Juniper, Cisco, Nokia, EXFO, Bell, TELUS), academic, and research leaders who are pooling their expertise and equipment to lower the barrier to market entry for SMEs and researchers.

CENGN was awarded an initial \$14 million in funding by the Networks of Centres of Excellence program in 2014 (for 2014-2021) and created the governance structure and technical and staff infrastructure to take on projects beginning in mid-2015. Subsequent, and larger, investments by the Government of Ontario in Budget 2017 have allowed CENGN to further increase their programming.

***Additional participants in CENGN will be able to leverage the CANARIE network to support advanced testing and demonstration of new ICT products and services***

CANARIE continues to play a key role in this initiative as CANARIE network resources are made available to support test-bed infrastructure for new product validation and testing.

**2.4 Activities Supporting Equity, Diversity, and Inclusion**

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CANARIE is supportive of the diverse communities it serves, and as such, is committed to activities that advance Equity, Diversity, and Inclusion (EDI).

CANARIE continues to support the growth of a diverse workforce. All job postings commit to providing accommodations upon request by any candidate. CANARIE also strives for diversity in its Board composition supported by the CANARIE Board Diversity Policy. That policy states: "ensure the Board composition includes a diverse set of perspectives, which reflects our core stakeholders and the varied personal and demographic characteristics of Canadian society."

### ***Development of an Equity, Diversity, and Inclusion advancement plan***

CANARIE has been working closely with NDRIO to support approaches to EDI which are shared between the two organizations. The two organizations have struck a Joint EDI Working Group, and a series of training sessions with key individuals from both organizations (including all members of Senior Management and a Board representative) have been scheduled for April and May 2021.

### ***Development of an NREN Equity, Diversity, and Inclusion plan***

CANARIE will be working with the NREN to develop an approach to EDI training in FY22.

### **Other Achievements – EDI**

In addition to activities which are carried out explicitly for EDI purposes, a number of other CANARIE activities have a strong positive impact on improving EDI. Examples of these in FY21 include: internally, supporting CANARIE staff members with young families during COVID-19 school closures by extending the CANARIE French language training availability to staff's school aged children; and externally, by working to extend the NREN into Nunavut, thereby working to improve the digital divide that effects Canadians living in rural and northern communities.

### **3. Update on Activities Funded Under the 2015-2020 Mandate**

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As is normal practice, CANARIE allocated funds under its 2015-2020 Mandate to be dispersed in the months immediately following the mandate. All of these activities are included in Section 2.0, but for clarity, these include related to:

- NREN SIEM Project
- JSP Platform Project
- RS Platform Calls 2a and 2b
- Research Software Local Support Pilot
- RDM Call 1
- Canadian Association of Research Libraries' (CARL) Portage Network

There was an underspend on the CARL Portage project support by CANARIE in 2019-20. In line with the terms of CANARIE's Contribution Agreement amendment, this underspend was reallocated within Technology Innovation to support RDM Call 1 projects:

- University of Saskatchewan: Radam - Management Software for Active Research Data
- Ontario Brain Institute: Research Portal for Secure Data Discovery, Access and Collaboration
- University of British Columbia: Federated Geospatial Data Discovery for Canada
- McGill University: Canadian Health Omics Repository, Distributed (CanDIG CHORD)
- University of Toronto: Dataverse for the Canadian Research Community
- University of Toronto: DuraCloud – Linking Data Repositories to Preservation Storage
- University of Prince Edward Island: Managing the Research Data Lifecycle using Islandora
- Ocean Networks Canada: Making Identifiers Necessary to Track Evolving Data (MINTED)
- CRIM:FAIR Repository for Annotations, Corpora and Schemas (FRACS)

All funding committed in the 2015-2020 Mandate is expected to be dispersed by June 2021.

## **4. Statement of Eligible Activities for 2021-22 and for the Foreseeable Future**

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In 2021-22, CANARIE will continue to align its activities towards the goal of strengthening Canada's digital research infrastructure. In 2021-22, CANARIE plans to continue its focus on its three eligible activities, as laid out in the 2021-22 Business Plan

### **4.1 Network Evolution:**

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#### **4.1.1 CANARIE Network:**

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##### ***Deployment of additional network capacity to support traffic growth***

CANARIE will continue to improve the capacity, redundancy, and resiliency of the CANARIE network, in order to meet the needs of Canada's research, education, and innovation communities.

##### ***Deployment of additional network capacity to support Northern connectivity***

CANARIE will improve the capacity, redundancy and resiliency of the CANARIE network in Northern Canada, in order to meet the needs of Canada's research, education, and innovation communities in these regions.

##### ***Improvement of network security reporting, monitoring and measurement system***

CANARIE will continue to work with the NREN Partners on the NREN SIEM Deployment Project, to improve the security of both the CANARIE Network and the NREN, and to create a community of NREN security analysts across the country. These projects have been extended into FY22.

##### ***Deployment of the Software Networking Applications***

CANARIE will continue to explore opportunities and technologies to deploy Network Automation tools for streamlining the network operational processes and improving alert notifications.

##### ***Deployment of support tools accessible through the user portal***

CANARIE continues to develop features for the network support portal, in order to improve support for users.

##### ***Improved commercial cloud support***

CANARIE will establish an additional direct connection with Microsoft in Montreal. CANARIE also plans to examine improving the peering capacity with cloud providers wherever feasible.

##### ***Improvement of the Global Research and Education Network (GREN) Map***

CANARIE will provide a demo of the GREN Map at the (online) TNC21 conference, held by the pan-European Research and Education Network GEANT, in June 2021, and will continue to add data and functionality to the map through 2021-22.

##### ***Adoption of NIST Risk Management Methodology for internal network Threat Risk Assessment***

CANARIE will transition from using the Information Security Forum (ISF) security posture HealthCheck

assessment to the National Institute of Standards and Technology (NIST) Cyber Security Framework (CSF) in late FY21. CANARIE plans to have the NIST CSF compliance assessment completed by a third-party certified auditor in FY22.

***Operate the Distributed Denial of Service (DDoS) detection system dedicated to the CANARIE network and actively collaborate with NREN Partners on the validation of incident data and delivery of mitigation options***

CANARIE will continue to work with NREN Partners to increase the value of the DDoS detection system. CANARIE will also collaborate internationally with our partners; for example, CANARIE is in dialogue with Internet2 in the United States to plan for mitigating DDoS attacks impacting both networks.

***Continue to support connections to government research facilities that meet the performance needs of the government science community***

CANARIE continues working with Shared Services Canada to evaluate departmental needs in supporting the government science community.

***4.1.2 Canadian Access Federation:***

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***Increased adoption of CAF services***

CANARIE will continue to promote the benefits of the Canadian Access Federation – both *eduroam* and Federated Identity Management – to the research and education community. To this end, CANARIE will continue to investigate opportunities to extend the reach and expand the benefit of the CAF identity services, including with the private sector.

***Increased number of eduroam logins per year, following the decline in March 2020 due to COVID-19***

CANARIE expects to see continued growth in *eduroam* logins as more students, faculty and staff are expected on campus following the COVID-19 pandemic.

***Increased number of projects to upgrade the capacity/capability of the federation; and Increased number of interfaces, applications, and tools available to support CAF services***

CANARIE will continue to investigate opportunities to extend the reach and expand the benefit of the CAF identity services, including with the private sector.

***4.1.3 NREN Program:***

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***Completion of second competitive funding call issued to meet NREN Partner's network requirements***

The second competitive funding call for the NREN program was launched on April 27, 2021. The purpose of this \$3.3M Competitive Funding Call is to enable NREN Partners to create, extend, or maintain network infrastructure and/or advanced network capabilities to support collaboration and research both nationally and internationally and to enable increased access to, and use of, the NREN.

***Technical audits of funded projects***

Audits of projects funded under Call 1 and Call 2 will take place over the course of this mandate.

### ***Increased reliability, capacity and security on network segments shared by NREN Partners***

The NREN Partners will continue to work together on the completion of projects to improve on the network operations and security of the NREN. Projects such as MANRS compliance, denial-of-service (DDoS) attack mitigation and Information Security Assessment are currently underway. In addition, the NREN Partners continue to work together in a collaborative manner on improvement of network operations and enhancements to network performance analysis.

### ***Development and launch of projects to enhance security***

CANARIE is working with the NREN GC to prioritize and action cybersecurity initiatives to enhance security for the NREN, and for the member institutions. This is an ongoing focus for the NREN GC and its Committees and Working Groups in FY22.

### ***Continued progress towards the technical implementation of the Nunavut NREN partner***

Work will continue, through the relationship established with Nunavut Arctic College, to develop a framework that will support the realization of an NREN connection in Nunavut.

### ***Organization of an NREN Assembly event to foster engagement between NREN Partners***

The NREN Assembly is now an annual event bringing together staff from various departments across the NREN Partners, to foster engagement and understanding of our shared goals.

#### ***4.1.4 Cybersecurity Initiatives Program:***

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##### ***Next set of Cybersecurity initiatives defined***

The tentative launch date for the IDS initiative has been set for July 2021. Proposals for future initiatives were introduced to the CAC at its June 7, 2021 meeting.

##### ***DNS Firewall, Intrusion Detection System, and Threat Feed initiatives deployed at eligible organizations***

CANARIE will continue to work with our NREN Partners to encourage adoption of all initiatives.

##### ***First draft of a cybersecurity assessment framework developed***

Work on a first draft of a cybersecurity assessment will be completed during FY22. Additionally, CANARIE is currently working with our NREN Partners on an Information Security (IS) assessment pilot.

## **4.2 Technology Innovation**

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### ***4.2.1 Research Software Program:***

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#### ***Enhanced documented metrics and best practices for the Local Research Software Support Initiative***

CANARIE will continue to build upon the best practices and metrics for the initiative based on the experiences gained from both the pilot and the projects funded under the Local Research Software Support Call 1.

### ***Financial and technical audits of the development portion of funded projects under platform Call 3***

CANARIE plans to carry out all necessary financial audits by the end of 2022-2023. End of development technical audits for platform Call 3 and Local Research Software Support Call 1 will be completed by mid-May 2021.

### ***Transition to the maintenance portions of projects funded under platform Call 3***

All fourteen (14) projects funded under Platform Call 3 have met the requirements to transition to the first maintenance phase, which runs from April 2021 to March 2022.

### ***CRSC 2021 held and feedback from attendees documented***

The Canadian Research Software Conference will return, following the cancellation of the 2020 edition due to the COVID-19 pandemic.

## **4.2.2 Research Data Management:**

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### ***Execution underway for all approved projects in Research Data Management Call 2***

CANARIE will continue execution for all approved projects.

### ***Development of an action plan for RDC's outreach efforts, including Canada's National Data Services Framework***

RDC will continue to facilitate discussions of best practices and national data services via additional NDSF Summits and associated stakeholder meetings. Remaining activities in the RDC Roadmap will be transitioned to NDRIO in FY22.

### ***Financial audits of Call 2 funded projects completed as required***

CANARIE plans to carry out all necessary financial audits of by the end of 2022-23.

### ***Development and use of RDM services, tools and platforms that enable Canadians to adopt RDM practices and comply with evolving funder policy***

RDC continues to work with several Canadian and international groups on the development and deployment of RDM tools and services. With the launch of the Tri-Agencies Data Management Policy in April 2021, this effort is gaining momentum, as research organizations will be required to respond to the three pillars of the Policy (institutional RDM strategies, data management plans, and data deposit) by 2023. Efforts include participation on various NDRIO working groups as both Portage and RDC transition to the new organization.

### ***Development of end-of-project metrics that demonstrate the impact of targeted funding to the RDM community***

All relevant metrics will be provided to the Government of Canada inline with the Performance Report.

## **4.2.3 Innovation Fund:**

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### ***Initial project to be supported is defined***

CANARIE will work with the community to define parameters for an initial project or projects.



## 4.3 Private Sector Innovation:

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### 4.3.1 DAIR Program:

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#### ***Increase usage of DAIR***

CANARIE will continue to accept applicants and to promote the DAIR program, and the benefits of cloud computing, to Canadian SMEs.

#### ***New features added to the DAIR cloud platform***

CANARIE will leverage Canadian public cloud to speed up SMEs' access to new cloud services based on availability, demand and the ability to monitor and control spending within an allocated budget.

#### ***Content released to educate SMEs on cloud independence and security in the cloud***

CANARIE will develop three or more tutorials published in the form of website documents, blog posts, or short videos intended to increase participant knowledge in the areas of cloud independence, cloud development and cloud security best practices.

#### ***Monitor ongoing cloud usage patterns of SMEs as they develop and test cloud-based applications and services***

CANARIE will monitor and evaluate cloud usage patterns to inform stakeholders and provide valuable input for future strategic investments and direction in the DAIR program.

#### ***Provide additional BoosterPack Tutorials, in order to reduce the time and cost for SMEs to develop new technology skills***

CANARIE expects to release six (6) new BoosterPacks before FY23.

#### ***Further advance the partnership between DAIR and CENGN, making participant transitions between programs more apparent and seamless***

CANARIE will work with CENGN and other stakeholders to develop an integrated ecosystem of support for SMEs.

### 4.3.2 Centre of Excellence in Next Generation Networks (CENGN):

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#### ***CENGN will be able to leverage the CANARIE network to support advanced testing and demonstration of new ICT products and services***

There continues to be a robust pipeline of new projects at CENGN that will likely leverage the CANARIE network. CANARIE continues to work with partners at CENGN to evolve the infrastructure to develop an enhanced level of capability.

CANARIE also continues to participate in discussions with public and private sector stakeholders wishing to gain CANARIE's support for new network test-bed initiatives. This interest indicates the critical role of advanced networking in supporting a range of strategic technology research and development projects. CANARIE will continue to work with its stakeholder partners and the Government of Canada to ensure

that its powerful network infrastructure is leveraged to support Canadian competitiveness in advanced technologies.

#### **4.4 Activities Supporting Equity, Diversity, and Inclusion:**

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In 2021-22 CANARIE will continue to implement activities that support EDI. CANARIE plans to continue working with NDRI, and our expected outcomes for 2021-22 include:

- Development of an Equity, Diversity, and Inclusion statement shared with other DRI providers

- Development of CANARIE's EDI philosophy

- Development of CANARIE's equity, diversity, and inclusion action plan

- Comprehensive training for CANARIE and the NREN GC

- Continued compliance with the Board diversity policy

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Over the next year, CANARIE will ensure that all activities that have been implemented to achieve these eligible activities will be successfully completed, in line with the terms and conditions of CANARIE's Contribution Agreement.

## 5. List of Eligible Projects and Funding Provided to Each

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### 5.1 National Research and Education Network Program (NREN)

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The NREN program continues to support the advancement of Canada's National Research and Education Network. The program's key objective is to strengthen the impact of Canada's co-delivery model and enable aligned strategic evolution of the NREN based on national priorities. Program objectives are achieved through a variety of initiatives:

- Competitive funding enables provincial/territorial network partners to upgrade network infrastructure and extend provincial network connections;
- Directed funding ensures that the National Research and Education Network evolves in a consistent, coherent and strategic manner;
- Interconnection and Co-delivery funding ensures that provincial and territorial partners support co-delivery of the NREN and comply with the requirements of CANARIE's Interconnection Agreement; and
- Operating and Strengthening the NREN promotes the impact of Canada's co-delivery model.

In 2020-21, \$.245M was paid to the NREN Partners for Interconnection and Co-delivery.

Table 5.1 details the NREN partners that utilized Competitive NREN funds during the year.

Table 5.1 NREN Program – Competitive Funding Call 1 (\$ 000s)

NREN Partner	Funding		
	2020-21	Commitments	Total
ORION	-	1,364	1,364
Cybera	17	191	208
BCNET	96	-	96
ECN-PEI	-	31	31
<b>Total</b>	<b>113</b>	<b>1,586</b>	<b>1,699</b>

The NREN program supported the funding for a Cybersecurity Analyst at each of the NREN Partners during the prior mandate in 2019-20. The project completed in 2020-21 and Table 5.1a details the utilization of the funds during the year.

Table 5.1a NREN Program – Directed Funding (\$ 000s)

NREN Partner	Total
ORION	85
BCNET	80
Yukon University	77
Cybera	67
RISQ	63
SRNET	55
ACORN-NS	44
ECN-NB	35
ACORN-NL	17
MRnet	10
<b>Total</b>	<b>533</b>

In 2020-21, \$.140M of Directed Funding was utilized to secure technical support for security infrastructure and renewal of server maintenance services for each of the NREN Partners.

## 5.2 Joint Security Project

The Joint Security Project strengthens the overall security of NREN-connected institutions in the short term, and helps them better understand potential vulnerabilities, by providing a common Intrusion Detection System (IDS) to participating institutions and promoting the sharing of threat data, and by facilitating the development of a community of institutional security specialists to increase institutional awareness of security issues.

Funding for the 137 institutions to participate and 3 IDS platform projects were approved during the prior mandate in 2019-20. The project completed in 2020-21 and Table 5.2 details the utilization of the funds during the year.

Table 5.2 Intrusion Detection System (\$ 000s)

	Total
<b>Institutional Participation</b>	2,287
<b>Platform Projects</b>	
Concordia University	205
University of Waterloo	208
McMaster University	48
<b>Total</b>	<b>2,748</b>

## 5.3 Cybersecurity Initiatives Program

The Cybersecurity Initiatives Program (CIP) provides investments in initiatives that will strengthen cybersecurity efforts of the research and education sector with advanced technologies, improved processes, and broadened expertise. These initiatives are delivered to eligible organizations through the provincial and territorial partners in Canada’s National Research and Education Network (NREN).

In 2020-21, CANARIE further extended the funding of the IDS platform projects. Table 5.3 details the utilization of the funds during the year.

**Table 5.3 Intrusion Detection System (\$ 000s)**

Platform Projects	Funding		Total
	2020-21	Commitments	
Concordia University	28	22	50
University of Waterloo	50	-	50
McMaster University	50	-	50
<b>Total</b>	<b>128</b>	<b>22</b>	<b>150</b>

In 2020-21, \$.099M was paid to secure CIRA DNS Firewall services for eligible organizations.

In 2020-21, \$.399M was paid to the NREN Partners for community collaboration support.

#### 5.4 Research Software Program

The Research Software Program leverages the services developed under previous mandates to drive collaborative development of reusable software services and adaptation of existing research platforms for use across multiple research domains, providing researchers with the tools required to accelerate research.

The Research Software Program launched its second funding call during the prior mandate in 2017-18. The projects were completed in 2020-21 and Table 5.4 details the utilization of the funds during the year.

**Table 5.4 Research Software Program – Call 2a (\$ 000s)**

Lead Contractor	Total
University of Waterloo	68
University of British Columbia	55
University of Guelph	45
Queen's University	25
University of Waterloo	10
<b>Total</b>	<b>203</b>

The Research Software Program launched its third funding call during the prior mandate in 2018-19. The projects were completed in 2020-21 and Table 5.4a details the utilization of the funds during the year.

**Table 5.4a Research Software Program – Call 2b (\$ 000s)**

<b>Lead Contractor</b>	<b>Total</b>
Ocean Networks Canada	99
École de technologie supérieure	68
University of Victoria	65
McMaster University	56
Simon Fraser University	55
SensorUp Inc	53
University of Guelph	51
Simon Fraser University	49
Concordia University	49
McGill University	49
McGill University	48
Université de Sherbrooke	47
Ocean Networks Canada	45
University of Calgary	44
Queens University	43
CRIM	43
Université de Sherbrooke	36
University of Waterloo	34
Bird Studies Canada	34
<b>Total</b>	<b>968</b>

The Research Software Program launched its first funding call of the current mandate in 2020-21. Table 5.4b details the projects that were approved for funding under that call, and the utilization of the funds during the year.

**Table 5.4b Research Software Program – Call 3 (\$ 000s)**

Lead Contractor	Funding		Total
	2020-21	Commitments	
University of Victoria	77	223	300
Ontario Institute for Cancer Research	100	199	299
The Governing Council of the University of Toronto	64	235	299
London Health Sciences Centre Research Inc.	97	199	296
The Royal Institution for the Advancement of Learning/McGill University	88	207	295
École de Technologie Supérieure	41	209	250
Université du Sherbrooke	50	200	250
Simon Fraser University	29	221	250
Queen's University	51	198	249
University of Waterloo	44	205	249
University of Waterloo	50	199	249
Bird Studies Canada	50	199	249
The Royal institution for the Advancement of Learning/McGill University	41	204	245
Concordia University	25	186	211
<b>Total</b>	<b>807</b>	<b>2,884</b>	<b>3,691</b>

The Research Software Program launched a local software support pilot during the prior mandate in 2018-19. The project completed in 2020-21 and Table 5.4c details the utilization of the funds during the year.

**Table 5.4c Research Software Program – Local software support pilot (\$ 000s)**

Lead Contractor	Total
Carleton University	344
University of Regina	217
McMaster University	115
<b>Total</b>	<b>676</b>

The Research Software Program launched the first local research software support call of the current mandate in 2020-21. Table 5.4d details the projects that were approved for funding under that call, and the utilization of the funds during the year.

Table 5.4d Research Software Program – Local Research Software Support - Call 1 (\$ 000s)

Lead Contractor	Funding		
	2020-21	Commitments	Total
Simon Fraser University	90	510	600
University of Sherbrooke	71	529	600
University of Laval	73	527	600
University of Calgary	58	542	600
Sunnybrook Research Institute	126	473	599
University of Ottawa	34	565	599
<b>Total</b>	<b>452</b>	<b>3,146</b>	<b>3,599</b>

## 5.5 Research Data Management

The Research Data Management Program continues to support and enable national initiatives that advance the appropriate management of research data across Canadian sectors, fueling new discoveries and business opportunities.

CANARIE supported the Canadian Association of Research Libraries' (CARL) Portage Network project during the prior mandate in 2019-20. The project completed in 2020-21 and Table 5.5 details the utilization of the funds during the year.

Table 5.5 Funding support for CARL (\$ 000s)

Lead Contractor	Total
CARL Portage	1,162
<b>Total</b>	<b>1,162</b>

The Research Data Management Program launched its first funding call of the current mandate in 2020-21. Table 5.5a details the projects that were approved for funding under that call, and the utilization of the funds during the year.

Table 5.5a Research Data Management – Call 2 (\$ 000s)

Lead Contractor	Funding		
	2020-21	Commitments	Total
The Hospital for Sick Children	326	366	692
Indoc Research	248	251	499
Simon Fraser University	223	257	480
<b>Total</b>	<b>797</b>	<b>874</b>	<b>1,671</b>

## 5.6 Digital Accelerator for Innovation and Research (DAIR) Program

DAIR is an integrated virtual environment that leverages the CANARIE network to enable SMEs to develop and test new ICT and other digital technologies. It combines advanced networking, cloud computing, and storage resources to create an environment to develop and test innovative ICT applications, protocols, and services; perform at-scale experimentation for deployment; and facilitate a faster time to market.



DAIR committed funding to partners to manage the DAIR resources and ensure their availability and maintenance for the duration of the mandate. Table 5.5 details the project that was approved for funding and the utilization of the funds during the year.

**Table 5.6 Digital Accelerator for Innovation and Research (DAIR) Program (\$ 000s)**

Lead Contractor	Funding		
	2020-21	Commitments	Total
Cybera	151	551	702
<b>Total</b>	<b>151</b>	<b>551</b>	<b>702</b>

## 6. Summary of Spending on Eligible Expenditures

Total Eligible Expenditures in 2020-21 were \$25.263M. Table 6.0 details the expenditures.

Table 6.0 Eligible Expenditures (\$ 000s)

Expenditures	Audited Financial Statements	Commitments 2015-20	Accounting Adjustments *	Total Eligible Expenditure 2020-21
<b>PROGRAM</b>				
<b>Network Operations</b>				
Network Infrastructure & Services	11,239	-	2,414	13,653
Security	5,381	(2,260)	(604)	2,518
NREN	1,571	(521)	(11)	1,039
<b>Technology Innovation</b>				
Research Software	3,715	(1,943)	(74)	1,697
Research Data Management	885	(40)	21	866
National Research Data Management (CARL)	1,182	(1,182)	-	-
Research Data Canada	296	-	-	296
<b>Private Sector Innovation</b>	1,227	(7)	(121)	1,100
<b>Total Program</b>	<b>25,497</b>	<b>(5,953)</b>	<b>1,625</b>	<b>21,168</b>
<b>Operating Expenses</b>	3,987	2	105	4,095
<b>Total</b>	<b>29,484</b>	<b>(5,951)</b>	<b>1,730</b>	<b>25,263</b>

\*Accounting adjustments include timing differences for assets purchases and related amortization.

## 7. Statement of Total Funding Received

In 2020-21, CANARIE received \$30.983M in total funding to support Eligible Activities. Table 7.0 details the funding sources.

Table 7.0 Total Funding Received (\$ 000s)

<b>Funding Received</b>	<b>2020-21</b>
ISED Funding	30,200
User Fees	719
Interest Income	64
<b>Total</b>	<b>30,983</b>

Table 7.0a details the 2020-21 Cost Recovery from CANARIE programs in the current mandate.

Table 7.0a Total Cost Recovery (\$ 000s)

<b>Cost Recovery</b>	<b>2020-21</b>
<b>Matching Funds</b>	
NREN	61
DAIR	16
<b>Total Matching Funds</b>	<b>77</b>
<b>In-Kind Contributions</b>	
Research Software	432
Research Data Management	225
<b>Total In-Kind Contributions</b>	<b>657</b>
<b>Total</b>	<b>734</b>

Table 7.0b details the 2020-21 Cost Recovery from CANARIE programs in the prior mandate.

Table 7.0b Total Cost Recovery (\$ 000s)

<b>Cost Recovery</b>	<b>2020-21</b>
<b>Matching Funds</b>	
NREN	181
<b>Total Matching Funds</b>	<b>181</b>
<b>In-Kind Contributions</b>	
Research Software	655
<b>Total In-Kind Contributions</b>	<b>655</b>
<b>Total</b>	<b>836</b>

## **8. Criteria Applied to Select Eligible Projects**

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Project proposals are reviewed relative to the mandatory criteria and the scoring criteria for each program. These criteria are approved by the CANARIE Board of Directors. Evaluation of proposals relative to these criteria constitute the basis for the decision whether or not a project receives CANARIE funding. Projects that fail to meet the mandatory criteria, or fail to meet evaluative criteria to an acceptable degree, are not funded.

## 9. Statement of Compensation

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Directors on CANARIE's Board, including officer positions such as Chair, Vice-Chair and Secretary/Treasurer, receive no compensation beyond reimbursement for any reasonable out-of-pocket expenses incurred while performing their duties or attending CANARIE meetings.

The President and CEO of the organization has a compensation package that is benchmarked regularly against external comparatives by an external consultant and overseen by the HR (Executive) Committee of the Board. All other staff positions at CANARIE are classified according to a structured system that assigns a salary range to each position. The system and staff salaries are regularly benchmarked against comparative organizations by an external consultant.

For the fiscal year ending March 31, 2021, salary ranges for all officers and employees of CANARIE whose total compensation remuneration paid exceeded \$100,000 (including any fee, allowance or other benefit) are presented below.

### **Officers**

President and CEO  
*\$337,500 - \$468,700*

Chief Financial Officer  
Chief Technology Officer  
Vice President, Business Development  
Vice President, External Relations  
*\$184,500 - \$297,000*

### **Employees**

Chief Engineer  
Director, Cybersecurity  
Executive Director, Research Data Canada  
Senior Director, Applications  
Senior Director, Business Development  
Senior Director, Finance and Operations  
Senior Director, Programs  
*\$153,000 - \$243,800*

Director, Communications  
Director, IT  
Director, Program Operations  
Director, Strategic Policy and Analysis  
Senior Network Engineer  
*\$113,700 - \$186,500*

DevOps Specialist  
Finance Manager  
Financial Systems Manager  
Manager, Analytics  
Manager, Corporate Services  
Manager, Human Resources  
Manager, Program Marketing  
Manager, Software Development  
Network Engineer  
Network Manager  
Program Accounting Manager  
Program Manager, Cybersecurity Initiatives  
Program Manager, DAIR Cloud  
Program Manager, Identity and Access Management  
Program Manager, NREN  
Project Manager  
Senior Cybersecurity Analyst  
Software Developer  
Solution Architect  
Technology Architect, CAF  
*\$105,000 - \$154,000*

Network Engineer  
Senior IT Specialist  
Support Engineer, IAM  
Test Engineer  
*\$100,000 - \$121,500*

## **10. Statement of CANARIE's Investment Policies, Standards, and Procedures**

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CANARIE's investment strategy is specifically tailored to the duration and quality constraints in terms of investment options imposed by the Statement of Investment Policy and the Contribution Agreement with Innovation, Science and Economic Development Canada. These constraints, while deemed appropriate and necessary to meet the overall objectives of CANARIE, preclude a more active approach to investment management.

Rather than active investment management, the strategy adopted by CANARIE is "buy and hold", based on the following framework:

- Investment maturities will, wherever possible, match the forecasted cash requirements of CANARIE.
- The quantitative limits on investment holdings provide ample structural liquidity to meet the needs of CANARIE. It is appropriate, therefore, to hold less liquid types of approved investments. Value added will be achieved by moving out the "liquidity curve" when possible.
- At all times, CANARIE will hold investments deemed eligible under the Statement of Investment Policy.

Within this context, CANARIE's official Statement of Investment Policy is adopted by the Board of Directors and reviewed and approved in the year by the Audit & Investment Committee of the Board. It was last reviewed and approved in October 2020. There were no changes to the Policy, standards, or procedures during the year.

## 11. Summary of the Results of Audits and Evaluations Carried Out During the Year

**Financial Audit:** CANARIE annually provides for a Financial Audit undertaken by independent auditors who are approved each year by CANARIE’s membership and overseen by the Audit and Investment Committee of the Board. The results of this Audit are provided to the Minister as part of each year’s Annual Report to the Minister. The Financial Audit for the 2020-21 Fiscal Year was completed in June 2021 by BDO Canada LLP, Chartered Professional Accountants.

**Recipient Audits:** In agreements with Eligible Ultimate Recipients for Eligible Projects, CANARIE is required to provide for the conduct of an audit of:

- (i) any Eligible Project where CANARIE’s contribution exceeds \$1M,
- (ii) any Eligible Project where CANARIE deems that an audit is appropriate, and
- (iii) a representative sample of projects to which CANARIE has contributed less than \$1M,

according to the terms and procedures set out in the Performance and Risk Framework and the Contribution Agreement.

CANARIE includes in its contracts with Eligible Ultimate Recipients a requirement for the conduct of an audit by an auditor selected by CANARIE for all funded projects, regardless of the amount of CANARIE funding received. This provides CANARIE with the ability to audit projects where warranted or deemed appropriate, and to perform representative sample audits.

Through a competitive procurement process CANARIE selected two audit firms to manage the recipient audits. The firms audited the projects where funding was provided during the current mandate, according to an audit plan that was developed to meet the requirements of the Contribution Agreement, and the Performance and Risk Framework developed for the current mandate.

The following tables reflects the audits performed in fiscal 2020-21 by program.

**Table 11.0 Recipient Audits – Cybersecurity Initiatives Program**

Lead Contractor	Project
McMaster University	CanIDS
University of Waterloo	Hadoop and Jupyter



**Table 11.0a Recipient Audits – Research Software**

<b>Lead Contractor</b>	<b>Project</b>
Bird Studies Canada	Motus Wild Life Tracking System
Concordia University	Atlascine
CRIM	VESTA integree a ELAN
École de technologie supérieure	PAVICS B
McGill University	CBRAIN
McGill University Health Centre	OBiBa
McMaster University	Local Support - Reuse Existing Software
McMaster University	HORTON
Ocean Networks Canada	2.0 Sea Tube SeaScribe
Queen's University	3D Slicer
Queen's University	3D slicer
SensorUp Inc.	GeoCENS
Simon Fraser University	iReceptor
Simon Fraser University	IRIDA
Universite de Sherbrooke	PAVICS A
Universite de Sherbrooke	GenAP
University of BC	Montage
University of Calgary	MSS-Improv
University of Regina	Local Support - Reuse Existing Software
University of Victoria	HUES
University of Waterloo	iEnvironment
University of Waterloo	Open PNM
University of Waterloo	iEnvironment++

**Table 11.0b Recipient Audits – Research Data Management**

<b>Lead Contractor</b>	<b>Project</b>
Canadian Association of Research Libraries	Portage
CRIM	FRACS-FAIR Repository for Annotations, Corpora and Schema
McGill University	CanDIG CHORD: Canadian Health Omics Repository, Distributed
Ocean Networks Canada	MINTED: Making Identifiers Necessary to Track Evolving Data
Ontario Brain Institute	Research Portal for Secure Data Discovery, Access, and Collaboration
UBC Library	Federated Geospatial Data Discovery for Canada
University of PEI	Islandora - Lifecycle Approach CLAW
University of Saskatchewan	Management Software for Active Research Data
University of Toronto	DuraCloud UAV
University of Toronto	Dataverse for the Canadian research Community: Developing reusable and scalable tools for data deposit, curation and sharing

**Appendix 1: CANARIE Inc. Financial Statements – March 31, 2021**

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~ attached ~

**CANARIE Inc.**  
**Financial Statements**  
For the year ended March 31, 2021

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Statement of Operations	7
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Suite 1700  
Ottawa ON K1P 0B6 Canada

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## Independent Auditor's Report

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### To the members of CANARIE Inc.

#### Opinion

We have audited the financial statements of CANARIE Inc., which comprise the statements of financial position at March 31, 2021 and the statements of operations, changes in net assets and cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of CANARIE Inc. as at March 31, 2021 and its financial performance and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

#### Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report. We are independent of CANARIE Inc. in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

#### Other Information

Management is responsible for the other information. The other information comprises the information included in the annual report.

Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information identified above and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

We obtained the annual report prior to the date of this auditor's report. If, based on the work we have performed on this other information, we conclude that there is a material misstatement of this other information, we are required to report that fact in this auditor's report. We have nothing to report in this regard.

## **Responsibilities of Management and Those Charged with Governance for the Financial Statements**

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing CANARIE Inc.'s ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate CANARIE Inc. or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing CANARIE Inc.'s financial reporting process.

## **Auditor's Responsibilities for the Audit of the Financial Statements**

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of CANARIE Inc.'s internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on CANARIE Inc.'s ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause CANARIE Inc. to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.



We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

*BDO Canada LLP*

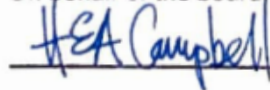
Chartered Professional Accountants, Licensed Public Accountants

Ottawa, Ontario  
June 28, 2021

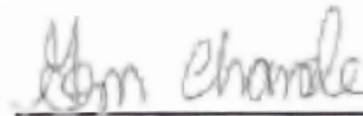
**CANARIE Inc.**  
**Statement of Financial Position**

March 31	2021	2020
<b>Assets</b>		
<b>Current</b>		
Cash	\$ 1,245,611	\$ 12,852,244
Investments (Note 2)	17,256,821	6,975,699
Accounts and other receivable	975,942	807,960
Prepaid expenses and deposits (Note 3)	5,121,259	3,627,575
	24,599,633	24,263,478
<b>Investments (Note 2)</b>	-	648,258
<b>Prepaid expenses and deposits (Note 3)</b>	6,157,176	4,337,579
<b>Tangible capital assets, assets under capital lease and intangible asset (Note 4)</b>	11,975,682	12,577,050
	\$ 42,732,491	\$ 41,826,365
<b>Liabilities and Net Assets</b>		
<b>Current</b>		
Accounts payable and accrued liabilities (Note 5)	\$ 5,547,938	\$ 4,553,851
Deferred revenue	40,000	-
Deferred funding (Note 6)	10,310,545	9,847,235
Current portion of obligation under capital lease (Note 8)	244,082	2,130,617
	16,142,565	16,531,703
<b>Deferred funding (Note 6)</b>	6,306,354	4,457,160
<b>Deferred capital funding (Note 7)</b>	12,113,998	12,715,251
<b>Obligation under capital lease (Note 8)</b>	452,970	697,052
	35,015,887	34,401,166
<b>Commitments (Note 9)</b>		
<b>Net Assets</b>		
Unrestricted	57,792	54,790
Internally restricted royalty fund	2,462,819	2,433,629
Internally restricted for windup of operations	5,195,993	4,936,780
	7,716,604	7,425,199
	\$ 42,732,491	\$ 41,826,365

On behalf of the board;



Director



Director

**CANARIE Inc.**  
**Statement of Changes in Net Assets**

<b>For the year ended March 31</b>	<b>Unrestricted</b>	<b>Internally Restricted Royalty Fund (Note 10)</b>	<b>Internally Restricted for Windup of Operations (Note 10)</b>	<b>2021</b>	<b>2020</b>
<b>Balance,</b> beginning of the year	\$ 54,790	\$2,433,629	\$ 4,936,780	\$7,425,199	\$7,012,119
Membership	326,875	-	-	326,875	297,294
Investment income	657	29,190	59,213	89,060	148,153
Expenses	(124,530)	-	-	(124,530)	(32,367)
<b>Excess of revenues over expenses</b>	203,002	29,190	59,213	291,405	413,080
	257,792	2,462,819	4,995,993	7,716,604	7,425,199
<b>Interfund transfers (Note 10)</b>	(200,000)	-	200,000	-	-
<b>Balance, end of the year</b>	<b>\$ 57,792</b>	<b>\$2,462,819</b>	<b>\$ 5,195,993</b>	<b>\$7,716,604</b>	<b>\$7,425,199</b>

The notes are an integral part of these financial statements.



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**CANARIE Inc.**  
**Statement of Operations**

<b>For the year ended March 31</b>	<b>2021</b>	<b>2020</b>
<b>Revenues</b>		
Industry Canada / ISED funding	\$ 29,484,244	\$ 29,977,129
Membership	326,875	297,294
Investment income	89,060	148,153
	<hr/>	<hr/>
	29,900,179	30,422,576
<b>Expenses (Schedule)</b>		
Program	25,496,800	26,229,453
Operating	3,987,444	3,747,676
Corporate	124,530	32,367
	<hr/>	<hr/>
	29,608,774	30,009,496
<b>Excess of revenues over expenses</b>	<b>\$ 291,405</b>	<b>\$ 413,080</b>

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**CANARIE Inc.**  
**Schedule of Expenses**

<b>For the year ended March 31</b>	<b>Program</b>	<b>Operating</b>	<b>Corporate</b>	<b>2021 Total</b>
Direct program	\$ 16,735,595	\$ -	\$ -	\$ 16,735,595
Employee and consultants	5,594,988	2,908,629	123,595	8,627,212
Marketing and promotion	85,376	100,736	-	186,112
Travel	3,043	2,756	-	5,799
Rent	-	480,326	-	480,326
General office and supplies	55,454	199,695	823	255,972
Meetings and conferences	8,711	1,925	-	10,636
Equipment, software and maintenance	99,610	162,868	-	262,478
Professional fees	218,897	28,885	-	247,782
Interest on obligation under capital lease	44,924	-	-	44,924
	22,846,598	3,885,820	124,418	26,856,836
Plus: amortization	2,650,202	101,624	112	2,751,938
	<b>\$ 25,496,800</b>	<b>\$ 3,987,444</b>	<b>\$ 124,530</b>	<b>\$ 29,608,774</b>

**CANARIE Inc.**  
**Schedule of Expenses**

<b>For the year ended March 31</b>	<b>Program</b>	<b>Operating</b>	<b>Corporate</b>	<b>2020 Total</b>
Direct program	\$ 18,193,486	\$ -	\$ -	\$ 18,193,486
Employee and consultants	4,601,421	2,617,686	17,660	7,236,767
Marketing and promotion	350,904	103,365	-	454,269
Travel	366,110	91,921	-	458,031
Rent	-	398,277	-	398,277
General office and supplies	33,337	162,698	8,191	204,226
Meetings and conferences	38,044	101,720	-	139,764
Equipment, software and maintenance	80,318	141,848	-	222,166
Professional fees	416	36,121	-	36,537
Interest on obligation under capital lease	111,713	-	-	111,713
	23,775,749	3,653,636	25,851	27,455,236
Plus: amortization	2,453,704	94,040	6,516	2,554,260
	<b>\$ 26,229,453</b>	<b>\$ 3,747,676</b>	<b>\$ 32,367</b>	<b>\$ 30,009,496</b>

**CANARIE Inc.**  
**Statement of Cash Flows**

<b>For the year ended March 31</b>	<b>2021</b>	<b>2020</b>
<b>Cash flows from operating activities</b>		
Industry Canada / ISED funding	\$ 30,200,000	\$ 35,958,824
Membership	366,875	294,469
Program - interest	64,605	293,256
Program - user fees	669,009	452,417
Investment income - Corporate	657	3,929
Investment income - Royalty Fund	29,190	50,354
Investment income - Windup of Operations	59,213	93,870
Program expenses	(25,036,698)	(20,001,402)
Operating expenses	(3,863,745)	(3,781,936)
Corporate expenses	(823)	(75,027)
	<u>2,488,283</u>	<u>13,288,754</u>
<b>Cash flows from investing activities</b>		
Acquisition of tangible capital assets and intangible asset	(2,332,075)	(2,821,079)
Proceeds on disposal of tangible capital assets	640	30
Purchase of investments	(30,132,864)	(34,325,000)
Proceeds from disposal of investments	20,500,000	35,500,000
	<u>(11,964,299)</u>	<u>(1,646,049)</u>
<b>Cash flows from financing activities</b>		
Repayment of obligation and interest under capital lease	(2,130,617)	-
	<u>(2,130,617)</u>	<u>-</u>
<b>Net (decrease) increase in cash</b>	(11,606,633)	11,642,705
<b>Cash, beginning of the year</b>	<u>12,852,244</u>	<u>1,209,539</u>
<b>Cash, end of the year</b>	<u>\$ 1,245,611</u>	<u>\$ 12,852,244</u>

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

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**1. Significant Accounting Policies**

**Purpose of Organization**

CANARIE Inc. was incorporated on March 5, 1993 as a non-profit organization without share capital under Part II of the Canadian Corporations Act. CANARIE Inc. was continued under section 211 of the Canada Not-for-profit Corporations Act on November 19, 2013. The objective of CANARIE Inc. is to support the development of the communications infrastructure for a knowledge-based Canada.

As a corporation constituted exclusively for the purpose of carrying on or promoting scientific research and experimental development, CANARIE Inc. is exempt from the payment of income taxes under Section 149(1)(J) of the Income Tax Act (Canada).

**Basis of Accounting**

The financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations.

**Use of Estimates**

The preparation of financial statements in accordance with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from management's best estimates as additional information becomes available in the future. Areas of significant estimates include useful lives of tangible capital assets, assets under capital lease and intangible asset.

**Deferred Funding**

Deferred funding relates to (1) funding received, including interest earned on funding, user fees collected and other recovered eligible costs, in advance of the funding period; (2) funding received for future service; and (3) funding received with respect to the purchase of tangible capital assets, assets under capital lease and intangible asset.

When tangible capital assets, assets under capital lease and intangible asset are disposed, the proceeds increase the deferred funding balance and the net book value decreases the deferred funding balance related to tangible capital assets, assets under capital lease and intangible asset.

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

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**1. Significant Accounting Policies (continued)**

**Revenue Recognition** CANARIE Inc. (the organization) follows the deferral method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unrestricted contributions are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

Funding related to tangible capital assets, assets under capital lease and intangible asset is deferred and recognized as revenue in the same year as the amortization expense of the related tangible capital assets, assets under capital lease and intangible asset.

Service contracts are recognized over the period of the services provided.

Membership fees are recognized over the period of membership.

**Financial Instruments**

Measurement

The organization initially measures its financial assets and liabilities at fair value. The organization subsequently measures all its financial assets and liabilities at amortized cost, except for investments which it chose to measure at fair value. Changes in fair value are recognized in the statement of operations.

Impairment

Financial assets measured at amortized cost are tested for impairment when there are indicators of impairment.

Transaction costs

The organization recognizes its transaction costs in the statement of operations in the year incurred for financial instruments measured at fair value. Financial instruments that are subsequently measured at amortized cost are adjusted by the transaction costs in the initial measurement of the asset or liability.

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

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**1. Significant Accounting Policies (continued)**

<b>Tangible Capital Assets and Intangible Asset</b>	<p>Tangible capital assets and intangible asset are stated at cost less accumulated amortization. Amortization is provided on the basis of their useful lives using the following methods and annual rates:</p> <table><tr><td>Computer equipment</td><td>3 years straight-line basis</td></tr><tr><td>Equipment</td><td>3 years straight-line basis</td></tr><tr><td>Leasehold improvements</td><td>over the term of the lease</td></tr><tr><td>Furniture</td><td>5 years straight-line basis</td></tr><tr><td>Network equipment</td><td>5 years straight-line basis</td></tr><tr><td>Computer software</td><td>2 years straight-line basis</td></tr></table>	Computer equipment	3 years straight-line basis	Equipment	3 years straight-line basis	Leasehold improvements	over the term of the lease	Furniture	5 years straight-line basis	Network equipment	5 years straight-line basis	Computer software	2 years straight-line basis
Computer equipment	3 years straight-line basis												
Equipment	3 years straight-line basis												
Leasehold improvements	over the term of the lease												
Furniture	5 years straight-line basis												
Network equipment	5 years straight-line basis												
Computer software	2 years straight-line basis												
<b>Impairment of Tangible Capital Assets and Intangible Asset</b>	<p>When a tangible capital asset or intangible asset no longer has any long-term service potential to the organization, the excess of its net carrying amount over any residual value is recognized as an expense in the statement of operations.</p>												
<b>Leases</b>	<p>Leases are classified as capital or operating leases. A lease that transfers substantially all of the benefits and risks incidental to the ownership of property is classified as a capital lease. All other leases are accounted for as operating leases wherein rental payments are expensed as incurred.</p> <p>Assets under capital lease are stated at cost less accumulated amortization. They are amortized on a straight-line basis over the expected useful life of the asset to the organization, not to exceed twenty years, which currently corresponds to the term of the lease.</p>												
<b>Contributed Services</b>	<p>During the year, voluntary services (including donated time and travel of board and committee members) were provided. Because of the difficulty of determining their fair value, contributed services are not recognized in the financial statements.</p>												
<b>Presentation of Expenses</b>	<p>Program development, design and implementation activities are classified as program expenses. Activities which are not directly in support of Programs are classified as operating expenses. Activities not eligible for funding under the current contribution agreement are classified as either corporate or royalty fund expenses.</p>												

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

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**2. Investments**

Investments consist of Canadian government treasury bills with annual yields of 0.14% to 0.16% and maturities ranging from June 2021 to December 2021, short-term provincial government coupon bonds with annual yields ranging from 0.22% to 0.34% and maturities ranging from May 2021 to March 2022, short-term guaranteed investment certificates with annual yields ranging from 0.32% to 1.98% and maturities ranging from April 2021 to March 2022, and cash held in investment savings accounts with an annual yield of 0.20%.

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**3. Prepaid Expenses and Deposits**

	<u>2021</u>	<u>2020</u>
Program prepayments and deposits	\$11,024,751	\$ 7,744,522
Operating prepayments	217,184	184,132
Rental deposit	36,500	36,500
	<hr/>	<hr/>
Balance, end of the year	11,278,435	7,965,154
	<hr/>	<hr/>
Current portion	5,121,259	3,627,575
	<hr/>	<hr/>
Long-term portion	<u>\$ 6,157,176</u>	<u>\$ 4,337,579</u>

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

**4. Tangible Capital Assets, Assets under Capital Lease and Intangible Asset**

	2021		2020	
	Cost	Accumulated Amortization	Cost	Accumulated Amortization
Computer equipment	\$ 752,447	\$ 525,746	\$ 608,472	\$ 492,824
Equipment	327,430	139,232	132,345	130,687
Leasehold improvements	838,680	-	464,519	464,519
Leasehold improvements under construction	-	-	320,940	-
Furniture	232,090	26,576	242,515	224,607
Art	2,139	-	2,139	-
Network equipment	16,488,772	12,708,194	15,499,651	11,134,273
Fibre under capital lease	12,712,911	6,060,979	12,712,911	5,080,462
Computer software	275,019	193,079	258,348	137,418
	<u>\$31,629,488</u>	<u>\$ 19,653,806</u>	<u>\$30,241,840</u>	<u>\$ 17,664,790</u>
Net book value		<u>\$ 11,975,682</u>		<u>\$ 12,577,050</u>

During the year, computer equipment with a cost of \$46,537 (2020 - \$69,430) and accumulated amortization of \$46,537 (2020 - \$69,430) was disposed and removed from the total cost and total accumulated amortization.

During the year, equipment with a cost of \$17,195 (2020 - \$Nil) and accumulated amortization of \$17,195 (2020 - \$Nil) was disposed and removed from the total cost and total accumulated amortization.

During the year, furniture with a cost of \$234,672 (2020 - \$Nil) and accumulated amortization of \$234,672 (2020 - \$Nil) was disposed and removed from the total cost and total accumulated amortization.

During the year, leasehold improvements with a cost of \$464,519 (2020 - \$Nil) and accumulated amortization of \$464,519 (2020 - \$Nil) was disposed and removed from the total cost and total accumulated amortization.

During the year, the organization acquired fibre under capital leases with a cost of \$Nil (2020 - \$38,026).

Accounts payable and accrued liabilities include purchased tangible capital assets with a cost of \$137,073 (2020 - \$318,577).

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

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**5. Accounts Payable and Accrued Liabilities**

	<b>2021</b>	2020
Accounts payable and accrued liabilities	\$ 5,515,649	\$ 4,553,851
Government remittances payable	32,289	-
	<b>\$ 5,547,938</b>	<b>\$ 4,553,851</b>

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**6. Deferred Funding**

Pursuant to Funding Agreements signed on July 6, 2019, October 9, 2015, September 4, 2012, and March 28, 2007, the organization received funding of \$30,200,000, \$113,658,824, \$62,000,000 and \$120,000,000 respectively from Innovation, Science and Economic Development Canada ("ISED") (formerly known as Industry Canada) for the design, development, deployment, improvement and operations of the CANARIE network and programs.

The balance of the funds has been reflected as follows:

	<b>2021</b>	2020
<b>Balance, beginning of year</b>	\$14,304,395	\$ 7,842,472
Industry Canada / ISED funding received	30,200,000	35,958,824
Program - user fees	671,955	609,906
Program - interest	64,605	293,256
Program - service contracts	7,520	4,157
Direct program and operating expenses	(26,481,003)	(27,429,385)
Transfer to operating for the acquisition of tangible capital assets, assets under capital lease and intangible asset	(2,150,573)	(2,974,835)
<b>Balance, end of year</b>	16,616,899	14,304,395
<b>Current portion</b>	10,310,545	9,847,235
<b>Long-term portion</b>	<b>\$ 6,306,354</b>	<b>\$ 4,457,160</b>

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

**7. Deferred Capital Funding**

Deferred capital contributions represent amounts funded by Industry Canada / ISED for the purchase of tangible capital assets, assets under capital lease and intangible asset. Deferred funding related to tangible capital assets, assets under capital lease and intangible asset is summarized below:

	<b>2021</b>	2020
<b>Balance, beginning of year</b>	\$12,715,251	\$12,288,160
Funding received related to the acquisition of tangible capital assets, assets under capital lease and intangible asset	2,150,573	2,974,835
Amortization of program and operating assets	(2,751,826)	(2,547,744)
<b>Balance, end of year</b>	<b>\$12,113,998</b>	<b>\$12,715,251</b>

**8. Obligation Under Capital Lease**

	<b>2021</b>	2020
Capital lease for infeasible rights of use of fibre, 4.35%, due December 2024, payable by monthly installments of \$22,423, principal and interest.	\$ 697,052	\$ 1,155,116
Capital lease for infeasible rights of use of fibre, 3.50%, repaid April 2020.	-	1,672,553
	697,052	2,827,669
<b>Less: current portion</b>	244,082	2,130,617
	<b>\$ 452,970</b>	<b>\$ 697,052</b>

Minimum lease payments required in the next three years under the capital lease are as follows:

2022	\$ 269,081
2023	269,081
2024	203,814
	741,976
<b>Less: interest included in minimum payments</b>	44,924
	<b>\$ 697,052</b>

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**CANARIE Inc.**  
**Notes to Financial Statements**

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**9. Commitments**

On November 20, 2019, the organization entered into a new lease agreement for a office space commencing on April 1, 2020, which expires March 31, 2025. Future minimum annual lease payments under this operating lease (which includes base rent and the current charge for additional rent) for the premise are due as follows:

2022	\$ 581,442
2023	591,752
2024	591,752
2025	<u>591,752</u>
	<u>\$ 2,356,698</u>

As at March 31, 2021, the organization had commitments of \$10,474,824 with respect to its programs.

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**10. Internally Restricted Net Assets**

**Royalty Fund**

During the 2007/2008 fiscal year, Industry Canada granted the organization the authority to retain royalties collected after March 31, 2007 and to use these funds in a manner to be determined by the organization. and its legal counsel. Annual allocations to the fund include investment income of \$29,190 (2020 - \$50,353). Disbursements from the fund represent payments to approved funded projects. The fund cannot be reallocated without the approval of the Board of Directors.

**Windup of Operations**

During the 1998 fiscal year, the organization established a fund for the eventual wind up of its operations or for the transition to a new mode of business. In either event, the fund will be used to cover outstanding operating expenses and obligations should a wind up or transition occur. Management performs an annual review of the sufficiency of this fund. Annual allocations to the fund include investment income of \$59,213 (2020 - \$93,870). At March 31, 2021, the organization transferred \$200,000 from its unrestricted net assets to Windup of Operations to maintain the fund. The fund cannot be reallocated without the approval of the Board of Directors.

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**CANARIE Inc.**  
**Notes to Financial Statements**

**March 31, 2021**

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**11. Economic Dependence**

On July 6, 2019, ISED entered into a contribution agreement with the organization to contribute funding totalling \$137,000,000 from April 1, 2020 to March 31, 2024. Of the total contribution, \$30,200,000 was received in fiscal 2021.

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**12. Financial Instruments**

Interest rate risk

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. Fixed rate instruments subject the organization to a fair value risk while variable rate instruments subject it to a cash flow risk. The organization is exposed to this risk for its short-term investments. The risk associated with investments is reduced to a minimum since these assets are invested in short-term maturities.

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**13. COVID-19**

On March 11, 2020 the World Health Organization declared COVID-19 a pandemic which also created a high degree of global economic uncertainty. The financial impact on the organization has been minimal as a result of the pandemic.